Construction Resources and Waste Roadmap 2008

May 2008

construction resources & waste platform

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Project partners:

May 2008

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Acknowledgements

AEA and BRE gratefully acknowledge support from:

- Defra's Business Resource Efficiency & Waste Programme (BREW) – for funding this work
- AMA, Salvo and Loughborough University – as key contributors
- the many organisations who contributed their ideas and their time through the various consultation workshops and drafts for comment.

Executive summary

The UK government is driving forward a challenging programme of sustainable development. One of the key tools it is using to do this is the 'roadmap'.

The key objective of a roadmap is:

- to build a critical mass of enthusiasm and commitment from stakeholders around the evidence, the need to act, and the policies and interventions required to achieve the desired outcome.

The construction sector has a particularly strong influence on the overall sustainability of the UK – not only because of its massive impact on the use and management of resources, but because of the amount of waste it generates. For example:

- around 380 million tonnes of resources are consumed by the construction industry each year
- construction, demolition and refurbishment activities produce around 33% of all waste generated in England – with inert waste alone accounting for some 90 million tonnes.

Therefore, the focus of this roadmap is the resources used and materials wasted from the construction, refurbishment and demolition of buildings in England. This is a welcome intervention that needs to build upon the extensive work already underway within the construction industry to reduce its overall environmental impact.

The level of activity relating to construction resources and waste in terms of evidence, support, policy and legislation has never been more frenetic.

In addition, the construction industry and its drivers are changing rapidly and will continue to do so for the foreseeable future. These changes represent opportunities and barriers to resource efficiency which, in turn, will affect the amounts of waste generated, reused and recycled over the next 10 years. Ideally, process improvements, new technologies, products and materials, and behavioural change will together lead to greater efficiencies in all areas, including material resource use.

When set against this background of change, the process of embedding resource efficiency into the construction industry is not simple. The setting of targets and measuring the impact of achieving these targets is one way of focussing efforts and allowing waste reduction, reuse and recycling to be considered throughout the supply chain.

The aim of this Construction Resources and Waste (CRW) roadmap is:

- to present a longer term perspective and vision for improving construction resource use and waste management, in line with government objectives set out in the Waste Strategy for England 2007.

The process of developing this CRW roadmap has included:

- taking a forward look at construction, along with threats/opportunities in relation to waste and resource efficiency
- consulting with industry and other stakeholders to explore their future needs in terms of support, evidence and policy
- developing long-term targets for improvement (where possible, related to baseline data and in line with relevant government proposals and policies)
- modelling ways to achieving these targets – short/medium term actions.

The various annexes to this document provide full details of the wide-ranging waste-related information gathered during the development of this roadmap; while this main document presents an overview of:

- ways to measure resource efficiency
- headline figures for waste generated, reused and recycled
- the main organisations involved in construction resource efficiency activities
- the legislation and policies that apply.

Finally, this report presents the 'roadmap' in the form of two clear targets, and various related actions (mainly targeted at reducing waste):

The targets are:

- **Target 1**. Reduce waste – Halve the amount of (non-aggregate) construction waste produced by 2015.*
- **Target 2**. Divert waste from landfill – Halve the amount of construction, demolition and extraction waste (CDEW) going to landfill by 2012 as a result of reuse and recycling (excluding materials needed for landfill restoration).*

Under the principle of 'shared responsibility' society as a whole needs to appreciate the importance of responsible waste management; and everyone has a role to play in achieving the targets.

There are numerous initiatives underway to help deliver Target 2. This document focusses on key actions that are necessary to achieve Target 1 as an immediate priority. These are:

1. Set baseline data for construction-related waste.
2. Measure performance consistently in terms of waste reduction, reuse, recycling etc., per company, sector, process and product.
3. Extended producer responsibility for all key construction products OR industry agreed voluntary commitments.
4. Supply chain commitments in place for all government-procured projects.
5. Relevant professional training/education to include modules on resource efficiency.
6. Strengthen the Code for Sustainable Homes to require significant waste reduction at all levels.
7. Develop a consistent method of measuring carbon impacts relating to waste and resources.
8. Develop a consistent method of measuring whole life cost impacts relating to waste and resources.
9. Encourage the reduction and reuse of waste in preference to recycling.
10. Simplify resource efficiency support to the construction sector.

The scope of the roadmap is restricted to England – in particular, policy, support and legislation related to construction and resources. However, some data sources are combined across the UK and difficult to disaggregate. This is noted in the text, where appropriate. Note also that the roadmap does NOT include any information relating to 'civil engineering'.

A shortened version of this roadmap has also been produced for wider circulation. Both the shorter version, and this document plus the annexes can be downloaded from:

www.bre.co.uk/wastestrategy

and

www.crwplatform.org.uk.

*From a baseline to be set during 2008.

Abbreviations used in this report

BE AWARE	Built Environment Action on Waste Awareness and Resource Efficiency
BERR	[Department for] Business, Enterprise and Regulatory Reform
BMRA	Building Materials Reuse Association
BRE	Building Research Establishment
BREMAP	Building Research Establishment Map
BREW	Business Resource Efficiency and Waste (programme)
C&D (W)	Construction and demolition (waste)
CBI	Confederation of British Industry
CDEW	Construction, demolition and excavation waste
CIB	International Council for Research and Innovation in Building and Construction
CLG	[Department for] Communities and Local Government
CLIP	Construction Lean Improvement Programme
CoRE	Construction Resource Efficiency programme
CRWP	Construction Resources and Waste Platform
CT	Carbon Trust
Defra	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EOL	End of life
EPI	Environmental performance indicator
KPI	Key performance indicator
LCA	Life cycle assessment
LCC	Life cycle costing
MMC/OSF	Modern methods of construction/off-site fabrication
MTP	Market Transformation Programme
NISP	National Industrial Symbiosis Programme
OGC	Office of Government Commerce
RDAs	Regional Development Agencies (RDAs): AWM (Advantage West Midlands) EEDA (East of England) EMDA (East Midlands) LDA (London) NWDA (North West) ONE (One North East) SEEDA (South East of England) SWRDA (South West) Yorkshire Forward
SME	Small and medium sized enterprise
SWMPs	Site waste management plans
WLC	Whole life costing
WRAP	Waste and Resources Action Programme

1. Introduction

What is a roadmap?

The UK government is driving forward a challenging programme of sustainable development. One of the key tools it is using to do this is the 'roadmap'.

A roadmap involves three main concepts:

- shared ownership and responsibility – providing the opportunity for stakeholders to work together to achieve change
- planned interventions over time – setting targets and a challenging timescale to achieve stronger and swifter change
- continuous improvement – providing focus and direction for innovation.

The key objective of a roadmap is:

- to build a critical mass of enthusiasm and commitment from stakeholders around the evidence, the need to act, and the policies and interventions required to achieve the desired outcome.

Who should read this report?

The stakeholders in this Construction Resources and Waste (CRW) roadmap are:

- the construction industry, and advisors and trade bodies throughout the supply chain, including: clients; product manufacturers and distribution; design; procurement; construction; demolition; refurbishment; and resource management companies dealing with construction materials
- Defra and others from central, regional and local government who is responsible for construction and resource-related policies and support
- government agencies and delivery partners, especially those funded to help the construction sector to be more resource efficient.

Why do we need a Construction Resources and Waste roadmap?

The government's Sustainable Development Strategy, *Securing the Future* (Defra 2005) recognised that the construction sector has a particularly strong influence on the overall sustainability of the UK – not only because of its massive impact on the use and management of resources, but because of the amount of waste it generates:

- Around 380 million tonnes of resources are consumed by the construction industry each year.
- Construction, demolition and refurbishment activities produce around 33% of all waste generated in England – with inert waste alone accounting for some 90 million tonnes.
- About half of this waste is recycled (from the demolition and excavation sectors, and parts of the construction sector).
- Construction and demolition waste is the largest component of hazardous waste in England and Wales.[1]

Therefore, the construction sector is a priority area for actions on waste and resource efficiency. The draft *Strategy for Sustainable Construction* (BERR, 2006), for example, recognised the need for a step-change in the sustainability of the procurement, design, construction and operation of all built assets.

However, this focus is not new – there are already a large number of successful programmes working to cut waste and improve resource efficiency in the sector. The challenge is to ensure that all these

[1] Environment Agency data for 2004. See www.environment-agency.gov.uk/commondata.

disparate activities are working together in harmony, and to the maximum possible benefit.

The CRW roadmap is a way to ensure this happens.

The roadmap:

- sets clear targets and timescales for construction resource efficiency
- identifies opportunities and actions for increasing resource efficiency.

The main objective of this report is to:

- provide a baseline for current evidence, policy and activities relating to construction resource use and waste management.

How have we developed the roadmap?

Data on the composition, cause and amount of waste relating to construction is fairly limited and does not promote long term assessment of how waste can be prevented or more effectively managed into the future. For example, the *Waste Strategy for England 2007* (Defra 2007) concluded that obtaining better data on non-aggregate is a particular priority.

Improving the data is ongoing within the Construction Resources and Waste Platform (CRWP) work programme (see box). In the meantime, however, a practical approach is to identify what the industry could be aiming for – a target – and then set up/reinforce the mechanisms to achieve the target and monitor progress towards it.

Therefore, the approach to developing this roadmap has included:

- taking a forward look at construction, and the threats/opportunities in relation to waste and resource efficiency
- consulting with industry and other stakeholders to explore their future needs in terms of support, evidence and policy
- developing long-term targets for improvement (where possible related to baseline data and in line with relevant government proposals and policies
- modelling ways of achieving these targets – short/medium term actions.

Scope of the research

The scope is restricted to England – in particular, policy, support and legislation related to construction and resources. However, some data sources are combined across the UK and difficult to disaggregate. This is noted in the text, where appropriate.

Most of the information and focus of this report is concerned with the resources used and materials wasted from the construction, refurbishment and demolition of buildings. It should be noted that significant amounts of resources relate to other forms of infrastructure, such as excavation and roads. During the early stages of development of the roadmap, the project team decided it would be preferable to focus on 'civil engineering' in future stages of the work rather than expand the scope to include it.

