



Resource Efficient Use of Mixed Wastes Improving management of construction and demolition waste

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1. Introduction

1.1. Context

Construction and demolition waste (CDW) is the left-over material from construction, refurbishment as well as road and building demolition. It is a mix of different material including inert waste, non-inert non-hazardous waste and hazardous waste.

Due to the diversity of CDW produced per activity, these activities each face different challenges and may develop various management practices accordingly. The two main sectors are the public works, including the road construction sector, and the building sector. While the public works sector has widely developed the use of recycled aggregates in most MS, the building sector is facing major issues mostly due to the diversity of material involved as well as the diversity of building and construction sites in terms of managed quantities and material characteristics. Indeed, CDW generated in the building sector includes a large variety of waste, especially when looking into the finished work waste as well as hazardous waste.

Figure 1 below illustrates the diversity of CDW:

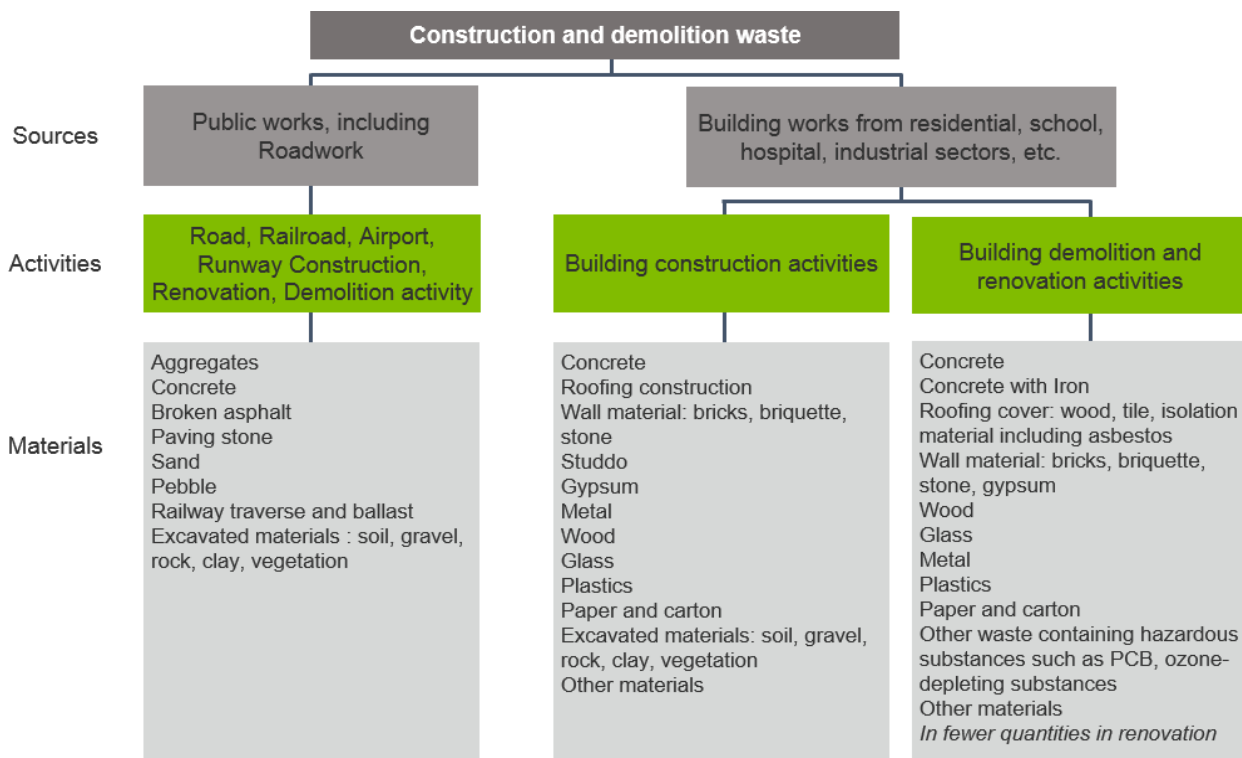


Figure 1: Diversity of CDW per activity

Note: soils are excluded from the WFD definition of CDW but may be included by some MS in their national legislation

CDW is the most significant waste stream in the EU, accounting for over 800 million tonnes per year (including soil). As shown in Figure 1, it consists of various material, including concrete, bricks, gypsum, wood, glass, metals, plastic, solvents, hazardous substances (asbestos, PCBs, etc.) and excavated soil, many of which can be recycled. CDW arises from activities such as the construction of buildings and civil infrastructure, total or partial demolition of buildings and civil infrastructure, road construction and maintenance.

CDW has received more and more attention in the past few years as it is a lens to understanding the potential for resource efficiency improvement in the construction sector. Indeed, CDW has a high potential for re-use and recycling, since some of its components have a high resource value and/or can be readily recycled. In particular, there is a market for aggregates derived from CDW in roads, drainage and other construction projects. But the recycling potential of CDW is still under-used. Moreover, recovery performances between EU Member States (MS) differ significantly from one MS to another (from 10% to over 95%). MS with the lowest

performances can certainly improve by applying good practices implemented by those achieving the highest performances.

The potential to increase the resource efficiency of the construction sector by improving the CDW recycling rate is significant but identifying and transferring good practices is not an easy task. In fact, the practical management of CDW varies greatly across MS (due to local variations in context, legislation, enforcement, and construction practices). Moreover, monitoring and data collection of recycling performance are often not accurate, due to data traceability and availability issues. Monitoring MS performances in recycling CDW is a real challenge that MS and European authorities are facing. It is however an essential step in assessing MS progress with regards to their recovery targets. Finally, different definitions of CDW are applied throughout the EU, which makes cross-country comparisons difficult.

In view of the importance of this waste stream, the lack of comprehensive information regarding the situation in Member States and some uncertainty linked to official CDW statistics made it necessary to perform an in-depth analysis of the situation, identifying best practices, as well as key factors to achieve a sustainable management of CDW and formulating recommendations for action.

1.2. Objectives of the study

This study was initiated in January 2015, led by Deloitte in partnership with BRE, ICEDD, VTT, RPS and FCT of NOVA University of Lisbon. It aims at investigating the current CDW management situation in EU Member States, identifying obstacles to recycling and potential deficiencies that could lead to non-compliance with EU waste legislation. Good practices in terms of creating conditions for increasing CDW recycling and for improving the quality of recycling and recovery were identified and a set of recommendations to address potential barriers was formulated. In parallel, success stories of efficient CDW management were showcased in 6 case studies, illustrating key elements for success, as well as any necessary preconditions. Finally, the credibility of official CDW statistics was assessed, identifying sources of inaccuracy and proposing measures for improvement.

The main objectives of this project were defined by the European Commission and are as follows:

- Analyse the current CDW management situation in Member States "on the ground", against national (and/or regional, where appropriate) waste management plans and waste prevention programmes, identifying obstacles to recycling and identifying potential shortfalls in CDW management practices in Member States that could lead to non-compliance with EU waste legislation, in particular the waste hierarchy and the recovery target for CDW established in Article 11 of the Waste Framework Directive.
- Perform six case studies of entities (regions, municipalities and companies) with a good record as regards to CDW management, explaining why they can be regarded as success stories and highlighting their main key elements that contributed to their success, as well as the necessary preconditions.
- Identify good practices in terms of creating conditions for increasing CDW recycling rates and for improving the quality of recycling and recovery and formulating a set of recommendations to address the shortfalls observed in those Member States (MS) where management of CDW raises some concerns.
- Assess the plausibility of official CDW statistics, identifying sources of inaccuracy, identifying best practices regarding statistics in Member States or regions and formulating recommendations to ensure that CDW can be effectively traced and that statistics duly reflect the actual waste raisings.

For an effective fulfilment of the abovementioned objectives, the work carried out was broken down into four tasks as well as a workshop held in May 2016:

- Task 1: Diagnosis of the situation as regards CDW management in EU Member States, including the distance to the target defined in Article 11 of the Waste Framework Directive;
- Task 2: Case studies;
- Task 3: Identification of good practices related to creating conditions for a sustainable management of CDW;
- Task 4: Assessment of the reliability of CDW statistics, including plausibility checks. Proposals for the improvement of CDW statistics;
- Task 5: Preparation and organisation of a workshop.

1.3. Presentation and methodology of the different tasks

1.3.1. Task 1: Diagnosis of the situation as regards CDW management in EU Member States

The main objective of Task 1 was to collect detailed information concerning CDW management in the 28 MS, focusing both on practical and legal points of view as well as on recycling and recovery performances. This objective was fulfilled thanks to a thorough screening phase. This task also aimed at giving a preliminary insight on performance and practices (practical and legal), and at identifying potential barriers and drivers, especially towards reaching the 2020 recovery target. It was thus a very important first step, laying the ground for further analysis on specific topics in CDW management practices in MS.

In order to analyse the performance and management practices of CDW in the 28 MS, a comprehensive methodology was set up, to facilitate the gathering of relevant data and information from each individual MS. Firstly, a set of criteria was established in order to have a solid and even basis for analysis of all MS. Secondly, based on the analysis criteria, MS screening factsheets were prepared, including a structured presentation of relevant information and data. The process of data gathering included in-depth literature analysis and stakeholder consultation.

The result of the screening of the MS included 28 comprehensive country factsheets, presenting a detailed current situation in CDW management. The full set of country factsheets is available on the webpage of the study (see Section 1.4: Structure of this report).

1.3.2. Task 2: Case studies

Task 2 of the project consisted in performing six case studies: these case studies were selected among initiatives that were identified during Task 1. The objective was to present case studies at different levels, from regions, municipalities to companies. These case studies aimed at highlighting barriers and drivers for a CDW sustainable management across the EU. Importance was given to the potential for replicability and innovation in order to identify opportunities for developing similar initiatives in other MS.

The main challenge of this task was the identification of relevant success stories. Their usefulness depends on their diversity but also on their potential for replicability and sustainability (economic, technical, social and environmental aspects). Furthermore, as a quality assessment of these success stories depends on available information, the selection of the case studies also depended on our access to information and willingness of the corresponding actors to share data and feedback. Therefore, actors were involved at the very beginning of the project to maximise their participation and our ability to access the required information.

The six case studies selected were:

- Democles (France)
- Gypsum to Gypsum (EU)
- London 2012 Summer Olympics (UK)
- Estonian Recycling Competence Centre (Estonia)
- Mechanical treatment plant for inert C&D waste in Buzau County (Romania)
- ZenRobotics Recyclers (Finland)

Six detailed case studies resulted from the analysis of the selected initiatives. These are available on the webpage of the study (see Section 1.4: Structure of this report).

1.3.3. Task 3: Identification of good practices

The objective of Task 3 was to analyse MS performance in terms of managing CDW and identifying good practices relating to the types of intervention and implementation across the EU.

This task included 5 subtasks, as described below:

- **Task 3.1: Analysis of Member States performance**

CDW performance can be measured in various ways, the most obvious being in relation to the EU target to recycle or recover at least 70% of CDW. Other quantitative criteria have also been assessed to identify any trends and to examine performance from different angles. This was built upon the information collected during tasks 1 and 2, taking into account results from Task 4 regarding the quality of reported statistics.

- **Task 3.2: Analysis of regional differences**

Three Member States were selected to undertake a regional analysis, in terms of performance in managing CDW. These were Belgium, UK and Spain. The purpose of this analysis was to consider key influencing factors and their impact on CDW management, such as population density, economic status, policy variation, tax measures, etc. Information from country reports from Task 1 were supplemented with additional data sources and stakeholder engagement as available to make the assessment.

- **Task 3.3: Analysis of good practices**

Each Member State has implemented various types of intervention with the objective of improving CDW management. There is great variation in terms of the types and quantities of interventions, how rigorously they are implemented and the level of impact they are having across the EU. A key part of task 3 was to gain insights into the extent to which specific types of intervention are having a positive impact, and investigate the framework of conditions upon which they might depend upon for success. Through undertaking this evaluation of interventions across the EU, it was expected that the recipe(s) for success would become clearer; i.e. to be able to determine correlations between specific types of intervention assessed in Task 3.3 and the performance measured in Task 3.1. The information was mainly derived from the country reports from Task 1, with cross-referencing to the performance measured in Task 3.1. Some specific measures (End of Waste Criteria and Green Public Procurement) were assessed using the information from the country reports prepared during Task 1 and external data sources.

- **Task 3.4: Analysis of backfilling practices**

This task focussed on the assessment of whether and under which circumstances backfilling can be considered a genuine and environmentally sound recovery operation in the context of the WFD 70% recovery target for CDW. This was built upon data provided in the country reports from Task 1 and the Eurostat statistics validated in Task 4.

- **Task 3.5: Conclusions and recommendations**

The recommendations were built upon interim reports from Task 3.1 to 3.4, as well as additional data sources and perspectives from BRE resource efficiency expertise to create a set of key recommendations.

The detailed findings of subtasks 3.1 to 3.5 are presented in five separate reports to which was added information gathered during the workshop (see Task 5 below). These specific reports are available on the webpage of the study (see Section 1.4: Structure of this report).

1.3.4. Task 4: Assessment of the reliability of CDW statistics

Statistical reliability is of outmost importance to ensure the validity and precision of any kind of analysis on CDW and hence for policymaking. The aim of task 4 was to assess the reliability of CDW data, by assessing the quality of MS official CDW data, by analysing the production process of CDW data (the way MS administration collect and report CDW data), and by looking at important changes that might affect the data quality in the near future, in particular with regards to comparability of CDW data across MS, as well as in terms of consistency of time series.

More specifically, the objectives of task 4 were to:

- Classify MS in terms of their CDW data quality level, based on a country by country analysis.
- Present the main methodologies used by MS to collect the data, assess and classify MS in terms of data collection methodologies, highlight the lessons learned from the less mature and best practices in methodologies used, and consider relatively new concepts such as backfilling and the end-of-waste status on the Eurostat statistics.
- Summarise the main problems highlighted in the Eurostat data, with a focus on hazardous waste.
- Summarise the main findings that arise from the comparison of Eurostat statistics with detailed national data, particularly on the extent to which the official CDW definition is representative or not of CDW generated and treated in MS.
- Present the available information on the current distance to target (set in the Waste Framework Directive) and forecasted CDW amounts in the future, using an update of the existing CDW model developed in 2015.

In order to perform the assessment of the data quality in the European Member States, a methodology was set up to come up with a non-subjective quotation of data quality for each Member State. This methodology consisted of producing, for each Member State, a separate report that analysed the different aspects of their data quality based on qualitative assessments of their data collection methodologies and comparisons with other data sources and quantitative assessments of their Eurostat data quality. These qualitative and quantitative assessments were summarised for each Member State according to a quotation system.

The separate reports for each Member State were sent to the national statistical offices (NSO) in charge of transmitting the data to Eurostat to get their feedback on analyses performed and to gather valuable information on issues that were still pending after the analyses. In total, only 6 countries did not answer the questions sent, which shows the very important implication of Member States on the topic of C&D waste. The international organisations FIR, FEAD, and EDA also gave their feedback via a conference call.

The information and findings of Task 4 are detailed in a specific report, into which was included the information gathered during the workshop. This specific report is available on the webpage of the study (see Section 1.4: Structure of this report).

1.3.5. Task 5: Preparation and organisation of a workshop

A one day workshop was held the 25 May 2016 at the premises of the European Commission in Brussels. This workshop had two key objectives:

- Discuss the findings of the study and share best practices.
- Carry out an open exchange of views with the aim of achieving a good understanding of barriers and opportunities, and the measures, tools and steps to take in order to address barriers and realise opportunities. It should also be considered how European legislation and funds could be used to improve the situation in the Member States.

In order to meet the aforementioned objectives, two forms of exchanges were proposed:

- A plenary session to present the preliminary findings of the study;
- Six thematic breakout sessions to enable exchanges of views between participants around six key issues identified in the study and discuss possible solutions at European level: EU targets, prevention, demolition practices, reuse, recycled materials market, data collection practices: how to improve reporting.

All information gathered from the presentations and the breakout sessions are recorded in a dedicated report, which is available on the webpage of the study (see Section 1.4: Structure of this report), as well as the presentations made during the workshop.

1.4. Structure of this report

This report presents the main findings of the study and aims at giving a global picture of the current situation as regard as CDW management practices and performances across the EU. It is structured as follows:

- Section 2 gives an overview of the performance of the 28 MS in terms of CDW management with three focus on regional differences, hazardous waste and backfilling;
- Section 3 presents the main results of the analysis of CDW statistics including the identification of good practices to enhance data quality as well as some details on the statistical treatment of specific materials and practices;
- Section 4 focuses on CDW management practices in EU-28 MS and presents an evaluation of good practices as well as the success factors for improved CDW management;
- Section 5 concludes this report with a synthesis of the main drivers and barriers to resource efficiency in CDW management and the main recommendations for improving CDW management based on the work of the study.

As mentioned above, all deliverables of tasks 1 to 5 may be downloaded from the webpage for the study: http://ec.europa.eu/environment/waste/studies/mixed_waste.htm

2. CDW management performance in EU-28 Member States

2.1. Introduction

2.1.1. CDW classification in EU statistics

Different waste streams and waste categories are used by Member States for the compilation of CDW data.

European Waste Catalogue (EWC-Stat) classification

Eurostat data referred to in this study is data on waste generation, treatment and treatment infrastructure and waste collection coverage pursuant to Regulation No 2150/2002¹. This data is available for all Member States in the same format. It is similar and publicly available on the Eurostat website². Eurostat waste statistics are available at the three digit level of the European Waste Catalogue³ (EWC_Stat), which is a mainly material-based classification of waste. The EWC_Stat codes do not include information regarding the waste generating activity, except for some EWC_Stat codes such as W121, which specifically refers to mineral waste from construction and demolition. Yet Eurostat data on generation are reported by the countries according to different NACE activities⁴. This means that EWC-Stat data does not allow the identification with certainty whether waste originates from construction and demolition activities, except for waste generated and reported under the construction sector (NACE F). It would however be an underestimation to only consider wastes reported in NACE F, as Member States are known to also report generated CDW in other sectors than the construction sector. Therefore a proxy was used to calculate the amounts of CDW generated in each Member State. This proxy is based on the method for calculating the target for CDW set out in Appendix III of the Commission Decision 2011/753/EU⁵ (more details on the EWC_Stat codes included in the proxy are presented in Appendix A).

European List of Waste (ELoW) classification

The Waste Framework Directive⁶ (WFD – 2008/98/EC) stipulates that the 70% CDW recovery objective must be calculated based on the European List of Waste (LoW) classification. In addition to the waste composition (LoW contains 17 codes for the different types of CDW), this classification also allows to track the activities generating this waste (the entire list of 17 codes and corresponding EWC-Stat codes are presented in Appendix A).

The facts and figures presented in section 2 of this report are based either on EWC_Stat or LoW codes, depending on the best available data. Sources for the data used are always indicated.

2.1.2. Data quality

Although this report provides a quantification of the performance for Member States, the results should be viewed while keeping the data quality in mind. Until all MS have a similar level of data quality, it will be difficult

¹ EC, *Regulation (EC) No 2150/2002 of the European Parliament and of the Council of 25 November 2002 on Waste Statistics*, 2002 <<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02002R2150-20101018&from=EN>> [accessed 26 February 2015].

² <http://ec.europa.eu/eurostat/data/database>

³ See Appendix I of EC, *Regulation (EC) No 2150/2002 of the European Parliament and of the Council of 25 November 2002 on Waste Statistics*.

⁴ Statistical classification of economic activities in the European Community (NACE Rev.2), see <http://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF>

⁵ EC, *Commission Decision of 18 November 2011 Establishing Rules and Calculation Methods for Verifying Compliance with the Targets Set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council*, 2011 <<http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32011D0753>>.

⁶ EC, *Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on Waste and Repealing Certain Directives*.

to carry out a quantitative comparison of MS performance and have confidence in the trends that may, or may not, be seen in the charts given in this report.

As part of Task 4 (CDW statistics cross-country analysis: results and recommendations, section 1.2), data has been reviewed for each MS, scored out of 5 and given a quality level of poor, modest or good. Where possible, the results showing the MS performance have been presented as figures and have been colour-coded according to the MS CDW data quality score, as shown in Table 1.

Table 1: MS colour coding – data quality level

CDW data quality score	Data Quality level	Colour used in charts
Between 1.5 and 2.5	Poor	Grey
Between 2.6 and 3.6	Modest	Yellow
Greater than 3.6	Good	Green

2.2. CDW generation performance

2.2.1. Key performance indicators – CDW generation tends to be related to the economic situation of the MS

In 2012, the 28 Member States generated around 830 Mtonnes of CDW, including 480 Mtonnes of soil and dredging spoil.

Hence, excluding soil and dredging spoil, the 28 MS generated around 350 Mtonnes of CDW in 2012. Table 2 below shows a breakdown by type of waste.

Table 2: CDW generated in 2012 by the 28 EU MS

Inert waste (Mt)	315
Non-inert non-hazardous waste (Mt)	26
Hazardous waste (Mt)	10
Total CDW excluding soil and dredging spoil (Mt)	351

As can be seen, inert waste represents 90% of total generated CDW.

Figure 2 below presents the amount of CDW generated by the 28 Member States. Unsurprisingly, large countries generate the most CDW.

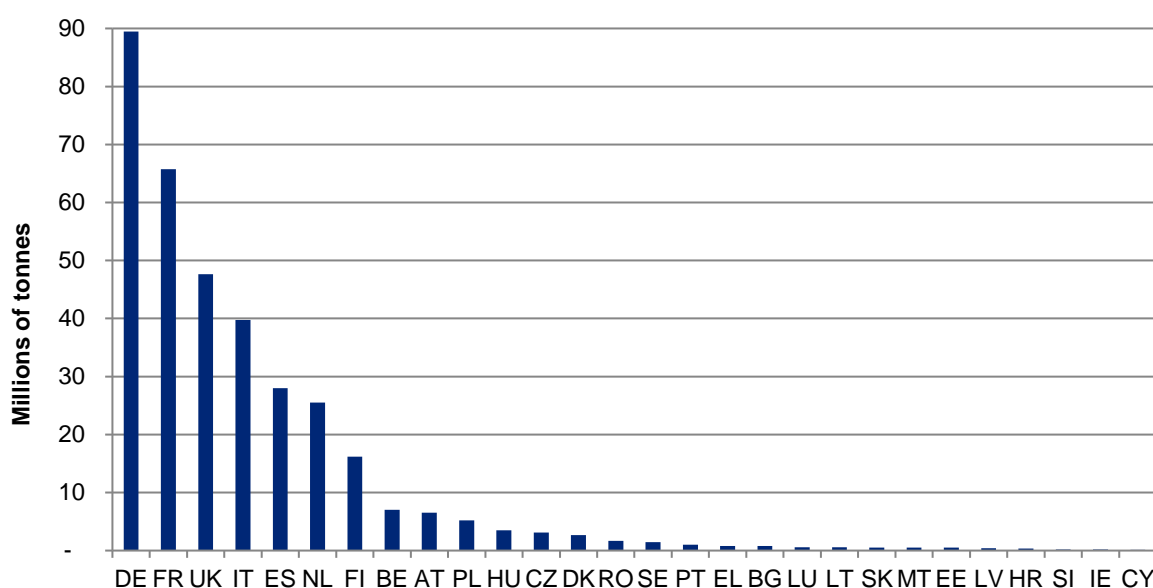


Figure 2: Mtonnes of CDW generated, 2012

The amount of CDW generated relative to the construction industry turnover is shown in Figure 3 for each MS together with the average for the MS with modest or good data quality (i.e. those with poor data quality have Resource Efficient Use of Mixed Wastes – Improving management of construction and demolition waste – Final report

been excluded from the average figure). The data relates to waste generated and turnover for 2012 from Eurostat⁷ (with the exception of the turnover data for Ireland, which dates from 2011 and has been provided by the country report).

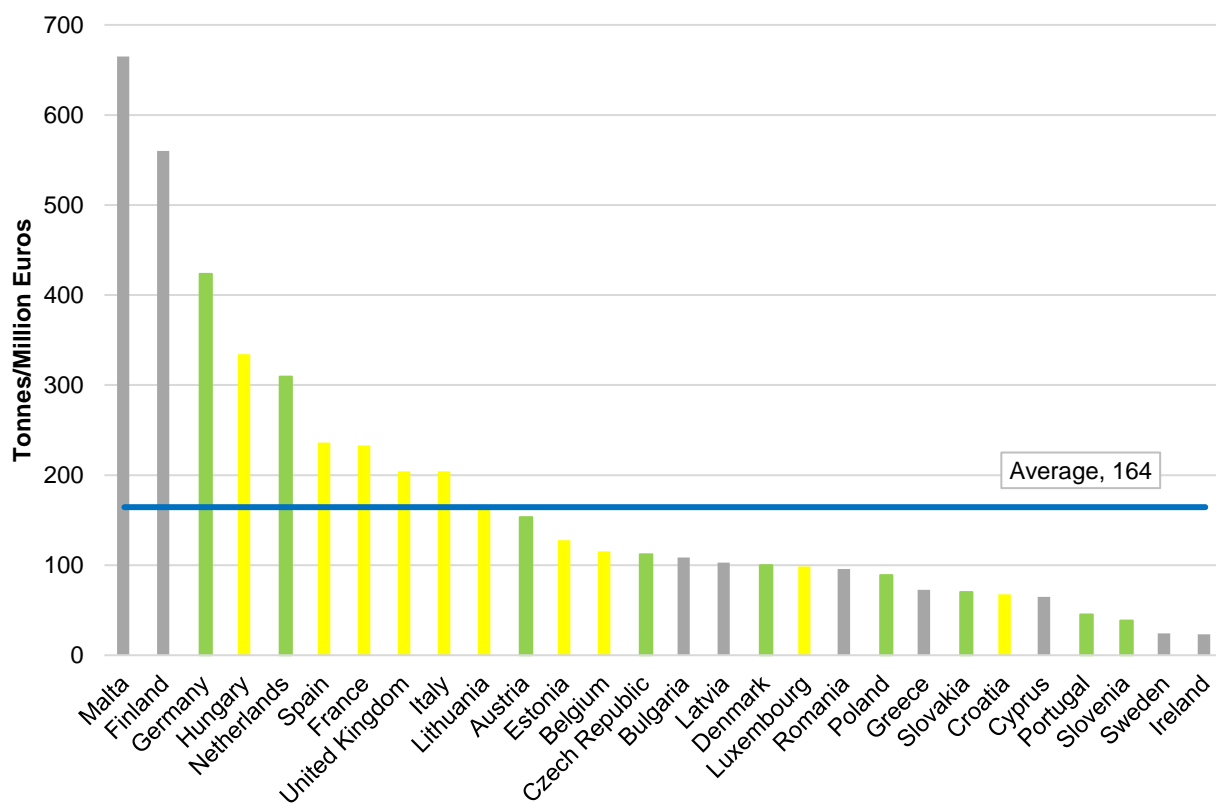


Figure 3: Tonnes of waste generated/€Million turnover, 2012

Note: For this analysis, Eurostat data for 2012 was used and the CDW definition includes W061, W062, W063, W071, W074, W075 from NACE F and W121 across all NACE activities. As requested by the EC, W077 and W12B from NACE F were also added.

There is a very large variation in the CDW generated related to the turnover of the construction sector (in € Million). Setting aside MS with poor data quality (in grey), **Germany, Hungary and the Netherlands produce significantly more CDW than the average** (above 300 tonnes/million euros) and **Portugal and Slovenia produce very small amounts** (around 20 tonnes/million euros). There is no clear explanation for these differences. Assuming that the cost to build the same building in a wealthier country (compared to less economically advanced countries) are higher because of the higher labour costs, this should lead to lower KPIs when comparing CDW versus turnover (in wealthier countries, a lower percentage of the money spent on construction will be devoted to materials and a higher percentage will be spent on salaries, compared to countries that are less wealthy). However, the trend for the KPI to be higher (in Western Europe) reinforces the conclusion that wealthier countries are more wasteful.

Large infrastructure projects have been reported for Germany, Hungary, France, Italy and the UK, which could account for the relatively large CDW generation. All countries with larger amounts of waste generated already have national waste prevention plans in place whereas Croatia, Slovenia and Portugal have not adopted waste prevention plans. This could indicate that where better waste prevention policies are in place, waste data is better reported.

The relationship between, on the one hand, CDW generated and MS population and, on the other hand, CDW generated and MS GDP was also examined. It confirmed the analysis of the amount of CDW generated relative to the construction industry turnover. For those countries where the data quality was thought to be good, Germany, France, Hungary and the Netherlands are consistently in the top CDW generators. Those countries producing the smallest amount of CDW include Slovenia, Portugal, Slovakia and Croatia. The results of waste generated Key Performance Indicators are summarised in Table 3.

⁷ Eurostat data 2012, Annual company statistics for special aggregates of activities, [sbs_na_sca_r2], Turnover or gross premiums written for NACE_R2 =F (Construction)

Table 3: Summary of waste generated KPIs

Key Performance Indicator	Top 5 MS (most waste)	Bottom 5 MS (least waste)
CDW/€Million turnover	Germany, Hungary, Netherlands, Spain, France	Slovenia, Portugal, Croatia, Slovakia, Poland
CDW/person	Netherlands, Luxembourg, Germany, France, Austria	Croatia, Slovenia, Portugal, Slovakia, Poland
CDW/GDP	Netherlands, Hungary, Germany, France, Estonia	Slovenia, Portugal, Slovakia, Croatia, Denmark

2.2.2. Nature of CDW generated – A major fraction of mineral waste

European statistics do not permit a break-down of CDW by activity (construction, refurbishment, demolition), or by subsector (public works, buildings), and too few information could be retrieved at MS level to perform an estimate.

However, the data available provides a break-down of the material included in CDW: the majority of CDW generated in Member States is composed of mineral waste from construction and demolition (W121) as shown in Figure 4.

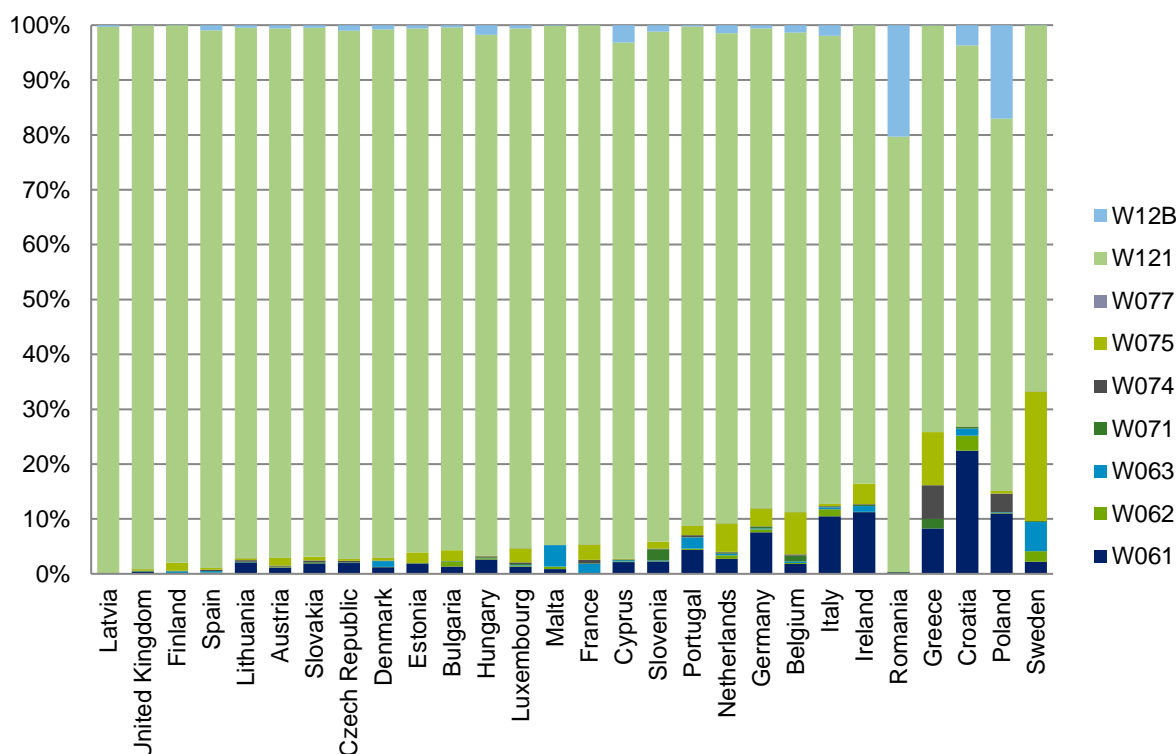


Figure 4: Breakdown of total generated waste in 2012

Note: W061 = ferrous metallic waste; W062 = non-ferrous metallic waste; W063 = mixed ferrous and non-ferrous metallic waste; W071 = glass waste; W074 = plastic waste; W075 = wood waste; W077 = waste containing PCBs; W12B = Other mineral waste (excl. C&D waste, combustion waste, soils, dredging spoils, waste from waste treatment); W121 = mineral waste from construction and demolition

When trying to go deeper into details regarding the breakdown by material type, data is only available for selected MS (Germany, Denmark, Estonia, Croatia, Hungary, Luxembourg, Portugal, Slovakia). A breakdown of the materials in CDW for these MS was based on the EWC top level categories (17 01, 17 02 etc.) These are shown in Figure 6 as a percentage of the total CDW generated (excluding soils, 17 05).

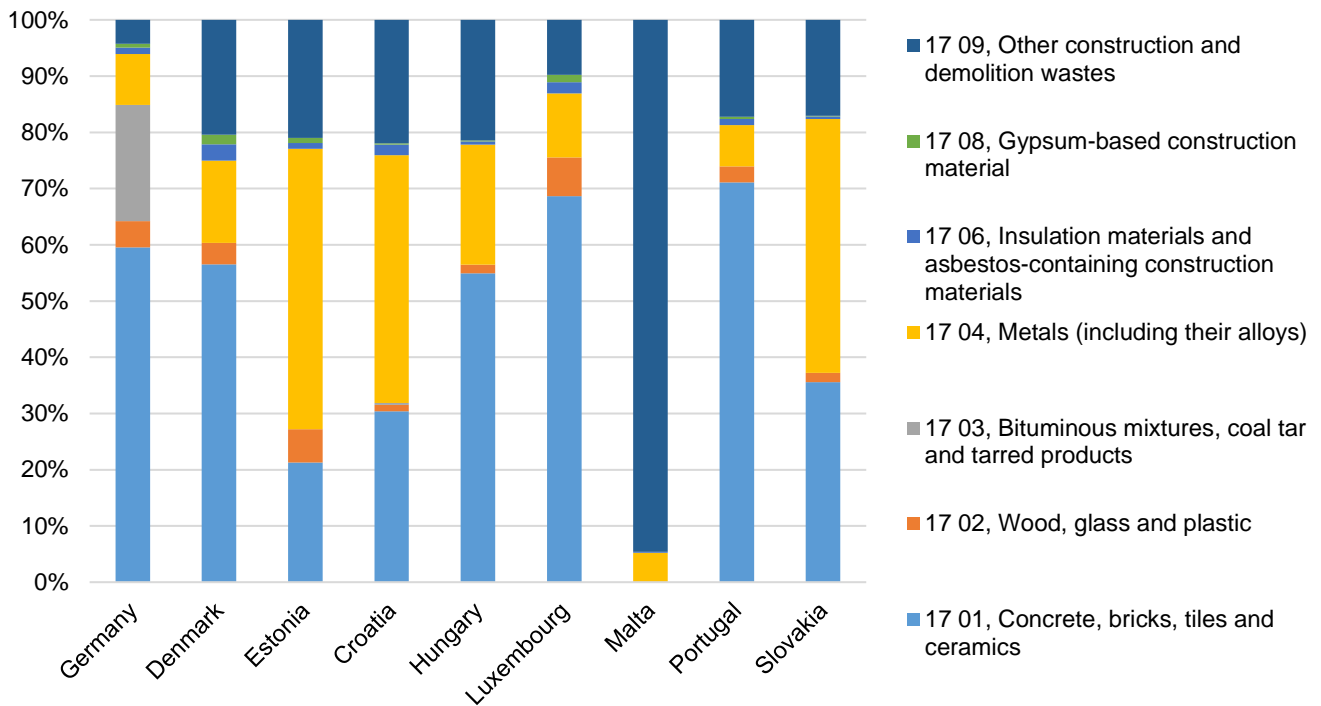


Figure 5: Breakdown of CDW generated by material type

This high level breakdown of materials for a limited number of MS shows a high degree of variability and surprising results. This shows that for **most MS the major waste types are concrete, bricks, tiles and ceramics**, which is consistent with the fact that the major fraction of CDW generated in Member States is composed of inert waste. But it seems unlikely that any MS would have **more metal-based waste** being generated than concrete and brick based waste, as this seems to be the case in **Estonia, Croatia and Slovakia**. In this regard, it is to be noted that the figures shown here are higher than those reported in official data. For Croatia, the national data is based only on that provided by the waste producers whereas the data provided to Eurostat pursuant Regulation (EC) No 2150/2002 (referred hereafter as WStatR) is an amalgamation of data from producers/collectors and treatment companies. For Slovakia and Estonia the national metal data includes all chapter 17 codes whereas the official data only includes metals from NACE F. In addition, this indicates that for **Malta, the CDW is poorly defined** with the majority being classified as 'Other construction and demolition waste'.

One conclusion that could be drawn is that **large amounts of 'inert' CDW are not being reported**, perhaps due to very high levels of on-site reuse. If this is happening, the overall waste generation data would be significantly underestimating the actual amount of CDW that is generated.

2.3. CDW treatment performance, distance to 2020 target and forecasts

2.3.1. CDW treatment performance – A relative importance of recovery compared to landfilling/backfilling for all Member States

In the manual on waste statistics, it is stated that **waste treatment** is understood as the generic term for all recovery and disposal operations including preparatory operations⁸. The Directive 2008/98/EC (or WFD)⁹ further defines the following terms:

- **Recovery** means any operation the main result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy.

⁸ Eurostat, p. 32.

⁹ EC, Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on Waste and Repealing Certain Directives, 2008, p. 28 (p. 98) <<http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0098>> [accessed 25 February 2015].

- **Recycling** is a subset of recovery and ‘means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes.’ It includes the reprocessing of organic material (e.g. composting, anaerobic digestion etc.) but excludes the **use as fuels** and the use for **backfilling** operations.
- **Disposal** means any operation which is not recovery even where the operation has, as a secondary consequence, the reclamation of substances or energy.’

The analysis of the amount of CDW treated compared to the amount of CDW generated is shown in Figure 6. It should be noted that CDW treatment data is only based on W121 code (mineral CDW) whereas the CDW generated includes other waste codes. This means that a country treating all the CDW it generates would show a percentage lower than 100 in the figure below.

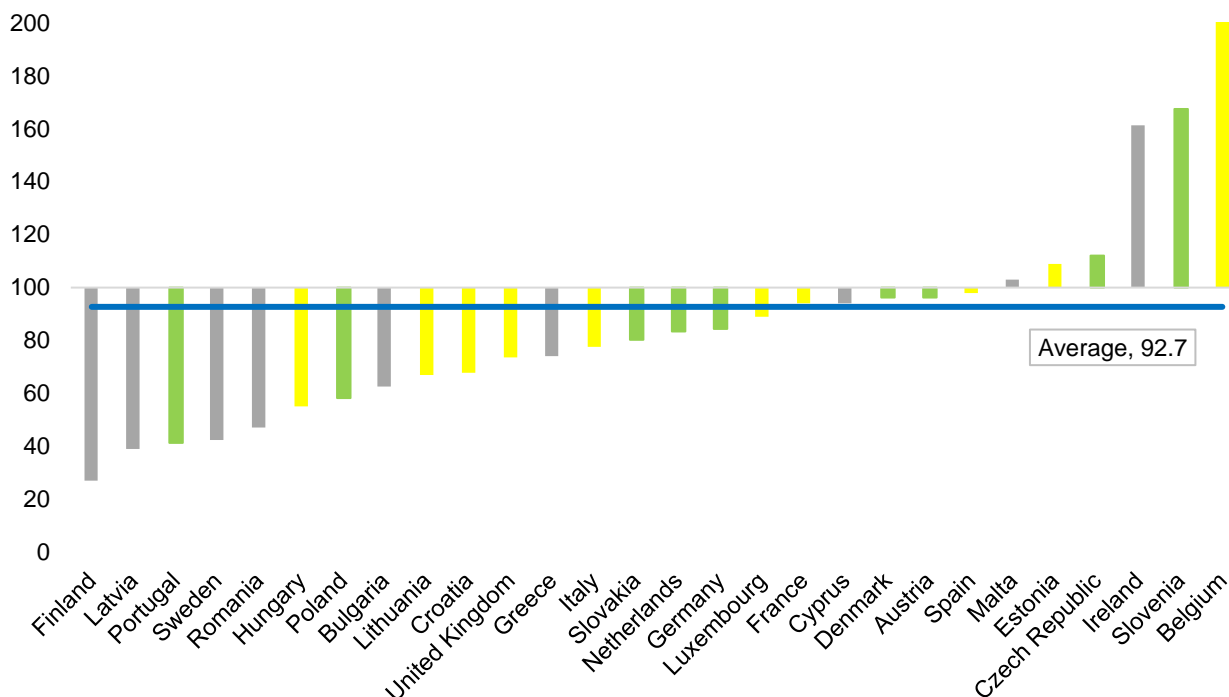


Figure 6: Total CDW treated as % total CDW generated

The data indicates that much **more CDW is treated than generated in Belgium and Slovenia whereas Portugal treats just over half of CDW generated** (MS with poor data quality were not included in the analysis).

The amount of CDW imported by Belgium, Slovenia and Ireland was investigated but it was minimal and would not account for the large amount of CDW treated.

Further information was sought from Belgium to explain the large difference between CDW generated and CDW treated and, according to OVAM, the public waste agency of the Flemish region, this difference is due to the fact that a large portion of generated rubble is crushed on-site and not reported as generated but only as treated.

For Slovenia, the discrepancy between generated and treated CDW is due to several reasons: the collapse of the construction industry in Slovenia resulted in large amounts of CDW in temporary storage awaiting treatment. Furthermore, there is inadequate legislation on reporting of CDW. No further information about the large amount of CDW in temporary storage was available but, after 3 years storage, this waste would be considered to be illegally landfilled, according to the Landfill Directive.

For Portugal, the difference between generated and treated CDW occurs because a significant number of businesses report a portion of treated CDW using treatment codes¹⁰ that are not covered by the Waste Statistics Regulation. This was also the case for Poland.

¹⁰ Codes for transfer/treatment of waste to enable its disposal (D13 – blending, D14 – repackaging and D15 – storage) or codes for transfer/treatment of waste to enable its recovery (R12 – exchange of waste and R13 – storage of waste prior to recovery)

The waste management routes used for CDW across the MS are summarised in Figure 7 below. This is based on Eurostat data of waste treated in 2012¹¹. However, in view of the above considerations about statistics, these figures have to be used with caution.

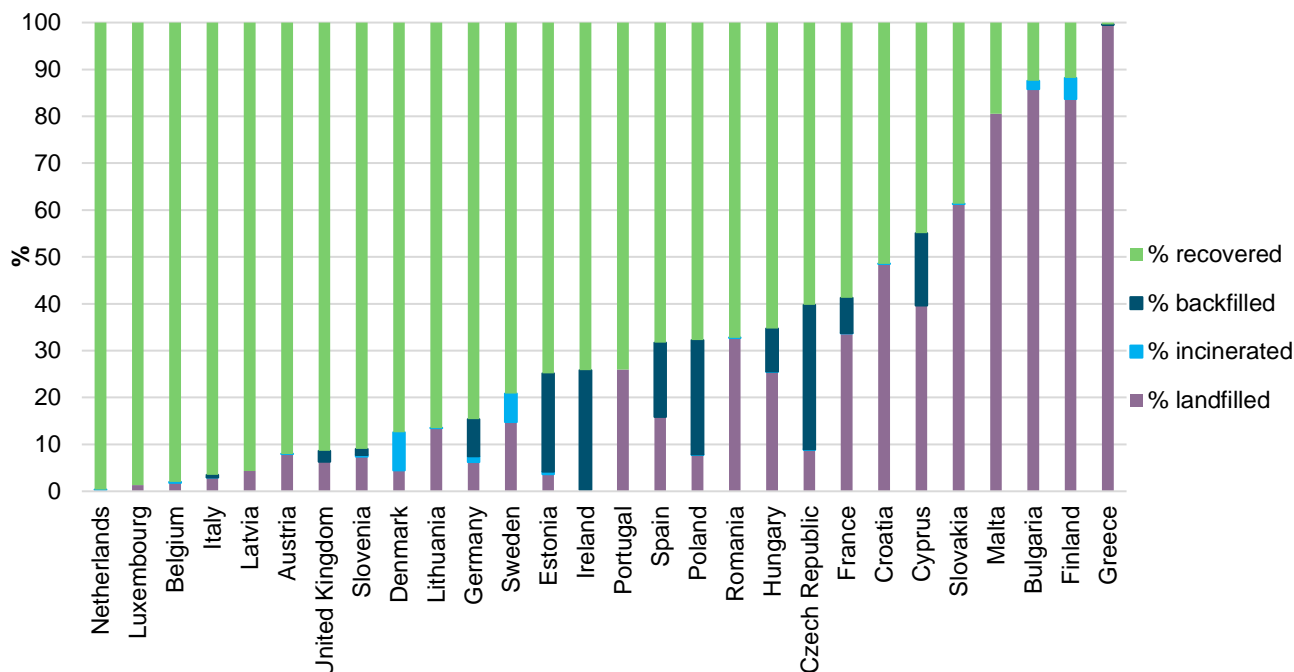


Figure 7: Waste management summary

Figure 7 displays the **relative importance of recovery compared to landfilling/backfilling for all Member States**. The percentage of waste landfilled varies from less than 1% (Netherlands) to over 99% (Greece).

Countries with high recovery rates are likely the countries with best practices in terms of CDW treatment (recycling) and correspond to countries that are classified under good or modest data quality:

- For instance, **the Netherlands, Luxembourg and Belgium** are densely populated areas, where **great efforts have been put in reducing the disposal of mineral waste** from construction and demolition, more specifically by recycling this waste to produce secondary aggregates that can be used, among others, for road applications.
- Many of the MS with higher proportions of recovery have a **good spread of CDW management facilities** available such as **Denmark, Italy, Ireland, Germany and Luxembourg**.
- In addition, some MS have **landfill bans** (or partial bans) in place. For example, **the Netherlands** has a landfill ban on recyclables and **Belgium** has bans in Wallonia and Flanders (ban on landfilling of mixed CDW). **Denmark** has a ban on landfilling of waste suitable for incineration, which would explain the low levels of landfilling and relatively high levels of CDW incineration (5%). **Malta** has been using backfilling as the primary treatment method of CDW since 2003 when a ban of CDW from landfills took place. Until recently, the backfilled amounts of CDW were reported as landfilled. However, under the light of the possibility of using backfilling as recovery in the calculation of the WFD target, Malta is considering reporting the entire volume of CDW backfilled in spent quarries as recovered and would thus reach an extremely high recovery rate (see Figure 12).

Regarding countries with low recovery rates:

- The low amounts of CDW recovered in **Greece** could be related to the **non-existence of an effective policy** for the use of recycled materials as well as the lack of obligations regarding recycled materials or recycled content in construction materials.

¹¹ Eurostat data 2012

- **Finland’s low recovery rate could be due the misallocation of excavated soils in the waste category mineral waste** from construction and demolition, therefore not reflecting the “real” figures of CDW treatment in the country¹².
- Many MS with low levels of recovery such as **Croatia, Estonia and Slovakia have a limited spread of CDW management facilities.**

The amount of CDW that is **incinerated** is **minimal except in Denmark, Sweden and Finland**, where there is a significant use of wood for construction activities. Similarly, the amount of **backfilling appears to be small except for Ireland, Estonia, Poland and the Czech Republic**. However, this is likely to be due to the differences in reporting of backfilling information. For example, Portugal, Denmark and Latvia have not reported any backfilling as this is wrongly included in the reported data to the EC as landfilling or recovery. In contrast, Ireland have followed the definition provided in the Commission Decision and Eurostat guidance on backfilling and have reported approximately 25% of CDW as backfilled.

When **focusing on the management routes by material types for concrete, brick, tiles and ceramics** as shown on Figure 8, one may observe that there are differences in how waste was reported with some countries reporting larger amounts of mixed waste. Improved segregation of materials revealed a strong trend for higher levels of recovery (as opposed to backfilling or landfilling) compared to MS with high levels of mixed waste, as shown in Figures 3 and 4. Indeed, source segregation is more likely to occur where there are legal requirements, such as selective demolition, or economic incentives contributing to lower waste management costs.

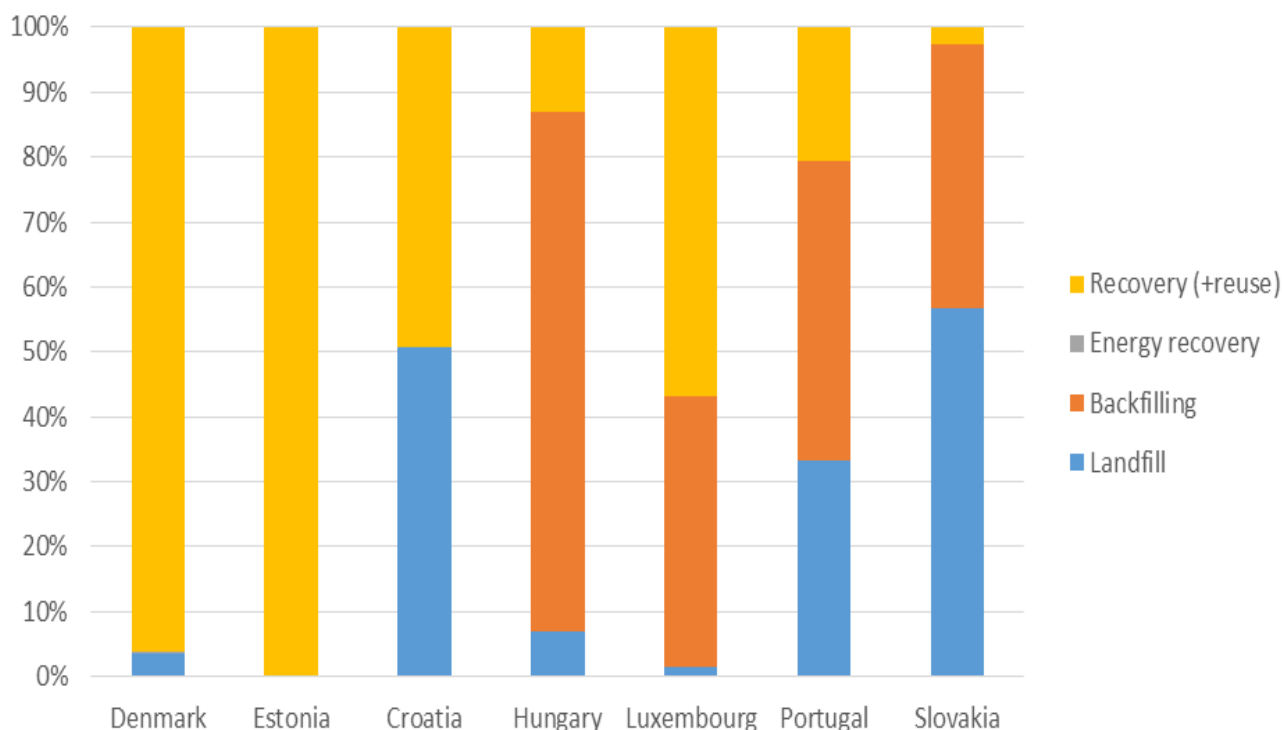


Figure 8: Waste management routes for ‘Concrete, brick, tiles and ceramics’ (17 01)

Disposal costs. Landfill taxes and high disposal costs are often cited as one of the drivers for recovery and recycling. Therefore, a negative correlation between overall disposal costs and the percentage of CDW landfilled could be expected. However, analysing the available data, it appears that there is not a clear correlation between disposal costs and recovery rates, most probably due to the fact that many other factors may affect the waste route in each MS (see Figure 9 below). In some instances such as the United Kingdom and the Netherlands, high disposal costs and low rates of landfilling were observed but in other instances such as Austria and Slovenia the rate of landfilling was low in spite of low disposal costs. For Slovenia, this could be due to the amount of waste, which is in temporary storage, rather than landfilled.

¹² ARGUS. Validation and Publication of Waste Statistics - Report on the in-Depth Validation of WStatR Data and Documentation of Country Specific Results - Reference Year 2010 -'.

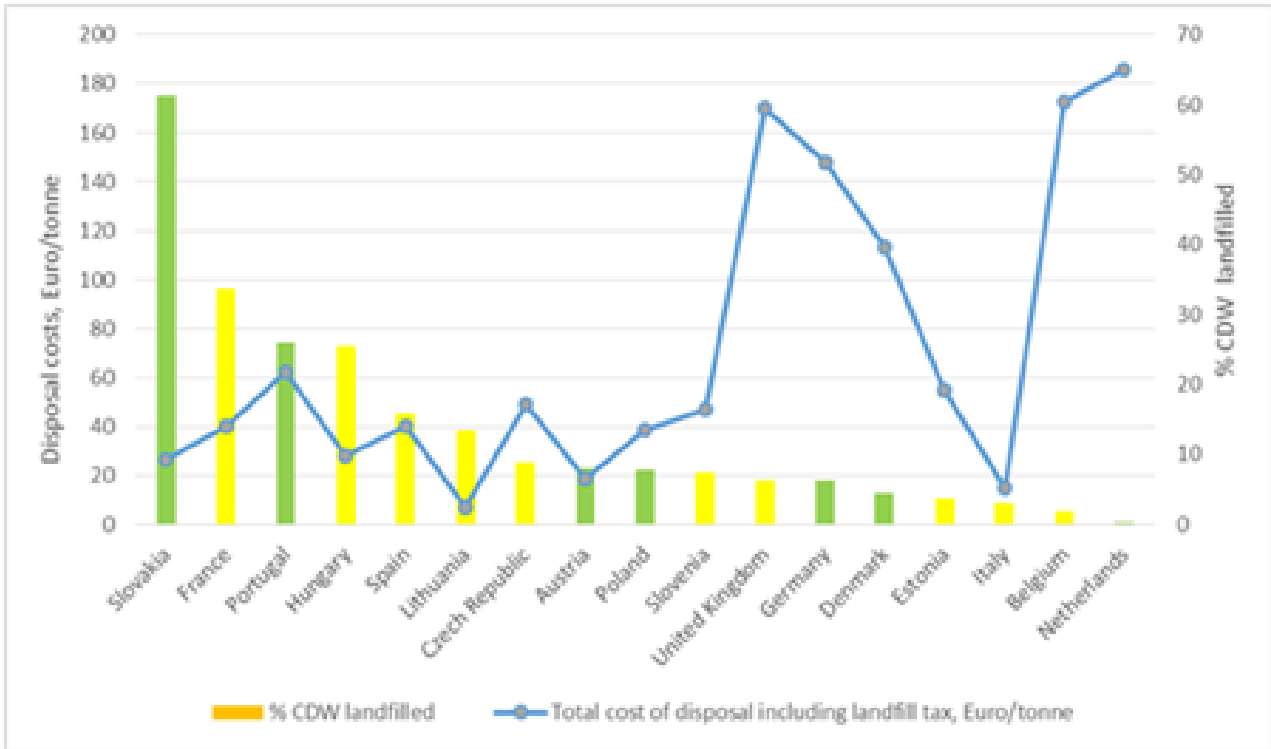


Figure 9: Share of CDW landfilled and disposal costs¹³

The weak (negative) correlation can be explained by other factors that also influence the level of landfilling, such as the actual implementation of a landfill tax and the existence of a suitable network of recycling infrastructure in all regions.

The landfill tax has been implemented differently in different MS, with some countries having regional variations or variations for different materials. There are also differences in the way the tax is collected and spent. The Netherlands, UK and Denmark have all had landfill tax in place for several years and the tax has increased over time. In all three cases, the tax is thought to have been effective at reducing the levels of landfilling. In contrast in Bulgaria, the implementation has not been effective due to contradictions between national law and local implementation. In Portugal, the perception was that the tax had not achieved the desired effect so changes to the way the tax is implemented have recently been made. The tax now varies depending on the waste treatment method.

The analysis suggests that the availability of treatment facilities affects the level of landfilling. In Slovakia the spread of facilities is poor with only 60 recovery facilities, 41 of which are mobile devices and these are thought to have insufficient capacity for current demand. According to the ZRSM (Association for construction material recycling development), the high costs of transport are seen as a barrier to using the recovery facilities and there is a complicated and expensive system of licences and fees in place which makes on-site recycling complicated.

In contrast, the UK, the Netherlands and Belgium have a good spread of facilities. In Belgium, there are 9 landfills but over 400 recovery facilities and for Austria, there is a dense network of recovery facilities across the country.

The impact of increasing landfill costs on the illegal management of CDW is not clear. For example, the landfill tax has been in place for several years in the UK and the levels of illegal fly-tipping in England increased from 2012 to 2014 although CDW only accounts for about 6% of all instances. However, the opposite is the case in Germany, which has no landfill tax in place and yet illegal CDW management is not thought to be a major issue. For Austria and the Netherlands, which have also had a landfill tax in place for several years, no information was available regarding the level of illegal CDW management but it is thought that existing enforcement is effective. In Bulgaria, Croatia and Greece the level of enforcement is low and illegal CDW management is reported to be a problem.

Imports and exports. CDW is usually heavy and not very valuable. Therefore, the amounts of CDW imported and exported generally represented a very small proportion of the total CDW generated. However, some MS

¹³ Various sources of data, including CEWEP report (available at http://www.cewep.eu/media/www.cewep.eu/org/med_557/1529_2016-10-10_cewep_-landfill_inctaxesbans.pdf) and country factsheets

exported a large proportion of hazardous CDW. This was thought to be due to the limited facilities available within these MS to manage the hazardous CDW generated. The MS that import hazardous CDW were reported to have sufficient capacity to manage this waste.

The MS exporting the greatest proportion of hazardous CDW are Ireland, Greece and Malta. For all three MS, the majority of the exports were asbestos containing waste which is exported to Germany or Spain. It has been reported that these MS do not have sufficient facilities to manage the CDW produced, therefore it is exported.

There are high levels of hazardous CDW imports to Belgium, Sweden, Germany and the Netherlands. For Belgium, most imports are from neighbouring countries (France and the Netherlands) with smaller amounts from Luxembourg. Similarly for the Netherlands, the majority of the imports are from Belgium, Switzerland and Germany. Some of these imports may be due to the fact that facilities in neighbouring countries are nearer the construction site. The Netherlands and Germany are both reported to have sufficient or excess capacity to treat hazardous CDW.

Recycled aggregates. Analyses of the amount of recycled aggregate produced show that this was relatively small compared to the total aggregate demand: as an average, 9% of the demand for aggregates was covered with recycled aggregates. This suggests that the market could absorb increasing amounts of recycled aggregates in most MS. However, it should be noted that the availability of recycled aggregate is likely to vary over time and regionally with some areas having a shortage of materials while other areas may have a surplus as highlighted in a German study of long-term potentials of high-grade recycling of mineral construction waste¹⁴. Figure 10 provides an overview of the proportion of national aggregate demand met by recycled aggregates across MS.

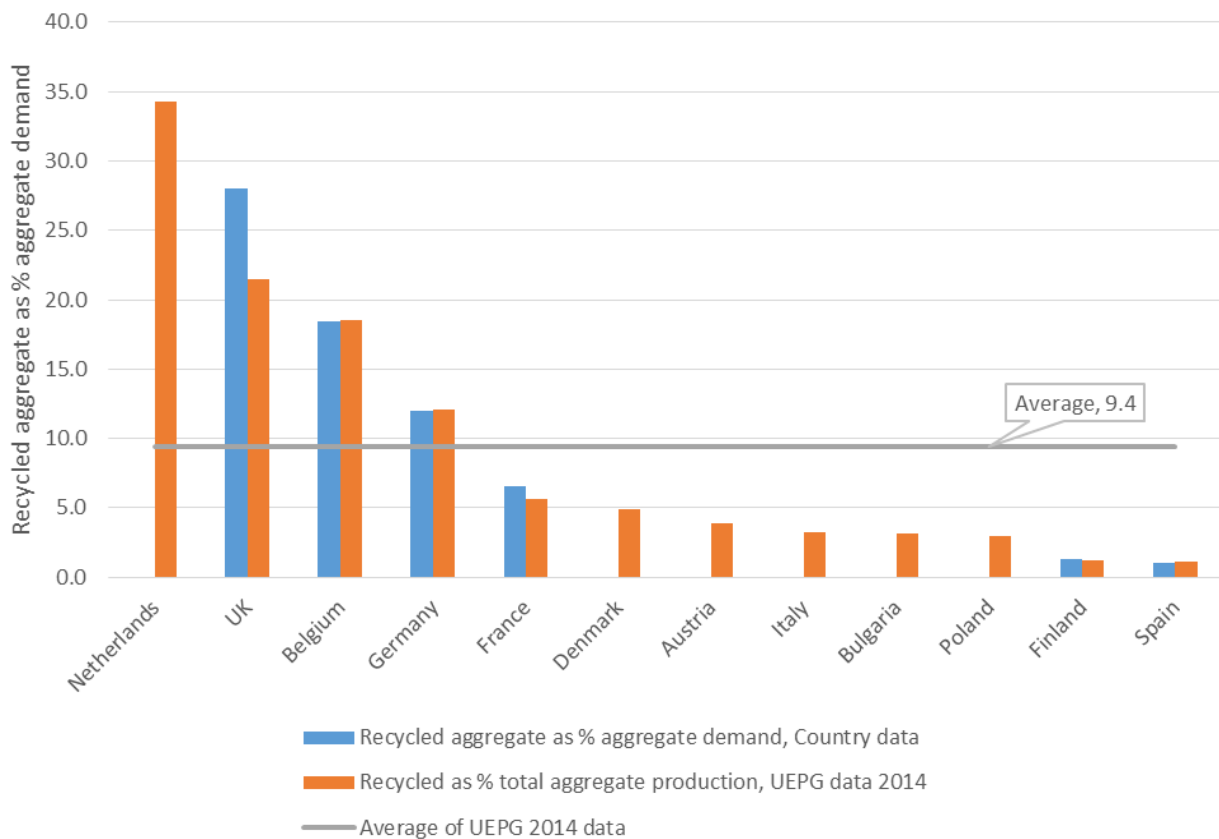


Figure 10: Proportion of national aggregate demand met by recycled aggregate

¹⁴ Determining Resource Conservation Potentials in the Recovery of Construction Waste and Formulating Recommendations on Their Use Schiller et al, Environmental Research of the Federal Ministry of the Environment, Nature Conservation and Nuclear Safety, 2010, https://www.umweltbundesamt.de/sites/default/files/medien/461/publikationen/texte_56_2010_kurzfassung_e1_0.pdf

2.3.2. Distance to 2020 target – A target already reached by 9 Member States

The Waste Framework Directive (2008/98/EC) includes in Article 11(2) a specific target for the reuse, recycling and other material recovery of CDW:

'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.'

Member States shall provide data on the state of preparation for reuse, recycling and material recovery of the respective waste stream either for each year, or for every other year, if data is calculated on the basis of the Waste Statistics Regulation. The first data under this reporting obligation was due by the end of September 2013, covering the reference period from 2010 to 2012.

CDW recovery rates calculated in compliance with the Waste Framework Directive were reported by only 22 EU Member States. As shown in Figure 11 below, the following six Member States did not report CDW data for any of the three reference years: Denmark, Greece, France, Cyprus, the Netherlands and Romania¹⁵.

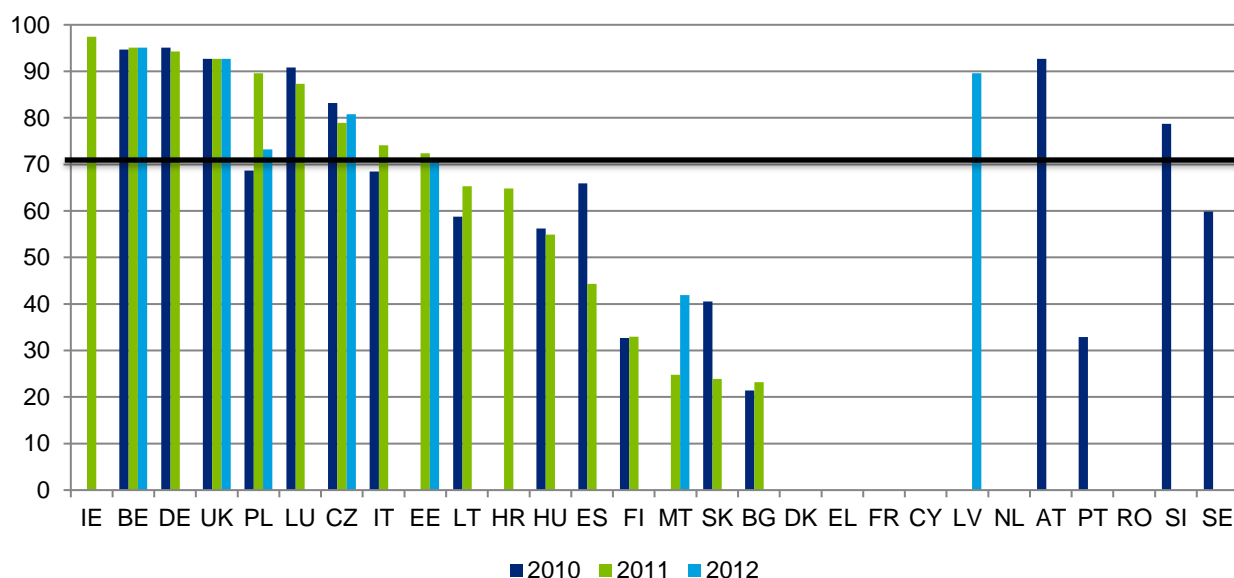


Figure 11: CDW recovery rates reported by MS in compliance with the Waste Framework Directive. The 70% target is shown in black

During the course of this study, additional data was provided by national statistics offices: either detailed national data with a more detailed breakdown by type of waste or national totals for CDW generated and treated that can be used to complete the picture provided in Figure 11.

Adjusted recovery rates were therefore calculated based on the best available information that had become available in the course of this study. The level of confidence of these adjusted recovery rates provided here depends on the following two factors:

- the method used to calculate the recovery rate (i.e. Eurostat data used for both numerator and denominator, Eurostat data used only for either the numerator or the denominator or detailed national data used for both numerator and denominator);
- the quality of the data used.

Confidence levels detailed for each country were obtained by giving a score from 1 to 3 on both methods and data quality. Each country has received a final confidence score that represents the sum of the data quality confidence score and the method confidence score and has subsequently been qualified as 'high confidence in recovery rate produced' (scores of 5 and 6), 'medium confidence in recovery rate produced' (scores of 3 and 4) and 'low confidence in recovery rate produced' (scores of 2).

¹⁵ 'ARGUS. Compliance Reporting on Waste Framework Directive - Recycling and Recovery Rates for 2010, 2011 and 2012. Report on the Validation of Construction and Demolition Waste Data - Draft'.

Table 4: Level of confidence in data quality

Confidence level	Colour used in Figure 12 and Figure 13
Low	Grey
Medium	Yellow
High	Green

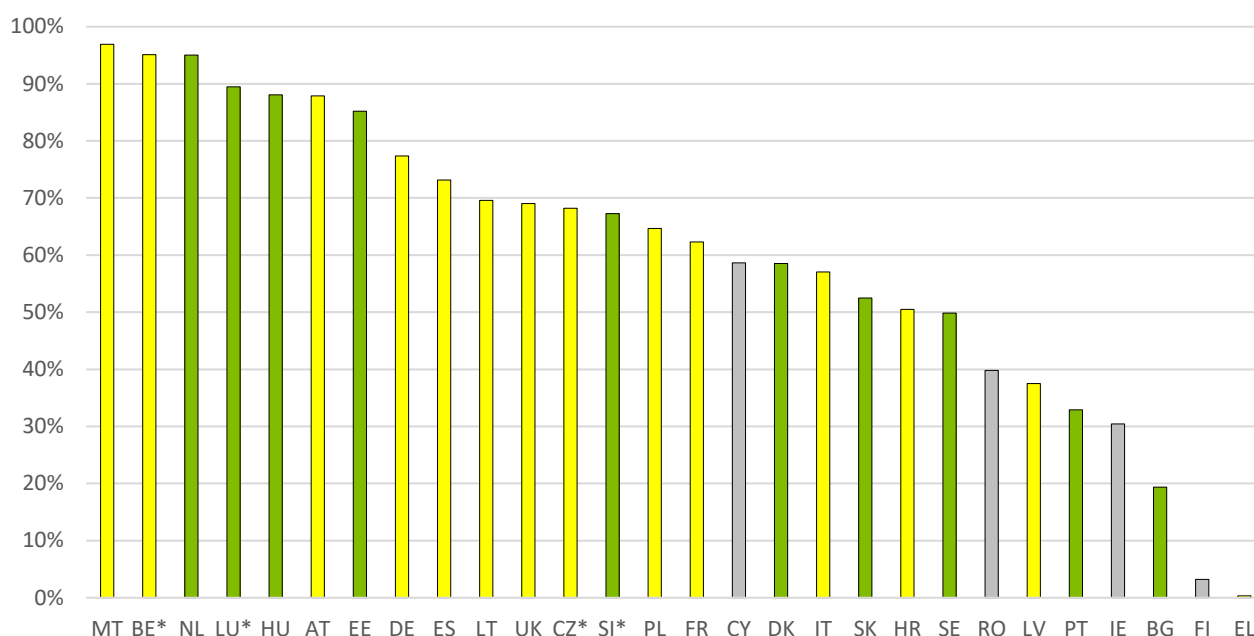


Figure 12: 2012 CDW recovery rates calculated in compliance with the WFD using all the available national information provided in Task 1 of this study

*Note: for countries indicated by *, i.e. BE, LU, SI and CZ, data are taken without backfilling as recovery rates would exceed 100% if backfilling was taken into account.*

There is a discrepancy between the recovery rates obtained using the methods presented in Figure 11 and the figures that were officially reported by the MS to the EC for several countries. This illustrates again that the **concepts behind the definition of the recovery rate might be unclear for some countries.**

Even if Figure 12 must be interpreted with caution, it shows that 9 MS already achieved the WFD 70% target (MT, BE, NL, LU, HU, AT, EE, DE, ES) in 2012 and 6 MS were close, with a recovery rate higher than 60% (LT, UK, CZ, SI, PL, FR).

In some MS (Malta, Spain, Slovakia, Cyprus and Poland), backfilling is a key factor in meeting the EU recovery target: In these countries, up to 74% of CDW is being backfilled (Malta). It is to be noted that there are indications that some operations that have been reported as backfilling may not meet the conditions laid down in EU legislation. The possibility of amending the definition of backfilling in EU legislation with a view to ensure that backfilling is carried out under environmentally sound conditions is being explored. For countries that are relying to a large extent on backfilling of CDW to meet the EU recovery target, an amendment of the backfilling definition after 2020 could **have a major impact.**

Figure 13 shows the recovery rates for all MS in 2012 excluding backfilling. In this case, only 7 MS would meet the EU recovery target.

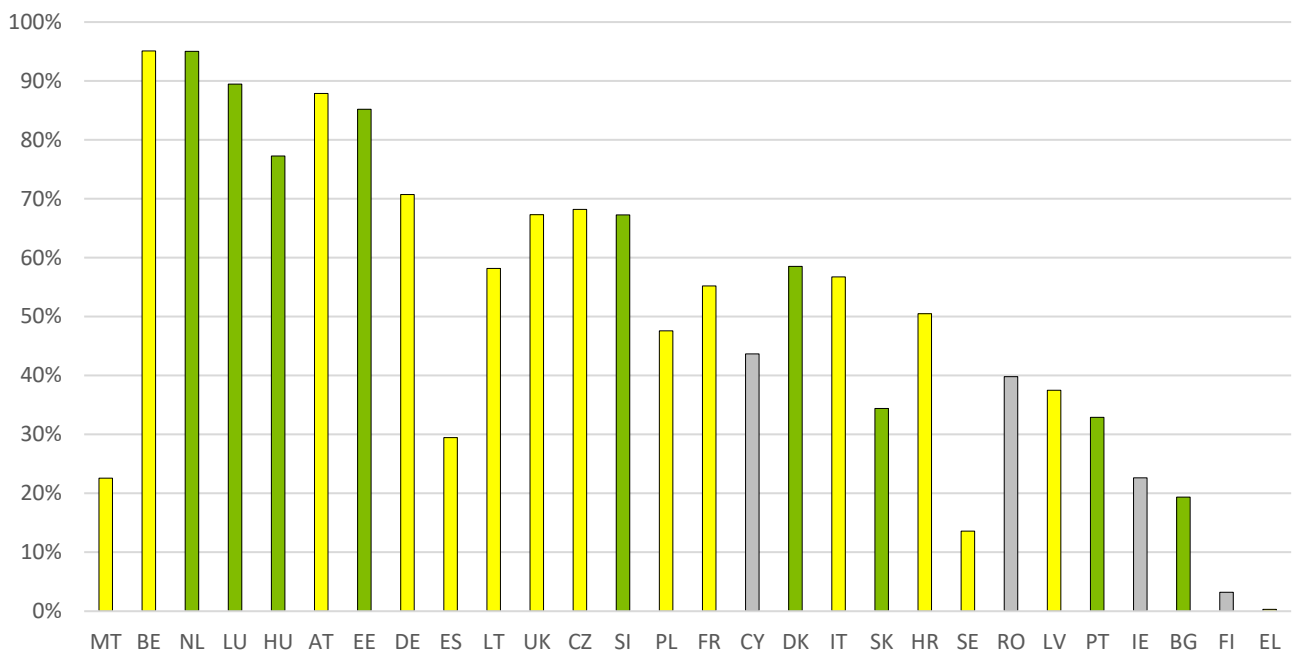


Figure 13 : 2012 CDW recovery rates calculated in compliance with the WFD using all the available national information provided in Task 1 of this study, excluding backfilling

2.3.3. Forecasts – An analysis that depends widely on the inclusion of backfilling

A project commissioned by the European Commission to Eunomia Research and Consulting Ltd and conducted in 2015 required that a construction & demolition (C&D) waste model be developed with several scenarios included.

The **business as usual (baseline) scenario** assumes that Member States will not make any effort to increase their recovery rates, and that the only thing that would change in the future are the amounts of C&D waste arising. These will indeed keep on growing at a rate defined by the GDP times the growth multiplier, which is set to 0.5 in wealthier Member States and to 1 in less wealthy Member States. In 2020, it is set to 0.5 for all Member States.

In the **more ambitious** scenario, backfilling was excluded in the calculations and the minimum target for 2020 was set at 70%. The main reason for excluding backfilling is due to the quality of the current data. Most countries are not able to correctly estimate backfilling and therefore include backfilling data in recycling data.

The overall increase in waste generated and treated in the EU is the same for both scenarios. The overall amount of CDW generated (excluding excavated soil) is 356 Mtonnes in 2012 and 385 Mtonnes in 2020. The increase in the amounts of waste treated follows exactly the same pattern as the model uses the same hypothesis to generate both numbers. It increases from 296 Mtonnes in 2012 to 320 Mtonnes in 2020.

Figure 14 presents the evolution of recycling and landfilling for both the baseline and the more ambitious scenario. In 2020, the fixed target for the recovery rate set in the more ambitious scenario induces an increase of 22 Mtonnes of CDW recycled and a decrease of 13 Mtonnes of CDW sent to landfill.

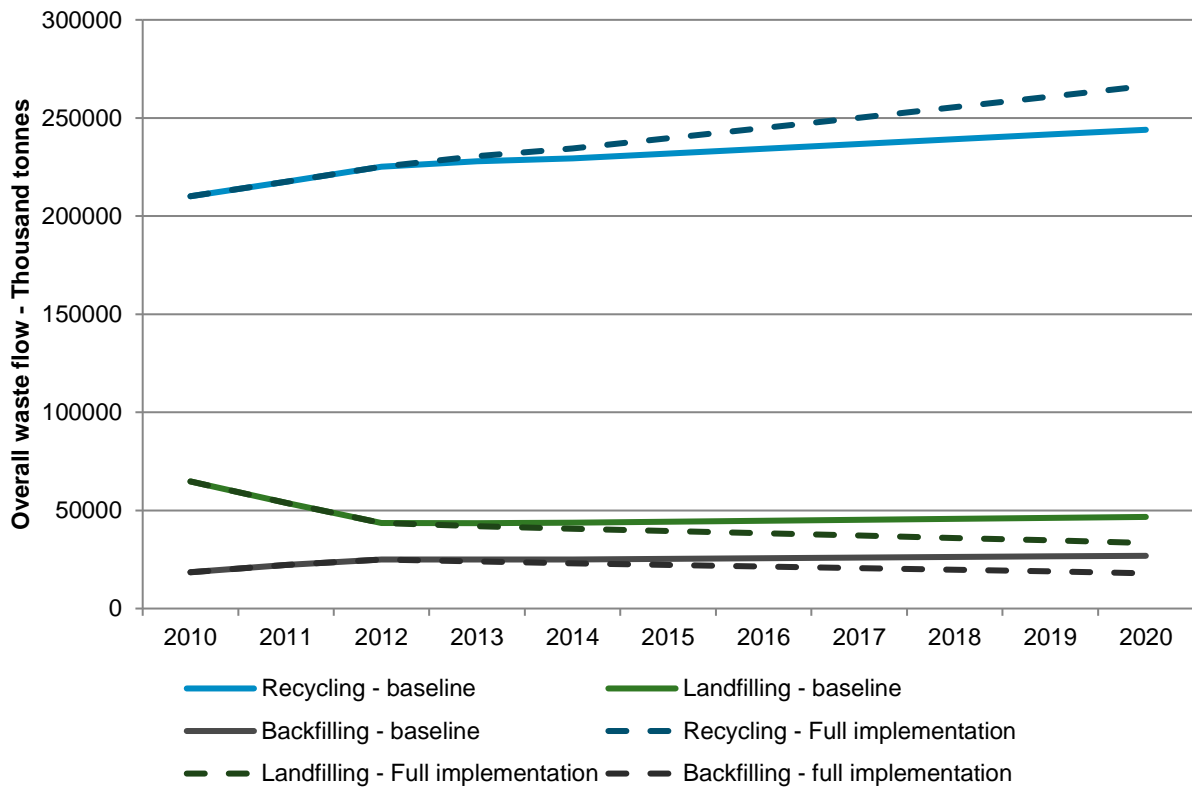


Figure 14: Model outputs for overall waste flows (generation, treatment, recycling and landfilling) for the baseline and the more ambitious scenarios (EU28)

The exercise presented here stresses the importance of quality input data. The quality of the output data is dependent on the quality of the input data.

2.4. Focus on hazardous waste

2.4.1. Hazardous waste generation – CDW, a major share in hazardous waste amounts

According to a European Environment Agency (EEA) study on hazardous waste published in June 2015¹⁶, **CDW holds a major share in generated hazardous waste amounts across several Member States.** For example in Germany, 32% of generated hazardous waste can be allocated to LoW chapter 17 ‘construction and demolition waste’ in 2012. A major share of imported waste amounts to Germany that are classified as hazardous according to the LoW are also CDW.

More generally, hazardous CDW is an important stream of hazardous waste in EU-28 (17% on average in 2012, including contaminated soils and dredging spoils) and includes different categories:

- 53% of mineral waste from construction and demolition (HAZ W121): **concrete, bricks and gypsum containing hazardous substances**, Tarmac ® and asphalt road covering containing hazardous substances, CDW containing mercury, insulation materials and other mixed CDW (e.g. plastic, wood, glass) containing hazardous substances;
- 38% of both **contaminated soils (W126) and dragging spoils (W127) from NACE F** (this waste stream is excluded from the present study’s scope);
- **8% of asbestos-containing waste (W12B)**: asbestos was commonly used as an insulating and fireproofing agent in construction materials such as cement. Since asbestos has been identified as a carcinogen product, asbestos-containing materials are no longer used. However, asbestos-containing waste is a major issue for all MS as it is present in most of the renovation and demolition projects.