Other issues – such as whole life cost, carbon impacts, planning and future drivers for construction – are discussed where they are relevant to, or can influence, resources used and materials wasted from the construction, refurbishment and demolition of buildings.

Supporting documents

The 'roadmap' is summarised in the leaflet A Short Guide to the CRW Roadmap.

As well as setting out the 'roadmap' in terms of targets and strategic actions, this report summarises the main findings of the extensive research conducted during the development of the roadmap. The Annexes (which are separate downloadable documents) provide more comprehensive details of the research.

About BREW and the Construction Resources and Waste Platform (CRWP)

The Business Resource Efficiency and Waste Programme (BREW) was charged with addressing resource efficiency issues across the whole range of UK business sectors – not just construction. BREW ceased operation in April 2008, and Defra has now adopted a single, more focussed approach to allocating the funding designed to increase resource efficiency and reduce carbon emissions.

BREW was a Defra programme that recycled landfill tax in order to improve resource efficiency, reduce waste, increase reuse, recycling and recovery, and divert waste from landfill.

This has economic benefits for industry because it reduces the cost of waste and resource management. The BREW delivery partners included:

- Carbon Trust
- Environment Agency
- Envirowise
- Market Transformation Programme (MTP)
- National Industrial Symbiosis Programme (NISP)
- Regional Development Agencies (RDAs)
- Waste and Resources Action Programme (WRAP)

The Construction Resources and Waste Platform (CRWP) was established to help align BREW activities that are focussing on the construction sector.

The work of CRWP is prioritised, reviewed and otherwise led by a steering group with representatives from across the construction supply chain. The current project delivery team is a partnership between BRE and AEAT.

The short-term goal of the CRWP was to review current support and guidance and gather the industry's views on what would help them most. The longer term goal was to identify activities and drivers that would dictate the future direction of resource efficiency in the construction sector.

A key outcome of the CWRP's work is this roadmap document and associated annexes.

2. How should we measure resource efficiency?

During the CRW roadmap consultation workshops, some people were concerned about targeting waste as a single issue because, in the context of life cycle assessment (LCA), waste issues form part of the overall assessment.

If these issues are separated and focussed on without this overarching context, there is a risk that overall environmental impact could increase.

Therefore, it is important that waste is considered, along with resource efficiency, within the wider sustainable consumption and production agenda. Energy use and water use are other key environmental impacts to consider.

The LCA debate

Life cycle assessment (LCA) is basically the combined effect of single impacts. For example, BRE's LCA methodology – Environmental profiles (www.bre.co.uk/envprofiles) – takes account of the following:

- manufacture (including impacts from virgin and recycled inputs)
- use in a building (taken over a typical building life and including maintenance and replacement)
- demolition (the waste produced, allowing for recycling and reuse).
- climate change – from CO_2 and other greenhouse gases, especially those associated with energy use
- ozone depletion – from gases affecting the ozone layer
- acidification – contribution to the formation of acid rain
- consumption of minerals and water
- emission of pollutants to air and water – including toxicity to humans and ecosystems
- quantity of waste sent to disposal.

In the BRE methodology, weighting these impacts provides an Ecopoint rating – a single measure of overall impact.

Clearly, material resource efficiency measures will affect the LCA result in a positive or negative way. It could therefore be concluded that, if the result is positive, these measures should be accelerated.

This is fine in principle, if all products and processes have been reported in terms of LCA, and if it is easy to extract the data relating to single impacts. However, many construction products do not have the necessary environmental information to enable comparisons between products that fulfil the same function. Even fewer have undergone third-party verification as required for a Type III declaration.[2]

Therefore, it is difficult to see how LCA will drive forward resource efficiency measures aimed at construction products. This is partly due to incomplete LCA data, but also due to the weighting allocated to impacts.

Weighting of LCA data is the only way to derive a single metric, e.g. carbon equivalence or Ecopoints. But weighting is an inherently subjective process. In general, impacts relating to climate change and the need to reduce fossil fuel consumption are given a higher weighting than any other type of impact. In the absence of other drivers this would not be a problem, i.e. most of the focus would be on reducing energy, with other issues only considered once this has been achieved. However, this approach can undervalue other drivers such as the need to:

- reduce waste to landfill
- reduce consumption of materials
- reduce contamination of the environment

[2]Type III environmental declarations present quantified environmental information on the life cycle of a product (based on independently verified LCA data, LCI data or information modules in accordance with the ISO 14040 series).

- reduce whole life costs
- reduce local environmental/social impact.

The evidence gathered and views from the CRW roadmap consultations indicate that the current status of LCA does not sufficiently reconcile all these needs.

As a consequence, other mechanisms – legislation, policy statements, minimum performance standards, and industry support and guidance – are being used to drive forward improvements in these areas. These mechanisms are discussed elsewhere in this report.

Until LCA data is sufficiently comprehensive to address the industry's needs, the CRW roadmap project developed two alternative strategies:

- a three-step approach to product selection
- prioritising materials resource efficiency measures.

Three-step approach to product selection

In the absence of full and comprehensive LCAs for all construction products, the CRW roadmap project developed the following three-step decision-making approach to product selection. First, ensure that operational water/energy efficiency have already been designed in. Then follow these three steps, as illustrated in Figure 1:

- **Step 1 – Choose A-rated specifications**
  There is a well-defined route to specifying construction elements that have lower environmental impacts. The *Green Guide to Specification* (Anderson et al, 2002) contains typical wall, roof, floor and other constructions listed against a simple environmental rating scale running from A (good) to C (poor). Twelve different environmental impacts are individually scored, together with an overall Summary Rating, information on recycling, and typical costs. The Summary Ratings enable users to select materials and components based on their overall environmental performance over the building's life. The *Green Guide to Specification* is currently being updated to expand the range of ratings and to be accessible from the internet.
- **Step 2 – Choose products within A-rated specifications that offer enhanced environmental performance**

  The *Green Guide to Specification* ratings are based on standard products used within the specifications listed. It should be possible to identify products that perform better than average – for example, by comparing Ecopoints/m^2.

  If such LCA data is not available, the decision-maker needs to establish a consistent way of selecting products based on other data (e.g. those in Step 3).
- **Step 3 – Improved material resource efficiency of selected products**

Extracting the LCA data for material resource issues will help identify products that also offer lower impact:

- lower wastage rates
- lower/zero hazardous content
- higher levels of recycled content
- greatest potential for reuse/recycling at end-of-life.

If this data is not readily accessible then discussions with suppliers are required.

Material resource efficiency measures

Focussing measures according to the key characteristics of products and materials is another possible approach to deriving maximum environmental benefit. Table 1 illustrates how this approach could be used.

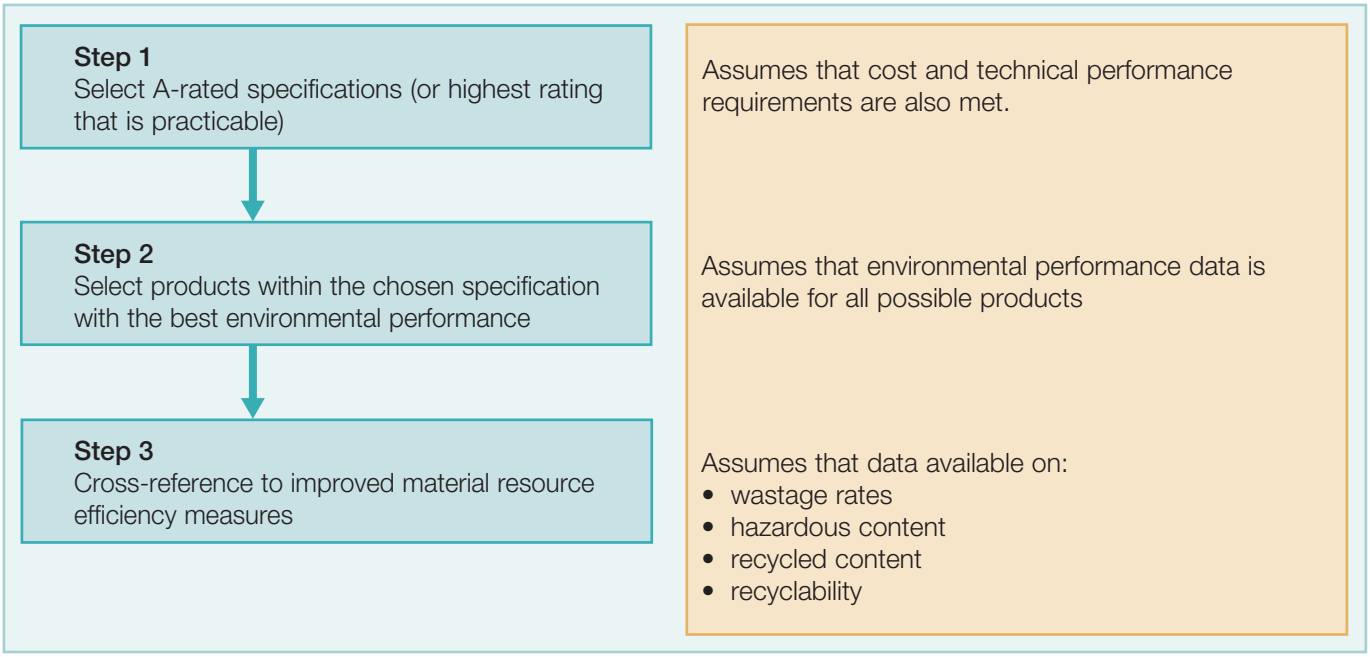


Figure 1 Possible decision-making approach for product selection

Key characteristic of product/material	Preferred option
All packaging	• Reusable and returnable, *or* • Minimal, single material type and recyclable
High embodied energy	• Reduce resource use to minimum
High wastage	• Identify causes of waste across supply chain • Reduce waste throughout life cycle/supply chain
Durable/long lived	• Enable reuse if removed within service life
Disposable/short lived	• Increase durability, *or* • Easy to segregate and recycle/recover
Hazardous waste	• Avoid using the product if possible, *or* • Only use in applications where no suitable alternative exists. Ensure records are maintained to transfer knowledge of hazardous materials
Heavy, bulk materials	• Reuse or recycle on or as near to site as possible
Light, high volume materials	• Avoid excessive transport – compact if possible
Small amounts	• Avoid excessive transport – bulk up through milk round or return haulage to supplier/storage yard
Low recycled content or difficult to reuse/recycle	• Improve recyclability and/or recycled content, *or* • Seek alternative products, unless this increases other environmental impacts (the overall benefit should be maintained or improved)

Table 1 Possible decision-making approach for prioritising materials resource efficiency measures

RECOMMENDATION

- **Develop consistent and transparent methods of measuring life cycle impacts relating to waste production and resource management.**

This will help to prioritise waste reduction. It will also verify that managing waste in a particular way leads to an overall reduction in environmental impact.