¹⁶ EEA (prepared by the ETC/SCP and ETC/WMGGE), 2015, “Hazardous waste review in the EU-28, Iceland, Norway, Switzerland and Turkey - Generation and treatment”

- **1% of wood waste** (HAZ W075): wood sawdust, shavings, loss, particle panels and veneer **containing chemicals** due to painting, lacquers and fungicides;
- The remaining hazardous CDW is relatively not significant in terms of quantity, while its dangerousness for both human and the environment is of paramount importance:
 - Glass waste (HAZ W071): **powder or small particles of glass containing heavy metals**, such as special glazing;
 - **PCB-containing waste**: fillers, synthetic soil covering, double glazing, disused transformers and condensers containing PCBs are commonly found in renovation and demolition works. PCBs are also identified as potentially carcinogen substances and thus require separate collection and proper treatment.
 - Other hazardous substances in finished works waste: **lead-based paints** were commonly used before being forbidden in most countries in the late 1940's and may thus be found in renovation and demolition works. In general, CDW may contain paint and lacquer waste, wood treatment substances, toxic solvents, adhesives, coatings, lamps, mercury containing equipment. These various hazardous waste products all need specific management practices (identification, separate demolition, separate collection, proper treatment).

The pattern for hazardous CDW generation is slightly different to the total waste generation with **Germany and the Netherlands generating a larger amount of hazardous waste relative to the construction industry turnover** (above 20 tonnes/million Euros). This could be due to the length of time and stringency of waste management regulations that have been implemented in these two countries. For example, Germany and the Czech Republic have guidance for identification and management of hazardous waste. However, other countries with similar characteristics do not show such high levels of hazardous waste generation. A more in depth evaluation of hazardous waste regulatory compliance requirements, over time and across the EU would be necessary to determine the underlying reasons for these outliers.

On the other hand, **Bulgaria, Greece, Latvia, Ireland and Romania show the lowest amounts of CDW generated taking into account the turnover rate of the construction sector** (ranging between 0.02 and 0.12 tonnes/million Euros). The countries that appear to produce the smallest amounts of hazardous CDW relative to turnover tend to have lower data quality scores than those producing higher amounts. This might suggest that the amount of hazardous waste is under-reported in these countries. Previous validation sessions of Eurostat statistics already pointed out inconsistencies in hazardous waste reporting in the case of Latvia and Romania^{17 18}. For Bulgaria and Greece, the overall drop of total CDW in NACE F is due to the economic slowdown¹⁹, but no specific explanations were provided for the decrease of hazardous CDW in 2012. Moreover, in the case of Greece, CDW may be underestimated due to some shortcomings in environmental permits for treatment facilities used as administrative sources to estimate both produced and treated waste amounts²⁰.

For Greece, Latvia and Romania it is reported that data may not be properly reported or not reported at all. In Latvia, illegal dumping is thought to be a problem due to a lack of resources so enforcement is not carried out properly. Similarly, in Greece, the issue of illegal CDW disposal is not being tackled due to a lack of enforcement/delays in applying the laws.

¹⁷ 'ARGUS. Validation and Publication of Waste Statistics - Report on the in-Depth Validation of WStatR Data and Documentation of Country Specific Results - Reference Year 2010 -'.

¹⁸ ICEDD asbl, *Waste Statistics in Depth Validation - Reference Year 2012. Data Validation Description and Country Fact Sheets* (For EUROSTAT, October 2015), p. 109.

¹⁹ 'ARGUS. Validation and Publication of Waste Statistics - Report on the in-Depth Validation of WStatR Data and Documentation of Country Specific Results - Reference Year 2010 -'.

²⁰ 'ARGUS. Validation and Publication of Waste Statistics - Report on the in-Depth Validation of WStatR Data and Documentation of Country Specific Results - Reference Year 2010 -'.

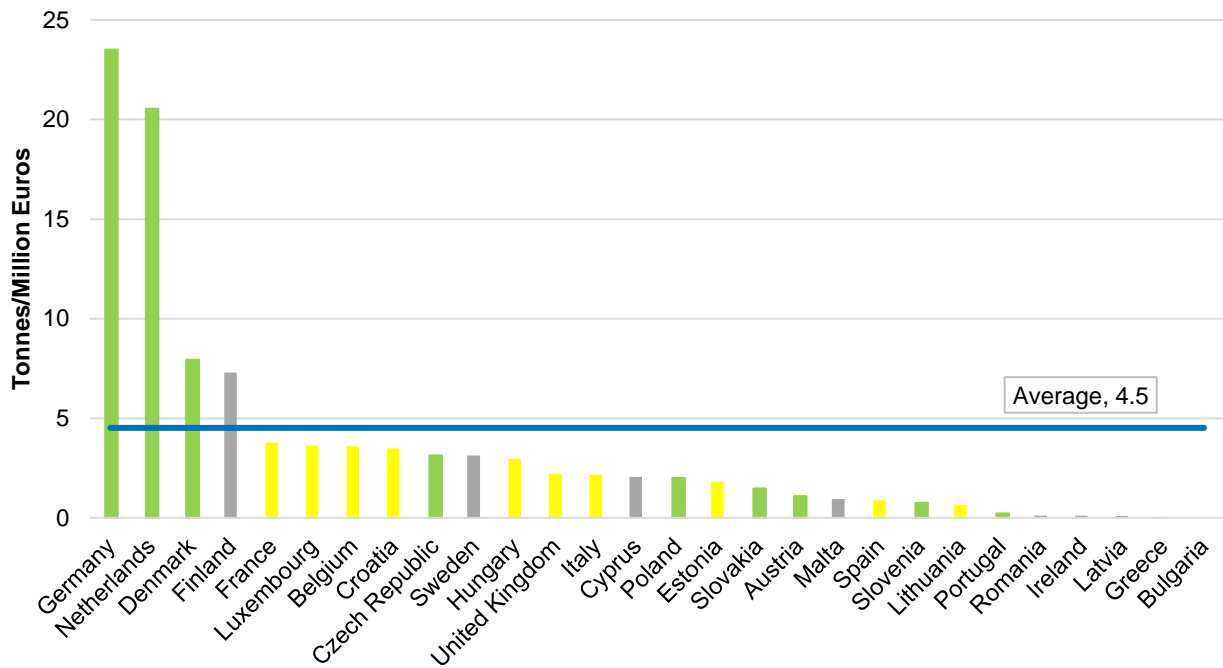


Figure 15: Hazardous CDW generated per €Million turnover, 2012

The breakdown of CDW generated into hazardous and non-hazardous has been calculated as shown in Figure 16. For some countries, there is a **major variation in the amount of hazardous CDW generated as a proportion of the total. Sweden (13%), Denmark (8%) and the Netherlands (7%) generating a much larger proportion of hazardous waste, whereas 11 countries reported generating less than 1% hazardous CDW.** This could be due to better governance in these countries, which means that hazardous waste is identified and managed better. Sweden, Denmark and the Netherlands all have established policies for reducing hazardous waste and dealing with legacy waste, whereas those MS producing less than 1% hazardous CDW have limited policies in place (based on the maturity matrix assessment in 3.3 report). In addition, the Member States producing lower levels of hazardous CDW appear to have limited legislation in place or limited enforcement.

A number of MS (Hungary, UK, Ireland, Poland, Slovakia and Sweden) require pre-demolition audits or inventories/surveys to identify hazardous waste present and in particular, asbestos. These requirements are usually linked to the demolition permit/licence and the driver is health and safety. This type of legislation has usually been in place for 5-10 years. However, the levels of hazardous CDW vary considerably between these so it is not possible to draw any conclusions about the impact of mandatory pre-demolition audits on the amount of hazardous CDW produced.

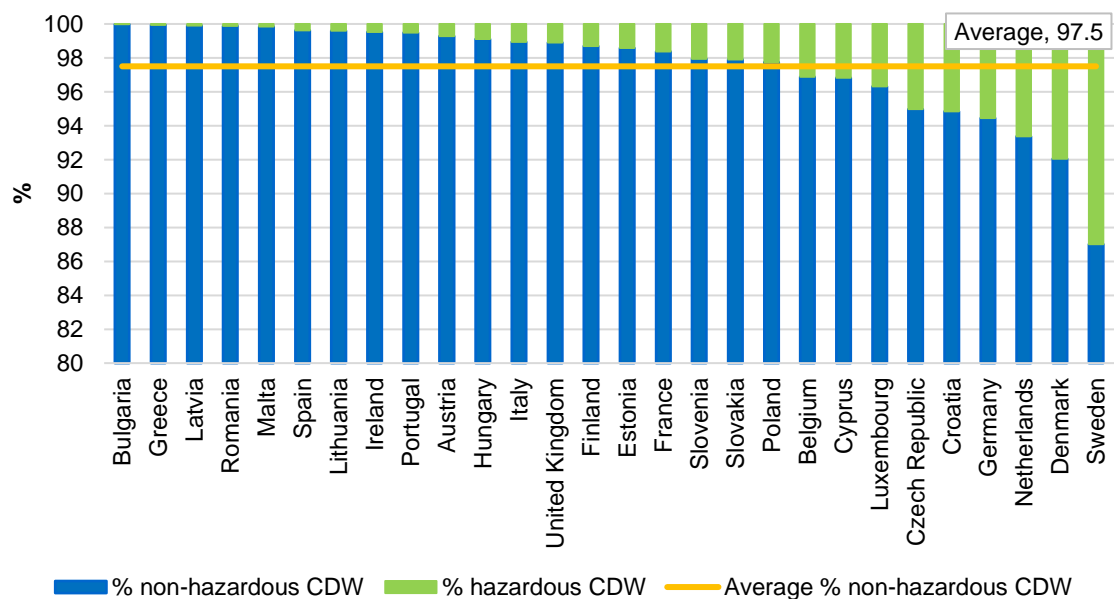


Figure 16: Breakdown of CDW generated, 2012

As shown in Figure 17, hazardous CDW generated by Member States is mainly composed of hazardous mineral waste from construction and demolition (W121) or other mineral waste containing asbestos (W12B). There is an apparent gradient of waste type compositions ranging from 100 % of hazardous mineral waste from construction and demolition (W121) in Ireland and Romania to 100% of hazardous other mineral waste containing asbestos (W12B) in Cyprus. No waste containing asbestos is being reported by some Member States, which suggests that asbestos is not being collected separately from other mineral CDW. The asbestos may be mixed with hazardous or non-hazardous mineral waste. For instance, in the case of Ireland, asbestos waste is produced in the country, but does not appear in Eurostat statistics²¹.

Moreover, the diverse patterns of hazardous CDW composition across the EU Member States might also be due to incorrect assignment of waste to the correct waste categories.

This figure should also be carefully read in light of Figure 15. For instance, the implausible low relative amounts of hazardous CDW reported by some Member States (i.e. Romania, Latvia, Greece and Bulgaria) due to inconsistent reporting might in fact not be representative of the “actual” amount of hazardous waste generated in the country.

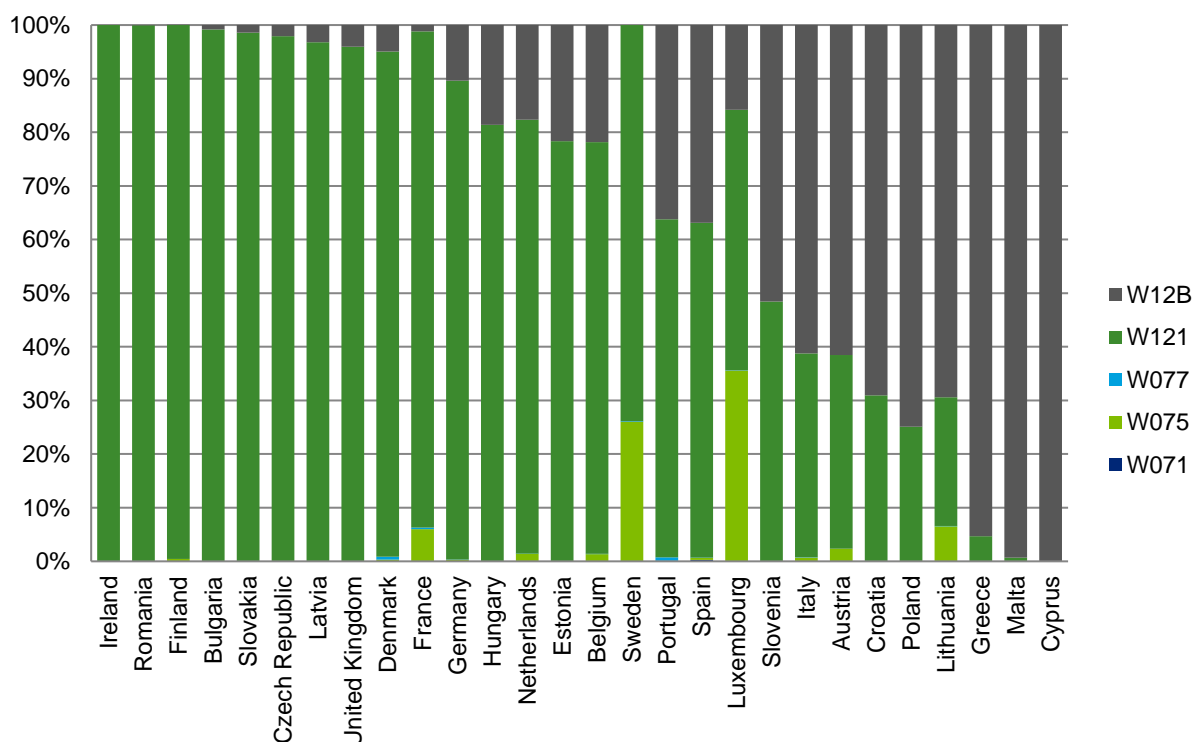


Figure 17: Breakdown of hazardous waste generated in 2012

Note: W071 = glass waste; W075 = wood waste; W077 = waste containing PCBs; W12B = Other mineral waste containing asbestos (excl. C&D waste, combustion waste, soils, dredging spoils, waste from waste treatment); W121 = mineral waste from construction and demolition

²¹ Personal communication with Conor Walsh from SLR Consulting Ireland (January 2016)

2.4.2. Hazardous waste treatment – A concentration of treatment facilities in a selection of Member States

The breakdown of hazardous and non-hazardous CDW treated by each MS is summarised in Figure 18 below. This is based on Eurostat data of waste treated in 2012.

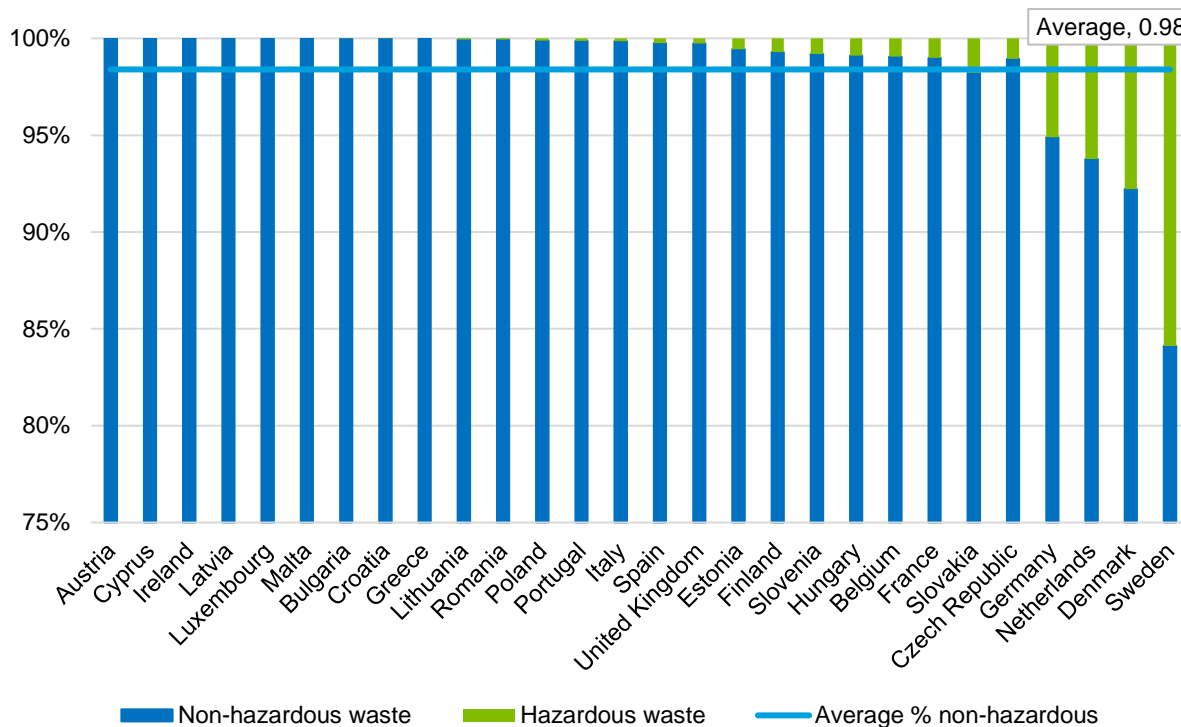


Figure 18: Breakdown of treated waste

This shows that **Sweden, Denmark, the Netherlands and Germany** treat a much larger proportion of hazardous CDW than the average. This is in line with the previous analysis of hazardous CDW generated as a proportion of all CDW generated with these four countries producing a larger proportion of hazardous CDW.

In addition, Sweden, Denmark, the Netherlands and Germany all import hazardous CDW whereas Ireland, Austria, Malta, Croatia and Greece all export hazardous CDW. Exports of hazardous CDW is a reality in a series of Member States which are not equipped for dealing with the specific treatment of these waste types. While these CDW have to be declared as being generated, they do not appear in the national statistics as far as treatment is concerned (the MS importing these CDW accounts for these additional amounts of treated waste in their own statistics). This phenomenon of hazardous CDW exports is often correlated with the size of the country (e.g. in Malta, Cyprus and Luxemburg). Small countries are likely not to invest in appropriate facilities for hazardous waste handling, probably more expensive than exporting this waste. Hence, in such countries, due to the lack of appropriate facilities for hazardous waste handling, most of hazardous CDW has to be exported for treatment ^{22,23}.

²² 'Quality Report for 2012 Waste Data Reported by Malta's National Statistics Office (NSO), Eurostat Metadata'.

²³ 'Email Communication with Mrs Nadine Mercieca, Senior Environment Protection Officer, EU Affairs at Environment Protection Directorate - MEPA, on Behalf of the Malta Environment and Planning Authority (MEPA) and Ministry for Sustainable Development, the Environment and Climate Change (MSDEC) of Matla, April - May 2015 (task 1)'.

Figure 19 below shows the percentage of the different processing operations performed on hazardous mineral CDW compared to the total amount treated (with still 7 countries not reporting data).

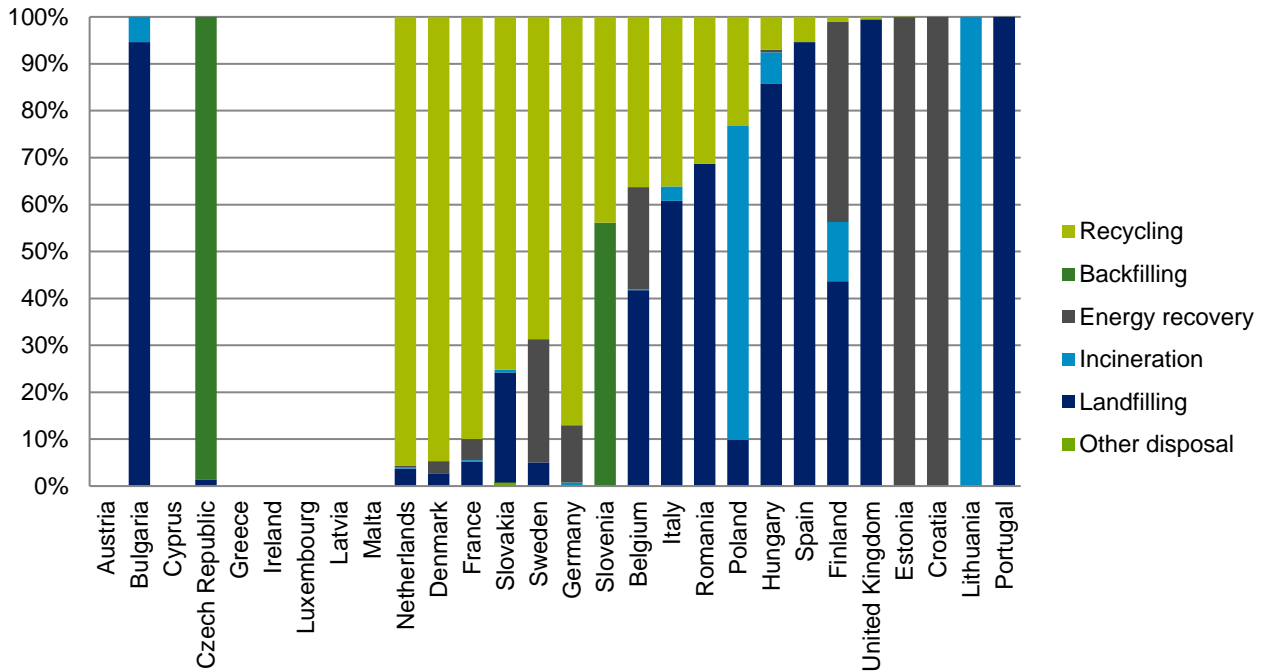


Figure 19: Share of each treatment operation compared to the total amount of hazardous mineral CDW treated in EU Member States for the year 2012

This figure shows EU MS achieving contrasting performances. Whereas **the Netherlands, Denmark and France recycled more than 90% of the treated waste**, countries such as **the United Kingdom, Estonia, Lithuania, Croatia and Portugal incinerated or landfilled it**.

In the Czech Republic, all hazardous CDW seems to be backfilled but this seems to be a reporting problem due to the absence of a specific code for backfilling in the country and at EU level. National authorities further confirmed that backfilling of hazardous waste is not actually taking place in that country. Unfortunately there is no information available on the actual treatment operation for hazardous CDW in the Czech Republic.

The percentage of treated waste that is recovered has been analysed based on Eurostat data for waste management route RCV_0, Recovery other than energy recovery - Except backfilling. This has been calculated for 2012 for total CDW treated, hazardous CDW treated and non-hazardous CDW treated as shown in Figure 20.

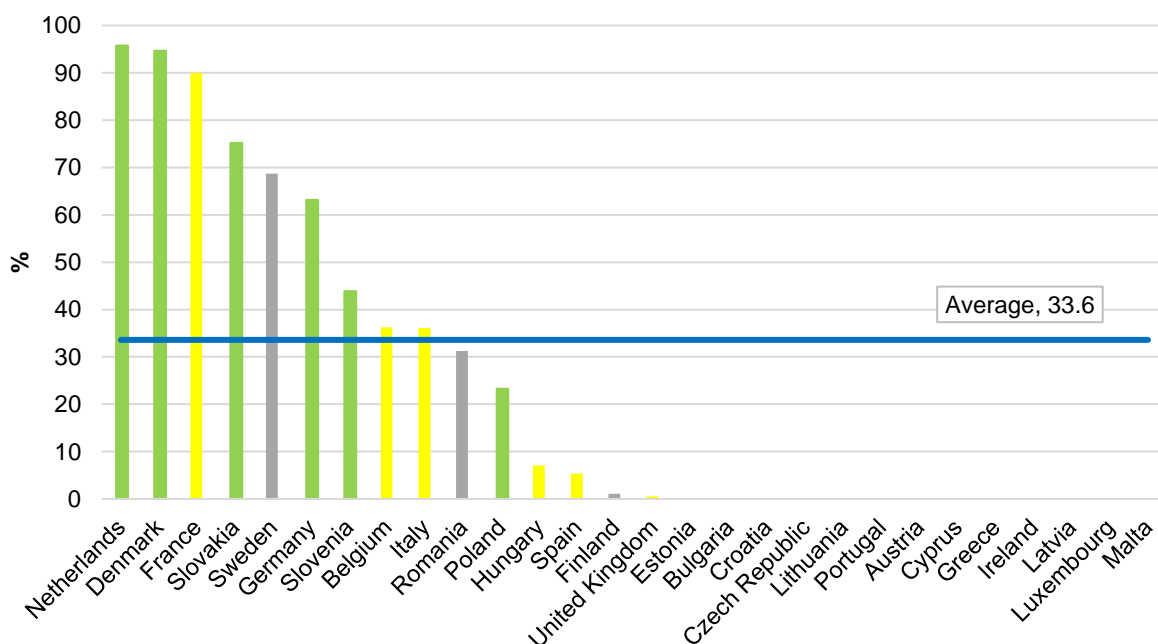


Figure 20: % Hazardous CDW recovered

As seen in Figure 20, the Netherlands, Denmark and France recover (RCV_O, Recovery other than energy recovery- Except backfilling) a high proportion of hazardous CDW but **almost half the MS do not recover any hazardous CDW waste**. In these cases, hazardous waste is either landfilled or incinerated (INC, without energy recovery and RCV_E, incineration/energy recovery).

2.5. Focus on backfilling

The definition of the CDW recovery target in the Waste Framework Directive (WFD) enables MS to include the volumes used for backfilling into the calculation of their national CDW recovery target. But the WFD also requires that MS “shall take measures to promote high quality recycling”, which is contradictory.

Also, as the WFD itself does not provide a definition for backfilling, there is a relative confusion among Member States (MS) concerning the term backfilling and its application as a recovery or a disposal operation. This results in a considerable variation in the reporting systems applied by MS to demonstrate their performance against the Article 11 (2) 70% target for construction and demolition waste.

2.5.1. Definition of “backfilling” – A Eurostat guidance that tends to clarify the WFD definition

‘Backfilling’ is not a term which has been defined in the Waste Framework Directive (WFD) ²⁴ however it is included in the target for re-use and recycling of CDW within Article 11/2b:

‘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.’

To provide rules and calculation methods for demonstrating compliance to the 70% CDW target, the Commission Decision 2011/753/EU²⁵ was published and a definition was given in Article 1 (6):

‘Backfilling’ means a recovery operation where suitable waste is used for reclamation purposes in excavated areas or for engineering purposes in landscaping and where the waste is a substitute for non-waste materials.’

According to this definition, backfilling meets the definition for “recovery” under the WFD (since it “serves a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function”), but fails to comply with the specific requirements for recycling (or for preparation for re-use). Hence, **backfilling can be considered as low quality recovery**, as energy recovery and the reprocessing into materials that are to be used as fuels.

There is **no specification of the type of waste other than it has to be “suitable”** but in the context of the 70% WFD CDW recovery target, this must exclude naturally occurring material defined in waste category 17 05 04, i.e. soils & stones. Also, it can be deduced with reference to the Landfill Directive that **only inert waste** with minimal potential for environmental risk **would be “suitable”** for such lightly regulated activities and be able to replace non-waste materials. **This inert waste will only include concrete, bricks, tiles and ceramics.**

However, this definition still failed to substantiate the claim of backfilling as a recovery operation, since MS could still report CDW stored in spent quarries as reclamation activity regardless if that purpose was intended or not. The vague interpretation of backfilling as a recovery operation could lead to increased recovery rates, while in reality CDW is treated similarly to landfilling but with the only difference of filling in void underground spaces instead of taking space on the surface areas of designated landfills.

To provide assistance on how ‘backfilling’ should be reported, Eurostat produced a document: ‘Guidance on the interpretation of the term backfilling’²⁶.

The guidance specifies the following aspects:

- *Any backfilling operation has to comply with the recovery definition by **replacing other materials or being prepared to fulfil a particular function.***

²⁴ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0098&from=EN>

²⁵ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011D0753&from=EN>

²⁶ Eurostat Guidance on the interpretation of the term backfilling

- Associated with the term backfilling is the notion of a **permanent placement of the material on/in particular sites**, it is not intended to be returned to the economic material cycle.
- The condition of substituting other (non-waste) materials suggests that **the reclamation or landscaping measures will be undertaken anyway**, whether a suitable waste for this purpose is available or not.

2.5.2. Potential modification of the definition of “backfilling” introduced by the Circular Economy Package – A risk of considering the production of recycled aggregates as backfilling

On the 2nd December 2015, the European Commission announced the adoption of a Circular Economy Package, which includes revised legislative proposals on waste. This includes proposed changes to the WFD Directive 2008/98/EC with regard to the definition of ‘backfilling’ and the wording of Article 11 2/b.

Article 11 2/b is modified as follows: ‘By 2020, the preparing for re-use, recycling and backfilling 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’.

Key changes are that the words ‘material recovery’ and ‘using waste to substitute other materials’ have been removed.

In addition, a definition for backfilling has been introduced, which is to replace the definition within the Commission Decision 2011/753/EU:

“backfilling” means any recovery operation where suitable waste is used for reclamation purposes in excavated areas or for engineering purposes in landscaping or construction instead of other non-waste materials which would otherwise have been used for that purpose.

The new definition has added engineering purposes in construction. Yet, as stated in the WFD definition of recycling (article 3/17), recycling “**does not include [...] the reprocessing into materials that are to be used [...] for backfilling operations**”

Consequently, **if this proposed expansion of activities considered to be backfilling is applied, it is likely to result in all suitable waste reprocessed into aggregates to standards and specifications for construction engineering being re-classified as backfilling rather than recycling**, unless they have ceased to be waste by meeting the WFD end of waste criteria.

2.5.3. Inclusion of backfilling in the EU 2020 target – A disputable statement toward high quality recycling

Having excluded soil, stones and dredging soil (waste code 17 05 04), the other CDW waste codes for waste which may be inert and suitable for backfilling activities (*‘reclamation purposes in excavated areas or for engineering purposes in landscaping’*) are: 17 01 01 Concrete, 17 01 02 Bricks, 17 01 03 Tiles & ceramics and 17 01 07 Mixtures of concrete, brick, tiles & ceramics.

Table 5: CDW suitable for backfilling

CDW suitable for backfilling	Included in scope of WFD CDW 70% target	Recycling potential at higher quality/value than backfilling		Recycling within scope of EN product Quality Standards
		Aggregates	Glass	
17 01 01 Concrete	Yes	100%	n/a	Yes
17 01 02 Bricks	Yes	100%	n/a	Yes
17 01 03 Tiles and ceramics	Yes	100%	n/a	Yes
17 01 07 Mixtures of concrete, bricks and ceramics	Yes	100%	n/a	Yes

17 02 02 Glass	Yes	100%	100%	Yes
17 05 04 Soils and stones	No	Minimal	n/a	n/a

The WFD Article 11 requires that ‘Member states shall take measures to promote high quality recycling and, to this end, shall set up separate collections of waste where technically, environmentally and economically practicable and appropriate to meet the necessary quality standards for the relevant recycling sectors.’

High quality recycling of waste coded 17 01 01/02/03/07 and suitable waste coded 19 12 09, is in the production of aggregates to meet Construction Products Regulations harmonised European aggregates product standards, which are mandatory in all EU MS.

Hence, **the inclusion of ‘backfilling’ of such ‘suitable’ waste to achieve the 70% target for re-use, recycling and recovery within Article 11/2b is contrary to the primary objective of high quality recycling to quality standards.**

Another point is that Eurostat guidance adds that ‘*the reclamation or landscaping measures will be undertaken anyway, whether a suitable waste for this purpose is available or not.*’

The reporting by MS of mines and quarries as recovery through backfilling with suitable waste implies that, in the absence of that waste, such restoration would have been accomplished by purchasing material from other quarries or mines is highly unlikely.

Backfilling activities and their level of likely compliance within the scope of the WFD are shown on Table 6 below. **Within the current practices considered as backfilling, only reclamation of excavated areas in construction could be considered as compliant with the WFD backfilling criteria**, as it substitutes non-waste materials and would be undertaken anyway if waste was not available (for more details on this recommendation, see paragraph 6.5. “Remove the backfilling barrier”)

Table 6: Backfilling activities and their likelihood of compliance with the WFD criteria, and their environmental risk

Activities within the scope of WFD backfilling (excluding Dec.’15 Circular Economy Package proposals)	Likelihood of compliance with WFD backfilling criteria*			Suitability of activity for recovery of waste code 17 05 04 Soils and Stones (i.e. not included in WFD 70% target)**	Environmental Risk*
	Substitution of non-waste materials	Activity would take place if waste was not available	Not intended to be returned to the economic material cycle		
Reclamation of excavated areas (in construction) (see Figure 21) Construction earthworks, i.e. engineering works involving the movement of soils and stone on a construction site, may require some of the soils and stone to be dug out and removed from the site because they are they are unsuitable for construction applications on that site. The hole or holes created are referred to as voids. These voids, or sections of the voids, may require raising to construction design levels with infill materials that have engineering properties meeting the technical material specifications for the construction works.	Medium	High	High	High	Low
Reclamation of excavated areas (mines and quarries) (see Figure 22 and Figure 23)	Low	Low	High	High	Low

Activities within the scope of WFD backfilling (excluding Dec.'15 Circular Economy Package proposals)	Likelihood of compliance with WFD backfilling criteria*			Suitability of activity for recovery of waste code 17 05 04 Soils and Stones (i.e. not included in WFD 70% target)**	Environmental Risk*
	Substitution of non-waste materials	Activity would take place if waste was not available	Not intended to be returned to the economic material cycle		
The commercial extraction of minerals from mines and quarries, i.e. mining and quarrying, also creates voids. The infilling of these voids with environmentally suitable materials may enable the restoration of the land for agriculture or development.					
Landscape engineering (see Figure 24) Construction works may include the shaping of the land around a building project to improve the visual appearance of an area and/or to provide some degree of screening to provide privacy or to reduce noise. These works are designed and engineered to fulfil a specific function and carried out with materials meeting a construction material specification. Landscape engineering may also be undertaken as part of the final restoration of landfills, see “Covering landfills” section below.	Low	Low	High	High	Low
Covering landfills (see Figure 25) This activity takes place during the final restoration works on a completed landfill e.g. when a landfill has been sealed by capping and requires soils to return the land to farming. EC guidance advises that landfill restoration may be defined as ‘backfilling’ if the waste is used instead of other virgin materials, suitable for the application (complying with the necessary properties for the particular performance), and applied in a process of landscaping engineering.	Low	High	High	High	Low

* An entry of ‘High’ against an activity indicates that there is a reasonable prospect of compliance with that element of the WFD requirements. An entry of ‘Medium’ indicates that compliance with the WFD target is possible and this is explained in more detail in the Note to Table 5. An entry of ‘Low’ indicates that compliance with that element of the WFD requirements is highly unlikely.

** This is included to emphasise the point that suitable materials with waste code 17 05 04 are highly appropriate for the listed activities and are a more sustainable option for the use of resources.

***Environmental Risk relates to the likely impact of the use of inert CDW on groundwater relative to each activity, this risk will increase where groundwater protection is a critical consideration; an entry of ‘Low’ indicates that there is a small risk.

Note: There is a medium chance of replacing non-waste materials and that is in excavated areas in construction. A construction project may have a clear need for a resource to fill a void, if hard inert CDW is not available, they may first look at infill soils (17 05 04) and lastly at crushed rock, i.e. virgin material. Other activities are likely to have a low possibility of substitution with non-waste materials. This is due to the fact that quarries sell their materials and are therefore not likely to be backfilled; mines are only backfilled with virgin materials when there is a planning/legal obligation to infill and groundwater risks requiring the use of specific aggregates, however this is rare; landscape engineering usually uses on-site excavation waste (17 05 04). The same excavation waste would be the first choice for screening banks and virgin

materials will be the last resort if waste was not available; and the final covering of completed landfills is sub-soil or clay. Virgin aggregates are unsuitable and extremely unlikely to be considered as an option.



Figure 21 : Reclamation of excavated areas (in construction) - earthworks²⁷

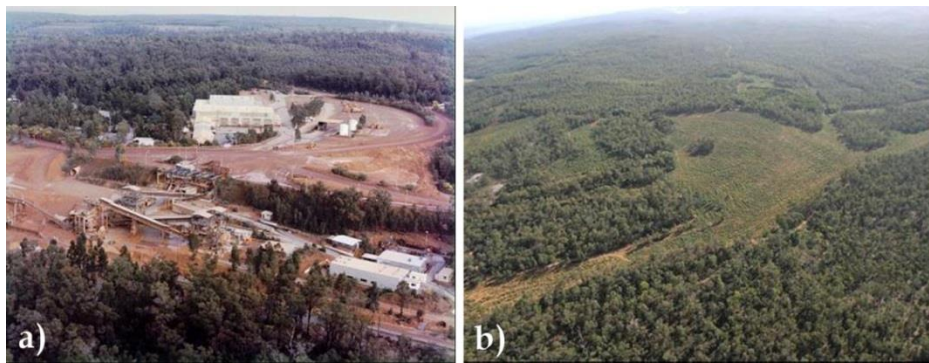


Figure 22: Reclamation of excavated areas: restoration of a mine (before and after)²⁸



Figure 23: Reclamation of excavated areas: filling in a quarry void²⁹

²⁷ Sourced from: <http://grounddevelopments.co.uk/ground-improvement/soil-stabilisation/>

²⁸ From: <https://www.intechopen.com/books/advances-in-landscape-architecture/reclamation-of-degraded-landscapes-due-to-opencast-mining>

²⁹ From : <http://www.chelvertondevelopments.co.uk/projects/chipping-sodbury>



Figure 24: Landscape engineering: an example of a noise bund/barrier³⁰



Figure 25: Covering landfills: capping of a landfill³¹

Table 7 provides examples of recycling applications for processed inert mineral CDW and applications for unprocessed inert waste. The applications for the uprocessed inert mineral CDW are demonstrated to be either backfilling, if waste is replacing a non-waste, or landfill if waste is not replacing a non-waste. These activities are within the scope of the WFD backfilling, as per Table 6.

Table 7: Examples of applications for processed and unprocessed inert mineral CDW

Applications for <u>processed</u> inert mineral CDW	Recycling	Backfilling	Landfilling
Aggregate meeting specification for unbound road layers (sub-base)	✓		
Aggregate meeting drainage aggregate specification	✓		
Fine aggregate to tennis court sand specification	✓		
Aggregates meeting specification for unbound road layers for use in agricultural paths	✓		

³⁰ Sourced from: <https://www.newcivilengineer.com/latest/gatwicks-premium-bund/8624222.article>

³¹ <http://www.deme-group.com/references/capping-category-iii-landfill>

Aggregates to engineering specifications for trench fill	✓		
Aggregates for engineering fill to earthworks specifications e.g. in noise barriers etc.	✓		
Aggregates for engineering fill to earthworks specifications for dams	✓		
Applications for unprocessed inert mineral CDW	Recycling	Backfilling	Landfilling
Reclamation of excavated areas (in construction) – the raising of holes(voids) to construction design levels			
Waste replacing non-waste resources as bulk filling material for dams		✓	
Reclamation of excavated areas (mines and quarries) - the filling of the holes (voids) for restoration purposes such as agriculture or development			
Waste replacing non-waste resources in restoration of quarries		✓	
Waste not replacing non-waste resources in restoration of quarries			✓
Waste replacing non-waste resources in restoration of mines		✓	
Waste not replacing non-waste resources in restoration of mines			✓
Landscape engineering – can include the shaping of the land to improve the visual appearance of an area and/or to provide some degree of screening to provide privacy or to reduce noise or development of pathways			
Waste replacing non-waste resources as filling material in landscaping e.g. in noise barriers		✓	
Waste replacing non-waste resources as unbound layers for agricultural paths		✓	
Covering landfills - the final restoration works on a completed landfill			
Waste replacing non-waste resources in restoration of landfills		✓	

The following checklist can be used to establish if an activity can be considered as backfilling.

Table 8: Checklist to establish if an activity can be considered as backfilling

Criteria for assessing validity of an activity as backfilling	
1. Would the construction, reclamation or landscaping activity be undertaken whether a waste suitable for this purpose is available or not?	In all cases where one or more of the responses are NO, the activity cannot be classified as Backfilling in the context of the WFD CDW 70% target.
2. Does the waste substitute a non-waste material?	
3. Are the wastes suitable inert construction wastes within the scope of WFD CDW 70% target and exclude waste code 17 05 04 soil and stones?	
4. Is the use of the waste permanent with no intention of returning the material to the economic cycle?	
5. If the activity is the reprocessing of waste into materials that are to be used for backfilling operations do the proposed backfills meet all criteria 1 to 4 above?	

The inclusion of ‘backfilling’ as a poorly defined option for ‘recovery’ within Article 11 2/b results in inconsistency in CDW data reported by MS. Activities classified as ‘backfilling’ vary depending on established practices in different MS and matters are more confused by widespread land recovery through restoration with inert soils (waste code 17 05 04), which involve a waste and a recovery process excluded from the 70% target in Article 11 2/b.

The inclusion of the term ‘backfilling’ in the present wording of Article 11 2/b has caused, and continues to cause misunderstanding, creating a disincentive to achieving the resource efficient objective of high quality recycling to quality standards.

This point is supported by the 2014 report completed for the Nordic Council of Ministers and titled 'ENCORT-CDW: Evaluation of the European recovery target for construction and demolition waste'³², in which one main conclusion was: *"The EU recovery target does not ensure a sustainable waste recovery in its present form as it does not favour the most sustainable recovery operations. Above all, it does not distinguish between backfilling and other more resource efficient recovery operations. Since backfilling is a recovery option that generally results in both low benefits and future environmental risks, this increases the risk for "downcycling", which means that the waste is not recovered in the most optimal way"*.

Excluding backfilling from the WFD recovery is an option recommended by the Swedish Geotechnical Institute as presented at the workshop³³. Findings from the workshop, indicated that two-thirds of attendees were unsure as to whether backfilling should be excluded from the WFD target. This suggests that there is a lack of awareness and understanding of the issues related to backfilling. These issues should be communicated more widely across MS. It is also vital to develop a better understanding of the impact of removing backfilling from the target for MS where backfilling rates are high and included in their recovery target.

2.5.4. Interpretation and reporting of backfilling by MS – Various practices among Member States

Despite the guidance document on 'backfilling' provided by Eurostat there is significant variation between the ways in which individual MS define and report 'Backfilling' as part of their internal regulations designed to report on the WFD Article 11 target for re-use, recycling and recovery of CDW.

The official percentage of CDW that is backfilled on average is quite small (<6%) but the **current backfilling figures seem to be underestimated in Eurostat** statistics and the share reported as being backfilled **varies consistently from one Member State to another**. More information on the statistical treatment of backfilling at EU level is available in section 3.3 of this report.

Task 3 further analysed the backfilling approach taken by Germany, Austria, and that of Malta and Poland, which show a clear difference, even if cross-analysis of these four examples was difficult due to inconsistencies in reporting and the varying degrees of confidence that can be attributed to the accuracy of some data.

Germany and Austria have a high rate of recycling and an established market for recycled aggregates. They also discourage backfilling of resources suitable for processing into aggregates whilst promoting legislation for the beneficial use of excavation waste/soils in the restoration and landscaping of land. In Germany, this is achieved through a high CDW landfilling cost and tight regulation for the use of waste in landscaping and restoration in most German states. This is in line with the requirements arising from environmental provisions associated to waste legislation and laws related to soil (Bundes-Bodenschutzgesetz (BBodSchG) and the Bundes-Bodenschutzverordnung (BBodSchV)) and groundwater (Wasserhaushaltsgesetz (WHG)). In Austria, backfilling is strictly controlled and permitted as a form of recovery only if the following criteria are fulfilled:

- Substitution of other material for a concrete purpose (structural engineering),
- Quality comparable to that of the substituted product by a quality assurance system,
- Limited use to an extent absolutely necessary for reaching the goal of backfilling.

Malta and Poland are dependent on activities classified as backfilling to reach the WFD 70% recovery target for CDW. Malta permitted a number of quarries for backfilling operations, whereby clean inert waste is recycled and/or backfilled. In 2009 all of these licences were revoked and quarry owners which were still interested in pursuing this activity submitted an application for an environmental permit under 2011 legislation for backfilling or recycling inert waste This is to prevent CDW taking up landfill space and to use it to restore exhausted and operational quarries; however the CDW is not a substitute for non-waste materials. Until recently, the backfilled CDW volumes were reported as landfilled and are still reported as such in Eurostat data. However, under the light of the possibility of using backfilling as recovery in the calculation of the WFD target, Malta is considering reporting the entire volume of CDW backfilled in spent quarries as recovered and thus would reach an extremely high recovery rate.

For Poland, the reporting of performance against the WFD 70% recovery target for CDW includes backfilling. This activity has, within its scope, stowage of suitable CDW in mines and quarries, land rehabilitation and landscaping. Poland has introduced new legislation to include more activities in the scope of backfilling, which

³² <http://norden.diva-portal.org/smash/record.jsf?pid=diva2%3A724760&dswid=8234>

³³ Presentations available at: http://ec.europa.eu/environment/waste/studies/mixed_waste.htm

could be viewed as a backward step by discouraging the use of suitable CDW into aggregates. These activities include:

- including filling areas negatively transformed, such as landslips, opencast workings, depleted workings
- hardening land surface
- using in underground mining techniques
- performing minor repairs and maintenance
- construction, reconstruction or renovation of tracks and track bed, embankments, railway embankments, road and highway foundations, impermeable linings, cores of hydraulic structures, and other buildings and structures, including foundations
- construction, development and maintenance of other hydraulic structures, such as artificial islands, structures and installations, submarine cables and pipelines, piers, embankments, platforms, silting fields, and other port infrastructure items, flood control structures, shore protection.

Finally, **in MS which still incorrectly include soils in CDW generation and treatment data** for the calculation of the WFD recovery target (e.g. Hungary, Cyprus), **backfilling might distort the recovery rates and influence positively or negatively the level of these recovery rates**, leading to a false rate and jeopardising the potential achievement of the WFD target.

3. Plausibility of official CDW statistics

As part of task 4, the overall data quality of EU MS was assessed through different methods and by using different available information sources. This section draws the overall conclusions that arose through analyses of data quality. This part also highlights key elements to improve data quality in the future.

3.1. CDW data quality in EU MS – Further improvements needed in most Member States

Three categories of quality for the CDW data in the EU have been created, i.e. poor, modest and good quality levels. The method used for classifying MS with regards the quality of their CDW data is the Natural Threshold (Jenks) Method, using the ARCGIS software³⁴. Category limits are located at the highest differences between values. This method, based on natural gathering existing in the data, therefore allows similar values to be grouped and differences between categories to be optimised. On the whole, this study highlights the overall modest quality of reported CDW data in the EU. **In average, the CDW data is given a quality score of 2.3/5 with a range from 1.5 to 4.3.** For most of MS, further improvements are therefore needed in terms of collection and reporting of CDW data to the EU.

Table 9: Levels of overall CDW data quality in 2012 (MS are classified by alphabetical order in each category)

Good	Modest	Poor
Austria	Belgium	Bulgaria
Czech Republic	Estonia	Sweden
Denmark	France	Cyprus
Germany	Hungary	Finland
The Netherlands	Italy	Greece
Poland	Lithuania	Ireland
Portugal	Luxembourg	Latvia
Slovakia	Spain	Malta
Slovenia	United Kingdom	Romania
	Croatia	

Most MS presenting a similar quality data are geographically clustered. Member States characterised by good quality CDW data are nearly all located in central Europe. These form an important area from The Netherlands to Poland in the W-E direction, and from Danemark to Slovenia in the N-S direction. Portugal also presents a good level of CDW data quality while it is not geographically close to other MS in the same category. At the opposite, one third of EU MS display poor quality CDW data. Among them, 4 are located in Northern Europe (i.e. Sweden, Finland, Latvia and Ireland) and 6 in Eastern Europe (i.e. Romania, Bulagria, Greece, Cyprus, Malta). In addition, France and Lithuania also suffer of a poor quality in terms of anomalies in their data sets while these have an overall modest data quality because of their more robust data collection methodologies compared to other countries.

³⁴ More details on the methodology of classification can be found in Task 4 report, Chapter 3.1.

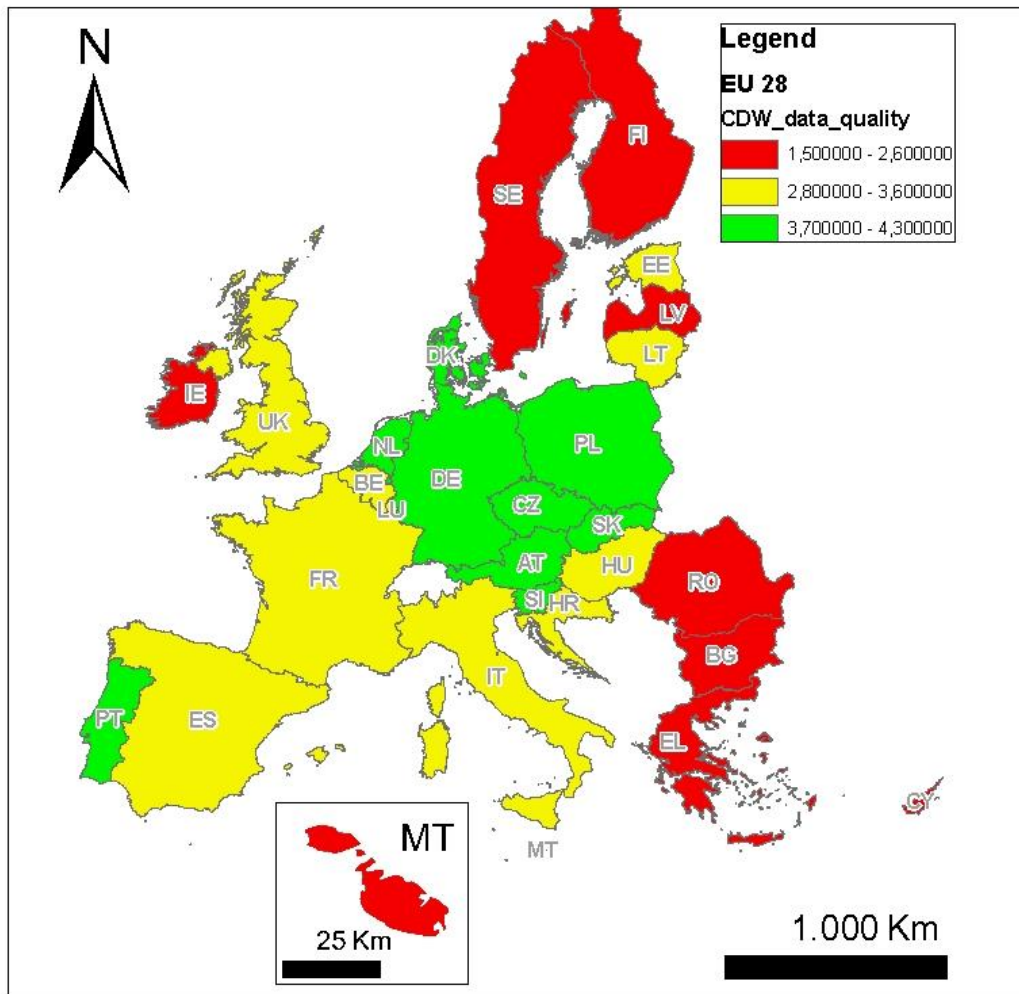


Figure 26: Spatial distribution of the overall data quality in the EU in 2012

Note: Good in green, modest in yellow, poor in red

As far as the poor level of CDW data is concerned, MS display a high number of abnormal values, as detected by advanced statistical tests, for a series of waste types. In addition, these statistical issues are often related to shortcomings in their data collection methodology. The good quality of the CDW data in Central Europe (i.e. Austria, Czech Republic, Denmark, Germany, The Netherlands, Poland, Portugal, Slovakia and Slovenia) is characterised by the small number or the absence of anomalies detected by statistical tests and also reflect on their good practices in terms of data collection methodologies.

Table 10 below presents a summary of all issues impacting the CDW data quality (i.e. concerning the data collection methodology, some inconsistencies with both national and international data and series of unexplained statistical anomalies as outliers, suspicious null values and abnormal temporal evolution).

Table 10: Summary of all types of issues impacting the CDW data quality and associated examples

Type of problems		# MS	Examples	Possible explanation
Data collection methodology	Waste production	27 (vs. 28)	In Greece , the number of economic sectors (NACE codes) in Eurostat statistics in which amounts of CDW are reported is too low. W121 are only reported in NACE code F (construction and demolition sector). This leads to an inaccurate estimation of CDW waste in general, as other sectors are also supposed to generate CDW.	
	Waste treatment	25 (vs. 28)	In Latvia and Finland , there is neither a legislative definition for backfilling, nor any official classification code for backfilling, nor available data for backfilling in Eurostat statistics. Hence, they seem to be reporting backfilling data as recovery as it has no way of estimating the share of backfilling performed in the country.	
	Waste treatment capacities	15 (vs. 28)	Cyprus, Greece, Ireland, Italy, Latvia, Malta, The Netherlands and Romania do not report any estimation for their remaining capacities.	CDW are landfilled in landfills other than inert landfills (e.g. landfills for non hazardous waste); Unauthorised landfill sites are still operating.
Inconsistencies with detailed national data	Waste production	4 (vs. 9)	Hungary : higher amounts of mineral waste from construction and demolition (W121) in Eurostat statistics across all NACE activities (3.3 Mt) compared to national detailed data (1.3 Mt)	The national detailed data are not yet extrapolated to the whole country for WStatR reporting and are therefore likely underestimated.
	Waste treatment	7 (vs. 8)	In Denmark , Eurostat statistics are higher for recycling and lower for landfilling than the national detailed data.	The exact reasons for these discrepancies are unknown .
Inconsistencies with international data		28 (vs. 28)	Austria produced 4.000.000 t of recycled aggregates (UEPG ³⁵), while national statistics report 5.786.101 t of recycled mineral CDW.	The recycled CDW reported in Eurostat data includes waste other than recycled aggregates .
Unexplained outliers	Abnormal high values	8 (vs. 28)	The amount of W121 reported by Malta (664 kt/€ or 500 kt) is far above the median amount for this type of CDW across all other economic sectors corrected by the turnover (107 kt/€).	Malta uses indirect estimates of generated waste, based on amounts of treated CDW reported by treatment facilities. In this specific case, this induces a double counting , explaining the overestimation of treated CDW, and indirectly of generated CDW.
	Abnormal low values	7 (vs. 28)	Both Bulgaria and Romania reported only 1 tonne of hazardous mineral CDW containing asbestos (W12B).	These MS are likely not collecting asbestos separately from other mineral CDW. In this case, asbestos may be mixed with hazardous mineral waste.
Unexplained suspicious null values	Waste production	16 (vs. 28)	Reported values of metallic waste (ferrous, nonferrous and mixed - 06.1, 6.2 and 06.3 respectively) in six MS (e.g. Latvia) are null, which is likely not accurate according to common construction and demolition practices in most EU MS.	MS often have inadequate information on metallic scrap due to no clear classification of these material waste types. The classification into this category is very unclear for some companies, because EWC contains many codes. This explanation was for example raised by Latvia.
Abnormal temporal evolution		14 (vs. 28)	Latvia shows a high decrease in generated non-hazardous waste from the construction sector (21 494 tonnes in 2010 to 7 432 t in 2012).	This is due to the methodological weaknesses of the way CDW is estimated in Latvia, as there are some issues in determining the source of waste .

³⁵ UEPG, *Annual Review 2013-2014* (Brussels: European Aggregates Association, 2013), p. 40 (p. 14) <http://www.uepg.eu/uploads/Modules/Publications/uepg-ar2013-2014_v28.pdf>.

3.2. Good methodological practices – Recommendations to enhance data quality and harmonise MS methodologies

Eurostat data are reported to Eurostat pursuant Regulation (EC) No 2150/2002 (referred hereafter as WStatR). Several methods for data collection are accepted in order to comply with this reporting obligation. This means Member States are allowed to use their existing administrative data sources as a basis for preparing the data for WStatR reporting. Member States might also carry out a survey that might be specifically designed for WStatR reporting. Moreover, several methods/models/surveys may be used to complement the different data sources in order to provide a full picture of waste data generation and treatment in the country³⁶.

This variety of methodologies allows MS to reduce the burden on companies and on local administrations. However this also means that **many different methodologies lay behind the data reported to Eurostat, even though the same classifications are used** (for waste types, waste operations and economic activities). Even though Eurostat and national statistical offices are constantly working together to improve the data comparability across countries, some data is still difficult to compare due to the lack of harmonisation in data collection methodologies. **A strong improvement has however already been observed since the first data collection year in 2004 on the matter.**

As far as CDW data collection methodologies are concerned, we recommend **the government and statistical offices of Member States** follow these guidelines to ensure the quality of CDW data. These are based on observed good practices in most Member States characterised by good quality CDW data:

For Member States using surveys to collect data on CDW:

- The survey should be updated on a **yearly basis**; temporal extrapolations or interpolations based on a survey carried out every two years are not recommended;
- The survey **should cover a representative sample of industries (in terms of waste amounts or of socio-economic indicators), following certain thresholds** (e.g. 70%) based either:
 - on the **number of employees** (e.g. as in Portugal),
 - and/or on the **generated amount of CDW** (e.g. as in Slovenia),

This method allows the survey of the most important waste producers in order to reach a quantitative representativity. However, some smaller producers have to be included for a matter of qualitative representativity.

- **An extrapolation of CDW data** is often necessary when collected information do not entirely cover the actual waste production and treatment deposits:
 - First, the non-replying waste producers have to be estimated using data reported by similar units;
 - Second, once the survey sample has been filled in, the issue is to calculate the percentage of produced waste amounts for which data have been collected based on the survey, and hence estimate the remaining part, i.e. the non-surveyed producers;
- **For these extrapolation tasks, two statistical methods provide satisfying results:**
 - **easily available socio-economic proxies** (e.g. turnover and employment) are recommended. The idea is to establish the correlation between a socio-economic proxy and the amount of produced waste for the surveyed companies. On this basis, knowing the value of the proxy for the other producers, the estimation of waste amounts can be easily obtained.
 - **Otherwise, another method consists in** choosing the reporting unit within the same sector that is most similar to the non-reporting unit. A possible method used to choose which unit is more similar to the one missing is the **nearest neighbour unit method**³⁷ (e.g. in Portugal). The implementation of such a method must be achieved by advanced statistics experts.

For Member states using administrative sources to collect data on CDW:

The key points are to **avoid both the under coverage** (and the subsequent underestimation of CDW amounts) and **the double counting** (and subsequent overestimation of CDW amounts). This last issue is of paramount

³⁶ Eurostat, p. 142.

³⁷ The nearest neighbour method is a well-known optimisation algorithm used for data extrapolation, which does not need to build any regression model (the model is the survey sample). This algorithm only needs both a distance function and a function of category chosen depending on the nearest neighbours' category. In this case, the distance is the difference between two values in the case of a simple linear algorithm, or the Euclidian distance in the case of a multispace search (e.g. if firms are compared for each type of waste).

importance when CDW generation data are estimated based on treatment data (secondary information). Therefore, **two efficient methods are recommended**:

- The first recommendation is to adopt an **input oriented** approach for CDW generation data (e.g. as in Germany), which means that treatment plants report directly to the NSO the amounts of waste received for treatment (rather than the amounts of CDW leaving the plants). In order to improve CDW data quality and to ensure a methodological consistency inside and among countries, we strongly recommend that European Commission and Member States governments adapt the waste regulations in this way (in case of Member States use administrative sources to collect data on CDW);
- Also, some MS (e.g. The Netherlands) have established systems (i.e. consignment registers) to ensure the traceability of CDW: this is the ideal path to provide reliable statistics and to avoid double counting. A registry is used as a source to compile specific statistics on waste. The principle is that companies that have a waste-permit are statutorily required to register each of their waste as far as they are transported. When a waste transport has actually taken place, the shipped weight is linked to the “waste stream code” and stored in the register. Hence, this easily allows quantifying each waste stream leaving or entering any company. While the implementation of such a tracing system would entail important costs and is probably not realistic in the short term in some Member States, we recommend the European Commission communicates on this method and promotes its use on a voluntary basis;

In addition, we recommend the European Commission encourages all Member States to adopt the following guidelines in order to improve consistency and comparability among Member states:

- **Having a common definition of CDW** : i.e. excluding dredging spoils (EWC code W127) and of soils (EWC code W126) from the definition of CDW (these waste types are not supposed to be declared as CDW according to the definition of CDW used by the EC, as explained in the section 2.1.1) ; some MS (e.g. Finland) include soils in W121, leading to an overestimation of CDW amounts (see the section 5.1.2);
- **Separately reporting backfilling data**, even though a clear definition does not always exist in all MS;
- To ensure **a cross-check of the CDW data** by dividing the process of CDW data between different national organisations closely cooperating. These kinds of collaboration also showed in some Member States that each actor thoroughly achieve its task;
- **To ensure a statistical control (quality checks) and correction of the data**: external controlling organisations (e.g. in Germany) or experts from NSO (e.g. in Czech Republic and Denmark) perform manual checks (first undertaken by experts in the field and then by contacting respondents to clarify any technical issue) and/or automatic checks;
- To include the **imported CDW and to exclude exported CDW** in the treatment table.

Therefore, some legislative tools should be used. The assessment of these practices should not entail significant costs, as the aim for the European Commission is mainly about clarifying the way to proceed and the aim for Member States is to adopt coherent procedures regarding member states characterised by high quality CDW data.

3.3. Statistical treatment of specific materials/practices – Observed discrepancies among Member States

3.3.1. Naturally occurring material defined in category 17 05 04 in the list of waste (Soil)

One of the most important issues for CDW data quality is the misclassification of soil waste. Soils are wrongly included in national estimated amounts of CDW in some MS (e.g. Lithuania and Finland). MS should not consider all excavated contaminated soils (normally W12.6) in mineral CDW (W121). Among other things, this impacts the calculation of the recovery rate related to the WFD target (risk of overestimation). Also, this leads to an important overestimation of non-hazardous mineral waste from construction and demolition (W121). Given that NHAZ W121 constitutes between 94% and 97% of the total amount of NHAZ generated waste (depending on the Member State), the overestimation of this waste has a tremendous importance on the total values reported.

3.3.2. Mineral waste from construction and demolition (W121)

In order to assess to which extent we may rely on the official CDW definition, national detailed data were compared to the Eurostat statistics. It is not possible to draw general conclusions from the analysis performed with the additional detailed national data provided, because only few countries provided these data (9/28).

However, when analysed with caution, it gives an indication on the fact that the more a country reports mineral waste from construction and demolition (W121) in several NACEs and the more the weight of these mineral waste in other NACES is important, the less we can rely on Eurostat statistics, in order to have a correct appraisal of CDW data for other waste streams than W121. Indeed, we could assume that if mineral waste from construction and demolition are reported in several NACEs, we could expect that other waste streams originating from construction and demolition activities, for which we cannot track the waste generating activity due to the EWC_Stat codes, might also be reported in different NACE activities (e.g. wood waste, metallic waste, etc.). In the case of this study, we could only allocate the amounts reported in the construction sector (NACE F) to construction and demolition activities for these waste streams and probably underestimated the real amounts produced by this activity. **The level of detail and the lack of information on the generating activity in the current breakdown of Eurostat statistics do therefore not allow having a correct appraisal of generated CDW amounts other than mineral waste from construction and demolition (W121), in particular for those MS, which report important amounts of W121 in other NACE sectors than NACE F.** However, the disaggregation in 2010 of EWC_Stat code W12 into W12B and W121, already allowed to have a better insight on mineral waste from construction and demolition (see Appendix A – Table 44 for more details on this breakdown).

3.3.3. Backfilling

Member States may include backfilling as a recovery operation when calculating the CDW recovery rate pursuant the WFD³⁸. Countries are also asked to report data on backfilling pursuant to Regulation No 2150/2002³⁹.

Figure 27 illustrates the amount of CDW backfilled in MS in 2012. It shows that the percentage of CDW that is backfilled on average is quite small (<6%).

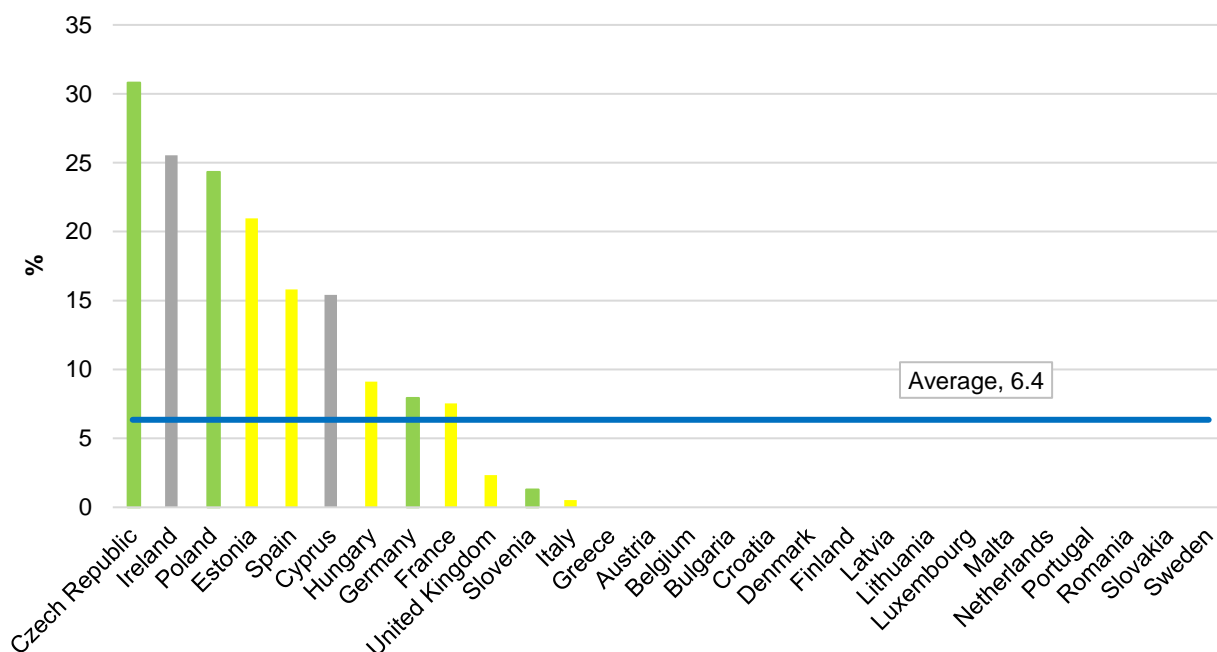


Figure 27: The amount of CDW backfilled (from Eurostat) – ref. Report 3.1

Only 13 countries report data on backfilling in Eurostat statistics. Among the 15 countries that reported zero amounts of CDW backfilled, 13 actually have backfilling operations. For these countries, it is an important question whether the respective amounts are included in the recycled amounts (e.g. because they cannot be reported separately) or whether the amounts are not covered at all.

According to the screening of all MS concerning backfilling information, it clearly appears that most of the countries that reported zero backfilling do report actually backfilled CDW amounts in the recycled amounts (RCV_O) and/or in the landfilled amounts (DSP_L). For instance, Malta reports an important share of CDW as

³⁸ EC, Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on Waste and Repealing Certain Directives.

³⁹ C, Regulation (EC) No 2150/2002 of the European Parliament and of the Council of 25 November 2002 on Waste Statistics. **Resource Efficient Use of Mixed Wastes – Improving management of construction and demolition waste – Final report**

being landfilled, whereas the main part of it is reported as backfilled (in spent quarries) in national data. Poland is an example of a Member State reporting high amounts of CDW being backfilled in Eurostat data. Both MS highly rely on these amounts that are backfilled to reach the WFD target and may actually not meet the conditions laid down in EU legislation. In this specific case of Poland, even though a good CDW data quality was identified through the statistical tests and the analysis of their methodology, it does not guarantee that backfilling data are correct (see sections 2.3.2. and 2.6.2).

However, the current backfilling figures seem to be underestimated in Eurostat statistics, although it is not clear to what extent recovery and disposal figures are overestimated or underestimated at the European level.

Overall, it seems that backfilling is not yet understood and/or reported in the same way by all MS, partly because some countries do not have a specific code for backfilling operations. The introduction of a specific R code for backfilling in the Waste Framework Directive would therefore be very helpful.

3.3.4. End of Waste (EoW) criteria

Only five countries (Austria, Belgium, France, The Netherlands and the United Kingdom) have end-of-waste criteria in place in national legislation mainly for recycled aggregates, other than the EoW criteria set at the European level (iron, steel, aluminium scrap, glass cullet, copper scrap). In these five countries, it appears that waste that ceases to be waste (EoW criteria) are still included in the Eurostat statistics. Indeed, EoW criteria do not seem to affect the CDW data quality as such, as waste ceased to be a waste at a certain step of the supply chain, and so it is accounted for in the data. EoW criteria might however have an impact on the statistical measurement of waste, i.e. the correct attribution of the final treatment of such a waste and at which stage the waste stream should be measured. It means that the introduction of EoW criteria might change the final treatment that should be included in the statistics reported i.e. it might in fact become a pre-treatment operation that should be included in the statistics. The reporting methodology proposed by Eurostat could provide further guidance to MS to help them with this correct attribution. A Workshop between national statistical offices to exchange their practices related to EoW criteria could as well be an interesting option.

3.3.5. On-site recycled waste

It is worth noting that in some cases, crushed aggregates from mobile crushers are directly recycled on site, and are therefore never reported as waste, neither generated nor treated.

This is in line with the recommendations of the Waste Statistics Regulation ((EC) No 2150/2002 (or also referred to as WStatR) that specifies that on-site recycled waste is excluded from reporting on waste generation and waste treatment.

Countries wishing to include these on-site recycled aggregates in their recovery targets are free to do so as the WFD does not specify whether on-site recycled waste should be considered in the recovery rate calculation.

Up to now, countries do not report such on-site recycled waste in their recovery targets as the quantities are very difficult to track. If they wish to do so, they should report these waste in both generation and treatment figures and mention in the quality report the quantities coming from on-site recycling. This would allow comparing these data with data reported to Eurostat.

3.3.6. Hazardous Waste

For hazardous CDW, while a series of the EU MS show abnormally low (or even null) values, only few countries display abnormally high values as compared to the median in the EU. As far as hazardous waste is concerned, the main issues concern hazardous glass waste (W071), asbestos (W12B) and to a lower extent hazardous mineral waste (W121):

- The absence of reported amounts of **hazardous glass waste (W071)** in most of EU Member States, as a result of miscoding issues due to the fuzzy distinction between this CDW category and **hazardous mineral CDW (W121)**. Actually, Germany and Spain are the only two countries that report non-null values of generated hazardous glass waste (W071).
- Some MS (i.e. Bulgaria, Ireland, Romania and Sweden) are likely not collecting **asbestos (W12B)** separately from other mineral CDW. In this case, asbestos may be mixed with hazardous or even non-hazardous mineral waste. Hence, these MS should pay particular attention to distinguish between these waste types in the future to avoid underestimation of this hazardous waste type. In Croatia, large

amounts of waste containing asbestos were collected and reported in 2012. In this case, the seemingly too high amounts of asbestos does not reflect a misreporting but an improvement of the practices in dealing with and reporting this waste type.

- Cyprus, Greece and Malta reported abnormally low or even null values of **hazardous mineral CDW** (W121). This low amount of declared hazardous CDW could be explained by local specificities, partly due to the hot climate impacting the construction practices in these Member States. Indeed, the vast majority of structures in Malta were and still are constructed from limestone and concrete with minimal insulation materials given Malta's climatic conditions. In this context, the presence of dangerous substances in wastes generated from construction and demolition activities is expected to be lower than in other MS. However, these low values could also be due to underreporting. This assumption is to be used with caution.

Related to the entire EU (28 MS), **only 8 MS** (i.e. less than 30 %) are **not characterised by null or low values regarding hazardous CDW**. These few member states have high quality CDW data. This supports the need to consider the few countries with high values as "normal" (good data quality) while the 20 member states with low amounts of reported hazardous CDW more than probably have problems regarding the collection and management of hazardous CDW.

Based on this study, it seems that most MS would benefit from more guidance on how to report their hazardous CDW data more correctly (allocation to the right waste code, sharing practices regarding surveys and systems for reporting, etc.). More specifically, a particular attention should be paid to hazardous glass waste (W071) **and** asbestos (W12B). For these two waste streams, the issue is to make sure that no possible interpretation could be done, which would allow member states to report **these waste types** either as **mineral CDW** (W121), or as non-hazardous wastes. To that aim, the EU should communicate on the feasibility to correctly estimate these waste types, sharing the good practices of other member states characterised by good quality hazardous CDW data.

4. CDW management practices in the MS

This section investigates the underlying reasons which lead to increased CDW recovery rates and to identify the management practices put forward by MS in order to achieve such high and resource efficient use of CDW.

4.1. Member States practices: main legislative, regulatory and structural differences observed

This section highlights the regulatory framework, legal obligations, as well as non-legal initiatives and other management practices observed in the 28 EU MS.

4.1.1. Legal and regulatory framework – Different levels of maturity across the EU

- General information on the national legislations

Different levels of maturity⁴⁰, scope and level of implementation are observed in different MS. Some MS have a long standing legislation concerning waste management issues, **already established in the 70s** (e.g. **Germany, France, Netherlands, Belgium**) and the waste management sector is regulated satisfactorily throughout the decades. However, most **MS have recently applied specific legislation on waste management**. These legislative provisions are at various stages of their implementation. The level of maturity of MS with regards to CDW management is further assessed in section 4.3 of this report.

All EU MS have successfully transposed the Waste Framework Directive (2008/98/EC) into national legislation and therefore there is a common basis across EU-28 which defines the principles of waste management, according to the waste hierarchy. However, in reality the **level of implementation of the several provisions in the WFD is extremely diverse among MS**. For example, waste legislation in the Netherlands was already more advanced by the time the WFD was adopted and waste management provisions were already anticipated in the country. On the other hand, several MS which have only recently adopted the principles of the WFD still struggle to align their national waste management performance to the goals of the European Directive. As a result, the observed differences in the CDW recovery targets was to be expected.

Specific legislation targeting CDW management is a recent phenomenon, with more and more MS adopting legislation specifying CDW management practices, while some of the best performers in EU-28 do not have any national legislation in place, specifically targeting the C&D waste stream. There are however several rules at local or regional levels which apply to CDW management and these rules have the most significant effect in driving the increase in recovery of CDW. For example, in Germany, every federal state has its own rules for CDW management while in Denmark and Estonia, the CDW management planning responsibility lies with the municipalities.

MS with decentralised government systems can lack the appropriately harmonised national legislation on CDW management to drive the performance of the country with regional performance varying dependant on the policies in place; this is particularly the case for Spain. Each region within a MS is entitled to come up with its own rules and local legislation for sustainable CDW management, which can be viewed as an opportunity to meet local conditions (e.g. in Brussels there are no landfills, so there is a focus on waste prevention) and be more flexible than national governments e.g. Basque Country and Catalonia in Spain have greater requirements compared to nationally. This is very prominent in MS containing many autonomous governments or regions, e.g. Germany, Italy, Spain, the UK, and Belgium.

⁴⁰ Levels of maturity were defined according to four criteria: period of application of relevant legislation (number of years since the legislation is in place); level of specificity of legislation (general overarching legislation on waste management vs. targeted legislation on CDW management); level of implementation of the existing legislation (effective application vs. infringement); forward-looking elements (draft proposals for new legislation, new WMP in place, etc.).

However, a very interesting pattern in legislation observed across EU-28 is that MS with the highest CDW recovery performances do not have specific national legislation on CDW management in place, but **good performance is achieved by a combination of several measures**, including general waste legislation, Waste Management Plan (WMP) and non-legislative CDW initiatives.

Taking Austria (high recovery rate) and Greece (low recovery rate) as examples, it is observed that although Austria has only one piece of legislation specifically referring to the sorting of CDW, the overall performance is high, while in Greece a very specific piece of legislation exists detailing the proper CDW management along the value chain of construction (and demolition), but the effectiveness of this legislation is practically non-existent (to date) mainly due to the persistence of illegal CDW disposal. As a direct conclusion, **the establishment of a robust legislative framework is not always enough to drive the CDW management towards a resource efficient direction.**

- National planification

As a direct result of the WFD comes the obligation for MS to draw up Waste Management Plans (WMP) and Waste Prevention Programmes (WPP). Several MS already have long standing WMP before the application of the WFD, however, updated rules and provisions in the WFD obliged all MS to revise their WMP in order to be compliant. In MS where the legal framework acts as an overarching policy document for the management of waste, the WMP is the main source of practical implementation of the waste policy, detailing the management of each waste stream. **These planification documents give guidelines and set objectives on a shorter term basis than the national laws.** A diagnosis of the initial situation shall be performed prior to establishing such plan and regular updates as well as assessments shall be undertaken in order to define management practices in line with the current challenges. **It is a key tool to ensure an efficient CDW management, promoting constant progress.**

As of March 2015, 22 MS had prepared a WPP and in the vast majority of them CDW is included as a specific chapter including provisions and measures for reducing the amount of this waste stream (exceptions include Latvia and Portugal).

The focus below recalls the main provisions defined by the WFD on this topic as well as examples of implementation of these provisions in a selection of MS.

Focus on WMP and WPP obligations defined in the WFD and examples of applications

Chapter V of the WFD and more specifically articles 28, 29 and 30 of the Directive define the following obligations:

- *MS shall ensure that their competent authorities establish waste management plans that shall:*
 - *set out an analysis of the current waste management situation in the geographical entity concerned, as well as the measures to be taken to improve environmentally sound preparing for re-use, recycling, recovery and disposal of waste and an evaluation of how the plan will support the implementation of the objectives and provisions of the Directive;*
 - *contain, as appropriate and taking into account the geographical level and coverage of the planning area;*
 - *conform to the waste planning requirements laid down in Article 14 of Directive 94/62/EC and the strategy for the implementation of the reduction of biodegradable waste going to landfills, referred to in Article 5 of Directive 1999/31/EC.*
- *MS shall establish waste prevention programmes not later than 12 December 2013 that shall:*
 - *be integrated either into the waste management plans or into other environmental policy programmes, as appropriate, or shall function as separate programmes;*
 - *set out the waste prevention objectives: MS shall describe the existing prevention measures and evaluate the usefulness of undertaken measures. The aim of such objectives and measures shall be to break the link between economic growth and the environmental impacts associated with the generation of waste;*
 - *define appropriate specific qualitative or quantitative benchmarks for waste prevention measures adopted in order to monitor and assess the progress of the measures and may determine specific qualitative or quantitative targets and indicators;*
- *MS shall ensure that the waste management plans and waste prevention programmes are evaluated at least every sixth year and revised as appropriate.*

Austria and the **Netherlands** have defined very extensive and inclusive waste management plans which, although not legally binding, are followed very closely for the effective implementation of CDW management. In **Italy**, according to the legislation, every region must draw up a separate WMP, as no centralised WMP exists. Similarly in **Spain**, the Autonomous Communities are drawing up WMP which

can be even more advanced and far reaching than the national WMP (e.g. in Catalonia, Basque Country – more details available in section 5 on Regional differences analysis). Most MS have updated their WMP covering the period 2014-2020, while only a few have not updated their WMP despite being quite old and outdated (e.g. Cyprus).

Discussions with the European Environmental Agency (EEA) suggest that there is little focus on CDW in national waste prevention plans, and there is a tendency to confuse or merge with recycling. With this in mind, the EEA is planning to undertake a detailed review of the national waste prevention programmes with a focus on CDW in 2018. It should also be noticed that in most MS first Waste Prevention Plans have been adopted in 2012/2014: experience is thus still lacking.

- National targets

Finally, as part of legislation or part of WMP **all MS have incorporated targets for the recovery of CDW**. Most MS have incorporated the WFD target – 70% – into national legislation and are required to meet this target by 2020. **Few MS have introduced more ambitious targets**, especially MS which have already achieved high levels of CDW recovery and have exceeded the threshold of 70% of the WFD target. Also, some regional targets are far more ambitious than the 70% target of the WFD. Examples are given in the focus below.

Focus on recovery and prevention targets

<p><i>Recovery target by 2020 higher than 70% (including backfilling)</i></p>	<ul style="list-style-type: none"> • Germany: 85% • Estonia: 75% • Netherlands: stabilising the current recovery target (above 90%) • Wales (UK): 90% • Flanders (Belgium): 85%
<p><i>Waste prevention targets</i></p>	<ul style="list-style-type: none"> • <i>The region of Wales in the UK has defined such targets in its construction and demolition sector plan. This plan, written by the Welsh Assembly Government in 2012, considers both management and prevention of CDW. The following targets are defined on waste prevention:</i> <ul style="list-style-type: none"> ○ <i>By 2050, waste raisings are to be reduced by around 1.5 per cent (2007 baseline) each year across all sectors;</i> ○ <i>The annual waste prevention target is of 1.4% (based in a 2006/07 baseline) for the construction and demolition waste managed off site;</i> • <i>The Swedish Waste Prevention plan 2014-2017 includes the following targets applied: in 2020 waste generation per m2 built is decreased compared to 2014 and also the content of hazardous substances in materials and products shall be reduced.</i>

The implementation, within the national or regional legislation framework, of such ambitious targets illustrates the determination of a selection of MS in the potential for recovery for CDW. However, such targets should be defined together with a clear prioritisation of treatment options to ensure sustainable management of CDW.

Concluding the discussion concerning the legislative framework in EU-28 MS, a preliminary distinction of the different MS in relation to the maturity of their legal framework is presented in Figure 28. The categorisation is based on the information retrieved during the screening phase from the 28 MS factsheets. The legal framework refers to all the relevant legislation in place in the MS which leads to sustainable and resource efficient waste management with specific focus on CDW. The criteria on which the categorisation is based are the following:

- Period of application of relevant legislation (number of years since the legislation is in place);
- Level of specificity of legislation (general overarching legislation on waste management vs. targeted legislation on CDW management);
- Level of implementation of the existing legislation (effective application vs. infringement);
- Forward-looking elements (draft proposals for new legislation, new WMP in place, etc.).

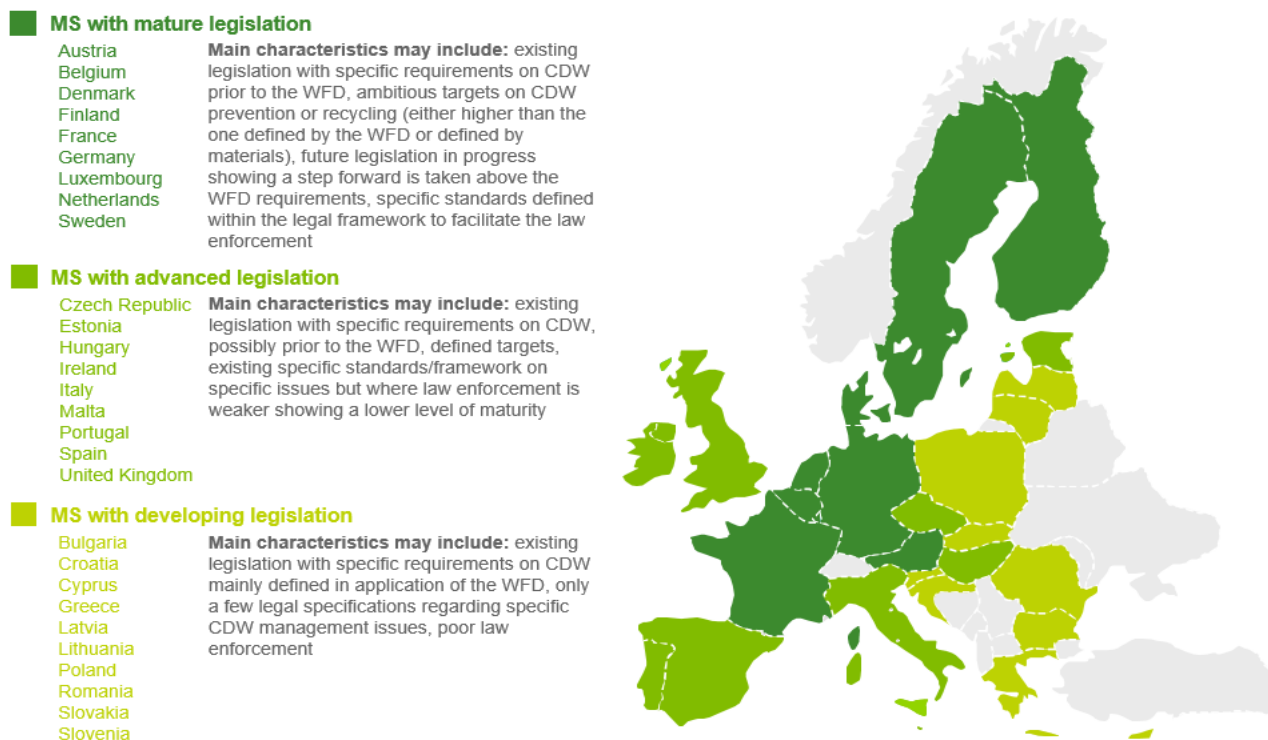


Figure 28: Level of maturity of legal framework in MS

4.1.2. Enforcement of legislation – A logical impact on CDW recovery performance

- Enforcement of legislation

Legislation defines the requirements for compliance, whereas enforcement monitors compliance and takes steps to educate and/or penalise individuals and organisations which do not comply with the requirements, as set out for each MS. Therefore, the enforcement of legislation is very important to achieving the objectives of each regulatory instrument. **Most MS have clearly defined responsibilities for CDW legislation enforcement**, often relying on local authorities in charge of inspections related to environmental legislations. Sanctions are usually applied to illegal practices, where they are uncovered, and there were a number of examples in country reports on steps taken to engage the public in assisting the enforcement authorities in highlighting possible incidences of non-compliance, typically illegal dumping hotlines, such as those established in Latvia, Portugal and Slovakia. However, **a lack of technical and human capacity** is often pointed out by the interviewed stakeholders. As a matter of fact, even though responsibilities and sanctions are well defined, it is hard to assess the effectiveness of these frameworks. Moreover, some MS appear to have undertaken important actions to tackle the issue of illegal landfilling but are still underperforming (in Croatia, some investigations were in progress in 2015 ; in Slovakia more than 700 inspections were performed in 2014 – see details in the focus below). The focus below presents some illustrations of such frameworks implemented by MS. These examples show that it is hard to link the existence of these frameworks with national performance. It also points out that **illegal landfilling of CDW is widely practiced despite legal frameworks and enforcement measures**, mainly due to the poor value of these waste streams.

Focus on national enforcement measures, especially on illegal landfilling

Austria, which is a well performing country, has defined a specific penalty to ensure CDW recovery: the law for Remediation of Contaminated Sites (*Altlastensanierungsgesetz (ALSAG)*) states that every ton of CDW that is not recovered in proper and structurally engineered way is charged 9.20 EUR. This law is controlled by the fiscal authorities and enforced by customs. However, if CDW is backfilled according to the law, the responsible person is exempt from a monetary contribution per ton.

However, in **Belgium**, which is also a well performing country, even though regional and local authorities are in charge of law enforcement, the lack of capacity is clearly pointed out by stakeholders.

In **Bulgaria**, which is a low performing country, responsibilities are clearly defined at each level: the mayor organises and controls closure, reclamation, and subsequent monitoring of landfills for household

and construction waste on the territory of the Municipalities, the Director of the Regional Inspectorate of Environment and Water (RIEW), or another appointed authorised person, is in charge of controlling compliance with the requirements for the waste treatment and the conditions of the permits. If cases of non-compliance are notified without any measures undertaken to correct them, penalties can be given with fines scaled according to the gravity of the violation. However, according to experts, the penalties are not high enough to really discourage the illegal practices as a proper waste management is perceived as being more costly.

Croatia, which is quite far from reaching the WFD target, has defined responsibilities at national level with appointed inspectors. Some measures are being taken to address the issue of illegal landfilling. For example, regarding the illegal landfill Pobrežje near Dubrovnik, the Ministry of Environmental and Nature Protection is initiating an investigation to determine the owner of the landfill. Recently, concrete blocks have been placed at the landfill entrance, and a video surveillance system is going to be installed soon. Again, the lack of inspectors is pointed out as an important issue by the stakeholders.

In **Slovakia**, where illegal landfilling is also a major issue, the Slovak Environment Agency performs regular inspections to ensure compliance with legislation. From 718 inspections in 2014 regarding waste management activities, 193 cases were found non-compliant. There is also an interesting initiative for individuals to report illegal dumping and fly-tipping to the municipality. As a result of this, a report in SME states that 109 illegal dump sites in the area of Bardejov were discovered, many of these contained construction waste, including asbestos.

- Impact of the legislation and the level of enforcement on CDW recovery performance

There may be several reasons for the different levels of performance in the MS such as the existence of landfill tax and landfill bans, the availability of facilities and the level of enforcement. These are summarised in Table 8 for three MS with high recovery levels. This indicates that those countries that have landfill tax and bans in place and an effective enforcement practice tend to have a higher rate of recovery of CDW. However, this trend is not clear as for these countries which are quite small and dense there may not be that much space for illegal landfilling in any case.

Table 11: Summary of factors influencing CDW management

MS	Recovery rate in 2012 (including backfilling)	Landfill tax in place	Landfill ban in place	Availability of facilities	Effectiveness of enforcement agencies
Netherlands	95%	Yes	Yes	Good	Good
Luxembourg	89%	Yes	No	Unknown	Good
Belgium	95%	Yes	Yes (in Wallonia and Flanders)	Good	Good

4.1.3. Regulatory and other non-legislative requirements / practices – Different tools helping MS in their CDW management

Several management practices were identified throughout the MS, but only a few were encountered in all MS. In an effort to concentrate the management practices that would most likely create favourable conditions for sustainable management of CDW, a table was developed for all MS factsheets with 5 relevant practices arising from legal/regulatory obligations in each MS. Figure 29 summarises the findings. The correlation between measures that create a favourable framework for better CDW management and the actual performance in a given MS is not as strong as expected: this can be due to a number of factors. In particular, low enforcement of regulations weakens this link. However, effects of regulations may be only fully visible some years later.

Pre-demolition audits

Pre-demolition audits are an important driver for recycling: this preliminary step provides all the stakeholders involved in the decommissioning, deconstruction and demolition process with important information on the existing building. Opportunities for reusing and recycling may then be identified and assessed based on specific details given on the quantities and accessibility of building materials. This type of legislation has usually been in place for 5-10 years.

17 countries⁴¹ have introduced them in their legislation. However, for some of these countries, there is a limited application (voluntary – mentioned in the waste management plan, regulated regionally or limited to hazardous wastes).

Application in 17 Member States

- wide application:

AT, BE (Flanders), BG, CZ, FI, FR, HU, IE, IT, LU, MT, PL, SL, ES, SE, NL, UK



National/regional sorting obligation

(on-site or in sorting facility)

Sorting obligations consist in ensuring the separation of different waste streams but may not be necessarily applied on-site and during the demolition process. Waste may be collected as mixed waste and sorted in a sorting facility. However, this legal obligation is often not enforced.

Application in 17 Member States

- wide application:

AT, BE, BG, CZ, DE, DK, EE, EL, ES, FI, HU, LV, LU, PT, SK, SE, UK



National/regional separate collection obligation for different materials

(iron and steel, plastic, glass, etc.)

Separate collection obligation for different materials consists in specific restrictions applied to waste collection. Separation of different materials may be required on-site using different containers to ensure the separate collection. However, this legal obligation is often not enforced.

Application in 14 Member States

- wide application:

AT, BE, NL, BG, CZ, DE, DK, EE, FI, HU, LU, SK, SI, SE, UK



⁴¹ A study assigned by DG Grow with regard to the Development of specific tools and/or guidelines for assessment of construction and demolition waste streams prior to demolition or renovation of buildings and infrastructures didn't confirm the requirement of such audits in Malta, Poland and Slovenia. This study also mentioned that Romania may have introduced this obligation but the information was not confirmed.

Obligation for separate collection and management of hazardous waste from C&D operations

Separate collection and management of hazardous waste consists in requiring the separation of hazardous waste on-site and specific provisions regarding their treatment. This kind of obligation is mandatory for all hazardous waste streams and is indeed observed in all MS for C&D operations.

Application in All Member States

- universal application even though in some cases hazardous waste may not be correctly identified and thus not separated.



CDW related Green Public Procurement requirements

Green Public Procurement requirements include obligations defined by the public authorities and to be implemented for any public work. These requirements may consist in recycling obligations or obligation to use recycled materials. They thus represent an important driver toward innovation and sustainable CDW management.

Application in 11 Member States and 1 region

- limited application:

AT, BE (Flanders), BG, DE, FI,

IT, LU, PT, PL, SI, SE, UK

Note : a study undertaken in 2012 showed that 53% of public contracts in the construction sector have some form of green criteria, 63% include one core EU GPP criteria and only 3% include all EU GPP criteria⁴². The study did not provide details of what environmental impacts the GPP criteria for construction covered (e.g. energy, water or waste). There is an increase in the use of sustainable building standards in Europe.



Figure 29: Management practices for sustainable CDW

As shown in Figure 29 above there is a **wide application of sorting (either on-site or in sorting facilities) and separate collection** of different materials in CDW as well as the separate collection and treatment of hazardous CDW away from the ordinary CD waste stream. Sorting and separate collection requirements set a list of fractions that have to be sorted and collected separately in order to improve CDW quality and therefore facilitate recycling. The definition of sorting and separate collection may defer from a MS to another. For example, in Finland, separate collection and recovery have to be organised for eight waste streams (concrete, brick, mineral tile and ceramic waste; gypsum-based waste; non-impregnated wood waste; metal waste; glass waste; plastic waste; paper and cardboard waste; soil and waste rock material). Austria requires 7 categories to be segregated once they exceed certain threshold levels (mineral building debris, excavated soil, waste fragments, broken asphalt, waste wood, metal and plastic, as well as construction site waste). Denmark requires segregation of 8 waste types, similar to Austria. Requiring these obligations means that the waste streams can be less contaminated and will assist in the development of markets for these materials. The level of contamination will depend on the application for recycled materials. For example, the amount of plastics is limited in the use of recycled aggregates. If wood is to be recycled into board products, then there will be a limit on treated wood; this limit may not apply for energy recovery. Metals is usually sorted due to its value.

⁴² Questions on the application of EU core GPP criteria for a product/service group implied the provision of specific data (e.g., if they included requirements on energy efficiency) by respondents¹⁰. This is why the uptake of at least one EU core GPP criterion appears higher than the reported use of any (unspecified) form of green criteria. In other words, sometimes administrations may be "greener" than they think.

One waste stream, where it is important to segregate, is gypsum waste, which whilst not hazardous, if landfilled with biodegradable waste it can produce odorous and toxic hydrogen sulphide gas.

CDW related **GPP requirements are applied in 12 MS in different forms**, either as requirements for CDW management or requirements for recycled content in the construction materials used in new construction (e.g. Portugal, Italy). The review of GPP criteria at national level indicates that requirements for recycled content, the preparation of demolition and CDW management plans for construction projects and building standards seems to be present in a voluntary manner (as opposed to mandatory due to legislation) in the procurement of construction work in a limited number of MS. The list of identified environmental management best practices for GPP in the building /construction sector identified in this report corroborate the findings from research carried out by the Joint Research Centre. These practices include:

- Environmental capabilities of designers and contractors
- Ecodesign of building structure;
- Environmental friendliness of construction materials and building elements;
- Restriction on construction materials;
- Recycled content and recyclability of construction materials;
- Environmental performance of the construction site;
- Management of construction and demolition waste.

Other non-legislative initiatives that are used extensively in MS for sustainable CDW management include:

- Requirement to submit waste management plans when preparing construction projects;
- Building certifications schemes;
- Technical specifications for recycled CDW materials e.g. for the use in highways;
- Technical guidelines for the proper treatment and management of CDW.

4.1.4. Treatment capacity – A significant number of Member States lacking treatment capacity

A fundamental limitation for increased recycling of CDW, in the short term, is access to adequate existing treatment capacity for CDW, not only for the mineral fraction but also for other materials, as well as hazardous CDW. Twelve⁴³ MS are identified as not having sufficient treatment capacity to improve recycling of CDW, due to financial and/or legislative drivers being insufficient. This can be exacerbated where there is widespread backfilling of spent quarries and mines or using CDW for landscaping purposes (e.g. Malta, Luxembourg). Furthermore, there is a **lack of hazardous waste treatment facilities in the majority of MS** (e.g. Ireland, Malta, Greece, Latvia), **including a lack of landfill capacity for hazardous waste in some MS**, with the only available facilities to be concentrated in a few MS situated centrally in Europe (e.g. Germany).

Treatment operations may include the following:

- Sorting of non-hazardous non-inert waste streams prior to recovery;
- Transformation of inert waste into aggregates;
- Incineration;
- Recycling processes for specific materials (glass, wood, metal fractions, etc.);
- Etc.

It should also be noted that some treatment options available for CDW streams such as metal, plastics, glass or wood fractions can also be applied to other waste streams: **it is thus difficult to assess the adequacy of the treatment capacity at a MS level comparing the treatment facilities capacities to the amount of generated CDW**. A preliminary assessment is presented Figure 30, excluding storage capacities. This assessment relies on stakeholders' points of view as well as objective information on the number of facilities, the total capacity and the variety of treatment options that are developed.

MS are grouped by available capacity:

- Group 1 (left column): MS exhibiting high rest capacity, being able to treat more CDW than produced in the country;
- Group 2 (middle column): MS having sufficient capacity to treat generated CDW domestically;
- Group 3 (right column): MS that are unable to treat part or all of generated CDW.

⁴³ According to the information collected in the country factsheets the following MS don't have sufficient treatment capacity: BG, HR, CY, FR, EL, HU, LV, LT, LU, MT, RO, SK.

There is no comprehensive data available for Slovenia, which is excluded from figure below.

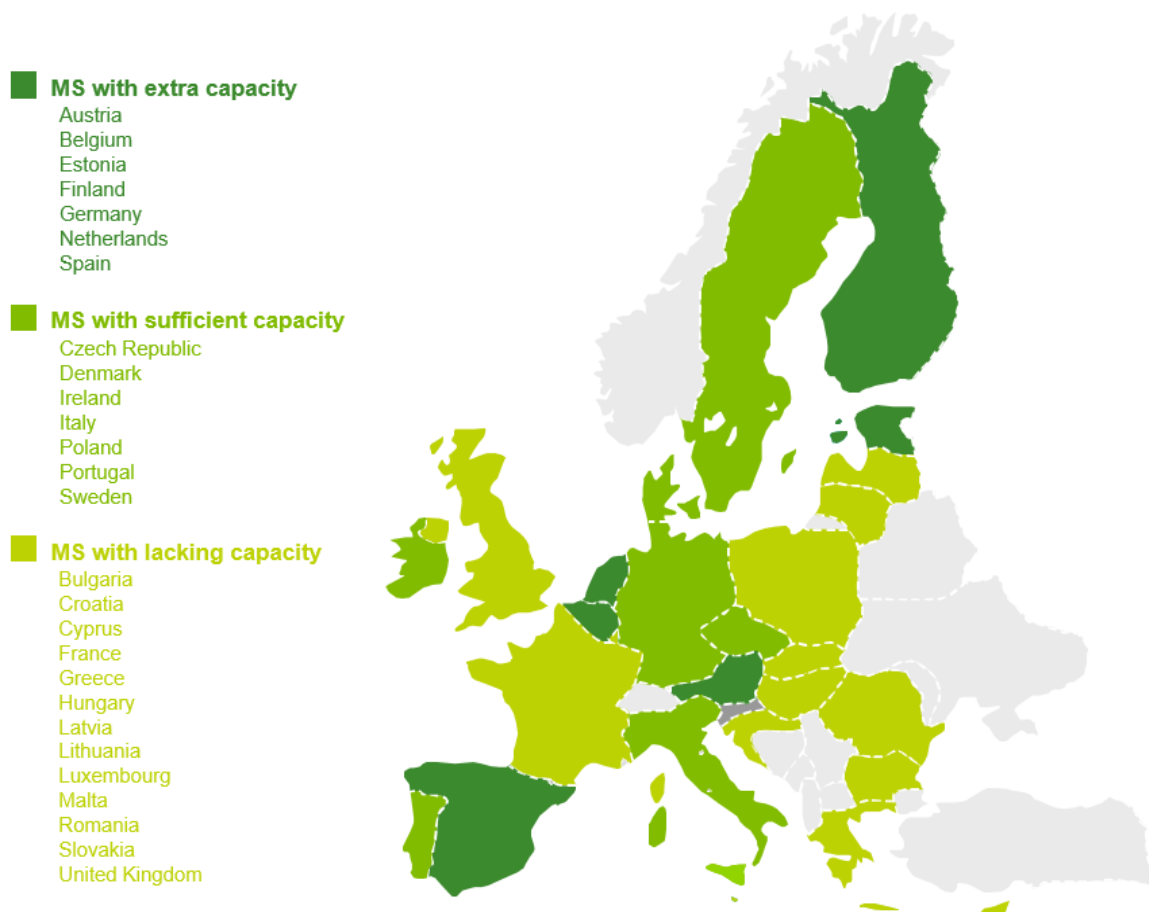


Figure 30: Treatment capacity in EU-28 Member States

National capacities vary a lot when looking into the details of the different treatment options. Some examples are given in the focus below.

Some small MS such as Malta and Luxembourg don't have enough capacity, including landfill for inert waste. Backfilling is thus widely practiced in these two countries. However in Luxembourg backfilling of excavated soils is widely practiced; CDW is mainly recovered and only a small fraction of CDW is backfilled.

In some MS, even though they are identified as having enough capacity, a lack of capacity is observed for some specific waste stream:

- In **Belgium**, some hazardous CDW are exported to be treated: asbestos-containing waste, if not landfilled in Belgium, are exported to France for vitrification. Asphalt-made roofing are sent for thermal treatment in the Netherlands.
- In the **Walloon region**, it is interesting to point out that there are 242 centres authorised to perform the sorting / recycling of inert CDW, 28 asphalt plants and concrete plants authorised to perform the incorporation of construction and demolition waste in their production.
- In **Finland**, there is enough landfill capacity as well as treatment capacity. Several different sized treatment facilities are geographically located rather extensively all over the country. These facilities treat mixed CDW that contains i.e. concrete, plastics, bricks, wood and metals: the mixed CDW are sorted thanks to an excavator and the separated waste streams are then transferred to accurate treatment facilities. Finland has a number of other recycling facilities operated both by private companies and by some municipalities that can treat also source separated waste fractions such as mineral waste (e.g. over 100,000 tonnes).
- **The Netherlands** have sufficient capacity for landfilling, incineration as well as recycling. The recycling industry is well developed for many materials, and not only for CDW.
- **Spain** currently has the infrastructure and furthermore the operational capacity to take on CDW on a national level. On the contrary, since the economic recession in 2008, treatment facilities have taken a

collective hit in the amounts of incoming CDW. As documented in the national WMP, treatment plants are running under treatment capacity, which makes it difficult for these facilities to stay open and properly function. Before the economic hit, public works commissioned by cities were a relatively sure and steady source of CDW, however as the demand for construction has diminished, treatment facilities rely more on privately commissioned projects which have proven to be unpredictable sources of waste flow, varying greatly from month to month. Regardless of waste supply, Spain does not face issues with treating particular waste sources (concrete, bricks, glass, etc.).

4.2. Lessons learned from the case studies

From a list of initiatives that have been analysed during Task 2, six success stories from regions, municipalities or companies which present particularly good practices and results in terms of CDW prevention and management, have been selected. The selection criteria included: representativeness, high potential for replicability and sustainability (economic, technical, social and environmental aspects) and interesting showcase of obstacles and leverages for sustainable management of CDW.

Table 12: Presentation of the selected case studies for Task 2

Initiative	Scope	Date	Description and results
Democles Link to Democles website	France – Public-private partnership	2014-2015 (in progress)	<p>Democles is a collaborative project aimed at improving the management of the end of life of finishing works waste from demolition/rehabilitation sites, set up by 28 organisations, companies and administrations.</p> <p>10 test sites made it possible to characterise the waste stream, to identify drivers and barriers and to measure the savings that would enable the recovering of finishing works waste sorted beforehand compared to their destruction as a mix.</p> <p>Results on test sites are available. The project focuses on the 10 Mt of waste of the finishing works, which represent a quarter of the building works waste.</p>
From production to recycling: a circular economy for the European gypsum Industry with the demolition and recycling Industry Link to Gypsum to Gypsum website	International (France, Germany, Belgium, UK) – Public-private partnership (GtoG study, by Recovering, within Life EU project)	2013	<p>State-of-the-art study on Gypsum products that lead to the publication of the European Handbook on best practices in deconstruction techniques that aims to promote the implementation of best practices for a controlled deconstruction process of such gypsum-based systems, which might ease recovery.</p>
Construction works in the preparation of the Olympics games in London Link to Olympic Delivery Authority website	London, local, public	2011	<p>The Olympic Delivery Authority (ODA) pledged to hold the greenest Games of modern times and sustainability was built into all the activities, from the procurement to the operation of the Games. The ODA set a number of CDW targets during the demolition, design and construction phases of the London 2012 Olympic Park, including:</p> <ul style="list-style-type: none"> • 90% re-used or recycled demolition waste by weight; • 90% re-used or recycled construction waste by weight; • 20% of materials to be from a re-used or recycled source by weight; • 25% recycled aggregate by weight.

Initiative	Scope	Date	Description and results
Estonian Recycling Competence Centre Link to Estonian Recycling Competence Centre website	National, Waste association (incl. private and public stakeholders)	2014	The Estonian Recycling Competence Centre offers training courses for employees in recycling companies, local authorities and sharing of international experiences with the aim of increasing the competency of actors involved in CDW recycling. It also promotes the use of recycled aggregates.
Pilot project of a mechanical treatment plant for C&D inert waste Link to the webpage of the project	Romania, local, (Buzau), Public-private initiative	2011	Development of a recycling plant has contributed to the proper management of CDW; reducing and eliminating illegal dumping of CDW. The levels are not available but according to the interviewed stakeholders the initiative was very successful.
Zenrobotics Recyclers, in partnership with Suez Link to Zenrobotics website	International – Industrial sector	2013	<p>A Finnish company developed a robotic recycling system (Zenrobotics Recyclers) which picks raw materials (wood, plastics, metal, stone, concrete etc.) from construction and demolition waste and sorts them.</p> <p>Suez Environment/Sita signed a framework agreement with this company to develop this process at an international level.</p> <p>Result: 12 000 tonnes of waste treated per year with a recovery rate of 90%.</p>

The detailed case studies are appended to this report and available on the project website. Summary sheets of each case study is presented in Appendix C of this document.

Each case study is unique and addresses specific issues in a specific context. However, it is interesting to point out that there are many initiatives across MS with a great potential for replication and for successful results toward reaching the WFD recovery target as well as enhancing sustainable CDW management practices.

The case studies give interesting solutions to the following issues that are encountered by most MS:

- **Sufficient treatment capacity:** some MS face the issue of insufficient treatment capacity, even though the main barrier remains the market demand for recycling materials. As shown in the case studies of Romania and Estonia, backfilling or landfilling are then the main options for inert CDW. The development of treatment plants such as the one in Romania is an example to follow in order to increase the treatment capacity of MS. This would result in the increase of recycled material availability and thus facilitate the development of a recycled material market. It is important to note that the development of such treatment plant should be accompanied by other measures as well as the involvement of all stakeholders of the value chain to ensure the development of recycled materials markets. Financial support from either public or private sources also needs to be identified prior to the development of a successful secondary material market. Regulatory incentives may also support such an initiative, such as landfill taxes mainly to avoid the constant domination of landfilling in some MS;
- **Low cost of landfill as well as low cost raw materials:** in direct connection with the previous issue, the low cost of landfill as well as the availability of low cost raw materials are major barriers, not enabling recycled materials to be cost effective. Stakeholders may be convinced of the advantages of recycling using the results of the LCA performed in the Romanian case study as well as the knowledge gained from the case study performed by the Estonian Recycling Competence Centre. The GtoG project also draws the conclusion that a landfill levy for disposing of gypsum waste should be set to act as a disincentive to disposing of gypsum waste. It thus appears that the development of a recycled material market will most probably need to be accompanied by regulatory incentives to ensure its economic advantage even where raw materials are easily available;
- **Waste streams separation:** when looking into the issue of CDW recycling, it is clear that the quality of materials is an important barrier toward recycling. Sorting (on-site or in sorting facilities) is thus an important driver. The Democles project in France offers interesting opportunities by involving all the stakeholders in looking into the finished work waste and identifying operational solutions to facilitate on-site waste sorting as well as recycling. For instance, during one of the demolition project studied within Democles, wood waste were separated on-site and recycled into wood panels by ECO3BOIS,

and non-hazardous waste, collected as a mix, were sent to a sorting facility that separates paper, cardboard, plastics according to their colours and characteristics, gypsum, inert waste, polystyrene, wood, iron, other metal. The resulting recovery rate is over 78%. The good practices implemented on the London Olympic Games construction's sites could also be replicated to improve sustainable CDW management and the interesting analysis of the cost benefits shown in this case study may also help convince stakeholders. Finally, the GtoG project, by looking into demolition practices, pointed out the importance of proper on-site sorting to ensure gypsum recycling.

- **Acceptability of secondary materials:** another important issue is the acceptability by the construction industry of material containing recycled materials. Every case study (except for ZenRobotics), by involving all the stakeholders of the value chain, confirmed the importance of involving actors from the construction sector. Indeed, when developing a new sorting and recycling plant such as the one in Romania, it is important to make sure of the development of a market for the recycled materials. Within the Democles project, involving the recycling industry as well as the construction sector enables the identification of opportunities for sorted materials to be reincorporated into the recycling industry and the definition of possible options to reuse these materials in construction materials considering the actors requirements. The GtoG project also highlighted the importance for demolition companies to be aware of the acceptance criteria at gypsum recycling facilities as well as for recyclers to know the specifications of the gypsum to be reincorporated. Increased communication through the value chain allows for consistent volumes and quality of recycled gypsum to be available for reincorporation. This project also identified that a requirement for the specific level of reincorporation of recycled gypsum in new gypsum products should be considered as part of the green public procurement framework. Finally, the Estonian Recycling Competence Centre also confirms developing standards or certifications is a great driver toward the development of secondary materials market, setting rules for the composition of the materials and ensuring the quality of the materials.

4.3. Evaluation of good practices and factors that support improved CDW management performance

This section provides an evaluation of good practices and factors that support improved CDW management performance. 'Good practices' are considered to be actions, activities or interventions which create conditions for sustainable management of CDW and for improving the use of construction resources.

The country reports were assessed and examples of good practices were collated into 4 broad 'good practice categories' and 2 'focus areas' which are:

- Waste prevention
- Reuse
- Recycling and recovery (including sorting)
- Use of reclaimed and recycled content
- *Focus* on end-of-waste criteria
- *Focus* on Green Public Procurement

A maturity matrix has been created that shows the level of CDW practices that would be expected from countries at the following levels of maturity in relation to CDW management. This maturity matrix has four levels; the initial (first level) is where MS have none or few legislation and policies, strategies for CDW, the next level, developing, is for MS where legislation and policies, strategies and the market for CDW is emerging, though they are not fully implemented; the third level, implemented, is for MS whereby legislation, policies, strategies and solutions are well established; finally, the fourth level, improving and optimising, is where MS are further developing their legislation, policies, strategies and solutions, learning from current practice.

The entire maturity matrix including maturity levels and CDW practices expected for each of these can be seen in Appendix B. The CDW practices of each of the MS was analysed against these expected practices and Table 13 details the MS results showing which levels of maturity each MS is at for each of the CDW practice categories. This was done using data available in the country reports and resulted in an evaluation of the overall maturity level of each country.

Table 13: Initial Maturity matrix overall results

Level 1 Initial	Level 2 Developing	Level 3 Implemented	Level 4 Improving and optimising
Bulgaria	Czech Republic		
Croatia	Estonia		
Cyprus	France		Denmark
Greece	Hungary	Austria	Germany
Latvia	Italy	Belgium	Luxembourg
Lithuania	Poland	Finland	Sweden
Malta	Portugal	Ireland	The Netherlands
Romania	Slovakia		United Kingdom
	Slovenia		
	Spain		

4.3.1. Waste prevention

4.3.1.1. Definition and practices

Waste prevention aims at reducing the amount of waste that is generated. It is the first option that should be considered as part of the waste hierarchy. Using this definition, demolition waste cannot be prevented, unless a decision is made to not demolish. This section focuses on waste reduction rather than reuse so the focus is upon construction waste prevention. However, it should be noted that reuse which prevents materials or products becoming a waste will contribute to reducing waste generation figures and therefore could be considered as waste reduction. For example, demolition waste could be prevented through the dismantling of buildings to create products and materials that can be used again without further processing.

A number of strategies can be pursued to prevent waste which include:

- **Implementing Waste Prevention Programmes (WPP):** Ideally, these should have a specific focus or section on CDW. They may be national and/or regional WPPs and for maximum impact should include tangible and measurable targets for CDW reduction. 27 national and regional waste prevention programmes had been adopted by the end of 2014, most of which cover CDW. Three programmes have quantitative targets for construction and demolition waste, namely France (stabilisation of CDW generation by 2020), Sweden (decrease CDW generation per built square meter, compared with 2014 levels – indicators under development), and Wales (reduction of CDW of 1.4% every year to 2050 for waste treated offsite, based on a 2006/2007 baseline). Here are some examples of measures: Austria’s WPP introduces a “building passport” that would be developed and kept throughout the building’s lifecycle; Czech Republic is targeting the reduction of hazardous CDW in the construction sector; Latvia is promoting GPP for the state and municipal institutions.
- **Policies to support CDW prevention:** These could be at regional and national levels. Examples can be seen in Austria with the “Waste reduction in Vienna”⁴⁴ initiative which proposes a guideline for sustainable management of CDW; and in Brussels where CDW has been made a priority waste stream with emphasis on prevention by providing tools, guidance and training⁴⁵.
- **Guidance, tools and methodologies related to waste prevention:** For example on topics such as designing out waste (examples in Ireland and the UK) and how this can influence waste arising later in the life cycle of a building when it is refurbished or demolished. This may include things like smart design, choice of materials and products (which could influence waste arising on site), procurement practices, information about materials and the way that they are put together (e.g. nails and screws vs. glue) and how these have an impact later in the life cycle of a building.
- **Industry working towards waste prevention initiatives:** These could be related to a specific sector or material. ZeroWin was a European Union funded project researching and trialling methods and strategies to eliminate the wasteful consumption of resources in key industrial sectors in Europe, primarily by way of the formation of industrial networks. For Portugal, this involved setting up industrial networks involving producers of materials, holders or promoters, architects, waste managers and other stakeholders to encourage symbiosis between these actors to reduce waste generation, energy and

⁴⁴ Waste reduction in Vienna initiative http://www.wenigermist.at/uploads/2010/06/Endbericht_AbfallvermeidungBausektor2003.pdf

⁴⁵ See Opalis Website - www.opalis.be

water consumption. By considering this broader resource efficiency approach, financial and environmental savings can be enhanced, with greater possibility of support being offered as a paid service.

- **Construction site practices:** Specific site practices can help prevent waste, for example having waste management plans which focus on dealing with waste according to the waste hierarchy. This may also cover other aspects such as greater use of offsite fabricated and standardised building elements to reduce off-cuts and wastage and when products are installed, the reuse any off-cuts that do arise. The reduction of excess materials can also be achieved through more exact ordering of products and materials. If excess product does arise, then there is also potential to move to another construction site operating close by.
- **Circular economy thinking:** for example, linked to the longevity of products and what happens at their end of life. A key objective is to keep products and materials at their highest economic value for as long as possible. For example, flexible and adaptable buildings that are able to have changing use, or internal reconfiguration, rather than demolition and rebuild. This could be a very effective approach to preventing construction and demolition waste arising.

4.3.1.2. National drivers and barriers

The following instances of country-specific barriers and drivers to waste prevention were noted by the authors, typically through discussions with local stakeholders:

Table 14: Examples of barriers for waste prevention

Waste prevention barriers description
<ul style="list-style-type: none"> • No focus on waste prevention by industry. (Czech Republic)
<ul style="list-style-type: none"> • The Waste Prevention Plan has only recently been developed and is theoretically focused; more practical guidance is required. (Czech Republic)
<ul style="list-style-type: none"> • No incentives in place to deter landfilling, which would support the case for prevention and participation for separate collection. (Latvia)
<ul style="list-style-type: none"> • Non-compliance with the requirement to create and implement a Prevention and Management Plan for CDW in public works (Decree-Law 46/2008 of 12 March, article 10). (Portugal).
<ul style="list-style-type: none"> • Necessary involvement of several stakeholders sets challenges for waste prevention. All the parties involved in the design and the construction together with the insurance sector need to be involved to facilitate waste prevention. (Sweden)

However, there were also a number of drivers for waste prevention highlighted by local stakeholders:

Table 15: Examples of drivers for waste prevention

Waste prevention drivers description
<ul style="list-style-type: none"> • Circular economy is being discussed more often regarding CDW. (Czech Republic)
<ul style="list-style-type: none"> • Systematising buildings eco-design would be a major driver to easing end-of-life deconstruction and recycling. (Ireland)
<ul style="list-style-type: none"> • Building Information Modelling combined with Environmental Product Declarations (EPDs) as a tool for sustainability in construction. (Ireland)
<ul style="list-style-type: none"> • Increasing levels of pre-manufacturing of building components (to reduce site based waste such as off-cuts) and the high cost of waste treatment (to provide financial deterrent) leads to waste reduction. (Luxembourg)
<ul style="list-style-type: none"> • Adaptive building is a major driver for prevention of waste, since building use can be easily changed rather than demolishing buildings when they become redundant. (The Netherlands)

4.3.1.3. Member States maturity and performance

Measures taken and maturity

Some examples stand out as being clearly targeted at reducing waste:

- Austria – The future introduction of Building Pass and long standing waste prevention planning
- UK – Designing out Waste⁴⁶ and SMARTWaste⁴⁷ benchmarks
- Luxembourg – Mandatory Site Waste prevention and management plans
- Belgium (Brussels) – Opalis⁴⁸ website with tools and guidance to encourage C&D materials reuse
- Belgium (Flanders) – Plan for material efficient construction
- Nordic countries – TemaNord⁴⁹ proposals for targets and indicators for waste prevention across the Nordic region
- France – ADEME provides companies and local communities with guidance, training, project support and financial support

Three Waste Prevention Programmes have quantitative targets for construction and demolition waste - France, Sweden and Wales:

- The Welsh waste prevention programme has a target for the reduction of CDW of 1.4% every year to 2050 for waste treated off-site, based on a 2006/2007 baseline;
- Sweden aims to decrease CDW generation per built square meter, compared with 2014 levels⁵⁰. Indicators will be developed by the EPA on hazardous waste and non-hazardous waste from construction, renovation and demolition overall, based on the national waste statistics, in relation to the number of built m², GDP and total turnover sector. Follow-up will also be done by putting the amount of used construction material in the form of non-metallic minerals, in relation to GDP and the number of built m²;
- The French programme sets a waste prevention objective (that is at the same time a quantitative target) until 2020 for the stabilisation of CDW generation. However, this broad objective will require further qualification.

As detailed in Table 16 and Table 17 below and according to the abovementioned maturity matrix, Denmark, Germany, Luxembourg, Sweden, the Netherlands and UK show the best levels of maturity and are considered to be at the top level of improving and optimising with regards to waste prevention.

Table 16: Maturity matrix levels related to waste prevention

CDW practice category	Level 1 Initial	Level 2 Developing	Level 3 Implemented	Level 4 Improving and optimising
Waste prevention	- No CDW prevention measures - CDW not included in WPP	- CDW covered in WPP - Very limited action on CDW prevention - Publically funded initiatives	- CDW covered in WPP with clear objectives and targets - Industry developing waste prevention initiatives	- Targets set for CDW prevention and being reached - Policies to support CDW prevention in place

Table 17: Member State maturity matrix performance for waste prevention

Maturity Matrix CDW Practice Category	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czech	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	The Netherlands	UK
Waste prevention	2	2	1	1	1	3	4	2	3	3	4	2	2	3	1	1	-	4	2	2	1	1	2	1	2	4	4	4

- = Information not available

⁴⁶ <http://www.wrap.org.uk/content/designing-out-waste-design-team-guide-buildings-0>

⁴⁷ <http://www.smartwaste.co.uk/>

⁴⁸ <http://opalis.be/>

⁴⁹ <http://www.norden.org/en/publications/guidelines/temanord>

⁵⁰ : <http://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6654-3.pdf?pid=14439>

Performance

The clearest KPI for waste prevention relates to CDW generated relative to construction sector turnover. After discounting countries with poor data quality, it can be seen that there is a significant variation between the highest and lowest performers.

Table 18: Best and worst country performers for relevant KPIs

KPI	Top three* (lowest waste)	Bottom three* (highest waste)	Range between top and bottom*
CDW generated relative to construction turnover	Portugal Slovenia Croatia	Germany Hungary Netherlands	<50 tonnes/MEuros turnover to >400 tonnes/MEuros turnover
Hazardous CDW relative to construction turnover	Portugal Lithuania Slovenia	Germany Netherlands Denmark	<1 tonne/MEuros turnover to >20 tonnes/MEuros turnover

The best performance (those with the lowest KPIs) is shown predominantly by countries in Eastern Europe, and the worst performance (those with the highest KPIs) by countries predominantly in Western Europe. A full picture is not possible until all MS have acceptable levels of data quality.

Assuming the cost to build the same building in a wealthier country (compared to less economically advanced) will be higher due to labour costs being higher, this should lead to lower KPIs when comparing waste vs. turnover. Therefore, the trend for the KPI to be higher (in W. Europe) reinforces the conclusion that wealthier countries are more wasteful.

When looking at the qualitative information from the country reports, there does not appear either to be a link between the type and number of waste prevention measures implemented and the performance reported. Generally, there are far fewer prevention measures compared to recycling and recovery. There appears to be little evidence of an EU consistency in the approaches taken. Several of the indicators used in waste prevention plans are not indicators of waste prevention, which adds to an increasingly confused picture: some MS have defined in their waste prevention plans targets on waste generation (i.e. the Wales region has set up the following objectives “by 2050, waste raisings are to be reduced by around 1.5 per cent (2007 baseline) each year across all sectors”; the Swedish Waste Prevention plan 2014-2017 includes the following targets: in 2020 waste generation per m2 built is decreased compared to 2014).

4.3.2. Reuse

4.3.2.1. Definition and practices

The Waste Framework Directive considers reuse to be any operation by which products or components that are not waste are used again for the same purpose for which they were conceived. The directive also has a definition for ‘preparing for reuse’ which refers to checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be reused without any other pre-processing.

There are many opportunities to reuse materials, especially at the demolition and significant refurbishment stages. Practices which facilitate reuse include:

- design for deconstruction;
- pre-demolition audits, on-site sorting and separate collection;
- waste exchanges and industrial symbiosis;
- standards and testing of products to promote reuse;
- planning and procurement practices which promote reuse;
- role of the community sector.

Some elements of reuse may be covered within waste prevention, such as reuse of off-cut materials on site, as this is actually preventing the useful material from becoming waste.

4.3.2.2. National drivers and barriers

The 6 EU countries in the table below noted barriers for the reuse of CDW, these are based on discussions with local stakeholders:

Table 19: Examples of barriers to reuse

Description of reuse barriers
<ul style="list-style-type: none"> Once the environmental licence has been received, construction work should be started before a set deadline. If existing buildings/infrastructure are still on the site, complying with such a deadline can make it difficult to carry out selective deconstruction and material reuse. (Belgium)
<ul style="list-style-type: none"> During demolition of old buildings, where certain parts (roof elements, windows, doors, brick, stones, etc.) could be reused (prepared for reuse), the reuse aspect of these elements is often neglected, due to the increased time and cost needed to separate each waste stream. (Estonia)
<ul style="list-style-type: none"> Lack of facilities to support reuse. (Poland)
<ul style="list-style-type: none"> Data on CDW amounts prepared for reuse is lacking: collection of this data is challenging and new methods are needed. There are also higher treatment costs associated with reuse compared to recovery, such as backfilling (for inert) or energy recovery for other waste types. (Sweden)
<ul style="list-style-type: none"> As waste that is disposed of in landfills which exclusively accept certain types of inert waste is exempt from landfill tax, this removes the financial incentive to reuse clean soil or inert material. (Sweden)
<ul style="list-style-type: none"> The sector is reluctant to use products that do not have certification of tested performance. This effectively rules out the reuse of construction products and materials from structural applications and limits other applications significantly. This is not an issue for construction products with recycled content since these can be tested and certified against EN standards. (The Netherlands)
<ul style="list-style-type: none"> There are H&S concerns relating to reuse (often requires a move away from mechanised demolition to manual deconstruction). (UK)

Countries where drivers for the reuse of CDW were recorded are listed in the table below. These were mainly developed from discussions with local stakeholders:

Table 20: Examples of drivers for reuse

Description of reuse drivers
<ul style="list-style-type: none"> There is a legal requirement that government should provide subsidies to non-profit or social organisations that are active in the area of reuse and preparation for reuse. (Brussels - Brussels Capital & Walloon Region)
<ul style="list-style-type: none"> Landfill tax (19 Euros/tonne of non-hazardous CDW) should make waste landfilling less cost-effective and promote waste reuse and recycling. However, there is no specific driver for reuse since this will equally promote recycling. (Czech Republic)
<ul style="list-style-type: none"> Construction Product Regulation (CPR) and its Basic Requirement of Construction Works (BRCW) 7 Sustainable use of natural resource: <ul style="list-style-type: none"> The construction works must be designed, built and demolished in such a way that the use of natural resources is sustainable and in particular ensure the following: reuse or recyclability of the construction works, their materials and parts after demolition; durability of the construction works; use of environmentally compatible raw and secondary materials in the construction works. <p>This is an EU level policy - the inclusion of this requirement will allow Member States to regulate for the use of sustainable products and for a sustainability characteristic to be included in the DoP (Declaration of performance) and the CE marking. However, for this to happen, MS will need a method for accessing the products performance.</p>
<ul style="list-style-type: none"> The development of online platforms for used construction products facilitate the reuse of materials between different C&D sites.

4.3.2.3. Member States maturity and performance

Measures taken and maturity

Consistent methods given below to promote reuse were observed in the following MS:

- Mandatory pre-demolition audits (Belgium, Luxemburg, France and Finland);
- Waste exchange systems (Austria, Czech Republic, Ireland etc.);
- Industrial symbiosis programmes (Slovakia, Hungary).

It should be noted that all of these methods will equally promote recycling, unless specific actions to promote reuse are adopted within these.

A number of other MS activities specifically target reuse:

- UK – Salvo (network and directory of reclamation facilities across the UK);
- Netherlands – Circle City (Greendeal Cirkel Stad). Green deal Circle City is a continuation of the project ‘Recycling of Construction & Demolition Waste: from Circle City to Circle Country’. By signing the Green Deal Circle City, involved parties commit to closing the loop by sustainable demolition and re-using high quality materials in the construction cycle;
- Belgium – Reuse VADEMECUM promotes reuse and Opalis reuse website facilitates the development of reuse thanks to the on-line platform and the tools and guidance provided on the website;
- Austria – Project RaABa⁵¹ – regional network for component reuse;
- Denmark – REBRICK⁵² – mechanical brick cleaning process;
- Finland – building reuse demonstration project⁵³. The research project ReUSE (Repetitive Utilisation of Structural Elements) finished in 2014. This project addressed the potential and challenges facing the reuse of elements from existing buildings and design for re-use in new buildings.

The qualitative data from the country reports indicates that there is less emphasis on reuse of products/materials compared to recycling, recovery, and waste prevention. Approximately 50% of the MS have none or one activity reported that is directly relevant to reuse of products/materials.

Performance

It is not possible to measure performance in terms of reuse across MS using the Eurostat or national datasets because they do not provide a split between recycling and preparation for reuse, the two are considered together. In addition, reuse activities (where no waste is produced and the product is directly reused) are not at all monitored by EU statistics. Therefore, it is not possible to provide conclusive evidence that existing reuse promotion initiatives have a significant effect on the levels of reuse, and hence levels of waste generation.

For the same reason, there is no mechanism to determine higher or lower performing MS. However, the number of initiatives, actions or projects can be used as a proxy to estimate the extent to which construction materials are reused. Reuse may be more frequent in MS that are less wealthy.

In the UK, WRAP has developed a methodology for quantifying the environmental (greenhouse gas emissions, energy demand and resource depletion) and economic (number of jobs and costs) impacts of reusing products⁵⁴. This can be applied to a range of products using an accompanying excel-based tool⁵⁵ to provide consistent means of assessing the impacts of different activities.

The tool shows that reuse may lead to:

- a net increase in jobs by creating new employment in refurbishment, transport and sale & distribution of products;
- greenhouse gas (GHG) emission reductions;
- significant economic benefits to households, both through the sale of unwanted items and access to goods at a lower price.

The results are project specific and quantify relative benefits using a number of scenarios compared to the baseline. For example, if Scenario 1 shows GHG emissions of 1 tonne CO₂eq, and Scenario 2 shows emissions of 0.2 tonnes CO₂eq, then Scenario 2 avoids 0.8 tonnes CO₂eq compared to Scenario 1. The

⁵¹ <http://www.rma.at/node/1506>

⁵² www.gamlemursten.dk

⁵³ <http://www.vtt.fi/sites/reuse/en>

⁵⁴ <http://www.wrap.org.uk/sites/files/wrap/Final%20Reuse%20Method.pdf> , see also www.wrap.org.uk/benefitsofreuse

⁵⁵ <http://www.wrap.org.uk/content/benefits-product-re-use-tool>

“Detailed Results” tab provides a breakdown of where different impacts occur, such as where emissions occur or where income changes.

An example of benefits from reuse is from the Community Wood Recycling⁵⁶ organisation in the UK, who also undertake reuse activities. In 2015 they obtained over 17,000 tonnes of waste wood, nearly half of which was reused and provided training and work experience places for more than 600 unemployed people.

In a McKinsey report produced in 2015 on the circular economy and Europe⁵⁷, it is stated that the British government has estimated that creating a fully efficient reuse and recycling system would cost around 14 billion Euros, which would translate into 108 billion Euros scaled to a Europe-wide level. However, this needs to be set against possible savings and internal revenue to have a complete picture. For example, the same report states Europe is the world’s largest net importer of resources at 760 billion Euros a year.

4.3.3. Recycling/recovery

4.3.3.1. Definition and practices

This section focuses on both recycling and recovery for which the Waste Framework directive has the following definitions:

- **Recycling:** any recovery operation by which ‘recycling’ means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations.
- **Recovery:** any operation the main result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy.

An analysis of measures to promote recycling and recovery showed that 96% of MS reported good practice measures for recycling and recovery with France having the highest number, closely followed by the Netherlands and UK. Only one country, Lithuania, provided no examples. It is to be noted that the number of measures reported should only be seen as an indicator among others of the extent to which CDW recycling and recovery are taken into account in the different MS.

The potential to recycle and recover CDW is greatly influenced by the construction sector practices within each Member State (MS) at the stages of construction, demolition and refurbishment, as well as the characteristics of the resource management sector in each MS. The drivers for best practice CDW management tend to be more economic than legislative, which includes client requirements set through the procurement process (both public and private), increasing the cost of waste disposal to landfill and the availability of suitable facilities to recycle or recover waste within a reasonable proximity of the site it is produced from.

Economic advantages of recovery/recycling over waste disposal

The above-mentioned McKinsey report⁵⁸ (2015) looked at the potential of adopting a circular economy within a vision for a competitive Europe. It suggests that more jobs are created from recycling processing (2 jobs per 1,000 tonnes) compared to waste disposal (0.1 jobs per 1,000 tonnes).

A report prepared for the European Commission in 2011⁵⁹ suggests that if EU waste legislation was fully implemented and the EU waste management sector was fully compliant, then the turnover of waste management and recycling would increase by 42 billion Euros per year and over 400,000 jobs would be created.

The report presents a number of tasks which would need to be carried out in order to overcome identified barriers to better implementation and enforcement and to enhance implementation of EU waste legislation.

⁵⁶ <http://www.communitywoodrecycling.org.uk/about-us/our-impact/>

⁵⁷ http://www.mckinsey.com/client_service/sustainability/latest_thinking/growth_within_a_circular_economy_vision_for_a_competitive_europe

⁵⁸ http://www.mckinsey.com/client_service/sustainability/latest_thinking/growth_within_a_circular_economy_vision_for_a_competitive_europe

⁵⁹ BIO Intelligence Service (2011), Implementing EU Waste Legislation for Green Growth, Final Report prepared for European Commission DG ENV <http://ec.europa.eu/environment/waste/studies/pdf/study%2012%20FINAL%20REPORT.pdf>

In 2011 a European Environment Agency report⁶⁰ documented that overall employment related to materials recovery in Europe increased by 45% from 422 inhabitants per million in 2000 to 611 in 2007. It also suggests there is evidence that the recycling industry generates more jobs at higher income levels than landfilling or incinerating waste.

4.3.3.2. National drivers and barriers

Common measures across the EU with the aim of promoting recycling and recovery, include:

Main drivers

- Landfill restrictions
- Landfill taxes
- Requirements for source separation
- Specific targets (including material specific) and associated programmes to support recycling CDW within MS
- Strong planning and waste management enforcement
- Requirement to have a site waste management plan
- Requirement to undertake a pre-demolition audit
- Green Public Procurement
- High demand for material reuse, such as road construction, railway infrastructure and land levelling.

Other drivers

- Quality assurance: certification schemes and quality protocols to establish controls on input materials and processes for production of high quality recyclables, leading to certification
- Public and private sector partnerships to establish best practices and recycling facilities
- Good spread of recycling facilities, including facilities to deal with key material streams – e.g. inert, gypsum, wood, plastics etc.
- Voluntary schemes and action plans led by industry, especially for key material streams/ product sectors.
- Best practice guidelines and tools for CDW management
- Software/apps to inspect, track and report waste generation and levels of recycling and recovery.

Although these measures are the focus of two different chapters of this report, there is an obvious overlap between levels of recycling and recovery and markets for recycled and recovered materials. Once there are sufficient economic and legislative drivers in place to promote recycling or recovery, the next step is the provision of infrastructure to undertake this activity. The ability to sell the treated materials, and realise their value, is key to understanding return on investment (ROI) and level of risk and whether it makes good business sense to invest in the required facilities.

An example of measures implemented is in the Netherlands, where as far back as 1972, the Dutch Government developed the Urgency Notes Environment⁶¹ which signalled an increase in waste volumes and lagging treatment facilities. The solution was to increase the capacity of landfills and incinerators. Due to a relatively low level of environmental protection at landfill and incineration sites, ambitious actions aimed at prevention, reuse, reduction of adverse environmental impacts and national planning, which mainly formed the basis for the current waste policy. Examples of milestones from that period (1988-1991) that still resound are the note on prevention and recycling, the introduction of producer responsibility, the Waste Institution and the Packaging Covenant. Since 1994, framework legislation was introduced for waste which included the waste management hierarchy, landfill tax and bans in 1995, including for CDW, waste collection requirements in 2004. National waste management plans have been implemented since 2003. The ban on the landfilling of CDW proved initially the most difficult to enforce, with an initial system of certificates, demonstrating that C&D waste was neither reusable, recyclable nor combustible, found to be open to fraud and was amended in 2001. A decree for the use of stony soil in the ground was introduced in 2008.

There is little evidence of public and private sector joint investments which reflects the low priority placed upon CDW compared to household waste by municipalities.

Many barriers to recycling and recovery have been identified. They are presented below by decreasing importance:

⁶⁰ <http://www.eea.europa.eu/publications/earnings-jobs-and-innovation-the>

⁶¹ Kenniscentrum InfoMil (2015), Manual EU environmental policy and Netherlands

Main barriers

- Recycling costs are higher than landfill/disposal costs, where low/no landfill taxes apply. This is also the case where significant numbers of illegal waste tips exist, illegal burning still takes place and general waste management enforcement is lax.
- Linked to the above point, there is not a compelling business case for the private sector to establish recycling/recovery facilities or invest in mobile recycling equipment
- Proximity and spread of suitable recycling facilities in relation to sites where waste is arising. This is closely linked to the cost of transport.
- Inadequate at-source segregation and material traceability.
- No EoW criteria established for recycling of inert waste.
- Lack of national emphasis on CDW management, compared to other waste streams such as household waste
- Contradictions and confusion between national, regional and local legislation, especially in the context of managing CDW in a legally compliant way, and demonstrating fitness for purpose in recycled material application
- Economic slowdown causing stockpiling and lack of markets for CDW recycled products. (Although this should also reduce the amount of CDW produced too).

Other barriers

- Backfilling definition and level of actual beneficial use e.g. may be taking material away from recycling routes
- Lack of experience, competence and infrastructure (mainly in those countries which have only recently started to recycle CDW)
- Lack of awareness and understanding by the industry on what they should and could be doing to improve CDW management and recycling
- Possible contamination with hazardous substances (or requirement to prove this has not occurred)
- Lack of data to inform policy makers and industry e.g. where and what facilities need to be established
- Lack of waste management site planning
- Logistics, space, cost and legislation issues in relation to small quantities of recyclable waste
- Recycling targets by weight promotes the recycling of heavy materials and reduces the emphasis on lighter weight material

4.3.3.3. Member States maturity and performance

Measures taken and maturity

When looking at the range of measures across the EU it is clear that most MS regard recycling and recovery as the highest priority in terms of driving change. The EU target for 70% recovery of waste by 2020 is likely to be driving much of this focus. However, the available data (of a consistent format, across the MS) is not precise enough to differentiate between recycling and recovery. This limits the identification of underlying trends and measures that could be effective across the EU.

It has been commonly thought that high disposal costs, either in gate fees, landfill taxes or a combination of the two, are one of the most effective measures to divert waste from landfill. However, this only seems to be true if laws are properly enforced and there is sufficient infrastructure for recycling and recovery. However, more detailed and robust data would be needed for all countries to prove definitively the expected correlation between landfill costs and landfill diversion.

The countries that have high levels of recycling and recovery have typically been promoting recycling and recovery of CDW, through economic and legislative drivers, for a number of years. The length of time and continuity of these approaches are thought to play a significant part in achieving high levels of recycling and recovery. Where recycling and recovery are economically viable compared to landfill, eventually the private sector, often supported by the public sector, will see long term business opportunities that are worth investing in. The Netherlands has a notably high rate of recycling and recovery and this has been enabled through landfill bans for recyclable materials. This was carried out in conjunction with the development of appropriate treatment infrastructure and driven by lack of additional landfill capacity.

As detailed in Table 21 and Table 22 below and according to the abovementioned maturity matrix, the Netherlands is indeed considered to be at the top level of improving and optimising for all of the CDW practice categories that relate to recycling and recovery.

Table 21: Maturity matrix levels related to recycling and recovery

CDW practice	Level 1 Initial	Level 2 Developing	Level 3 Implemented	Level 4 Improving and optimising
Waste management Legislation	No specific CDW legislation (or waste legislation that specifically applies to CDW)	Development of specific CDW legislation	CDW legislation established	CDW legislation, reviewed and updated Focusing on higher levels in waste hierarchy
Landfill	Illegal landfill No policy for diversion of waste from landfill	Development of landfill diversion policies Most landfills managed adequately	Well managed landfills Landfills decreasing in number	Established landfill bans Small number of landfills
Waste policy and strategy	Waste policy/strategy not specific to CDW Only undertaken due to WFD requirements	Waste policy/strategy specific to CDW but limited implementation	Waste policy/strategy specific to CDW fully implemented	Waste policy/strategy specific to CDW developed and optimised
Fiscal measures	No fiscal measures in place (Landfill tax, Aggregates Levy etc.)	Landfill Tax in place Unlikely to change market conditions	Landfill Tax implemented, enforced Aggregates Levy (or similar) being developed	Landfill Tax increasing Aggregates Levy developed and implemented
Enforcement	No/limited enforcement Limited legislation Lack of resources Lack of clear responsibilities	Limited enforcement Legislation covering enforcement Poorly resourced Responsibilities defined but not could be ambiguity	Adequate enforcement Legislation covering enforcement providing a high level deterrent Clearly defined responsibilities	High level of enforcement Adequately resourced Innovative approaches Data collected and reviewed
CDW treated – Country performance	0-50 %	60-65 % Backfilling	65-85 % Backfilling	>85 % Backfilling
Waste management infrastructure	Infrastructure is largely landfill	Starting to develop CDW recycling infrastructure Publically supported Limited geographical spread	Established CDW infrastructure Adequate geographical spread Mostly private funded and owned	Nearly complete geographical coverage Mature infrastructure Privately funded Innovative processes
CDW Hazardous waste	Requirement to separate CDW hazardous waste	Developing hazardous waste policies which include CDW	Implementing hazardous waste policies and plans which include CDW	Reduction in hazardous waste Dealing with legacy wastes
Waste data		As per ICEDD rating = poor	As per ICEDD rating = modest	As per ICEDD rating = good

Table 22: Member State initial maturity matrix performance for recycling and recovery

Maturity Matrix CDW Practice Categories	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czech Republic	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	The Netherlands	UK
Waste management Legislation	4	3	2	2	3	1	4	2	4	4	4	3	2	4	4	1	2	4	1	2	3	1	3	2	3	3	4	4
Landfill management and diversion	2	4	1	1	1	2	4	3	4	2	3	1	3	3	3	1	1	4	1	1	2	1	2	2	2	4	4	4
Waste policy and strategy	3	4	2	2	1	3	4	3	4	2	4	1	2	4	1	2	1	3	2	2	2	2	2	1	2	4	4	4
Fiscal measures	2	3	2	1	1	3	4	3	4	2	3	2	2	4	2	2	2	4	2	2	2	2	2	3	2	4	4	4
Enforcement	2	3	1	2	1	2	3	3	2	2	3	1	1	3	2	1	1	3	2	1	1	1	1	2	2	4	4	4
CDW treated – Country performance	4	4	1	2	1	2	4	3	1	2	4	1	2	3	4	4	4	4	1	3	3	3	1	4	3	3	4	4

Waste management infrastructure	3	2	2	1	1	2	3	3	4	2	4	1	2	3	-	1	-	3	1	1	3	1	2	1	3	4	4	3
CDW Hazardous waste	2	2	1	2	1	2	4	3	3	2	3	1	1	3	1	1	-	3	1	1	1	1	2	2	1	4	4	4
Waste data	4	3	3	3	3	4	4	3	2	2	4	3	3	2	3	2	3	3	2	4	4	2	4	4	3	2	4	3
TOTAL	26	28	15	16	13	21	34	26	28	20	32	14	18	29	20	15	14	31	13	17	21	14	19	21	21	32	36	34

- = Information not available

1 – Initial level; 2 – Developing level; 3 – Improving level; 4 – Optimising level (more information available in Appendix B – CDW management maturity matrix)

Performance

The level of precision and the quality of data across the MS is insufficient to see a full picture of possible trends and correlations between the number and range of measures and the result achieved.

However, section 2.3 of this report provides analysis of KPIs relating to the treatment of CDW which includes the recovery of materials. Also, Task 3.1 (Analysis of Member States performance) report (appendix to this report, available on the website) details the analysis of KPIs for CDW for the recovery of specific materials in selected Member States and also considers the effects of landfill taxes.

Considering these KPIs, and excluding countries with poor data quality, the 3 countries which perform best & worst for the most relevant KPIs are summarised below:

Table 23: Country KPI performance for CDW

KPI	Top three*	Bottom three*	Range between top and bottom*
% total CDW landfilled	Netherlands (0.3%), Luxembourg (1.3%), Belgium (1.8%).	Slovakia (61.3%), Croatia (48.5%), France (33.7%).	<0.5% and >60%
% total CDW recovered	Netherlands (99.7%), Luxembourg (98.7%), Belgium (97.9%).	Slovakia (38.6%), Croatia (51.5%), France (58.7%).	Almost 100% and <40%
% concrete, bricks, tiles landfilled (limited dataset – 7 countries)	Estonia (0.22%), Luxembourg (1.4%), Denmark (3.6%).	Slovakia (56.7%), Croatia (50.7%), Portugal (33.3%)	0% to >50%
Cost of mixed CDW landfill (gate fee & tax)	Finland (225 Euro/tonne), Netherlands (199 Euro/tonne), UK (161 Euro/tonne)	Austria (18 Euro/tonne), Slovakia (27 Euro/tonne), Slovenia (30 Euro/tonne).	18 Euro/tonne to 225 Euro/tonne

* Excludes countries with 'poor' data quality

The level of landfilling seems to have some correlation with evidence of measures relating to recycling and recovery. Unsurprisingly, the share of recovery mirrors this. The Netherlands has a long standing ban on landfilling recyclable materials that has led to an exceptionally low proportion of waste being landfilled. There are landfill restrictions and taxes in Belgium, and a national sorting obligation in Luxembourg.

The single largest identifiable waste stream is typically concrete, bricks, tiles and ceramics. Of the previous top three, only Luxembourg had a dataset providing the waste management routes for concrete, bricks, tiles and ceramics; whereas in the bottom three, both Slovakia and Croatia have this dataset. This suggests that levels of landfilling for this waste stream, once separately identified, are a good proxy for overall levels of recycling and recovery. It also suggests that this is the most important waste stream to target to achieve high recovery levels.

The final KPI on the table above indicated that there is no strong correlation between the cost of landfilling CDW and the amount landfilled. One would expect that high landfill charges should provide a good economic incentive to seek out recycling and recovery alternatives. Further examination relating to CDW recycling/recovery infrastructure and levels of landfill tax enforcement with high cost/high landfill rates (e.g. Finland) and low cost/low landfill rates (e.g. Austria) MS did not explain why this commonly accepted viewpoint is not shown at MS level. This supports the conclusion that a wide spectrum of policy measures is needed to support waste prevention, reuse and recycling of CDW, which may include financial incentives to avoid landfill. A possible multi-faceted approach is detailed in the recommendations section of this report.

4.3.4. Use of reclaimed and recycled content

4.3.4.1. Definition and practices

The construction sector is a major consumer of materials across the EU. Annual raw material consumption in the EU is 7.3 billion tonnes per year and construction accounts for 24% of overall raw material extraction. This provides a very large potential market for reused and recycled within the built environment sector and appears to provide sound economic drivers for the resource management sector and construction product/material suppliers to invest in the infrastructure needed to convert CDW into recyclable and reusable building products and materials.

In Europe, recycled materials currently represent around 30% of the value of the materials used in construction. Examples from the most advanced MS show that this could potentially rise to 90%, which would help support sustainable construction and would lead to a range of environmental and economic benefits including reductions in waste, energy consumption, transportation costs and pollution levels and conservation of natural resources and biodiversity. A report by Frost & Sullivan⁶² states that the market for recycled construction materials such as PVC, gypsum, aggregates and recycled glass generated revenues of €744.1 million in 2010, and is estimated to reach €1.3 billion by 2016. The report concludes that it will be crucial to increase awareness in the marketplace about the value of recyclable or reusable products and materials to facilitate such increases.

4.3.4.2. National drivers and barriers

The following barriers were noted for the incorporation of reclaimed and recycled content, based upon discussions with local stakeholders:

Table 24: Examples of barriers to the incorporation of reclaimed and recycled content listed by interviewed stakeholders

Country	Examples of barriers for the incorporation of reclaimed and recycled content
Greece	<ul style="list-style-type: none"> No obligations for recycled materials or recycled content in construction materials. No standards available.
Malta	<ul style="list-style-type: none"> No GPP or provisions for recycled content in new construction in public tendering procedures.
The Netherlands and UK	<ul style="list-style-type: none"> The sector is reluctant to use products that do not have certification of tested performance. This effectively rules out the reuse of construction products and materials from structural applications and limits other applications significantly. This is not an issue for construction products with recycled content since these can be tested and certified against BS/EN standards. (BS = British Standards; EN = European Norm)

It is important to emphasize that a particular barrier to incorporating secondary materials in new construction relates to the difficulty in achieving certification for recycling or reuse into construction, due to the tests that need to be passed to gain such certification. For example, destructive tests can be carried out on a small sample of manufactured products to determine conformance for a whole batch of product. This is not possible for salvaged products because there is not guaranteed way of proving a small sample will be representative of the entire stock of products or materials. Therefore, the use of reclaimed products back into construction

⁶² <http://waste-management-world.com/a/recycled-materials-could-supply-90-of-europes-construction-needs> Report title: Strategic Analysis of the European Recycled Materials and Chemicals Market in Construction Industry

tends to be at a lower performance requirement, e.g. non-load bearing; or where the client is prepared to take on the risk of failure or defect.

Certification is not always required to enable reuse. For example, the Steel Construction Institute in the UK recommends the following for reuse of structural steel⁶³:

Many steel construction products and components are highly re-usable including:

- *Piles (sheet and bearing piles)*
- *Structural members including hollow sections*
- *Light gauge product such as purlins and rails.*

The process is straightforward; for example, deconstructed sections are inspected to verify their dimensional properties; tested to confirm their strength properties and the section is then shot or sand blasted to remove any coatings and refabricated and primed to the requirements of the new project. This will usually involve cutting the ends of the beams and columns to the required length.

On the positive side the following drivers were recorded, based upon discussions with local stakeholders:

Table 25: Examples of drivers for the incorporation of reclaimed and recycled content listed by interviewed stakeholders

Country	Examples of drivers for the incorporation of reclaimed and recycled content
Austria	<ul style="list-style-type: none"> • Austria has a draft norm for recycled building materials (ÖNORM B 3140) that sets requirements for recycled aggregates. • One advantage from a legal perspective in Austria is that technical requirements for construction and environment are formulated in one system of rules and that a standardised guideline for recycled materials exists which helps in creating a legally binding regulation.
Belgium	<ul style="list-style-type: none"> • Standard specifications for road works in the three regions (Standaardbestek 250, Cahier des Charges-Type 2011, QualiRoutes) have played an important role in the uptake of recycling in Belgium, as they allow the use of recycled aggregates in several applications. It makes clients confident in their use, and thus, this material has been applied (since it is cheaper). • Further research (in collaboration with the different actors of the sector) is carried out to find recycling applications of the different streams of the non-stony CDW fraction (e.g. gypsum, aerated concrete, flat glass, etc.) as well as on ways to build and renovate in a more sustainable way. • Flanders: The technical framework allowing the use of recycled granulates in the building of roads (Standaardbestek 250) is an important driver toward the use of recycled CDW.
Bulgaria	<ul style="list-style-type: none"> • Major construction projects are public and the requirements in terms of use of recycled building materials and proper treatment are higher than in private sector, which may help the development of the initiatives at this early stage.
Denmark	<ul style="list-style-type: none"> • Economic support (loans) for refurbishment and use of recycled material and tax on non-reusable CDW are implemented. • The use of recycled materials in construction products (e.g. in public procurement) is a requirement.
Estonia	<ul style="list-style-type: none"> • Estonia is carrying out research projects on the application and quality of recycled aggregates. • Currently, there is a concentrated effort to boost the image of recycled aggregates, by the Waste Recycling Cluster, in order to improve the market of such materials and make them competitive in the market.
Germany	<ul style="list-style-type: none"> • Public tenders that value recycled materials at least the same way as primary raw materials or even explicitly favour the use of recycled construction materials. This is happening in some regional projects, but would need to be further elaborated in the future.

⁶³ http://www.steelconstruction.info/Recycling_and_reuse

Country	Examples of drivers for the incorporation of reclaimed and recycled content
Italy	<ul style="list-style-type: none"> • Taxation of mining activities would increase the competitiveness of recycled aggregates. The inclusion of recycled aggregates prices in the price lists would highlight the price competitiveness of such products compared to natural aggregates. • The use of selective demolition practice would increase the quality and reduce the costs for recycled aggregates. • Full assimilation of recycled aggregates in the technical guidelines relating to the field of road construction. The impact on recycled aggregate use should be evaluated and eventually the revision of technical standards for other construction works can be pursued. • Specifications in tender documents in the buildings sector: The public administration must make sure that the particular specifications are updated based on the latest European technical standards, which does not distinguish the aggregates by their nature, but by their performance characteristics. • A ban on landfilling of CDW would be more effective than the current tax in pushing the industry of recycled materials from CDW.
Portugal	<ul style="list-style-type: none"> • The Portuguese target to incorporate at least 5% of recycled materials, regarding the total amount of raw materials used in public construction works.
Spain	<ul style="list-style-type: none"> • One of the objectives in the PEMAR (state master plan for waste management) is to include environmental costs within the cost for natural aggregates in order to make recycled aggregates more competitively priced. • Various working groups have been established to address the topic of recycled aggregates.
The Netherlands	<ul style="list-style-type: none"> • The introduction of tax on landfilling and incineration is an enabler for more recycled CDW.
UK	<ul style="list-style-type: none"> • There has been a substantial increase in guidance available for companies seeking to increase their recycled content within construction products, which may use CDW; as well as drivers to set higher recycled content targets for projects. • The Government sponsored the Waste Resources Action Programme (WRAP), which led to a variety of work undertaken to increase recycling for CDW over a 10 year period. This included working with the construction sector to specify higher levels of recycled content, and a major programme of assisting companies to reduce CDW to landfill. Furthermore, WRAP provided financial assistance to assessing feasibility and supporting the set up of recycling plants.

4.3.4.3. Member States maturity and performance

Measures taken and maturity

Apart from the implementation of EoW criteria, other measures that have been adopted to promote recycled aggregate production include:

- Czech Republic – reduced VAT for recycled materials;
- UK - primary aggregates levy, credits in sustainability standards such as BREEAM, Ska and CEEQUAL;
- Guidance, tools and case studies across MS, such as the UK's net waste tool, a freely accessible online resource, available at www.wrap.org.uk/nwtool. It will help generate waste forecasts and prioritise waste reduction and recovery actions;
- Labelling and certification schemes, such as Slovakia's EVP¹⁰, which is a national eco-label that is used for the labelling of environmentally friendly products;
- Searchable databases to find suppliers of recycled aggregates, such as Sweden's STA, which has developed a materials database for the trading of and information concerning excavated materials;
- Focus on developing specifications for different applications, such as road building, such as the UK's Highways Agency Specifications for Highway Works (SHW), which sets out the standards required for materials used in constructing and maintaining its network.

As detailed in Table 26 and Table 27 below and according to the abovementioned maturity matrix, the Netherlands and UK are considered to be at the top level of improving and optimising for the CDW practice categories that relate to the incorporation of reclaimed and recycled content. On the other hand, Bulgaria,

Cyprus, Greece, Latvia, Lithuania, Malta, Romania and Spain are all at the lowest level of maturity.

Table 26: Maturity matrix levels related to incorporation of reclaimed and recycled content

CDW practice	Level 1 Initial	Level 2 Developing	Level 3 Implemented	Level 4 Improving and optimising
Reused and recycled materials	None or very small market for recycled materials (aggregates) No specifications	Limited market for recycled materials (aggregates) but is starting to develop Specifications starting to be developed	Established market for aggregates Markets being developed for other CDW materials Market is being developed Starting to look at reclaimed materials Guidance for use of materials available	Mature/ Established market for recycled materials (aggregates and other materials) Moving towards 'upcycling' High take up of specifications/guidance Common/ standard practice R&D
End of Waste criteria	No EoW criteria Limited/no reference to the EC end of waste criteria	Starting to develop end of waste criteria specific to CDW Some reference to use of EC end of waste criteria	End of waste criteria for CDW established	End of waste criteria for CDW established, reviewed and being improved

Table 27: Member State maturity matrix performance for incorporation of reclaimed and recycled content

Maturity Matrix CDW Practice Categories	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czech Republic	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	The Netherlands	UK
Reused and recycled materials	2	4	1	1	1	3	4	2	2	2	3	1	2	3	2	1	1	4	1	2	2	1	2	3	1	4	4	4
End of Waste criteria	3	3	1	1	1	2	1	1	1	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4

1 – Initial level (No EoW criteria , Limited/no reference to the EC end of waste criteria); 2 – Developing level (Starting to develop end of waste criteria specific to CDW, Some reference to use of EC end of waste criteria); 3 – Improving level (End of waste criteria for CDW established); 4 – Optimising level (End of waste criteria for CDW established, reviewed and being improved). More information available in

Appendix B – CDW management maturity matrix

Performance

We observed no clear impact of good practice measures for incorporation of reclaimed and recycled content on national performance, aside from the strong correlation between having EoW criteria in place (or under development) and levels of recycled aggregate production. There is some debate as to whether this is a cause or effect, i.e. does having EoW criteria greatly stimulate recycled aggregate production, or do MS with strong recycled aggregate markets/production tend to develop EoW criteria to reduce time and costs.

There is no data available to assess levels of use of reclaimed materials across the EU and this mirrors the absence of activity in terms of promoting reuse, as discussed in the previous reuse section.

The best data relates to recycled aggregates, and is produced by UEPG (European Aggregates Association). According to these, the top 5 countries for recycled aggregates production⁶⁴, by way of proportion of primary aggregates are:

- Netherlands – 34%
- UK – 21%
- Belgium – 18%
- Germany – 12%
- France – 6%

⁶⁴ Using UEPG 2014 data, rather than country report data

The ability to use these products in construction applications is heavily dependent on their compliance with MS/EU standards relating to aggregates applications they are being produced for. Of the five above-mentioned best performing countries, Belgium (Flanders), France, Netherlands and the UK have EoW regulations in place for inert CDW or producing recycled aggregates. Germany has similar draft regulations. Austria is the only other country to have EoW for recycled aggregates and is the 8th highest producer of recycled aggregates. This presents a significant correlation between EoW criteria being in place in a MS and the production of recycled aggregates. This is not surprising since the recycled aggregates are effectively being converted into products that conform to relevant standards governing their use as products. They also cease to be a waste and are therefore not subjected to the many restrictions/ additional requirements that can be placed upon subsequent use, in terms of proving exemptions, or obtaining permitting and planning consent.

4.3.5. Focus on end-of-waste criteria

4.3.5.1. Overview and implementation at EU level

In response to concerns expressed by industrial stakeholders that the status of waste-derived material is a barrier to recycling, the Waste Framework Directive (WFD) 2008/98/EC includes the option to set end-of-waste (EoW) criteria under which specified waste fractions will cease to be classified as waste. If these criteria are fulfilled, the material will no longer be classified as a waste but it will instead become a product subject to free trade and use (although for specific purposes). Article 6 of the WFD regulates the circumstances under which certain specified types of waste cease to be classified as waste. This “end-of-waste” status is reached when the waste has undergone a recovery operation, including recycling, and complies with specific criteria to be developed in accordance with the following cumulative conditions:

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

EoW legislation supports the recycling markets in the EU by creating a level playing field for all actors (industry, administration), increasing legal certainty.

Article 6(4) of the WFD states that where no EoW criteria have been set at EU level, “Member States may decide case by case whether certain waste has ceased to be waste taking into account the applicable case law”. One of the benefits in this approach is that national differences can be taken into account. However, it is important to note that when a waste reaches national EoW status, it only ceases to be waste in that Member State. The waste is still to be considered as a waste in other Member States and the regulation on waste shipment is still applicable.

When classified as a waste, environmental and health protection aspects of the use of CDW for construction purposes are regulated by national (and EU) waste legislation. If recycled aggregates obtain EoW status and ceases to be waste, it becomes a product. In that case the use of the material will be entirely regulated by the products legislation. Recycled aggregates ceasing to be a waste are not required to be registered under the REACH Regulation as they are considered as articles, due to their function (shape, surface or design) is more important than their chemical compositions. Hence, EoW legislation reduces administrative burdens related to shipment, transport and trade that are redundant for environmentally safe materials.