Actions to improve resource efficiency often lie with product manufacturers, who are also in the best position to quantify life cycle impacts of their products. It is important to understand the overall resource implications of key products, in order to reduce environmental impact through better use of resources. This is best achieved at a product level, driven by the manufacturers in collaboration with their supply chains.

3. How much waste is generated, reused and recycled?

Although there are numerous data sources that can be used to determine the amount of construction resources used, wasted, and managed through different recovery routes, these data vary hugely in terms of scope, frequency, reliability and accessibility.

Ideally, data would be available to provide national baselines on waste generation, so that targets could be set for waste reduction and measure improvements in future years.

Unfortunately, only a limited dataset exists and this is of little help when determining priorities for resource efficiency, other than primary aggregate replacement. In particular, there is little breakdown of current data, which also excludes most of the materials that would be classed as 'active' i.e. attracting a higher rate of landfill tax. Fundamental knowledge gaps are illustrated in Table 2.

Waste management and efficient use of materials are issues facing all sectors of industry in England. The relative impact of construction sector waste, when set against overall waste arisings in England, is shown in Figure 2.

As Figure 2 shows, construction and demolition account for the single largest waste stream, with additional construction-related waste included in the 'industrial' (construction product manufacture), and 'mining & quarrying' (primary aggregates/raw material production) sectors.

When producing this roadmap, attempts were made to refine the waste stream further into:

- construction
- refurbishment
- demolition waste.

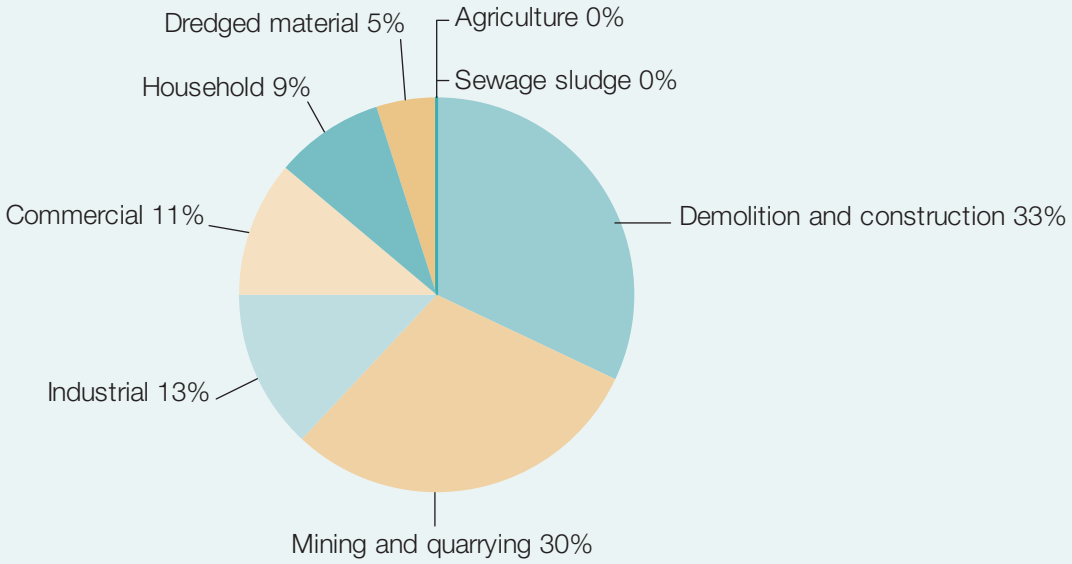
The Construction Waste Compendium (Annex 1) reviews most of the disparate sources of data using a consistent format. The key findings are summarised in this Section, with the following provisos:

- It was possible to extrapolate waste benchmark data for new housing construction waste. However, attempting the same for housing refurbishment waste was not possible because of a lack of data

Waste generating activity	Inert waste: aggregate potential (Mtonnes)	Active waste: non-aggregate potential (Mtonnes)	Overall amount (Mtonnes)	Total
Construction	Currently unknown	Currently unknown	Currently unknown	Currently unknown
Demolition	Currently unknown	Currently unknown	Currently unknown	Currently unknown
Refurbishment	Currently unknown	Currently unknown	Currently unknown	Currently unknown
Excavation	Currently unknown	Currently unknown	Currently unknown	Currently unknown
Total	89.63 million ± 9%*	Currently unknown	Currently unknown	Currently unknown

*National estimates of construction, demolition and excavation waste (CDEW) recycled by crushers and/or screens, used/disposed of at landfills, and spread on Paragraph 9A(1) and 19A(2) registered exempt sites in England in 2005 (million tonnes). Source: *CDEW Survey of Arisings and Use of Alternatives to Primary Aggregates in England 2005* (CLG, 2007).

Table 2 Knowledge gaps



* Total waste arising estimated to be around 272 million tonnes per annum. Source: combined data from a number of sources (2004–2007) in the Waste Strategy for England 2007 (Defra, 2007).

Figure 2 Estimated waste arisings in England by sector

on levels of activity. Other refurbishment activities were not considered due to a lack of data.

- Using data from the NFDC (NFDC, 2002) and BigREc Survey (Salvo, 1998) produced an overall waste arising from demolition of around 26 million tonnes per year. However, when compared to the CDEW Survey (CLG, 2007) there is a gap of over 60 million tonnes which is unaccounted for.

Construction products

Knowing the amount and types of resources being used by the construction sector is a fundamental starting point. AMA Research was commissioned to draw together relevant data and this is summarised in Table 3 (overleaf) and discussed in Annex 2.

The only complete dataset is for 'value'. This, of course, is of use when identifying key construction products (Figure 3).

Headline figures

Based on this research, the headline figures for construction products are:

Headline figures: construction products 2005[3]

Total mass = 376 million tonnes

Total recycled/secondary mass = 80 million tonnes (or 21%)

Total value = £28 billion

Previous data was collected in 1998 (Biffaward & Viridis, 2002) using much of the same primary data source (Prodcom reports) but not the same methodology. Here the headline figures were:

Headline figures: construction products 1998[3]

Total mass = 363 million tonnes

Total recycled/secondary mass = 65 million tonnes (or 18%)

Total reclaimed mass = 3 million tonnes

[3]Note: data gaps mean these headline figures are less than actual figures (see Annex 2).

Products	Value (£ millions)	Volume (000 tonnes)	Recycled volume (000 tonnes)
Ceramics	426		10
Chemicals	1,167		
Clay	636.5	5,752	
Concrete products	3,193	62,343	8,022
Electrical and lighting	2,180		
Glazed systems	4,953		
Hardware metal products	741		
Heating products	2,323		
Insulation	661	655	197.8
Other cement	1,678	18,902	2062
Plastic	1,679	771	
Plumbing and sanitaryware	928		
Raw materials	2,184	277,300	68,300
Rubber	32	168	168
Security, fire protection	1,284		
Slate	112	156.5	30
Steel	671	3,120	485
Timber	2,803	6,511	444
Total	**27,651.5**	**375,678.5**	**79,718.8**

Table 3 Overview of UK construction products (mostly data from 2005)

Market transformation programme data

Another source of data on construction products is the Market Transformation Programme (MTP).

The MTP has been undertaking work at the product level, some of which is waste-related data (for example, identifying future waste impacts and developing actions to reduce those impacts over time). Initial scoping results are shown in Table 4. Note that these findings are subject to change following consultation with industry stakeholders. Work published so far is for window systems and plasterboard. Work still underway is for floor covering and roofing membranes, modern methods of construction, and insulation products.[4]

[4]MTP work on these product groups is on-going as part of CRWP work for 2008/09. Published documents will be available at www.crwplatform.org.uk; for drafts, contact hobbsg@bre.co.uk.

Benchmarks and performance indicators data

An alternative approach is to use site-based benchmarks.[5] Data gathered in this way can then be extrapolated to give national figures for construction-related waste.

Currently, many contractors collect waste data either through systems such as SMARTWaste (BRE's construction-related waste benchmarking website), their own systems, or from waste contractors.

[5]For the purposes of this report 'benchmark' refers to the standard figure and 'performance indicator' refers to the metric/unit of measurement. For example, if we say '10 m^3 waste/100 m^2 floor area' – the benchmark is '10' and the performance indicator (metric) is 'm^3 waste/100 m^2' floor area.