The European Commission has already set down end-of-waste criteria for iron, steel and aluminium scrap⁶⁵, glass cullet⁶⁶ and copper scrap⁶⁷ and criteria for various other materials (paper waste, biodegradable waste). Although the EoW regulations for scrap metals and glass do not refer specifically to materials arising from CDW, they are still relevant since these materials are present in the CDW stream. However, in order for the criteria to be applicable, for example the metal waste from construction and demolition, it requires it to be separately collected and treated. There is no possibility of meeting EoW criteria of metals in mixed CDW fractions.

⁶⁵ EU Commission Regulation n°333/2011. Adopted in March 2011

⁶⁶ EU Commission Regulation n°1179/2012

⁶⁷ EU Commission Regulation n°715/2013

For aggregates derived from CDW, a study⁶⁸ was carried out by JRC on the methodological aspects regarding threshold values for pollutants in aggregates which proposed a risk-based methodology for the release of salts and metals from recycled aggregates. Two different options were considered:

- the recycling is connected with certain requirements on the construction or in its surroundings (e.g. paving, direct contact with groundwater) using a risk assessment for the development of threshold values
- no restrictions or conditions on the use of waste-derived aggregates are given.

The latter approach, with no restriction or conditions placed on the use, would lead to very strict threshold values and would in practice lead to the rejection of many aggregates for recycling. The first approach, with restrictions, was not found suitable for implementation at European level, because the practical implementation of the risk based methodology might be challenging and time consuming (e.g. taking into account specific conditions in the use in Member States). In view of the recommendations of the study and some mixed experiences with the development of EoW criteria at EU level, it was decided that at present, no further steps will be taken by the European Commission for developing EoW criteria for aggregates at EU level.⁶⁹

4.3.5.2. Status of EoW implementation in Member States

As of January 2016, five Member States (Austria, Belgium (Flanders), France, the Netherlands and UK) had introduced national legislation or protocols for CDW to cease to be classified as waste. Additionally, two Member States (Germany, Czech Republic) were preparing national EoW (see country fact sheets). Based on information in the country factsheets, two Member States have made or are discussing a case by case decision on waste status. In Finland, construction wood waste from a defined origin for the use in wood stone has received a EoW status by the authorities. The Irish EPA has in 2012 received an application for EoW-status for crushed rubble, also described as builders fill, which is said to be suitable as general fill and the construction of unbound haul roads, for example on farms (no decision made according to the situation as of September, 2015).

A few Member States have made or are discussing some case by case decisions on waste status.

The national EoW criteria developed in the Member States mainly concern mineral CDW (concrete waste, bricks and their mixtures and bituminous mixtures) to be used as aggregate. Austria, Belgium, Italy and UK are the only countries that have also developed national EoW criteria for other wastes than CDW. National EoW criteria have been developed for unbound and bound construction.

Four countries (Austria, Belgium, France, the Netherlands) have threshold values related to the release of harmful substances and three countries (Austria, Belgium, the Netherlands) have threshold values for inorganic and/or organic harmful substances (France has a limited list of threshold values for the total content in some materials). The threshold values for release have been developed based on risk or impact assessment. The UK does not require testing of environmental properties.

For technical properties, all Member States with EoW legislation make references to the harmonised product standards related to CE-marking and developed for implementation of the Construction Products Regulation. If a waste-derived aggregate achieves EoW status, it will become a (construction) product and hence be regulated by the Construction Products Regulation (CPR). In practice, it means that when a harmonised European product standard exists, the properties related to basic work requirements defined in CPR must be tested with common tools (methods) and the system of attestation of conformity (“assessment and verification of constancy of performance”) for specific construction products must be followed. The conformity system for use of specific construction products in construction works determines the involvement and tasks of the manufacturer and in some cases, a third party (the approved body). However, the conditions for the use of construction products and the requirements on the construction product are set at national level (e.g. requirements in the national EoW regulations for environmental properties).

Quality control on input material is addressed in the national EoW legislation. Some Member States with EoW criteria require pre-auditing prior to demolition and the use of selective demolition (e.g. removal of materials containing hazardous substances or impurities and sorting of materials into different fractions). In the Netherlands, a pre-demolition audit can be asked for by local authorities as part of the demolition permit; though their EoW regulation for granular material 'starts' at the point of acceptance of the waste material at the recovery site. Documentation and records of the materials are typically required in proving the conformity with

⁶⁸ Saveyn, H. et al. 2014. Study on methodological aspects regarding threshold values for pollutants in aggregates in the context of the development of end-of-waste criteria under the EU Waste Framework Directive.

⁶⁹ EUWID Recycling and Waste management. Policy 8.15. “EU has no plans for EU wide end-of-waste rules for aggregate (article) 2015. http://www.organics-recycling.org.uk/dmdocuments/EUWID%20article_Fertilisers%20Regulation.pdf

the EoW concept. Belgium and the Netherlands have introduced a certification system with external control. Professionalism in the whole recycling chain including setting clear responsibilities for each stakeholder involved is addressed in the quality management systems.

4.3.5.3. Lessons learned from nationally implemented EoW legislations and recommendations

The experience and documentation regarding the use of the EoW concept in specific waste streams is limited. Member States do not yet understand how much recycled material enters the recycling process as aggregates via EoW, and the influence of the EoW concept on the recycling rates have not yet been assessed by Member States. Therefore it is not possible, based on available data, to evaluate whether the recycling rates for aggregates or other materials have increased due to EoW legislation. However, the EoW concept seems to lighten the authorities' administrative work concerning handling permits for the use of CDW. Many industrial stakeholders also point out that the EoW concept allows aggregates from CDW to equate natural materials and can contribute to building up trust related to the quality of recycled materials following negative experience in the past, when waste streams were poorly controlled and managed.

Based on our research and the information shared by interviewed stakeholders, a summary of main drivers and barriers regarding the EoW concept is given Table 28 below.

Table 28: Summary of main drivers and barriers regarding the EoW concept

Quality	The environmental and constructional quality of manufactured recycled building materials on the market is variable . This barrier should be overcome with the new EoW framework currently being developed which will require specific standards for recycled building materials.
	Market confidence should be enhanced by ensuring reliability of materials, in particular through EoW.
Legislation	Standards for recycled building materials is an important driver that can help the development of EoW criteria.
	One advantage with the EoW legislation is that technical requirements for environmental and construction engineering are formulated according to one set of rules and that a standardised guideline for recycled materials is available and helps create a legally binding regulation.
	Another driver can be seen in the close collaboration between the public and private sector while working on the EoW regulation.
	National requirements can be included in the EoW legislation (e.g. conditions of application)
Image	The lack of detailed rules in national legislation on EoW status and the lack of a certification system for EoW are barriers for recycling.
	Secondary building materials still have a negative image. Many builders still discriminate against secondary building materials, because of their negative past experiences and do not trust the quality of recycled materials. According to some stakeholders, it would be better to label EoW materials as new raw material instead of waste.
	The end-of-life status of recycled CDW is seen as a significant barrier from the industry, since products that fulfil strict norms and standards are handled as waste.
Costs	The time needed for sampling and testing the aggregate quality is seen as a barrier by stakeholders running facilities operating small volumes
Threshold values	According to CDW recyclers in France, the national EoW regulation is not usable in its current state because the currently accepted threshold value for leachable sulphate in recycled aggregate is too low and also because the regulation requires numerous analyses to be run a priori, which is not possible on small sites with high stock rotation.
Scale of business	EoW concept is not workable for small-scale recycling, professionalism required to cover the whole value chain. Moreover, the line between small-scale and professional uses of wastes should also be clarified.
	Only major players can benefit from EoW concept.

Exchange of information among Member States on the experience concerning the EoW concept (identified development needs, good practices, etc.) is recommended. There are differences in the implementation of EoW criteria which are due to national conditions and practices. EoW legislation is clearly one approach to promote recycling of certain waste-derived materials, but there are many Member States which achieve high levels of recycling through waste status. Within a Circular Economy context, different parallel approaches, systems and tools are needed. No single system can handle the large variety of recycling routes and possibilities. It is therefore important to assess and clarify the applicability of different tools and systems.

For recycled aggregates, a key factor is to ensure the quality of the input material. This requires further development of:

- Pre-audit schemes prior to demolition;
- The traceability system of input materials (better quality management among stakeholders along the whole value chain by understanding the controls);
- Robust testing schemes for quality controls.

4.3.6. Focus on Green Public Procurement (GPP)

4.3.6.1. GPP in the construction sector

GPP is a voluntary instrument defined as "a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured."⁷⁰

In order to achieve these objectives, public sector organisations might integrate environmental criteria into public procurement processes.

The environmental criteria may cover the full procurement cycle from needs assessment and subject matter definition (e.g. supply of sustainable concrete), technical specifications (e.g. choice of construction methods and materials) through selection (e.g. experience of designer or contractor), award (e.g. additional marks for use of building materials with recycled content) and contract management (e.g. staff training for onsite separation of CDW, reporting on achievement of CDW recovery targets).

GPP in the construction sector encompasses the minimisation of environmental impacts of construction works at every phase of the lifecycle of a building and other physical infrastructures, including planning/design, construction, renovation, use and disposal/deconstruction. The environmental impacts of construction works are many and complex ranging from impacts related to energy consumption, transport, water usage, ecological and human toxicity, consumption of natural resources and waste generation. Public authorities that are developing a GPP approach must prioritise which environmental impacts to address⁷¹.

From a CDW perspective, then a first step enabler for the greater use of recycled aggregates generated from inert CDW is the GPP requirement from public authorities within road construction and maintenance activities. According to the European Commission's Reference Document on Best Environmental Management Practice in the building and construction sector⁷², the use of materials with high recycled content is one of the best practices with the potential for greatest influence on resource efficiency in construction and should be taken into consideration by contracting authorities, project teams and relevant stakeholders during the procurement process. There are a number of examples of authorities in Member States specifying the use of recycled materials from CDW within roads, with the development of technical specifications, testing regimes and guidance. For example, in the UK, the Highways Agency's Specifications for Highway Works (SHW) sets out the standards required for materials used in constructing and maintaining its network and in Portugal, there is the SUPREMA initiative: the Sustainable application of construction and demolition recycled materials in road infrastructures.

Building LCA studies show that most of the environmental impact is due to the building's energy consumption during its operational phase, with a small part coming from the embodied energy of construction materials and end-of-life⁷³. However the relative share of each impact may vary depending on the type of physical infrastructure and its use.⁷⁴

⁷⁰ European Commission COM (2008) 400 final Public Procurement for a Better Environment. <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0400:FIN:EN:PDF>

⁷¹ three main factors are recommended for prioritisation: 1) which impacts have a high impact on the environment over their life cycle, 2) focus efforts on areas of significant spend and 3) the potential to influence the market.

⁷² EC Reference Document on Best Environmental Management Practice in the building and construction sector (2012): <http://susproc.jrc.ec.europa.eu/activities/emas/documents/ConstructionSector.pdf>

⁷³ JRC-IPTS (2014) Green Public Procurement Criteria for the design, construction and management of Office buildings (Draft) Technical background report and criteria proposal.

⁷⁴ For example, a road construction project it may have a larger share of environmental impacts coming from embodied energy of construction materials than a building. With improvement in energy efficiency the share of environmental impacts from embodied energy may also increase.

The environmental impacts that are relevant to this study and to materials efficiency⁷⁵ relate to the consumption of natural resources and waste generation. The presence of harmful substances may also be relevant as they may limit the ability to recover waste materials. To address these environmental impacts, the European Commission recommended GPP approaches shown in Table 29⁷⁶.

Table 29: Construction key environment impacts relevant to materials efficiency and recommended GPP

Construction Key Environmental impacts	GPP Approach
Consumption of natural resources	Design and specification to reduce the embodied impacts and resource use associated with construction materials. Design, specification and site management to use building products or materials with a high recycled or re-used content.
Waste generation	Design, specification and site management to minimise construction and demolition (C&D) waste
Substances harmful to human health and the environment during the production or disposal of building materials leading to air and water pollution Negative health impacts on building users due to building materials containing dangerous substances	Encourage the use of non-toxic building materials Encourage the use of substitute substances/ materials for dangerous building materials ⁷⁷

4.3.6.2. Issues related to GPP Criteria

The establishment of environmental criteria for buildings and construction projects is not an easy task and requires a consistent methodology to compare performance and be used effectively in procurement.

Building level assessments (such as BREEAM, LEED, and DGNB) could assist with this challenge, but they have different methodologies which make them problematic to use in the procurement process. To prevent market distortion due to national schemes, public authorities must also reference criteria ‘behind the label’ rather than requiring a specific building standard.

In order to develop GPP criteria, public authorities need to access and understand information about the lifecycle environmental impacts of the projects, prioritise environmental impacts to address in procurement and integrate value-for-money considerations. A review of GPP measures indicates that energy efficiency measures appear to be more widely used than measures relating to material efficiency.

The ability to develop GPP criteria and verify information submitted by tenderers in response to environmental criteria in construction is also a challenge as clear guidelines are still being developed. However the situation is improving, as shown in the draft EU GPP Criteria for office building, published in 2014. This is introducing clear criteria relating to decreases in embodied energy of materials by increasing recycled content, minimum waste arisings and reuse/recycling targets.

4.3.6.3. Level of use / uptake of GPP

The strategic use of procurement to achieve environmental objectives has gained ground in Europe and internationally since the mid-1990s. However, as shown in Figure 2, the inclusion of green criteria in procurement appears to be lower than 20% in as many as twelve Member States⁷⁸.

⁷⁵ Degree in which usage of raw materials, construction projects or physical processes are used or carried out in a manner which consumes, incorporates, or wastes less of a given material compared to previous measures.

⁷⁶ Adapted from European Commission, (2008) Construction - GPP Product Sheet, (2014) Draft Green Public Procurement Criteria for the design, construction and management of Office buildings and (2015) Draft Green Public Procurement Criteria for design, construction and maintenance of roads. It is expected that the building criteria will replace the Construction criteria in the future.

⁷⁷ Contracting authorities must ensure that the functionality of the building materials is not compromised (for example in terms of resistance to fungal growth) when using substitute substances/materials.

⁷⁸ CEPS (2012) The Uptake Of Green Public Procurement In The EU27 <http://ec.europa.eu/environment/gpp/pdf/CEPS-CoE-GPP%20MAIN%20REPORT.pdf>

Sweden, Belgium, the Netherlands and Denmark have relatively high rates of GPP. These countries and others have been able to develop and refine criteria covering a wide range of goods and services purchased by the public sector. Guidance and training programmes were developed to ensure the uptake of these criteria and to engage the broader public sector.

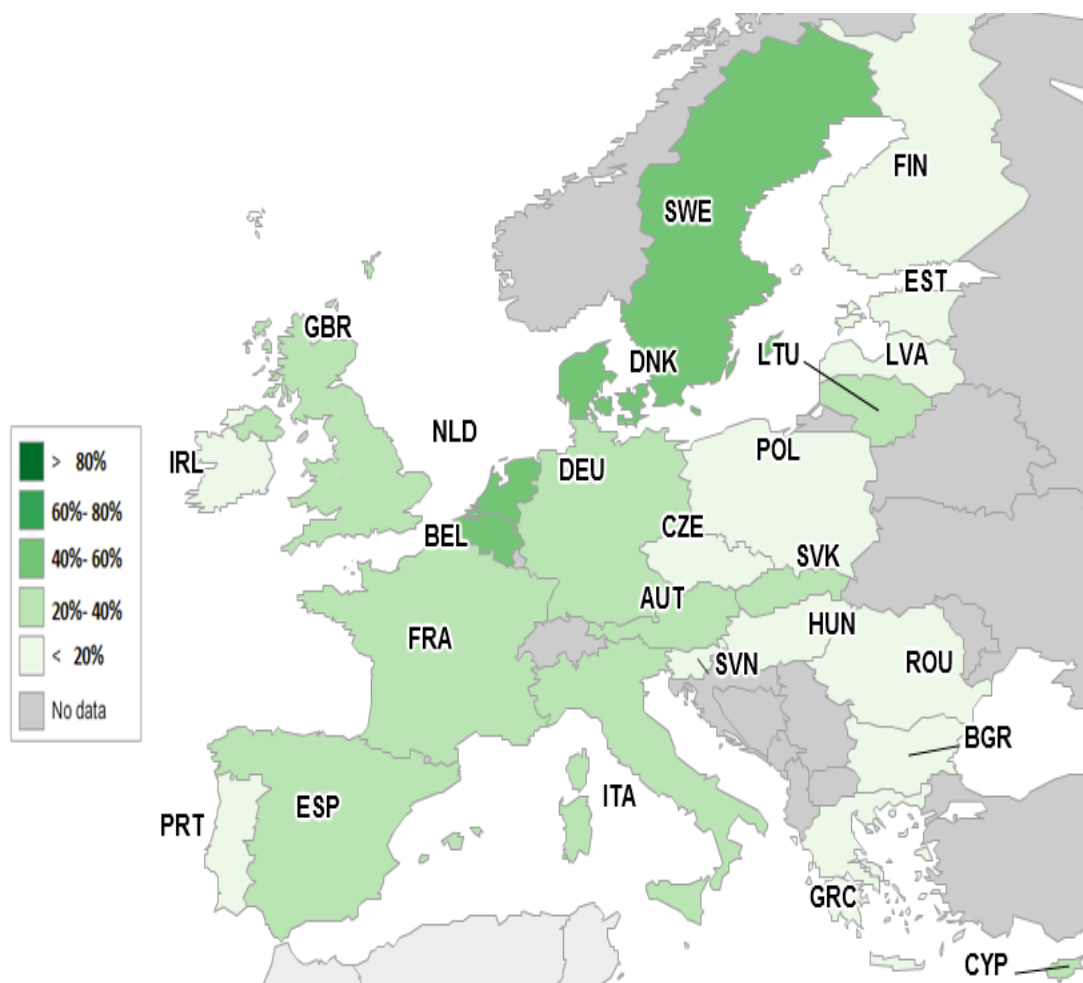


Figure 31: Uptake of all EU GPP in the EU27 (last contracts by numbers) (CEPS, 2012)

The reported level of uptake also differs per product group. At the time of the survey, only three EU core GPP criteria were used by more than 50% of the respondents: double-sided printing and energy performance for office IT equipment, and the criterion on CO₂ emissions for transport. The high score for energy performance of IT equipment may also stem from the fact that, under the Energy Star regulation, central governments have an obligation to buy energy-efficient equipment. This shows the importance of the combination of GPP (mainly voluntary) with EU Directives (mandatory).

With regards to criteria relevant to construction, the same study showed that 53% of public contracts in the construction sector have some form of green criteria, 63% include one core EU GPP criterion and only 3% include all EU GPP criteria⁷⁹. Unfortunately the study did not give details of what environmental impacts the GPP criteria for construction covered (e.g. energy, water or waste).

Another study⁸⁰, presenting the levels and impact of GPP measured in Austria, Denmark, Finland, Germany, The Netherlands, Sweden and the United Kingdom in 2006/2007, showed that for most Member States surveyed, the GPP levels are relatively low, except for the UK. A closer look at the study showed that the majority of the constructed buildings appears to have been designed so as to reduce the energy consumption but are not guaranteed free of hazardous materials.

⁷⁹ Questions on the application of EU core GPP criteria for a product/service group implied the provision of specific data (e.g., if they included requirements on energy efficiency) by respondents. This is why the uptake of at least one EU core GPP criterion appears higher than the reported use of any (unspecified) form of green criteria. In other words, sometimes administrations may be “greener” than they think.

⁸⁰ Pricewaterhousecoopers, Significant and Ecofys (2009) Collection of statistical information on green public procurement in the EU. http://ec.europa.eu/environment/gpp/pdf/statistical_information.pdf

While not directly focusing on Green Public Procurement, WRAP research⁸¹, undertaken for a broad range of building types in the UK, indicates that most buildings contain at least 10% **recycled content** by value using standard products.

Overall there is an increase in the use of sustainable building standards in Europe. However, outside the main sustainable building standards (BREEAM, LEED, DGNB and HQE), there is limited information on the number of certifications for each standard which make comparison difficult. It was not possible to relate the number of certified buildings to the number of buildings completed as this information was not available for the majority of EU countries.

4.3.6.4. Impact of GPP on material efficiency

At a macro level, it is difficult to assess the impact of GPP on improving material efficiency in the construction sector due to a lack of national indicators with which to monitor GPP use per product and service group and GPP overlaps with other drivers such as national legislation.

There are however a number of case studies that have indicated significant environmental benefits at project level. The use of materials with high recycled content, demolition and construction waste management plans are some of the practices which seems to have the greatest potential to improve material efficiency in the construction sector. These practices contribute to sustainable development by diverting materials from landfill and saving natural resources.

4.3.7. Other measures

Other good practices, which did not easily fit into the previous categories, were identified, and should be recognised as significant in improved material efficiency and diversion of waste from landfill. They fall into several categories, including:

- Understanding the environmental, social and economic impacts and benefits from better CDW management or incorporation of recycled content into the built environment (this is also referenced in the earlier sections)
- General best practice guides and tools
- Improving enforcement and waste producer knowledge of their responsibilities
- Hazardous waste identification and management

These aspects of CDW are frequently viewed as peripheral of activity to improve the current performance levels.

⁸¹ WRAP (2009) Delivering higher recycled content in construction projects http://www2.wrap.org.uk/downloads/Delivering_higher_recycled_content_in_construction_projects.a5cbdb03.5021.pdf
Resource Efficient Use of Mixed Wastes – Improving management of construction and demolition waste – Final report

5. Regional differences in CDW management performance for selected MS

Within this project, a study has been undertaken to evaluate the differences in regional CDW management in selected MS, and to identify any lessons that can be learnt for improved CDW management across Europe. This includes an assessment of the CDW performance of the selected MS at regional level, identification of key drivers for this performance, any barriers at a regional level, and a description of lessons learnt and recommendations.

Three Member States were chosen for regional analysis, in agreement with the Commission: United Kingdom (UK), Spain, and Belgium. For each of these, a regional assessment has been undertaken. These regions were chosen because they had the following characteristics:

- A difference in legislation and policy for CDW at regional level versus national level;
- Some CDW data available at regional level;
- Strong regional administration;
- Differences in waste infrastructure.

For the UK, the analysis has been carried out at country level: England, Wales, Scotland and Northern Ireland. Within the UK, unitary sovereign states, Wales, Scotland and Northern Ireland have gained a degree of autonomy through devolution, however as the waste legislation and CDW performance is largely similar, all Regions have been analysed.

For Spain, the analysis has been carried out at the autonomous community level (NUTS 2), for 3 out of 17: Catalonia, Basque Country and Rioja. These are autonomous communities (regions) which have limited autonomy with powers devolved down to this level. These regions were chosen as Catalonia and Basque Country are more progressive in CDW management and also represent urban areas within Spain. The Rioja region has been selected as it is more representative of a rural region.

Within Belgium, the 3 regions of Brussels, Flanders and Wallonia have been analysed. Each of these regions has its own Government and Parliament and as such their legislation and CDW practices vary, making them interesting to assess from a regional perspective.

Table 27 provides an overview of the framework for CDW management at national and regional levels for the three MS that were studied (UK, Belgium and Spain). The approach to CDW legislation varies substantially in the regions studied. Legislation can be applied at both a national and a regional level as per the UK and Spain. In the UK, waste legislation can be devolved to the regions (countries), which is the case for Scotland, or may be undertaken at a national or devolved to a regional level for the other regions. In Spain, there is overarching national CDW legislation which applies to all regions (autonomous communities). The Spanish regions can also make their own legislation. For Belgium, CDW legislation only exists at the regional (Federal) level. The approach is largely dependent on the statutory powers that exist within the countries assessed.

Table 30: Overall framework for CDW activities for the selected Member States

	UK		Spain		Belgium	
	National level	Regional/ country level	National level	Regional level	National level	Regional/ Federation level
CDW Definition	✓		✓			✓
Drafting of waste legislation		✓	✓	✓		✓
Specific CDW legislation	n/a	n/a	✓	✓		✓
End of Waste criteria	✓	✓				✓
Backfilling criteria/guidance		✓	✓		n/a	n/a
Waste management and prevention plans		✓	✓	✓		✓
Landfill tax	✓	✓		✓		✓
Enforcement activities		✓		✓		✓
Demolition requirement (pre-demolition audit and/or selective demolition)				✓		✓
Green Public Procurement		✓		✓		✓

5.1. The UK and its regions

The main findings regarding CDW legislation and polices for the UK and its regions, are summarised below (more details are available in

).

Waste legislation

There is little difference in how the requirements of the WFD have been legislated in the UK Regions. Much of the waste legislation in Wales is developed by or with England, and as such is similar. All waste legislation relevant to Northern Ireland is identical with legislation in England. Scotland has developed its own waste legislation which the Scottish Government has responsibility for, however it is largely similar to the other regions. There is little difference in the timing of waste and environmental protection legislation developed by the regions which has been in place in various forms since the late 1990's. It can therefore be surmised that waste legislation does not have a major role in any difference in CDW performance between the UK Regions.

Waste management plans (including prevention plans)

In the UK, Waste Management Plans (WMP) have been developed by each of the regional Government bodies and as such their aspirations and policies are diverging. For example, Wales has set a higher target than the WFD recovery target of 70%, as well as an annual waste prevention target of 1.4% (based on a 2006/07 baseline) for CDW managed off site; whereas the other regions have adopted the WFD target.

Wales is the only region within the UK to produce a specific CDW plan⁸² which covers both its prevention and management and as such it more detailed than the rest of the regions. This has been in place since 2012. This plan includes sections on reducing, reusing and recycling specific waste streams related to construction and

⁸² <http://gov.wales/docs/desh/publications/130301construction-demolition-waste-plan-en.pdf>

demolition such as packaging, biodegradable waste, hazardous waste, wood, plastic, metal, insulation and gypsum. It also has detailed outcomes, policies and delivery actions for organisations, companies and individuals involved within the construction and demolition sector in Wales. Examples include:

- Encouraging all producers of waste within the C&D sector to take note of the Welsh Government's 'Guidance on Applying the Waste Hierarchy'.
- Improving understanding of eco-design with the intention that it becomes a thread that runs through the design, planning and development of all construction activities. This includes Design for Deconstruction (D4D) and 'greening' the Welsh Housing Quality Standard Refurbishment.
- Investigating the feasibility of introducing a producer responsibility measure for the C&D sector, with the potential for delivering a life cycle approach to building development.

A number of actions have been achieved since the inception of the CDW plan including:

- A specification for recycled aggregate for use in minor schemes, to encourage the use of CDW
- Green Compass Scheme - provides independent verification of the performance data reported by waste management organisations against the standard: PAS 402:2013

For the other region's WMPs, there are small sections on CDW within an overarching document, with Scotland and Northern Ireland having a few specific CDW actions. Examples include:

- Scotland WMP (2013)⁸³: Resource Efficient Scotland will work with the construction industry to encourage prevention, reuse and recycling of construction wastes through: seeking collective action on resource efficiency with the sector; promoting good practice across the construction industry, including the use of Site Waste Management Plans; building on evaluation of Site Waste Management Planning to develop and trial Resource Management Plans to encompass the design stage of construction and the wider benefits of resource efficiency. The Scottish Government has started to implement a number of these actions recently through funding business support programmes and the development of a construction material exchange and promotion of recycled aggregate producers.
- Northern Ireland WPP (2014)⁸⁴: The Department of the Environment will periodically review the effectiveness of voluntary environmental schemes within the construction sector in determining whether to consider statutory instruments in the future.

Within the English WMP⁸⁵, which has been in place since 2013, the built environment (including construction and demolition and facilities management) is highlighted as one of 8 priority material/streams for waste prevention activities, although little guidance is given on what should be specifically done.

CDW policies – diversion from landfill

In general terms, Scotland and Wales are developing more policies related to CDW, supported by financial resources, than England and Northern Ireland. Both Wales and Scotland fund a number of actions for CDW as mentioned previously.

The Welsh Government funds Constructing Excellence in Wales to provide support to business on CDW via the Waste Prevention Programme.

The Scottish Government funds Zero Waste Scotland (ZWS) which undertakes activities related to CDW. Scotland has also recently issued its Circular Economy Strategy⁸⁶ and has identified CDW as a priority area and as such funding is likely to continue.

In Northern Ireland, the Department of Environment (DOENI), which is part of the Northern Ireland Executive, has responsibility for waste policy. It has had its funding cut in recent years and its attention is more focused on the control of waste.

In England, the Department for Environment, Food and Rural Affairs (Defra) has undergone significant change in the last few years and no longer has a policy lead for CDW or supports any action programmes related to CDW due to budget constraints and the likelihood of England meeting the WFD target of 70% for CDW. However, prior to 2014, England supported a number of organisations to reduce and divert CDW to landfill,

⁸³ <http://www.gov.scot/Resource/Doc/314168/0099749.pdf>

⁸⁴ <https://www.daera-ni.gov.uk/articles/waste-management-strategy>

⁸⁵ <https://www.gov.uk/government/publications/waste-management-plan-for-england>

⁸⁶ <http://www.gov.scot/Resource/0049/00494471.pdf>

which involved producing guidance, support and tools to waste producers. This was seen to be successful; examples of this include €38bn value of projects with good practice CDW procurement wording, and waste sent to landfill reduced by 28% from 2008-2009 by 32 companies⁸⁷. England also had specific CDW legislation, the Site Waste Management Plan Regulations (SWMP) 2008⁸⁸ which were introduced in April 2008; these were repealed in December 2012. There was a mandatory requirement for projects over £300,000 (£355,000) to create a SWMP before construction work commenced on site, including statements regarding waste minimisation and a forecast of the types and amounts of waste that would be generated on the project, as well as details of how these would be managed. They were repealed as the Government felt that the impact on reducing construction waste, diverting it from landfill and reducing fly-tipping was minimal; along with a view that the industry was also better equipped to self-regulate following 4 years of SWMPs implementation. There was also a belief that construction businesses will prevent and recover CDW due to the related business benefits. It is interesting that many large construction companies have continued to implement SWMPs (or something similar) on a voluntary basis, as demonstrated by BRE Smartwaste usage⁸⁹. To summarise, construction companies in England have benefited from more CDW support and specific legislation in the recent past compared to other regions, which is likely to have had a positive effect on CDW management; less support has been available in the other regions, though this is increasing.

There is landfill tax legislation in the UK, which has recently been devolved to Wales and Scotland. The cost for this is currently⁹⁰ £84.60/tonne standard rate (equivalent to 100.37 EUR/tonne) and £2.65/tonne (equivalent to 3.15 EUR/tonne) lower rate⁹¹. The lower rate is paid on wastes such as rocks or soil. The Welsh Government is consulting on introducing a replacement for Landfill Tax known as the Landfill Disposals Tax; Scotland has kept the rate the same as the rest of the UK. The Landfill Tax has had a positive effect on the amount of waste that has been landfilled since its introduction in 1996. As this is a national based tax, this is not considered as a driver for any differences in CDW regional performance.

CDW policies – market demand Green public procurement (GPP) requirements are set at the regional level. All of the regions have policy statements and or action plans for GPP. Additionally, the environmental building standard, BREEAM, which has a number of credits for the prevention and diversion of CDW from landfill, is required for certain publically funded buildings; being most used in England.

Northern Ireland mentions CDW specifically in its procurement policies with targets for the recovery of CDW and use of recycled materials; the Government works closely with clients through the Sustainable Construction Government Client Plan. In Wales, there is a commitment for the public sector to use its influence as the largest construction client, through 'greening' of public procurement. In Scotland, at least 10% of the total value of materials used on public construction projects over £1m (€1.18m) should derive from recycled or re-used content. At the UK level, the majority of publically funded buildings will have some form of GPP associated to them - according to a study, 77% of construction projects have GPP based on value in the UK⁹². It is difficult to ascertain any difference in regional CDW performance related to GPP, as the GPP are roughly similar, though it will certainly be a contributing factor.

Other policies which seek to stimulate market demand include the Quality Protocols, which are voluntary end of waste frameworks for specific wastes including inert waste, flat glass, lubricating oils, waste plasterboard and non-packaging plastics used in the UK Regions. These are the same in England, Wales and Northern Ireland but may differ for Scotland, as the regulator, the Scottish Environment Protection Agency (SEPA), does not automatically recognise the validity of them. However the Quality Protocol for aggregates is applicable in Scotland, and those supplying to this standard are publicised on the Zero Waste Scotland 'Aggregate Quality Protocol Supplier Directory' website.

There is also the UK-wide aggregates Levy which places a tax on primary aggregates (when used in a construction application which is around 90% of aggregates) which enables recycled aggregates to be more competitively priced, thus stimulating the market for recycled and secondary aggregates (around 28% of all aggregates) which are mainly derived from CDW. The Levy enabled more investment in recycling infrastructure and allowed recyclers to have a higher unit production cost and still be competitive with primary aggregates. However, the market expectation for recycled aggregates to be cheaper because of the Levy has been an

⁸⁷ http://www.wrap.org.uk/sites/files/wrap/HW2L_Report__10555.pdf

⁸⁸ <http://www.legislation.gov.uk/ukxi/2008/314/contents/made>

⁸⁹ <http://www.smartwaste.co.uk/modules>

⁹⁰ From 1st April 2016 – 31st March 2017

⁹¹ Exchange rate on 22/7/16 at 1.19 EUR to 1 GBP.

⁹² http://ec.europa.eu/environment/gpp/pdf/statistical_information.pdf

issue. This was introduced in 2002 and has had little increase since. Rate for 2014/15 (UK): £2 per tonne (equivalent to €2.37/tonne)

Specifications also exist to encourage the use of recycled materials from CDW. These are similar across the UK regions, though a specification for recycled aggregate for use in minor schemes has been developed for Wales and a long-standing HAUC Specification for the Reinstatement of Openings in Highways in England is used.

In summary, the UK regions have a similar approach in their market demand-led policies for CDW and as such it is unlikely to be a major factor in any difference in CDW performance across the UK.

Enforcement

The UK environmental protection bodies are responsible for enforcing waste regulations; one is provided for each of the regions (England, - Environment Agency; Wales – Natural Resource Wales; Scotland - Scottish Environmental Protection Agency (SEPA) and Northern Ireland - Northern Ireland Environment Agency).

The roles and responsibilities of waste carriers, brokers and those who carry out treatment, recovery and disposal operations are well defined in national legislation. In the UK, local councils and environmental regulatory bodies are in charge of dealing with illegally deposited waste. These bodies carry out a large number of inspections of waste sites, though due to budget constraints these are becoming less. There are various penalties in place for those who do not comply with waste regulations, with an increasing emphasis to tackle waste crime. The figures below show the number of illegal activities per region (except for Northern Ireland where data is not available).

- **England** – 852,000 flytipping incidents occurred in 2013/14, 6% were from CDEW, up by nearly 20% from 2012/13
- **Wales**⁹³ – 32,934 flytipping incidents were reported by local authorities in 2013/14, costing €2.2 million to clear up. 2216 (7%) were CDEW related. This number has consistently fallen since a peak in 2007/08. 24,701 enforcement actions were taken; of those where local authorities carried out prosecutions, 75 per cent resulted in a fine. Wales has consulted on a fly-tipping strategy⁹⁴
- **Scotland**^{95, 96} – 61,000 flytipping incidents per year, costing over £8.9m (€10.5m) to clear up, of which 4.6% were related to construction and demolition

It is hard to draw a comparison between the regions in terms of enforcement activity, as they undertake similar roles and activities and also joint initiatives.

Waste data

There are quite a few differences in the way CDW data is collected by each region. England and Northern Ireland use permitted waste site data. Wales uses a combination of site data and industry surveys. Scotland also uses permitted waste site data; however it estimates the recovery rate through apportioning the CDW recovery rate to the overall waste recovery rate. More information is needed to understand the differences that may arise from the different methodologies, however it can be surmised that certain treatment activities may not be included for Scotland and Northern Ireland.

Waste infrastructure

There is considered to be adequate waste infrastructure for CDW in the UK; though there can be challenge of providing enough capacity in remote areas (e.g. rural parts of Scotland). In recent years there has been a focus on the development of treatment facilities, largely due to the rising costs of the Landfill Tax. England has far more waste facilities than the other Regions; however it produces much more CDW than the others. For example, the number of landfills in England is 478, compared to 71 in Scotland, 25 in Wales and 20 in Northern Ireland.

⁹³ <http://gov.wales/statistics-and-research/local-authority-recorded-flytipping/?lang=en>

⁹⁴ <http://www.tacklingflytipping.com/Documents/NFTPG-Files/150226-fly-tipping-strategy-en.pdf>

⁹⁵ <http://www.zerowastescotland.org.uk/content/flytipping-1>

⁹⁶ http://www.zerowastescotland.org.uk/sites/files/zws/Scotland%27s%20Litter%20Problem%20-%20Full%20Final%20Report_0.pdf

Analysis

An analysis of the UK region's CDW policies and legislation and their waste generation and recovery rates is provided in Table 28. The assessment is largely subjective, dependant on the type and quality of information available. When comparing the CDW performance most of the regions perform similarly (around 80-90% recovery rate), with Northern Ireland lagging behind at around 70% (though the dataset is older than the other regions). It should also be noted that regions have different data collection methods which may affect the figures reported. For CDW generation, there is more of a difference with Wales and Northern Ireland producing twice as much as Scotland, relative to GDP. However, for CDW generated relative to population size, England produces the most, twice as much as Scotland. A trend can be seen between the CDW scores (and related activities) as they largely concur with the waste recovery performance in each region. For instance, England which has a high recovery rate of 88% also has the highest score (or amount of CDW support) at 79%, largely due to the recent legal requirement for SWMPs, which will have influenced positively the recovery and waste generation figures. However, it is too early to tell if the lack of ongoing support and the repeal of the SWMP legislation will have an overall effect in the management of CDW.

In Wales, which has a recovery rate of 87% and a score of 76%, it may be that the effect of the WMP and CDW support is starting to take effect, though the amount of CDW generated is considerably higher than for Scotland or England, relative to GDP. Wales, unlike the other regions, has a CDW prevention target and actions; which may be due to the higher waste generation rate; however this so far looks like to have had little effect when compared to the other regions. Scotland is interesting, in that it has the highest recovery rate (90%) and the lowest waste generation figures, but doesn't score particularly differently (76%) from the other regions in terms of the actions it is undertaking; however it should be noted that the waste data methods are different.

Northern Ireland has limited actions in its WMP for CDW and due to funding constraints; CDW may not be considered a priority, which reflects in its recovery rate of 70% and high waste generation figure. A factor that may affect Northern Ireland is the difference when applying the Aggregates Levy (In Northern Ireland, sites registered to the Aggregates Levy Credit Scheme can claim 80% relief from the full rate of the levy) compared to other Countries, which may have slightly limited the amount of CDW recycled for aggregates purposes. Overall, it is to be expected that the regions perform generally the same as they have similar waste legislation, landfill taxes and market drivers.

Table 28: UK Regions CDW assessment

	England		Wales		Scotland		Northern Ireland	
	Implementation	Effectiveness	Implementation	Effectiveness	Implementation	Effectiveness	Implementation	Effectiveness
Recent and Existing Waste legislation for diversion of CDW from landfill	3	3	2	2	2	2	2	2
Waste management/prevention plan (CDW related)	2	1	2	2	2	2	2	1
Targets for CDW	2	1	2	1	2	1	2	1
Landfill tax	3	3	3	3	3	3	3	3
Promotion of markets for CDW (inc. GPP, specifications and EoW)	3	2	3	2	3	2	3	2
Waste infrastructure	3	3	3	3	3	3	3	2
Level of enforcement	3	1	3	1	3	1	3	1
Total	19	14	18	14	18	14	18	12

	England		Wales		Scotland		Northern Ireland	
	Implementation	Effectiveness	Implementation	Effectiveness	Implementation	Effectiveness	Implementation	Effectiveness
Overall total (max of 42)	33 (79%)		32 (76%)		32 (76%)		30 (71%)	
Recovery rate (%)	88		87		90		70	
CDW generated (t/million €)	22		27		11		27	
CDW (t)/person	0.73		0.61		0.36		0.67	

Key to table:

Existence and implementation:

0 – non-existent; 1- existing but not implemented; 2 – partially implemented; 3 – fully implemented

Effectiveness:

0 – not effective; 1 – partially effective; 2 – fully effective; 3 – effective and progressing further.

5.2. Spain and its regions

The main findings regarding CDW legislation and policies for Spain and its regions, are summarised below (more details are available in).

Waste legislation

National legislation and plans on waste management encourage and lay out a framework for Autonomous Communities to develop region-wide plans and legislation adapted to their region. As such, Spain has both national and regional legislation and plans; and there can be considerable variation between the regions depending on if, and how, they have adapted the national legislation. Waste legislation is therefore a key factor in the performance of CDW at a regional level.

Waste management plans (including prevention plans)

At a national level, CDW management is an important issue within the revised version of the 2015-2020 State Waste Framework Plan (PEMAR)⁹⁷ which was issued in 2015. This has a number of targets for CDW including:

- Non-hazardous CDW for the preparation for reuse, recycling and other recovery operations (excluding soil and stones):
 - 2016- 60% / 2018-65% / 2020-70%
- Objectives on remaining hazardous waste generation:
 - 2016-40% / 2018-35% / 2020-30%;

At a regional level, CDW management plans are seen as positive drivers by the regional Governments and are developed collaboratively with stakeholders. All of the three selected regions have a WMP (which includes waste prevention) with sections on CDW. **The Basque Country** introduced their WMP⁹⁸ in 2015, which has a number of measures for CDW for both waste generation and recovery, including:

- Advise companies to verify compliance with the technical standard to use materials from CDW
- Encourage industrialized construction processes (use of prefabrication to reduce waste)

⁹⁷ 2015-2020 Plan Estatal Marco De Residuos.. http://www.magrama.gob.es/imagenes/es/pemaraaprobado6noviembrecondae_tcm7-401704.pdf

⁹⁸

http://www.ingurumena.ejgv.euskadi.eus/contenidos/informacion/plan_estrategia/es_def/adjuntos/DocuCompletoCAS_%20Plan_RESIDUOS_2020+Anexos.pdf

- Promote regeneration where feasible and selective demolition and disseminate among the stakeholders
- Promoting products that are easily reusable or recyclable at the end of their useful life
- Promote the use of materials/products from the demolition for the same purposes for which they were conceived.

The WMP also has CDW targets including 5% prevention by 2016 compared to 2010; separate collection of 75% of CDW by 2020 as well as the WFD recovery target of 70%. As this WMP has only been in place since 2015, most of the actions are only now beginning to be implemented and are unlikely to have affected current CDW performance in the Basque Country. Going forward, these targets should encourage the better measurement of CDW.

Catalonia has a WMP for 2013-2020⁹⁹ which includes a number of measures for the prevention and recovery of CDW such as:

- Prevention criteria in the design phase of the project
- Evaluate techniques to estimate the generation of work and CDW
- Updating the inventory of existing dumps, identifying areas of recent spills and prioritizing possible actions necessary restoration or prevention.
- Promote selective demolition, applying the principle of waste hierarchy.
- Life cycle assessment of non-hazardous CDW
- Implementation of tariff systems at the entrance of the CDW in landfill, to promote the work of recovery and recycling.

The Catalonian WMP also has a number of CDW targets including the recovery of 75% CDW by 2020, (higher than the WFD target), recovery of waste packaging materials from construction – 50 % by 2020 and collection of CDW -100% by 2020. It is difficult to assess the effectiveness of this WMP in relation to waste performance, as the latest available CDW data pre-dates the WMP.

The **La Rioja** WMP (2016-2026)¹⁰⁰, which has yet to be approved, includes CDW measures, mostly linked to CDW collection and recovery such as:

- Municipalities may establish a control mechanism i.e. bond linked to building permits
- Prepare the waste management plan to be provided with the bond
- Separation of CDW into a number of fractions
- For isolated populations, a zoning is proposed based on treatment plants and existing disposal, establishing for each of them an agreement for the collection of the CDW

There are also a number of CDW targets in the La Rioja WMP including a reduction in weight of the waste produced in 2020 by 10% compared to those generated in 2010, though it is not clear how this may be achieved, and the WFD target of 70%. The previous WMP (2007-2015) had objectives to increase the controlled collection of CDW as this was recognised as significant issue along with the lack of treatment facilities. There was also an objective to look at implementing measures for CDW including:

- Promotion of standards for the use of recycled aggregates in works and restoration of quarries in order to replace the use of natural resources.
- Establishment of agreements with construction companies and with the Guild of Construction to promote segregation at source.
- Using bonds for CDW management when issuing planning or construction licenses in partnership with local bodies
- In collaboration with local entities, municipal ordinances that contemplate the deposit of bonds in the concession of planning or construction licenses.

The previous WMP objectives should have had an impact on the CDW management within the La Rioja region.

CDW polices – diversion from landfill

⁹⁹ http://residus.gencat.cat/web/.content/home/ambits_dactuacio/planificacio/precat20_novembre15/PRECAT20-doc-principal_sigov.pdf - Catalonia

¹⁰⁰ <http://www.larioja.org/medio-ambiente/es/residuos/plan-director-residuos-rioja-2016-2026>

Nationally, Spain has the Royal Decree (105/2008) which requires the inclusion and development of a waste management model for each construction project which should include the drawing up of a waste management report (WMR), developed during the design phase of the project and a waste management plan (WMP), and developed during the planning of the construction work.

These national provisions have been transposed into regional law after adaptation to regional considerations. Both Catalonia and Basque regions have legislation for waste management plans which extend the Royal Decree. These regions are generally considered to be leaders in CDW management by the Ministry.

In Catalonia, the plan must identify all those actions which should be considered to minimise the work to prevent the generation of waste from construction and demolition during the construction phase or reduce production. In the Basque Country, there is an obligation to include in the draft work a study of waste management of construction and demolition.

Both regions have also transposed the Royal Decree's specification on deposits. In Catalonia, the waste producer must submit a deposit of EUR 11/tonne (with a minimum of 150 euros) for CDW upon the issuing of their licence. The waste producer is reimbursed after proving lawful management of CDW. In Basque, there is a bond for the producer which is linked to obtaining a building permit, in order to ensure proper management of CDW.

There are some differences between the three regions for CDW legislation. In the Basque region, selective demolition is a legal requirement. Specific levels of separation are required depending on the waste type (concrete, bricks, tiles and ceramics, metals, glass, plastic, gypsum and paper and cardboard). According to a CDW Service Manager for the Basque Regional Government, the requirement for onsite sorting is generally followed by waste actors, although it remains difficult to measure its actual implementation¹⁰¹. Catalonia is the only selected region to implement landfill tax for CDW, which is at EUR 3 per tonne¹⁰². La Rioja has no specific CDW legislation.

CDW policies – market demand

Nationally, GPP is specified in the Law 2/2011 on Sustainable Economy which boosts efficiency in public procurement and public-private partnerships including sustainability parameters. All of the selected regions have some form of GPP in relation to CDW, though the Basque Country is probably the most advanced.

In 2016, Catalonia approved an agreement and a draft decree to promote the use of up to 75% of recycled aggregates from construction and demolition waste. This agreement will ensure that all the recycled aggregates put on the market come from only authorised managers which have CE marking, avoiding unfair competition. The decree includes the quality of recycled aggregates, specifying the allowed uses, the conditions for their use and the control criteria of its production¹⁰³. Catalonia also has a commitment for using, in all public and private works, at least 5% of recycled aggregates¹⁰⁴ and to provide model specifications and / or benchmarks for public procurement procedures for works related to CDW.

The Basque Country has commitments to develop and promote GPP agreements with various organisations and, similar to Catalonia, to incorporate mandatory rules for the consumption of recycled aggregates in public works. Since 2009, within all tenders for the construction, restoration and design of industrial buildings (from the design stage to the execution of works), the degree of sustainability of the proposed project, which is based on the application of guides for the sustainable development of industrial buildings and urban development projects is considered within the award criteria¹⁰⁵. The Basque region also has criteria for the use of CDW as aggregate, for instance in roads.

La Rioja has looked at the possibility of specifying recycled aggregates within public procurement works and has a commitment to promote the use of recycled materials from non-hazardous CDW in public projects.

¹⁰¹ Interview with Joseba González Artaza, CDW Service Manager for the Basque Regional Government. 26/05/2015.

¹⁰² (<http://www.boe.es/buscar/pdf/2008/BOE-A-2008-13350-consolidado.pdf>)

¹⁰³ <http://www.acrplus.org/index.php/en/news/news-from-our-members/732-catalan-waste-agency-arc-promotion-of-the-use-of-recycled-aggregates-from-construction-waste>

¹⁰⁴ <http://www.acrplus.org/index.php/en/news/news-from-our-members/732-catalan-waste-agency-arc-promotion-of-the-use-of-recycled-aggregates-from-construction-waste>

¹⁰⁵ http://ec.europa.eu/environment/gpp/pdf/news_alert/Issue44_Case_Study92_Basque_Country_Spain.pdf

Waste infrastructure

Nationally, regarding treatment facility capacity, Spain currently has the infrastructure and furthermore the operational capacity for CDW. Since the economic recession in 2008, treatment facilities have taken a collective hit in the amounts of incoming CDW. As documented in the PEMAR, treatment plants are running under treatment capacity which makes it difficult for these facilities to stay open and properly function. Before the economic hit, public works commissioned by cities were a relatively sure and steady source of CDW, however as the demand for construction has diminished, treatment facilities rely more on privately commissioned projects which have proven to be unpredictable sources of waste flow, varying greatly from month to month.¹⁰⁶ Additionally, the materials processed by these facilities do not have enough demand, since the Government which were the main purchasers of these materials have greatly reduced their activity. This is true for all regions; whereby Regions are encouraging the facilities to reach full capacities to prevent closure due to lack of profitability. La Rioja has developed a number of facilities to deal with CDW after recognising a need; it currently has 2 landfills, compared to 57 landfills in Catalonia. Catalonia also has 50 treatment plants (including mobile), Basque Country has 11 mobile treatment plants and Rioja has 16 treatment plants. The waste infrastructure data for the Basque Country is limited.

Enforcement

Regional authorities monitor and enforce waste regulations within their region. Generally, when “waste owners” violate permit or licencing rights, local/regional authorities may impose sanctions or fines against the waste owner. Data on illegal dumping does not exist; though stakeholders indicated that while levels of illegal waste disposal have diminished (per general knowledge/observations); it is still a challenging aspect to control and quantify. La Rioja and Catalonia have both acknowledged the issue of uncontrolled CDW. In Catalonia, there was an objective for 100% CDW to be monitored by 2012; however the figure was 80%, it could therefore be assumed that the remaining 20% was illegally managed or dumped.

Waste data

It has not been possible to obtain a breakdown per region from the official statistics for 2012 to undertake further analysis. However, The FERCD (Spanish Federation of Construction and Demolition Waste) published figures for 2009-2013; the 2012 figures have been used in the subsequent analysis. The FERCD data varies from official data and as such have only been used to show trends at a regional level. The FERCD reports controlled and uncontrolled waste (not usually treated and sent to landfill) separately but only treatment methods for controlled waste. If controlled and uncontrolled are combined they are more similar to the National and Eurostat data.

Analysis

An analysis of the selected Spanish region’s CDW policies and legislation and their waste generation and recovery rates is provided in Table 29. The assessment is largely subjective, dependant on the type and quality of information available. For CDW performance, the Basque Country has the highest CDW recovery rate at 52%, followed by Catalonia at 42% and 40% for La Rioja. It is questionable as to why the recovery rate for Catalonia is similar to La Rioja, when it has more mature polices, similar to the Basque Country. One reason may be the large number of landfills (estimated to be 57), making it easier to dispose of CDW to landfill; however it is difficult to draw comparisons with the Basque Country as the number of landfills haven’t been disclosed. Also within Catalonia and La Rioja, it is acknowledged that there are issues with uncontrolled waste, which may be affect the amount disposed. The CDW generation figures are similar for Catalonia and the Basque Country, whilst La Rioja produces nearly twice as much, relative to GDP and population size. For CDW generation, both Catalonia and the Basque Country have objectives in their WMPs to prevent waste and the Basque Country has a target for waste prevention; however these objectives have only been in place a short while and so it is difficult to assess if they have had an effect as yet. La Rioja is also planning on introducing a waste prevention target.

There is a trend in the CDW scores (and related activities) and waste performance in the fact that La Rioja scores only 26%, with a low recovery rate due to the lack of mature CDW policies and implementation. Both Catalonia and Basque Country have mature policies and legislation that is specific for CDW, such as requiring a CDW plan and bonds. However, Catalonia scores slightly higher, at 57%, compared to the Basque Country

¹⁰⁶ Interview with stakeholder in EU wide Construction and Demolition Sector. 11/05/2015.

at 55%, despite having a lower recovery rate. The main reason for this is Catalonia has a landfill tax; however the rate is relatively low when compared to other countries and may not be having the desired effect of diverting waste from landfill. The Basque Country also appears to have more mature policies for the use of recycled aggregates than Catalonia, whose policies are more recent. Interestingly, Catalonia has a more ambitious CDW recovery target than the Basque Country and a target focusing on a specific waste streams - the recovery of packaging waste from construction; conversely the Basque region has targets for waste prevention and an ambitious circular economy strategy. La Rioja can be considered as less advanced as the other two selected regions in CDW management; possibly due to it being more rural; however their recent waste management plan is looking at progressing in this area by introducing taxes and life cycle assessments.

Table 29: Selected Spanish Regions CDW Assessment

	Basque Country		Catalonia		La Rioja	
	Implementation	Effectiveness	Implementation	Effectiveness	Implementation	Effectiveness
Recent and existing waste legislation for diversion of CDW from landfill	3	2	3	1	0	0
Waste management/prevention plan (CDW related)	2	1	2	1	1	1
Targets for CDW	2	1	2	1	1	1
Landfill tax	0	0	3	1	0	0
Promotion of markets for CDW (inc. GPP, specifications and EoW)	2	2	2	1	1	0
Waste infrastructure	2	2	2	2	2	1
Level of enforcement	2	2	2	1	2	1
Total	13	10	16	8	7	4
Overall total (max of 42)	23 (55%)		24 (57%)		11 (26%)	
Recovery rate (%)	52		42		40	
CDW generated (t/million €)	12		13		23	
CDW (t)/person	0.35		0.34		0.61	

Key to table:

Existence and implementation:

0 – non-existent; 1- existing but not implemented; 2 – partially implemented; 3 – fully implemented

Effectiveness:

0 – not effective; 1 – partially effective; 2 – fully effective; 3 – effective and progressing further.

5.3. Belgium and its Regions

The main findings regarding CDW legislation and policies for Belgium and its regions, are summarised below (more details are available in Appendix E – Regional analysis).

Waste legislation

Belgium is a largely federalised country with shared responsibility between the Federal Government and the regions for environmental matters. Regions are almost fully in charge of environmental and waste management, which is not coordinated or harmonised amongst regions in a mandatory manner. The Federal Government has however retained limited responsibility for some specific environmental matters such as nuclear waste, product standards, etc. Moreover, all regions do implement the European Directives and their legislation in principle follows similar lines in the three regions. All of the three regions have their own waste management legislation including specific requirements for CDW and as such will have a significant effect on the CDW performance. The type of waste that is defined as CDW may differ between the regions, as Flanders includes codes other than Chapter 17. Brussels and Wallonia also have more categories under Chapter 17 for CDW.

Waste management plans (including prevention plans)

Flanders is the only region with a waste management plan specifically for CDW. The other two regions are preparing new waste management plans. In Flanders, several sectoral implementation plans were adopted for the management of CDW. In 2014, a new policy programme called “resource conscious construction in cycles” was launched¹⁰⁷. This prevention programme for the sustainable management of materials in the construction sector for the period 2014-2020 deepens and expands the approach adopted in previous implementation plans. The action programme “Resource conscious construction 2014-2016”¹⁰⁸ describes the steps undertaken for the prevention programme. This includes preventing the use of hazardous materials in new buildings and retrieving these materials from older buildings during demolition, using as few primary materials as possible in the manufacture of construction products, optimising material cycles, adaptability of buildings and ensuring the recoverability of materials. A CDW recycling target of 75% was set in 2000 for Flanders which was met, with an actual rate of 85%. As this WMP has only been in place since 2014, it is hard to show any link with CDW performance as the measures are only starting to be investigated and implemented. A number of actions have been completed such as:

- *Guidance document for drawing up a demolition inventory* - this guide aims at identifying the amounts and types of waste that will appear when dismantling a building
- *Guidance on defining the end-of-waste phase of materials, waste and resources* - this document helps interpreting the conditions for a material to be considered as a resource and not waste

For **Brussels**, the 4th Waste Plan dates from 2010 and waste prevention is fully integrated. This plan is not specific to CDW. CDW is covered in chapter 6 - industrial waste, specific or hazardous. The Brussels government is currently evaluating this plan (every 3-4 years) and intends to draw a new plan shortly. For waste prevention, there is a focus on reuse, an integrated eco-construction approach and sustainable purchasing. According to the Waste Plan, the target for CDW is a recycling rate of 90 % by weight. This target is not binding. As this WMP has been in place since 2010, it should be having an effect on CDW management, particularly waste generation. There are a number of actions that have been completed such as:

- *Practical Guide Green building* - this publication highlights specific information on the construction market of Eco- Labels
- *Re-use VADEMECUM* - this tool explains how to sell materials before they reach the waste status for the public sector.

For **Wallonia**, the new waste plan is in preparation and should be published shortly. The older plan was valid to 2010 and had a number of objectives related to CDW such as the compulsory sorting of CDW, increase the use of recycled aggregates, and system of taxation for CDW. The previous target for CDW was a recycling

¹⁰⁷ OVAM, *Materiaalbewust Bouwen in Kringlopen. Preventieprogramma Duurzaam Materialenbeheer in de Bouwsector 2014-2020* (Mechelen: OVAM, 2013) <<http://www.ovam.be/sites/default/files/2014-DEF-Milieuverantwoord-milieugebruik-bouw-3luik-LR.pdf>>.

¹⁰⁸ OVAM, *Actieprogramma Materiaalbewust Bouwen 2014-2016* (Mechelen: OVAM, February 2015), p. 21 <<http://www.ovam.be/sites/default/files/atoms/files/Actieprogramma-Materiaalbewust-Bouwen-2014-2016-Beleidsprogramma-bouw.pdf>>.

rate of 87 % in 2010, and a landfilling rate of less than 10%. It is unlikely that the WMP for Wallonia is a key driver for CDW performance as there has not been one in place for a number of years.

CDW policies – diversion from landfill

Each region has developed its own policies for CDW and these should have a significant effect on CDW performance. The main differences are that Flanders requires a demolition inventory for certain types and sizes of buildings; whilst Brussels requires a pre-demolition inventory for asbestos¹⁰⁹. Brussels has a focus on waste prevention as there are no landfills or treatment facilities in Brussels. Landfill bans and sorting requirements are in place for all three regions, but it may differ on the types of materials. This is most developed for the Wallonia region.

Over the past 25 years, Flemish waste policy evolved towards a well-structured and regulated framework for prevention, re-use, recycling, other recovery and final treatment of waste materials. Flanders has limited material resources which provide an incentive for keeping waste products from the construction industry within the material loop. Therefore, the recycling of debris and the production of recycled aggregates has known a long history in Flanders, but usually recycled aggregates were only used for low-grade applications as embankments and foundations. The legislation (“Materialendecreet” or Materials Decree) changed considerably towards a more holistic approach of the integral material chain, including waste, in 2012. Key CDW requirements include separate collection and a pre-demolition inventory for non-residential buildings over 1000 m³. It is forbidden to landfill the mixed fraction of CDW directly and there are bans for materials that are collected together which because of their nature, quantity and homogeneity should be considered for re-use or recycling according to the best available techniques. The principle of proximity and self-sufficiency applies to CDW sorting residues (from households) and the mixed fraction of CDW (from households and enterprises)¹¹⁰; though the CDW tonnages are likely to be small. Overall, CDW management is an important issue for the Flemish region and the sector is very dynamic in terms of technical innovation and waste policy.

In Brussels, CDW makes up a third of non-household waste and Brussels Environment (IBGE) has therefore made it a priority stream. First, the emphasis is laid on prevention, which means preserving existing buildings and its constituent materials (quantitative prevention), limiting the hazardous nature of the materials used (qualitative prevention), and designing new buildings to increase their lifespan (quality and building flexibility), anticipating their deconstruction (design for deconstruction) and using materials and recycled/recyclable elements (design for recycling and reversible connections). The second step after prevention is the promotion of selective deconstruction and reuse and the third one is on-site sorting and recycling. Brussels Environment offers many tools (guidance, training, etc.). Key CDW legislative requirements include obtaining an environmental permit before construction for some activities, requirements of hazardous waste including a register and undertaking a pre-demolition inventory/audit for hazardous materials. There is also a mandatory requirement to recycle the stony and sandy fraction of CDW. There may also be sorting requirements for certain sites. A new legal text is in preparation, BRUDALEX. This will make it mandatory for holders of CDW to sort or to have their CDW sorted in a sorting facility.

In Wallonia, the legal framework transposes the European Waste Framework Directive and its waste hierarchy (prevention, re-use, recycling, other recovery and final treatment). This legal framework is constantly changing. Key CDW requirements include a requirement for an environmental permit (EP), sorting obligations for certain waste types, the different types of recovery routes and backfilling is defined, and landfill bans for certain CDW including related sorting requirements. Only residual wastes from sorting and treatment may be accepted in a landfill site. According to stakeholders in the sector, waste management is effective in Wallonia and the European objectives are outperformed. Moreover, the region is implementing further concepts of circular economy and this is expected to continue in the near future.

Flanders and Wallonia both have landfill taxes. The average landfill tax for inert landfills is of EUR 12.73 per tonne in Flanders. For Wallonia it is EUR 7.23 per tonne. There are no landfills in Brussels, and therefore no landfill tax.

¹⁰⁹ Obligation to make a pre-demolition inventory and remove asbestos in a building before its demolition. In case of demolition: the entire building must be cleared of containing the asbestos. In case of single renovation or important refurbishment: all applications containing asbestos that may be affected by the works must be removed. It is forbidden to use high-speed machinery tools, high pressure water jet cleaners, air compressors, etc. Any EP demand for a removal site or encapsulation of asbestos must be accompanied by a compliant asbestos inventory and is treated by the IBGE

¹¹⁰ OVAM, *Implementatie Zelfvoorzieningsprincipe in Vlaanderen* (Mechelen: OVAM, 1 January 2014), p. 8 <http://www.ovam.be/sites/default/files/atoms/files/2014-01-01_Implementatie_zelfvoorzieningsprincipe_in_Vlaanderen.pdf>.

CDW policies – market demand

In terms of market-led policies, Flanders has undertaken more work on the use of recycled aggregates, including the development of a demolition management system, known as Tracimat, which is established in the 2012 Materials Decree. It includes separate collection, a demolition inventory, and a demolition management organisation that delivers demolition certificates whenever the demolition is carried out according to requirements. Flanders also has End of Waste criteria in place for aggregates. The other two regions decide on a case by case basis and are looking at introducing EoW criteria in the future.

The concept of secondary resources was introduced in 1997 in Flanders (and further evolved to EoW criteria in 2012). Specifications are also in place for the use of CDW in certain applications. In Wallonia, there are the CCTB¹¹¹ and QUALITOURE¹¹² for road applications which describe the obligations of contractors concerning the management of waste before and during the construction. In Brussels, there is the CCT¹¹³ (cahier des charges type – type tender specification) which determines the technical and administrative clauses applicable to the execution of road works located in the Brussels Capital Region including recycled materials.

The Regions also undertake GPP activities. In Brussels, REF-B has been developed, which is an environmental assessment methodology. The Flemish Government has decided on minimum sustainability criteria for certain product groups. The Flanders' Materials Programme is a public-private partnership aiming to achieve a circular economy in Flanders. Within the programme ambitious long-term vision development, policy research and action in the field are combined. In Brussels, contracting authorities may include environmental clauses in the special specifications for their procurement. Wallonia has policies concerning sustainable purchasing¹¹⁴.

Waste infrastructure

Belgium currently has enough capacity to treat its own CDW generated. There is little imported/exported but there is internal movement of CDW, mainly from Brussels to be treated. In summary:

- Flanders has 4 landfills for inert waste (category 3) with a total remaining capacity of 1.046.515 tonnes in 2013. At the beginning of 2014, there were 197 fixed locations (sorting of mixed CDW, crushing of rubble, sometimes also mixing of lean concrete) and 50 mobile installations working under the COPRO-certification in Flanders¹¹⁵.
- There are no landfills and there are three sorting facilities in Brussels.
- There are 5 landfills for inert waste in activity in Wallonia with a total capacity of 3.093.419m³. There are 242 centres authorized to perform the sorting / recycling of inert CDW. However, 150 of them are building contractors who can store their waste. There are 28 asphalt plants and concrete plants authorized to perform the incorporation of CDW in their production.

Enforcement

Enforcement is undertaken regionally and each region has identified issues with illegal waste. In Brussels, the competent authorities for supervising the enforcement of CDW activities, the waste inspection team from Brussels Environment, do not have adequate capacity to make a high number of controls. There are a lot of infractions on private land (illegal fly-tipping). Moreover, with the knowledge of Brussels' buildings and the number of renovation projects, it is known that more asbestos should be sent to landfill and so hazardous waste related infractions are occurring. In Flanders, enforcement is identified by stakeholders as a bottleneck, for example decisions for CDW management, such as meeting EoW criteria can take a long time. The competent authorities for supervising the enforcement of CDW related activities are LNE-AMI (Environment, nature and energy department, environmental inspection unit) and the local supervisors in cities and municipalities. In Wallonia, the Walloon Waste Office is responsible for the legislation and the DPC is the department which is in charge of inspections. Inspection authorities do not have adequate capacity to carry out field checks. Fly-tipping is occurring and more controls are needed.

¹¹¹ <http://batiments.wallonie.be/home/iframe-html.html>

¹¹² <http://qc.spw.wallonie.be/fr/qualiroutes/>

¹¹³ <http://www.bruxellesmobilite.irisnet.be/partners/professionnels/cct-2011>

¹¹⁴ 28 NOVEMBRE 2013. – Circulaire relative à la mise en place d'une politique d'achat durable pour les pouvoirs adjudicateurs régionaux wallons (*M.B. du 17/12/2013, p. 99196*)

¹¹⁵ COPRO, *Activiteitenverslag 2013*, 2013, p. 118 <http://www.copro.eu/content/Vaste_doc/jaarverslagen/2013%20NL/index.html>.

Waste data

CDW data is collected in different ways and from different datasets and such makes comparison between the Regions difficult. Brussels is based on register, survey and statistics; Flanders is based on facilities and a survey. Wallonia is developing a new methodology as they have not had data available since 2008.

Analysis

An analysis of Belgium region's CDW policies and legislation and their waste generation and recovery rates is provided in Table 30. The assessment is largely subjective, dependant on the type and quality of information available. For CDW performance, Flanders has a very high recovery rate of 99%; with Wallonia at 85%. Brussels does not disclose its own recovery rate (as there is no landfill and few other treatment facilities, CDW treatment is performed in other regions, which provide less leverage for Brussels to develop a fully autonomous policy). For Belgium it is hard to draw significant conclusions from the CDW recovery data, in particular as the data for Wallonia is over 8 years old. However, it may be that Flanders has better treatment figures than Wallonia due to having a more robust market demand policy in place and less opportunity to use primary aggregates. According to the Flanders Government, it is essential to work step by step: firstly containing the environmental risks and building the framework to create resources from waste; next going for higher quality recycled materials and fully closing the material cycle; finally, the precondition for a well-functioning market is cooperation and support between government, producers and consumers. The CDW generation figures vary substantially between the regions with Wallonia producing twice as much as Flanders; and Flanders producing over twice as much as Brussels relative to GDP. The same trend is shown for CDW generation relative to population size. An influencing factor here could be that Wallonia and to a lesser extent, Flanders are material rich regions and as such are not materially constrained as much as Brussels. As previously highlighted, the Brussels Government has developed its policy more so on the prevention on CDW, with the effect evidenced in the figures.

There is a trend in the CDW scores (and related activities) and waste performance, in that Flanders scores the highest at 88%, and has the highest recovery rate, followed by Brussels at 83% and Wallonia at 69%. Whilst all regions have progressive CDW legislation, which can be considered mature, Flanders scores higher than the others for having more market led policies to establish the use of CDW such as fully developed EoW criteria and a focus on the quality requirements for the use of recycled aggregates; this is evidenced by the high recovery rate. Wallonia scores lower, a key factor of this is a lack of a WMP; both Brussels and Flanders have strong waste management plans with sections dedicated to CDW along with a focus on prevention. It should be noted that the CDW management policy in Brussels cannot be considered to be fully autonomous as it is reliant on the other regions for the treatment of its waste; however it can look to influence CDW generation and encourage the reuse of waste, which is a focus within its WMP. Both Flanders and Wallonia have a landfill tax; however the rate is over EUR 5 per tonne more for Flanders, which may have more of an effect on diverting CDW from landfill than in Wallonia.

Table 30: Belgium Regions CDW Assessment

	Brussels		Flanders		Wallonia	
	Implementation	Effectiveness	Implementation	Effectiveness	Implementation	Effectiveness
Recent and existing waste legislation for diversion of CDW from landfill	3	2	3	3	3	2
Waste management/prevention plan (CDW related)	3	2	2	2	0	0
Targets for CDW	3	3	3	2	3	2
Landfill tax	n/a	n/a	3	3	3	2
Promotion of markets for CDW (inc. GPP, specifications and EoW)	3	2	3	3	2	2

	Brussels		Flanders		Wallonia	
	Implementation	Effectiveness	Implementation	Effectiveness	Implementation	Effectiveness
Waste infrastructure	3	2	3	3	3	3
Level of enforcement	3	1	3	1	3	1
Total	18	12	20	17	17	12
Overall total (max of 42)	30 (max of 36) (83%)		37 (88%)		29 (69%)	
Recovery rate (%)	n/a		99		85	
CDW generated (t/million €)	9		21		48	
CDW (t)/person	0.56		0.77		1.23	

Key to table:

Existence and implementation:

0 – non-existent; 1- existing but not implemented; 2 – partially implemented; 3 – fully implemented

Effectiveness:

0 – not effective; 1 – partially effective; 2 – fully effective; 3 – effective and progressing further.

5.4. Key success factors – A need for national consistency

There are a number of benefits for the regionalisation approach which can include improved accountability and transparency, good governance, promotion of innovation, better co-ordination of regional/local actors, a better understanding and appreciation of a local context, with the development of appropriate solutions and the possibility to be more flexible in responding to local needs. However, regionalisation can also present a number of challenges such as the uneven provision of services, duplication and competition between regions and a potential lack of resources and knowledge. From an environmental perspective, specific technical issues can be addressed by taking into account local conditions as well as the differences between the preferences in the level of environmental protection. On the other hand, without national regulation, some regions may not develop appropriate policies or legislation or could potentially have an environmental impact on other regions, especially where resources are shared. A national (centralised) approach could ensure a minimum level of performance across a country.

Key factors for success for regional CDW are now summarized.

- **Regional waste legislation**

Devolution of powers to regions is often justified by the argument that regions making their own legislation, tend to contribute to a greater sense of ownership, enabling regions who wish to become front runners in specific policy areas, e.g. waste management. It is also thought to facilitate better design and update of legislation, according to regional needs. Stakeholders were positive about decentralisation, with strengths including better knowledge of the region, solving issues in a local context and they can act faster, ensuring, where possible, CDW is not transported over great distances. Policies can also be undertaken and directly relate to the conditions of that region (e.g. Brussels is 100% urban). At the same time, devolution bears several risks: it may contribute to different legal frameworks, rendering it difficult for companies to act in several regions, creating market distortions and leading to diverging performances within a state. The lack of harmonisation can lead in some cases to transport of wastes to regions with less strict requirements or less expensive waste management fees (typically, CDW can be shipped to regions with lower landfill costs). However, a key factor of regional waste legislation successes is that there needs to be some level of national collaborative thinking in terms of the requirements, dates of implementation/revision and enforcement. This is to ensure that the CDW producers and facilities are aware of the various regional requirements and they are not seen as an additional burden, if they differ substantially.

Additionally, it was thought that policies promoting CDW management in line with the waste hierarchy tend to be adopted first in regions that have a high population density, above average GDP per capita and are more industrialised. Whilst this is to some extent true, e.g. Flanders, Brussels and England; other regions such as Northern Ireland and Wales also have a focus on waste prevention, with lower GDP/capita and population density. However this could be due to the regional Governments in place and their policies – for example in Wales, the Government has a targeted programme for CDW.

- **Technical specifications**

Technical specifications, where possible, should be uniform across the Member State, unless diverse environmental local factors are apparent. Stakeholder feedback has indicated for example that, in Wallonia, the specification for the use of aggregates in roads is high compared to other regional and European specifications and therefore more demanding; making it more difficult and costly to use recycled CDW. According to some stakeholders, these strict requirements may have been introduced to render use of recycled aggregates more cumbersome and thus protect the market for natural aggregates as there are more quarries in this Region.

- **End of Waste (EoW) criteria**

Ideally EoW criteria should be set up at the EU or national level, with stakeholders indicating a preference at the EU level, as long as it does not contradict existing legislation. This is particularly important where certain regions such as Flanders have stricter requirements than other regions such as the UK (e.g. leaching values). Although data is not available at the regional level, at a national level, where EoW criteria does exist there is usually a higher use of recycled aggregates as it can be easier to reuse them, provide end market confidence and liability for the use of waste is not indefinite. Stakeholders have also pointed out that there can be less administration. For example, the UK which has well-established EoW criteria (quality protocol) for inert wastes has around 20% of the market of aggregates made from recycled sources (according to UPEG data). There is no difference in the EoW criteria across the UK regions. There is EoW status for aggregates in Flanders and according to the Government, this is a key part of the success for a high level of recycled aggregates; however it can impede the use of recycled aggregates from Wallonia. Much effort has been undertaken to introduce EoW criteria within the regions assessed and as such any proposed criteria at an EU level should take existing EoW conditions into account. It should be noted that there is likely to be a burden in adopting any new system; therefore the development of any EU EoW criteria should consider the ramifications to existing legislation as well as the option of developing an EU EoW criteria for those regions that do not already have this in place.

- **Recycled materials**

Where there are regional requirements to recycle certain fractions of the CDW stream (such as Brussels) or landfill bans (such as Flanders and Wallonia) and these have been in place for a number of years then there is better performance. For example, the Basque Country has implemented separation for certain CDW streams in 2015 but, as yet, have not reported on any improved performance. The Government for Flanders suggests that they have high levels for recycled aggregates due to 1) a legal framework for end-of-waste for recycled aggregates, 2) a guarantee of quality and law conformity through certification of a European Accreditation member, 3) having a sufficient number of applications in which the recycled aggregates may be used, and 4) a sufficient and constant supply of recycled aggregates. Feedback also suggests that market conditions for the use of recycled materials have to be similar across regions to enable a consistent uptake. The use of green procurement criteria could also have an effect as a driver for recycled content, along with the use of specifications. However there was little evidence of recycled content requirements at a regional level and the effect this may have on other regions and companies. Stakeholders feedback suggested that ambitious eco-design directives and product normalisation, both for construction material and building at EU level would be beneficial as would recycled content requirements in public works.

- **CDW data and forecasting**

To enable data to be collected consistently and to allow a meaningful analysis, there should either be a common approach in regions or at least a mechanism to enable comparisons. This requires the regions to work together in developing a unified framework or at least, a common set of rules. When CDW data is devolved to the regions it makes comparison difficult and reporting to European legislation is problematic (e.g. in Belgium there is no reliable and harmonized data on CDW at a regional level, other than the data reported pursuant the Waste Statistics Regulation (WStatR). There can also be a lack of traceability of materials. It is therefore recommended that CDW data collection and reporting should be undertaken in a consistent manner across Regions, with methodologies set and agreed at national level. These could be supplemented by regional studies where required.

In all of the regions analysed, little information was obtained on the method of forecasting CDW generation and there was scant information within the waste management plans on CDW projections. Therefore there is

considerable uncertainty at how these projections have been developed. There also was no validation of any projections at a national level. This forecasting has caused issues; for example in Spain, the forecasting of CDW generated from construction activities was over-estimated due to the economic recession and has led to facilities running under capacity. Where there is a lot of inter-regional movement of waste (e.g. Brussels to Flanders/Wallonia) then joint forecasting is a sensible option, using a common methodology and timescales. It may be that in certain countries, waste management planning occurs at a local level, for instance in the UK, local authorities (municipalities) are responsible for developing waste plans and associated infrastructure requirements.

- **Enforcement**

According to stakeholder feedback, all regions experienced a lack of enforcement, due to a lack of resources to undertake high activity levels. It is difficult to assess whether enforcement at a certain level (e.g. regional vs. local) is preferred; however costs are a key factor, especially in terms of transport and personnel. Illegal dumping remains an issue in all regions. There are a number of examples of collaboration of enforcement and relationships with the agencies, in the Regions identified. In the UK, The Shared Agency Regulatory Evidence Programme (ShARE) funds joint research between the UK and Irish Environment Agencies and cross-border activity can be shared, for instance through the LIFE SMART Waste project¹¹⁶ which aims at developing new and innovative strategies for tackling and disrupting waste crime and involves the Scottish and Welsh agencies. There seems to be little difference in the way enforcement occurred across Regions.

- **Waste management plans**

Generally, the more advanced the region is in terms of its CDW management, the more likely it is to have its own plan or at least have its own identifiable aims and objectives and a programme of support to the industry. All regions analysed produce their own waste management plans, with Wales and Flanders producing ones solely on CDW. Of the others, all regions except for England and La Rioja have a section dedicated to CDW. It is interesting to note, that Wallonia, with a high recovery rate, did not have a current waste management plan, which brings into question the usefulness of these, for certain regions. However in Spain, stakeholder dialogue indicated that the regional waste management plans were the key driver for CDW policy and initiatives over the next 10-15 years. Regions which are performing well in terms of CDW recovery, such as Flanders and Wales, have waste management plans with clear objectives and actions to move towards waste prevention such as preventing the use of hazardous materials, a focus on reuse and programmes of support.

- **Landfill Tax**

Evidence shows that landfill taxes are part of a mix of suitable instruments to divert CDW from landfills and boost recycling. The regions with a high level of landfill tax which is dependent upon the type of CDW (all UK regions, Flanders and Wallonia) can make it more cost effective to recover this waste and generally perform better in terms of recovery. By taxing the non-inert waste at a higher rate, companies are encouraged to separate the fractions. However, the landfill tax level is important, in terms of when it becomes economically beneficial to recover waste rather than send it to landfill – this may explain why Catalonia, which has a low rate of landfill tax and only one rate for all CDW, performs worse than other regions. The location of landfills could also affect the amount of waste that is landfilled, in terms of the ease and transportation of CDW to them; again Catalonia has a large number of landfills (57) compared to other regions with a similar population density.

- **Planning for waste treatment facilities**

Providing detailed information at the regional level in terms of types of facilities and capacities helps determine future requirements, especially within that region and at a national level. This is driven through the requirements of regional plans and reporting. There was little evidence of cross-border coordination between regions for the planning of CDW facilities.

- **The national role**

The MS studied tend to have different approaches with regards to the relationship between the National Government (where applicable), the Regional Governments and the EU, though this is dependent upon their structure. In Belgium, the role for the national Government appears to be largely administrative with no formal reporting structures for CDW with the Regional Governments. In the UK, the devolved administrations are responsible for transposing certain EU legislation, with the UK Government (England) reporting to the EU. Spain was seen as most problematic, in that there was a lack of centralised awareness of the regional and national waste legislation. For countries such as Spain, where there is a national framework for waste legislation, the national Government needs to have greater awareness, which can also be shared with

¹¹⁶ <https://www.sepa.org.uk/regulations/waste/life-smart-waste/about-life-smart-waste/>

professional associations and will lead to an improved understanding, sharing of good practices and ensuring that any regional legislation that is in place is in line with the goals and objectives of the nation. It is also important to boost the capacity for recycling and recovery, although in Spain, facilities are generally running under capacity and are not receiving enough 'quality' CDW, which has inhibited growth. If there is not a national oversight, this makes it difficult to obtain a picture of the current initiatives. This also includes regional plans, which may be written and updated in differing timescales. There is also an issue whereby it can be difficult for national government to control regions and impose targets on them; this is important as the national government reports to the EU; for meeting the WFD target for instance. Waste exports between regions could also be an issue if there is a lack of oversight and harmonisation. It is recommended that the role of the national Government for CDW within a decentralised system is to have oversight of regional legislation, a greater awareness and understanding of regional policy, legislation and initiatives and to assess the impact of these, in a cumulative manner, in reaching national goals, objectives and targets as well as any unintended consequences between regions e.g. a higher landfill tax in a neighbouring region could affect waste exports and recovery rates.

- **Transfer of best practice**

From the stakeholder dialogue undertaken, there seems to be little formal regional cooperation in the sharing and exchange of best practice. In the UK, there are a number of industry-led groups which various members of the devolved authorities may be part of for waste, including CDW; otherwise knowledge is exchanged in an informal manner largely at a personal level. However there are Government-led groups that are convened for certain waste types e.g. packaging and hazardous waste which may include elements of CDW. There needs to be some form of transfer of best practices from one region to another and at a national level. However it was pointed out, by stakeholders, that the situations in the regions can be very different e.g. the climate, such as greater precipitation can have an effect in Northern Spain on the type of leachate control implemented for landfills compared to other regions. There is also the potential for frontrunner regions to disseminate best practices to other regions.

Conclusions

From the above analysis it can be concluded that a number of actions for CDW should be undertaken at the national level, namely:

- Technical specifications for the use of CDW, unless there are significant local environmental factors
- EoW criteria for CDW, which can take into account any particular local conditions
- CDW data collection and forecasting
- Backfilling criteria

Other CDW actions can be taken at the regional level (or nationally and regionally) but if applied regionally consistency is required, these are:

- Regional CDW waste legislation such as the development of plans, bonds, landfill bans
- Waste management plans (including prevention)
- Landfill Tax (consistency is required though to avoid potential perverse impacts)
- Enforcement

It is difficult to draw any major conclusions in relation to the CDW performance of regions compared to the various legislation, policies and initiatives they have in place. This is largely because the CDW data available at the regional level is either unobtainable or patchy in its coverage, making analysis and comparison difficult. A similar issue has been identified at national level. Therefore any recommendations going forward in relation to CDW data need also to be applied at a regional level. Some trends have been identified such as the use of EoW criteria, landfill tax, landfill bans and sorting obligations for CDW all providing a good platform for CDW management. Several experts suggest that EoW criteria could be formulated at EU level along with procurement requirements.

Key success factors for successful regional approaches to CDW management include having a national oversight, transferring best practice and having similar technical and market conditions for the recovery of CDW. Working at a regional level gives regions who want to develop their own approaches to CDW management the opportunity to do so, and those that do generally outperform those that do not develop them. This last finding suggests that regional ownership and implementation should be encouraged to improve performance, bearing in mind the previous conclusions on national perspective and harmonisation across regions for key policies/interventions.

6. Recommendations for improving CDW management in MS

The key recommendations emerging from the MS screening, performance comparison, good practices identification and analysis are presented in this section.

The recommendations are not set out in any order of priority, and they are organised along the following sections:

1. Measure to manage
2. Target waste prevention
3. Refocus on reuse
4. Keep it clean (source segregation)
5. Remove the backfilling barrier
6. Products, not waste
7. GPP: lead by example
8. Enforce to reinforce
9. Continuous and holistic improvement

6.1. Measure to manage

This recommendation revolves around the need for better quality and detail of data, upon which many other recommendations are dependent. Rationale for individual aspects of data improvement is provided in Table 3. The overall reason for improving data is to have good evidence upon which actions to improve can be prioritised, developed and measured for progress. Without this ability to have clear and robust measurement over time, MS will not achieve significant improvements in CDW management. They may reach the WFD target by means of the Eurostat reporting mechanism, but this will always be open to doubt as to whether the recovery is genuine or not, especially if the current approaches relating to backfilling are continued.

The reader has to distinguish between these two groups of recommendations: on one hand the better data quality, and on the other hand the higher level of details and availability of CDW data.

Recommendations for better data quality

Based on the analyses presented in **section 3**, a series of guidelines are recommended **for government and statistical offices of Member States** to improve CDW data quality. These recommendations are presented in section 3.2.

Recommendations for more complete data

Based on stakeholder feedback¹¹⁷ connected to this recommendation, the following conclusions were noted:

- There are inherent issues in terms of data quality, variability of waste types and levels of current performance that act against setting specific targets for different waste streams.
- However, there should be a focus to recover more materials, such as wood, gypsum, flat glass, insulation materials and plastics.
- Better data is definitely needed – both in terms of quality and level of detail, specifically: distinction between construction and demolition, recycling and recovery, separate R Code for backfilling, and this should be via a single statistics body. Although it was acknowledged that many MS struggle to comply with existing reporting requirements.

¹¹⁷ IMPROVING MANAGEMENT OF CONSTRUCTION AND DEMOLITION WASTE – LESSONS LEARNED FROM THE STUDY 'RESOURCE EFFICIENT MANAGEMENT OF MIXED WASTE' which was held on Wednesday 25 May 2016 at the premises of the European Commission in Brussels, Belgium

The key areas for improving data are summarised in Table 31, ideally, there would be a consistency of approach and/or metrics set at an EU level to allow comparison across MS, although the incentives and support to undertake more detailed data collection are more appropriate at a MS level. High levels of involvement with industry stakeholders will help increase participation rates and ensure the benefits of having better data (at the various levels described in Table 27) are optimised.

Table 31: Recommended Data improvements to support best practices

Data improvement description	Rationale
Waste generation data on site, by activity, at regional and national level, distinguishing by new construction, demolition and refurbishment waste	<p>Ideally, the prevention of waste will take precedence over the recovery of it. Much waste is preventable but it is difficult to measure success in preventing waste unless a comprehensive set of benchmarks are available. This enables targets to be set at appropriate levels and requirements to meet targets embedded into legislative or procurement instruments (e.g. BREEAM waste related credits are based upon SMARTWaste benchmarks, which are available for generation, material and recovery route breakdown).</p> <p>The range of waste generation relative to all construction activity across MS is very large according to available data. The reasons for this variation will not be possible to ascertain until data is collected in a consistent and robust way that can be split into construction types (e.g. residential, commercial, infrastructure), and activities of new build, demolition and refurbishment).</p>
Waste generation data at material and product level	<p>Similarly, to the point above, it is not possible to work out if the variation of waste generation, by tonnages, is due to differences in the products and materials, which make up the overall waste generation figure for a country. Whilst the LoW codes may be useful for mapping CDW treatment, they are not sufficient to drive waste prevention, especially at product level. Such information would enable targeted action to reduce particular types of waste being produced, working with the suppliers and manufacturers of such products. It would also help to inform Environmental Product Declarations (EPD)/ Product Environmental Footprints (PEF), to act as an incentive for waste to be reduced at source. Although this might not drastically reduce tonnes of waste produced, waste prevention has higher environmental and economic benefits than any treatment option.</p>
Waste treatment data available for reuse, recycling, 'backfilling', energy recovery and disposal	<p>Currently, it is difficult to disaggregate the treatment of CDW beyond recovery and landfill. This obviously misses out a great deal of data that is relevant to driving the waste hierarchy and best practice in CDW. Notably, the amount of CDW reused is not distinguishable at all. There are particular issues with the current method of collating data that makes it difficult to determine levels of reuse on-site (e.g., reuse of demolition products in new build). Anecdotally, this is known to happen in many MS but the act of reuse will remove materials from being classed as waste – which is often the best practice for unavoidable waste. However, to encourage such best practice, it is important to be able to understand what is currently happening and measure progress through other interventions (such as mandatory pre-demolition and renovation audits). There is also a great deal of high quality recycling underway in many MS, and this is also unquantifiable in most cases, apart from recycled aggregates.</p>
Waste treatment data split by recovery route and material type.	<p>For all the reasons described above with additional benefits that could be derived through extended producer responsibility and promotion of EU/sector wide schemes such as Recovinyl. More accurate end of life scenarios for specific material streams will also influence EPD/PEF results and encourage incorporation of recycled materials into new products.</p>
Waste treatment data split by recovery route, sector and activity type	<p>As above, with the ability to understand the performance at sector level (e.g. residential, commercial, public, infrastructure), and activity level (new build, refurbishment, demolition). There are different opportunities and barriers at each of these levels, which may promote or hinder adoption of best practices. For example, 95%+ levels of reuse and good quality recycling are achievable on</p>

Data improvement description	Rationale
	many demolition projects but it is currently impossible to see what the overall benchmark of performance is for demolition sites across the EU.

6.2. Target waste prevention

Waste prevention is the best preferred option of the waste hierarchy. Also called waste minimisation and waste reduction, this route typically offers the best economic and environmental benefits when compared to managing avoidable waste. All waste is avoidable, including demolition, in case a choice can be made to refurbish rather than rebuild. However, once the decision has been made to demolish then there will inevitably be waste products and materials to manage. Similarly, the decision can be made to not refurbish or build at all, though practically the decisions to go ahead or not are not connected to resource efficiency issues. Waste prevention in construction can include the reduction of waste generated, and the reduction of hazardous materials. Based on stakeholder feedback to this recommendation¹¹⁸, the following conclusions were noted:

- **Potential waste prevention indicators** that could be developed include reuse potential of a building to avoid new building, building design assessment of relative waste generation (such as waste/m²), and waste reduced during renovation. Alternative measurements should also be explored (such as carbon/environmental footprint).
- **Targets for waste prevention** require construction waste to be measured separately to demolition waste. The current waste data across the EU is currently too poor to set any waste prevention target at this level.
- **Eco and long lasting design** is also important to consider in the context of waste prevention. This requires better information on how to achieve this in practice and there needs to be a market pull to stimulate the use of new concepts in design. The building passport approach developed in Austria (but yet to be implemented) was also suggested as a possible mandatory approach to reduce waste and hazardous materials.
- **Other suggestions** included further education of designers on waste prevention, development (updating) of building certification schemes, evaluating traditional designs and redesigning to reduce waste, especially hazardous, extending producer responsibility so that suppliers retain ownership of any waste produced (during installation), and promoting soil stabilisation (instead of soil excavation) on road building projects.
- **An example** was also given of a comparison of different building designs producing different amounts of waste (see Target Zero – http://www.steelconstruction.info/Target_Zero).

There are a number of actions that could promote waste prevention that are also applicable across the EU. These are listed in Table 32. Similarly to the actions relating to improved data collection, it would be ideal to set consistency of reporting and target setting metrics at an EU level, with the expectation that MS will have ownership of waste prevention in action, working in a public private collaborative approach. This MS level approach will facilitate tailoring to the current performance and priorities within each country.

Table 32: Waste prevention related recommendations

Waste prevention action	Rationale
Waste prevention targets and benchmarks set for construction type ¹¹⁹ , activities ¹²⁰ and sectors ¹²¹ .	Having reliable benchmarks means that targets can be set at site, product, building, regional, company and national levels. The same measurement approach can also be used to measure progress. This is the only way success can be measured for waste prevention in a quantifiable and objective way. Some countries have set waste prevention targets at a national level using the current data on waste generation.

¹¹⁸ IMPROVING MANAGEMENT OF CONSTRUCTION AND DEMOLITION WASTE – LESSONS LEARNED FROM THE STUDY 'RESOURCE EFFICIENT MANAGEMENT OF MIXED WASTE' which was held on Wednesday 25 May 2016 at the premises of the European Commission in Brussels, Belgium

¹¹⁹ Throughout the recommendation section, the use of the term “construction type” refers to residential, commercial, public, infrastructure. Additional categories of leisure, education and industrial could also be relevant

¹²⁰ Throughout the recommendation section, the use of the term (construction) activities refers to new build/ installation, refurbishment (strip out and fit out), and demolition/deconstruction

¹²¹ Throughout the recommendation section, the use of the term (construction) sectors refers to product groups, such as concrete, bricks, flooring, mechanical and electrical etc.. Splitting these in different ways to adopt a consistent approach to such categorisation would also be necessary

Waste prevention action	Rationale
	There is no evidence that this impacts on waste generation since it is difficult to see how such a high-level target cascades down to the level where decisions are made that influence waste generation, e.g. the design of buildings. The UK's SMARTWaste system is able to provide benchmarks at all these levels from data collected on construction sites.
Reuse and clarification of waste reporting	Reuse can be a valuable measure to reduce waste, but this is largely unreported, or is not reported consistently across the EU. Clarification of how, or if, reuse should be reported would improve consistency and aid understanding levels of performance here. If there is a strong driver to reduce waste across the EU then this should promote reuse. Without such a driver, there is little incentive for MS to report reuse, other than where it contributes to WFD target.
Wastage rates for key construction products	Currently used wastage rates, e.g. for EPDs, are embedded into LCA tools and other applications that use this information to estimate costs and/or environmental impacts. Development of an EU (with MS variation if applicable) dataset for wastage rates that have had some form of verification, and is updated regularly would help ensure this data is correct. This dataset would also highlight the products that are inherently wasteful at the point of installation to encourage actions to reduce these amounts at a sector or proprietary level. These actions could include specific advice to designers on detailing what would be less wasteful.
Impact measurement to promote waste prevention	The current methods for measuring environmental impact of buildings and their constituent parts does not encourage waste prevention since the applications tend to use industry/sector wide assumptions on levels of waste. Therefore, actions to reduce waste are not collected by way of environmental impact until the underlying assumptions shift (which could be done linked to the point above). Greater understanding at a building level of the environmental and economic benefits associated with demonstrated levels of waste reduction (e.g. reduction compared to the relevant benchmark) would act as a driver to implement waste reduction activities. This has been attempted sporadically in various countries; however, a consistent and EU applicable approach could increase the extent and impact of such an approach.
Procurement incentives	Linked to waste generating benchmarks is the ability to set targets, either within a building level standard (such as BREEAM, which has waste prevention, credits) or on a strict target basis. For example, in public sector projects the allowable costs for waste management could be fixed (instead of being variable according to the actual amounts of waste generated). This fixed rate could be based on a typical level of waste generation (i.e. from the public sector benchmark), for example at 10% below this level. This "objective based" type of remuneration would incentivise efforts to reduce the amounts of waste generated.
Innovation in the Built Environment	Offsite fabrication will reduce waste generated on the construction site but the whole picture should include waste generated at the factory to give a comparable performance metric with traditional construction methods. Where proven to reduce waste, on a whole lifecycle basis, these new approaches and new sectors can contribute. Issues that may prevent uptake include lack of skills and additional cost of set up. Other aspects of innovation in data management, such as Building Information Modelling, could also play a key role in improving data (as discussed in the first recommendation) and reducing defects on site, which can lead to rework being required. The Austrian Building Pass is another interesting example of data management across a building's life cycle.
Reuse of buildings	Several MS had policies and instruments in place to promote the reuse of buildings, i.e. refurbish, where possible, rather than demolish.
Sharing of best practice	There are several countries, which have tools, guidance and other best practice material, which has been produced to promote waste prevention specifically, such as the Belgian Opalis website. A fairly simple action could be to create a pan EU web

Waste prevention action	Rationale
	site to sign post to the existing materials and to also, maybe, fill any gaps in support that could be developed at an EU level and translated into each MS language
Reduce future hazardous waste	It is not possible to reduce hazardous waste that is already installed into the built environment, such as asbestos. However, it may be useful to alert those specifying building products and materials to potentially hazardous wastes of the future. This could be in the form of an updatable risk assessment, or extension of the Swedish BASTA system

6.3. Refocus on reuse

This key recommendation revolves around the approaches that could increase levels of reuse, in preference to recycling or recovery. There is often confusion over the distinction between reuse and recycling. For the purposes of this section, reuse is defined as a ‘waste’ application that does not require reprocessing, for example using a brick as a brick rather than being crushed and used as backfilling material. Reuse can be on the same or on a different site, though it is generally more likely to occur on the same site of arising. Where this happens, it is unlikely that these tonnages of reused materials will be included in waste generation statistics. Based on stakeholder feedback connected to this recommendation¹²², the following conclusions were noted:

- It can be challenging to address liability and quality issues relating to reused products and materials. For example, who is liable for the reused product? Especially given the time lag between the product being installed originally and its second life. To mitigate risk, it might be better to limit reuse of structural elements, although it was noted that the Czech Republic has a demolition permit, which enables the reuse of steel sections.
- Performance of buildings and construction materials is another area that needs to be considered, such as energy efficiency requirements and whether older products can meet new requirements.
- Opportunities or solutions raised in relation to these issues included: developing new products standards and GPP criteria focussed on reuse, case studies and guidance on reuse, building for deconstruction (possibly as part of a building passport), credits for CO₂ savings attributable to reuse, and promotion of exchange programmes to help match supply and demand.

Rationale is described within each specific reuse recommendation in Table 33 but the overarching need to refocus attention onto reuse, compared to recovery, is that around half the MS had no activity registered that was aimed at promoting reuse (all had ones to promote recovery).

Table 33: Reuse recommendations

Reuse action	Rationale
Mandatory pre-demolition and renovation audits with promotion of reuse	There are requirements to undertake pre-demolition audits in a number of MS, such as Hungary and Finland. However, carrying out such an audit does not necessarily result in increased reuse, especially where the rationale behind it is for identifying hazardous substances. If a common approach was adopted, whereby a third party conducted the audit and certain levels of reuse were identified and measured against, this might have a positive effect. Subsequent linking with recertification and a suitable market demand would add weight to such audits
Managing supply and demand	Frequently the specifications of the follow-on development does not enable reusable demolition products to be incorporated at the same site. Several countries have waste exchanges and industrial symbiosis programmes to help match supply and demand – although these platforms are equally used to facilitate recycling. The ability to match supply and demand for reusable products and materials is essential, as evidenced by reclamation activities in the UK through the Salvo network. There is a clear need to

¹²² Improving management of construction and demolition waste – lessons learnt from the study “Resource efficient management of mixed waste” which was held on Wednesday 25 May 2016 at the premises of the European Commission in Brussels, Belgium

Reuse action	Rationale
	have traceability in the supply chain, linked to the information requirements of the markets to which they can be best used.
Innovation in reuse	Removing products for reuse during demolition can be time consuming and increase health and safety risks, compared to mechanical techniques to separate into material streams. There are innovations, such as REBRICK in Denmark that can help overcome such barriers. The EU R&D programme could have a focussed call to develop additional technologies targeting reuse on a pan EU collaborative basis. Transfer of existing technologies could also be promoted, taking into account the typically SME nature of the reclamation industry.
Support for the reclamation sector	In addition to supporting R&D in this sector, there could be advantages in supporting those in this sector, both existing and to establish new facilities. These sites act as stockholders for products and materials, enabling their accumulation and retention for a demand that might not be available when they are removed from buildings at end of life. Making public land available for such enterprises at a reasonable cost could help new business start-ups/ social enterprises. Existing facilities could also be supported, upon the condition that they had minimal 'reproduction' stock.
Construction Product declaration and recertification	Lack of certification and uncertainty over performance prevent reclaimed products and materials being used in mainstream construction, where there could be significant market pull. The key issue, beyond availability of certain volumes, relates to demonstration
Better impact data	There is no clear impact data that can be used to promote reuse in preference to recycling. These are typically a combined option on LCA. This is despite the widespread opinion that reuse offers better environmental, social and (possibly) economic outcomes. Such evidence, or calculation tool, could be valuable in green procurement. EU R&D projects focussed on existing buildings and optimised demolition to promote reuse have impact data aspects, including HISER and FISSAC.
Data management, including BIM.	<p>The Austrian Building Pass is a good example of where the importance of transferring information across a building life cycle has been recognised by a MS. This approach could be adopted across the EU with far reaching positive effects. A vehicle that could be sensibly used to enable such a pan EU policy would be through the combining of resource optimisation data within building information modelling. This is a key output of the EU funded R&D project – Buildings as Materials Banks (BAMB).</p> <p>Building Information Management (BIM) is a key way of storing information on a building digitally, such as the design parameters and type and amount of products and materials as well as management data. It is being increasingly used to manage a building's data across the lifecycle. Two EU funded R&D projects are developing BIM-enabled tools to take into account resource management data; these are: Buildings as Materials Banks (BAMB) and the H2020 HISER project (Holistic Innovative Solutions for an Efficient Recycling and Recovery of Valuable Raw Materials from Complex Construction and Demolition Waste)</p>

6.4. Keep it clean (source segregation)

Source segregation relates to the separation of CDW into distinct product and material streams at the point of arising. This separation of materials, in particular, should be maintained through the reprocessing and eventual application of the materials. Based on stakeholder feedback connected to this recommendation¹²³, the following conclusions were noted:

¹²³ Improving management of construction and demolition waste – lessons learnt from the study “Resource efficient management of mixed waste” which was held on Wednesday 25 May 2016 at the premises of the European Commission in Brussels, Belgium

- Demolition practices are key, including: pre-demolition audits (which enable all players to know what wastes are present and in which quantity) should be mandatory for construction clients and carried out by a certified organisation, and selective demolition is a win-win situation but there is a lack of knowledge relating to this;
- Pre-refurbishment audits and on-site sorting should also be strongly promoted.

The main reason to promote source segregation is that it keeps the materials much less contaminated, thus aiding high quality levels for reuse or recycling. The evaluation carried out for MS showed that demonstrably higher levels of recycling were achieved where materials were not mixed as much.

Table 34 summarises the recommendations to promote source segregation.

Table 34: Source segregation recommendations

Reuse action	Rationale
Mandatory pre-demolition and renovation audits	<p>Could help identify markets for demolition products and materials in advance of the demolition contractor starting work. It could be specified that all reusable and recyclable materials are kept separate – this is already common practice in some MS.</p> <p>A study on pre-demolition and renovation waste audit is currently being carried out by the European Commission (DG GROW). The final report of the study is due by end 2016 and pre-demolition assessment guidelines for the construction sector are awaited by 2017.</p>
Mandatory selective demolition	<p>This intervention should help make sure materials are not mixed up during the demolition process. It is key for good management that at least three streams are separated: hazardous waste, inert waste and mixed waste. Depending on site specific conditions and market considerations other materials could be separated.</p> <p>Ultimately, there needs to be markets for separated materials or products, or there is a risk that these materials will be mixed up again for transportation from the site of arising.</p>
Industry take back schemes	<p>Schemes such as Recovynyl and gypsum take back are good approaches to removing specific materials from the construction and refurbishment activities in a controlled and selective manner. It has proven more difficult for demolition wastes owing to the lifespan of buildings. However, extending this approach out to more countries and more product streams could be an effective way to ensure materials are separated as a first objective. Recovynyl already operates in 17 MS, so it would be a good model to look at in more detail when considering expansion of existing schemes. Other material streams could also be targeted. For example, expansion of the Carpet Recycling UK scheme, which currently operates in the UK, and mineral wool insulation recovery operating in Denmark.</p>
Keep inert waste separate	<p>Helped by industry take back schemes, it is apparent from the CDW data that the vast tonnage of CDW is inert by nature. It is very easy to identify inert materials (e.g. compared to mineral-based insulation from foamed insulation). All MS should develop approaches to ensure these materials are always separated from non-inert waste. There are a number of policy approaches that could be used to promote this, such as mandatory selective demolition or much higher landfill taxes for any waste that contains even the smallest fraction of non- inert waste.</p>
Mixed waste levy	<p>Similar to the point above, there could be additional levies at point of waste collection on any mixed wastes, inert or otherwise. This would penalise those sites which did not make adequate provision for separate waste containers for all materials that were recyclable or reusable</p>

6.5. Remove the backfilling barrier

Backfilling, at best, is a low-grade use of inert materials to fill holes. These can be very large holes, such as old quarries. At worst, there is no beneficial use associated with material that is deemed to be backfilled, thus it is essentially being landfilled. The objective of these recommendations is to overcome the contradiction between the inclusion of backfilling in the calculation of the WFD 70% recovery target and the primary objective of high quality recycling also required by the WFD in its article 11.

Keeping backfilling inside the recovery target enables MS to meet this target although their recycling rate is low and to include disguised landfilling as backfilling.

We have three main recommendations regarding backfilling.

- **The first recommendation is to stop using the term backfilling and provide clarification on what a CDW recovery operation is.**

Indeed, the current practices considered as backfilling are in fact quite different (for details, see paragraph 2.5.3. “Inclusion of backfilling in the EU 2020 target – A disputable statement toward high quality recycling”):

- Reclamation of excavated areas in construction
- Reclamation of excavated areas in mines and quarries
- Landscape engineering
- Final restoration of a landfill

It is suggested that only applications where suitable unprocessed inert waste is used for engineering purposes in construction instead of other non-waste material is considered as CDW recovery. Indeed, construction earthworks may require the excavation of on-site material due to its unsuitability for construction purposes on that site. The void created, or sections of that void, may require raising to construction design levels with infill materials compliant with a construction material specification. Hence, reclamation of excavated areas in construction could be considered as compliant with the ‘Guidance on the interpretation of the term backfilling’ as it substitutes non-waste materials and would be undertaken anyway if waste was not available. The following definition of what a CDW recovery operation is could be introduced:

A construction and demolition waste recovery operation includes applications where suitable unprocessed inert waste is used for engineering purposes in construction instead of other non-waste materials which would otherwise have been used for that purpose.’

Other practices should not be considered as recovery since in most cases the reclamation or landscaping operations would not be undertaken if CDW were not available and since the appropriate material to be used for these operations is soil.

In other words, backfilling would disappear and inert CDW would either be reused, recycled, recovered or landfilled.

- **The second recommendation, which arises from the previous one, is to remove backfilling from the 70% objective and include in the WFD a 70% recycling target for CDW to be met by 2030, with possible revision as follows:**

‘By 2030, the recycling 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’,

Indeed, as high quality recycling of inert wastes is in the production of aggregate, the inclusion of ‘backfilling’ of inert wastes in the 70% CDW recovery target is contrary to the primary objective of high quality recycling. Inert CDW should be reoriented towards recycling into aggregates, and replaced in backfilling operations by uncontaminated soils and earth.

However, at the stakeholder workshop held to discuss findings and recommendations¹²⁴, there were mixed opinions relating to this recommendation. There seems to be a lack of awareness and understanding of the issues related to backfilling and the potential impact of removing backfilling from

¹²⁴ Improving management of construction and demolition waste – lessons learnt from the study “Resource efficient management of mixed waste” which was held on Wednesday 25 May 2016 at the premises of the European Commission in Brussels – Minutes available here: <http://ec.europa.eu/environment/waste/studies/pdf/construction/Minutes.pdf>

the WFD target. These issues should be communicated more widely across the MS, as well as developing a better understanding of the impact of removing backfilling from the target for MS where backfilling rates are high and they account towards their recovery target.

- **The third recommendation is to withdraw the new definition of backfilling, proposed in the 2nd December 2015 Circular Economy Package** adopted by the European Commission with regard to the Waste Framework Directive and detailed in section 2.1 of the backfilling report. Stakeholders concurred that this could result in all suitable wastes processed into aggregates to standards and specifications for construction engineering being re-classified as backfilling rather than recycling, unless they have ceased to be waste by meeting Waste Framework Directive end of waste criteria.

6.6. Products, not waste

When waste is turned into a product, restrictions on applications tend to be far fewer and requirements relating to environmental permitting and transfer of waste are no longer relevant. This has the effect of increasing the value of these materials/products and removing possible barriers for recycling applications that genuinely displace primary materials. The highest levels of recycled aggregates in MS are shown by those with related EoW legislation or protocols, so it is apparent that having a clear route towards converting wastes into products is a highly effective measure in increasing recycling.

Further to the workshop of 25th May¹²⁵, the following conclusions were noted:

- There was debate as to whether EoW criteria stimulates recycled product production or whether this tends to be a natural part of an evolving process for high performing MS
- Conversely, some stakeholders felt that EoW criteria is an essential tool to increase recycled products and materials production
- There are real and perceived quality issues that need to be considered, and this could be exacerbated for subsequent recycling of recycled products and materials.
- Stakeholders stated that there is a strong market for appropriate quality products and materials.
- Stakeholders also pointed out that EoW criteria cannot be developed without referring to schemes, tools and protocols that secure the environmental and technical soundness of aggregates.

There are a number of measures that can be helpful in moving from ‘waste’ to a ‘product’, as detailed in Table 35.

Table 35: Recommendations to move from waste into products

Waste into products measures	Rationale
Develop EoW criteria for recycled aggregates across all MS. This could be through EU level approach or within each MS	Achieving End of Waste is the accepted way to turn a waste into a product. There are only 5 MS, which have national legislation or protocols to turn inert waste into a recycled product. Whilst it is recognized that generic EoW criteria to cover all EU is not viable, there could be scope to establish a common framework to develop EoW requirements for specific CDW streams within a MS, which could reduce the time and resources needed.
Develop EoW criteria for non-aggregate applications across all MS	Other than the UK, there are no other MS, which have CDW relevant EoW applied outside of aggregates. The UK has quality protocols for aggregates, flat glass and gypsum, which are widely used, albeit that these do differ from other MS EoW approaches. Extending the range of CDW wastes that can be turned into products would promote recycling of such waste streams through the removal of barriers to their application. Rather than suggest a list of materials here, it is more important for each MS to prioritise according to local conditions. For example, is there relevant industry participation, and is there an identified need, for a particular application/ range of applications for a specific material group?

¹²⁵ Improving management of construction and demolition waste – lessons learnt from the study “Resource efficient management of mixed waste” which was held on Wednesday 25 May 2016 at the premises of the European Commission in Brussels, Belgium

Consistent and clear use of standards and specifications	Even though materials can still be classed as a waste, owing to the fact they have not met EoW criteria, they can still be used in similar applications to products where they have met the relevant standards and specifications for that use. However, despite having harmonised EU standards for applications, such as the harmonised aggregates product standards produced by CEN TC 154 ¹²⁶ , which are mandatory in all EU MS, there can be differences at MS or even regional level. This is unnecessary and contrary to the requirements of the CPR (Construction Product Regulations)
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6.7. GPP: lead by example

Public sector procurement in the built environment is significant in most MS. As such, the obvious way to drive best practice without resorting to EU wide legislation is to require it for all publicly procured construction. Where this is done for the first time, there are also great learning outcomes that can be used to inform policy and generate much needed data for impact evaluation.

Green procurements, particularly green public procurement (GPP) acts as a powerful approach to promoting best practices. These should be included to measures needing to be pushed forward in the absence of mandatory requirements or inadequate enforcement for mandatory requirements i.e. where there is a medium to high risk that current legislation is not complied with. Based on stakeholder feedback combined with this recommendation¹²⁷, the following conclusions were noted:

- High recovery rates should follow from clear political will, including setting green public procurement requirements (and landfill bans).
- In GPP, recycled content should not be universally applied to all materials. It should target the ones most needing it.
- GPP is a major driver to stimulate demand for reuse.

Table 36 provides some suggested GPP criteria and measures that could have a strong influence in promoting the uptake of best practices across the EU. A strong lead from procurement linked to EU funded building and infrastructure projects could set many of these actions in motion, without imposing excess burden onto MS administrations. The levels set should take into account local conditions in being able to meet certain requirements, along with threshold levels for implementation, e.g. develop more demanding requirements for higher value projects.

Table 36: GPP recommendations

GPP measures	Rationale
Set GPP requirements to measure and monitor CDW in accordance with best practices	GPP criteria could be developed to set out the requirements to provide better quality and detail of data on a project scale. This should embed aspects of pre-demolition audits, site waste management planning and reporting, and possibly the Building Pass concept/ data management through Building Information Modelling.
Set GPP requirements to prevent waste	GPP criteria to prevent waste is not currently implemented, but could be readily developed. Criteria here could revolve around the requirement of a project level waste prevention plan or plan for materials efficiency, based on the examples of Luxembourg (mandatory site waste prevention plans) and Belgium (Flanders Plan for material efficient construction). Once reasonable benchmarks are established, the amount of waste that can be costed for in public sector projects could be restricted, based upon targeted reduction.

¹²⁶ http://standards.cen.eu/dyn/www/f?p=204:7:0:::FSP_ORG_ID:6136&cs=1E628A70D0CE8D5C6E7457C1BE13552A2

¹²⁷ Improving management of construction and demolition waste – lessons learnt from the study “Resource efficient management of mixed waste” which was held on Wednesday 25 May 2016 at the premises of the European Commission in Brussels, Belgium

GPP measures	Rationale
Set GPP requirements to include reclaimed content	The simplest criteria would be a certain % by weight or by value. Alternatively, the 'net waste' approach could be used, whereby the amount of material disposed of should be incorporated as reclaimed/recycled content.
Set GPP requirements to include recycled content	The simplest criteria would be a certain % by weight or by value. Alternatively, the 'net waste' approach could be used, whereby the amount of material disposed of should be incorporated as reclaimed/recycled content.
Use GPP to collect impact data	It is very difficult to find reliable data upon which the impact can be assessed. Projects requiring certain measures because of GPP requirements could be filling this data gap. To avoid differences in the methods undertaken, a preferred monitoring and evaluation approach to measure economic, social and environmental costs and benefits relating to implemented measures could be developed. The results may also be useful in justifying applying the related criteria.

6.8. Enforce to reinforce

Until all CDW is managed in accordance with legal requirements, inadequate enforcement will act as a fundamental barrier to achieving best practice in CDW across the EU. Most best practice measures will only be successful if the legal requirements for correct and safe CDW management are complied with for most/all related activities. The stumbling block for many MS is insufficient resources to enforce existing legislation properly, rather than an absence of legislation.

Table 37 makes some suggestions on how the consistency of enforcement across the EU could be improved. Owing to lack of suitable information from individual MS on quantifying levels of enforcement compared to levels of infringement, it would be advantageous to understand this better at an EU level. This further work could help inform MS on benchmarks to achieve good or high performance with respect to enforcement. However, this is not a simple scale, e.g. high levels of public funding = high enforcement performance, since there will be other factors to consider. These could include:

- cultural attitudes to non-compliance with legislation
- length of time legislation has been in place/adequately enforced
- geopolitical issues, such as likelihood of seeing an illegal activity, consistency of legislation to be applied within the MS, or proximity of other MS borders with lower enforcement provision.

Table 37: Enforcement recommendations

Enforcement measures	Rationale
Identify and set minimum resourcing levels needed to adequately enforce CDW related legislation	Many comments relate to lack of resources to adequately enforce and this has been intensified for many MS in recent times due to public funding cuts/ austerity measures. However, this is possibly the worst time to cut back on enforcement, i.e. when resources are also constrained in the industry too and the temptation to reduce costs through non-compliance could be higher than in better economic times.
Introduce dissuasive penalties in case of breach of waste legislation	In particular concerning illegal landfill, heavy financial penalties (a fine per tonne several times higher than the legal cost per tonne of landfilling the same waste), would be a deterrent. The revenues could be used to promote CDW reuse and recycling or to finance inspecting staff.

Enforcement measures	Rationale
Introduction (in some MS) of lower Landfill taxes for hazardous CDW than for non-hazardous CDW.	High Landfill taxes may encourage illegal landfill. As illegal landfill of hazardous waste must absolutely be avoided, reducing taxes on the landfill of hazardous waste could help decrease illegal landfill practices.
Identify and focus attention on 'hot spots'	Where lack of enforcement is acting as a competitive barrier, i.e. compliant companies are losing significant work to non-compliant companies, it is particularly important to take steps to clamp down quickly on these companies to avoid others joining them. This could also include awareness raising campaigns to construction clients to ensure they know what documentation, for example, should be available for checking compliance themselves.
Ensure all CDW hazardous waste is correctly identified and dealt with correctly	There is a lot of confusion and lack of awareness on what wastes should be treated as potentially hazardous. The demolition sector is most likely to be affected by this as they deal with the existing buildings legacy. Adequate guidance and training of this sector should help identify hazardous materials at source and keep them separate from recyclable materials. There should be adequate provision within each MS to treat CDW or know where it will be treated. Forecasting of hazardous waste arising will help understand the provision needs. A guidance on waste classification is being prepared on behalf of the EC and is expected to be available at the beginning of 2017.
Greater uptake of EDOC (electronic duty of care)	Given the widespread coverage of mobile data, most CDW could be transferred using an EDOC approach. This could significantly reduce the costs of enforcement and also collect much needed data at the same time.

6.9. Continuous and holistic improvement

Without compelling evidence to support the approach of having specific mandated measures rolled out across all MS, the current situation of each MS trying out different approaches on a mixed voluntary and mandatory basis is likely to continue. This should be supported with a more structured approach to critical yet constructive self-assessment of strengths and weaknesses. The ideas presented here are suggested to prompt further thought and discussion in this general area.

Until better data is available to judge the impact of individual best practice measures or actions, it is not possible to judge their effectiveness. The top performing MS have many specific measures in place, often for 5 years or more. This suggests that there is no single measure that transforms performance of CDW generation and management. Therefore, the final recommendation revolves around the creation of a holistic framework of conditions, measures and interventions that collectively should improve performance over a period of time.

Even if some measures see results faster than others (e.g. stronger levels of enforcement taking immediate effect vs. setting GPP criteria), there is indeed a common thread between the top performing MS: industry and government have sat together and discussed an action plan for CDW management. Political willingness is the key. Targets will be next followed by the right measures to be taken.

Experience in the UK with setting targets for sustainability in the built environment shows that the sector responds well to a firm policy commitment over a period of around 10 years with intervening targets every two to three years. Provided the policy does not keep changing with successive governments, this provides a solid view of the future and how performance needs to be raised over time. The interim targets ensure that some investment is made throughout in terms of incremental improvements, or creating a state of continuous improvement.

Could this be replicated for CDW prevention and management? If so, this needs to be at MS level and should start with a critical self-assessment of strengths and weaknesses across the 'factors of success' to achieving better performance.

An example of how this could be done is presented in Appendix B, with a working title of 'Maturity Matrix'.

The categories considered include:

1. Waste management legislation
2. Landfill policy and practice
3. Waste policy and strategy
4. Fiscal measures
5. Enforcement
6. CDW treated % performance
7. Reused and recycled materials
8. End of Waste criteria
9. Green public procurement
10. Waste management infrastructure
11. Waste prevention
12. CDW hazardous waste
13. Quality of waste data

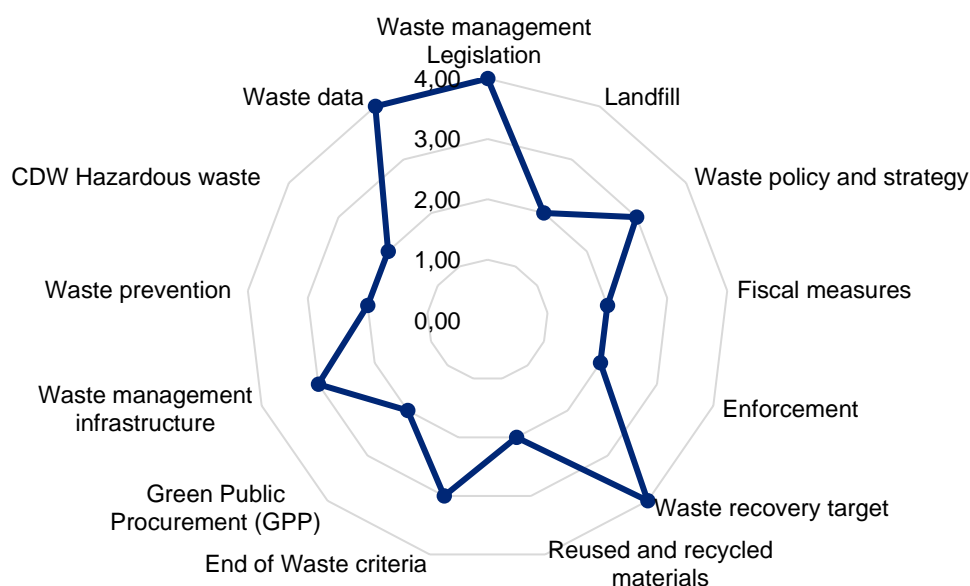
An assessment for all Member States (MS) was done, using the criteria for each category of the Maturity Matrix. The overall results provided an illustration of which level each MS could be at, and what is their performance across the categories listed above.

Table 38: Matrix overall results –initial

Level 1 Initial	Level 2 Developing	Level 3 Implemented	Level 4 Improving/optimising
Lithuania Cyprus Malta Romania Bulgaria Greece Croatia Latvia	Hungary Poland Slovakia Spain Portugal Slovenia Italy France Czech Republic Estonia	Austria Belgium Finland Ireland	Luxembourg Denmark Germany Sweden United Kingdom The Netherlands

The results for each MS can be easily captured in a spider diagram, as illustrated below for Austria:

Maturity matrix summary for Austria



Such an approach quickly flags up the areas where improvements should be targeted (note that the above diagram is for illustration only).

Should this be considered a useful way to carry out regular self-assessment, with more detailed work following on the areas of improvement, then a period of stakeholder consultation and consensus would be required to agree the methodology, scoring and application.

Celebrating success is part of this process of holistic and continuous improvement. To illustrate how a qualitative assessment, which can summarise performance, best practices and opportunities (amongst others), a snapshot of each MS has been produced and is included in Appendix D.

7. Prioritisation of the recommendations and potential impact of the main measures

7.1. Prioritisation of the recommendations

As stated in paragraph 5.9 “Continuous and holistic improvement”, no measure could by itself reduce CDW generation and radically improve its management. In order to ensure minimal CDW generation and sustainable CDW management, the only solution is to combine strong political will, including precise and realistic targets, involvement of all stakeholders and implementation of complementary measures.

The measures presented in Part 5 “Recommendations for improving CDW management in MS” address the whole spectrum of potential action areas. They can be implemented on various levels (legislative, regulatory, fiscal, etc.) and scales (European, national, regional, local). Some fall within the competencies of Member States, whilst others can be introduced and driven by local and regional authorities.

Of course, the European Commission has a major role to play in the definition and harmonisation of the European level playing field.

In order to determine which measures would be both a source of environmental benefits (reduction of the amount of CDW generated and increase in their recycling rate), not too complex to implement and actionable by the EC, we ranked the recommendations according to these three criteria.

The ranking was made in accordance to our best knowledge, based on the research performed during this study:

- Potential benefits: we analysed the propensity of the measures to encourage CDW prevention, reuse and recycling, over backfilling and landfilling.
- Ease of implementation: this takes into account the potential cost, complexity (actors involved, legal aspects, etc.) that would require the implementation of the measure. A high level means that the measure would be relatively simple to implement.
- Opportunity of EC action: we considered the extent to which the European Commission has an opportunity to act or decide on the implementation of the measure.

Table 39 below presents the recommendations with high potential of benefits. The recommendations are then ranked according to their ease of implementation and to the level of control by the European Commission.

Recommendations which ranked as “medium” or “low” potential benefits are summarised in Appendix F – Prioritisation of the recommendations.

Table 39 : Ranking of the recommendations with high potential benefits

Category	Recommendation	Rationale	Potential benefits	Ease of implementation (cost, complexity, actors involved...)	Opportunity of EC action
Remove the backfilling barrier	Stop using the term backfilling and provide clarification on what a CDW recovery operation is.	Current practices considered as backfilling are diverse, and not all comply with the principle of moving towards high quality recycling (see section 2.5.3). It is suggested that only applications where suitable unprocessed inert waste is used for engineering purposes in construction instead of other non-waste material is considered as CDW recovery.	<p>High</p> <p>Clarification of reporting, better comparability of MS performance, higher quality recycling. See section XX for further estimations of the impacts</p>	<p>High</p> <p>Currently, only a few countries correctly report backfilling. This recommendation would mostly lead to a clarification, and therefore better relevance and comparability of statistics. Countries heavily relying on backfilling operations that would not be considered as recovery anymore would however need to accelerate their efforts to meet the 70% target. But cases of highly performing countries, reaching the target without backfilling operations, show that this is not unachievable.</p>	<p>High</p> <p>These recommendations are in direct link with the framework set by the EU Directive.</p>
	Remove backfilling from the 70% objective and include in the WFD a 70% recycling target for CDW to be met by 2030	In line with the above recommendation, backfilling would not be included in the 70% target.			
	Withdraw the new definition of backfilling, proposed in the 2 nd December 2015 Circular Economy Package.	Stakeholders concurred that this could result in all suitable wastes processed into aggregates to standards and specifications for construction engineering being re-classified as backfilling rather than recycling, unless they have ceased to be waste by meeting Waste Framework Directive end of waste criteria.			

Keep it clean (source segregation)	Mandatory pre-demolition and renovation audits	Pre-demolition audits help identify markets for demolition products and materials before the demolition contractor starts work. It could be specified that all reusable and recyclable materials are kept separate – this is already common practice in some MS.	High Assuming good levels of source segregation lead to high grade recycling, there are potentially high economic gains to be made in primary feedstock replacement across MS. The built environment consumes around 24% of material resources across the EU and prices for many resources have risen sharply in the last 15 years. This in turn has a potential environmental benefit through the reduction of raw material extraction and consumption.	Medium Although a good pre-demolition audit, followed by adapter source separation practices (such as selective demolition) offers the potential to produce higher quality materials, and stimulate the market for secondary raw materials, thereby increasing the value (and prices) of reclaimed and recycled materials, and reducing the net costs of deconstruction, this also comes at an initial direct cost for building owners.	High As this is the case for some municipal waste streams (such as biowaste), it is a viable option to include such requirements in EU regulation.
	Mandatory selective demolition	It is key for good management that at least three streams are separated: hazardous waste, inert waste and mixed other waste. Depending on site specific conditions and market considerations other materials could be separated.			
	Keep inert waste separate	There are a number of policy approaches that could be used to promote this, such as mandatory selective demolition or much higher landfill taxes for any waste that contains even the smallest fraction of non-inert waste.			
	Industry take back schemes	Schemes such as Recovinyl and gypsum take back are good approaches to removing specific materials from the construction and refurbishment activities in a controlled and selective manner. Extending this approach out to more countries and more product streams could be an effective way to ensure materials are separated as a first objective.	High This approach is clearly in line with the principles of a circular economy, whereby materials indefinitely re-enter the production loop. This would incentivise the development of infrastructure to optimise deconstruction, logistics, sorting and treatment, as well as the design of more long-lasting, modular, and dismantable building or building pieces.	Medium This approach is currently applied to specific construction products categories, and limited in its geographical scope (e.g. only the Netherlands have set up such a scheme for window glazing). The costs that would be incurred by the industry very much on depend on the objectives set (specific recycling targets for example). In addition, the long lifetime of certain construction products (compared to other products where this principle has been applied, like packaging, electronic equipment, etc.) renders its application more complex.	Medium This recommendations, were it to be introduced as an EU obligation (like for EEE, or batteries for example), would probably require a specific piece of legislation, with a complexity commensurate to the diversity of construction materials, buildings, etc.

Products, not waste	Develop EoW criteria for recycled aggregates across all MS	Achieving End of Waste is the accepted way to turn a waste into a product. There are only 5 MS which have national legislation or protocols to turn inert waste into a recycled product.	High		
	Develop EoW criteria for non-aggregate applications across all MS	Other than the UK, there are no other MS which have CDW relevant EoW applied outside of aggregates. The UK has quality protocols for aggregates, flat glass and gypsum, which are widely used. Extending the range of CDW wastes that can be turned into products would greatly promote recycling of such waste streams.	<p>The aggregates sector in the EU is 2.5 billion tonnes and there is great potential to displace primary aggregates with recycled products. There should be cost savings to the consumer, though these would vary according to local markets. UK experience suggests that 10-20% savings are passed onto the consumer. Additional economic benefits will be assigned to the producers of recycled products. Although this can displace the traditional market, reducing reliance on primary materials provides greater resource security for EU suppliers. Technically, most of the CDW stream can be converted into products, assuming there is supporting EoW criteria to facilitate this transition. This would start with inert materials into recycled aggregates but could be extended into other material streams, as evidenced in the UK for plasterboard and flat glass</p>		

Enforce to reinforce	Identify and set minimum resourcing levels needed to adequately enforce CDW related legislation	<p>Most best practice measures will only be successful if the legal requirements for correct and safe CDW management are complied with for most/all related activities. The stumbling block for many MS is insufficient resources to enforce existing legislation properly, rather than an absence of legislation. Many MS lack resources to enforce legislation. The situation has worsened due to public funding cuts/ austerity measures. However, this is possibly the worst time to cut back on enforcement, when the temptation to reduce costs through non-compliance could be higher than in better economic times.</p>	<p style="text-align: center;">High</p> <p>Enforcement is needed to create an equal market for all companies to which regulations may apply. Lack of or inadequate enforcement enables some companies to financially benefit from this - usually at the expense of competitors and the local/natural environment. Therefore, there may be negative impacts on higher levels of enforcement. Ultimately, these costs will be negated by achieving the economic gains outlined in the previous impact tables.</p> <p>High financial penalties would also generate additional revenues that could be devoted to strengthening the financial means of enforcement. There are high environmental impacts associated with illegal dumping and inappropriate treatment/handling of waste. Improved enforcement levels are key to reducing non-compliance with carefully developed legislation designed to minimise harm to human health and the environment.</p>	<p style="text-align: center;">Medium</p> <p>The main barrier is resourcing constraints that already exist for most enforcing bodies across the EU. There could also be political negativity relating to external influence on how budgets are allocated and local legislation is enforced.</p>	<p style="text-align: center;">Low</p> <p>Although the Commission may decide to provide guidance to MS, this issue is essentially a question of resources allocated at national (sometimes regional) level.</p>
	Introduce dissuasive penalties in case of breach of waste legislation.	<p>In particular for illegal landfill, heavy financial penalties would be a deterrent. The revenues could be used to promote CDW reuse and recycling or to finance inspecting staff.</p>			

<p>Target waste prevention</p>	<p>Waste prevention targets and benchmarks set for construction type, activities and sectors.</p>	<p>Having reliable benchmarks means that targets can be set at site, product, building, regional, company and national levels. The same measurement approach can also be used to measure progress. This is the only way success can be measured for waste prevention in a quantifiable and objective way. Some countries have set waste prevention targets at a national level using the current data on waste generation. There is no evidence that this impacts on waste generation since it is difficult to see how such a high-level target cascades down to the level where decisions are made that influence waste generation, e.g. the design of buildings. The UK's SMARTWaste system is able to provide benchmarks at all these levels from data collected on construction sites.</p>	<p>High</p> <p>Prevention may potentially entail very high economic and environmental benefits. At the top of the waste hierarchy, it is also often the strategy which leads to the highest environmental benefits (e.g. energy and resource savings)</p>	<p>Low</p> <p>The main barrier to waste prevention relates to the lack of incentives to achieve this in reality. Waste prevention requires adopting measures changing current production and consumption patterns. These barriers are not easily removed by a single measure, so a more comprehensive and consistently applied bundle of measures, aimed at reducing waste, is required to be effective.</p>	<p>Medium</p> <p>EC can coordinate studies and sharing of best practices, which would contribute to setting a framework for the prevention of CDW. This work can build upon interesting experience at MS level (e.g. UK, Netherlands, France). Setting quantitative ambitions and targets would only be possible after this, and even though national specificities may still hinder an harmonised approach. Any EC action on this topic seems to be a medium to long-term strategy</p>
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GPP: lead by example	Set GPP requirements to include reclaimed content	The simplest criteria would be a certain % by weight or by value. Alternatively, the 'net waste' approach could be used, whereby the amount of material disposed of should be incorporated as reclaimed/ recycled content.	<p>High</p> <p>Green public procurement offers great potential to stimulate eco-design and the greater use of recycled and reused products and materials. Public authority spending represents 16% of GDP across the EU . Maximising value of resources within MS and the EU improves competitiveness and resource security. Setting challenging GPP requirements and then enforcing them can be practised across the EU, irrespective of minimum legislative requirements and levels of general enforcement. Leading by example usually means demonstrating best practices across multiple areas of sustainability, and hence high levels of environmental benefit.</p>	<p>Medium</p> <p>The ability to develop GPP criteria and verify information submitted by tenderers in response to environmental criteria in construction can be a challenge as clear guidelines are still being developed. The existing GPP criteria are not adopted as a matter of course so there are barriers to be overcome in the whole area to ensure that once GPP criteria are set, MS feel these must be applied in procurement projects.</p>	<p>Medium</p> <p>EC can provide guidance through its GPP tools, but application at MS level would still be voluntary</p>
	Set GPP requirements to include recycled content	The simplest criteria would be a certain % by weight or by value. Alternatively, the 'net waste' approach could be used, whereby the amount of material disposed of should be incorporated as reclaimed/ recycled content.			
Keep it clean (source segregation)	Mixed waste levy	There could be additional levies at waste collection point on any mixed wastes, inert or otherwise. This would penalise those sites which did not make adequate provision for separate waste containers for all materials that were recyclable or reusable	<p>High</p> <p>This would provide a strong incentive to source separation, thus contributing to achieving the benefits of higher quality recycling and higher value from secondary raw materials.</p>	<p>Low</p> <p>Such a levy would induce initially additional costs for building owners / CDW operators. Such instruments generally raise high resistance from stakeholders.</p>	<p>Low</p> <p>Financial instruments such as levies can generally not be imposed at EU level</p>

<p>Target waste prevention</p>	<p>Procurement incentives for waste prevention</p>	<p>Linked to waste generating benchmarks is the ability to set targets, either within a building level standard (such as BREEAM, which has waste prevention, credits) or on a strict target basis. For example, in public sector projects the allowable costs for waste management could be fixed (instead of being variable according to the actual amounts of waste generated). This fixed rate could be based on a typical level of waste generation (i.e. from the public sector benchmark), for example at 10% below this level. This “objective based” type of remuneration would incentivise efforts to reduce the amounts of waste generated.</p>	<p>High Economic and contractual incentives for the reduction of waste generation can potentially lead to high resource savings</p>	<p>Low The applicability of such incentives depends on the capacity to build sectorial benchmarks, to revise the design of contracts and remuneration in construction and demolition projects. Although it seems to be a very promising area for development, its relatively low level of maturity calls for further work before any implementation.</p>	<p>Medium The EC may contribute to financing research on such contractual agreements, but this is essentially a question of public procurement and B2B contractual arrangements</p>
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<p>Refocus on reuse</p>	<p>Managing supply and demand</p>	<p>Frequently the specifications of the follow-on development does not enable reusable demolition products to be incorporated at the same site. Several countries have waste exchanges and industrial symbiosis programmes to help match supply and demand – although these platforms are equally used to facilitate recycling. The ability to match supply and demand for reusable products and materials is essential, as evidenced by reclamation activities in the UK through the Salvo network. There is a clear need to have traceability in the supply chain, linked to the information requirements of the markets to which they can be best used.</p>	<p>High Reduction in environmental impacts associated in the manufacture and distribution of products and materials through displacement of new products/materials. Also, a reduction in the environmental impacts associated in the reprocessing of waste materials.</p>	<p>Low Reuse is not always straightforward, with supply and demand constraints being a key barrier that is not easily addressed through the legislative framework. Additional barriers relate to improving confidence in using such products and materials whilst not adding risk through promoting their use. The size of the sector is a further barrier, with low levels of investment and lobbying power, for example, there is no EU level voice if the reclamation sector. This adds risk to any interventions not being developed with these stakeholders, leading to low levels of participation and awareness.</p>	<p>Low Supply and demand of reused construction products is usually very local, and the existing initiatives or networks have developed on quite small geographical areas. Setting an EU ambition or target seems therefore difficult at this stage.</p>
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7.2. Environmental and socio-economic benefits and impacts of the most promising measures

In the section below we analyse the environmental and socio-economic benefits and impacts of three of the six recommendations showing high potential direct environmental benefits and high level of control by the EC:

- Include in the WFD a 70% recycling target for CDW to be met by 2030
- Mandatory pre-demolition and renovation audits
- Mandatory selective demolition

7.2.1. Include in the WFD a 70% recycling target for CDW to be met by 2030

Current situation

The definition of the CDW recovery target in the Waste Framework Directive (WFD) enables MS to include the volumes used for backfilling into the calculation of their national CDW recovery target.

'Backfilling' is not a defined term in the WFD and even if it has been later defined in the Commission Decision 2011/753/EU¹²⁸, it encompasses very disparate practices:

- reclamation of excavated areas in construction;
- reclamation of excavated areas in mines and quarries;
- landscape engineering (visual or noise screening);
- covering landfills (final restoration of the landfill once the landfill is closed, capped and sealed).

Among these practices, as seen previously (see paragraph 2.5 Backfilling), only reclamation of excavated areas in construction should be considered as recovery, as it substitutes non-waste materials and would be undertaken anyway if waste was not available.

The official percentage of CDW that is backfilled on average is quite small (<6%) according to 2012 Eurostat statistics but:

- there are huge differences from one MS to another;
- the current backfilling figures seem to be underestimated, as 11 MS show no data (either Eurostat or national data) although most of them are believed to practice backfilling.

The graph below presents the percentage of CDW generated that were backfilled in 2012 in MS which data quality confidence score are high or medium. One can see that even for these countries the differences are very important.

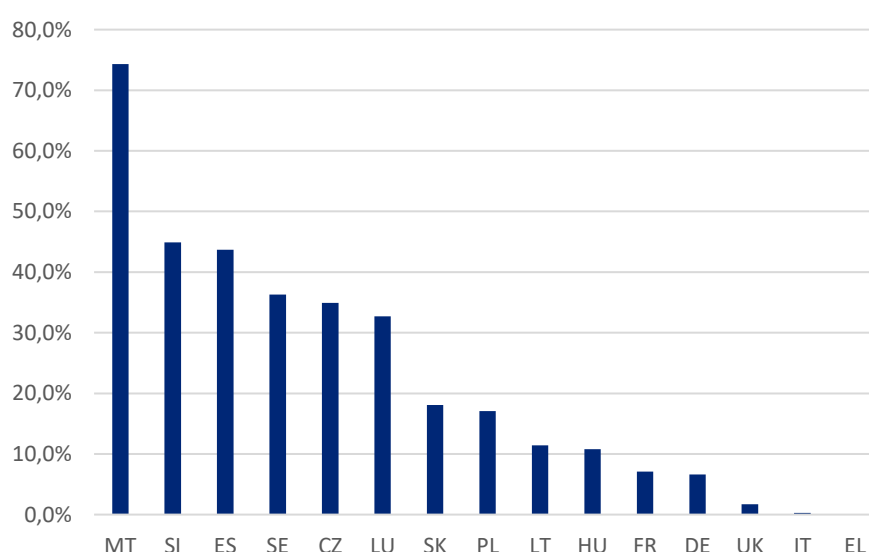


Figure 32: Backfilling (% of generated CDW), Eurostat, 2012

¹²⁸ 'Backfilling' means a recovery operation where suitable waste is used for reclamation purposes in excavated areas or for engineering purposes in landscaping and where the waste is a substitute for non-waste materials.'

Considering only these MS, which data can be considered as relatively reliable, the weighted average of backfilling would be 8.6%.

Description of the issue

The main issue is that, on the one hand, the definition of the CDW recovery target in the WFD enables MS to count the amounts backfilled into the calculation of their national CDW recovery target but on the other hand, the WFD Article 11 requires that 'Member states shall take measures to promote high quality recycling'.

And high quality recycling of inert wastes is in the production of aggregates. Hence, the inclusion of 'backfilling' of inert wastes in the 70% CDW recovery target is contrary to the primary objective of high quality recycling to quality standards. Inert CDW should be reoriented towards recycling into aggregates to make a better use of resources. At the same time, uncontaminated soils and earth – rather than CDW – should be used for backfilling operations. In addition to the resources saved, application of these materials would not be problematic from an environmental point of view.

A second issue is that, due to the confusion over the concept of backfilling, the available statistics cannot be considered as reliable. On the one hand, some MS do not report backfilling and, on the other hand, some practices that are reported as backfilling operations might in fact be disguised landfill operations.

Description of the proposed measure

If a 70% recycling target for CDW to be met by 2030 was introduced in the WFD, backfilling would be excluded from the calculation of the target. Hence, Member states would be encouraged to boost recycling, inter alia by directing inert CDW currently backfilled towards aggregate production, in order to raise their recycling rate. Inert CDW would, as a result, be replaced by soils in backfilling practices.

The analysed measure is the inclusion in the WFD of a 70% recycling target for CDW to be met by 2030. If this measure is implemented, backfilling would still be considered as a recovery operation, but it could not be included anymore in the calculation of the CDW recycling rate as per the WFD.

As seen in this report, a 70% recycling target for CDW seems achievable. This is the case for instance in The Netherlands, where more than 90% of CDW are recycled and almost 35% of total aggregate production is in recycled aggregate. Six other MS, with medium to high data confidence level, don't need backfilling to meet the WFD target, showing a recycling rate higher than 70%: Belgium, Luxemburg, Austria, Estonia, Hungary and Germany.

Assumptions and scenarios

A one-size-fits-all assessment using the abovementioned 8.6% weighted average of backfilling would not reflect reality as a majority of MS will be able to meet the target by 2030 without backfilling or would need less than 10% to meet the target. Thus, the impact of including in the WFD a 70% recycling target for CDW will be very limited in these countries.

In order to better reflect reality, MS were categorised¹²⁹ as follows:

- **Category 1:** MS where backfilling is significant and the 70% recovery target could not be met without backfilling. According to the ESTAT data for 2012, this would be the case for Spain, France, Poland, Sweden, Malta, Slovakia, Lithuania and Cyprus.
- **Category 2:** MS where backfilling rates are high, but where it seems that the 70% target could be otherwise met. According to the diagnosis of CDW management in the MS performed in Task 1 of this study, this would be the case for Ireland and Czech Republic
- **Category 3:** MS where recycling is almost non-existing and backfilling not reported. In these countries, including in the WFD a 70% recycling target for CDW target would not mean that waste formerly backfilled has to be diverted towards recycling; it would mean that CDW that is landfilled has to be diverted towards recycling. This would be the case for Finland and Greece.
- **Category 4:** MS where the 70% CDW target is already met by considering only recycling, or that will probably be in position of recycling more than 70% of their CDW by 2030. According to the ESTAT data for 2012, this would be the case for all MS that are not listed in categories 1 to 3.

¹²⁹ The categories in which the different MS may be classified are based on data (2012 Eurostat data) of variable quality and comprehensiveness. This classification may change when new Eurostat data is available.

According to the above, the CDW management practices of MS belonging to category 1 would be the ones mostly affected by the inclusion in the WFD of a 70% recycling target for CDW to be met by 2030. The tonnage of inert CDW backfilled (ESTAT data for 2012) in category 1 countries is presented below:

	CDW backfilled (Mt), 2012	% of CDW backfilled over total CDW generated, 2012	% of CDW recycled over total CDW generated, 2012
Spain	9.4	44%	29%
France	4.7	7%	55%
Poland	0.7	17%	48%
Sweden	0.5	36%	14%
Malta	0.4	74%	23%
Slovakia	0.2	18%	34%
Lithuania	0.1	11%	58%
Cyprus	0.02	15%	44%

In these countries, the inclusion in the WFD of a 70% recycling target for CDW should lead to a clear redirection of CDW currently backfilled towards aggregate production.

Assumptions

In order to analyse the potential environmental and socio-economic benefits and impacts of the inclusion in the WFD of a 70% recycling target for CDW to be met by 2030, we made the following assumptions:

- among practices currently considered as backfilling, only reclamation of excavated areas in construction would be considered as recycling;
- reclamation of excavated areas in construction represents 15% of the total CDW backfilled¹³⁰;
- X is the annual tonnage of inert CDW that is currently backfilled other than through reclamation of excavated areas in construction.
- According to above presented 2012 ESTAT data, the sum of tonnage of inert CDW currently backfilled by the 7 countries (Spain, France, Poland, Sweden, Malta, Slovakia, Lithuania and Cyprus) where backfilling is significant and the 70% recovery target could not be met without backfilling, is 16Mt. Considering that reclamation of excavated areas in construction represents 15% of the total CDW backfilled, **the maximum value of X, which is also the maximum tonnage of inert CDW that could be reoriented towards aggregate production, is 13.6Mt** (i.e. 85% of 16Mt).

Baseline scenario

In this scenario, the WFD 70% recovery objective remains unchanged, i.e. MS are still authorized to include the volumes used for backfilling into the calculation of their national CDW recovery target in 2030. This means that every year:

- X tonnes of soils are of no real use whereas they could be used to replace inert CDW in backfilling operations;
- X tonnes of inert CDW are backfilled other than through reclamation of excavated areas in construction;
- X tonnes of natural aggregate are produced, that could be replaced by recycled aggregate.

Alternative scenario

In this scenario, a 70% recycling target for CDW to be met by 2030 is included in the WFD, which excludes backfilling from the calculation of the target. Hence, it is assumed that MS that are currently reaching the 70% target by recycling CDW continue to do so and that for those MS that currently use backfilling to reach the recovery target, backfilling is progressively replaced by recycling to meet the 70% recycling target in 2030. This means that every year:

- a sufficient amount of soils is available to replace inert CDW in backfilling practices other than reclamation of excavated areas in construction;
- X tonnes of inert CDW are redirected towards aggregate production;
- as a result, X tonnes of natural aggregate are saved.

¹³⁰ This figure is a rough estimate based on the stakeholders interviews performed during this study.

Analysis and results

Analysis

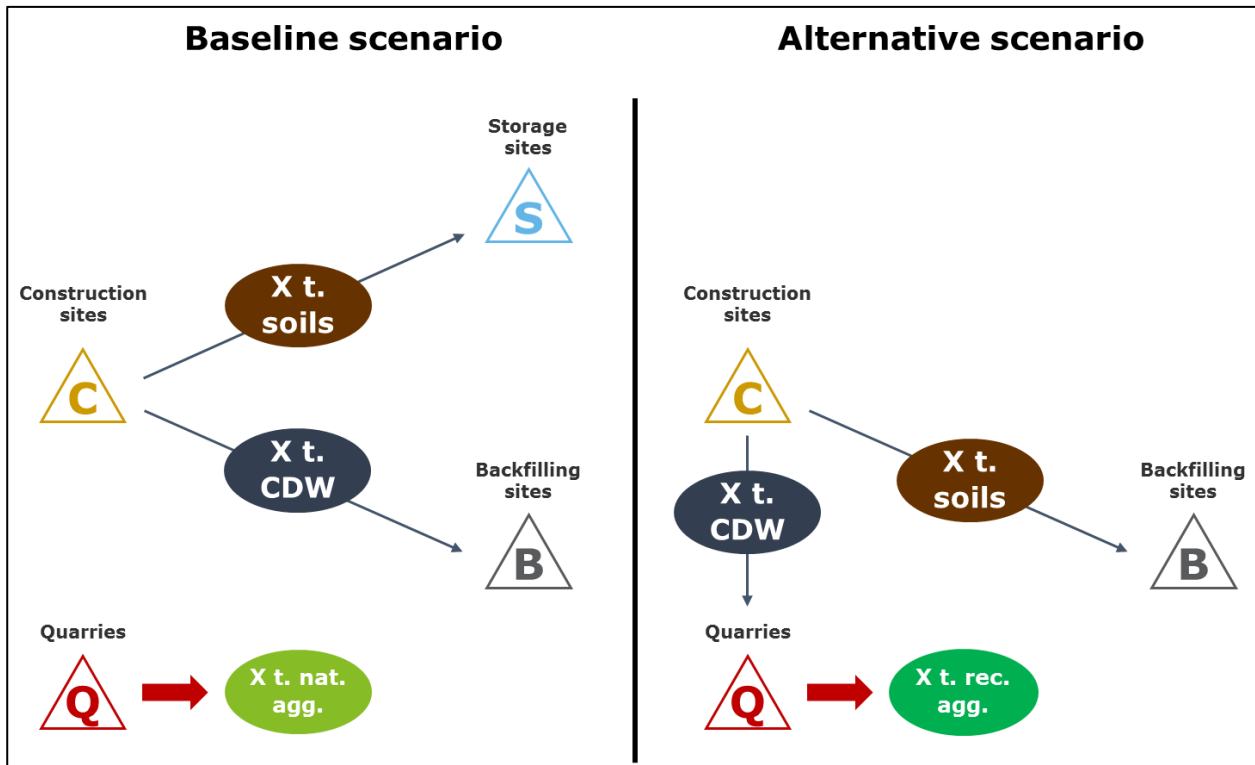


Figure 33: Schematic representation of the baseline scenario and the alternative scenario

- In baseline scenario, X tonnes of soils are stored, which is not the case in alternative scenario. Both socio-economic and environmental impacts of this storage operation are considered negligible.
- It is considered that impacts related to transport cancel each other out:
 - In both scenarios, X tonnes of materials are transferred to backfilling sites.
 - The transport of X tonnes of soils to storage sites in baseline scenario is replaced by the transport of X tonnes of CDW to quarries in alternative scenario. The distances are expected to be similar in both cases.
- The same amount of materials (X tonnes of inert CDW in the baseline scenario and X tonnes of soils in the alternative scenario) is backfilled in both scenarios. Socio-economic and environmental of these backfilling operations are considered the same.
- As regards socio-economic and environmental impacts, **the major difference between both scenarios is that in X tonnes of inert CDW are recycled into aggregate, while in baseline scenario, whereas in the baseline scenario X tonnes of natural aggregate are produced.** The socio-economic and environmental impacts of producing X tonnes of recycled aggregate, compared to the production of X tonnes of natural aggregate are summarised in the below table.

Results

Impact type	Qualitative impact	Max. annual quantitative impacts*	Comments
Economic and social impacts			
Administrative costs	0		Recycling inert CDW instead of backfilling them and producing the same amount of natural CDW would not have significant effects on costs or employment: <ul style="list-style-type: none"> ○ Impacts related to transport cancel each other out ○ Administrative and operative costs, as well as employment, are considered to be very similar between natural and recycled aggregate production
Operating costs	0		
Transport	0		
Impact on the recycled aggregates market	+		
Employment	0		
			The main socio-economic impact would be the strengthening of the recycled aggregates market.

Impact type	Qualitative impact	Max. annual quantitative impacts*	Comments
Environmental impacts			
Savings of natural aggregates	++	13.6 Mt	13.6 Mt is the annual tonnage of inert CDW that is currently backfilled other than through reclamation of excavated areas in construction and that could be reoriented towards aggregate production (see above).
Energy consumption (transport and production)	+ / ++	55 GWh ¹³¹	The production of 1t of recycled aggregate requires 23% less energy than 1t of natural aggregate ¹³² .
Soil pollution	+		Inert CDW has a high chance of containing hazardous substances. This is confirmed for instance in The Netherlands, where "backfilled" C&DW that was used under roads for years, now presents a nation wide problem of diffuse asbestos contamination ¹³³
GHG emissions	0	6,222 teCO ₂	The production of 1t of recycled aggregate emits 18% more CO ₂ e than 1t of natural aggregate ¹³⁴ . However, this difference is highly dependant on hypothesis taken for transportation, which may vary significantly depending on the local distances. In any case, the total impact is insignificant.

* This column presents the impacts occur if all inert CDW that are currently backfilled, other than through reclamation of excavated areas in construction, in the 7 countries (Spain, France, Poland, Sweden, Malta, Slovakia, Lithuania and Cyprus) where backfilling is significant and the 70% recovery target could not be met without backfilling, were reoriented towards aggregate production.

The main impacts of the inclusion in the WFD of a 70% recycling target for CDW to be met by 2030 would be the following

- The greatest environmental benefits are with the savings of natural resources, although it should be noted that in the best-case scenario, the savings of natural aggregates (15 Mtonnes) represent only a few percents of the annual aggregates production in Europe¹³⁵. Recycled aggregate meeting quality standards will find a market without being a threat to natural aggregate market.
- Energy savings might be very important as well, depending on the distance between the recycling site and the construction site.
- Positive impacts on soil pollution would occur as there would be no more putting in or on soil of waste with an unknown environmental impact (untreated C&DW has a important chance of containing hazardous substances).
- Potential savings in terms of GHG emissions are insignificant, due to the low GHG intensiveness of aggregates (in the order of 2 – 3 kgCO₂ per tonne of aggregates)

This measure would be a costless and strong signal to the construction and demolition sector, discouraging backfilling and significantly enhancing the recycled aggregates market.

¹³¹ Based on the assumption that the production of 1t of recycled aggregate requires 13.17 kWh of primary energy versus 17.20 kWh for 1t of natural aggregate (these values come from the report mentioned in the following footnote). The difference (4,03 kWh) was then multiplied by 13.6 Mt.

¹³² Réalisation de bilans des émissions de gaz à effet de serre - Guide sectoriel ADEME 2012 : Carrières de granulats et sites de recyclage, ADEME, 2012

¹³³ Pointed out by the Fédération Internationale du Recyclage (FIR)

¹³⁴ Based on the assumption that the production of 1t of recycled aggregate emits 2.96 kgCO₂ versus 2.50 kgCO₂e for 1t of natural aggregate (these values come from the report mentioned in the previous footnote). The difference (0.46 kgCO₂e) was then multiplied by 13.6 Mt.

¹³⁵ Union Européenne des Producteurs de Granulats, http://www.uepg.eu/uploads/Modules/Publications/uepg-ar2016-17_32pages_v04_small.pdf

7.2.2. Pre-demolition and renovation audits and selective demolition

Current situation

Pre-demolition and renovation audits definition and current situation

As defined by the European Commission in the EU C&D waste management protocol, pre-demolition / pre-renovation audits consist in a preparatory activity with the purpose of collecting information about the qualities and quantities of the C&D waste materials that will be released during the demolition or renovation works and giving general and site-specific recommendations regarding the demolition process. It is a key step to identifying the reusable and recyclable materials. It can also contribute to making the right decision regarding the separation of materials. This preliminary step provides all the stakeholders involved in the decommissioning, deconstruction and demolition process with important information on the existing building. Opportunities for reusing and recycling may then be identified and assessed based on specific details given on the quantities and the accessibility of building materials.

According to this study and a study assigned by DG Grow with regard to the Development of Specific Tools and/or Guidelines for Assessment of Construction and Demolition Waste Streams prior to Demolition or Renovation of Buildings and Infrastructures¹³⁶, the following countries have introduced them in their legislation: Austria, Bulgaria, the Czech Republic, Finland, France, Hungary, Luxembourg, The Netherlands, Romania¹³⁷, Spain, and Sweden. Other countries have limited application of such audits (voluntary or regulated regionally): Belgium, Denmark, Germany, Ireland, Italy, Slovakia and the UK.

However, carrying out such an audit does not necessarily result in increased reuse, especially where the rationale behind is the identification of hazardous substances. If a common approach was adopted, whereby a third party conducted the audit and certain levels of reuse were identified and measured against, this might have a positive effect. Subsequent linking with recertification and a suitable market demand would add weight to such audits. Another condition for such audits to have an impact is to link these audits with a sorting (on-site, i.e. selective demolition, or on a sorting facility).

Selective demolition requirement definition and current situation

Selective demolition consists in sorting materials on-site during the demolition phase. Most MS apply this practice to separate hazardous materials and only a limited number of MS sort other materials. The on-site separation can encourage on-site reuse. It also facilitates the distinction of different treatment solutions according to each material, which may improve recycling.

According to our research, Germany, Greece, Spain (Basque Country), Finland and Luxembourg have implemented selective demolition obligations.

In France, some examples were studied under Democles project. For instance, the remediation of a hotel was performed according to the following criteria:

- Definition of the project:
 - Demolition of floors covers
 - Demolition of light walls
 - Demolition of walls covers and ceilings
 - Demolition of the bathrooms
 - Evacuation of the equipments
- Waste were sorted into 3 containers: woods, inert waste, non hazardous waste
- Recycling options:
 - Wood waste is recycled into wood panels.
 - Non hazardous waste, collected as a mix, was sent to a sorting facility that separates paper, cardboard, plastics according to their colours and characteristics, gypsum, inert waste, and polystyrene, wood, iron, other metal. The resulting recovering rate is over 78%.
- 77% of the collected waste was recovered.

It should be noted that sorting can also be done in a sorting facility outside of the demolition or construction site. Both actions can also be complementary as shown during the above quoted example in the context of the Democles project. The main objective of these actions is to separate the materials and therefore to facilitate their reuse or recycling by ensuring a better quality.

¹³⁶ Study in progress by VTT, Tecnalia and RPA – Information shared from the first progress report – July 2016

¹³⁷ According to the information gathered by VTT, Tecnalia and RPA, the national regulation of predemolition and prerenovation audits remains questionable in Romania.

Suggested measure: Requiring certain levels of separation, reuse and recycling, based on the results of a pre-demolition/pre-renovation audits could lead to a significant increase of reuse and recycling, enhancing the quality of the sorted materials.

Description of the issue

- Pre-demolition and renovation audits are not applied with a common framework across the EU. Some MS limit the pre-demolition and renovation audit to the identification of hazardous wastes.
- Pre-demolition and renovation audits may increase recycling if they are performed with a sufficient level of details. As mentioned in the EU C&D waste management protocol, it takes full account of local markets for C&D waste and re-used and recycled materials, including the available capacity of recycling installations.
- There are also some issues regarding timing and responsibility:
 - Should the pre-demolition and renovation audit be performed before identifying the contractors in charge of the project? Indeed, if the audit is performed prior to the identification of the contractors, it may help building owners with setting performance levels for demolition contractors, support a site-specific waste management plan, demonstrate environmental credentials, increase material and labour efficiency, reduce waste and maximise profit.¹³⁸ The audit should thus be performed as part of the project planning.
 - Do contractors have interest in the result of such an audit? The audit's results should be shared with contractors to help them with identifying the best route for each waste stream and adapt their work accordingly. As recommended in the "Technical and Economic Study with regard to the Development of Specific Tools and/or Guidelines for Assessment of Construction and Demolition Waste Streams prior to Demolition or Renovation of Buildings and Infrastructures" carried out by DG-Grow, should involve all the stakeholders: property owner, authority, auditor, contractor, waste manager and products manufacturer.
 - Should the result of such an audit have an impact on the requirements regarding reuse and recycling? How can these requirements be implemented? As recommended in the study with regard to the Development of Specific Tools for Assessment of Construction and Demolition Waste Streams prior to Demolition or Renovation, the audit's report may include information on the reusability of the materials as well as waste management recommendations.
 - Should it depend on the localisation of the project and the opportunities for recycling and reuse in the area? Indeed, one of the key objective of predemolition and prerenovation audits is to adapt the waste management according to the specificity of the project, including its localisation. As a matter of fact, the audit should include an assessment of the possible waste route per material as well as an estimated cost of waste management process based on the local recycling and reuse opportunities. Moreover, the audit should also take into account local legislation on waste management.
- Selective demolition can efficiently be performed if a pre-demolition and renovation audit has been performed.
- Recycling may be efficient only if the materials are properly sorted.
- Selective demolition is relevant as soon as there are specific reuse or recycling activities identified per waste stream.
- Some key questions are:
 - To what extent should selective demolition be defined? Is there any pre-requisite depending on the results of the pre-demolition and renovation audit? Indeed, it seems important to sort at least hazardous materials and materials with a high potential for recycling, such as metal. Relevant thresholds should be defined so that only materials in sufficient quantity to be efficiently managed are sorted.
 - Should it depend on the localisation of the project and the opportunities for recycling and reuse in the area? From a cost-effective point of view, it is important to take into account the localisation of the project and the opportunities for recycling and reuse in the area. However incentive could be defined depending on the reuse and recycling rates so that the demolition or renovation project is designed to optimize these rates.
 - Does it matter if the sorting is done on-site or on a sorting facility? The answer may be different if a renovation or a demolition project is taken into account: in the case of a renovation project, on-site sorting may facilitate the on-site reuse of material and should thus probably preferred.