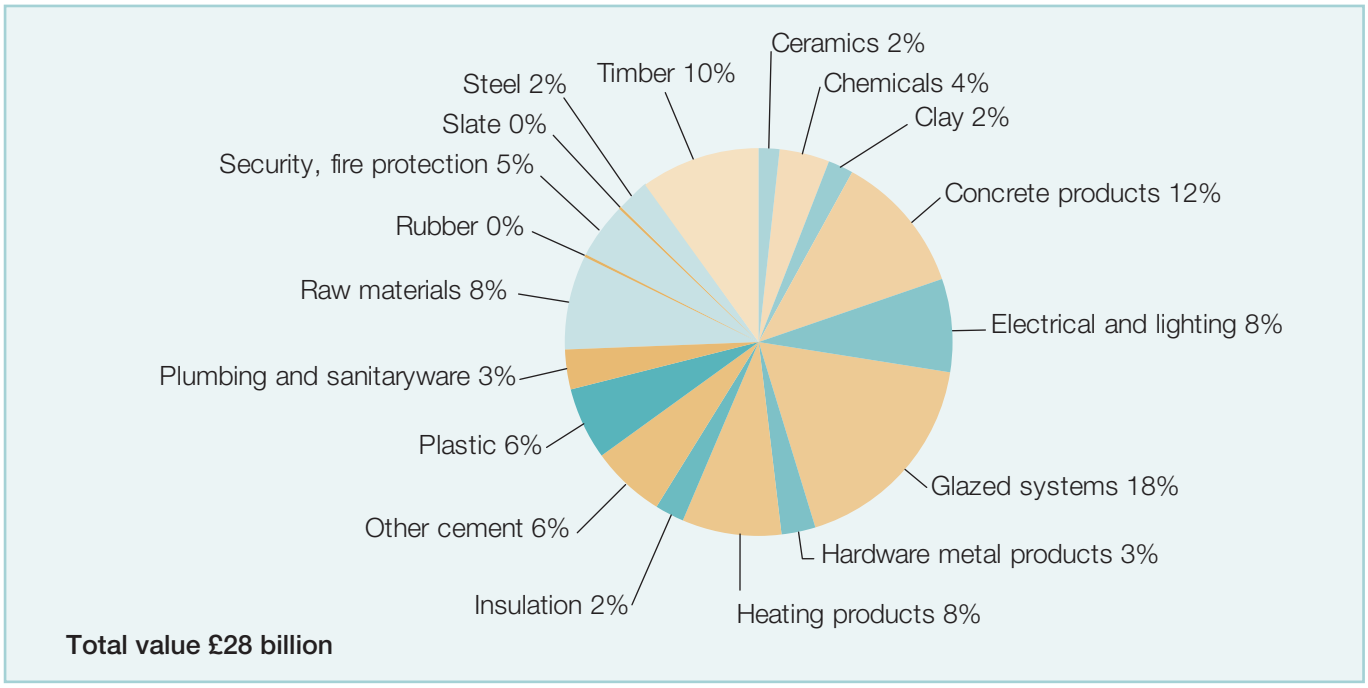


Figure 3 Construction products by value

Product	Waste impact
Domestic window systems	• Estimated: 175,000 tonnes in 2003 • Predicted to rise to 275,000 tonnes by 2020 • The majority of this is coming from glass and U-PVC
Plasterboard	• Estimated to increase year on year to around 500,000 tonnes per annum by 2020 • Additional waste from removing plasterboard through refurbishment and demolition activities estimated to be between 500,000 and 1 million tonnes per year
Insulation	• Housing demolition waste of 106,000 m^3 per year in the short term, which will increase in future years as the insulation in homes increases • Added to the immediate waste anticipated from all new build, this would result in an average of 1.4 million m^3 of insulation waste per year to 2010, rising to over 3.7 million m^3 per year by 2020
Flooring products	• Predicted to increase from around 1 million tonnes in 2005 to around 2.1 million tonnes products in 2020 • This increase is mainly due to more frequent flooring replacement and changing market shares of different materials
Roofing membranes	• Waste arisings could increase from 124,000 tonnes in 2007 to 160,000 tonnes in 2040 waterproofing membranes, bitumen, plastic, rubber • A reduction is expected to 105,000 tonnes because of the prolonged life of existing products
Modern Methods of Construction (MMC); (housing only)	• The amount of waste sent to landfill as a result of MMC in 2006 is estimated to have been 6,000 tonnes • This will rise due to the expected take up of MMC installations to an estimated 68,000 tonnes of waste to landfill by 2020 unless improvements are made • The future recyclability of these products needs further investigation

Table 4 Summary of waste impact data from MTP reports

With no consistent approach to collecting waste data at a site level, aggregation and comparison of data is virtually impossible. However, the introduction of SWMPs will significantly boost the collection process.

Benchmarks and performance indicators can be used for:

- setting waste reduction targets
- comparing performance at a site, company, regional and national level
- estimating waste throughout a project
- setting contractual clauses/conditions for a project
- site waste management planning
- support for planning applications
- providing data for local and regional resource management planning.

BRE is conducting a project funded by Defra to establish minimum reporting requirements for construction, refurbishment and demolition waste, and to generate self-updating benchmarks for a set of performance indicators. As part of this project, companies are being asked to supply site waste data to the SMARTWaste benchmarking website (www.smartwaste.co.uk/benchmarking). Table 5 shows current construction waste benchmarks gathered in this way.[6]

Site-based benchmarks, such as those shown in Table 5, can be extrapolated to give national figures for construction related waste, as follows:

Headline figures: waste from construction of new houses, per year*

Waste amount = 2.9 million m^3, 1.8 million tonnes

Cost of waste = £1.2 billion
(includes cost of materials and labour)

Carbon equivalence of waste =1 million tonnes CO_2

*Note: Many assumptions were used to derive these figures, and the methodology is described in *Developing a Strategic Approach to Construction Waste – 20 year strategy* (Hobbs, 2006).

[6]BRE's new, free to use, site waste management planning tool (SMARTWaste Plan), will significantly increase the amount of data pulled into the benchmarking website. This in turn will further refine and add confidence to the figures provided back to the industry for target setting, and for predicting waste generated, as required in a site waste management plan (SWMP).

Project type*	Number of completed projects	m^3/100 m^2 (average)
Residential	99	14.9
Public buildings	6	23.7
Leisure	4	11.6
Industrial buildings	8	25.4
Healthcare	13	14.8
Education	21	16
Commercial retail	32	14.8
Commercial offices	18	18.4
Civil Engineering	9	24.3

*These figures are based on actual volume (not bulk volume which includes void space). These benchmarks were calculated in February 2008, and are updated quarterly.

Table 5 Current construction waste benchmarks on SMARTWaste website

Hazardous wastes

Construction and demolition waste (including asbestos) is the largest component of hazardous waste in England and Wales, accounting for 32% of the total – nearly 1.7 million tonnes (Environment Agency, 2004). Nearly all of this goes to designated hazardous-waste landfill sites. Although arisings increased sharply in 2004, as industry sought to beat the co-disposal ban, the overall trend is downwards.

Disposal of hazardous wastes presents a particular problem, because only a limited number of sites are available. Although total capacity in England may be sufficient to meet demand, the majority of this capacity is located outside the regions where the majority of hazardous waste arises (i.e. London, the South East and East of England). Substantial long-distance transport will therefore be required, increasing the costs of waste disposal and carbon impact.

Waste crime

Construction and demolition (C&D) waste is a major component of fly-tipped waste. Nearly 60,000 incidents involving construction-related waste were reported to English local authorities (Defra, 2007), resulting in significant clean-up costs.

The primary motive for much fly-tipping is to avoid the costs associated with legitimate routes of disposal. However, the incidence of fly-tipping could diminish if the economics of recycling, demand for recovered materials, and local availability of recovery schemes can be improved (Webb, 2006).

In addition, the introduction of Site Waste Management Plans (SWMPs) in April 2008 will help to reduce fly-tipping.

Reclamation and reuse

Anecdotal evidence suggested that the policy and support push on recycling had negatively affected reclamation, but it has been difficult to prove this link. One of the evidence projects carried out in 2007 (see Annex 2: Reclamation Survey) involved an update survey of the reclamation industry. The last time this was carried out was in 1997; a comparison of the results is given in Figure 4.

- This represents a 21% reduction (700,000 tonnes) in the reclamation of demolition products over 10 years.

Work is now underway as part of the CRWP to stimulate demand for reclaimed products.

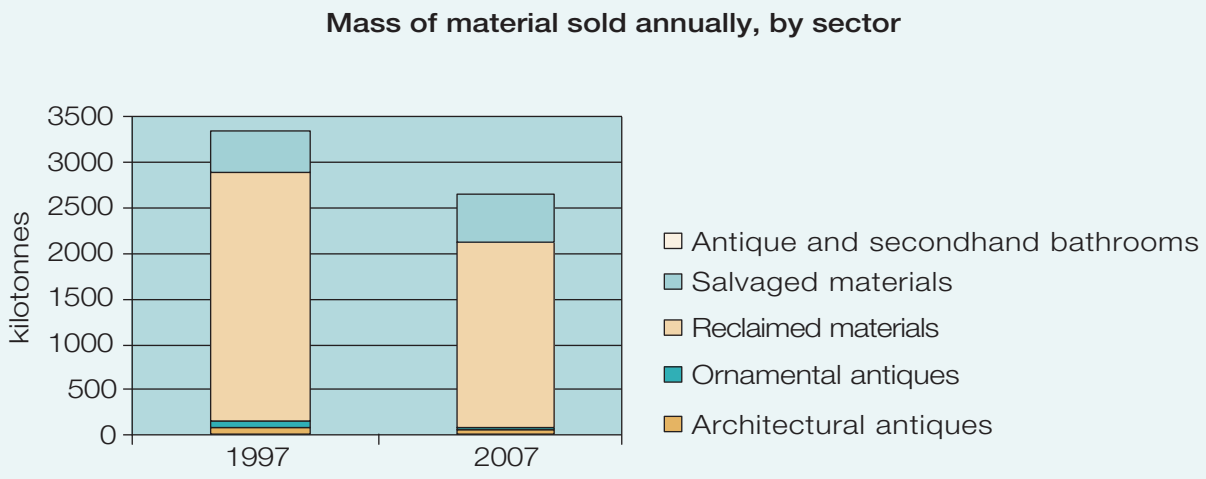
A longer term concern is the effect that changing construction techniques will have on demand for reclaimed and recycled demolition products. Potentially, demand will decrease in line with growing market share of lighter weight, offsite fabrication of buildings and their elements. This will make diversion from landfill increasingly difficult.

Recycling

Much of the support and policy is geared towards diverting construction-related waste from landfill. This leads to the obvious question – what happens to wasted materials now?

Again, the answer is not available with much degree of confidence, apart from those materials that have potential to be processed into recycled aggregates or soil replacement, which have shown a steady increase in terms of recycling other the last few years, as shown in Figure 5. The current recycling rate for these materials into recycled aggregates is around 52% (CLG, 2007).