¹³⁸ BRE Smartwaste, 2015, <https://www.smartwaste.co.uk/page.jsp?id=30>

Description of the measure

Considering the previously detailed issue, a number of questions should be addressed when considering the implementation of a measure on predemolition/prenovation audits and selective demolition. However, and in order to assess the potential impacts of predemolition audits and selective demolition, we have here defined such a measure as follows:

- Mandatory pre-demolition and renovation audits that enable to quantify each material (glass, metal, concrete, plastic, etc.):
 - Such audits would be performed prior to the demolition or renovation project by an independent third-party, mandated by the owner of the project;
 - As described in the study with regard to the Development of Specific Tools for Assessment of Construction and Demolition Waste Streams prior to Demolition or Renovation, such audits should include:
 - Desk study (based on the available documentation on the building, the site and the area);
 - Site visit (to complete the information gathered in the desk study, in order to perform the inventory);
 - Inventory of materials and elements (type of materials, quantification and possibly location, quality and reusability);
 - Management recommendations (recommended waste diversion, recommended on-site sorting activities, valorisation, estimated cost of waste management, recommendations regarding possible precautions): while the study with regard to the Development of Specific Tools for Assessment of Construction and Demolition Waste Streams prior to Demolition or Renovation considers this step optional, we identify this step as essential to help defining the accurate selective demolition on a case by case basis;
 - Reporting (audit report, including scope of the audit, summary of the audit, inventory of materials and element, waste management recommendations);
 - Quality checking (auditor skills and certifications, traceability).
 - The audits would conclude on the relevant separation level as well as on reuse and recycling requirements/recommendations. The results would be made available to all the involved stakeholders (property owner, authority, auditor, contractor, waste manager, products manufacturer).
 - Additional assessments should also be performed during the demolition/renovation and the waste management plan amended according to any unexpected substances or materials identified.
- Together with mandatory selective demolition or sorting on a sorting facility:
 - Depending on the results of the pre-demolition and renovation audit, a selective demolition is required in order to separate the materials according to the best treatment option available (different fractions of non-inert waste would be separated such as gypsum, wood, plastic, metal and glass);
 - Sorting may also be performed in a sorting facility, with specific requirements on the sorting performances to ensure the quality of the sorted materials.

This measure would improve the quality of materials available on demolition sites and therefore the quality of materials available for recycling activities such as aggregates.

Impact assessment

In order to analyse the potential environmental and socio-economic benefits and impacts of the implementation of mandatory pre-demolition and renovation audits and selective demolition, the following assumptions were made:

- Management of hazardous CDW would most probably be impacted: even though these waste streams are deemed to be already managed separately, the measure would probably facilitate the identification of hazardous waste and enhance their separated management. Indeed, as shown in this study, declared quantities of hazardous CDW seem very low for some countries. The following assumptions are taken:

Region	Generated CDW (Mtonnes) ¹³⁹	Baseline scenario		Optimised scenario	
		Mtonnes of hazardous CDW ¹³¹	% of hazardous CDW ¹³¹	% hazardous CDW ¹⁴⁰	Mtonnes of hazardous CDW ¹³²
Nordic region ¹⁴¹	197	8	4%	7%	14
Mediterranean region ¹⁴²	136	1,6	1%	5%	6,8
Eastern region ¹⁴³	16	0,3	2%	5%	0,8
Total	350	10			22

- Impact of transportation is not considered as it might be very different depending where the site is located;
- The recycling rates of inert waste as well as non-inert waste would be optimized and the following assumptions are taken:

Waste types	Generated CDW (Mtonnes)	Baseline scenario		Optimised scenario	
		% recycled	Mtonnes recycled	% recycled	Mtonnes recycled [AC11]
Inert waste ¹⁴⁴	315	50%	158	80%	252
Non inert waste					
Metallic waste ¹⁴⁵	15,6	80%	12,5	95%	14,82
Glass waste ¹⁴⁶	1,56	6%	0,0936	50%	0,78
Plastic waste ¹⁴⁷	1,56	25%	0,39	50%	0,78
Wood waste ¹⁴⁸	5,46	30%	1,64	50%	2,73
Gypsum waste ¹⁴⁹	2,34	10%	0,23	20%	0,468

Results

Impact type	Potential impacts	Explanation (more details below)
Economic and social impacts		
Administrative costs	-	Enforcement of predemolition audits would require administrative costs.
Operating costs	0	According to existing experiences, operating costs for selective demolition would be compensated by the separated materials value.
Transport	-	Depending on the localisation of the site, transportation cost could be higher, as materials

¹³⁹ Data based on the current study results

¹⁴⁰ The optimized scenario hazardous waste rates are estimated as follow: for the Eastern and Mediterranean regions, the highest rate of hazardous waste observed in the current study are taken into account and for the Nordic region, the highest rate is also considered, excluding Sweden (15%) and Denmark (9%) that are particularly high.

¹⁴¹ Nordic region countries: Austria, Belgium, Denmark, Finland, Germany, Ireland, Luxembourg, Netherlands, Sweden, United Kingdom

¹⁴² Mediterranean region countries: Croatia, Cyprus, France, Greece, Italy, Malta, Portugal, Spain

¹⁴³ Eastern region countries : Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia

¹⁴⁴ It is considered that 50% of inert CDW is currently recycled, estimate based on data available from the current study

¹⁴⁵ It is considered that 60% of non-inert waste are composed of metallic waste and that 80% of these waste is currently recycled, estimate based on data available from the current study and based on recycling rates presented in "Circular economy potential for climate change mitigation" - Deloitte - November 2016. The optimized scenario as well as the baseline scenario hypothesis were validated with Eurofer, The European Steel Association

¹⁴⁶ It is considered that 6% of non-inert waste are composed of glass waste and that 6% of these waste is currently recycled, estimate validated with Glass for Europe

¹⁴⁷ It is considered that 6% of non-inert waste are composed of plastic waste and that 25% of these waste is currently recycled, estimate based on data available from the current study, from "Increased EU Plastics Recycling Targets: Environmental, Economic and Social Impact Assessment" - Deloitte for Plastic Recyclers Europe – 2015 and recycling rate validated with the European Council of Vinyl Manufacturers

¹⁴⁸ It is considered that 21% of non-inert waste are composed of wood waste and that 30% of these waste is currently recycled, estimate based on data available from the current study and based on recycling rates presented in "Circular economy potential for climate change mitigation" - Deloitte - November 2016

¹⁴⁹ It is considered that 9% of non-inert waste are composed of gypsum waste and that 10% of these waste is currently recycled, estimate based on Gypsum to Gypsum Life Project, EuroGypsum – 2016. The optimized scenario as well as the baseline scenario hypothesis were validated with Eurogypsum

Impact type	Potential impacts	Explanation (more details below)
		would be transported in different recycling facilities and/or separating facilities.
Impact on the recycled CDW markets	++	Higher amount of materials suitable for recycling would be available in better quality.
Employment	+	Increasing the separation and recycling activities may create jobs.
Hazardous waste management costs	++	12 Mt of hazardous waste would be identified, sorted and should be managed according to the local regulation. Additional cost would come from the management of these wastes, estimated to 15 billion euros ¹⁵⁰ . However, this additional cost will be partly compensated by the higher quality of other fractions and therefore their recyclability.
Environmental impacts		
Savings of natural aggregates	+	95 Mtonnes of natural aggregates could be saved ¹¹³
Energy consumption	++	800 TJ of energy savings
GHG emissions	++	The potential reduction of global warming is estimated at 730 t eq CO ₂
Avoided negative effects due to safe management of hazardous fractions	+	The measure would enhance the separation of hazardous fractions.

The main conclusions of an implementation of mandatory pre-demolition and renovation audits and selective demolition are as follows:

- Administrative costs would be necessary to implement the measure, define the associated requirements, control the correct implementation of the measure and ensure the traceability of each material.
- As mentioned in the study with regard to the Development of Specific Tools for Assessment of Construction and Demolition Waste Streams prior to Demolition or Renovation, it is relatively difficult to estimate the cost of the audit process itself, but it is considered to be below 5% of the whole demolition and treatment process activities. As an example, a predemolition audit of a residential house in the UK would cost around 4€/m², that is to say 1600€ for a 4-family house of 400m²;
- As observed in the Gypsum to Gypsum pilot projects, operating including transport costs would be compensated by the benefits from the materials separated and sold for recycling and the reduced costs for landfilling: in the example of a pilot project within the GtoG project, the outlet costs were 50% lower for separated waste than mixed waste (0,48€/m² compared to 0,95€/m² that is to say an economy of 190€ for a 4-family house of 400m²);
- The measure would most probably create employment within the CDW management sector as well as within the recycling industry. Even though no detailed information on the direct impact of such a measure on employment is available, it is clearly demonstrated that countries that practice selective demolition (mandatory or not) have an efficient CDW management, reaching high recycling rates and having a strong recycling CDW industry (Netherlands, Flanders in Belgium). Indeed, selective demolition encourage CDW recycling per waste stream and can thus impact positively the recycling industry. Moreover, predemolition/prerenovation audits would create employments among audit and certification companies;
- The main economic impact would possibly come from the management of additional hazardous waste quantities: given the hypothesis taken above, the additional cost could be of 15 billion euros¹⁵¹. However this additional cost would be partly compensated by a higher quality of other separated materials which will facilitate their valorisation;

¹⁵⁰ According to a study on hazardous waste led by the European Commission in 2002, hazardous waste treatment costs go from 0.42€/kg to 2.2€/kg. We thus considered an average cost of 1.3€/kg.

¹⁵¹ According to a study on hazardous waste led by the European Commission in 2002, hazardous waste treatment costs go from 0.42€/kg to 2.2€/kg. We thus considered an average cost of 1.3€/kg.

- The greatest environmental benefits are with the savings of natural resources, although it should be noted that in the optimised scenario, the savings of natural aggregates (95 Mtonnes¹⁵²) represent only a small fraction of the annual aggregates production in Europe¹⁵³;
- Energy and GHG emissions savings appear to be important as the energy consumption for recycling is largely compensated by the positive impact of the substitution of raw material: the potential reduction of global warming is estimated at 560 t eq CO₂ and the potential energy saving is estimated at 700 TJ. These potential impacts were estimated based on the assumptions presented above on the recycling CDW amounts per materials for both the baseline and optimized scenarii. Energy consumption ratios and emissions factors were applied based on the following life-cycle-analysis inventory:

Waste types	Life-cycle-analysis inventory
Inert waste	Ecoinvent v3 - Waste reinforced concrete, treatment of, recycling, CH, infra (kg)
Metallic waste	Ecoinvent v3 - Steel, low-alloyed, steel production, electric, low-alloyed, RER, infra (kg) Ecoinvent v3 - Aluminium, wrought alloy, treatment of aluminium scrap, new, at remelter, RER, infra (kg) Ecoinvent v3 - Copper, treatment of scrap by electrolytic refining, RER, infra (kg)
Glass waste	Ecoinvent v3 - Glass cullet, sorted, treatment of waste glass from unsorted public collection, sorting, RER, infra (kg)
Plastic waste	BIO – Recycled PET, RER, kg
Wood waste	Ecoinvent v3 - Wood chipping, industrial residual wood, stationary electric chipper, GLO, infra (kg)
Gypsum waste	Ecoinvent v3 - Waste gypsum plasterboard, treatment of, recycling, CH, infra (kg)

Suggested implementation conditions

In order to facilitate the implementation of such a measure, a tiered introduction could be chosen lowering progressively the threshold to ensure a smooth introduction (the suggested thresholds should be submitted during a consultation phase of involved stakeholders if such a measure was to be defined):

- Size: big buildings (above 1000m² in a first phase and extend to buildings above 200m² in a second phase) could first be considered as the potential benefits would be higher;
- Age: more recent buildings for which more information may be available on the materials could be first considered;
- Materials: a list of substances to be identified in the predemolition audit and to be sorted during the demolition process could be defined and adjusted to cover progressively more substances and materials; in a first phase, consider sorting hazardous materials as well as metals and in a second phase, add glass, wood and plastic; a minimum quantity (such as 100 tonnes for a given material as defined in the Austrian standard ÖNORM B 3151) could be set from which sorting would be compulsory;
- Treatment options: recycling could be mandatory for substances that would meet a certain level of quality based on standards defined by the industry; regional obligations could be set up depending on the available treatment facilities.

Such a measure should clearly define:

- Level of details required in the predemolition audit: the measure should specify the substances to be identified by the predemolition audit. The list of substances could be implemented progressively. It could also specify different materials depending on the construction year and the type of building;
- Separation requirements: the measure should specify a minimum list of materials to be separated and define specific criteria (materials that can be easily recycled, substances that deteriorate the quality of recycling materials, available treatment facilities, etc.).

¹⁵² Based on a total inert CDW generated quantity of 315 Mtonnes and a recycling rate of 50% in the baseline scenario and 80% in the optimized scenario

¹⁵³ Union Européenne des Producteurs de Granulats, http://www.uepg.eu/uploads/Modules/Publications/uepg-ar2016-17_32pages_v04_small.pdf

As described in the study with regard to the Development of Specific Tools for Assessment of Construction and Demolition Waste Streams prior to Demolition or Renovation, such audits should include:

- Desk study (based on the available documentation on the building, the site and the area);
- Site visit (to complete the information gathered in the desk study, in order to perform the inventory);
- Inventory of materials and elements (type of materials, quantification and possibly location, quality and reusability);
- Management recommendations (recommended waste diversion, recommended on-site sorting activities, valorisation, estimated cost of waste management, recommendations regarding possible precautions): while the study with regard to the Development of Specific Tools for Assessment of Construction and Demolition Waste Streams prior to Demolition or Renovation considers this step optional, we identify this step as essential to help defining the accurate selective demolition on a case by case basis;
- Reporting (audit report, including scope of the audit, summary of the audit, inventory of materials and element, waste management recommendations);
- Quality checking (auditor skills and certifications, traceability).

The Austrian Recycled Construction Materials Ordinance that defines requirements to be fulfilled during demolition such as examining for any contaminants and undesired substances that may remain, and the orderly and recovery-oriented dismantling of buildings may be taken as an example:

- Enforcement: published on 29 June 2015 it entered into force on 1 January 2016;
- Only for some demolition projects: examinations for contaminants and undesirable substances are obligatory in cases where the total demolition material amounts is above 100 tonnes and more comprehensive pre-examinations are only required for building volumes of over 3,500 cubic metres;
- List of covered substances: this ordonnance focuses on substances that may affect the quality of recycled materials, such as various forms of asbestos, PFCs and HFCs in foam insulation, tar, and PCB-containing sealants.

8. Appendices

8.1. Appendix A – EWC_Stat and ELoW codes

EWC Stat codes

The proxy used to represent the amounts of CDW generated in each Member State based on EWC_Stat codes includes the following codes and NACE Rev. 2 activities:

- generated by the NACE Rev. 2 Section F (construction sector): W061, W062, W063, W071, W074 and W075;
- total of waste category W121 across all activities (all NACE Rev.2 sectors).

In addition, EWC-Stat codes W077 and W12B generated by Section F (construction sector) of the NACE Rev.2, which are not considered in the target calculation method of Commission Decision 2011/753/EU, were also analyzed in order to consider wastes containing PCB and asbestos that come from the C&D activities. Table 40 presents and defines these different waste types of the target calculation suggested definition.

Table 40: Waste types (EWC-Stat codes) considered in the CDW target calculation suggested definition

Waste type (EWC-Codes)	NHAZ	HAZ	Aggregated codes (before 2010)	Description
W061	Metallic wastes, ferrous	/	W06	Metallic wastes
W062	Metallic wastes, non-ferrous	/		
W063	Metallic wastes, mixed ferrous and non-ferrous	/		
W071	Glass wastes	Glass wastes	W071	Glass wastes
W074	Plastic wastes	/	W074	Plastic wastes
W075	Wood wastes	Wood wastes	W075	Wood wastes
W077	/	Wastes containing <u>PCB</u>	W077	Wastes containing PCB
W12B (12.2 + 12.3 + 12.5)	Other mineral wastes (excl. C&D waste, combustion wastes, soils, dredging spoils, waste from waste treatment)	Other mineral wastes (excl. C&D waste, combustion wastes, soils, dredging spoils, waste from waste treatment) → containing <u>asbestos</u>	W12 ¹⁵⁴ (12.1 + 12.2 + 12.3 + 12.5)	Mineral wastes (excluding combustion wastes, contaminated soils and polluted dredging spoils)
W121	Mineral wastes from construction and demolition	Mineral wastes from construction and demolition		

¹⁵⁴ Which is equivalent to waste code W12A from the Manual on waste statistics Eurostat, *Manual on Waste Statistics, A Handbook for Data Collection on Waste Generation and Treatment* (Luxembourg: European Commission, 2013), p. 150 (p. 127) <<http://ec.europa.eu/eurostat/documents/3859598/5926045/KS-RA-13-015-EN.PDF/055ad62c-347b-4315-9faa-0a1ebcb1313e?version=1.0>>.

ELoW codes and corresponding EWC-Stat Codes

ELoW code	ELoW label	EWC-Stat code	Target calculation suggested definition*	Codes to be considered in CDW treatment data of target calculation*
17	CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)			
17 01	concrete, bricks, tiles and ceramics			
17 01 01	Concrete	W121	x	x
17 01 02	Bricks	W121	x	x
17 01 03	tiles and ceramics	W121	x	x
17 01 06*	mixtures of, or separate fractions of concrete, bricks, tiles and ceramics containing hazardous substances	W121	x	
17 01 07	mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	W121	x	x
17 02	wood, glass and plastic			
17 02 01	Wood	W075	x	x
17 02 02	Glass	W071	x	x
17 02 03	Plastic	W074	x	x
17 02 04*	glass, plastic and wood containing or contaminated with hazardous substances	W121	x	
17 03	bituminous mixtures, coal tar and tarred products			
17 03 01*	bituminous mixtures containing coal tar	W121	x	
17 03 02	bituminous mixtures other than those mentioned in 17 03 01	W121	x	x
17 03 03*	coal tar and tarred products	W121	x	
17 04	metals (including their alloys)			
17 04 01	copper, bronze, brass	W062	x	
17 04 02	Aluminium	W062	x	
17 04 03	Lead	W062	x	x
17 04 04	Zinc	W062	x	x
17 04 05	iron and steel	W061	x	x
17 04 06	Tin	W062	x	x
17 04 07	mixed metals	W063	x	x
17 04 09*	metal waste contaminated with hazardous substances	W102		
17 04 10*	cables containing oil, coal tar and other hazardous substances	W102		
17 04 11	cables other than those mentioned in 17 04 10	W062	x	x
17 05	soil (including excavated soil from contaminated sites), stones and dredging spoil			
17 05 03*	soil and stones containing hazardous substances	W126		
17 05 04	soil and stones other than those mentioned in 17 05 03	W126		
17 05 05*	dredging spoil containing hazardous substances	W127		
17 05 06	dredging spoil other than those mentioned in 17 05 05	W127		
17 05 07*	track ballast containing hazardous substances	W121	x	
17 05 08	track ballast other than those mentioned in 17 05 07	W121	x	x
17 06	insulation materials and asbestos-containing construction materials			
17 06 01*	insulation materials containing asbestos	W12B	xx	

17 06 03*	other insulation materials consisting of or containing hazardous substances	W121	x	
17 06 04	insulation materials other than those mentioned in 17 06 01 and 17 06 03	W121	x	x
17 06 05*	construction materials containing asbestos	W12B	xx*	
17 08	gypsum-based construction material			
17 08 01*	gypsum-based construction materials contaminated with hazardous substances	W121	x	
17 08 02	gypsum-based construction materials other than those mentioned in 17 08 01	W121	x	x
17 09	other construction and demolition wastes			
17 09 01*	construction and demolition wastes containing mercury	W121	x	
17 09 02*	construction and demolition wastes containing PCB (for example PCB-containing sealants, PCB-containing resin-based floorings, PCB-containing sealed glazing units, PCB-containing capacitors)	W077	xx*	
17 09 03*	other construction and demolition wastes (including mixed wastes) containing hazardous substances	W121	x	
17 09 04	mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03	W121	x	x

* target calculation suggested definition as defined in Commission Decision 2011/753/EU¹⁵⁵ for amounts of waste generated, also including two additional waste streams (W077 and W12B) in order to cover specific hazardous waste streams in the data quality analysis. These two waste streams are indicated with two crosses (xx).

**Waste codes that are considered for the calculation of materially recovered amounts of CDW (numerator of the target of WFD) in Commission Decision 2011/753/EU. Note that the target also includes a series of other codes, if these wastes are generated in the C&D sector: 19 12 01, 19 12 02, 19 12 03, 19 12 04, 19 12 05, 19 12 07, 19 12 09.

¹⁵⁵ EC, Commission Decision of 18 November 2011 Establishing Rules and Calculation Methods for Verifying Compliance with the Targets Set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council.

8.2. Appendix B – CDW management maturity matrix

Levels of CDW practice expected for each level of maturity

CDW practice	Level 1 Initial	Level 2 Developing	Level 3 Implemented	Level 4 Improving and optimising
Waste management Legislation	No specific CDW legislation (or waste legislation that specifically applies to CDW)	Development of specific CDW legislation	CDW legislation established	CDW legislation, reviewed and updated Focusing on higher levels in waste hierarchy
Landfill management and diversion	Illegal landfill No policy for diversion of waste from landfill	Development of landfill diversion policies Most landfills managed adequately	Well managed landfills Landfills decreasing in number	Established landfill bans Small number of landfills
Waste policy and strategy	Waste policy/strategy not specific to CDW Only undertaken due to WFD requirements	Waste policy/strategy specific to CDW but limited implemented	Waste policy/strategy specific to CDW fully implemented	Waste policy/strategy specific to CDW developed and optimised
Fiscal measures	No fiscal measures in place (Landfill tax, Aggregates Levy etc.)	Landfill Tax in place Unlikely to change market conditions	Landfill Tax implemented, enforced Aggregates Levy (or similar) being developed	Landfill Tax increasing Aggregates Levy developed and implemented
Enforcement	No/limited enforcement Limited legislation Lack of resources Lack of clear responsibilities	Limited enforcement Legislation covering enforcement Poorly resourced Responsibilities defined but not could be ambiguity	Adequate enforcement Legislation covering enforcement providing a high level deterrent Clearly defined responsibilities	High level of enforcement Adequately resourced Innovative approaches Data collected and reviewed
CDW treated – Country performance	0-50 %	60-65 % Backfilling	65-85 % Backfilling	>85 % Backfilling
Reused and recycled materials	None or very small market for recycled materials (aggregates) No specifications	Limited market for recycled materials (aggregates) but is starting to develop Specifications starting to be developed	Established market for aggregates Markets being developed for other CDW materials Market is being developed Starting to look at reclaimed materials Guidance for use of materials available	Mature/ Established market for recycled materials (aggregates and other materials) Moving towards 'upcycling' High take up of specifications/guidance Common/ standard practice R&D
End of Waste criteria	No EoW criteria Limited/no reference to the of EC end of waste criteria	Starting to develop end of waste criteria specific to CDW Some reference to use of EC end of waste criteria	End of waste criteria for CDW established	End of waste criteria for CDW established, reviewed and being improved
Green Public Procurement	None or very limited use of GPP (e.g. one off's)	Limited use of GPP Limited use (industry driven) of existing standards e.g. BREEAM/Lead (industry driven)	Requirements for GPP by national/regional Governments but not reviewed Private sector showing greater levels of use of industry standards	GPP being reviewed, updated and improved Large scale use of standards
Waste management infrastructure	Infrastructure is largely landfill	Starting to develop CDW recycling infrastructure Publically supported Limited geographical spread	Established CDW infrastructure Adequate geographical spread Mostly private funded and owned	Nearly complete geographical coverage Mature infrastructure Privately funded Innovative processes
Waste prevention	Nothing being undertaken for CDW prevention CDW not included in WPP	CDW covered in WPP Very limited action on CDW prevention Publically funded initiatives	CDW covered in WPP with clear objectives and targets Industry developing waste prevention initiatives	Targets set for CDW prevention and being reached Policies to support CDW prevention in place
CDW Hazardous waste	Requirement to separate CDW hazardous waste	Developing hazardous waste policies which include CDW	Implementing hazardous waste policies and plans which include CDW	Reduction in hazardous waste Dealing with legacy wastes
Waste data		As per ICEDD rating = poor	As per ICEDD rating = modest	As per ICEDD rating = good

Member States initial results showing which levels of maturity each MS is at for each of the CDW practice categories

Maturity Matrix CDW Practice Categories	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czech Republic	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	The Netherlands	UK
Waste management Legislation	4	3	2	2	3	1	4	2	4	4	4	3	2	4	4	1	2	4	1	2	3	1	3	2	3	3	4	4
Landfill management and diversion	2	4	1	1	1	2	4	3	4	2	3	1	3	3	3	1	1	4	1	1	2	1	2	2	2	4	4	4
Waste policy and strategy	3	4	2	2	1	3	4	3	4	2	4	1	2	4	1	2	1	3	2	2	2	2	2	1	2	4	4	4
Fiscal measures	2	3	2	1	1	3	4	3	4	2	3	2	2	4	2	2	2	4	2	2	2	2	2	3	2	4	4	4
Enforcement	2	3	1	2	1	2	3	3	2	2	3	1	1	3	2	1	1	3	2	1	1	1	1	2	2	4	4	4
CDW treated – Country performance	4	4	1	2	1	2	4	3	1	2	4	1	2	3	4	4	4	4	1	3	3	3	1	4	3	3	4	4
Reused and recycled materials	2	4	1	1	1	3	4	2	2	2	3	1	2	3	2	1	1	4	1	2	2	1	2	3	1	4	4	4
End of Waste criteria	3	3	1	1	1	2	1	1	1	3	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	4	4
Green Public Procurement	2	2	1	1	1	2	2	1	3	3	2	1	1	3	4	2	-	4	1	3	2	1	2	2	1	4	4	4
Waste management infrastructure	3	2	2	1	1	2	3	3	4	2	4	1	2	3	-	1	-	3	1	1	3	1	2	1	3	4	4	3
Waste prevention	2	2	1	1	1	3	4	2	3	3	4	2	2	3	1	1	-	4	2	2	1	1	2	1	2	4	4	4
CDW Hazardous waste	2	2	1	2	1	2	4	3	3	2	3	1	1	3	1	1	-	3	1	1	1	1	2	2	1	4	4	4
Waste data	4	3	3	3	3	4	4	3	2	2	4	3	3	2	3	2	3	3	2	4	4	2	4	4	3	2	4	3
Total	35	39	19	20	17	31	45	32	37	31	43	19	24	39	28	20	16	44	18	25	27	18	26	28	26	45	52	50

8.3. Appendix C – Summary sheets of the six selected case studies

8.3.1. Democles

Presentation of the issue
<p>In 2012, 246.7 million tonnes of construction and demolition waste (CDW) were officially generated in France, as reported by the Ministry of Ecology, Sustainable Development and Energy. The amount of non-hazardous CDW excluding naturally occurring materials (soil) is around 65 million tonnes. The amount of CDW generated by the building industry is estimated to 38 million tonnes, including 10,2 finished work waste. Focusing on the finishing work waste, the French Environmental Agency (ADEME) estimates that more than 10 millions of tonnes per year are generated. 49% are inert waste (glass, earthenware, tiles, etc.), 48,6% are non-hazardous waste (gypsum, floor covering, wood, insulation materials, electric equipment, etc.) and 2,4% are hazardous waste (lamps, treated wood, etc.). It appears that this waste is poorly sorted and recycled, mainly for two reasons: these waste streams are composed of many different materials and they are usually collected as mixed waste. Many recycling options exist but are not widely practiced.</p>
Context
<p>Democles was launched in November 2014 for a duration of 18 months, in the context of the French law for the energetic transition. This national law confirms the European target of 70% recycling of CDW by 2020. First conclusions are expected by early 2016.</p> <p>Récylum, a French collective organism in charge of collecting electric and electronic equipment from buildings to ensure their recycling, has been appointed to coordinate the initiative.</p> <p>Eight organisms, representing clients, C&D companies, waste management companies, recycling industries, material manufacturers, and public actors involved in building management, compose the steering committee. The initiative is also sponsored by the French ministries in charge of sustainability and economy as well as by the French environmental agency, the ADEME.</p>
Description and main results
<p>The Democles (“Demo” for demolition and “Cles” for keys in French) project is an initiative involving all the stakeholders of the construction and demolition sector dealing with the management of finished work waste. It aims at identifying the key factors to improve the recycling rate of finishing work in order to contribute to the European objective of 70% of the CDW by 2020.</p> <p>Democles is implemented through four main steps:</p> <ul style="list-style-type: none">• Step 1: Identification of actual and emerging practices in recycling of finishing work waste;• Step 2: Realisation of on-site case studies;• Step 3: Formulation of technical and operational guidelines for on-site sorting;• Step 4: Formulation of recommendations for clients and C&D companies as well as for training. <p>Expected outcomes are mainly operational recommendations in terms of tracking tools, training needs or contract specifications to facilitate on-site sorting and improve finishing work recycling. The project also aims at gathering reliable data regarding technical and economic characteristics of the recycling chain per material. So far, six case studies have been carried out and three working groups are focusing on different issues (on-site sorting, recycling, on-site waste tracking). As of now, the involved stakeholders are convinced of the economic benefit of on-site sorting. However, recycling solutions are complex and not always developed for all the categories of waste.</p>
Key factors of success
<p>The interviewed stakeholders pointed out the following key factors of success for such an initiative:</p> <ul style="list-style-type: none">• Collectiveness: all the stakeholders involved in C&D sites need to be part of the project;• Applicability: suggested solutions need to be operational and cost-effective in order to be implemented by the actors on C&D sites. Testing ideas on six case studies was thus a key step in the Democles project;• Ressources: funding as well as human ressources need to be allocated to the project. Democles is financed by the ADEME, Récylum, Ares Services, GTM Bâtiment and Nantet. Recylum is dedicating 1 part time employee on the project. The budget is estimated to 500 000 euros and 2 full time employees.
Potential for replication
<p>All Member States are facing the issue of finished work recycling. Such a project could thus be implemented in any MS, especially where a low recycling rate is observed or where backfilling is the main option toward the WFD recycling rate objective. The recommendation resulting from Democles could probably be shared with other MS in order to be implemented. Such an initiative would need concertation between all the involved stakeholders at MS level.</p>

8.3.2. Gypsum to Gypsum

Presentation of the issue

Construction and demolition waste (CDW) is one of the most significant waste streams in the EU. It consists of numerous materials. Although gypsum-based waste is a highly recyclable material, the recycling rate for gypsum-based waste remains low. The low recycling rate of gypsum-based waste is due to current demolition practices that result in the mixing of all CDW fractions which prevent further recycling of gypsum.

Council Decision 2003/33/EC specifying procedures and criteria for the acceptance of waste at landfills has not been correctly implemented in several Member States and this has resulted in potentially recyclable gypsum-based waste to be disposed of instead of being available for recycling.

Context

The gypsum-to-gypsum (hereafter referred to as 'GtoG') project looked at the production of gypsum, the generation of gypsum waste and the recycling of gypsum waste in order to develop a methodology that maximised closed-loop recycling of gypsum.

The project started in January 2013 and is expected to finish at the end of 2015.

The project targeted 8 EU countries (Belgium, France, Germany, Greece, Poland, Spain, the Netherlands and the UK) which generated 1,150,000 tonnes of gypsum based waste in 2012.

The Project Coordinator was Eurogypsum, the European federation of national associations of producers of gypsum products based in Brussels.

Description and main results

The GtoG project involved key stakeholders of the value chain: demolition companies, recycling companies and production companies - so that each actor in the chain knew what was required of their output in order to optimise the quality and quantity of material available for the next step in the process. It had three distinct phases:

- Phase A: Establish current practices in demolition/deconstruction, recycling and production of gypsum products in Europe.
- Phase B: Conduct pilot projects whereby the demolition companies would apply best practices to the deconstruction of buildings in order to maximise the quantity of gypsum available for recycling. The pilot projects aim to inform the production of codified standards in the form of best practices for the audit of a building prior to deconstruction and also best practice deconstruction techniques.
- The final phase of the project, Phase C, which is to be completed in December 2015 consists of a detailed qualitative and quantitative assessment of the pilot projects and overall project.

The information is not yet available but Eurogypsum are confident that the rate of 30% reincorporation of recycled gypsum into new gypsum-based products has been achieved.



The efficient value chain assessed under the GtoG Project

Key factors of success

Sufficient resources need to be allocated to such a project. The GtoG project cost is estimated at 3,5 million € and approximately 55 people were allocated to the project across the 17 partners.

Such an initiative requires the involvement of many actors in the gypsum value chain, coordination and good lines of communication will also be essential to the success of the initiative. It is important for demolition companies to be aware of the acceptance criteria at gypsum recycling facilities and it is also crucial for recyclers to know the specifications of the gypsum to be reincorporated, e.g. particle size, paper content, etc. Increased communication through the value chain allows for consistent volumes and quality of recycled gypsum to be available for reincorporation.

Potential for replication

The successful replication of the project depends on a number of pre-conditions relating to the enforcement of current CDW legislation and also the use of policy instruments such as landfill levy, requirements for deconstruction rather than demolition:

- A mandatory requirement for an audit of the gypsum-based waste prior to demolition of buildings where the project is above a certain threshold.
- A mandatory requirement to segregate gypsum waste from other CDW.
- The enforcement of the Council Decision 2003/33/EC must be stricter.
- The landfill levy for disposing of gypsum waste should be set to act as a disincentive to disposing of gypsum waste.
- The level of segregation of plasterboard waste from other C&D waste which can be influenced by legal requirements such as designing for deconstruction and making deconstruction a mandatory requirement.

- A requirement for the specific level of reincorporation of recycled gypsum in new gypsum products should be considered as part of the green procurement framework.

8.3.3. Olympics games construction works

Presentation of the issue

The Olympic Delivery Authority (ODA) pledged to hold the greenest Games of modern times and sustainability was built into all the activities, from the procurement to the operation of the Games. The ODA set a number of CDW targets during the demolition, design and construction phases of the London 2012 Olympic Park, including:

- 90% re-used or recycled demolition waste by weight;
- 90% re-used or recycled construction waste by weight;
- 20% of materials to be from a re-used or recycled source by weight;
- 25% recycled aggregate by weight.

Context

In 2005, London submits its bid for the 2012 Olympic Games with sustainability included as a key commitment and subsequently won the rights to host the Games. When London won the right to host the London 2012 Olympic and Paralympic Games in July 2005, the bid team identified a 2.5 km² site in East London, as the site for the Olympic Park.

This case study represents the best practices implemented during London 2012 Olympic Park Construction for construction and demolition waste (CDW) management and resource efficiency.

In addition to the design and construction of London 2012 Olympic and Paralympic Games, the ODA also took into consideration the post Games legacy, which is managed by the London Legacy Development Corporation.

Description and main results

The ODA worked with the Delivery Partner (DP), which was a consortium of CH2M Hill, Laing O'Rourke and Mace (CLM) with Atkins as project manager.

The mission of the body set up to oversee the delivery, the Olympic Delivery Authority's (ODA) was to "deliver venues, facilities and infrastructure and transport on time and in a way that maximises the delivery of a sustainable legacy within the available budget".

Demonstrating exemplar sustainable waste management during the demolition, design and construction phases of the Park project presented a myriad of challenges for the ODA (for example, achieving a target for 90 per cent re-use, recycling or recovery waste segregation by contractors).

There were many stakeholders working together to achieve the project's waste targets. Clear processes, allocated responsibilities and communication were key factors in ensuring that these relationships were effective.

Two of the most important lessons from the learning legacy were that many of the environmental sustainability benefits go hand in hand with cost savings, and that with the right approach to projects of this scale it is possible to drive innovation in areas such as design and materials specification.

The ODA's overall objective of achieving exemplar sustainable waste management was achieved on a project of significant scale, with challenging and inflexible deadlines.



Key factors of success

Design out Waste (DoW)

- Setting out early on the whole project lifecycle for waste management;
- Define targets and embedding in briefs, procurement documentation and contracts;
- Improve DoW opportunities and provide guidance to design teams;
- Designing future buildings for deconstruction is essential for facilitating higher levels of reclamation and re-use.

Demolition and remediation

- The approach of integrating pre-demolition audits with materials management planning.
- A waste strategy was developed which resulted in 98.5% of Olympic Park demolition materials being diverted from landfill as well as cost savings through innovative solutions developed by the project teams.

Construction

- Working in partnership with the English Regulator, allowing the Park site to operate as a single site in terms of waste management.

- A Waste Consolidation Centre (WCC) was set up on site to achieve economies of scale and minimise the effects of transporting waste.
- Accurate forecasting of waste is important to ensure planning and resource efficiency.
- Incentivisation of partner organisations via a share in savings and recognition through awards were key drivers for high levels of waste segregation.

Potential for replication

Many of the initiatives that took place during the project are good examples of how the construction industry can improve waste management and derive associated benefits. The lessons learnt by clients, designs teams and contractors highlighted above should be replicable in the construction industry.

8.3.4. Estonian Recycling Competence Centre

Presentation of the issue

Estonia has reached high recovery rates and already surpassed the 70% recovery target of the Waste Framework Directive (2008/98/EC) concerning CDW as early as 2011 (72%). In 2013, the CDW recovery rate of Estonia was 91%. However, these high recovery rates have been reached mostly through backfilling.

Estonia faces a problem with acquiring high quality recycling and the production of recycled CDW that can be effectively used back into construction activities.

Context

In order to address the current situation and in an effort to overcome the apparent barriers in improving the quality of recycling and the market of CDW recycled products (e.g. recycled aggregates), the waste management sector in Estonia through its Waste Management Association initiated the creation of a Waste Recycling Cluster (eventually becoming the Waste Recycling Competence Centre).

The initiative started in 2011 and ended in August 2015. It was developed by the Estonian Waste Management Association and involved 21 partners (16 private waste management, 2 construction and construction product companies and 3 academic institutions).

Description and main results

The initiative resulted in the development of the Waste Recycling Competence Centre which offers the following activities:

- Training programmes: the center has been very successful in organising and implementing training programmes concerning principles and practice of efficient waste management;
- Knowledge sharing and international networking: partnerships are established with other cluster networks and recycling associations in the EU (e.g. the Austrian Association for the Recycling of Building Materials - BRV) as well as an extensive network of partners in the Nordic countries, especially Norway, Finland and Sweden.
- Supporting the implementation of a research and demonstration project: the Tallinn University of Technology developed the concept of the construction of a test road using recycled aggregates from CDW. Initial tests were carried out in the laboratory of the University in order to assess the properties of the material. The material used in the test road was recycled aggregate - crushed concrete 0/31.5 mm. Following the material tests, a road section was sought in order to construct a real scale test road.
- Trademark of high quality recycled products: the center has also developed its own trademark for certifying the quality of recycled products, which is used extensively by its members that produce recycled materials. It thus aims at receiving accreditation for the establishment of a certification scheme for recycled aggregates which meet specific quality standards.

The initiative has been largely successful with providing much needed knowledge and hands-on experience on CDW recycling issues and on the use of recycled products across the CDW management sector in Estonia. The wide activity of the Recycling Competence Centre has also boosted the recycling figures in Estonia, by the promotion and improvement of recycling practices and the demonstration of reutilisation practices for recycled products.



Estonian Waste Recycling Competence Centre logo

Key factors of success

The interviewed stakeholders pointed out the following key factors of success:

- High level of cooperation between all involved partners;
- Research and demonstration activities;
- Sufficient financing (private and EU funds);
- High involvement and interest of private CDW management and recycling companies;
- Good project management and administrative capacity skills;
- Extensive networking and dissemination of project activities and results;
- Involvement of national and international actors in the sector.

Sufficient resources also need to be allocated to the project: the cost of this initiative is estimated at 662 k€ and the human resources at 45 people across 21 project partners.

Potential for replication

The organisational setting and the whole range of activities of the Recycling Competence Centre could potentially be developed in any Member State or region of the EU-28 and beyond (e.g. ENPI - European Neighbourhood countries), in which there is a need for CDW recycling increase both qualitatively and quantitatively. Ideally, the initiative could be replicated in a medium-small country or a regional department of a bigger country, which tries to move away from landfilling and backfilling practices and introduce quality standards in CDW recycling and utilisation of the recycled products.

8.3.5. Pilot project of a mechanical treatment plant for C&D inert waste

Presentation of the issue

The lack of infrastructure to store, treat and recycle C&D waste remains one of the biggest obstacles to sustainable C&D waste management in Romania. There are currently countless practices of improper C&D waste management, the majority consisting of uncontrolled landfilling in and outside the cities. The improper waste management, the lack of infrastructure coupled with an abundance of natural mineral aggregates lead to very poor conditions for recycled materials.

Only two recovery systems of C&D waste were identified in Romania. The most recent one is the installation of a mechanical treatment plant for C&D inert waste developed in the framework of the European project LIFE10ENV/RO/000727 "Recovery of Construction and Demolition Waste in Buzău County" (VAL-C&DW project) which ran between September 2011 and June 2014.

Context

The project was implemented by the Buzău County Council in partnership with SC Natura Management SRL. It consisted in the development of a recovery system for C&D waste at the level of Buzău county via the installation of a mechanical treatment plant for inert C&D waste (respectively class 17 01 of waste as defined in European List of Waste, namely concrete, bricks, tiles and ceramics) through which local crushing and sorting of inert C&D waste is carried out, followed by its recovery. The mechanical treatment plant was materialized through the European project LIFE10ENV/RO/000727 "Recovery of Construction and Demolition Waste in Buzău County", which ran between September 2011 and June 2014. The project was financed by LIFE+ Programme of the European Commission and implemented by the Buzău County Council in partnership with SC Natura Management SRL.

Description and main results

The overall objective of the LIFE10ENV/RO/000727 project was to develop a functional and effective C&D management system through:

- Detailed knowledge of the current situation regarding the generation, collection, recovery and disposal of C&D waste in Buzău county;
- Development of a coherent decision making system by clarifying the responsibilities of all actors involved in the C&D waste management in Buzău county;
- Development of a procedure for ceasing the waste status of the materials resulting from the treatment of inert C&D waste;
- Promotion of C&D waste recovery ;
- Fulfilment of legal objectives regarding the recovery of C&D waste in Buzău County, including the recovery of this type of waste that is disposed illegally.

The project obtained the following main results:

- A recovery system for inert C&D waste at the level of Buzău County was developed via the installation of a mechanical treatment plant for inert C&D waste, namely concrete, bricks, tiles and ceramics;
- The illegal dumping of C&D waste in Buzău County decreased and the recovery/recycling of C&D waste has increased;
- Net environmental benefits of using recycled aggregates versus the use of natural aggregates were assessed through a Life Cycle Assessment study;



CDW crushing

- The recycled aggregates market was developed and four jobs were created.

Key factors of success

The interviewed stakeholders pointed out the following main key factors of success:

- Successful collaboration between the involved parties: Buzău County Council, Natura Management and Domenii Prest Serv;
- Good project management and administrative capacity, including qualified technical expertise;
- Good cooperation with institutions that influence, directly or indirectly, the waste sector (i.e. Ministry of Environment, Local Environmental Agency, National Environmental Guard, Local Public Authorities etc.);
- Competitive price of the recycled aggregate.

This project was also successful thanks to the allocated resources:

- The total cost of the investment was evaluated at €413 704. These costs only cover the necessary equipment and infrastructure for the setup of a C&D mechanical treatment plant site. The resources came from public, private and EU funds.
- A team of experts with broad specialisation in waste management, waste processing and recycling, construction, IT and communication from both Buzău County Council and Natura Management SRL was allocated to the project.

Potential for replication

The findings of the Life Cycle Assessment of the use of recycled aggregates versus natural aggregates, as well as those from the diagnosis phase, are relevant for all counties in Romania and can contribute effectively to designing the necessary network of C&D inert waste processing infrastructure.

There is huge potential to use this initiative as best practice example in order to encourage other counties in Romania to replicate the use of C&D waste recovery technology.

8.3.6. ZenRobotics

Presentation of the issue

Traditional waste sorting plants are large facilities that consume a lot of energy. They require high initial investments and have very high operating costs. Furthermore, existing methods can separate only a limited number of fractions or specific particle sizes. Waste has to be processed by several items of equipment positioned one after another, leading to large plants and high energy consumption. There are also waste companies who operate very small facilities with inefficient excavators and labor-intensive manual sorting resulting in high operational cost. High initial investment required for setting up innovative facilities is a major barrier for waste management companies. Despite the increasing utilisation of automation in the facilities (drums, conveyor belts, etc.), manual labour is still required to guarantee the required purity of sorting materials. Moreover, the diversity of waste generated on C&D sites is a well-known barrier to CDW recycling.

Context

ZenRobotics Ltd is a Finnish small company established in 2007 that develops waste sorting systems. In 2013 ZenRobotics and SUEZ environnement signed a Global Frame Agreement on the delivery of ZenRobotics Recylers (ZRR) waste sorting systems. The world's first robotic sorting station that's designed around the robots was installed at a SUEZ Finland site in Helsinki in 2014. The increasing demand for smart waste sorting services and technologies provide a major market opportunity for technology providers.

Description and main results

ZenRobotics aims to revolutionise waste sorting with highly efficient and fast autonomous robotic pickers. The key innovation of ZRR is a unique machine-learning based system, which gathers gigabytes of data of its environment, makes smart decisions and moves a robot arm in an unpredictable environment. Robotic sorting requires some pre-processing, after which multiple fractions can be separated using only one ZRR system. First, an excavator sorts the largest objects from the waste batch. Next, the waste is screened in order to remove the light fraction (foils and paper) and fines (sand, very small objects). A vibratory feeder spreads the waste on the sorting belt as a so called singularized monolayer, meaning that most of the objects should not be overlapping. An even flow of material improves the recognition capabilities. Finally, the waste is run under a sensor module and picked by the robot arms. At SUEZ Finland, the implementation of ZRR resulted in an increase of the utilization rate of waste from 70% to 90%.



ZRR system

Key factors of success

The capabilities of the ZenRobotics Recycler system have been developed by in-house research of ZenRobotics, with both private and public funding, primarily by the private investors in ZenRobotics, but also Tekes (the Finnish Funding Agency for Technology and Innovation). The company, with about 30 employees, has already raised €17 million in equity investments and its C&D ZRR has won several reputable cleantech awards. Also, years of product development at the SUEZ Finland pilot site resulted in the Global Frame Agreement that was signed by SUEZ environnement and ZenRobotics in 2013.

Potential for replication

The ZenRobotics Recycler can be installed in most C&D waste-processing sites. The type of installation depends on the existing process. The ZRR system can be installed as a retrofit to an existing sorting line, for example to replace manual sorting, or as a stand-alone system.

The trainable AI technology opens the possibility to modify the system per operator needs and requirements in the business environment. For example, certain fractions such as red brick are valuable in some markets. The customer can choose whether or not to sort out that specific fraction. This kind of flexibility and option for localisation is not currently widely available in waste sorting.

The market potential for ZenRobotics Recycler is clear as the system will provide waste management companies unprecedented purity of sorted material at a lower operating cost, compared to existing methods. Adoption of new technology by operators and regulatory pressure toward recycling can generate important market opportunities.

8.4. Appendix D – Country snapshots

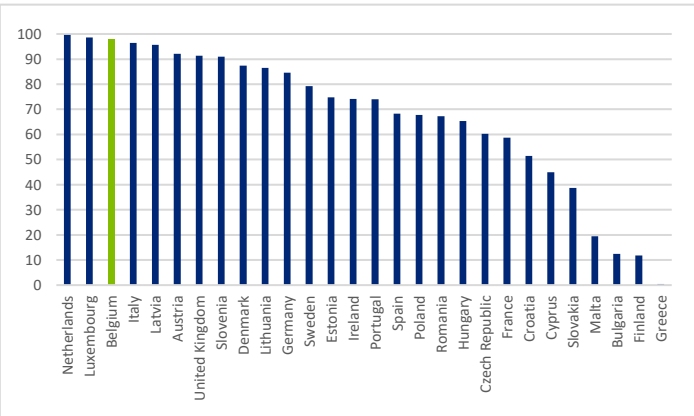
8.4.1. Austria

Austria																																																																					
<p>CDW treated – Country performance</p> <table border="1"> <caption>CDW treated – Country performance (Estimated %)</caption> <thead> <tr> <th>Country</th> <th>%</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>98</td></tr> <tr><td>Luxembourg</td><td>95</td></tr> <tr><td>Belgium</td><td>92</td></tr> <tr><td>Italy</td><td>90</td></tr> <tr><td>Latvia</td><td>88</td></tr> <tr><td>Austria</td><td>92</td></tr> <tr><td>United Kingdom</td><td>85</td></tr> <tr><td>Slovenia</td><td>82</td></tr> <tr><td>Denmark</td><td>80</td></tr> <tr><td>Lithuania</td><td>78</td></tr> <tr><td>Germany</td><td>75</td></tr> <tr><td>Sweden</td><td>72</td></tr> <tr><td>Estonia</td><td>70</td></tr> <tr><td>Ireland</td><td>68</td></tr> <tr><td>Portugal</td><td>65</td></tr> <tr><td>Spain</td><td>62</td></tr> <tr><td>Poland</td><td>60</td></tr> <tr><td>Romania</td><td>58</td></tr> <tr><td>Hungary</td><td>55</td></tr> <tr><td>Czech Republic</td><td>52</td></tr> <tr><td>France</td><td>50</td></tr> <tr><td>Croatia</td><td>48</td></tr> <tr><td>Cyprus</td><td>45</td></tr> <tr><td>Slovakia</td><td>42</td></tr> <tr><td>Malta</td><td>38</td></tr> <tr><td>Bulgaria</td><td>35</td></tr> <tr><td>Finland</td><td>32</td></tr> <tr><td>Greece</td><td>30</td></tr> </tbody> </table> <p>92% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	%	Netherlands	98	Luxembourg	95	Belgium	92	Italy	90	Latvia	88	Austria	92	United Kingdom	85	Slovenia	82	Denmark	80	Lithuania	78	Germany	75	Sweden	72	Estonia	70	Ireland	68	Portugal	65	Spain	62	Poland	60	Romania	58	Hungary	55	Czech Republic	52	France	50	Croatia	48	Cyprus	45	Slovakia	42	Malta	38	Bulgaria	35	Finland	32	Greece	30	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> • A nation-wide guideline for management of CDW exists for more than 20 years and a detailed waste management plan, which covers CDW, is published and updated on a regular basis. • The Federal Waste Management Plan (FWMP) serves to support achievement of the objectives and principles of the Waste management Act of 2002. • Recycled Construction Materials Regulation was published on 29th June 2015. • Austria does not use LOW, but specific national codes. • Austria has a draft norm for recycled building materials (ÖNORM B 3140) that sets requirements for recycled aggregates. The final publication is planned for 01.01.2016. • The law for Remediation of Contaminated Sites (Altlastensanierungsgesetz) states that every ton of CDW that is not recovered in proper and structurally engineered way is charged with 9.20 EUR. <table border="0"> <tr> <td>Backfilling definition</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>End of Waste criteria</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Green Public Procurement</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Pre-demolition audits</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Landfill tax (9.2 €/tonne)</td> <td><input checked="" type="checkbox"/></td> </tr> </table>	Backfilling definition	<input checked="" type="checkbox"/>	End of Waste criteria	<input checked="" type="checkbox"/>	Green Public Procurement	<input checked="" type="checkbox"/>	Pre-demolition audits	<input checked="" type="checkbox"/>	Landfill tax (9.2 €/tonne)	<input checked="" type="checkbox"/>
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<p>Key performance indicators</p> <ul style="list-style-type: none"> • 153.4 tonnes CDW/€ million turnover • 1.1 tonnes hazardous CDW/€ million turnover • 152.3 tonnes non-hazardous CDW/€ million turnover • 0.77 tonnes/million population • X% CDW recycled • Y% CDW recovered (incl. Backfilling) • 0% CDW backfilled • 8% CDW landfilled • 2.2% CDW imported • 1.5% CDW exported 	<p>Data quality indicator and trend</p> <p>4.2/5 – Good KPI Trend</p>																																																																				
<p>Key 'best practices/ interventions'</p> <ul style="list-style-type: none"> • A 'building pass' was introduced as part of a building material information system. The passport is kept with the building's documentation throughout its life cycle. • Exchange for recycling materials in the construction sector (RBB). Platform to match supply and demand for recycled CDW. • Guideline for Recycled Construction Material: regulates the production of quality proven recycled construction materials made from demolition waste for standardized applications. • Hazardous excavated material is either treated biologically, physico-chemically or, to a lesser extent, thermally. 	<p>Building Pass</p> <p>The FWMP defines a set of measures for the prevention of CDW. This set of measures comprises three main packages:</p> <ul style="list-style-type: none"> • building pass; • low-waste construction and extension of the useful life of buildings; • selective dismantling/urban mining/re-use of building parts. 																																																																				

<p>Key 'best practices' for CDW data collection</p> <ul style="list-style-type: none"> Country presenting a robust methodology of CDW data collection based on data from treatment facilities. High survey participation rate achieved. 	<p>The building pass provides information on the material composition of a building. It should contain the necessary information for optimal, low-waste management of the building over its entire lifecycle. The pass aims to connect the architect, suppliers and statistical registers to enable the careful, selective demolition of buildings; the reuse and high quality recycling of building materials, and the prevention of waste by extending the use of houses through improved maintenance schemes.</p>
<p>Key opportunities</p> <ul style="list-style-type: none"> Technical requirements for construction and environment are formulated in one system of rules and that a standardised guideline for recycled materials exists which helps to create a legally binding regulation. The close collaboration between the public and private sector while working on the new regulation is an important driver to sustainable CDW management. CDW is generally collected and recovered by smaller or mid-sized companies (10-50 employees) of which 80% are member of the Austrian Association for Recycling of Building Materials (BRV, 74 members). The BRV, in collaboration with the Federal Ministry of Agriculture, Forestry, Environment and Water Management, has been working on guidelines, for recycled construction material, for several years. 	

8.4.2. Belgium

'Belgium'

<p>CDW treated – Country performance</p>  <table border="1" style="display: none;"> <caption>CDW treated – Country performance</caption> <thead> <tr> <th>Country</th> <th>CDW treated (%)</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>98</td></tr> <tr><td>Luxembourg</td><td>98</td></tr> <tr><td>Belgium</td><td>98</td></tr> <tr><td>Italy</td><td>95</td></tr> <tr><td>Latvia</td><td>94</td></tr> <tr><td>Austria</td><td>93</td></tr> <tr><td>United Kingdom</td><td>92</td></tr> <tr><td>Slovenia</td><td>91</td></tr> <tr><td>Denmark</td><td>88</td></tr> <tr><td>Lithuania</td><td>87</td></tr> <tr><td>Germany</td><td>85</td></tr> <tr><td>Sweden</td><td>82</td></tr> <tr><td>Estonia</td><td>78</td></tr> <tr><td>Ireland</td><td>75</td></tr> <tr><td>Portugal</td><td>74</td></tr> <tr><td>Spain</td><td>72</td></tr> <tr><td>Poland</td><td>70</td></tr> <tr><td>Romania</td><td>68</td></tr> <tr><td>Hungary</td><td>65</td></tr> <tr><td>Czech Republic</td><td>62</td></tr> <tr><td>France</td><td>58</td></tr> <tr><td>Croatia</td><td>52</td></tr> <tr><td>Cyprus</td><td>48</td></tr> <tr><td>Slovakia</td><td>42</td></tr> <tr><td>Malta</td><td>20</td></tr> <tr><td>Bulgaria</td><td>15</td></tr> <tr><td>Finland</td><td>12</td></tr> <tr><td>Greece</td><td>10</td></tr> </tbody> </table> <p>98% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	CDW treated (%)	Netherlands	98	Luxembourg	98	Belgium	98	Italy	95	Latvia	94	Austria	93	United Kingdom	92	Slovenia	91	Denmark	88	Lithuania	87	Germany	85	Sweden	82	Estonia	78	Ireland	75	Portugal	74	Spain	72	Poland	70	Romania	68	Hungary	65	Czech Republic	62	France	58	Croatia	52	Cyprus	48	Slovakia	42	Malta	20	Bulgaria	15	Finland	12	Greece	10	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> Legislation and actors in the CDW sector vary from one region to another (three different waste legislations). Flemish waste legislation started in 1981 concerning the prevention and management of waste materials. Brussels Capital Region transpose European directive in 2012. In Walloon the basis of waste legislation was defined in 1996. Flemish and Brussels regions have a Waste Plan and Wallonia has a new waste plan in preparation. All regions have a reduction target of 70% by weight. Overall Belgium has a good capacity to recycle almost all its hazardous CDW. A pre-demolition inventory is required in the three regions.
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<p>Key performance indicators</p> <ul style="list-style-type: none"> • 115.1 tonnes/€ million turnover • 3.6 tonnes hazardous/€ million turnover • 111.5 tonnes non-hazardous/€ million turnover • 0.63 tonnes/million population • 0% CDW backfilled • 1.8% CDW landfilled • 1.9% CDW imported • 6.0% CDW exported 	<ul style="list-style-type: none"> • The higher landfilling prices (taxes) compared to other treatment options encourage the recovery of waste. <p style="text-align: right;"> Backfilling definition <input checked="" type="checkbox"/> EoW criteria (Flanders) <input checked="" type="checkbox"/> Green Public Procurement <input checked="" type="checkbox"/> Pre-demolition audits (Flanders) <input checked="" type="checkbox"/> Landfill tax <input checked="" type="checkbox"/> </p>
<p>Key ‘best practices/ interventions’</p> <ul style="list-style-type: none"> • Develop an integrated eco-construction approach. • Standards for sustainability assessment of buildings using a life cycle approach. • Standard recycling specifications for road works in the 3 regions, as they allow the use of recycled aggregates in several applications. • In Flanders, the material loop of the stony-fraction has almost been closed (more than 95%) and further attention is paid to research and to encouraging the high-grade applications of recycled granulates. • Guidance document for drawing up a demolition inventory. • Sustainability standards for buildings are growing, but not widespread, they represent more or less 300 projects/50.000 construction projects in Belgium. • Gypsum recycling factory established 2009. 	<p>Data quality indicator and trend</p> <p>3.1/5 – Modest KPI Trend</p> <p>Gypsum recycling factory</p> <ul style="list-style-type: none"> • Built next to an existing gypsum-producing factory • In function since 2009, partnership between the gypsum factory and a recycling specialist. • To promote good examples of relocation of recycling units and waste management in the territory. • Before all these gypsum waste were transported to Germany. Decreases the dependence of the region and enhances the valuation of gypsum waste
<p>Key ‘best practices’ for CDW data collection</p> <ul style="list-style-type: none"> • No best practice identified for CDW data. Belgium suffers from a lack of harmonisation of data collection across regions. The methodology needs to be strengthened and consolidated. 	<p>Key opportunities</p> <ul style="list-style-type: none"> • The use of natural products could facilitate the recycling (e.g. natural insulation), because it might have a less complex composition, which is easier to separate and recycle. • Further research (in collaboration with the different actors of the sector) is carried out to recycling applications of the different streams of the non-stony CDW fraction (e.g. gypsum, aerated concrete, flat glass, etc.) as well as on ways to build and renovate in a more sustainable way. • Several treatment facilities for different CDW streams exist or are under development.

8.4.3. Bulgaria

'Bulgaria'																																																																					
<p>CDW treated – Country performance</p> <table border="1"> <caption>CDW treated – Country performance (Estimated %)</caption> <thead> <tr> <th>Country</th> <th>%</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>98</td></tr> <tr><td>Luxembourg</td><td>97</td></tr> <tr><td>Belgium</td><td>96</td></tr> <tr><td>Italy</td><td>95</td></tr> <tr><td>Latvia</td><td>94</td></tr> <tr><td>Austria</td><td>93</td></tr> <tr><td>United Kingdom</td><td>92</td></tr> <tr><td>Slovenia</td><td>91</td></tr> <tr><td>Denmark</td><td>90</td></tr> <tr><td>Lithuania</td><td>89</td></tr> <tr><td>Germany</td><td>88</td></tr> <tr><td>Sweden</td><td>87</td></tr> <tr><td>Estonia</td><td>86</td></tr> <tr><td>Ireland</td><td>85</td></tr> <tr><td>Portugal</td><td>84</td></tr> <tr><td>Spain</td><td>83</td></tr> <tr><td>Poland</td><td>82</td></tr> <tr><td>Romania</td><td>81</td></tr> <tr><td>Hungary</td><td>80</td></tr> <tr><td>Czech Republic</td><td>79</td></tr> <tr><td>France</td><td>78</td></tr> <tr><td>Croatia</td><td>77</td></tr> <tr><td>Cyprus</td><td>76</td></tr> <tr><td>Slovakia</td><td>75</td></tr> <tr><td>Malta</td><td>74</td></tr> <tr><td>Bulgaria</td><td>12</td></tr> <tr><td>Finland</td><td>11</td></tr> <tr><td>Greece</td><td>10</td></tr> </tbody> </table> <p>12% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	%	Netherlands	98	Luxembourg	97	Belgium	96	Italy	95	Latvia	94	Austria	93	United Kingdom	92	Slovenia	91	Denmark	90	Lithuania	89	Germany	88	Sweden	87	Estonia	86	Ireland	85	Portugal	84	Spain	83	Poland	82	Romania	81	Hungary	80	Czech Republic	79	France	78	Croatia	77	Cyprus	76	Slovakia	75	Malta	74	Bulgaria	12	Finland	11	Greece	10	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> The Waste Management Act of 2003 brought precisions to waste management laws and it was reformulated and completed in 2012. Addresses all kind of waste streams including CDW. An Ordinance on CDW management and use of recycled construction materials defines more specific regulations. The National Waste Management Plan (2014 – 2020) is in place and a specific National Strategic Plan for CDW Management for 2011-2020. Guidelines for management of construction and demolition waste in Bulgaria. Contradiction between national law and local implementation. Landfill tax is ten times lower than for recycling. <table border="0" style="width: 100%;"> <tr> <td style="text-align: right;">Backfilling definition</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">EoW criteria</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Green Public Procurement</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">e-demolition audits (CDW plan)</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Landfill tax (14.3 €/tonne)</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> </table>	Backfilling definition	<input checked="" type="checkbox"/>	EoW criteria	<input checked="" type="checkbox"/>	Green Public Procurement	<input checked="" type="checkbox"/>	e-demolition audits (CDW plan)	<input checked="" type="checkbox"/>	Landfill tax (14.3 €/tonne)	<input checked="" type="checkbox"/>
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<p>Key performance indicators</p> <ul style="list-style-type: none"> 108.4 tonnes/€ million turnover 0 tonnes hazardous/€ million turnover 108.4 tonnes non-hazardous/€ million turnover 0.11 tonnes/million population 0% CDW backfilled 85.8% CDW landfilled No data available for CDW imported No data available for CDW exported 	<p>Data quality indicator and trend</p> <p>2.6/5 – Modest KPI Trend</p>																																																																				
<p>Key 'best practices/ interventions'</p> <ul style="list-style-type: none"> Contracting entity shall draw up a plan for management of CDW before the beginning of construction/demolition works. 'Polluter pays' principle applied. Stakeholders engagement in training and guidance initiatives. 	<p>Polluter Pays Principle</p> <ul style="list-style-type: none"> The "polluter pays" principle applies for CDW according to Art. 11 of the Waste Management Act. 																																																																				
<p>Key 'best practices' for CDW data collection</p> <ul style="list-style-type: none"> No best practice identified for CDW data. Data are, however, carefully analysed and their quality assessed. It should be improved in the near future thanks to a new legislation. 																																																																					
<p>Key opportunities</p> <ul style="list-style-type: none"> Ongoing recycling facilities development projects on the territory (at least 7 recycling facilities in the last two years). Major construction projects are public and the requirements of use of recycled building materials and proper treatment are higher than in private sector. 																																																																					

- In 2014, construction sector slight increase after a significant decrease in the economic crisis period.
- Enhancing of training and awareness among the players from institutions and associations.
- National obligation for selective demolition, separation on site and separation of hazardous waste from Ordinance on CDW management and use of recycled building materials.

8.4.4. Croatia

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<p>CDW treated – Country performance</p> <table border="1"> <caption>CDW treated – Country performance (Estimated %)</caption> <thead> <tr> <th>Country</th> <th>CDW Treated (%)</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>100</td></tr> <tr><td>Luxembourg</td><td>98</td></tr> <tr><td>Belgium</td><td>95</td></tr> <tr><td>Italy</td><td>92</td></tr> <tr><td>Latvia</td><td>90</td></tr> <tr><td>Austria</td><td>88</td></tr> <tr><td>United Kingdom</td><td>85</td></tr> <tr><td>Slovenia</td><td>82</td></tr> <tr><td>Denmark</td><td>80</td></tr> <tr><td>Lithuania</td><td>78</td></tr> <tr><td>Germany</td><td>75</td></tr> <tr><td>Sweden</td><td>72</td></tr> <tr><td>Estonia</td><td>70</td></tr> <tr><td>Ireland</td><td>68</td></tr> <tr><td>Portugal</td><td>65</td></tr> <tr><td>Spain</td><td>62</td></tr> <tr><td>Poland</td><td>60</td></tr> <tr><td>Romania</td><td>58</td></tr> <tr><td>Hungary</td><td>55</td></tr> <tr><td>Czech Republic</td><td>52</td></tr> <tr><td>France</td><td>50</td></tr> <tr><td>Croatia</td><td>52</td></tr> <tr><td>Cyprus</td><td>45</td></tr> <tr><td>Slovakia</td><td>40</td></tr> <tr><td>Malta</td><td>35</td></tr> <tr><td>Bulgaria</td><td>20</td></tr> <tr><td>Finland</td><td>15</td></tr> <tr><td>Greece</td><td>10</td></tr> </tbody> </table> <p>52% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	CDW Treated (%)	Netherlands	100	Luxembourg	98	Belgium	95	Italy	92	Latvia	90	Austria	88	United Kingdom	85	Slovenia	82	Denmark	80	Lithuania	78	Germany	75	Sweden	72	Estonia	70	Ireland	68	Portugal	65	Spain	62	Poland	60	Romania	58	Hungary	55	Czech Republic	52	France	50	Croatia	52	Cyprus	45	Slovakia	40	Malta	35	Bulgaria	20	Finland	15	Greece	10	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> • The Act on Sustainable Waste Management (2013) addresses general waste management and CDW. It defines that 70 % of the CDW mass to be recovered and recycled by 2020. • The rules on construction waste management were defined in 2008, and rules on waste catalogue (OG 90/15). • Specific rules on the method and procedures for managing waste containing asbestos (OG 42/07). • Croatian Waste Management Strategy for the period 2005–2025 and Waste Management Plan for the period 2007–2015. • Refunds are stimulating for the holders of waste, as they encourage them to deliver specific waste to the producer. This system is regulated by the Environmental Protection and Energy Efficiency Fund. <table border="0"> <tr> <td>Backfilling definition</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>W criteria</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Open Public Procurement</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Selective demolition audits</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Landfill tax</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> </table>	Backfilling definition	<input checked="" type="checkbox"/>	W criteria	<input checked="" type="checkbox"/>	Open Public Procurement	<input checked="" type="checkbox"/>	Selective demolition audits	<input checked="" type="checkbox"/>	Landfill tax	<input checked="" type="checkbox"/>
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<p>Key performance indicators</p> <ul style="list-style-type: none"> • 67.6 tonnes/€ million turnover • 3.5 tonnes hazardous/€ million turnover • 64.1 tonnes non-hazardous/€ million turnover • 0.08 tonnes/million population • 0% CDW backfilled • 48.5% CDW landfilled • No data available for CDW imported • 0.8% CDW exported 	<p>Data quality indicator and trend</p> <p>2.8/5 – Modest KPI Trend</p>																																																																				
<p>Key 'best practices/ interventions'</p> <ul style="list-style-type: none"> • Cities and municipalities have the obligation to develop and adopt their own WMP's for an eight-year period. • 7 special EoW status requirements have been established for seven CDW types in Croatia insofar. 	<p>Fees apply to CDW containing asbestos</p> <ul style="list-style-type: none"> • Fees to cover the costs of managing CDW containing asbestos. • This objective aims to stimulate responsible asbestos-containing CDW management by those possessing the license to collect CDW. • Contract with the Environmental Protection and Energy Efficiency Fund. • The fund pays a fee aimed to stimulate relevant stakeholders to collect, transport, permanently dispose and treat asbestos-containing CDW accepted from individuals/natural persons. 																																																																				
<p>Key 'best practices' for CDW data collection</p> <ul style="list-style-type: none"> • No best practice identified for CDW data. Croatia suffers from a lack of adequate practices concerning CDW data collection and will improve the quality of reported data thanks to a new project that will start in 2016. 																																																																					

Key opportunities

- National strategic programmes and EU funding priorities promote the establishment of treatment facilities.
- Strong engagement of the Croatian Environment Agency in improving the system. Legislation changes and activities in the area signify positive political will.
- More law enforcement where specific penalty provisions need to be introduced for non-compliance.
- Changes to the data management system announced.

8.4.5. Cyprus

'Cyprus'																																																																					
<p>CDW treated – Country performance</p> <table border="1"> <caption>CDW treated – Country performance (Estimated %)</caption> <thead> <tr> <th>Country</th> <th>CDW Treated (%)</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>100</td></tr> <tr><td>Luxembourg</td><td>100</td></tr> <tr><td>Belgium</td><td>98</td></tr> <tr><td>Italy</td><td>95</td></tr> <tr><td>Latvia</td><td>92</td></tr> <tr><td>Austria</td><td>90</td></tr> <tr><td>United Kingdom</td><td>88</td></tr> <tr><td>Slovenia</td><td>85</td></tr> <tr><td>Denmark</td><td>82</td></tr> <tr><td>Lithuania</td><td>80</td></tr> <tr><td>Germany</td><td>78</td></tr> <tr><td>Sweden</td><td>75</td></tr> <tr><td>Estonia</td><td>72</td></tr> <tr><td>Ireland</td><td>70</td></tr> <tr><td>Portugal</td><td>68</td></tr> <tr><td>Spain</td><td>65</td></tr> <tr><td>Poland</td><td>62</td></tr> <tr><td>Romania</td><td>60</td></tr> <tr><td>Hungary</td><td>58</td></tr> <tr><td>Czech Republic</td><td>55</td></tr> <tr><td>France</td><td>52</td></tr> <tr><td>Croatia</td><td>50</td></tr> <tr><td>Cyprus</td><td>45</td></tr> <tr><td>Slovakia</td><td>40</td></tr> <tr><td>Malta</td><td>20</td></tr> <tr><td>Bulgaria</td><td>15</td></tr> <tr><td>Finland</td><td>12</td></tr> <tr><td>Greece</td><td>10</td></tr> </tbody> </table> <p>45% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	CDW Treated (%)	Netherlands	100	Luxembourg	100	Belgium	98	Italy	95	Latvia	92	Austria	90	United Kingdom	88	Slovenia	85	Denmark	82	Lithuania	80	Germany	78	Sweden	75	Estonia	72	Ireland	70	Portugal	68	Spain	65	Poland	62	Romania	60	Hungary	58	Czech Republic	55	France	52	Croatia	50	Cyprus	45	Slovakia	40	Malta	20	Bulgaria	15	Finland	12	Greece	10	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> • Waste Management Plan of Cyprus (2004) contains a dedicated chapter for the management of CDW. • Waste Prevention Programme of Cyprus is currently under preparation. • Waste Law of 2011 (N. 185(I)/2011), for the management of CDW and transpose the target defined in the WFD for recovery of CDW. • The Solid and Hazardous Waste (Management of Excavation, Construction and Demolition Waste) Regulations of 2011 (P.I. 159/2011), addresses management of excavation, construction and demolition waste (ECDW). • Management of waste is not in line with the waste hierarchy, as most of the generated waste is landfilled or disposed uncontrollably. • Lack of know-how in the organisation and implementation of CDW management activities by the relevant key stakeholders. • Construction sector try to avoid the costs of CDW management. <table border="0"> <tr> <td>Backfilling definition</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>EoW criteria</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Green Public Procurement</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Pre-demolition audits</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Landfill tax</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> </table>	Backfilling definition	<input checked="" type="checkbox"/>	EoW criteria	<input checked="" type="checkbox"/>	Green Public Procurement	<input checked="" type="checkbox"/>	Pre-demolition audits	<input checked="" type="checkbox"/>	Landfill tax	<input checked="" type="checkbox"/>
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<p>Key performance indicators</p> <ul style="list-style-type: none"> • 64.6 tonnes/€ million turnover • 2.1 tonnes hazardous/€ million turnover • 62.6 tonnes non-hazardous/€ million turnover • 0.17 tonnes/million population • 15.4% CDW backfilled • 39.6% CDW landfilled • No data available for CDW imported • 8.0% CDW exported 	<p>Data quality indicator and trend</p> <p>2.6/5 – Modest KPI Trend</p>																																																																				
<p>Key 'best practices/ interventions'</p> <ul style="list-style-type: none"> • Standards for recycled CDW. • Obligation prior to construction permitting for setting up a Waste Management Plan. 	<p>CDW management systems</p> <ul style="list-style-type: none"> • CDW management systems are non-for-profit private entities owned by one or more contractors. 																																																																				
<p>Key 'best practices' for CDW data collection</p> <ul style="list-style-type: none"> • Official data are very consistent over time. 																																																																					

	<ul style="list-style-type: none"> • The Systems are responsible for organising and supervising the operations of CDW management (collection, transport, recovery) conducted by public or private legal bodies on behalf of the System and for informing the public administration and CDW holders about their obligations according to the regulations. • The roles of all actors involved in CDW management are well articulated in national legislation.
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Key opportunities

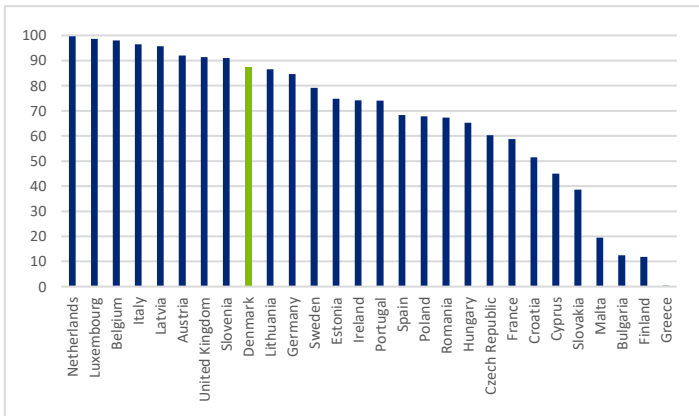
- **Responsibility for CDW management is well defined.**
- **Certified CDW management systems to increase awareness among the local and regional administrative authorities and construction sector, under economic, social and environmental perspectives.**
- **Legislation obliges to develop adequate CDW management systems and a network of treatment facilities.**
- **Obligation prior to construction permitting for setting up a Waste Management Plan, by the contractor.**

8.4.6. Czech Republic

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<p>CDW treated – Country performance</p> <table border="1"> <caption>CDW treated – Country performance</caption> <thead> <tr> <th>Country</th> <th>Percentage (%)</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>100</td></tr> <tr><td>Luxembourg</td><td>98</td></tr> <tr><td>Belgium</td><td>95</td></tr> <tr><td>Italy</td><td>92</td></tr> <tr><td>Latvia</td><td>90</td></tr> <tr><td>Austria</td><td>88</td></tr> <tr><td>United Kingdom</td><td>85</td></tr> <tr><td>Slovenia</td><td>82</td></tr> <tr><td>Denmark</td><td>80</td></tr> <tr><td>Lithuania</td><td>78</td></tr> <tr><td>Germany</td><td>75</td></tr> <tr><td>Sweden</td><td>72</td></tr> <tr><td>Estonia</td><td>70</td></tr> <tr><td>Ireland</td><td>68</td></tr> <tr><td>Portugal</td><td>65</td></tr> <tr><td>Spain</td><td>62</td></tr> <tr><td>Poland</td><td>60</td></tr> <tr><td>Romania</td><td>58</td></tr> <tr><td>Hungary</td><td>55</td></tr> <tr style="background-color: #90EE90;"><td>Czech Republic</td><td>60</td></tr> <tr><td>France</td><td>52</td></tr> <tr><td>Croatia</td><td>48</td></tr> <tr><td>Cyprus</td><td>45</td></tr> <tr><td>Slovakia</td><td>40</td></tr> <tr><td>Malta</td><td>20</td></tr> <tr><td>Bulgaria</td><td>15</td></tr> <tr><td>Finland</td><td>12</td></tr> <tr><td>Greece</td><td>10</td></tr> </tbody> </table> <p>60% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	Percentage (%)	Netherlands	100	Luxembourg	98	Belgium	95	Italy	92	Latvia	90	Austria	88	United Kingdom	85	Slovenia	82	Denmark	80	Lithuania	78	Germany	75	Sweden	72	Estonia	70	Ireland	68	Portugal	65	Spain	62	Poland	60	Romania	58	Hungary	55	Czech Republic	60	France	52	Croatia	48	Cyprus	45	Slovakia	40	Malta	20	Bulgaria	15	Finland	12	Greece	10	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> • The Waste Prevention Plan of CR (WPP CR) has been adopted in 2014 and the targets set within the previous WMP (2003) were successfully met. These targets were: <ul style="list-style-type: none"> ○ The recovery/recycling of 50% (by weight) of CDW produced by 31/12/2005 ○ The recovery/recycling of 75% (by weight) of CDW produced by 31/12/2012 • Waste Act no. 185/2001 addresses waste management, and Decree no. 294/2005 explains the criteria about landfilling and using waste on the ground surface. • CDW can be marketed as products in accordance with Act no. 22/1997 on technical requirements for products. • Building Act 183/2006 part of the Planning and Building (Building Act) requires, giving permission for demolition of buildings, that a pre-demolition audit is undertaken as well as a CDW management plan. • Landfill ‘fees’ for CDW for mixed CDW is 19 €/tonne and EUR 225€/tonne for hazardous waste. • A landfill ban has been implemented in the Legislation no. 352/2014.
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<p>Key performance indicators</p> <ul style="list-style-type: none"> • 111.9 tonnes/€ million turnover • 3.1 tonnes hazardous/€ million turnover • 104.2 tonnes non-hazardous/€ million turnover • 0.30 tonnes/million population • 30.8% CDW backfilled • 8.9% CDW landfilled • No data available for CDW imported • No data available for CDW exported 	<p>Backfilling definition <input checked="" type="checkbox"/></p> <p>EoW criteria <input checked="" type="checkbox"/></p>																																																										

<p>Key ‘best practices/ interventions’</p> <ul style="list-style-type: none"> • BREEAM widely used in Czech Republic. The main incentive is to attract international customers with BREEAM certified buildings. • Expert analysis of hazardous substances. • Circular economy is being discussed more often regarding CDW. • Environmental technology verification (industry lead); opportunity to certify innovative processes (e.g. reprocessing of bricks). • Environmental Product Declaration. • Standards for the quality of recycled materials, recycled construction materials. 	<p>Green Public Procurement <input checked="" type="checkbox"/></p> <p>Pre-demolition audits <input checked="" type="checkbox"/></p> <p>Landfill tax (19 €/tonne) <input checked="" type="checkbox"/></p>
<p>Key ‘best practices’ for CDW data collection</p> <ul style="list-style-type: none"> • Lack of details on the different collection methodologies does not allow highlighting specific good practices. 	<p>Data quality indicator and trend</p> <p>3.9/5 – Good KPI Trend</p> <p>Recycled Construction Materials (RCM)</p> <ul style="list-style-type: none"> • Are the material outputs of non-hazardous CDW and wastes similar to CDW from facilities used for the CDW treatments based on shredding and separation of different fractions. • RCM are divided into: <ul style="list-style-type: none"> ○ Recycled concrete ○ Recycled road material ○ Recycled masonry ○ Mixed Recycled CDW ○ R-material ○ Recycled asphalt
<p>Key opportunities</p> <ul style="list-style-type: none"> • The recycling of CDW is financially beneficial, when a recycling facility is close to the place of waste arising, which are available in or near most large cities. • Czech Republic will ban landfilling of recyclable, reusable and untreated mixed municipal waste after 2023. • Green Building Council may adapt the UK’s SMARTWaste system for Czech Republic. • Green building council has a Sustainable Materials Group which holds seminars and conferences for the latest legislation and best practises regarding sustainable CDW. • The Ministry of Environment will be addressing the issue of CDW in the new Operational Programme of Environment 2014 – 2020 (EU cohesion funds). • The Association for Recycling of Construction Materials ARSM (60% of all CDW recycling companies are members) is a public association engaged in solving problems related to the recycling of inert CDW. 	