The situation for 'active' waste – which attracts a higher rate of landfill tax (currently £32/tonne and



Source: Salvo and the BigREc surveys of 1997 and 2007

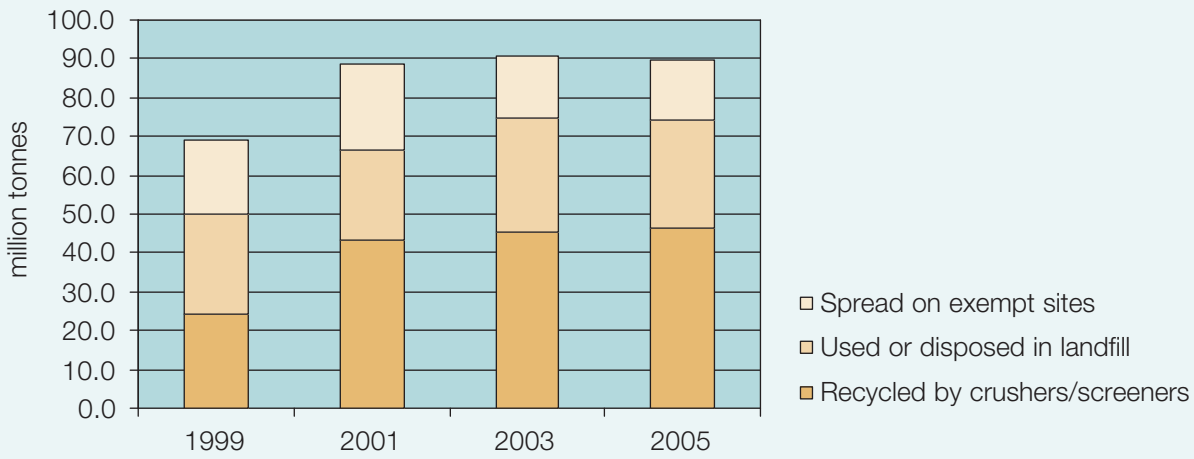
Figure 4 Trends in reclamation

increasing to at least £48/tonne in April 2010 – has not been established, mainly because these materials have not been the focus of CLG surveys that established amounts and recycling rates for 'inert' waste. (Inert waste includes materials that can be readily processed into recycled aggregates, such as concrete, and has a lower rate of landfill tax – currently £2.50/tonne.

The *Green Guide to Specification* (Anderson et al, 2002) uses industry-generated or default recycling rates for all the materials used in construction. Many of these figures would benefit from further investigation. Table 6 shows current data for 'active' materials.

Material	Landfill (%)	Incineration (energy recovery) (%)	Recycling (%)	Reuse (%)
Timber	58	6	23	13
Board materials/wood panel products	90	10		
Insulation	90	10		
Plaster/cement	90	10		
Plastics	82	9	9	
Composites	90	10		
Packaging (ave. across)	60	6	33	1

Table 6 Estimated recovery rates for 'active' materials



Source: *CDEW Survey of Arisings and Use of Alternatives to Primary Aggregates in England 2005* (CLG, 2007)

Figure 5 *Management of 'inert' construction and demolition waste*

RECOMMENDATIONS

Data sources vary considerably and more work is needed to improve the evidence base. Follow-on tasks of the CRWP include obtaining better data on:

- resource management routes for key materials
- wastage rates of key construction products
- waste arising from refurbishment
- waste arising from demolition.

In order to support a longer term waste strategy, resource management facility planning, and voluntary industry agreements to reduce waste and divert more waste from landfill we will need:

- to set baseline data at the national, regional, sector and product level
- to measure performance consistently in terms of waste reduction, reuse, recycling, recovery per company, sector, process and product
- to develop better understanding of the long-term supply and demand for demolition products related to changing construction techniques.

4. Who are the main organisations working on construction waste issues?

The Department for Environment, Food and Rural Affairs (Defra) is the lead government department on environmental issues. Defra is responsible for policies on environmental protection, waste management and sustainable development. Defra also has responsibilities relating to 'producer responsibility', alongside the Department for Business, Enterprise and Regulatory Reform (BERR).

Support for the construction sector has been principally funded through Defra and its Landfill Tax recycling scheme – BREW – Business Resource Efficiency and Waste programme. However, BREW ceased operation in April 2008, and Defra has now adopted a single, more focussed approach to allocating the funding designed to increase resource efficiency and reduce carbon emissions.

The delivery partners

The BREW delivery bodies are continuing to operate, in the main, with funding from Defra. The partners have been key players in the drive towards resource efficiency in construction, with roles and responsibilities ranging from policy and strategy development, practical research, trials and assistance, training and market development for recycled materials.

BREW identified the construction sector as a priority for action.

As well as national initiatives, many organisations within England operate at a regional level, in accordance with the nine Regional Development Agencies (RDAs). This has meant that many projects have a local focus so it is not always easy to access at the national level.

Therefore, a BREW coherence group for construction was established, including all the relevant BREW delivery partners, co-ordinated by BRE through the Construction Resources & Waste Platform (CRWP).

Table 7 summarises the BREW delivery bodies and their key activities relating to construction resource efficiency. More detail is available in Annex 3.

Other organisations

Many other organisations are tackling construction resource efficiency outside of the BREW partnership.

Table 8 summarises key support activities relating to construction resource efficiency, outside BREW. More detail is available in Annex 3, along with a summary of local authority programmes.

Delivery body and website	Key activities[7]
Carbon Trust www.carbontrust.co.uk	• Low Carbon Building Accelerator • Building Design Advice
BERR (formerly the DTI) www.berr.gov.uk	• Resource Efficiency Knowledge Transfer Network • Technology programme (now managed by the Technology Strategy Board)
Environment Agency www.environment-agency.gov.uk	• (Construction) Sector Plan • Awareness campaign – Sitewise II • Sustainable design and construction • Hazardous waste advice – HAZRED • Legislation advice – NetRegs
Envirowise www.envirowise.gov.uk	• Guides for trade suppliers, packaging, designing for resource efficiency, site waste management plans (SWMPs) • Training for small builders, SWMPs • Resource Efficiency Clubs • Supply Chain Partnerships, case studies • Fast Track and Design Track visits • Newsletter – BrickSandMortar
MTP (Market Transformation Programme) www.mtprog.com	Forward look and recommendations on resource efficiency improvements for: • Modern methods of construction (MMC) • Floor coverings • Roofing membranes • Insulation products • Window systems • Plasterboard (including further development of supply chain voluntary commitment to reduce/recycle)
NISP (National Industrial Symbiosis Programme) www.nisp.org.uk	• Regional networks • Workshops • Linking companies from different sectors to identify and implement synergies to improve efficiency and use of materials • Case studies
Regional Development Agencies	• All 9 RDAs received funding from BREW to co-ordinate resource efficiency and waste initiatives to meet the needs of business. More detail on each region can be found in Annex 3
WRAP (Waste and Resources Action Programme) www.wrap.org.uk/construction	• Waste minimisation and management • Materials recycling • Procuring recycled content • AggRegain website • Construction web portal

Table 7 BREW delivery bodies and key activities

[7]Revised funding arrangements mean that some of these activities have ceased.

Delivery body and website	Key activities
BRE (Building Research Establishment) www.bre.co.uk www.smartwaste.co.uk	• National Construction Waste Benchmarking project • Reducing waste through refurbishment – T-ZERO • Reducing construction product waste – Be Aware • Waste auditing software – SMARTStart/Audit • Waste auditing software – SMARTStart/Audit • Recycling site locator – BREMAP • On-site help for sites – CoRE • Recycled building products network • BREEAM • Construction Lean Improvement Programme
CIRIA (Construction Industry Research and Information Association) www.ciria.org.uk	• Publications, training • Networks – Construction Productivity Network (CPN), Construction Industry Environmental Forum (CIEF)
TRADA www.trada.co.uk	• Information and research relating to the specification and use of timber and wood products
Mass Balance www.massbalance.org	• Biffaward-funded reports using mass balance principles. Around 60 waste and materials studies based upon regions and sectors
Resource Efficiency Knowledge Transfer Network www.resource-efficiency.org	• Enables exchange of information relating to resource efficiency • E-newsletters and other online support
Constructing Excellence www.constructingexcellence.org	• Construction products key performance indicators available from website
Remades	• Generic name for organisations working to create markets for recycled materials. More details available in Annex 3
English Partnerships – Design for Manufacture www.designformanufacture.info	• Measurement and reduction of waste of housing related to this programme • EP recently announced another programme of work – the Carbon Challenge
SmartLIFE www.smartlife-project.net	• Detailed waste measurement of 100 houses – three types of MMC and more traditional construction
Vinyl2010 www.vinyl2010.org	• The European PVC industry's voluntary commitment to sustainability, subscribed to by 23,000 companies. Includes recycling of PVC through subsidised collection
MINRES (Mineral Industries Research Organisation, MIRO) www.miro.co.uk	• Approach to improving the use and uptake of mineral wastes in construction products
Strategic Supply Chain Group www.sscf.info	• Network of companies, public agencies and institutions who promote sustainable procurement • Tools, guidance and training events
Resource Recovery Forum www.resourcesnotwaste.org	• Network of organisations interested in resource efficiency • Comprehensive library

Table 8 Overview of other delivery bodies and key activities

RECOMMENDATION

■ Simplify resource efficiency support to the construction sector.

A key message coming back from industry stakeholders is that there are too many providers of business support in relation to resource efficiency. This would be improved by clearer delineation of key areas of activity and greater co-ordination between service providers.[8]

[8]In February 2008, Defra announced a review of support to organisations and consumers in the drive to a low carbon, resource efficient future. The review will look to ensure that they can deliver coherent, effective and efficient support and is being considered in the context of the Government's Business Support Simplification Programme.

5. Which legislation and policies apply to construction waste?

The waste-related legislation that applies to the construction and demolition sectors originated from the requirement to protect the environment in terms of the management of wastes produced. This has had a knock-on effect on the waste producers.

The UK follows the principles of the waste hierarchy, which was first introduced into Europe-wide waste policies in 1975 (see Figure 6).

The waste hierarchy indicates that waste should be prevented in the first instance, and what cannot be prevented should be reused, recycled and recovered as much as feasible, with landfill being used as little as possible.

Landfill is seen as the worst option for the environment because it signifies a loss of resources and could turn into a future environmental liability.

This section summarises existing and emerging policy and legislation. More detail is provided in Annex 4.

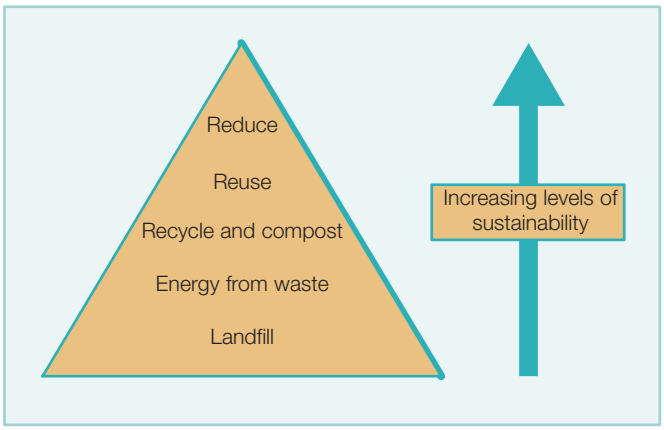


Figure 6 The waste hierarchy

Legislation

Tables 9 and 10 summarise the relevant UK and EU legislation and regulations that apply to England.

Policy and other drivers

Table 11 summarises the relevant UK policies that apply to England.

The *Waste Strategy for England 2007* (Defra, 2007), the DTI's (now BERR) *Review of Sustainable Construction 2006* (DTi, 2006) and workshops preparing for the *Sustainable Construction Strategy* (Berr, 2006 and 2007) have helped inform development of this roadmap, and these key policies are discussed in more detail below.

Driver	Issue	Effect on construction	
		2007	Predicted within 5–7 years
Approved Document Part H – Drainage and Waste Disposal (23)	Provision for the storage of waste within buildings. The government and the devolved administrations have put much emphasis on the collection and recycling of household waste with statutory targets for local authorities to meet	Planning permission may only be given if the design of the development encourages household waste recycling. Developers should consider the space for the internal and external storage of waste and recyclables in and around buildings	More space required for containers to separate different waste streams. Possibly more planning and design considered for community waste sorting and collection areas. Access required for waste collection and internal/external storage areas
Packaging regulations	Companies are obliged to recover packaging waste	Construction industry must comply with the Producer Responsibility Obligations (Packaging Waste) Regulations if they have a turnover of more than £2 million and handle 50 tonnes of packaging waste per year	Work with supply chains and product manufacturers to reduce waste and ensure packaging is reusable/returnable
Landfill tax	Landfill tax for active waste is currently £32/tonne (from April 2008), increasing to at least £48/tonne in April 2010	Increased costs for collection of waste from construction, refurbishment and demolition sites	Significantly increased costs to industry if producing waste and using waste management contractors. Incentives to reduce the amount of waste produced and recycle and recover more waste, making it economically beneficial to do so
	Landfill tax for inactive waste is £2.50/tonne from 1 April 2008	Static tax cost for inert waste – collection costs affected by local markets	Static tax cost for inert waste – collection costs affected by local markets
Aggregates Levy	Aggregates Levy is £1.95/tonne from 1 April 2008	There is an economic incentive to use recycled materials and to minimse the use of primary aggregates so reducing environmental impacts. Encouragement of recycled and secondary aggregates being used in low grade applications	Increased economic incentive to recycled and secondary aggregates, including more on-site reuse and more procurement/ purchasing considerations. Better quality of supply of recycled and secondary aggregates, being used in high value applications
Hazardous Waste (England and Wales) Regulations 2005	Pre-treatment of most waste before landfill. Fewer landfill sites accepting hazardous waste. More waste materials defined as hazardous waste	Increased costs of disposing of hazardous waste to landfill and requirement to establish what wastes are hazardous. If a site produces more than 200 kg per year, the company will have to register that site with the Environment Agency. Engaging with the suppliers of products in terms of their hazardousness when disposed of is useful – this could encourage the use of non-hazardous materials. More contaminated sites treated in-situ to avoid removal and disposal costs	Increased costs for removal of hazardous waste from construction and demolition sites. Encourage designers, contractors and subcontractors to use materials that are non-hazardous

Table 9 Issues relating to legislation and regulation in England

Driver	Issue	Effect on construction	
		2007	Predicted within 5–7 years
EU Thematic Strategy on Waste Prevention and Recycling	Prevention programmes and recycling targets for priority materials, including construction demolition waste are being considered	No current effect as the Strategy is currently being consulted on and developed	Likely to require more waste from construction and demolition to be recycled and therefore systems put in place on and off site
	A revision of the Waste Framework Directive, including the definition of disposal and recovery and clarifying the extent of the waste definition	No effect at present, as still in the consultation stage	There may be fewer requirements for waste management licensing and exemptions
Possible development of End of Life Building Directive (10–15 years)	Industry will have to bear responsibility for the houses they build, maintain and demolish, and the waste generated at each stage	No effect at present	The construction industry will eventually have to design buildings and use products that can ultimately be reused, recycled and recovered at the end of their life. Design for deconstruction and disassembly of products

Table 10 Issues relating to EU legislation and regulations

Driver	Issue	Effect on construction	
		2007	Predicted within 5–7 years
Waste Strategy for England 2007, Defra	Key objectives include: • Create less waste across the supply chain • Close the loop through reuse and recycling • Improve economics of the reuse and recycling sector Targets (under consultation) include: • Halve amount of C,D & E wastes going to landfill by 2012 • Construction clients to include contractual requirements for measurement and improvement in half of construction projects over £1 million in value by 2009 • Government to achieve wate-neutral construction in its major construction projects by 2012	Developing policy and focus for the construction sector and its waste by providing clear targets, milestones and actions Joined up thinking between industry and government Increased diversion of waste from landfill, focus on the supply chain and government procurement	Joint working between government and industry Increased diversion from landfill, reduction in amount of waste arising, increased client requirements for resource efficiency Increased markets for reclaimed and recycled materials
Draft Sustainable Construction Strategy 2007, BERR	Aims to establish a joint government and industry strategy to make a step change in the sustainability of the industry; consulting on the targets within the England Waste Strategy, as well as introducing: • By 2015, zero net waste at construction site level • By 2020 zero waste to landfill	Industry/government shared vision and strategy for sustainable construction including waste Provision of suitable targets for the the industry to carry out effective action	Manufacturers consider resource efficiency within lifecycles Integrated supply chains to tackle waste Designers/architects to specify resource efficiency

Continued

Table 11 Issues arising from government policy in England

Driver	Issue	Effect on construction	
		2007	Predicted within 5–7 years
	• Halve the amount of construction waste produced at site level by 2015 (new build)		
Site Waste Management Plans (SWMPs)	SWMPs are compulsory from April 2008 for projects over £300,000	Encouragement to plan and manage their waste effectively on site; reduction in flytipping	Effective planning, monitoring and management of waste on site through the use of a SWMP; ongoing reduction in flytipping
Code for Sustainable Homes	Voluntary code to assist housebuilders to meet minimum environmental standards A CSH rating is required for all new homes from May 2008	Require SWMP (see above) Some push towards best practice	Will be revised to require additional waste reduction and resource and efficiency above those in SWMPs, e.g. targets will be set for waste generation

Table 11 Continued

Waste Strategy for England 2007

One purpose of this roadmap is to assist the implementation of the Waste Strategy for England 2007. Tackling waste in the construction sector is a priority in this new strategy. Key objectives include:

- placing a greater emphasis on waste reduction and reuse
- decoupling waste growth from economic growth
- increase diversion of non-municipal waste from landfill.

Emphasis is placed on economic instruments (e.g. landfill tax escalator), better regulation (e.g. waste protocols), action on priority materials, products and sectors (including construction), greater segregation and sorting of waste (through investment in infrastructure) and improving local and regional governance. A key theme is aligning the waste strategy with action on climate change, resource efficiency, and sustainable consumption and production, as well as environmental impact.

Attention is given to the construction sector and the waste it produces within the Waste Strategy in terms of both specific and overarching actions. Annex C3 of the *Waste Strategy* focusses solely on construction, demolition and excavation waste. The following areas are likely to have an impact on the sector:

- Pricing: yearly cost increase of landfill tax by £8/tonne from April 2008 until at least 2010/2011 for active waste; increase in inert waste to £2.50/tonne from April 2008; increase in Aggregates Levy to £1.95/tonne from April 2008.
- Regulation: review of the current permits and exemptions systems, waste protocols; review of the regulation of inert waste; review of the handling, transfer and control of waste (further consultation expected); consultation (subject to further analysis) on more restrictions on landfilling of biodegradable wastes and recyclable materials; pre-treatment of non-hazardous wastes destined to landfill.
- Materials, products and sectors: identification of priority waste materials based on environmental impact including plastics, glass, wood and aluminium; priority product groups based on waste impact including packaging, paints, and electronic and electrical equipment and sectors including construction. A new products and materials unit has been set up within Defra focussing on 10 product roadmaps including plasterboard and window systems; eco-design requirements for energy-using products; support for re-use and re-manufacture.
- Investment: ensure that Regional Spatial Strategies and local development plans conform to national planning guidance on waste to enable planning approval for waste infrastructure projects; developing collection arrangements and the energy market for wood waste which cannot be re-used or recycled; setting a clearer strategy for the BREW programme; continued support for market development focussing on priority materials.
- Local and regional governance: encouraging local authorities to take a wider role to help local (especially smaller) businesses to reduce and recycle

their waste; encourage the RDAs and other regional bodies to co-ordinate business waste and resource management.

Shared responsibility

Emphasis is also placed on a 'shared responsibility' for waste, which includes a vision for society as a whole to appreciate the importance of responsible waste management. For businesses, this includes building resource efficiency and sustainable waste management into the design of products, the services offered and what is purchased. There are also similar responsibilities for government in terms of its own waste and procurement practices.