8.4.7. Denmark

‘Denmark’																																																									
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<p>87% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	<ul style="list-style-type: none"> • High recycling rates are obtained in Denmark (86% in 2012). • In 2015, the former Danish Government published a strategy for waste prevention. • The Danish Ministry of the Environment (2013) 'Denmark without waste – Recycle more, incinerate less'. This is the Government's presentation of a new approach to waste. It especially addresses quality in recycling construction and demolition waste. • Taxes for the hazardous waste became the same as the regular landfill tax of 475 Dkr/ton (64 €/ton). • Since 1997 a "ban" on landfilling of waste suitable for incineration. • High concern about presence of PCB and asbestos in CDW. The Danish EPA is working on establishing a national limit value for PCB in CDW 										
<p>Key performance indicators</p> <ul style="list-style-type: none"> • 99.9 tonnes/€ million turnover • 7.9 tonnes hazardous/€ million turnover • 92.0 tonnes non-hazardous/€ million turnover • 0.48 tonnes/million population • 0% CDW backfilled • 4.5% CDW landfilled • 0.18% CDW imported • 0.13% CDW exported 	<table border="0"> <tr> <td>Backfilling definition</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>EoW criteria</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Green Public Procurement</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Pre-demolition audits</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Landfill tax (64 €/tonne)</td> <td><input checked="" type="checkbox"/></td> </tr> </table>	Backfilling definition	<input checked="" type="checkbox"/>	EoW criteria	<input checked="" type="checkbox"/>	Green Public Procurement	<input checked="" type="checkbox"/>	Pre-demolition audits	<input checked="" type="checkbox"/>	Landfill tax (64 €/tonne)	<input checked="" type="checkbox"/>
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Green Public Procurement	<input checked="" type="checkbox"/>										
Pre-demolition audits	<input checked="" type="checkbox"/>										
Landfill tax (64 €/tonne)	<input checked="" type="checkbox"/>										
<p>Key 'best practices/ interventions'</p> <ul style="list-style-type: none"> • Good cooperation between construction producer and waste treatment sector leads to cost savings and supports sustainable recycling and enable new business. • Possibility for recycling CDW without a specific permit under the Environmental Protection Act, provided the CDW is sorted, unpolluted and processed. • Tax on non-reusable CDW and on natural resources. • Economic support (loans) for refurbishment and use of recycled material. • Strict requirements for demolition activities in combination with on-site sorting promote high-quality recycling. • Improved attention of building owners, architects and consulting engineers to recycling of CDW as an easy and important element of sustainable buildings, and contribution to the certificate score. <p>DGNB is the certification system of sustainable buildings in Denmark. The certification of new buildings covers assessment of the whole life cycle of the building, including end-of-life and therefore CDW.</p>	<p>Data quality indicator and trend</p> <p>3.8/5 – Good KPI Trend</p> <p>Use of CDW without a specific permit</p> <ul style="list-style-type: none"> • CDW can be used, without a specific permit under the Environmental Protection Act, provided that conditions, stipulated in Statutory Order no. 1662/2010 on recycling of residual products and soil in building and construction work and on recycling of sorted, unpolluted CDW are met. • In the Statutory Order, uncontaminated CDW is defined as CDW with a high degree of certainty, that the waste does not contain polluting materials or substances to such an extent or of 										

Key 'best practices' for CDW data collection

- The newly developed Danish waste data collection system has started operating for 2011 reference year. It seems quite robust and could be taken as an example for estimating waste from waste treatment facilities and waste collectors.
- Denmark is also one of the few countries having estimates for future projections of CDW generation and management.

such a nature and concentration that the use of the waste may have an adverse impact on the environment or human health.

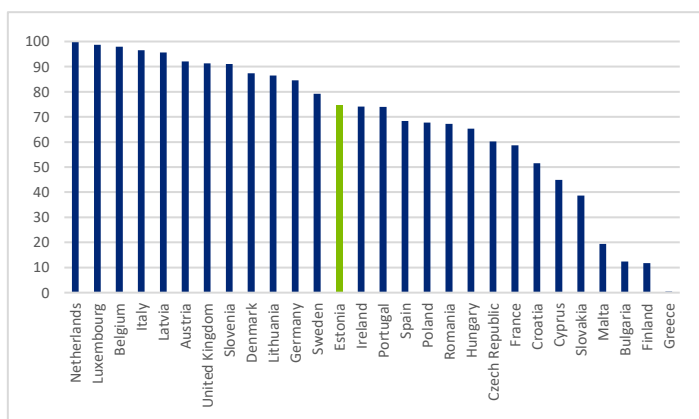
Key opportunities

- Over 400 recycling facilities in Denmark providing good opportunities for recycling.
- Improving knowledge of high-level recycling technologies.
- Exploitation of opportunities for matching demolition and CDW production with supply of materials for new buildings and construction.
- Business opportunities for secondary resources (CDW).
- Cost savings and resource saving (energy, raw materials) through development of prefabricated elements that can be reused.

8.4.8. Estonia

'Estonia'

CDW treated – Country performance



75% of treated CDW that is recovered (and reused).

Source: Eurostat % of treated waste

Key CDW policy and legislation

- National Waste Management Plan for the period 2014-2020, in 2011 the recovery rate of CDW was 72%.
- Waste Act (RT I 2004, 9, 52), adopted in 2004, and its subsequent amendments (the most recent one in 2015) however does not include specific rules for CDW.
- The Environmental Charges Act (RT I 2005, 67, 512) describes the conditions under which the landfill operators should pay landfill tax to the State for receiving waste in landfills.
- Local governments' waste management rules.
- Standards for recycled aggregates.
- Pollution charge (landfill tax) applied to all waste being disposed in landfills and lower gate fees for separately collected CDW than for mixed CDW.

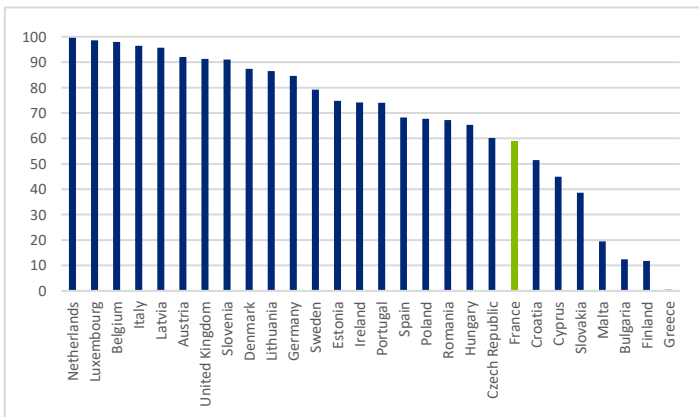
<p>Key performance indicators</p> <ul style="list-style-type: none"> • 127.9 tonnes/€ million turnover • 1.8 tonnes hazardous/€ million turnover • 126 tonnes non-hazardous/€ million turnover • 0.38 tonnes/million population • 21% CDW backfilled • 3.6% CDW landfilled • No data available for CDW imported • 0.42% CDW exported 	<ul style="list-style-type: none"> • Significantly lower charges for asbestos- containing waste in order to discourage illegal dumping of this waste. <p style="text-align: right;"> Backfilling definition <input checked="" type="checkbox"/> EoW criteria <input checked="" type="checkbox"/> Green Public Procurement <input checked="" type="checkbox"/> Pre-demolition audits <input checked="" type="checkbox"/> Landfill tax (29.8 €/tonne) <input checked="" type="checkbox"/> </p>
<p>Key ‘best practices/ interventions’</p> <ul style="list-style-type: none"> • Construction and demolition companies must submit CDW management plan to local authorities. • Landfilling is an expensive option and as a result services providing recovery and recycling options are well developed. • Mineral resource extraction tax. • Local waste management rules in municipalities. • Well-developed Waste Register database (JATS). • The Estonian Waste Management Association has been granted financing through the Enterprise Estonia for development a project crushed concrete as constructions material (recycling of aggregates). 	<p>Data quality indicator and trend</p> <p>3.6/5 – Modest KPI Trend</p>
<p>Key ‘best practices’ for CDW data collection</p> <ul style="list-style-type: none"> • Internal consistency of data collected. • Good example of country using administrative data to produce robust estimates. Waste factors are used to extrapolate the data to enterprises that do not have a permit and double counting avoided through specific algorithms. 	<p>Recycling Cluster</p> <ul style="list-style-type: none"> • Estonian Recycling Cluster and the Estonian Waste Recycling Competence Centre was developed by the Estonian Waste Management Association (EWMA) and has 40 members (private waste management companies). • The mission is to stand for the common interests of the members and to develop waste management by the general principles of sustainable development: <ul style="list-style-type: none"> ○ Increase the amounts of waste recycled ○ Produce from waste, products compliant to quality standards and certified ○ Increase production capacity and volumes, joint marketing; ○ sales of the products-services and export. ○ international competitiveness. • Currently Cluster members, are private waste management companies, research and educational institutions, as well as the Estonian Water Works Association and the Estonian Waste Recycling Competence Centre.
<p>Key opportunities</p> <ul style="list-style-type: none"> • Financial support through for demolition projects of the obsolete Soviet era military, industrial and collective farms (agricultural) buildings if demonstrate separate collection in the demolition project and that CDW is handled according to the waste hierarchy. • CDW management has been increasingly elevating the steps of the waste hierarchy over the recent years and currently the recovery performance is high. 	

8.4.9. Finland

'Finland'																																																											
<p>CDW treated – Country performance</p> <table border="1"> <caption>CDW treated – Country performance (Estimated data from chart)</caption> <thead> <tr> <th>Country</th> <th>CDW treated (%)</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>98</td></tr> <tr><td>Luxembourg</td><td>98</td></tr> <tr><td>Belgium</td><td>95</td></tr> <tr><td>Italy</td><td>95</td></tr> <tr><td>Latvia</td><td>92</td></tr> <tr><td>Austria</td><td>90</td></tr> <tr><td>United Kingdom</td><td>88</td></tr> <tr><td>Slovenia</td><td>85</td></tr> <tr><td>Denmark</td><td>82</td></tr> <tr><td>Lithuania</td><td>80</td></tr> <tr><td>Germany</td><td>78</td></tr> <tr><td>Sweden</td><td>75</td></tr> <tr><td>Estonia</td><td>72</td></tr> <tr><td>Ireland</td><td>70</td></tr> <tr><td>Portugal</td><td>68</td></tr> <tr><td>Spain</td><td>65</td></tr> <tr><td>Poland</td><td>62</td></tr> <tr><td>Romania</td><td>60</td></tr> <tr><td>Hungary</td><td>58</td></tr> <tr><td>Czech Republic</td><td>55</td></tr> <tr><td>France</td><td>52</td></tr> <tr><td>Croatia</td><td>48</td></tr> <tr><td>Cyprus</td><td>45</td></tr> <tr><td>Slovakia</td><td>40</td></tr> <tr><td>Malta</td><td>20</td></tr> <tr><td>Bulgaria</td><td>15</td></tr> <tr><td>Finland</td><td>12</td></tr> <tr><td>Greece</td><td>10</td></tr> </tbody> </table> <p>12% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	CDW treated (%)	Netherlands	98	Luxembourg	98	Belgium	95	Italy	95	Latvia	92	Austria	90	United Kingdom	88	Slovenia	85	Denmark	82	Lithuania	80	Germany	78	Sweden	75	Estonia	72	Ireland	70	Portugal	68	Spain	65	Poland	62	Romania	60	Hungary	58	Czech Republic	55	France	52	Croatia	48	Cyprus	45	Slovakia	40	Malta	20	Bulgaria	15	Finland	12	Greece	10	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> The Land Use and Building Decree 895/1999 gives guidelines on the ecological considerations in building and the Land Use and Building Act 132/1999 gives guidelines on the occasions when a permit is required to demolish a building or part thereof. Environmental Protection Act 527/2014 gives general requirements of environmental protection and it applies also to waste treatment activities. The Environmental Protection Decree 713/2014 defines professional or facility-based treatment of wastes as one of the operations where an environmental permit from the municipal environmental authority is required. The national waste prevention plan is incorporated in the national WMP. Some specific targets are given for CDW, especially prolonging the service life of building stock. Government Decree 591/2006 promotes the utilization of crushed concrete. CPR/BRCW 7 Sustainable use of natural resource: National Action Plan for Green Public Procurement, guidance and criteria for 14 procurement areas have been developed, many of which are directly relevant for buildings. For mixed C&D waste typical gate fees for landfills range from 100 to 170 €/tonne and 55€/tonne for sorted waste.
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<p>Key performance indicators</p> <ul style="list-style-type: none"> 599.9 tonnes/€ million turnover 7.3 tonnes hazardous/€ million turnover 552.6 tonnes non-hazardous/€ million turnover 3.01 tonnes/million population 0% CDW backfilled 83.7% CDW landfilled 0.01% CDW imported 0.12% CDW exported 	<p>Key 'best practices/ interventions'</p> <ul style="list-style-type: none"> Requirement for pre-demolition audits and selective demolition to promote reuse. For certain categories of buildings a diagnosis related to CDW is mandatory before any demolition work. Best practices developed to study and improve demountable and deconstruction buildings to aid reuse, recycling and recovery. The construction works must be designed, built and demolished in such a way that the use of natural resources is sustainable. Procedures relating to CE marking of recycled products. Finnish Association of Civil Engineers (2013) Guidance on life cycle management of constructions and buildings . Finnish ministry of the Environment (2015) Webguide; good practice in recycling of household construction & demolition waste from refurbishment. Wood recovery as fuel standard. 																																																										
<p>Key 'best practices/ interventions'</p> <ul style="list-style-type: none"> Backfilling definition <input checked="" type="checkbox"/> EoW criteria <input checked="" type="checkbox"/> Green Public Procurement <input checked="" type="checkbox"/> Pre-demolition audits <input checked="" type="checkbox"/> Landfill tax (55 €/tonne) <input checked="" type="checkbox"/> 	<p>Data quality indicator and trend</p> <p>1.8/5 – Poor KPI Trend</p>																																																										

<p>Key 'best practices' for CDW data collection</p> <ul style="list-style-type: none"> • No best practice identified for CDW data. 	<p>Recycling of Reclaimed Concrete</p> <ul style="list-style-type: none"> • Legislative simplification of regulations to promote the recycling of reclaimed concrete. Crushed demolition wastes have been successfully used for about 20 years in infra constructions to replace high-grade natural aggregates. Key issues in successful recycling are: <ul style="list-style-type: none"> ○ Use and development of adaptive legislative instruments enabling sustainable recycling; ○ Selective demolition and traceability of waste material flows; ○ Quality assurance (including limit values for environmental properties in compliance testing) and turning waste into product.
<p>Key opportunities</p> <ul style="list-style-type: none"> • Quality control scheme in production. • Awareness of risks related to hazardous compounds in construction products promote the development of construction products. • A significant part of the CDW in Finland is wood waste due to the building typology. Industrial initiatives to find new solutions for recycling of wood waste as new products. • Environmental Product Declaration does not include recycling. 	

8.4.10. France

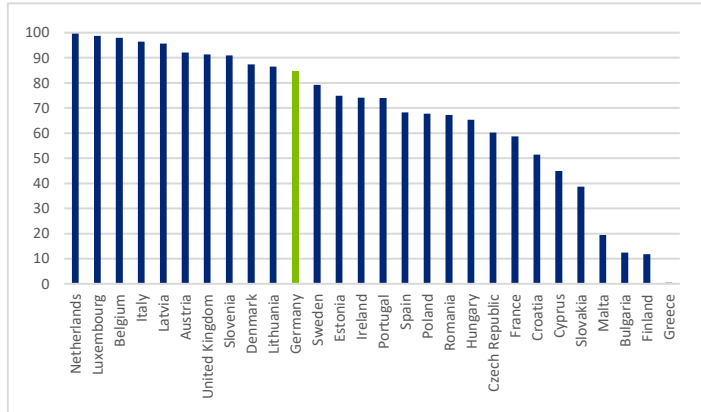
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<p>CDW treated – Country performance</p>  <table border="1"> <caption>CDW treated – Country performance</caption> <thead> <tr> <th>Country</th> <th>CDW treated (%)</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>100</td></tr> <tr><td>Luxembourg</td><td>100</td></tr> <tr><td>Belgium</td><td>98</td></tr> <tr><td>Italy</td><td>95</td></tr> <tr><td>Latvia</td><td>92</td></tr> <tr><td>Austria</td><td>90</td></tr> <tr><td>United Kingdom</td><td>88</td></tr> <tr><td>Slovenia</td><td>85</td></tr> <tr><td>Denmark</td><td>82</td></tr> <tr><td>Lithuania</td><td>80</td></tr> <tr><td>Germany</td><td>78</td></tr> <tr><td>Sweden</td><td>75</td></tr> <tr><td>Estonia</td><td>72</td></tr> <tr><td>Ireland</td><td>70</td></tr> <tr><td>Portugal</td><td>68</td></tr> <tr><td>Spain</td><td>65</td></tr> <tr><td>Poland</td><td>62</td></tr> <tr><td>Romania</td><td>60</td></tr> <tr><td>Hungary</td><td>58</td></tr> <tr><td>Czech Republic</td><td>55</td></tr> <tr><td style="background-color: #90EE90;">France</td><td style="background-color: #90EE90;">59</td></tr> <tr><td>Croatia</td><td>50</td></tr> <tr><td>Cyprus</td><td>45</td></tr> <tr><td>Slovakia</td><td>40</td></tr> <tr><td>Ivarta</td><td>35</td></tr> <tr><td>Bulgaria</td><td>30</td></tr> <tr><td>Finland</td><td>25</td></tr> <tr><td>Greece</td><td>20</td></tr> </tbody> </table> <p>59% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	CDW treated (%)	Netherlands	100	Luxembourg	100	Belgium	98	Italy	95	Latvia	92	Austria	90	United Kingdom	88	Slovenia	85	Denmark	82	Lithuania	80	Germany	78	Sweden	75	Estonia	72	Ireland	70	Portugal	68	Spain	65	Poland	62	Romania	60	Hungary	58	Czech Republic	55	France	59	Croatia	50	Cyprus	45	Slovakia	40	Ivarta	35	Bulgaria	30	Finland	25	Greece	20	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> • After the introduction of the concept of waste prevention in French law in 1975, the first waste prevention plan was adopted in February 2004. • Law 2009-967 of 3 August 2009 and Law 2010-788 of 12 July 2010 make pre-audits compulsory on demolition sites and departmental CDW management plans. • Law 2015-992 of 17 August 2015, related to the energy transition for a green growth. • The Waste reduction and recovery plan for 2014-2020. The plan also announces a Zero wasting, zero building and public works waste program. • A majority of construction companies declare that operating costs of CDW sorting, recovery and recycling are too high. • General tax on polluting activities (TGAP). If mixed non-hazardous waste: an average of 40€/t. <ul style="list-style-type: none"> Backfilling definition <input checked="" type="checkbox"/> EoW criteria <input checked="" type="checkbox"/> Green Public Procurement <input checked="" type="checkbox"/> Pre-demolition audits <input checked="" type="checkbox"/> Landfill tax <input checked="" type="checkbox"/>
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<p>Key performance indicators</p> <ul style="list-style-type: none"> • 233.0 tonnes/€ million turnover • 3.8 tonnes hazardous/€ million turnover 																																																											

<ul style="list-style-type: none"> • 229.2 tonnes non-hazardous/€ million turnover • 1.01 tonnes/million population • 7.5% CDW backfilled • 33.7% CDW landfilled • 1.44% CDW imported • 0.26% CDW exported 	<p>Data quality indicator and trend</p> <p>3.4/5 – Modest KPI Trend</p>
<p>Key 'best practices/ interventions'</p> <ul style="list-style-type: none"> • Aggregate tax. • Smartphone application: Excavated soil exchange Application, This app helps craftsmen and construction company locating the nearest CDW recovery/recycling facility. • Good cooperation between the public authorities and the professionals, in particular via the National Waste Council. • HQE is the Building certification leader in France, with 90% of the 800 certified building operations. 	<p>Financial Incentives to waste prevention and management projects</p> <ul style="list-style-type: none"> • Different funding possibilities are available for companies and local communities developing a project in the field of waste prevention or management. • ADEME provides full support (informative, technical, and financial) to individuals, companies and local communities regarding waste prevention and management. • ADEME intervention budget on waste matters amounted 943 M€ for the period 2009-2013, of which 222Me were dedicated to prevention.
<p>Key 'best practices' for CDW data collection</p> <ul style="list-style-type: none"> • No best practice identified for CDW data. Data are based on a 2008 survey. Methodological changes are expected with the renewal of this survey in 2016. 	
<p>Key opportunities</p> <ul style="list-style-type: none"> • Almost all stakeholders pointed out that there are currently not enough treatment installations. • Many R&D programs on recycled materials from CDW and great financial and technical support by Agency for the Environment and Energy Management. • Different funding possibilities are available for companies and local communities developing a project in the field of waste prevention or management. • EoW status for aggregates made from CDW for on-road applications is work in progress. • Environmental acceptability of alternative materials in road building. 	

8.4.11. Germany

'Germany'

CDW treated – Country performance



85% of treated CDW that is recovered (and reused).

Source: Eurostat % of treated waste

Key performance indicators

- 423.4 tonnes/€ million turnover
- 23.5 tonnes hazardous/€ million turnover
- 399.9 tonnes non-hazardous/€ million turnover
- 1.11 tonnes/million population
- 7.9% CDW backfilled
- 6.2% CDW landfilled
- 1.2% CDW imported
- 0.4% CDW exported

Key 'best practices/ interventions'

- Lander: waste management plans.
- **Optimization of demolition / dismantling of buildings for the recovery and treatment of building materials considering the reduction of harmful substances (in particular sulphates) in the recycled building material and aspects of life-cycle analyses.**
- Standards for recycled CDW.
- **DIN and EN norms do not constitute any barriers for CDW recycling and could act as drivers (e.g. to be pointed out for public tenders).**
- **There exist several frameworks and guidelines for physical requirements of CDW.**
- **A landfill dumping ban is in place in Germany since 2005.**
- **Certificates are an important driver for sustainable CDW management. For instance, the German Sustainable Building Council assesses buildings and urban districts, which demonstrate an outstanding commitment to meeting sustainability objectives.**

Key CDW policy and legislation

- Germany's first uniform national waste disposal act, the Abfallbeseitigungsgesetz (AbfG), was adopted in 1972.
- The Circular Economy Act (KrWG), currently, main waste disposal statute, incorporates the main structural elements of the Kreislaufwirtschafts- und Abfallgesetz (KrW-/AbfG).
- The Ordinance on the Management of Municipal Wastes (Gewerbeabfallverordnung), currently under revision, contains important elements related to CDW management.
- The legal framework for CDW recycling is manifested in specific state laws.
- In 2013, the German Government's Waste Prevention Programme entitled "Waste prevention programme under the involvement of the federal Länder.
- In 2012, the valorisation rate of CDW reached 95.5%.
- The LAGA note M34 (2003) provides enforcement instructions for the Ordinance on the Management of Municipal Wastes.

Backfilling definition	<input checked="" type="checkbox"/>
EoW criteria	<input checked="" type="checkbox"/>
Green Public Procurement	<input checked="" type="checkbox"/>
Pre-demolition audits	<input checked="" type="checkbox"/>
Landfill tax	<input checked="" type="checkbox"/>

Data quality indicator and trend

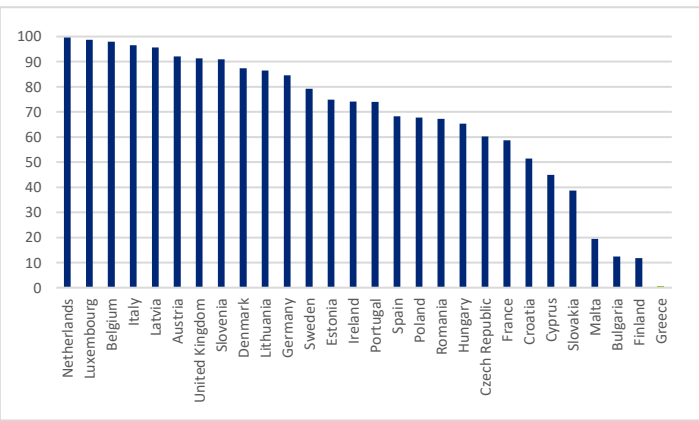
4.3/5 – Good KPI Trend

Circular Economy in Building

- The initiative "Kreislaufwirtschaft Bau" (Circular Economy in Building) started in 1995 with a voluntary commitment between the industry and the federal government.
- The objective of this agreement was to reduce the amount of mineral building wastes that was dumped, despite of reuse potential.
- It unifies six main market actors to enhance the circular economy in the construction sector. Their work is documented in monitoring reports, which are published every two years.

<ul style="list-style-type: none"> • RAL-Quality Assurance for recycled construction materials. 	
<p>Key ‘best practices’ for CDW data collection</p> <ul style="list-style-type: none"> • Robust methodology based on data from treatment facilities. • Automatic data preparation in place. • Independent quality assurance tests carried out before releasing the data in the IT network. 	
<p>Key opportunities</p> <ul style="list-style-type: none"> • Monitoring and enforcement of waste regulation is managed on the local level. • Optimization of demolition / dismantling of buildings for the recovery. • Several municipalities integrate the preferred use of recycled construction material in their calls for tenders but this is not a standard. 	

8.4.12. Greece

‘Greece’																																																											
<p>CDW treated – Country performance</p>  <table border="1"> <caption>CDW treated – Country performance (Estimated %)</caption> <thead> <tr> <th>Country</th> <th>% of CDW Treated</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>100</td></tr> <tr><td>Luxembourg</td><td>100</td></tr> <tr><td>Belgium</td><td>98</td></tr> <tr><td>Italy</td><td>95</td></tr> <tr><td>Latvia</td><td>92</td></tr> <tr><td>Austria</td><td>90</td></tr> <tr><td>United Kingdom</td><td>88</td></tr> <tr><td>Slovenia</td><td>85</td></tr> <tr><td>Denmark</td><td>82</td></tr> <tr><td>Lithuania</td><td>80</td></tr> <tr><td>Germany</td><td>78</td></tr> <tr><td>Sweden</td><td>75</td></tr> <tr><td>Estonia</td><td>72</td></tr> <tr><td>Ireland</td><td>70</td></tr> <tr><td>Portugal</td><td>68</td></tr> <tr><td>Spain</td><td>65</td></tr> <tr><td>Poland</td><td>62</td></tr> <tr><td>Romania</td><td>60</td></tr> <tr><td>Hungary</td><td>58</td></tr> <tr><td>Czech Republic</td><td>55</td></tr> <tr><td>France</td><td>52</td></tr> <tr><td>Croatia</td><td>48</td></tr> <tr><td>Cyprus</td><td>45</td></tr> <tr><td>Slovakia</td><td>40</td></tr> <tr><td>Malta</td><td>20</td></tr> <tr><td>Bulgaria</td><td>15</td></tr> <tr><td>Finland</td><td>12</td></tr> <tr><td>Greece</td><td>0.4</td></tr> </tbody> </table> <p>0.4% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	% of CDW Treated	Netherlands	100	Luxembourg	100	Belgium	98	Italy	95	Latvia	92	Austria	90	United Kingdom	88	Slovenia	85	Denmark	82	Lithuania	80	Germany	78	Sweden	75	Estonia	72	Ireland	70	Portugal	68	Spain	65	Poland	62	Romania	60	Hungary	58	Czech Republic	55	France	52	Croatia	48	Cyprus	45	Slovakia	40	Malta	20	Bulgaria	15	Finland	12	Greece	0.4	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> • Law 4042 of 2012, is the legislative framework for waste management. • Joint Ministerial Decision 36259/1757/E103 of 2010 stipulating measures, conditions and programmes for the alternative management of excavation, CDW. • The National Waste Management Plan is in a final draft version, however administrative regions have adopted their own regional Waste Management Plans. • Waste Prevention Plan published since 31 December 2014. • Existence of private land/allotments used for the purpose of dumping CDW by their owner for a price and thus diverting CDW away from CDW management systems.
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<p>Key performance indicators</p> <ul style="list-style-type: none"> • 72.5 tonnes/€ million turnover • 0.3 tonnes hazardous/€ million turnover • 72.2tonnes non-hazardous/€ million turnover • 0.08 tonnes/million population • 0% CDW backfilled • 99.6% CDW landfilled • No data available for CDW imported • 0.08% CDW exported 	<ul style="list-style-type: none"> • High recovery/recycling costs. High costs of establishment of treatment facilities. • Landfill tax is used as a landfill diversion mechanism. <p style="text-align: right;"> Backfilling definition <input checked="" type="checkbox"/> EoW criteria <input checked="" type="checkbox"/> Green Public Procurement <input checked="" type="checkbox"/> Pre-demolition audits <input checked="" type="checkbox"/> Landfill tax (40 €/tonne) <input checked="" type="checkbox"/> </p>
<p>Key ‘best practices/ interventions’</p> <ul style="list-style-type: none"> • Hellenic Recycling Agency monitoring the operation of existing CDW alternative management systems. • The obligation of the officially licenced CDW management systems to report data regarding CDW management. • Inexistence of an effective policy for the use of recycled materials. • No obligations for recycled materials or recycled content in construction materials. 	<p>Data quality indicator and trend</p> <p>2.6/5 – Modest KPI Trend</p>
<p>Key ‘best practices’ for CDW data collection</p> <ul style="list-style-type: none"> • Good example of estimation of CDW data generated using an annual survey combined with administrative data source for cross-checks. • CDW data are directly obtained from a survey and then extrapolated based on economical proxies (e.g. building activity index). Administrative data are then used to further improve the data quality. 	<p>Letter of guarantee</p> <ul style="list-style-type: none"> • Letter of guarantee amounting to 0.2% of the total project budget for excavation and construction works and 0.5% of the total project budget for demolition. • Required by the Building and urban planning authorities in order to make sure that the management of CDW will comply with existing legislation.
<p>Key opportunities</p> <ul style="list-style-type: none"> • About 40% of the Greek population is not covered by any system of alternative CDW management. • Local community action, taking matters in its hands. Recycling of CDW comprises thriving new business opportunities in small communities. • Rising conscience among the public about the need of sound environmental management and sustainability issues in general. 	

8.4.13. Hungary

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<p>CDW treated – Country performance</p> <table border="1"> <caption>CDW treated – Country performance (Estimated %)</caption> <thead> <tr> <th>Country</th> <th>%</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>98</td></tr> <tr><td>Luxembourg</td><td>98</td></tr> <tr><td>Belgium</td><td>95</td></tr> <tr><td>Italy</td><td>92</td></tr> <tr><td>Latvia</td><td>90</td></tr> <tr><td>Austria</td><td>88</td></tr> <tr><td>United Kingdom</td><td>85</td></tr> <tr><td>Slovenia</td><td>82</td></tr> <tr><td>Denmark</td><td>80</td></tr> <tr><td>Lithuania</td><td>78</td></tr> <tr><td>Germany</td><td>75</td></tr> <tr><td>Sweden</td><td>72</td></tr> <tr><td>Estonia</td><td>70</td></tr> <tr><td>Ireland</td><td>68</td></tr> <tr><td>Portugal</td><td>65</td></tr> <tr><td>Spain</td><td>62</td></tr> <tr><td>Poland</td><td>60</td></tr> <tr><td>Romania</td><td>58</td></tr> <tr><td>Hungary</td><td>65</td></tr> <tr><td>Czech Republic</td><td>55</td></tr> <tr><td>France</td><td>52</td></tr> <tr><td>Croatia</td><td>48</td></tr> <tr><td>Cyprus</td><td>45</td></tr> <tr><td>Slovakia</td><td>40</td></tr> <tr><td>Malta</td><td>20</td></tr> <tr><td>Bulgaria</td><td>15</td></tr> <tr><td>Finland</td><td>12</td></tr> <tr><td>Greece</td><td>10</td></tr> </tbody> </table> <p>65% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	%	Netherlands	98	Luxembourg	98	Belgium	95	Italy	92	Latvia	90	Austria	88	United Kingdom	85	Slovenia	82	Denmark	80	Lithuania	78	Germany	75	Sweden	72	Estonia	70	Ireland	68	Portugal	65	Spain	62	Poland	60	Romania	58	Hungary	65	Czech Republic	55	France	52	Croatia	48	Cyprus	45	Slovakia	40	Malta	20	Bulgaria	15	Finland	12	Greece	10	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> Act of Environmental Protection (Act LIII of 1995) sets obligations for responsible waste management and construction activities. Act LXXVIII on Built Environment and Conservation 1997 for CDW. Government Regulation 191/2009 (IX 15) On obligations for construction activities. National Waste Management Plan (NWMP) 2014-2020, third NWMP and it builds upon the findings from the previous NWMP 2003-2008 as well as define the target of 70 % of reused/ recycled/ recovered non-hazardous CDW by 2020. The National Waste Prevention Program is part of the NWMP and CDW includes attention to the alternative utilization possibilities of unused/dysfunctional buildings and structures. National Environmental Program (NEP) 2014-2019 specialises in environmental awareness and contains a section on CDW describing the targets and recommended measures. Newly introduced Landfill Tax. <table style="width: 100%; border: none;"> <tr> <td style="text-align: right;">Backfilling definition</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">EoW criteria</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Green Public Procurement</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">e-demolition audits (haz. waste)</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Landfill tax (28 €/tonne)</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Other Specific info</td> <td></td> </tr> </table>	Backfilling definition	<input checked="" type="checkbox"/>	EoW criteria	<input checked="" type="checkbox"/>	Green Public Procurement	<input checked="" type="checkbox"/>	e-demolition audits (haz. waste)	<input checked="" type="checkbox"/>	Landfill tax (28 €/tonne)	<input checked="" type="checkbox"/>	Other Specific info	
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<p>Key performance indicators</p> <ul style="list-style-type: none"> 334.3 tonnes/€ million turnover 3 tonnes hazardous/€ million turnover 331.3 tonnes non-hazardous/€ million turnover 0.35 tonnes/million population 9.1% CDW backfilled 25.5% CDW landfilled No data available for CDW imported No data available for CDW exported 	<p>Data quality indicator and trend</p> <p>3.4/5 – Modest KPI Trend</p>																																																																						
<p>Key 'best practices/ interventions'</p> <ul style="list-style-type: none"> Concrete production with utilisation of recovered CDW and other building materials. Standards for use of recycled materials; road construction, and bricks and tiles. A demolition plan has to be prepared. A Hungarian-Slovakian Cross-Border Co-Operation Programme called REPROWIS – Reducing Production Waste by Industrial Symbiosis. 	<p>Reuse quota for materials in construction processes</p> <ul style="list-style-type: none"> An obligatory share of reused materials is being proposed to support construction and demolition operators, who prioritise the reuse and recycling of materials. The aim is to reduce the amount of primary raw materials used. 																																																																						
<p>Key 'best practices' for CDW data collection</p> <ul style="list-style-type: none"> Robust methodology to estimate data from non-replying units and for enterprises that have no obligation to report their data. Two different organisms are responsible for the quality of the data sets and the data quality control. 																																																																							

Key opportunities

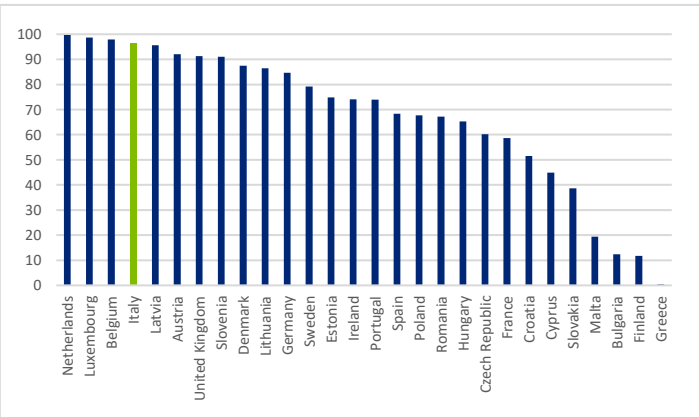
- New legislation is being developed with detailed rules for CDW management.
- Required financial resources are set by the Environment Efficiency and Energy Operational Programme (KEHOP), the Economic Development and Innovation Operational Programme (GINOP) and the Regional and Local Development Operational Programme (TOP) available to achieve the targets set out in the various EU Directives between 2014-2020.
- Communication between stakeholders involved in CDW.
- The number of eco-friendly products on the market has increased.

8.4.14. Ireland

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<p>CDW treated – Country performance</p> <table border="1"> <caption>CDW treated – Country performance</caption> <thead> <tr> <th>Country</th> <th>CDW treated (%)</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>100</td></tr> <tr><td>Luxembourg</td><td>98</td></tr> <tr><td>Belgium</td><td>97</td></tr> <tr><td>Italy</td><td>95</td></tr> <tr><td>Latvia</td><td>94</td></tr> <tr><td>Austria</td><td>92</td></tr> <tr><td>United Kingdom</td><td>91</td></tr> <tr><td>Slovenia</td><td>90</td></tr> <tr><td>Denmark</td><td>88</td></tr> <tr><td>Lithuania</td><td>87</td></tr> <tr><td>Germany</td><td>85</td></tr> <tr><td>Sweden</td><td>80</td></tr> <tr><td style="background-color: #90EE90;">Ireland</td><td style="background-color: #90EE90;">74</td></tr> <tr><td>Estonia</td><td>73</td></tr> <tr><td>Portugal</td><td>72</td></tr> <tr><td>Spain</td><td>68</td></tr> <tr><td>Poland</td><td>67</td></tr> <tr><td>Romania</td><td>66</td></tr> <tr><td>Hungary</td><td>65</td></tr> <tr><td>Czech Republic</td><td>60</td></tr> <tr><td>France</td><td>58</td></tr> <tr><td>Croatia</td><td>52</td></tr> <tr><td>Cyprus</td><td>45</td></tr> <tr><td>Slovakia</td><td>40</td></tr> <tr><td>Malta</td><td>20</td></tr> <tr><td>Bulgaria</td><td>15</td></tr> <tr><td>Finland</td><td>12</td></tr> <tr><td>Greece</td><td>10</td></tr> </tbody> </table> <p>74% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	CDW treated (%)	Netherlands	100	Luxembourg	98	Belgium	97	Italy	95	Latvia	94	Austria	92	United Kingdom	91	Slovenia	90	Denmark	88	Lithuania	87	Germany	85	Sweden	80	Ireland	74	Estonia	73	Portugal	72	Spain	68	Poland	67	Romania	66	Hungary	65	Czech Republic	60	France	58	Croatia	52	Cyprus	45	Slovakia	40	Malta	20	Bulgaria	15	Finland	12	Greece	10	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> • Waste Management Act 1996 provided for the organisation of public authority functions in relation to waste management. • The adoption in 1998 of ambitious construction sector recycling targets of 50% by 2003 and 85% by 2013 in national policy. • Regional non-hazardous waste management planning with some of the plans including specific policies and targets for CDW management since 1998. • National Construction & Demolition Waste Council (NCDWC) established in 2002. • Target of 85% recycling of CDW by 2013. • Hazardous waste management planning, at National level since 1996. • Resource Efficiency and Waste Prevention Programme at national level and regional level, Planning Guidelines for Local Authorities. • Landfill levy which is currently at €75 per tonne of waste landfilled. <table border="0" style="width: 100%;"> <tr> <td style="text-align: right;">Backfilling definition</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">EoW criteria</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Green Public Procurement</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">e-demolition audits (haz. waste)</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Landfill tax (75 €/tonne)</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> </table>	Backfilling definition	<input checked="" type="checkbox"/>	EoW criteria	<input checked="" type="checkbox"/>	Green Public Procurement	<input checked="" type="checkbox"/>	e-demolition audits (haz. waste)	<input checked="" type="checkbox"/>	Landfill tax (75 €/tonne)	<input checked="" type="checkbox"/>
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<p>Key performance indicators</p> <ul style="list-style-type: none"> • 23.1 tonnes/€ million turnover • 0.1 tonnes hazardous/€ million turnover • 23 tonnes non-hazardous/€ million turnover • 0.04 tonnes/million population • 25.5% CDW backfilled • 0.3% CDW landfilled • No data available for CDW imported • 4% CDW exported 	<p>Key ‘best practices/ interventions’</p> <ul style="list-style-type: none"> • Implementation of regional and national targets for CDW Recovery prior to the WFD Directive targets. 																																																																				
<p>Data quality indicator and trend</p> <p>2.1/5 – Poor KPI Trend</p>																																																																					

<ul style="list-style-type: none"> • Planning requirements for construction projects above a certain threshold to develop a site specific CDW management plan since 2006. • The production of a number of very useful guidance documents on CDW management best practice, all of which are available on the National Construction and Demolition Waste Council. • Design out Waste - A design team guide to waste reduction in construction and demolition projects; EPA Strive programme 2007-2013. • Sustainability standard on CDW for public roadwork only. 	<p>National Construction and Demolition Waste Council (NCDWC)</p> <ul style="list-style-type: none"> • Setup as an industry led, voluntary initiative to assist in achieving compliance with the 85% policy target set by 'Changing Our Ways'. • Run successful waste prevention programmes when it was in operation. • Setting up of CDW Management Taskforces to recommend improvements to CDW management through planning, prevention and reclamation, development of awareness and training programmes. • Publication of a handbook for site managers on CDW management and best practice guidelines for the preparation of waste management plans for CD projects.
<p>Key 'best practices' for CDW data collection</p> <ul style="list-style-type: none"> • No best practice identified for CDW data. 	
<p>Key opportunities</p> <ul style="list-style-type: none"> • Systematising buildings eco-conception would be a major driver to easing end-of-life deconstruction and recycling. • The role of Building Information Modelling (BIM) combined with Environmental Product Declarations (EPDs) as a tool for sustainability in construction. • A number of innovative companies and R&D programmes. • The Use of Building Regulations to include provisions to improve the recyclability of buildings. • Research on secondary raw materials to determine their suitability as a replacement to virgin material in specific engineering applications. 	

8.4.15. Italy

'Italy'											
<p>CDW treated – Country performance</p>  <p>97% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> • D.Lgs 152/2006 is the main piece of legislation on waste and addresses the target of 70% recovery by weight by 2020. • No national waste management plan, as the legislation provides that plans should be developed at regional level. • DM 203/03 introduced the mandatory use of recycled materials by the government. • Landfill tax depends on the Region and the type of waste. <table border="0"> <tr> <td>Backfilling definition</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>EoW criteria</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Green Public Procurement</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Pre-demolition audits</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Landfill tax (10 €/tonne)</td> <td><input checked="" type="checkbox"/></td> </tr> </table>	Backfilling definition	<input checked="" type="checkbox"/>	EoW criteria	<input checked="" type="checkbox"/>	Green Public Procurement	<input checked="" type="checkbox"/>	Pre-demolition audits	<input checked="" type="checkbox"/>	Landfill tax (10 €/tonne)	<input checked="" type="checkbox"/>
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<p>Key performance indicators</p> <ul style="list-style-type: none"> • 204.2 tonnes/€ million turnover • 2.2 tonnes hazardous/€ million turnover • 202.1 tonnes non-hazardous/€ million turnover • 0.66 tonnes/million population • 0.5% CDW backfilled • 3% CDW landfilled • 0.09% CDW imported • 0.09% CDW exported 	<p>Data quality indicator and trend</p> <p>3.6/5 – Modest KPI Trend</p>
<p>Key ‘best practices/ interventions’</p> <ul style="list-style-type: none"> • Full assimilation of natural and recycled aggregates has been already introduced in the technical guidelines relating to the field of road construction. • Standards for aggregates recycled and reused in construction, road and environmental fields. • Enforcement of green procurement law to use of recycled materials. • CDW hazardous waste has to be treated according to the same rules of other hazardous wastes. 	<p>Green Public Procurement and Requirement for CE marking for recycled aggregates</p> <ul style="list-style-type: none"> • Mandatory use of recycled materials by the government (in particular, of recycled aggregates in infrastructure). • The adoption GPP could provide a significant boost to the market of recycled aggregates. • The GPP legislation is based on the possibility of substituting products with recycled products with the same characteristics. • Recognition of standardisation bodies as for example the CE marking. • The requirement for CE labelling is not observed by manufacturers or required by the market but could solve most of the problems of the market of recycled aggregates.
<p>Key ‘best practices’ for CDW data collection</p> <ul style="list-style-type: none"> • Internal consistency of time series of official data sets. 	
<p>Key opportunities</p> <ul style="list-style-type: none"> • Lack of knowledge of the technical characteristics of recycled aggregates reduce the use of CDW recycled materials. • The use of selective demolition practice would increase the quality and reduce the costs for recycled aggregates. • The inclusion of recycled aggregates prices in the price lists would highlight the price competitiveness on such products with regards to natural aggregates. 	

8.4.16. Latvia

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<p>CDW treated – Country performance</p> <table border="1"> <caption>CDW treated – Country performance (Estimated data from chart)</caption> <thead> <tr> <th>Country</th> <th>CDW treated (%)</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>98</td></tr> <tr><td>Luxembourg</td><td>97</td></tr> <tr><td>Belgium</td><td>96</td></tr> <tr><td>Italy</td><td>95</td></tr> <tr><td>Latvia</td><td>96</td></tr> <tr><td>Austria</td><td>92</td></tr> <tr><td>United Kingdom</td><td>91</td></tr> <tr><td>Slovenia</td><td>90</td></tr> <tr><td>Denmark</td><td>88</td></tr> <tr><td>Lithuania</td><td>87</td></tr> <tr><td>Germany</td><td>85</td></tr> <tr><td>Sweden</td><td>82</td></tr> <tr><td>Estonia</td><td>78</td></tr> <tr><td>Ireland</td><td>75</td></tr> <tr><td>Portugal</td><td>74</td></tr> <tr><td>Spain</td><td>72</td></tr> <tr><td>Poland</td><td>70</td></tr> <tr><td>Romania</td><td>68</td></tr> <tr><td>Hungary</td><td>65</td></tr> <tr><td>Czech Republic</td><td>62</td></tr> <tr><td>France</td><td>60</td></tr> <tr><td>Croatia</td><td>52</td></tr> <tr><td>Cyprus</td><td>48</td></tr> <tr><td>Slovakia</td><td>42</td></tr> <tr><td>Malta</td><td>20</td></tr> <tr><td>Bulgaria</td><td>15</td></tr> <tr><td>Finland</td><td>12</td></tr> <tr><td>Greece</td><td>10</td></tr> </tbody> </table> <p>96% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	CDW treated (%)	Netherlands	98	Luxembourg	97	Belgium	96	Italy	95	Latvia	96	Austria	92	United Kingdom	91	Slovenia	90	Denmark	88	Lithuania	87	Germany	85	Sweden	82	Estonia	78	Ireland	75	Portugal	74	Spain	72	Poland	70	Romania	68	Hungary	65	Czech Republic	62	France	60	Croatia	52	Cyprus	48	Slovakia	42	Malta	20	Bulgaria	15	Finland	12	Greece	10	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> Waste management is implemented at national, regional, and local level, however, there are no legal acts or planning documents that specifically regulate CDW management. Waste Management Act of 18 November 2010. State Waste Management Plan adopted in 2006, and was reviewed for 2013-2020. Green Procurement Promotion Plan. Tighter enforcement on illegal dumping and the introduction of stricter landfill costs. <table border="0"> <tr> <td>Backfilling definition</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>EoW criteria</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Green Public Procurement</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Pre-demolition audits</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td>Landfill tax (13 €/tonne)</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> </table>	Backfilling definition	<input checked="" type="checkbox"/>	EoW criteria	<input checked="" type="checkbox"/>	Green Public Procurement	<input checked="" type="checkbox"/>	Pre-demolition audits	<input checked="" type="checkbox"/>	Landfill tax (13 €/tonne)	<input checked="" type="checkbox"/>
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<p>Key 'best practices/ interventions'</p> <ul style="list-style-type: none"> Guidelines on promotion of environmentally friendly construction. 	<p>Guidelines for Green Procurement and environmentally friendly construction</p> <ul style="list-style-type: none"> Guidelines on the promotion of green procurement in state and municipal institutions, geared towards six groups of goods and services outside the scope of CDW, along with Guidelines on promotion of environmentally friendly construction: <ul style="list-style-type: none"> Design, construction, operation of buildings and demolition phases; Outline of possible environmental criteria relating to: energy consumption, renewable energy resources, construction and materials used in products, waste management and water management, environmental impact, architectural experience, and monitoring 																																																																				
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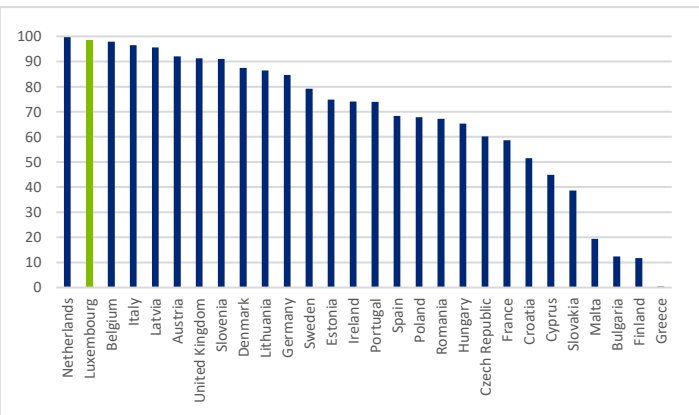
- There is an organised hierarchy that could potentially facilitate waste management (i.e. MoE & regional authorities).
- EU-funding for CDW projects.
- Incentives towards favourable use of recycled aggregates.

8.4.17. Lithuania

'Lithuania'																																																																					
<p>CDW treated – Country performance</p> <table border="1"> <caption>CDW treated – Country performance</caption> <thead> <tr> <th>Country</th> <th>CDW treated (%)</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>100</td></tr> <tr><td>Luxembourg</td><td>98</td></tr> <tr><td>Belgium</td><td>95</td></tr> <tr><td>Italy</td><td>92</td></tr> <tr><td>Latvia</td><td>90</td></tr> <tr><td>Austria</td><td>88</td></tr> <tr><td>United Kingdom</td><td>85</td></tr> <tr><td>Slovenia</td><td>82</td></tr> <tr><td>Denmark</td><td>80</td></tr> <tr><td>Lithuania</td><td>87</td></tr> <tr><td>Germany</td><td>78</td></tr> <tr><td>Sweden</td><td>75</td></tr> <tr><td>Estonia</td><td>72</td></tr> <tr><td>Ireland</td><td>70</td></tr> <tr><td>Portugal</td><td>68</td></tr> <tr><td>Spain</td><td>65</td></tr> <tr><td>Poland</td><td>62</td></tr> <tr><td>Romania</td><td>60</td></tr> <tr><td>Hungary</td><td>58</td></tr> <tr><td>Czech Republic</td><td>55</td></tr> <tr><td>France</td><td>52</td></tr> <tr><td>Croatia</td><td>48</td></tr> <tr><td>Cyprus</td><td>45</td></tr> <tr><td>Slovakia</td><td>42</td></tr> <tr><td>Malta</td><td>38</td></tr> <tr><td>Bulgaria</td><td>35</td></tr> <tr><td>Finland</td><td>32</td></tr> <tr><td>Greece</td><td>30</td></tr> </tbody> </table> <p>87% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	CDW treated (%)	Netherlands	100	Luxembourg	98	Belgium	95	Italy	92	Latvia	90	Austria	88	United Kingdom	85	Slovenia	82	Denmark	80	Lithuania	87	Germany	78	Sweden	75	Estonia	72	Ireland	70	Portugal	68	Spain	65	Poland	62	Romania	60	Hungary	58	Czech Republic	55	France	52	Croatia	48	Cyprus	45	Slovakia	42	Malta	38	Bulgaria	35	Finland	32	Greece	30	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> • Law on Waste Management establishes general requirements for waste and the Rules of Waste Management (part 125) defines requirements of CDW sorting, collection, transportation and treatment are set in Rules of construction waste management. • National Waste Management Plan for the period of 2014-2020 and the major municipalities have created their WMP. • A Landfill Tax is applied to inert waste that contains no biodegradable material which applies to CDW. <table border="0"> <tr> <td>Backfilling definition</td> <td>-</td> </tr> <tr> <td>EoW criteria</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Green Public Procurement</td> <td>-</td> </tr> <tr> <td>Pre-demolition audits</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Landfill tax (7.14 €/tonne)</td> <td><input checked="" type="checkbox"/></td> </tr> </table>	Backfilling definition	-	EoW criteria	<input checked="" type="checkbox"/>	Green Public Procurement	-	Pre-demolition audits	<input checked="" type="checkbox"/>	Landfill tax (7.14 €/tonne)	<input checked="" type="checkbox"/>
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<p>Key performance indicators</p> <ul style="list-style-type: none"> • 162 tonnes/€ million turnover • 0.6 tonnes hazardous/€ million turnover • 161.3 tonnes non-hazardous/€ million turnover • 0.19 tonnes/million population • 0% CDW backfilled • 13.4% CDW landfilled • No data available for CDW imported • No data available for CDW exported 	<p>Data quality indicator and trend</p> <p>3.1/5 – Modest KPI Trend</p>																																																																				
<p>Key 'best practices/ interventions'</p> <ul style="list-style-type: none"> • Rules clearly indicate requirements for the records on CDW on site. • Obligation to establish separate collection of municipal solid waste, inert waste, recyclable waste, hazardous waste and non-recyclable waste. • Non-hazardous waste can be temporarily stored on site for one year, and hazardous waste for 6 months. • The builder must provide the documents of waste transportation to an appropriate waste treatment facility for the commission which evaluates the 	<p>National Waste Management Plan 2014-2020</p> <p>The main objectives of the plan are:</p> <ul style="list-style-type: none"> • to prevent the effects of waste pollution by the recovery of material and energy; • to ensure a waste management framework that would address the issues of the general population, guarantee environmental quality and agree to the standards of market economy; 																																																																				

<p>quality of building at the time of works have been finished.</p>	<ul style="list-style-type: none"> to set waste management targets, action plans and evaluation measures in order to implement WFD in the required time frame.
<p>Key 'best practices' for CDW data collection</p> <ul style="list-style-type: none"> No best practice identified for CDW data. This will improve in the coming years thanks to new legislations. 	
<p>Key opportunities</p> <ul style="list-style-type: none"> The construction sector will face several challenges and opportunities in the future such as renovation of residential buildings built before the 1990s, projects such as offices, shopping centers and other non-residential buildings have been postponed during the crisis and may be rescheduled and tourism increases and hotels construction projects are increasing. 	

8.4.18. Luxembourg

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<p>CDW treated – Country performance</p>  <table border="1"> <caption>CDW treated – Country performance</caption> <thead> <tr> <th>Country</th> <th>CDW treated (%)</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>98</td></tr> <tr><td>Luxembourg</td><td>99</td></tr> <tr><td>Belgium</td><td>97</td></tr> <tr><td>Italy</td><td>95</td></tr> <tr><td>Latvia</td><td>94</td></tr> <tr><td>Austria</td><td>93</td></tr> <tr><td>United Kingdom</td><td>92</td></tr> <tr><td>Slovenia</td><td>91</td></tr> <tr><td>Denmark</td><td>88</td></tr> <tr><td>Lithuania</td><td>87</td></tr> <tr><td>Germany</td><td>85</td></tr> <tr><td>Sweden</td><td>80</td></tr> <tr><td>Estonia</td><td>75</td></tr> <tr><td>Ireland</td><td>74</td></tr> <tr><td>Portugal</td><td>73</td></tr> <tr><td>Spain</td><td>70</td></tr> <tr><td>Poland</td><td>68</td></tr> <tr><td>Romania</td><td>67</td></tr> <tr><td>Hungary</td><td>65</td></tr> <tr><td>Czech Republic</td><td>60</td></tr> <tr><td>France</td><td>58</td></tr> <tr><td>Croatia</td><td>52</td></tr> <tr><td>Cyprus</td><td>45</td></tr> <tr><td>Slovakia</td><td>38</td></tr> <tr><td>Malta</td><td>20</td></tr> <tr><td>Bulgaria</td><td>15</td></tr> <tr><td>Finland</td><td>12</td></tr> <tr><td>Greece</td><td>10</td></tr> </tbody> </table> <p>99% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	CDW treated (%)	Netherlands	98	Luxembourg	99	Belgium	97	Italy	95	Latvia	94	Austria	93	United Kingdom	92	Slovenia	91	Denmark	88	Lithuania	87	Germany	85	Sweden	80	Estonia	75	Ireland	74	Portugal	73	Spain	70	Poland	68	Romania	67	Hungary	65	Czech Republic	60	France	58	Croatia	52	Cyprus	45	Slovakia	38	Malta	20	Bulgaria	15	Finland	12	Greece	10	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> Law of 17 June 1994 on prevention and management of waste and later in 2006 reviewed to include prevention and management of waste. No official definition CDW. General Waste Management Plan in 2010, considerer construction site waste, Inert Waste and concentrates on CDW and also stands for National Waste Prevention Plan. Sectoral Directive Plan on Inert Waste: to ensure that inert waste is disposed of in the closest landfill, the requirement must be included in public tender facets. There is no incentives to recycling, but is less expensive for companies to sort materials (and recover them) than not to do so. Municipalities levy taxes on landfilling.
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<p>Key performance indicators</p> <ul style="list-style-type: none"> 98.5 tonnes/€ million turnover 3.6 tonnes hazardous/€ million turnover 94.6 tonnes non-hazardous/€ million turnover 	<table border="0"> <tr> <td>Backfilling definition</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>EoW criteria</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Green Public Procurement</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Pre-demolition audits</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Landfill tax</td> <td><input checked="" type="checkbox"/></td> </tr> </table>	Backfilling definition	<input checked="" type="checkbox"/>	EoW criteria	<input checked="" type="checkbox"/>	Green Public Procurement	<input checked="" type="checkbox"/>	Pre-demolition audits	<input checked="" type="checkbox"/>	Landfill tax	<input checked="" type="checkbox"/>																																																
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<ul style="list-style-type: none"> • 1.14 tonnes/million population • 0% CDW backfilled • 1.3% CDW landfilled • No data available for CDW imported • No data available for CDW exported 	<p>Data quality indicator and trend</p> <p>3/5 – Modest KPI Trend</p>
<p>Key ‘best practices/ interventions’</p> <ul style="list-style-type: none"> • Reuse of collected inert wastes is mandatory in public tender facets relating to construction of roads and other buildings. • Companies have to prepare a Waste Prevention and Management Plan. • National sorting obligation on site and if mixed waste is collected there is an obligation to submit to sorting later on. • In addition, municipalities are obliged to provide facilities to separately collect CDW, including from households as far as feasible. • Public program SDK to help companies implement sustainable CDW management and to reduce and sort waste properly. • Regarding norms of recycled materials, Luxembourg follows French or German norms. • Several certification schemes, BREEAM, HQE, DGNG, LEED. 	<p>Public labelling specifically on CDW</p> <ul style="list-style-type: none"> • SuperDrecksKëscht label is attributed to construction sites which are managed according to the waste prevention and management rules of SuperDrecksKëscht: • These construction sites are accompanied and audited by counsellors of SuperDrecksKëscht.
<p>Key ‘best practices’ for CDW data collection</p> <ul style="list-style-type: none"> • No best practice identified for CDW data. 	
<p>Key opportunities</p> <ul style="list-style-type: none"> • Certification of engineering and architects bureaus and consultancies which have to put in practice the concept of sustainable CDW. • New initiatives put in place: a study shall be carried out in the subject to better understand different material flow and value chains. • Centrally planned and supervised infrastructure of inert waste treatment facilities. • Demand for excavated soils for backfilling and scrap iron from the steel industry. 	

8.4.19. Malta

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<p>CDW treated – Country performance</p> <table border="1"> <caption>CDW treated – Country performance (Estimated data from chart)</caption> <thead> <tr> <th>Country</th> <th>CDW Treated (%)</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>98</td></tr> <tr><td>Luxembourg</td><td>97</td></tr> <tr><td>Belgium</td><td>96</td></tr> <tr><td>Italy</td><td>95</td></tr> <tr><td>Latvia</td><td>94</td></tr> <tr><td>Austria</td><td>93</td></tr> <tr><td>United Kingdom</td><td>92</td></tr> <tr><td>Slovenia</td><td>91</td></tr> <tr><td>Denmark</td><td>90</td></tr> <tr><td>Lithuania</td><td>89</td></tr> <tr><td>Germany</td><td>88</td></tr> <tr><td>Sweden</td><td>87</td></tr> <tr><td>Estonia</td><td>86</td></tr> <tr><td>Ireland</td><td>85</td></tr> <tr><td>Portugal</td><td>84</td></tr> <tr><td>Spain</td><td>83</td></tr> <tr><td>Poland</td><td>82</td></tr> <tr><td>Romania</td><td>81</td></tr> <tr><td>Hungary</td><td>80</td></tr> <tr><td>Czech Republic</td><td>79</td></tr> <tr><td>France</td><td>78</td></tr> <tr><td>Croatia</td><td>77</td></tr> <tr><td>Cyprus</td><td>76</td></tr> <tr><td>Slovakia</td><td>75</td></tr> <tr><td style="background-color: #90EE90;">Malta</td><td style="background-color: #90EE90;">19</td></tr> <tr><td>Bulgaria</td><td>18</td></tr> <tr><td>Finland</td><td>17</td></tr> <tr><td>Greece</td><td>16</td></tr> </tbody> </table> <p>19% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	CDW Treated (%)	Netherlands	98	Luxembourg	97	Belgium	96	Italy	95	Latvia	94	Austria	93	United Kingdom	92	Slovenia	91	Denmark	90	Lithuania	89	Germany	88	Sweden	87	Estonia	86	Ireland	85	Portugal	84	Spain	83	Poland	82	Romania	81	Hungary	80	Czech Republic	79	France	78	Croatia	77	Cyprus	76	Slovakia	75	Malta	19	Bulgaria	18	Finland	17	Greece	16	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> The Waste Regulations (L.N. 184 of 2011) define the legislative framework for waste management. Waste Management Plan for the Maltese Islands 2014 – 2020: Specific section on CDW with aims to minimise CDW and a target to recover 70% of CDW by 2020 and include Waste Prevention Plan (WPP). Ban on landfilling of clean inert CDW: Instead, clean inert CDW is diverted to quarries for backfilling. There is no landfill tax but there is however a deposit fee for CDW. <table border="0" style="width: 100%;"> <tr> <td style="text-align: right;">Backfilling definition</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">EoW criteria</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Green Public Procurement</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Pre-demolition audits (waste plan)</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Landfill tax</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> </table>	Backfilling definition	<input checked="" type="checkbox"/>	EoW criteria	<input checked="" type="checkbox"/>	Green Public Procurement	<input checked="" type="checkbox"/>	Pre-demolition audits (waste plan)	<input checked="" type="checkbox"/>	Landfill tax	<input checked="" type="checkbox"/>
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<p>Key 'best practices/ interventions'</p> <ul style="list-style-type: none"> Economic incentives (lower tax) for restoration of old buildings instead of demolition. Hazardous CDW is stored and exported overseas since Malta does not have any hazardous landfills or hazardous treatment facilities. Obligation prior to construction permitting for setting up a Waste Management Plan concerning the construction project, by the contractor. Economic incentives for first time buyers purchasing old property, so as to promote the restoration and rehabilitation of such properties instead of demolition. Incentives for the rehabilitation of village cores and protected buildings. 	<p>Economic incentives for rehabilitation of old properties</p> <ul style="list-style-type: none"> Introduction of economic incentives in the form of lower tax rates for first time buyers purchasing old property. Increased potential for CDW prevention by avoiding demolition of old buildings and the use of new raw materials. It might get too costly to maintain for long periods of time. 																																																																				

Key 'best practices' for CDW data collection

- No best practice identified for CDW data.

Key opportunities

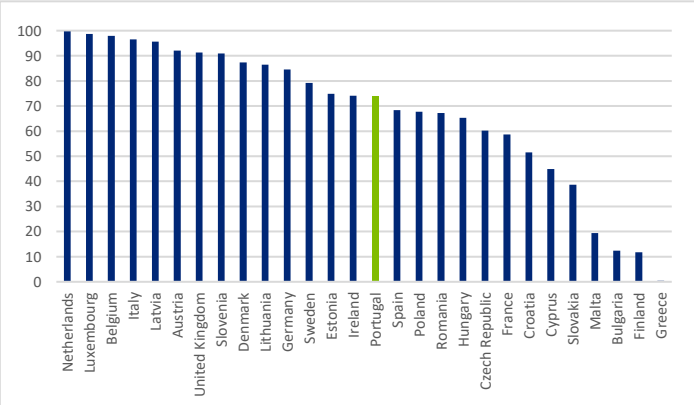
- Adequate network of facilities for receiving CDW (for recovery/backfilling), consisting mainly of spent or operating quarries belonging to private entities.
- There are no recycling facilities available for non-mineral CDW, e.g. plastic, etc. and the amount of separately collected non-mineral CDW is exported for recycling.

8.4.20. Poland

'Poland'																																																																					
<p>CDW treated – Country performance</p> <table border="1"> <caption>CDW treated – Country performance (Estimated Data)</caption> <thead> <tr> <th>Country</th> <th>CDW Treated (%)</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>98</td></tr> <tr><td>Luxembourg</td><td>98</td></tr> <tr><td>Belgium</td><td>95</td></tr> <tr><td>Italy</td><td>92</td></tr> <tr><td>Latvia</td><td>90</td></tr> <tr><td>Austria</td><td>88</td></tr> <tr><td>United Kingdom</td><td>85</td></tr> <tr><td>Slovenia</td><td>82</td></tr> <tr><td>Denmark</td><td>80</td></tr> <tr><td>Lithuania</td><td>78</td></tr> <tr><td>Germany</td><td>75</td></tr> <tr><td>Sweden</td><td>72</td></tr> <tr><td>Estonia</td><td>70</td></tr> <tr><td>Ireland</td><td>68</td></tr> <tr><td>Portugal</td><td>65</td></tr> <tr><td>Spain</td><td>62</td></tr> <tr><td>Poland</td><td>68</td></tr> <tr><td>Romania</td><td>60</td></tr> <tr><td>Hungary</td><td>58</td></tr> <tr><td>Czech Republic</td><td>55</td></tr> <tr><td>France</td><td>52</td></tr> <tr><td>Croatia</td><td>48</td></tr> <tr><td>Cyprus</td><td>45</td></tr> <tr><td>Slovakia</td><td>40</td></tr> <tr><td>Malta</td><td>20</td></tr> <tr><td>Bulgaria</td><td>15</td></tr> <tr><td>Finland</td><td>12</td></tr> <tr><td>Greece</td><td>10</td></tr> </tbody> </table> <p>68% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	CDW Treated (%)	Netherlands	98	Luxembourg	98	Belgium	95	Italy	92	Latvia	90	Austria	88	United Kingdom	85	Slovenia	82	Denmark	80	Lithuania	78	Germany	75	Sweden	72	Estonia	70	Ireland	68	Portugal	65	Spain	62	Poland	68	Romania	60	Hungary	58	Czech Republic	55	France	52	Croatia	48	Cyprus	45	Slovakia	40	Malta	20	Bulgaria	15	Finland	12	Greece	10	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> • The Act on Waste of 14 December 2012, addresses the management of CDW that is generated by households including making municipalities responsible for ensuring access for collection, the 70% target is met. • Undertaking information and educational activities. • Landfill 'fees' are defined by a Decree of the Minister for the Environment of 11 August 2014 and for CDW range from 2.7€ to 38.7€. • A legal requirement to progressively eliminate asbestos and PCB and other harmful substances. <table border="0"> <tr> <td style="text-align: right;">Backfilling definition</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">EoW criteria</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Green Public Procurement</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">e-demolition audits (haz. waste)</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Landfill tax (2.7 €/tonne)</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> </table>	Backfilling definition	<input checked="" type="checkbox"/>	EoW criteria	<input checked="" type="checkbox"/>	Green Public Procurement	<input checked="" type="checkbox"/>	e-demolition audits (haz. waste)	<input checked="" type="checkbox"/>	Landfill tax (2.7 €/tonne)	<input checked="" type="checkbox"/>
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<p>Key performance indicators</p> <ul style="list-style-type: none"> • 89.1 tonnes/€ million turnover • 2 tonnes hazardous/€ million turnover • 87.1 tonnes non-hazardous/€ million turnover • 0.11 tonnes/million population • 24.3% CDW backfilled • 7.7% CDW landfilled • 0.01% CDW imported • No data available for CDW exported 	<p>Data quality indicator and trend</p> <p>4.3/5 – Good KPI Trend</p>																																																																				

<p>Key 'best practices/ interventions'</p> <ul style="list-style-type: none"> Public entities wherever possible should use criteria to encourage the reuse of CDW waste. Information on CDW waste generation and how it is managed should be collected and checked for public construction works. A financial penalty can be imposed by the purchasing entity if this is breached. Over 500 buildings have been certificated to the 'BREEAM' standard. 	<p>Hazardous CDW Management</p> <ul style="list-style-type: none"> PCB – since 2010 all devices containing more than 5dm³ (50ppm) should be decontaminated or disposed of; they are disposed of aboard. Asbestos – a requirement to remove and dispose of asbestos containing products; minimise effects on human health and then environment. Implemented progressively to 2032 when it is estimated that Poland will be asbestos free. An 'Asbestos' Database is used as an inventory.
<p>Key 'best practices' for CDW data collection</p> <ul style="list-style-type: none"> Coherence between the reported national data and the official data presented by Eurostat. Robust methodology for waste generation: data are collected based on permits and licenses through the Integrated Waste Management System. 	
<p>Key opportunities</p> <ul style="list-style-type: none"> Increasing incentives through environmental standards to prevent and sort CDW onsite. Enhancing awareness and increasing the demand for recycled materials. A binding regulatory framework for CDW. More legal enforcement and monitoring. 	

8.4.21. Portugal

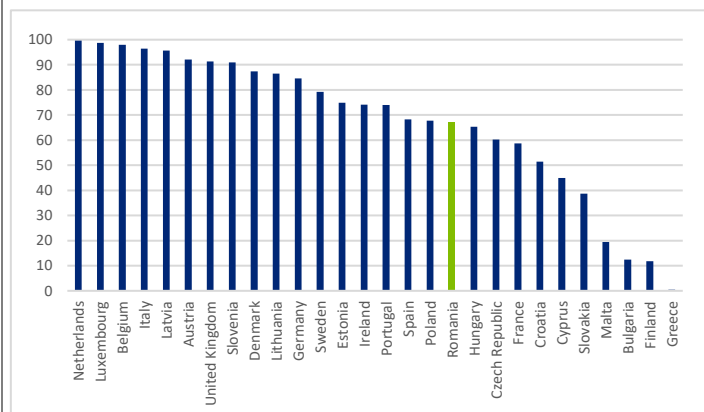
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<ul style="list-style-type: none"> • 0.10 tonnes/million population • 0% CDW backfilled • 26% CDW landfilled • No data available for CDW imported • No data available for CDW exported 	
<p>Key ‘best practices/ interventions’</p> <ul style="list-style-type: none"> • 4 technical guides for the use of recycled CDW. • Target define to incorporate at least 5% of recycled materials, regarding the total amount of raw materials used in public construction works. • The obligation to report data regarding CDW (SIRAPA). • Law establishes the elaboration and implementation of a CDW prevention and management plan for all public construction works. • LiderA – Portuguese Sustainability Assessment System and SBTOOLPT - Adaptation of the assessment tool for sustainable construction SBTool International. 	<p>Data quality indicator and trend</p> <p>4.3/5 – Good KPI Trend</p>
<p>Key ‘best practices’ for CDW data collection</p> <ul style="list-style-type: none"> • Robust treatment of non-replies. • Robust validation tests performed to insure internal coherence and time-series consistency. • Combination of data from waste generators and waste operators to increase coverage of waste treatment data, correct some reporting mistakes and reduce double counting. 	<p>Prevention and Management Plan for CDW</p> <ul style="list-style-type: none"> • Elaboration and implementation of a CDW prevention and management plan for all public construction works. • This plan identifies which type of CDW will be produced during construction phase, and quantifies and identifies the final destination for CDW. • The Portuguese target to incorporate at least 5% of recycled materials, regarding the total amount of raw materials used in public construction works, should be considered in this plan. • The execution of the plan should be verified at the end of the construction phase.
<p>Key opportunities</p> <ul style="list-style-type: none"> • High potential for recycling of CDW, although the quantities of CDW generation are lower than before due to the economic situation of the country. • The existence of inspection authorities, national, regional, municipality and police, with responsibility well defined in the legal framework. • Development of three more specific technical guidelines for the construction sector. • Existence of representative associations for the various actors involved in the management process for CDW. 	

8.4.22. Romania

'Romania'

CDW treated – Country performance



67% of treated CDW that is recovered (and reused).

Source: Eurostat % of treated waste

Key performance indicators

- 95.8 tonnes/€ million turnover
- 0.1 tonnes hazardous/€ million turnover
- 95.6 tonnes non-hazardous/€ million turnover
- 0.07 tonnes/million population
- 0% CDW backfilled
- 32.7% CDW landfilled
- **No data available for CDW imported**
- **No data available for CDW exported**

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EoW criteria	<input checked="" type="checkbox"/>
Green Public Procurement	<input checked="" type="checkbox"/>
Pre-demolition audits	<input checked="" type="checkbox"/>
Landfill tax (4.5 €/tonne)	<input checked="" type="checkbox"/>

Key 'best practices/ interventions'

- Incentives for economic operators to choose recycled over natural.
- The LIFE ENV/RO/00727 project has drafted a "Code of Best Practices on the management of CDW" that addresses both small and big generators of waste, as well as the Local Public Authorities.
- The CDW Exchange database.

Key 'best practices' for CDW data collection

- **No best practice identified for CDW data.**

Key CDW policy and legislation

- Government Decision no. 856/2002 on waste management, approves waste categories, including hazardous waste.
- Decision no. 349/2005, sets the legal framework for landfilling of waste and establishes selection procedures, obligations and sanctions.
- Law no. 211/2011 (republished in 2014) defines that must reach until 2020 a level of preparation for reuse and recycling of minimum 70% by weight of CDW.
- National Waste Management Strategy (2014-2020) came into force in January 2014.
- National Waste Management Plan for period 2003-2013.
- Regional Waste Management Plans were developed two years later after the National Waste Management Strategy adopted in 2004.
- The landfill tax is very small and it does not incentivise stakeholders to engage in recovery.

Data quality indicator and trend

2.2/5 – Poor KPI Trend

The CDW Exchange database

- An interactive web application where supply and demand of CDW, aggregates resulting from C&D inert waste treatment, meet.
- Regional (Buzau) 2014.

Key opportunities

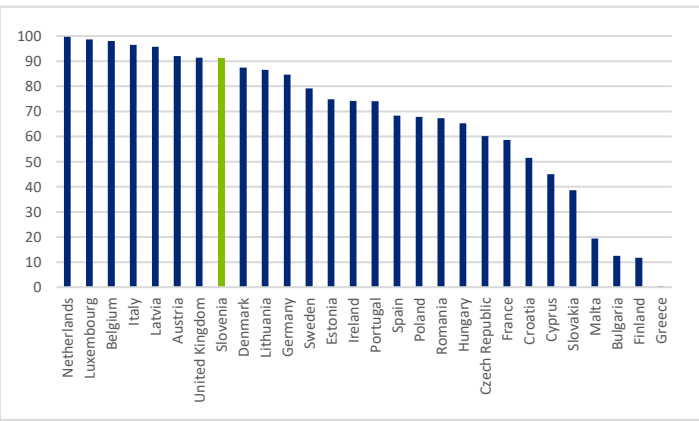
- **Introduction of waste management requirements in the construction and demolition authorisations.**
- Public and private investments.
- **Building treatment infrastructures within a maximum of 30 km area from urban area in order to improve cost-effectiveness of recovery.**
- **Involve local and regional authorities in data collection.**
- **In 2015, the number of constructions has increased 13.8%, this demonstrates gradual recovery from the economic crisis.**

8.4.23. Slovakia

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<p>CDW treated – Country performance</p> <table border="1"> <caption>CDW treated – Country performance (Estimated %)</caption> <thead> <tr> <th>Country</th> <th>%</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>100</td></tr> <tr><td>Luxembourg</td><td>98</td></tr> <tr><td>Belgium</td><td>95</td></tr> <tr><td>Italy</td><td>92</td></tr> <tr><td>Latvia</td><td>90</td></tr> <tr><td>Austria</td><td>88</td></tr> <tr><td>United Kingdom</td><td>85</td></tr> <tr><td>Slovenia</td><td>82</td></tr> <tr><td>Denmark</td><td>80</td></tr> <tr><td>Lithuania</td><td>78</td></tr> <tr><td>Germany</td><td>75</td></tr> <tr><td>Sweden</td><td>72</td></tr> <tr><td>Estonia</td><td>70</td></tr> <tr><td>Ireland</td><td>68</td></tr> <tr><td>Portugal</td><td>65</td></tr> <tr><td>Spain</td><td>62</td></tr> <tr><td>Poland</td><td>60</td></tr> <tr><td>Romania</td><td>58</td></tr> <tr><td>Hungary</td><td>55</td></tr> <tr><td>Czech Republic</td><td>52</td></tr> <tr><td>France</td><td>50</td></tr> <tr><td>Croatia</td><td>48</td></tr> <tr><td>Cyprus</td><td>45</td></tr> <tr><td style="background-color: #90EE90;">Slovakia</td><td>39</td></tr> <tr><td>Malta</td><td>20</td></tr> <tr><td>Bulgaria</td><td>15</td></tr> <tr><td>Finland</td><td>12</td></tr> <tr><td>Greece</td><td>10</td></tr> </tbody> </table> <p>39% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	%	Netherlands	100	Luxembourg	98	Belgium	95	Italy	92	Latvia	90	Austria	88	United Kingdom	85	Slovenia	82	Denmark	80	Lithuania	78	Germany	75	Sweden	72	Estonia	70	Ireland	68	Portugal	65	Spain	62	Poland	60	Romania	58	Hungary	55	Czech Republic	52	France	50	Croatia	48	Cyprus	45	Slovakia	39	Malta	20	Bulgaria	15	Finland	12	Greece	10	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> • The Waste Act 223/2001 defines waste and CDW, waste treatment operations and lays down the obligations for waste producers. • Act no. 582/2004 on local taxes and local fees for municipal waste and minor construction waste. • The new Waste Act 79/2015 will come in force from January 2016. • Waste Management Plan SR 2011-2015 is developed on three levels and targets to increase the level of preparation for reuse, recycling and recovery at least to 35% by weight of CDW by the end of 2015: <ul style="list-style-type: none"> ○ Nationwide - Waste Management Plan of the Slovak Republic, ○ Regional level ○ Waste management plans for individual waste producers and municipalities. • The 2003 raw material and energy policy describes the utilisation of secondary materials. • The Waste Prevention Plan for 2014 - 2018 is the first waste prevention plan for Slovakia. <table border="0" style="width: 100%;"> <tr> <td style="text-align: right;">Backfilling definition</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">EoW criteria</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Green Public Procurement</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Pre-demolition audits</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Landfill tax (6.6 €/tonne)</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> </table>	Backfilling definition	<input checked="" type="checkbox"/>	EoW criteria	<input checked="" type="checkbox"/>	Green Public Procurement	<input checked="" type="checkbox"/>	Pre-demolition audits	<input checked="" type="checkbox"/>	Landfill tax (6.6 €/tonne)	<input checked="" type="checkbox"/>
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<p>Key performance indicators</p> <ul style="list-style-type: none"> • 70.1 tonnes/€ million turnover • 1.5 tonnes hazardous/€ million turnover • 68.7 tonnes non-hazardous/€ million turnover • 0.10 tonnes/million population • 0% CDW backfilled • 61.3% CDW landfilled • No data available for CDW imported • 1.44% CDW exported 	<p>Key ‘best practices/ interventions’</p> <ul style="list-style-type: none"> • There are existing standards for recycled aggregates. • “EVP” is nationally used for the labelling of environmentally friendly products. 																																																																				
<p>Data quality indicator and trend</p> <p>4.2/5 – Good KPI Trend</p>																																																																					

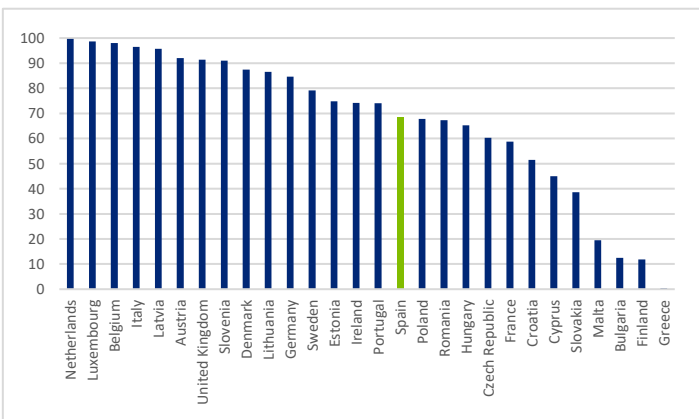
<ul style="list-style-type: none"> Request for permission for building/demolition must contain a CDW management plan for transfer or disposal, to be submitted to the relevant District/Municipal office before starting work. A Hungarian-Slovakian Cross-Border Co-Operation Programme called REPROWIS – Reducing Production Waste by Industrial Symbiosis. 	<p>Waste treatment code - "DO" - Domestic Utilisation</p> <ul style="list-style-type: none"> Municipal and Regional Authorities are able to provide authorisation to waste producers/holders for the utilisation of waste at home. This may be subject to a professional review depending on the conditions. The waste producer/holder that received an authorisation is allowed to transfer waste suitable for domestic usage as material, fuel or other, except hazardous waste and some other waste. CDW streams utilised in this way are mostly wood, concrete, bricks and soil.
<p>Key 'best practices' for CDW data collection</p> <ul style="list-style-type: none"> No best practices identified for CDW data collection. It should be noted that the thresholds for the survey are quite low (all units having more than 50 kg of HAZ waste and 1 tonne of non-HAZ waste are covered by survey reporting obligations). 	
<p>Key opportunities</p> <ul style="list-style-type: none"> The National Action Plan for Green Public Procurement in the Slovak Republic for 2011-2015 sets a strategic objective to increase the proportion of GPP used in Slovakia to 65% at the level of central government bodies and the level of self-governing regions and municipalities by 2015. Obligation for road workers to recover the CDW from roads in the construction, reconstruction and maintenance of roads. 	

8.4.24. Slovenia

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<p>CDW treated – Country performance</p>  <table border="1"> <caption>CDW treated – Country performance (Estimated %)</caption> <thead> <tr> <th>Country</th> <th>%</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>100</td></tr> <tr><td>Luxembourg</td><td>98</td></tr> <tr><td>Belgium</td><td>95</td></tr> <tr><td>Italy</td><td>92</td></tr> <tr><td>Latvia</td><td>90</td></tr> <tr><td>Austria</td><td>88</td></tr> <tr><td>United Kingdom</td><td>85</td></tr> <tr><td style="background-color: #90ee90;">Slovenia</td><td style="background-color: #90ee90;">91</td></tr> <tr><td>Denmark</td><td>82</td></tr> <tr><td>Lithuania</td><td>80</td></tr> <tr><td>Germany</td><td>78</td></tr> <tr><td>Sweden</td><td>75</td></tr> <tr><td>Estonia</td><td>72</td></tr> <tr><td>Ireland</td><td>70</td></tr> <tr><td>Portugal</td><td>68</td></tr> <tr><td>Spain</td><td>65</td></tr> <tr><td>Poland</td><td>62</td></tr> <tr><td>Romania</td><td>60</td></tr> <tr><td>Hungary</td><td>58</td></tr> <tr><td>Czech Republic</td><td>55</td></tr> <tr><td>France</td><td>52</td></tr> <tr><td>Croatia</td><td>48</td></tr> <tr><td>Cyprus</td><td>45</td></tr> <tr><td>Slovakia</td><td>40</td></tr> <tr><td>Malta</td><td>20</td></tr> <tr><td>Bulgaria</td><td>15</td></tr> <tr><td>Finland</td><td>12</td></tr> <tr><td>Greece</td><td>10</td></tr> </tbody> </table> <p>91% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	%	Netherlands	100	Luxembourg	98	Belgium	95	Italy	92	Latvia	90	Austria	88	United Kingdom	85	Slovenia	91	Denmark	82	Lithuania	80	Germany	78	Sweden	75	Estonia	72	Ireland	70	Portugal	68	Spain	65	Poland	62	Romania	60	Hungary	58	Czech Republic	55	France	52	Croatia	48	Cyprus	45	Slovakia	40	Malta	20	Bulgaria	15	Finland	12	Greece	10	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> Environmental Protection Act of 7 May 2004 defines environmental protection. Waste management is defined since 2011, Decree on Waste of 31 December. Decree on the management of waste arising from construction work of 22 April 2008. National Environment Protection Action Programme in 1999. Operational Programme for the construction waste management for the period 2004 – 2008. Waste disposal tax is paid for environmental pollution due to waste disposal at inert waste landfills, at non-hazardous waste landfills and at hazardous landfills. <table border="0" style="width: 100%;"> <tr> <td style="text-align: right;">Backfilling definition</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">EoW criteria</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Green Public Procurement</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">e-demolition audits (haz. waste)</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Landfill tax (19.2 €/tonne)</td> <td style="text-align: right;"><input checked="" type="checkbox"/></td> </tr> </table>	Backfilling definition	<input checked="" type="checkbox"/>	EoW criteria	<input checked="" type="checkbox"/>	Green Public Procurement	<input checked="" type="checkbox"/>	e-demolition audits (haz. waste)	<input checked="" type="checkbox"/>	Landfill tax (19.2 €/tonne)	<input checked="" type="checkbox"/>
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<p>Key performance indicators</p> <ul style="list-style-type: none"> 38.6 tonnes/€ million turnover 0.8 tonnes hazardous/€ million turnover 36.5 tonnes non-hazardous/€ million turnover 0.09 tonnes/million population 1.3% CDW backfilled 7.4% CDW landfilled 	<p>Data quality indicator and trend</p> <p>3.7/5 – Good KPI Trend</p>																																																																				

<ul style="list-style-type: none"> • No data available for CDW imported • 0.42% CDW exported 	
<p>Key 'best practices/ interventions'</p> <ul style="list-style-type: none"> • Requirement of a construction waste plan. • Chamber of Commerce and Industry of Slovenia and some other private Organizations are actively promoting reuse of CDW and changes of regulation. • Manual for production of recycled aggregates from inert waste and manual for sustainable management of construction minerals. 	<p>Construction waste plan</p> <ul style="list-style-type: none"> • Requirement of a construction waste plan which must include information on: <ul style="list-style-type: none"> ○ elimination of hazardous construction waste, ○ separate collection and processing of construction waste on the site ○ anticipated volume of excavated material ○ quantities and types of construction waste ○ planned methods of processing construction waste.
<p>Key 'best practices' for CDW data collection</p> <ul style="list-style-type: none"> • 100% coverage of reporting units for treatment data. • Data are collected using an advanced web survey. 	
<p>Key opportunities</p> <ul style="list-style-type: none"> • Green procurement, a solid basis for the use of recycled CDW. • Chamber of Commerce and Industry of Slovenia is representing construction stakeholders and is actively participating in discussions for legislation and regulation changes, including the EoW status. • Prices of recycled aggregates in Slovenia are lower than the prices of natural aggregates. 	

8.4.25. Spain

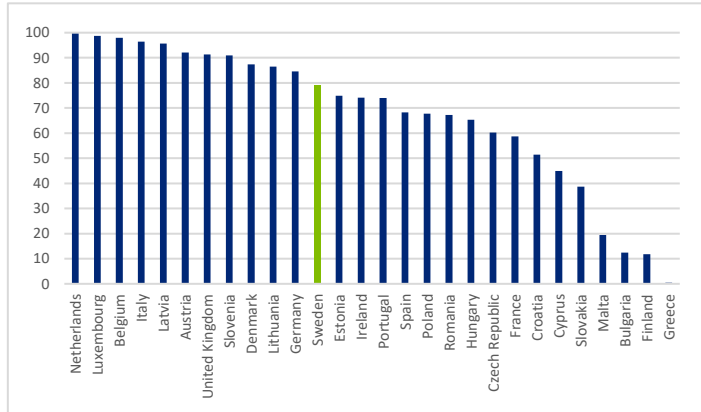
'Spain'	
<p>CDW treated – Country performance</p>  <p>68% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> • 2007-2015 Integrated National Plan for Waste. • 2007-2015 National Plan on Construction and Demolition Waste (II PNRC D). • 2015-2020 State Waste Framework Plan (PEMAR): specific section on CDW including qualitative and quantitative targets. One of the objectives in the PEAR is to include environmental costs within the cost for natural aggregates in order to make recycled aggregates more competitively priced. • Madrid: Integrated Waste Plan for CDW. • The Balears regional waste plan. • Landfill tax & gate fee. • National - Royal Decree 105/2008: Obligation for the waste producer to include a document outlining how CDW will be managed throughout

<p>Key performance indicators</p> <ul style="list-style-type: none"> • 236 tonnes/€ million turnover • 0.9 tonnes hazardous/€ million turnover • 235.1 tonnes non-hazardous/€ million turnover • 0.59 tonnes/million population • 15.8% CDW backfilled • 15.9% CDW landfilled • 0.08% CDW imported • 0.03% CDW exported 	<p>the project’s duration. A mandatory deposit is required by law prior to demolishing buildings, which is reimbursed after proving lawful management of CDW. Outlines the separation fractions per waste flow. States that hazardous waste must be collected separately from non-hazardous waste.</p> <ul style="list-style-type: none"> • Aragon region: Decree 262/2006 regarding CDW management and recovery of debris not from construction and home repair. This outlines an obligation for selective demolition, however Article 12 indicates this can be waived if the financial costs outweigh the environmental benefits. • On the regional level (Basque Country), Specific levels of separation requirements are outlined per waste flow (170101, 170102, 170103, 1704, 170202, 170203, 200101, and 170802). 										
<p>Key ‘best practices/ interventions’</p> <ul style="list-style-type: none"> • Best practice interactive portal aimed at SMEs. • Best practice documents illustrating best practices of C&D Building Waste management. • Project: Guide to Recycled aggregates originating from CDW. • Various working groups have been established to address the topic of recycled aggregates. • Research: to develop new products (e.g. panels, wood-plastic composites) by using fibres from wood CDW and there are already products on the market. However, the recyclability of these products needs also to be assessed, especially if the wood fibres are mixed with other materials. • Data: Experimental analysis on identifying effective indicators to quantify total waste generation on construction site in each site and for different material categories. 	<table border="0"> <tr> <td>Backfilling definition</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>EoW criteria</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Green Public Procurement</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Pre-demolition audits (waste plan)</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>Landfill tax (40 €/tonne)</td> <td><input checked="" type="checkbox"/></td> </tr> </table>	Backfilling definition	<input checked="" type="checkbox"/>	EoW criteria	<input checked="" type="checkbox"/>	Green Public Procurement	<input checked="" type="checkbox"/>	Pre-demolition audits (waste plan)	<input checked="" type="checkbox"/>	Landfill tax (40 €/tonne)	<input checked="" type="checkbox"/>
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Landfill tax (40 €/tonne)	<input checked="" type="checkbox"/>										
<p>Key ‘best practices’ for CDW data collection</p> <ul style="list-style-type: none"> • National and Eurostat data are consistent. • No best practices identified for CDW data. 	<p>Data quality indicator and trend</p> <p>3.4/5 – Modest KPI Trend</p> <p>Financial Deposit – demolishing buildings</p> <ul style="list-style-type: none"> • 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. 										
<p>Key opportunities</p> <ul style="list-style-type: none"> • Important C&D waste actors are involved in legislation process. • The number of permanent treatment sites is higher than landfills or transition platforms that could potentially host a favourable climate for recycling. • Regions have the freedom to develop their own waste laws or plans; this facilitates better design and uptake, according to regional needs. • Potential opportunity for non-legislation initiatives after. The economic crisis drastically lowered the amount of CDW generated. • Standards for recycled CDW under discussion at the Ministry level. • Green Public Procurement it is a currently discussed topic on the national scale. 											

8.4.26. Sweden

'Sweden'

CDW treated – Country performance



79% of treated CDW that is recovered (and reused).

Source: Eurostat % of treated waste

Key performance indicators

- 24.1 tonnes/€ million turnover
- 3.1 tonnes hazardous/€ million turnover
- 21 tonnes non-hazardous/€ million turnover
- 0.16 tonnes/million population
- 0% CDW backfilled
- 14.7% CDW landfilled
- 4.43% CDW imported
- 0.22% CDW exported

Key 'best practices/ interventions'

- **Waste exchange: CDW material bank for reuse (managed by municipalities or private companies).**
- **Swedish Transport Administration (STA) has developed a materials database for the trading of and information concerning excavated materials.**
- **TemaNord 2013:533 - Proposals for targets and indicators for waste prevention in four waste streams, for all Nordic countries.**
- **A number of guidance documents on waste prevention, reduction, and management some at a specific local level and some on a national level.**
- **Standards for recycled CDW: Guidance values for recycling of waste in civil engineering without prior notification to environmental authorities (SEPA, 2010).**
- **Byggarbedömningen (for choice of safe construction materials): A system for building material assessment.**

Key CDW policy and legislation

- Swedish Waste Prevention Plan with one of the focus areas being CDW for which targets are given:
 - a. in 2020 waste generation per m2 built is decreased compared to 2014
 - b. the content of hazardous substances in materials and products shall be reduced.
- The Swedish Waste Management Plan has a law on landfill tax (SFS 1999:673).
- Ordinance on Landfilling of Waste (2001:512) which prohibits the disposal of unsorted combustible waste at a landfill site.
- Waste Ordinance (SFS 2011: 927, § 16) sets provisions for keeping hazardous waste separate and a ban on the mixing of hazardous waste.
- Building Code (SFS 2010:900) regulates waste management in the demolition of buildings and guidance is given by the Swedish National Board of Housing, Building and Planning. An inventory of the generation of hazardous waste is required prior to the demolition of buildings.
- Regulation NFS 2004:4 imposes sorting of combustible waste.
- CDW is a priority area in Sweden's Waste Plan 2012-2017:
 - a. Includes an objective for CDW for reuse, recycling and other material utilisation of non-hazardous construction and demolition waste to increase to 70% by weight by 2020.
 - b. It also has an action for construction contractors: "Develop the sorting of waste at source and identify solutions as regards the possible reuse of surplus construction materials, e.g. through delivering it to a common recipient and retailer, instead of for waste recycling."

Backfilling definition	<input checked="" type="checkbox"/>
EoW criteria	<input checked="" type="checkbox"/>
Green Public Procurement	<input checked="" type="checkbox"/>
Pre-demolition audits	<input checked="" type="checkbox"/>
Landfill tax (54 €/tonne)	<input checked="" type="checkbox"/>

Data quality indicator and trend

2.3/5 – Poor KPI Trend

Key 'best practices' for CDW data collection

- **Robust quantification of uncertainties on CDW data.**

Hazardous waste

- A number of initiatives around hazardous waste including:
 - a. BASTA Database on construction materials with low content of hazardous substances.
 - b. Smartphone application on hazardous waste: This app helps to identify hazardous waste and gives guidance on waste management.
 - c. Guidance from The Swedish EPA on the hazard classification of asphalt (SEPA, 2013)
 - d. Guidance: hazardous materials in building.

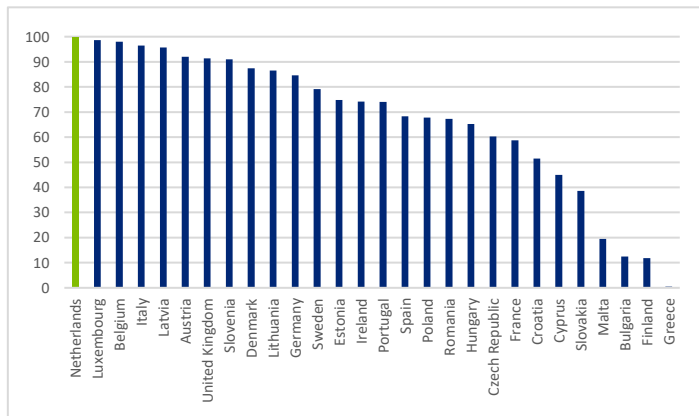
Key opportunities

- **High priority is given to phasing out hazardous substances from society.**
- **Platform for material exchange (mainly focus on household).**
- Waste prevention through planning.
- **A higher level in the waste hierarchy in waste treatment can be further achieved primarily through improved sorting and the encouragement of used raw material exchanges.**

8.4.27. The Netherlands

'The Netherlands'

CDW treated – Country performance



99% of treated CDW that is recovered (and reused).

Source: Eurostat % of treated waste

Key CDW policy and legislation

- A number of sustainability standards cover CDW:
 - a. Greendeal Cirkel Stad (circle city)
 - b. Greendeal Circulaire Gebouwen (circular buildings): The building 'passport'
 - c. Greendeal Duurzaam GWW (ground, road and water construction)
 - d. Greendeal duurzaam bosbeheer (sustainable forest management): voluntary
 - e. Greendeal Duurzaam Beton (sustainable concrete): voluntary
- Requirements for construction and demolition:
 - a. Demolition licence, Model Bouwverordening (MBV) (Model Build Regulation)
 - b. Besluit Bodemkwaliteit (Decree Soil Quality)
 - c. Bouwbesluit (building decree)
- Decree on landfills and waste bans (Bssa): Details landfill bans for a number of waste materials.

<p>Key performance indicators</p> <ul style="list-style-type: none"> • 309.5 tonnes/€ million turnover • 20.5 tonnes hazardous/€ million turnover • 289 tonnes non-hazardous/€ million turnover • 1.51 tonnes/million population • 0% CDW backfilled • 0.3% CDW landfilled • 2.78% CDW imported • 0.91% CDW exported 	<ul style="list-style-type: none"> • National waste management plan: The National Waste Plan (Landelijk Afval Plan; LAP). Includes a sector plan for CDW with a target to at least maintain achieved rate in 2006 of 95% recovery of CDW. • Waste prevention programme: From Waste to Resource (Van Afval Naar Grondstof, VANG) <ul style="list-style-type: none"> Backfilling definition <input checked="" type="checkbox"/> EoW criteria <input checked="" type="checkbox"/> Green Public Procurement <input checked="" type="checkbox"/> Pre-demolition audits <input checked="" type="checkbox"/> Landfill tax (13 €/tonne) <input checked="" type="checkbox"/>
<p>Key ‘best practices/ interventions’</p> <ul style="list-style-type: none"> • Adaptive building is a major driver for prevention of waste. Guidebook - Adaptief vermogen (Adaptive capacity for buildings). • Container Service App: For private and professional order of waste containers for CDW. 86% of the collected waste is recycled. • Standards for recycling waste: Ladder van Lansink (Waste recycle hierarchy standard). • Initiatives around concrete waste and its recycling, reuse and incorporation into new product e.g. ADR (Advance Dry Recovery technology), C2CA (Concrete To Concrete Aggregates project), Durable Concrete (supply chain initiative). • Tax on landfilling and burning. 	<p>Data quality indicator and trend</p> <p>4/5 – Good KPI Trend</p>
<p>Key ‘best practices’ for CDW data collection</p> <ul style="list-style-type: none"> • Numerous cross checks with other data sources are performed to ensure data robustness. 	<p>Market conditions</p> <ul style="list-style-type: none"> • Builders are positive about buying secondary materials because the quality is good compared to the price. • If the quality of the materials would be assured by a quality label, then builders are willing to use the materials. • Cost reduction is an important driver for good CDW management. E.g.: Constructors focus on the separation of waste at the source, in order to minimize logistics. Separation gets cheaper than not separating. • Clients more and more ask for buildings with renewable labels.
<p>Key opportunities</p> <ul style="list-style-type: none"> • Many governmental entities, building designers, clients, contractors and recyclers are involved in sustainable CDW management. • Many industry initiatives exist in which buildings or entire districts are built with the use of CDW. • Finding and implementing circular economy solutions is on the rise in for different waste types, among which concrete. • More and more CDW prevention initiatives start to arise. • Clients increasingly ask for buildings with renewable labels. • Prohibition of waste burning would be a major driver for waste recycling in general. 	

8.4.28. United Kingdom

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<p>CDW treated – Country performance</p> <table border="1"> <caption>CDW treated – Country performance (Estimated data from chart)</caption> <thead> <tr> <th>Country</th> <th>CDW treated (%)</th> </tr> </thead> <tbody> <tr><td>Netherlands</td><td>98</td></tr> <tr><td>Luxembourg</td><td>97</td></tr> <tr><td>Belgium</td><td>96</td></tr> <tr><td>Italy</td><td>95</td></tr> <tr><td>Latvia</td><td>94</td></tr> <tr><td>Austria</td><td>93</td></tr> <tr><td>United Kingdom</td><td>91</td></tr> <tr><td>Slovenia</td><td>90</td></tr> <tr><td>Denmark</td><td>88</td></tr> <tr><td>Lithuania</td><td>87</td></tr> <tr><td>Germany</td><td>86</td></tr> <tr><td>Sweden</td><td>85</td></tr> <tr><td>Estonia</td><td>84</td></tr> <tr><td>Ireland</td><td>83</td></tr> <tr><td>Portugal</td><td>82</td></tr> <tr><td>Spain</td><td>81</td></tr> <tr><td>Poland</td><td>80</td></tr> <tr><td>Romania</td><td>79</td></tr> <tr><td>Hungary</td><td>78</td></tr> <tr><td>Czech Republic</td><td>77</td></tr> <tr><td>France</td><td>76</td></tr> <tr><td>Croatia</td><td>75</td></tr> <tr><td>Cyprus</td><td>74</td></tr> <tr><td>Slovakia</td><td>73</td></tr> <tr><td>Malta</td><td>72</td></tr> <tr><td>Bulgaria</td><td>71</td></tr> <tr><td>Finland</td><td>70</td></tr> <tr><td>Greece</td><td>69</td></tr> </tbody> </table> <p>91% of treated CDW that is recovered (and reused).</p> <p>Source: Eurostat % of treated waste</p>	Country	CDW treated (%)	Netherlands	98	Luxembourg	97	Belgium	96	Italy	95	Latvia	94	Austria	93	United Kingdom	91	Slovenia	90	Denmark	88	Lithuania	87	Germany	86	Sweden	85	Estonia	84	Ireland	83	Portugal	82	Spain	81	Poland	80	Romania	79	Hungary	78	Czech Republic	77	France	76	Croatia	75	Cyprus	74	Slovakia	73	Malta	72	Bulgaria	71	Finland	70	Greece	69	<p>Key CDW policy and legislation</p> <ul style="list-style-type: none"> Waste legislation in the UK applies to all types of waste. There are no current specific pieces of legislation/regulation which relate to CDW alone. Waste prevention programmes exist in each of the 4 regions, each with waste prevention indicators for CDW. Waste management plans and strategies exist for each region, each with their own targets, but these in general relate to meeting or exceeding the EU 70% recovery target. Wales also has a specific Construction and Demolition Sector Plan with more detailed targets. <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Backfilling definition</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">EoW criteria</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Green Public Procurement</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">e-demolition audits (haz. waste)</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> <tr> <td style="text-align: right;">Landfill tax (112.1 €/tonne)</td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> </table>	Backfilling definition	<input checked="" type="checkbox"/>	EoW criteria	<input checked="" type="checkbox"/>	Green Public Procurement	<input checked="" type="checkbox"/>	e-demolition audits (haz. waste)	<input checked="" type="checkbox"/>	Landfill tax (112.1 €/tonne)	<input checked="" type="checkbox"/>
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<p>Key performance indicators</p> <ul style="list-style-type: none"> 204.3 tonnes/€ million turnover 2.2 tonnes hazardous/€ million turnover 202.1 tonnes non-hazardous/€ million turnover 0.75 tonnes/million population 2.3% CDW backfilled 6.3% CDW landfilled 0.02% CDW imported 0.0% CDW exported 	<p>Data quality indicator and trend</p> <p>3.6/5 – Good KPI Trend</p>																																																																				
<p>Key 'best practices/ interventions'</p> <ul style="list-style-type: none"> Requirement on waste producers to consider waste hierarchy. All regions promote the voluntary use of Site Waste Management Plans (SWMPs). Initiatives around a number of CDW streams e.g. demolition waste (DRIDS datasheets), PVC (Recovinyl and Recofloor), reuse of soils (CL:AIRE), regionally based surplus/reuse schemes. UK Landfill Tax with a standard rate and lower rate. Aggregates Levy: A tax on primary aggregates used in a construction application. Creators of BREEM: The Building Research Establishment's Environmental Assessment Method for buildings which has specific issues related to CDW. Sector Resource Efficiency Action Plans (REAPs) developed by 10 construction product sectors. Quality protocols developed for inert waste, flat glass, lubricating oils, waste plasterboard and non- 	<p>Build UK</p> <ul style="list-style-type: none"> An organisation representing the contracting supply chain in UK construction. It brings together 27 of the industry's largest Main Contractors and 40 leading trade associations representing over 11,500 Specialist Contractors. It is encouraging its members to use PAS402:2013 certified waste management companies. It has targets for members which include diverting at least 90% of CDW away from landfill, with the aspiration of achieving zero non-hazardous CDW to landfill by 2020; and halving construction waste production by 2020 (based on a 2010 baseline of 10.6t/£100k). 																																																																				

<p>packaging plastics. These enable recovered products to be used without the need for waste regulation controls.</p>	
<p>Key 'best practices' for CDW data collection</p> <ul style="list-style-type: none"> • No best practices identified for CDW data. 	
<p>Key opportunities</p> <ul style="list-style-type: none"> • Legacy issues, longevity of buildings. • There has been a significant investment in waste infrastructure which continues, however there is still a lack of waste infrastructure in certain areas. • Lack of good quality data especially at the national level providing granularity for CDW types. • Bans on landfilling of certain wastes may possibly form part of the EU circular economy package which is currently being considered. • Sustainability certification scheme, mandatory for social housing, voluntary for other. 	

8.5. Appendix E – Regional analysis

Table 41: CDW Legislation and policies for UK Regions

Area	England	Wales	Scotland	Northern Ireland
End of Waste Status	Quality Protocols are voluntary end of waste frameworks for specific wastes and end uses based on relevant end of waste case law. Those that are relevant for CDW are inert waste, flat glass, lubricating oils, waste plasterboard and non-packaging plastics.	Same as England	Scotland's regulator, the Scottish Environment Protection Agency (SEPA), does not automatically recognise the validity of the Quality Protocols. Regulatory position statements are issued in some cases; for example the use of recycled gypsum from plasterboard is not regulated under waste legislation where it complies with SEPA Policy Statement: Gypsum from Waste Plasterboard, but the recycled gypsum is still classified as a waste. In others, the Quality Protocol applies; for example, the Quality Protocol for aggregates is applicable in Scotland, and those supplying to this standard are publicised on the Zero Waste Scotland 'Aggregate Quality Protocol Supplier Directory' website.	Same as England

Area	England	Wales	Scotland	Northern Ireland
Key waste management legislation	<p>The requirements of the WFD are applied by the Waste (England and Wales) Regulations 2011¹⁵⁶ and subsequent amendments</p> <p>The Hazardous Waste Regulations 2005¹⁵⁷ make provisions for the controlled management of hazardous waste from the point of production to the final point of disposal or recovery</p> <p>In England & Wales, the Environmental Permitting (England and Wales) Regulations 2010¹⁵⁸ and subsequent</p>	<p>The requirements of the WFD are applied by the Waste (England and Wales) Regulations 2011¹⁶¹ and subsequent amendments including in Wales the Waste (Wales) Measure 2010¹⁶².</p> <p>The Hazardous Waste (Wales) Regulations 2005, make provisions for the controlled management of hazardous waste from the point of production to the final point of disposal or recovery</p> <p>In England & Wales, the Environmental Permitting (England and Wales) Regulations 2010¹⁶³ and subsequent</p>	<p>The Waste (Scotland) Regulations 2011¹⁶⁶ and subsequent amendments¹⁶⁷ apply the requirements of the WFD.</p> <p>Special Waste (Scotland) Regulations 1996¹⁶⁸ and all subsequent amendments^{169,170} put in place measures for the controlled management of hazardous waste</p> <p>The Waste Management Licensing (Scotland) Regulations 2011¹⁷¹ set out the requirements for the licensing of waste management operations. The Landfill (Scotland) Regulations 2003¹⁷² (as amended) implement the Landfill Directive.</p>	<p>The Waste Regulations (Northern Ireland) 2011¹⁷³ and subsequent amendments¹⁷⁴ transpose the WFD.</p> <p>Hazardous Waste Regulations (Northern Ireland) 2005¹⁷⁵ provide an effective system of control for these wastes and make sure that they are soundly managed from their point of production to their final destination for disposal or recovery</p> <p>In Northern Ireland, the Waste Management Licensing Regulations (NI) 2003¹⁷⁶ and subsequent</p>

¹⁵⁶ The Waste (England and Wales) Regulations 2011 (28th March 2011) <http://www.legislation.gov.uk/ukxi/2011/988/contents/made>

¹⁵⁷ <http://www.legislation.gov.uk/ukxi/2005/894/contents/made>

¹⁵⁸ <http://www.legislation.gov.uk/ukxi/2010/675/contents/made>

¹⁶¹ The Waste (England and Wales) Regulations 2011 (28th March 2011) <http://www.legislation.gov.uk/ukxi/2011/988/contents/made>

¹⁶² <http://www.legislation.gov.uk/mwa/2010/8/contents/enacted>

¹⁶³ <http://www.legislation.gov.uk/ukxi/2010/675/contents/made>

¹⁶⁶ The Waste (Scotland) Regulations 2011 (27th March 2011) <http://www.legislation.gov.uk/ssi/2011/226/executive-note/contents>

¹⁶⁷ The Waste (Scotland) Regulations 2012 (17th May 2012) <http://www.legislation.gov.uk/ssi/2012/148/introduction/made>

¹⁶⁸ The Special Waste (Scotland) Regulations 1997 (1st May 1997) <http://www.legislation.gov.uk/ukxi/1997/257/regulation/1/sld/made>

¹⁶⁹ The Special Waste Amendment (Scotland) Regulations 2004 <http://www.legislation.gov.uk/ssi/2004/112/contents/made>

¹⁷⁰ The Special Waste Amendment (Scotland) Amendment Regulations 2004 <http://www.legislation.gov.uk/ssi/2004/204/contents/made>

¹⁷¹ The Waste Management Licensing (Scotland) Regulations 2011 (27th March 2011) <http://www.legislation.gov.uk/ssi/2011/228/introduction/made>

¹⁷² <http://www.legislation.gov.uk/ssi/2003/235/contents/made>

¹⁷³ The Waste Regulations (Northern Ireland) 2011 (8th April 2011) <http://www.legislation.gov.uk/nisr/2011/127/introduction/made>

¹⁷⁴ The Waste (Amendment) Regulations (Northern Ireland) 2013 (30th November 2013) <http://www.legislation.gov.uk/nisr/2013/241/contents/made>

¹⁷⁵ Hazardous Waste Regulations (Northern Ireland) 2005 (16th July 2005) <http://www.legislation.gov.uk/nisr/2005/300/made>

¹⁷⁶ Waste Management Licensing Regulations (NI) 2003 (19th December 2003) <http://www.legislation.gov.uk/nisr/2003/493/contents/made>

Area	England	Wales	Scotland	Northern Ireland
	amendments ^{159,160} apply the on-going requirements of the Landfill Directive.	amendments ^{164,165} apply the on-going requirements of the Landfill Directive.		amendments ^{177,178} set out the requirements for the licencing of waste management options.
Waste management plan	Waste Management Plan for England (2013). Contains a small section which specifically considers CDW. This highlights the targets listed below and the performance against these. It also states that a methodology has been produced by Defra and industry stakeholders to calculate the recovery rate of CDW to landfill.	Towards Zero Waste – One Wales: One Planet (2010). It contains some information which specifically considers CDW and has produced a CDW plan. It makes other comments about reducing, reusing and recycling specific waste streams related to construction and demolition such as packaging, biodegradable waste, hazardous waste, wood, plastic, metal, insulation and gypsum This document was designed to support the Overarching Waste Strategy by detailing outcomes, policies and delivery actions for organisations, companies and individuals involved within the construction and demolition sector in Wales. This document considers both the management and prevention of CDW.	Scotland - Zero Waste Plan (2010). Although this plan considers CDW it does not have its own specific section.	Delivering Resource Efficiency (2013). This document does include a specific section for CDW which details the current performance of recycling
Waste prevention plan	England - Prevention is better than cure (2013). It highlights the built environment (including construction and demolition and facilities management) as one of 8 priority material for waste	Same as the waste management plan. Include monitoring the amount of CDW per unit of GVA against constant prices.	Safeguarding Scotland's Resources (2013). Although the document puts in place action points which concern CDW, there is no specific section regarding CDW. Actions include:	The Waste Prevention Programme for Northern Ireland (2014). This document contains a specific section for CDW along with actions. It details ways in which waste can be designed

¹⁵⁹ <http://www.legislation.gov.uk/uksi/2010/676/contents/made>

¹⁶⁰ <http://www.legislation.gov.uk/uksi/2010/2172/contents/made>

¹⁶⁴ <http://www.legislation.gov.uk/uksi/2010/676/contents/made>

¹⁶⁵ <http://www.legislation.gov.uk/uksi/2010/2172/contents/made>

¹⁷⁷ Waste Management Licensing (Amendment No. 2) Regulations (Northern Ireland) 2014 (24th October 2014) <http://www.legislation.gov.uk/nisr/2014/253/contents/made>

¹⁷⁸ Waste Management Licensing (Amendment) Regulations (Northern Ireland) 2014 (12th June 2014) <http://www.legislation.gov.uk/nisr/2014/137/contents/made>

Area	England	Wales	Scotland	Northern Ireland
	prevention activities. Including monitoring the amount of CDW per unit of GVA against constant prices.		Resource Efficient Scotland will work with the construction industry to encourage prevention, reuse and recycling of construction wastes through: seeking collective action on resource efficiency with the sector; promoting good practice across the construction industry, including the use of Site Waste Management Plans; building on evaluation of Site Waste Management Planning to develop and trial Resource Management Plans to encompass the design stage of construction and the wider benefits of resource efficiency. Monitor the amount of CDW per unit of GVA against constant prices and the carbon impact of waste.	out and information about the Sustainable Construction Group which provides guidance in relation to sustainable construction. The Department of the Environment will periodically review the effectiveness of voluntary environmental schemes within the construction sector in determining whether to consider statutory instruments in the future. The Department of the Environment will work with partners and stakeholders to develop a follow-up voluntary agreement to Halving Waste to Landfill appropriate for Northern Ireland. Measurement for CDW per unit of GVA once data is available.
CDW targets	70% recovery of CDW waste by 2020 (as per WFD)	Annual waste prevention target of 1.4% (based on a 2006/07 baseline) for CDW managed off site By 2015 the amount of CDW disposed of to landfill will be reduced by 50%. By 2020 the amount of CDW being prepared for reuse and recycling will have increased to a minimum of 90% by weight for all non-hazardous CDW excluding soils and stones.	70% recovery of CDW waste by 2020 (as per WFD)	70% recovery of CDW waste by 2020 (as per WFD) In the previous strategy, and aspirational target of recycling and reuse of 75% of CD&E waste by 2020 was set. This is not in the 2013 Strategy.

Area	England	Wales	Scotland	Northern Ireland
CDW data	<p>Based on licensed waste management facilities data collected by the Environment Agency and some industry data.</p> <p>The English methodology was originally devised in conjunction with industry, as part of the work with the Strategic Forum for Construction/Green Construction Board Subgroup on CDW. Estimates are dependent on several key assumptions relating to the role of permitted sites, simple registrations and the volume of aggregate production.</p>	<p>Surveys are used in Wales. A survey on CDEW was carried out for 2012 which was used for the EC Waste Return¹⁷⁹. A 2005-06 survey was used for the EC Waste Stats 2006 return and was adjusted for the 2008 return.</p> <p>The CDW recovery rate for 2010, 2011 & 2012 was estimated based on permitted site return and industry data for Waste Framework Directive monitoring (as per generation)</p> <p>There is no lack of completeness in the data, but owing to the nature of surveys and methodology in modelling, there are varying precision levels in the estimates that should be considered when using the data.</p>	<p>Data is collected via site returns based on their activities, this is not published. There is no specific CDW recovery data. This is determined through the amount of CDW that is generated as a proportion of overall waste and the recycling rate is apportioned to this amount.</p>	<p>In Northern Ireland, data is based on the permitting regime, with data being provided every quarter.</p> <p>In Northern Ireland, a survey was undertaken in 2011 for 2009/10 on CDW arising use and disposal¹⁸⁰.</p> <p>The Northern Ireland Government are recording the outputs from quality protocol operations producing tonnage figures per quarter (these are not counted within the waste data).</p>
Landfill Tax (same rate across the UK)	<p>Applies for the disposal of waste to landfill. The cost for this is currently¹⁸¹ £84.402.60/tonne standard rate (equivalent to 100.37 EUR/tonne) and £2.65/tonne (equivalent to 3.15 EUR/tonne) lower rate¹⁸². The lower rate is paid on wastes such as rocks or soil.</p>	<p>As England, though the Wales Act 2014 provides for Landfill Tax to be devolved to Wales. This is expected to take effect in April 2018.</p> <p>The Welsh Government are consulting in introducing a replacement for Landfill Tax known as the Landfill Disposals Tax for when it is devolved, where it is seeking views on whether the rates should be different than the other regions.</p>	<p>As England, though from 1st April 2015, the Scotland Act 2012 provides for the Landfill Tax to be devolved to Scotland.</p> <p>The Scottish Government has kept the rate the same as the rest of the UK.</p>	<p>As England</p>

¹⁷⁹ <https://www.naturalresourceswales.gov.uk/our-evidence-and-reports/waste-reports/construction-demolition-waste-survey/?lang=en>

¹⁸⁰ http://www.doeni.gov.uk/niea/cdew_arisings_use_and_disposal_in_ni_2009-10.pdf

¹⁸¹ From 1st April 2016 – 31st March 2017

¹⁸² Exchange rate on 22/7/16 at 1.19 EUR to 1 GBP.

Area	England	Wales	Scotland	Northern Ireland
Standards and specifications for recycled CDW	National BS/EN Standards Specification for highway works HAUC Specification for the Reinstatement of Openings in highways	National BS/EN Standards Specification for highway works A specification for recycled aggregate for use in minor schemes	National BS/EN Standards Specification for highway works	National BS/EN Standards Specification for highway works
Green Public Procurement	Greening Government Commitment targets. BREEAM Excellent required for new buildings and Very Good for major refurbishment. The majority of publically funded buildings in England will have some form of GPP associated to them. According to a study, 77% of construction projects have GPP based on value in the UK ¹⁸³	Wales's procurement policy statement. Requires BREEAM for certain developments (being phased out) The vast majority of publically funded buildings in Wales will have some form of GPP associated to them. According to a study, 77% of construction projects have GPP based on value in the UK ¹⁸⁴	Scottish Sustainable Procurement Action Plan. BREEAM may also be a requirement for certain developments	Northern Ireland Public Procurement Policy 2014 Northern Ireland Government Construction Clients Sustainability Action Plan (2012 – 2015) with a target to reach 75% (or better) recycling or re-use of construction, demolition & excavation waste by 2020 using a 1998 baseline A minimum of “10% of the materials value of the project should derive from recycled or re-used content”.
CDW initiatives (only included if regional)	Environment Agency Carbon Calculator	Green Compass Scheme (verifying waste management companies)	A map based system for aggregate producers who have complied with the Quality Protocol	Government Guidance Notes: ¹⁸⁵

¹⁸³ http://ec.europa.eu/environment/gpp/pdf/statistical_information.pdf

¹⁸⁴ http://ec.europa.eu/environment/gpp/pdf/statistical_information.pdf

¹⁸⁵ Central Procurement Directorate (CPD) is responsible for disseminating advice and guidance to the NI public sector on public procurement policies and for monitoring implementation. CPD does this through the publication of Procurement Guidance Notes (PGNs). These Procurement Guidance Notes are developed in consultation with the Centres of Procurement Expertise (CoPEs). Once endorsed by the Procurement Board, they are issued to Departments and CoPEs and placed on CPD's website. They are, therefore, the administrative means by which the public sector is advised of procurement policy and best practice developments

Area	England	Wales	Scotland	Northern Ireland
	<p>IsItWaste tool and Quality Protocol checker</p> <p>Strategic Forum for Construction/Green Construction Board Subgroup on CDW</p>	<p>Constructing Excellence in Wales Construction Programme</p>	<p>Construction Material Exchange (Scotland)</p>	<p>Guidance Note 2 : Targets for Recycling</p> <p>Guidance Note 3: Construction, Demolition and Excavation Materials</p> <p>Guidance Note 4 : Bulk Inert Materials/Aggregates - Re-use and Recycling</p> <p>Guidance Note 6 : Demolition, Dismantling, Recovery and Re-use</p> <p>NVIR-O-CERT (a means for construction companies to achieve environmental accreditation)</p>

Table 42: CDW Legislation and policies for Spain and selected Regions

rea	National	Basque Region	Catalonia	La Rioja
End of Waste Status	At the national level, Spain has not yet developed an EoW status for any waste flow. Discussions on how to integrate a set End of Waste status for various waste flows for aggregates have recently started.	No End of Waste Status	No End of Waste Status	No End of Waste Status
Key waste management legislation	<p>The National Waste Law 10/1998 of 21 April which expired on 30 June 2011 was derogated by the current Law 22/2011 on Waste and Contaminated Soil (Ley 22/2011, de 28 de julio, de residuos y suelos contaminados)¹⁸⁶ and this transposes the WFD.</p> <p>Royal Decree 105/2008 of Construction and Demolition Waste Production and Management: valid as of 14 February 2008 (Real Decreto 105/2008, de 1 de febrero, por el que se regula la producción y gestión de los residuos de construcción y demolición)¹⁸⁷.</p>	<p>Decree 112/2012, which regulates the production and management of CDW. It establishes the requirements to be met by producers and the propertied people waste materials from construction and demolition major work, including the obligation to include in the draft work a study of waste management of construction and demolition is included. The obligation for the producer is a bond as a control mechanism linked to obtaining a building permit, in order to ensure proper management CDW.</p> <p>The Decree also regulates the activities of recovery and disposal of waste from construction and demolition for whose development the environmental agency prior authorization is required..</p>	<p>Catalonia: Decree 89/2010 approving the programme for CDW management (PROGROC)¹⁸⁹. This Decree is an extension of the Royal Decree sets out various regional specifications, namely quantitative objectives on CDW management and the waste management plan. The management plan must identify all those actions which should be considered to minimize the work to prevent the generation of waste from construction and demolition during the construction phase or reduce production.</p> <p>It additionally transposes the Royal Decree's specification on deposits. This Decree 89/2010 indicates that the waste actor must submit a deposit of EUR</p>	Articles 14 and 15 of Law 22/2011, of 28 July, waste and soils contaminated led to the development of a new waste management plan.

¹⁸⁶ Agencia Estatal Boletín Oficial Del Estado: Ley 22/2011, De 28 De Julio, De Residuos Y Suelos Contaminados." *BOE.es*. N.p., n.d. Web. 31 May 2015. <<http://www.boe.es/buscar/doc.php?id=BOE-A-2011-13046>>.

¹⁸⁷ "Real Decreto 105/2008, De 1 De Febrero, Por El Que Se Regula La Producción Y Gestión De Los Residuos De Construcción Y Demolición." *Noticias Jurídicas*. N.p., 13 Feb. 2008. Web. <http://noticias.juridicas.com/base_datos/Admin/rd105-2008.html#a2>.

¹⁸⁹ "Decreto 89/2010, De 29 De Junio, Por El Que Se Aprueba El Programa De Gestión De Residuos." *Diari Oicial De La 51930 Generalitat De Catalunya* Núm. 5664 – 6.7.2010 (2010): n. pag. 29 July 2010. Web. <http://www20.gencat.cat/docs/arc/Home/Ambits%20dactuacio/Planificacio/Programa%20de%20gestio%20de%20residus%20de%20la%20Construccio%20a%20Catalunya%20-%20PROGROC/Decreto_89_2010_es.pdf>.

rea	National	Basque Region	Catalonia	La Rioja
	Specifically covers CDW management.	Order of 12/01/2015 ¹⁸⁸ . This Order is inspired from the 22/2011 Law but furthermore goes a step further by outlining the obligation for selective demolition within the region. Specific levels of separation requirements are outlined per waste flow (170101, 170102, 170103, 1704, 170202, 170203, 200101, and 170802).	11/tonne (with a minimum of 150 euros) for CDW upon the issuing of their licence. The waste actor is reimbursed after proving lawful management of CDW.	
Waste management plan	<p>The 2015-2020 State Waste Framework Plan (Plan Estatal Marco de Residuos (PEMAR). Has a specific section on CDW (Section 13) as well as all other types of wastes and sets forth more ambitious objectives, based off of the evolution of Spain's current status in CDW since the PMIR/ II PNRC.</p> <p>It is evaluated biannually. The amount of construction and demolition waste/year/ GVA will be monitored.</p> <p>Base framework for all Autonomous Communities to further develop and tailor their own waste plan for their particular regions, in large part by</p>	<p>2020 Prevention and waste management Plan for Basque Region (Plan de Prevención y Gestión de Residuos de la CAPV 2020)</p> <p>Measures include:</p> <ul style="list-style-type: none"> - Voluntary Agreements with sectors of waste production - Approval Orders to Management Techniques of CDW 	<p>The draft of the WMP, PRECAT 2013-2020¹⁹⁰ defines 10 strategic objectives which are broken down into 112 specific objectives both qualitative and quantitative.</p> <p>Strategic goals (related to CDW)</p> <ul style="list-style-type: none"> - Promote waste as a resource - Contribute, from a life cycle perspective to an energy policy framework, combating climate change and other impacts associated with waste management and use of resources. - Reduce waste generation, promoting prevention and particularly reuse. 	<p>The drafted (to be approved) La Rioja Waste Plan 2016-2026¹⁹¹. Areas include:</p> <ul style="list-style-type: none"> - Municipalities may establish a control mechanism i.e. bond linked to building permits - Prepare the waste management plan to be provided with the bond - CDW must be separated into the following fractions: <ul style="list-style-type: none"> o Concrete: 80 tons. Bricks, tiles, ceramics: 40 tons. Metal: 2 tons. Wood 1 ton. Glass: 1 ton. Plastic; 0.5 tons.

¹⁸⁸ DISPOSICIONES GENERALES: DECRETO 112/2012, De 26 De Junio, Por El Que Se Regula La Producción Y Gestión De Los Residuos De Construcción Y Demolición." N.p., 26 June 2012. Web. <<http://www.lehendakaritza.ejgv.euskadi.eus/r48-bopv2/es/bopv2/datos/2012/09/1203962a.shtml>>.

¹⁹⁰ http://residus.gencat.cat/web/.content/home/ambits_dactuacio/planificacio/precat20_novembre15/PRECAT20-doc-principal_sigov.pdf - Catalonia

¹⁹¹ <http://www.larioja.org/medio-ambiente/es/residuos/plan-director-residuos-rioja-2016-2026>

rea	National	Basque Region	Catalonia	La Rioja
	<p>outlining the scope and current status of CDW management in Spain;</p>		<ul style="list-style-type: none"> - Encourage preparation for reuse waste. - Increasing recovery of all waste, particularly recovery material from a perspective of circular economy and low carbon. - Gradually avoid recoverable waste disposal. <p>According to Law 2/2014 of 27 January, fiscal, administrative, financial and public sector in the first additional provision is a tax moratorium on waste disposal and building back fees accrued.</p>	<p>Paper and cardboard or 0.5 tons.</p> <ul style="list-style-type: none"> - For isolated populations, a zoning is proposed based on treatment plants and existing disposal, establishing for each of them an agreement approved for the collection of the CDW. It also has a regional support ranging from 80% of the cost of relocation and displacement in isolated populations and 50% in the rest the population.
CDW targets	<p>Some of the most notable quantitative targets in the PEMAR for 2016-2020 are:</p> <ul style="list-style-type: none"> - Reduce (all waste) by 10% by 2020 compared to 2010 levels. <p>Non-hazardous CDW for the preparation for reuse, recycling and other recovery operations (excluding soil and stones):</p> <ul style="list-style-type: none"> - 2016- 60% / 2018-65% / 2020-70% <p>Objectives on remaining hazardous waste:</p> <ul style="list-style-type: none"> - 2016-40% / 2018-35% / 2020-30%; 	<ul style="list-style-type: none"> - 5% prevention compared to 2010 by 2016 - separate collection 75% of CDW by 2020 - 70% recovery of CDW by 2020 	<ul style="list-style-type: none"> - Recovery of 75% CDW by 2020. - Selective collection and treatment of hazardous waste – 70% by 2020 - Recovery of waste packaging materials from construction – 50 % by 2020 - Collection of CDW -100% by 2020 <p>Progress on previous targets:</p> <p>Monitored CDW management: objective: ensure 100% -- by 2012, 80% was ensured.</p> <p>Reduction of CDW generation: objective: lower by 10% -- by 2012, 76% was ensured.</p> <p>Recycling of CDW: objective: 50% --by 2012, 43% was ensured.</p>	<ul style="list-style-type: none"> - 70% recovery of CDW by 2020 (60% by 2016; 65% by 2018) - 90% of non-hazardous soils and stones used in earthworks and restoration, conditioning or filler by 2020 (75% by 2016; 85% by 2018). - reduction in weight of the waste produced in 2020 by 10% compared to those generated in 2010

rea	National	Basque Region	Catalonia	La Rioja
	<p>Soil and stones (17 05 04) used in earthworks and restoration, backfill:</p> <ul style="list-style-type: none"> – 2016-75% / 2018-85% / 2020-90% <p>Objectives on remaining soil in landfills:</p> <ul style="list-style-type: none"> – 2016-25% / 2018-15% / 2020-10% <p>Requirements to monitor GPP by the number and value of tenders.</p> <p>A minimum rate of 5% of recycled aggregate in public works.</p>		<p>Recovery of construction packaging waste: objective: increase to 70% -- data unavailable.</p> <p>Selective demolition of hazardous materials: objective: ensure 100% -- by 2012, 85% was ensured.</p> <p>As only 80% of CDW was estimated to be monitored; it could be assumed that the remaining 20% is undergoing illegal activities.</p>	
Landfill tax	Landfill tax in Catalonia and Madrid (in Madrid at 1 €/m ³ ¹⁹² the landfill tax from CDW)	No Landfill tax	Landfill tax at EUR 3/tonne ¹⁹³ .	No Landfill tax.
Standards and specifications for recycled CDW	<p>Spanish General Technical Specifications for Roads and Bridge Works (PG-3)</p> <p>Use of recycled aggregates is outlined in the specification for structural concrete EHE-08.</p>	Standard Dimensioning of Roads of the Basque Country and the Technical Order which is introduced in Decree 112/2012 for CDW management in the Basque Country ¹⁹⁴ determines the technical and environmental requirements to be met by materials from CDW	<u>Waste Agency of Catalonia</u> approved on 17 June 2016, an agreement and a draft decree to promote the use of up to 75% of recycled aggregates from construction and demolition waste generated in Catalonia. This agreement will ensure that all the recycled aggregates put on the market comes only from authorized managers which have CE marking, avoiding unfair competitors. The Decree includes the quality of recycled aggregates, specifying	No specific regional specification

¹⁹² <http://www.boe.es/buscar/pdf/2003/BOE-A-2003-10726-consolidado.pdf>

¹⁹³ (<http://www.boe.es/buscar/pdf/2008/BOE-A-2008-13350-consolidado.pdf>)

¹⁹⁴ DISPOSICIONES GENERALES: DECRETO 112/2012, De 26 De Junio, Por El Que Se Regula La Producción Y Gestión De Los Residuos De Construcción Y Demolición." N.p., 26 June 2012. Web. <<http://www.lehendakaritza.ejgv.euskadi.eus/r48-bopv2/es/bopv2/datos/2012/09/1203962a.shtml>>.

rea	National	Basque Region	Catalonia	La Rioja
			the allowed uses, the conditions for their use and the control criteria of its production ¹⁹⁵	
Green Public Procurement	The <u>Law 2/2011 on Sustainable Economy</u> boosts efficiency in public procurement and public - private partnership including sustainability parameters.	<p>Since 2009, within all tenders for the construction, restoration and design of industrial buildings (from the design stage to the execution of works), SPRILUR include as part of the award criteria, the degree of sustainability of the proposed project, which is based on the application of guides for the sustainable development of industrial buildings and urban development projects¹⁹⁶.</p> <p>The commitment of the Basque Government's green procurement is enshrined in the Agreement adopted by the Governing Council in June 2008 <u>on the incorporation of social, environmental standards and other public policies in hiring the Administration of the Autonomous Community and of its public sector</u> .</p>	<p>The commitment for using, in all public and private works, at least a 5% of recycled aggregates¹⁹⁷.</p> <p>Inclusion of criteria within framework agreements including and GPP guidance</p>	No regional requirement
CDW initiatives (only included if regional)	n/a	All these measures are presented in Plan de Prevención y Gestion de Resíduos de la CAPV 2020 ¹⁹⁸ :	The draft of the WMP, PRECAT 2013-2020 includes:	Within the La Rioja Waste Plan 2016-2026

¹⁹⁵ <http://www.acrplus.org/index.php/en/news/news-from-our-members/732-catalan-waste-agency-arc-promotion-of-the-use-of-recycled-aggregates-from-construction-waste>

¹⁹⁶ http://ec.europa.eu/environment/gpp/pdf/news_alert/Issue44_Case_Study92_Basque_Country_Spain.pdf

¹⁹⁷ <http://www.acrplus.org/index.php/en/news/news-from-our-members/732-catalan-waste-agency-arc-promotion-of-the-use-of-recycled-aggregates-from-construction-waste>

¹⁹⁸ http://www.ingurumena.ejgv.euskadi.eus/contenidos/informacion/plan_estrategia/es_def/adjuntos/DocuCompletoCAS_%20Plan_RESIDUOS_2020+Anexos.pdf

rea	National	Basque Region	Catalonia	La Rioja
		<ul style="list-style-type: none"> - Advise companies to verify compliance with the technical standard to use materials from CDW - Encourage industrialized construction processes (Use of prefabricated to prevent the generation waste) - Promote rehabilitation and selective demolition and disseminate among the stakeholders - Promoting products that are easily reusable or recyclable at the end of its useful life - Promote the use of materials from the demolition for the same purposes for which they were conceived by the producers and promoters - Continue research and technical standardization of new uses - Develop tools and promote Green Public Procurement agreements with the Departments of Housing, Transport, big builders, architects and municipalities. - Incorporate mandatory rules consumption of recycled aggregates in public works in % consistent with the different uses maximum prescribed in the Technical Order of uses of recycled aggregates Basque Government 	<ul style="list-style-type: none"> - Prevention criteria in the design phase of the project - Model specifications and / or benchmarks for public procurement procedures for works - The Government of Catalonia to enable the inclusion criteria - prevention of CDW in the respective contracting models - Application Scaling fare for the differentiation of the raw material front - to clean material . - Consolidate the market recycled aggregate : - Research interests in construction techniques and new applications - Evaluate techniques to estimate the generation of work and CDW 	<ul style="list-style-type: none"> - . Updating the inventory of existing dumps, identifying areas of recent spills and prioritizing possible actions necessary restoration or prevention. Promote selective demolition, applying the principle of waste hierarchy. - Life cycle assessment of non-hazardous CDW - Promote the use of recycled materials from non-hazardous CDW in public, such as earthworks, structural layers (subbase of road shape layer), and the manufacture of concrete, etc. in collaboration with other departments of the Government of La Rioja (Highways Laboratory Government of La Rioja) - Promote the use of inert materials in local roads maintenance and restoration of degraded areas - Implementation of tariff systems at the entrance of the CDW in landfill, to promote the work of recovery and recycling.

rea	National	Basque Region	Catalonia	La Rioja
		<ul style="list-style-type: none"> - Support municipalities in the development of the Ordinances governing the prevention, production and management of CDW and sustainable building <p>The following publications have been produced:</p> <ul style="list-style-type: none"> • Guide to environmentally sustainable building and restoration: public authority buildings and offices in the Basque Autonomous Community • Manual of guidelines for the use of recycled aggregates in public works in the Basque Autonomous Community • Guide books on eco-design. Construction Material • Methodological Guide Book for Selective Demolition Projects in the Basque Autonomous Community. 		

Table 43: CDW Legislation and policies for Belgium Regions

Area	Brussels	Flanders	Wallonia
End of Waste Status	<p>The criteria are the same as the WFD and are established in the article 9 of “Ordonnance relative aux déchets du 14 juin 2012.” If there are no defined criteria, the regional government can decide that wastes cease to be waste if some conditions are respected.</p> <p>Up to now, no CDW ceased to be waste¹⁹⁹.</p> <p>Discussions are ongoing about the EoW status of concrete waste because the reuse of concrete waste is in opposition with soil legislation. (discussion with FEGE²⁰⁰ and Confederation of Construction)</p>	<p>The concept of secondary resources was introduced in 1997 in Flanders (in the previous implementation order VLAREA) and further evolved to EoW criteria in 2012 (in the new implementing decision of the Materials Decree of 2012). Some criteria correspond to the ones set in Regulation 333/2011 at the European level and others are specific to the case of Flanders. There are six categories of EoW criteria including for use a construction material, soil conditioner and as soil.</p>	<p>The criteria are the same as the WFD. If no specific criteria are defined by the EU, the Walloon government can decide in specific cases if waste can take the EoW status. At the moment, there is no implementing order for this text, so there is no EoW status attributed in Wallonia.</p> <p>New legislation is under development. When this legislation will be in place, Federations will try to create an EoW for recycled aggregates and for excavated soils.</p>
Key waste management legislation	<p>Transposition of the WFD is made in the following texts :</p> <p>14 Juin 2012 – Ordonnance relative aux déchets (Article 2.);</p> <p>21 JUIN 2012. - Arrêté du Gouvernement de la Région de Bruxelles-Capitale déterminant les règles de mise en œuvre de l'obligation de tri pour les producteurs ou détenteurs de déchets autres que ménagers;</p> <p>21 JUIN 2012. - Arrêté du Gouvernement de la Région de Bruxelles-Capitale relatif à l'enregistrement des collecteurs et des transporteurs de déchets non dangereux autres que ménagers.</p>	<p>The 2012 Decree on the management of material cycles and waste (“Materialendecreet” or Materials Decree), which partly transposes the Waste Framework Directive 2008/98/EC. Its implementation order is the VLAREMA with detailed provisions on the transport and trade of waste, the reporting of waste and resources, the use of resources, the selective collection by enterprises and the extended producer responsibility.</p> <ul style="list-style-type: none"> Key CDW requirements include separate collection, a pre-demolition inventory for non-residential buildings over 1000 m³. It is forbidden to landfill the mixed fraction of CDW directly and there bans for materials that are collected selectively in view of recycling or for materials, which because of their nature, quantity and homogeneity should be considered for re-use or recycling according to the best available techniques. The principle of proximity 	<p>The basis of the waste legislation is in the waste decree of 27 June 1996²⁰². This text was modified several times especially to transpose WFD.</p> <p>Key CDW requirements include a requirement for an environmental permit (EP), sorting obligations for certain waste types, the different types of recovery routes and backfilling is defined, and landfill bans for certain CDW including related sorting requirements, Only final wastes from sorting and treatment of such waste may be accepted in a landfill site.</p>

¹⁹⁹ Brussels Capital Region

²⁰⁰ Fédération des Entreprises de Gestion de l'Environnement - Federation of Environmental Management Companies

²⁰² 27 juin 1996 – Décret relatif aux déchets + modifications, consolidated version : <http://environnement.wallonie.be/legis/dechets/degen019.htm>

Area	Brussels	Flanders	Wallonia
	<p>Key CDW requirements include obtaining an environmental permit before construction for some activities, requirements of hazardous waste including a register and to undertake a pre-demolition inventory and remove asbestos in a building before its demolition. In case of demolition: the entire building must be cleared of containing the asbestos. In case of single renovation or important refurbishment: all applications containing asbestos that may be affected by the works must be removed. There is also a mandatory requirement to recycle the stony and sandy fraction of CDW. There may also be sorting requirements for certain sites.</p> <p>A new legal text is in preparation, BRUDALEX. This will make it mandatory for holders of CDW to sort or to have their CDW sorted in a sorting facility.</p>	<p>and self-sufficiency applies to CDW sorting residues (from households) and the mixed fraction of CDW (from households and enterprises)²⁰¹.</p>	
Waste management plans	<p>The 4th Waste Plan dates from 2010 and waste prevention is fully integrated. This plan is not specific to CDW. CDW is covered in chapter 6 - industrial waste, specific or hazardous. The Brussels government is currently evaluating this plan (every 3-4 years) and intends to draw a new plan for 2016. For waste prevention, there is a focus on reuse, an integrated eco-construction approach and sustainable purchasing</p>	<p>MINA plan 4 gives the guidelines for environmental policy, amongst others, on waste and material strategies/policy. The environmental program executes this plan with a special focus on the organisation, timeframe and defining priorities for the different actions.</p> <p>Several sectorial implementation plans were adopted for the management of CDW. In 2014, a new policy programme called “resource conscious construction in cycles” was launched²⁰³. This prevention programme for the sustainable management of materials in the construction sector for the period 2014-2020 deepens and expands the approach adopted in</p>	<p>The new waste plan is in preparation. It should be published soon. The older plan was valid to 2010 and had objectives related to CDW.</p> <p>There is no specific programme for waste prevention.</p> <p><i>Implementation score: 0</i></p> <p><i>Effectiveness score: 0</i></p>

²⁰¹ OVAM, *Implementatie Zelfvoorzieningsprincipe in Vlaanderen* (Mechelen: OVAM, 1 January 2014), p. 8 <http://www.ovam.be/sites/default/files/atoms/files/2014-01-01_Implementatie_zelfvoorzieningsprincipe_in_Vlaanderen.pdf>.

²⁰³ OVAM, *Materiaalbewust Bouwen in Kringlopen. Preventieprogramma Duurzaam Materialenbeheer in de Bouwsector 2014-2020* (Mechelen: OVAM, 2013) <<http://www.ovam.be/sites/default/files/2014-DEF-Milieuverantwoord-milieugebruik-bouw-3luik-LR.pdf>>.

Area	Brussels	Flanders	Wallonia
		<p>previous implementation plans. The action programme “Resource conscious construction 2014-2016”²⁰⁴ describes the steps undertaken in the frame of the prevention programme. This includes preventing the use of hazardous materials in new buildings and retrieving these materials from older buildings during demolition, using as few primary materials as possible in the manufacture of construction products, optimising material cycles, adaptability of buildings and ensure recoverability of materials.</p>	
CDW targets	<p>According to the Waste Plan, the target for CDW is a recycling rate of 90 % of weight. This target is not binding.</p>	<p>In 2000, the recycling target of 75% for CDW set at the regional level was outperformed with a recycling rate of 85%.</p>	<p>The previous target was a recycling rate of 87 % in 2010, and a landfilling rate of less than 10 % (the Walloon Waste Management Plan). The next plan is under development thus new target should be available soon.</p>
CDW data	<p>Data on CDW generation are not collected on a yearly basis. The estimation of CDW is based on two different sources. The first source is the register of waste (2008). Data is gathered by collecting, sorting and treating facilities and by producers of waste, who send their waste to another region.</p> <p>The second source is based on building typologies. Data comes from statistics and surveys and are treated to have an idea of global CDW.</p> <p>No data is available for treatment.</p>	<p>Since 2010, data is collected every two years and is estimated from data reported by businesses in their annual integrated environment report (Integraal Milieujarverslag campagne or IMJV)²⁰⁵.</p> <p>This IMJV campaign is extensive during even years, including an analysis across more than 60 sectors, 60 types of waste or resources and 8 types of waste treatment facilities as well as data from waste treatment facilities and enterprises which have PRTR (Pollutant Release and Transfer Register) reporting obligations.</p>	<p>Data on CDW generation are not collected on a yearly basis. Last estimation dates from 2008. A new reporting methodology is under development. The first data will be available soon</p>

²⁰⁴ OVAM, *Actieprogramma Materiaalbewust Bouwen 2014-2016* (Mechelen: OVAM, February 2015), p. 21 <<http://www.ovam.be/sites/default/files/atoms/files/Actieprogramma-Materiaalbewust-Bouwen-2014-2016-Beleidsprogramma-bouw.pdf>>.

²⁰⁵ OVAM, *Bedrijfsafvalstoffen Productiejaar 2004-2012 (uitgave 2014)* (Mechelen: OVAM, 2014), p. 39 <<http://www.ovam.be/sites/default/files/Publicatie%20bedrijfsafvalstoffen%202004-2012%20%28uitgave%202014%29.pdf>>.

Area	Brussels	Flanders	Wallonia																
Landfill tax	There are no landfill sites in Brussels	<p>Landfill taxes are charged dependent upon the waste types. It depends on whether they come from a certified crushing facility and on whether the waste stream is inflammable²⁰⁶:</p> <p>The average landfill operational cost for landfills for inert waste was 53,35 euros/tonne in 2013 ²⁰⁷. The average landfill tax for inert landfills was of 12,73 euros/tonne. Aside from the inert fraction of CDW, a differentiated tax system is applied to waste streams. It depends on whether they come from a certified crushing facility and on whether the waste stream is inflammable²⁰⁸:</p>	<p>Landfill Tax applies to non-hazardous and hazardous waste. This is summarised:</p> <table border="1"> <tr> <td>rice by tons excluding VAT</td> <td>Soils with max 5% of stones</td> <td>Land sorting with 5 to 30 % of inert waste</td> <td>Land sorting with more than 30 % of inert waste</td> </tr> <tr> <td>CAT (recycling)</td> <td>5,40€ / 6,40€</td> <td>8,60€ / 9,60 €</td> <td>10,90€ / 11,90 €</td> </tr> <tr> <td></td> <td>Soils</td> <td>Ultimate inert waste</td> <td>Other waste are not authorized in CET</td> </tr> <tr> <td>CET (landfill)</td> <td>7, 23 €</td> <td>85,96 € (including taxes)</td> <td>/</td> </tr> </table>	rice by tons excluding VAT	Soils with max 5% of stones	Land sorting with 5 to 30 % of inert waste	Land sorting with more than 30 % of inert waste	CAT (recycling)	5,40€ / 6,40€	8,60€ / 9,60 €	10,90€ / 11,90 €		Soils	Ultimate inert waste	Other waste are not authorized in CET	CET (landfill)	7, 23 €	85,96 € (including taxes)	/
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²⁰⁶ OVAM, 'Milieueffingen', 2015 <<http://www.ovam.be/afval-materialen/storten-verbranden-en-landfill-mining/milieueffingen>> [accessed 16 April 2015].

²⁰⁷ OVAM, *Tarieven En Capaciteiten Voor Storten En Verbranden - Actualisatie Tot 2011*.

²⁰⁸ OVAM, 'Milieueffingen', 2015 <<http://www.ovam.be/afval-materialen/storten-verbranden-en-landfill-mining/milieueffingen>> [accessed 16 April 2015].

Area	Brussels	Flanders	Wallonia															
		<table border="1"> <thead> <tr> <th>Landfill tax</th> <th>Type of waste</th> <th>Euros/tonne</th> </tr> </thead> <tbody> <tr> <td>Residues from certified crushers</td> <td>Flammable</td> <td>2,45</td> </tr> <tr> <td></td> <td>Not flammable</td> <td>1,35</td> </tr> <tr> <td>Delivered by others</td> <td>Flammable</td> <td>61,11</td> </tr> <tr> <td></td> <td>Not flammable</td> <td>32,59</td> </tr> </tbody> </table>	Landfill tax	Type of waste	Euros/tonne	Residues from certified crushers	Flammable	2,45		Not flammable	1,35	Delivered by others	Flammable	61,11		Not flammable	32,59	
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Residues from certified crushers	Flammable	2,45																
	Not flammable	1,35																
Delivered by others	Flammable	61,11																
	Not flammable	32,59																
Standards and specifications for recycled CDW	<p>At a national level there is the COPRO and QUAREA (CERTIPRO) certification. COPRO is an impartial certification organisation that controls construction products. In particular, it has to organise, coordinate and improve the control of construction products' quality and their treatment. According to the Belgian Decree on general building conditions, the quality control task is delegated to COPRO. CERTIPRO is another certification organisation managed by VITO for the following products: waste water treatment plants and septic tanks, and recycled granulates.</p> <p>The CCT²⁰⁹ (cahier des charges type – type tender specification) determines the technical and</p>	<p>At a national level there is the COPRO/BENOR and QUAREA certification. COPRO is an impartial certification organisation that controls construction products. In particular, it has to organise, coordinate and improve the control of construction products' quality and their treatment. According to the Belgian Decree on general building conditions, the quality control task is delegated to COPRO. CERTIPRO is another certification organisation managed by VITO for the following products: waste water treatment plants and septic tanks, and recycled granulates</p> <p>The demolition management system²¹⁰, which aims to guarantee the quality and traceability of the recycled</p>	<p>At a national level there is the COPRO/BENOR and QUAREA certification. COPRO is an impartial certification organisation that controls construction products. In particular, it has to organise, coordinate and improve the control of construction products' quality and their treatment. According to the Belgian Decree on general building conditions, the quality control task is delegated to COPRO. CERTIPRO is another certification organisation managed by VITO for the following products: waste water treatment plants and septic tanks, and recycled granulates</p> <p>There is also the CCTB²¹¹ and QUALITOURE²¹² for road applications. These two documents are very</p>															

²⁰⁹ <http://www.bruxellesmobilite.irisnet.be/partners/professionnels/cct-2011>

²¹⁰ OVAM, *Beheersysteem Milieukwaliteit Voor Gerecycleerde Granulaten* (Mechelen: OVAM, n.a.), p. 50

<http://www.ovam.be/sites/default/files/FILE1322216585747ovhl111125_Beheersysteem_granulaten_dec2010.pdf>.

²¹¹ <http://batiments.wallonie.be/home/iframe.html>

²¹² <http://qc.spw.wallonie.be/fr/qualiroutes/>

Area	Brussels	Flanders	Wallonia
	administrative clauses applicable to the execution of road works located in the Brussels Capital Region including recycled materials.	aggregates. This management system resulted in a regulation for ensuring the quality of recycled granulates, the so-called "eenheidsreglement", that forms the basis for the certification of recycled aggregates (obliging the two certification institutions for recycled granulates, Copro and Certipro, to base certification procedures on this common regulation). A recognised demolition management organisation can deliver a demolition certificate when CDW is collected separately. At present, no demolition management organisation is active or has been recognised yet. TraciMat, which is such an organisation, will only be operational in 2016. They are linked to the introduction of debris with a "high environmental risk profile" and a "low environmental risk profile" at the breaker/crusher, as specified in the regulation "eenheidsreglement"	complete and describe the obligations of contractors concerning the management of waste before and during the construction.
Green Public Procurement	Environmental standards such as BREEAM, LEED: They represent more or less 300 projects of the 50.000 construction projects in Belgium. Important construction works are usually using these sustainability standards (national). REF-B: it is a kind of BREEAM but adapted to Brussels. Sustainable building guide: guide based on REF-B Contracting authorities may include environmental clauses in the special specifications for their procurement	Environmental standards such as BREEAM, LEED: They represent more or less 300 projects of the 50.000 construction projects in Belgium. Important construction works typically apply these sustainability standards (national).	Environmental standards such as BREEAM, LEED: They represent more or less 300 projects of the 50.000 construction projects in Belgium. Important construction works typically apply these sustainability standards (national). There are policies concerning sustainable purchasing ²¹³ .
Selected CDW initiatives (only)	<ul style="list-style-type: none"> Reuse of building material guide produced, explains how to sell materials; OPALIS 1 reuse website; OPALIS 2 - reuse specification/clauses & market feasibility; Construction and demolition waste 	<ul style="list-style-type: none"> Current consideration of flat glass recycling promotion; gypsum recycling; PVC recycling initiative Voluntary TraciMat system (which will enable to distinguish between the high and low risk 	<ul style="list-style-type: none"> The MEDECO tool details each waste and highlights full cost of waste management - not updated or considered to be used much Roof bitumen recycling initiative (2000 tonnes) TRADECOWALL: public/private set up to

²¹³ 28 NOVEMBRE 2013. – Circulaire relative à la mise en place d'une politique d'achat durable pour les pouvoirs adjudicateurs régionaux wallons (M.B. du 17/12/2013, p. 99196)

Area	Brussels	Flanders	Wallonia
included if regional)	<p>management guidance</p> <ul style="list-style-type: none"> • Green construction - CDW management training; eco-construction management of construction and demolition waste 2010 drafting and monitoring specifications • Alliance de Emploi Environnement - mobilise & co-ordinates public/private and community around concerted actions 	<p>environmental profile of rubble and differentiate the recycling cost according to the high or low risk profile</p> <ul style="list-style-type: none"> • NIB project on ready-mixed concrete of the future, including concrete with RCA, demonstrations and guidance; • Gypsum recycling back into gypsum (40KT) • Catalogue on granular materials to provide guidance on possibilities of use of materials in construction as defined in VLAREMA 	<p>manage inert waste. From 1994 evolved into network of treatment facilities for inert waste. There are now semi-public recycling centres in each province of the region. These organizations were created and they are the basis of inert waste recycling in Wallonia at present</p>

8.6. Appendix F – Prioritisation of the recommendations (medium and low potential benefits)

Recommendation	Detailed recommendation / explanation	Category	Potential benefits	Ease of implementation (cost, complexity, actors involved...)	Level of control by the EC
Reduce future hazardous waste	This could be in the form of an updatable risk assessment, or extension of the Swedish BASTA system	Target waste prevention	Medium	High	Medium
Data management, including BIM	The Austrian Building Pass is a good example of where the importance of transferring information across a building life cycle has been recognised by a MS. This approach could be adopted across the EU with far reaching positive effects.	Refocus on reuse	Medium	Medium	High
Innovation in the Built Environment	- Offsite fabrication - Data management, such as Building Information Modelling or the Austrian Building Pass	Target waste prevention	Medium	Medium	Medium
Reuse of buildings	Several MS had policies and instruments in place to promote the reuse of buildings, i.e. refurbish, where possible, rather than demolish.	Target waste prevention	Medium	Medium	Medium
Support for the reclamation sector	These sites act as stockholders for products and materials, enabling their accumulation and retention for a demand that might not be available when they are removed from buildings at end of life. Making public land available for such enterprises at a reasonable cost could help new business start-ups/ social enterprises.	Refocus on reuse	Medium	Medium	Low
Introduction (in some MS) of lower Landfill taxes for haz CDW than for non-haz CDW	High Landfill taxes may encourage illegal landfill. As illegal landfill of hazardous waste must absolutely be avoided, reducing taxes on the landfill of hazardous waste could help decrease illegal landfill practices.	Enforce to reinforce	Medium	Medium	Low

Recommendation	Detailed recommendation / explanation	Category	Potential benefits	Ease of implementation (cost, complexity, actors involved...)	Level of control by the EC
Identify and focus attention on 'hot spots'	Where lack of enforcement is acting as a competitive barrier, i.e. compliant companies are losing significant work to non-compliant companies, it is particularly important to take steps to clamp down quickly on these companies to avoid others joining them.	Enforce to reinforce	Medium	Medium	Low
Construction declaration and recertification	Lack of certification and uncertainty over performance prevent reclaimed products and materials being used in mainstream construction, where there could be significant market pull.	Refocus on reuse	Medium	Low	Medium
Consistent and clear use of standards and specification	Materials that failed to meet EoW criteria can still be used in similar applications to products where they have met the relevant standards and specifications for that use. However, despite having harmonised EU standards for applications, such as the harmonised aggregates product standards produced by CEN TC 154 [1], which are mandatory in all EU MS, there can be differences at MS or even regional levels.	Products, not waste	Medium	Low	Low
Recommendations for better data quality - EC level	Encourage all MS to adopt guidelines in order to improve consistency and comparability among Member states (have a common definition of CDW, separately report backfilling data, ensure a cross-check of the CDW data and a statistical control - quality checks - and correction of the data, include the imported CDW and exclude exported CDW)	Measure to manage	Low	High	High

Recommendation	Detailed recommendation / explanation	Category	Potential benefits	Ease of implementation (cost, complexity, actors involved...)	Level of control by the EC
Recommendations for more complete data - EC level	Data improvements on: - Waste generation data at site, activity, regional and national level for new build, demolition and refurbishment waste - Waste generation data at material and product level - Waste treatment data available for reuse, recycling, 'backfilling', energy recovery and disposal - Waste treatment data split by recovery route and material type - Waste treatment data split by recovery route, sector and activity type	Measure to manage	Low	High	High
Wastage rates for key construction products	Development of an EU (with MS variation if applicable) dataset for wastage rates that have had some form of verification, and is updated regularly would help to ensure that currently used wastage rates are correct and highlight the products that are inherently wasteful at the point of installation to encourage actions to reduce these amounts at a sector or proprietary level.	Target waste prevention	Low	High	High
Impact measurement to promote waste prevention	Greater understanding at a building level of the environmental and economic benefits associated with demonstrated levels of waste reduction (e.g. reduction compared to the relevant benchmark) would act as a driver to implement waste reduction activities.	Target waste prevention	Low	High	High
Sharing of best practice	There are several countries, which have tools, guidance and other best practice material, which has been produced to promote waste prevention specifically, such as the Belgian Opalis website.	Target waste prevention	Low	High	High
Recommendations for better data quality -	Ensure the application of CDW data collection guidelines (for MS using surveys and MS	Measure to manage	Low	High	Medium

Recommendation	Detailed recommendation / explanation	Category	Potential benefits	Ease of implementation (cost, complexity, actors involved...)	Level of control by the EC
Government and statistical offices of MS level	using administrative tools) detailed in section 3.2				
Ensure all CDW hazardous waste is correctly identified and dealt with correctly	Adequate guidance and training of this sector should help to identify hazardous materials at source and keep them separate from recyclable materials. A guidance on waste classification is being prepared on behalf of the EC and is expected to be available at the beginning of 2017.	Enforce to reinforce	Low	High	Medium
Reuse and clarification of waste reporting	Reuse can be a valuable measure to reduce waste, but this is largely unreported, or is not reported consistently across the EU. Clarification of how, or if, reuse should be reported would improve consistency and aid understanding in levels of performance here.	Target waste prevention	Low	Medium	High
Innovation in reuse	<ul style="list-style-type: none"> - Overcome time consumption and health and safety barriers raised when removing products for reuse during demolition - Focussed call to develop additional technologies targeting reuse on a pan EU collaborative basis - Transfer of existing technologies could also be promoted 	Refocus on reuse	Low	Medium	Medium
Set GPP requirements to measure and monitor CDW in accordance with best practice	GPP criteria could be developed that sets out the requirements to provide better quality and detail of data on a project scale (aspects of pre-demolition audits, site waste management planning and reporting, and possibly the Building Pass concept/ data management through Building Information Modelling).	GPP: lead by example	Low	Medium	Medium
Use GPP to collect impact data	It is very difficult to find reliable data upon which impact evaluation can be made. Projects requiring certain measures because of GPP	GPP: lead by example	Low	Medium	Medium

Recommendation	Detailed recommendation / explanation	Category	Potential benefits	Ease of implementation (cost, complexity, actors involved...)	Level of control by the EC
	requirements could be filling this data gap.				
Greater uptake of EDOC (electronic duty of care)	Given the widespread coverage of mobile data, most CDW could be transferred using an EDOC approach. This could significantly reduce the costs of enforcement and also collect much needed data at the same time.	Enforce to reinforce	Low	Medium	Low
Better impact data	Reuse and recycling are typically a combined option on LCA, despite the widespread opinion that reuse offers better environmental, social and (possibly) economic outcomes. Such evidence, or calculation tool, could be valuable in green procurement.	Refocus on reuse	Low	Low	Medium

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