Implementation plan

The high level implementation plan for the Waste Strategy for England 2007 has the following actions with associated time-frames:

- Develop sector-level agreement to reduce plasterboard waste to landfill and increase collection and recycling (end of 2007).
- Develop policy roadmaps for other priority construction products such as window systems (ongoing).
- Consult on making Site Waste Management Plans mandatory for larger construction sites.[9]
- Implement the Construction Waste & Resources roadmap i.e. this document (Summer 2007 onwards).

Construction waste objectives and priorities

The construction annex of the Waste Strategy outlines objectives for construction waste:

- Provide drivers to improve the economic efficiency by creating less waste at every stage of the supply chain.
- Encourage the sector to treat waste as a resource, closing the loop by re-using and recycling more and asking contractors for greater use of recovered materials.
- Improve the economics of re-use and recycling by increasing sector demand and securing investment in the treatment of waste.

Key issues for the sector include: greater diversion of waste from landfill; and a lack of data, especially related to non-inert waste, predicted growth in demolition waste, greater levels of construction and the importance of de-coupling this growth from materials consumption through increased resource efficiency, off-site fabrication and illegal waste activity.

Emphasis is placed on key policies such as the Code for Sustainable Homes (which requires a SWMP as a minimum requirement), sustainable procurement, sector commitments and policy roadmaps for priority products and materials and linkages with the Sustainable Construction Strategy and Environment Agency sector plan. In addition, it will be essential to ensure that construction resource efficiency is at the heart of 'flagship' developments such as Thames Gateway and the 2012 Olympics.

Draft Sustainable Construction Strategy 2007

The government is consulting on the draft Sustainable Construction Strategy published in July 2007 (BERR, 2007). The aim is to establish a joint government and industry strategy. The final strategy should be published in June 2008.

The aim is to:

- make a step change in the sustainability of the construction industry and then to drive continuous improvement
- support the development of a committed, skilled and adaptable workforce and take forward change in the construction industry in order to enhance efficiency
- create long-term certainty so that industry can innovate and lead internationally in products and services for sustainable construction.

The draft Strategy recommends: businesses could develop and implement a programme to encourage smaller contractors to ensure current performance; for manufacturers to consider the resource efficiency of a product throughout its lifecycle; designers/architects to consider resource efficiency within an overarching framework of sustainable design; and contractors and subcontractors to use SWMPs as a tool for resource efficiency.

[9]SWMPs are mandatory for all new sites over £300,000 project cost from April 2008.

Planning

In each of the English regions a regional planning body is responsible for drawing up regional planning guidance, including a regional waste strategy. Regional planning guidance is concerned with strategic questions, such as how many incinerators, recycling facilities and so on, are needed in each county or conurbation.

Planning is increasingly seen as an important mechanism for driving sustainability and resource efficiency. National, regional and local planning policies all have guidance relating to resource efficiency and a number of local authorities are now starting to produce supplementary planning guidance focussing on construction and demolition waste (e.g. East Sussex, and Brighton and Hove).

More planning authorities are asking for targets and waste recovery methods within the planning application process. The use of the checklists for sustainable development is also increasing. It is expected that this area will increase as a driver and will increasingly target housebuilders.

Regional technical advisory bodies

The regional planning bodies are advised by regional technical advisory bodies. These bodies consider land use planning provisions, identification of guide figures for waste streams to be managed, and levels of transportation across regional boundaries. All of these waste management strategies consider the production and management of construction and demolition waste, and some have indicators and targets related to this.

RECOMMENDATIONS

There are multiple regulatory and policy areas that influence construction resource use and waste management. Better joining up and reinforcement of key and consistent messages should be an ongoing activity.

There also needs to be a greater understanding of what is expected from the various parts of the construction sector that can collectively influence progress towards targets. Coherent awareness-raising, training and education will then have more impact.

Specific recommendations include:

- **develop extended producer responsibility for all key construction products *or* industry agreed voluntary commitments**
- **supply chain commitments in place for all government procured projects, i.e. lead by example**
- **strengthen the Code for Sustainable Homes (and other relevant building codes) to require significant waste reduction at all levels**
- **encourage the reduction of waste and the reuse of products in preference to recycling**
- **relevant professional training/education to include modules on resource efficiency.**

6. Which way now? The roadmap

This section sets out a key targets, as developed during the research phase, and describes the key actions needed to achieve the targets.

Target 1. Halve the amount of (non-aggregate) construction waste produced by 2015[10]

This target relates to the amount of waste generated relative to construction activity. It is measured through performance indicators, such as m^3 waste/100 m^2, or wastage rates of products and materials.

Owner: Construction Resources and Waste Platform

Target audience: construction and refurbishment (not demolition)

Waste areas covered: waste reduction

Timescale: 2015

Potential impact: high

Notes:

- There are risks associated with pursuing targets outside the context of overall life cycle impacts (see Section 2 of this roadmap).
- Prevention of waste will lead to the best improvements in terms of environmental impact and cost savings, so a clear target is for the industry to reduce the amount of construction waste produced in the first place (this would not include demolition waste).

Target 2. Halve the amount of construction, demolition and extraction waste going to landfill by 2012 as a result of re-use and recycling[10]

This target relates to the amount of waste landfilled, excluding materials needed for landfill restoration.

Owner: Defra/BERR

Target audience: construction industry

Waste areas covered: diversion from landfill

Timescale: 2012/2020

Potential impact: medium – needs to be clearly related to construction sector activities

Note:

- This target is in Defra's Waste Strategy for England 2007 and has been consulted on with industry in the draft Sustainable Construction Strategy.

Other targets

There are various targets/actions that are being consulted on or already set relating to construction resource efficiency. Annex 4 gives a short overview of the main targets/actions, the targeted audience and the potential impact.

[10]Targets 1 and 2 apply to building-related construction waste only; the baseline will be set during 2008.

Achieving the waste reduction target

Achieving the waste reduction target will require co-ordinated and concerted action across a fragmented supply chain. Key actions that would help achieve a waste reduction target are listed in Table 12 and discussed in more detail, below.

1. Set baseline data for construction related waste

Setting baseline data is important because it allows progress towards a waste reduction target to be measured. Waste reduction is far less tangible than tonnes of waste being recycled. However, benchmarks are being set in 2008 to allow comparison in future years.

BRE have set up a benchmarking website (www.smartwaste.co.uk/benchmarking.jsp) which will enable this data to be collected centrally. Construction and waste contractors need to input data to improve the statistical validity of the resultant figures.

Other ways of measuring waste can be through the standard figures used in pricing books. If wastage rates are demonstrably lower, these figures should fall over time. This would require developing and submitting evidence to organisations producing the books before amendments can be made. Once amended, there should be further improvements because the extra amounts currently purchased to compensate for wastage will be further reduced.

2. Measure performance consistently in terms of waste reduction, reuse, recycling, recovery per company, sector, process and product

Lots of companies are collecting information on the amount of waste produced and what they do with it. Unfortunately, this key data is being collected using differing metrics and methods. This means that even with centralised reporting in place, the scope to amalgamate individual data sets is complicated and possibly unworkable.

Once targets are clearly defined, it will be possible to provide guidance on the best metrics and methods of data collection. The introduction of site waste management plans (SWMPs) seems an ideal opportunity, but it is not being fully exploited.

Wherever possible, site-based commitments to measure and monitor should be embedded into this forthcoming legislative requirement. Companies should be encouraged to send their completed SWMPs to a centralised data collection system. For example, all users of BRE's SMARTWaste Plan will be encouraged to collect and provide data for industry benchmarking and performance monitoring in future years (www.smartwaste.co.uk/swmp). Another example is the Major Contractors Group (MCG), whose members have made a commitment to measure the waste their projects produce.

3. Extended producer responsibility and voluntary commitments

For over a decade the construction sector has been subject to increasing requirements to reduce the environmental impact of the built environment. This often takes the form of client specifications (for example, 'achieving a BREEAM Excellent' score), i.e. there is a general drive to measure environmental performance and reduce impacts throughout the supply chain.

Voluntary commitments are a powerful means of achieving consistency and added value, i.e. build on what is already happening rather than take a separate path for resource efficiency. Business support can then be applied to help achieve industry-agreed commitments. This would result in greater buy-in, with support provided in a more structured and holistic way.

4. Supply chain commitments in place for all government-procured projects

Discussions with industry stakeholders have identified the difficulty of achieving change with a fragmented supply chain. Again, this stems from not having a clear lead as to what is required and by whom. Government-procured projects are an ideal opportunity for working out the best approaches and identifying barriers that need to be addressed. This is happening already with the Olympics and other large developments. However, headline targets apply unilaterally, irrespective of the ability for different partners of the supply chain to deliver against these. A better understanding of accountability throughout the supply chain could lead to more specific contractual targets which help deliver the headline objective.

Commitments	Suggested champion	Timescale	Purpose/links
1. Set baseline data for construction-related waste	CRWP	2008	Start process of improvement
2. Measure performance consistently in terms of waste reduction, reuse, recycling etc., per company, sector, process and product	CRWP	Annual reporting	Measure levels of improvement
3. Extended producer responsibility for all key construction products *or* industry agreed voluntary commitments	Defra	2010	Promote resource efficiency on a product basis, e.g. returnable packaging, ecodesign
4. Supply chain commitments in place for all government-procured projects	OGC	2009	Targets for waste reduction will only be met if the supply chain is committed to combined action
5. Relevant professional training/education to include modules on resource efficiency	CRWP	2010	Construction professionals (e.g. designers) educated to consider resource efficiency to be part of their future jobs
6. Strengthen the Code for Sustainable Homes to require significant waste reduction at all levels	CLG	2009	Sets out requirements to reduce waste as part of overall standard
Recommendations			
7. Develop consistent method of measuring carbon impacts relating to waste and resources	CRWP	2009	Links to reducing overall environmental impact of construction through better decision-making
8. Develop consistent method of measuring whole life cost impacts relating to waste and resources	CRWP	2009	Links to reducing overall cost of resources and waste through better decision making
9. Encourage the reduction and reuse of waste in preference to recycling	Defra and BMRA (Building Materials Reuse Association)	2008	Recycling has been promoted above reduction and reuse. It is important to redress the balance
10. Simplify resource efficiency support to the construction sector	Defra	2009	Too many initiatives and support programmes dilute the key messages and confuse the people they are trying to help

Table 12 Key actions on waste reduction

5. Relevant professional training/ education to include modules on resource efficiency

Most construction professionals will have completed a relevant qualification. Within this, there may have been some element of awareness raising in terms of resource efficiency. If so, it will have been fairly ad hoc and developed in house with varying degrees of competency. A more comprehensive and consistent approach is to develop resource efficiency modules clearly linked to the relevant profession. Consequently, newly qualified professionals would understand the key issues, actions they can take, and have a commonality of approach. The modules can be developed quite quickly, with the benefits being realised over the whole working life of trained individuals.

6. Strengthen the Code for Sustainable Homes to require significant waste reduction at all levels

Any industry likes to have certainty of the standards they will have to meet so that investment in people, process and products can meet future demands.

The Code for Sustainable Homes is a good example of removing some uncertainty over future energy and water consumption performance requirements. This document clearly states the performance levels expected over the next 10 years and the housebuilding industry is aligning itself to meet them.

The requirements for material resource efficiency are less clear, with the only real requirement being to have a site waste management plan (SWMP). Since this is now required through legislation, added improvements through the Code are needed to promote better practice. Currently, extra points can be earned for following 'best practice', though this presents little direction in terms of actual performance requirements.

Now that SWMPs are in place, further requirements to reduce, reuse and recycle waste should be considered in subsequent revisions of the Code for Sustainable Homes, and other sustainable building codes. This is especially important if, in future, there are to be regulatory requirements for achieving a certain level. In particular, if 'codes' are to be developed for existing homes and other buildings, it is imperative for these to include strong waste reduction requirements.

7. Develop consistent methods of measuring carbon impacts relating to waste and resources

There are two main reasons for measuring carbon impacts. Firstly, to make sure the right decisions are being made (for example, diverting the last 5% of waste from landfill could cause significant increases in energy used to transport and reprocess it). Secondly, a key driver in the construction sector is to reduce climate change impacts. When this driver is set against wasted resources, the embodied energy that has been wasted will predominate in terms of carbon impact. Awareness of these issues is increasing with no clear method to capture and display carbon impacts associated with construction waste. These impacts are included in current life cycle assessment methodologies and could be unpacked to provide a consistent method. Work is currently underway within Defra in partnership with BSI and the Carbon Trust to label products and services.[11] Any resultant methodology needs to be compatible with existing methodologies for measuring the environmental impact of construction products.

8. Develop consistent methods for measuring whole life cost impacts relating to waste and resources

Whole life costing techniques allow costs and benefits to be evaluated over the expected lifetime of a building or other infrastructure. The current methods do not effectively calculate the cost of wasting resources and disposal over that lifetime. If the financial implications of wasting resources are to be captured, it should be in the form of whole life costs, with the actual costs and benefits at each stage of the supply chain also being transparent. This information will allow decisions to be made over a longer term. For example, a product may be cheaper to install now with minimal waste; but if it lasts half as long or has no realistic means of being reused or recycled, it might not be the best option.

9. Encourage reduction of waste and reuse in preference to recycling

Business benefits derived from recycling and incorporating recycled content are minimal when compared to preventing waste from being produced in the first place. The same is true of environmental benefits.

A clear and specific drive to reduce waste should be central to policy, measurement, commitments, education and targets. This should not be confused or bundled up with reusing or recycling waste, which is why having a zero net waste target is potentially misguided.

In terms of reuse of building products, the evidence suggests that this has declined as recycling has increased. More focussed business support for the reclamation industry should be provided (perhaps through the recently created Building Materials Reuse Association).

10. Simplify resource efficiency support to the construction sector

A key message coming back from industry stakeholders was that there are too many providers of business support in relation to resource efficiency.

[11]See PAS 2050 – Measuring the embodied greenhouse gas emissions in products and services www.bsigroup.com/en/Standards-and-Publications/How-we-can-help-you/Professional-Standards-Service/PAS-2050/).

Therefore, in February 2008, Defra announced a review of support to both organisations and consumers in the drive to a low carbon, resource efficient future. This is part of the government's Business Support Simplification Programme. The review aims to ensure that support is coherent, effective and efficient.

There are other resource efficiency delivery bodies working outside government supported programmes. Ideally, they should be working alongside these programmes, perhaps with costs to industry being offset by government funding.

Achieving the diversion from landfill target

Many of the activities to achieve the second target – diversion from landfill – are already underway with existing BREW business support programmes and activities.

Some additional actions were flagged up as part of the consultation process, as shown in Table 13.

Actions based on evidence/ knowledge	Recyclability/recycled content of products only considered within life cycle environmental impacts
Actions for the supply chain	Need supply chain collaboration and commitment, strategic approach to materials and sub-contract procurement, also consider different systems for designing out waste and the effect on costs
Actions to improve support	Develop and implement a programme to encourage smaller contractors to measure current performance, identify good practice and reduce site waste
	Recyclability indicators for products and materials
	Good, comprehensive network of resource management facilities for reuse, recycling and recovery
	Consolidation centres strategically placed to reduce transport of products and waste, and promote recirculation of surplus products and materials

Table 13 Additional actions to help divert waste from landfill

Summary

There are links and interdependencies between the recommendations described above, and these need to be created and maintained. Figure 7 summarises the overriding need to have far more consistency and industry understanding when providing business support for this sector.

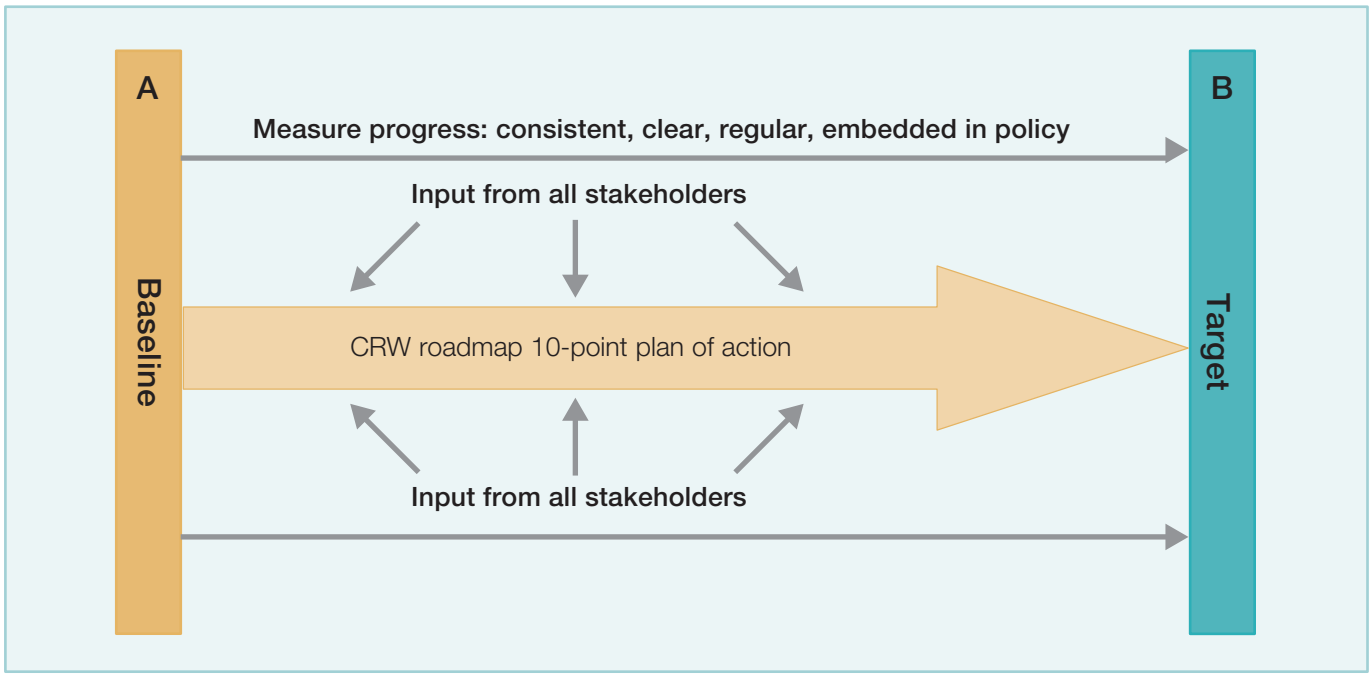


Figure 7 The CRW roadmap: moving from A to B

7. Further reading and sources of information

Further reading

Anderson, J. et al. (2002). *Green Guide to Specification*, BRE, ISBN 0-632-05961-3. Progress on update is downloadable from www.bre.co.uk/greenguide.

BERR (2006). *Draft Strategy for Sustainable Construction* www.berr.gov.uk/files/file21326.pdf

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SALVO (1998). *BigREc Survey* www.reuse.it/salvo/bigrec.html

CLG (2007). *CDEW Survey of Arisings and Use of Alternatives to Primary Aggregates in England 2005* www.communities.gov.uk/documents/planningandbuilding/pdf/surveyother2005

Defra (2005). *Securing the Future (Sustainable Development Strategy)*, (Cm 6467) www.sustainable-development.gov.uk/ publications/uk-strategy/index.htm

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Environment Agency (2004). *Hazardous Waste Produced in Regions of England & Wales by Type/Sector in 2004*, Environment Agency website: www.environment-agency.gov.uk/commondata/103196/1381147?referrer=/subjects/waste/1031954/315439/1434288/1378

Hobbs, G. (2006). *Developing a Strategic Approach to Construction Waste – 20 Year Strategy*, Defra, AEAT and BRE, downloadable from www.bre.co.uk/wastestrategy

NFDC (2002). *Annual Returns 2002* , National Federation of Demolition Contractors www.demolition-nfdc.com

Webb, B. et al. (2006). *Fly-tipping: Causes, Incentives and Solutions*, University College London, Jill Dando Institute of Crime Science, for Defra; downloadable from www.defra.gov.uk/environment/localenv/flytipping/research/index.htm

Sources of information

BERR	Department for Business, Enterprise and Regulatory Reform www.berr.gov.uk
BRE	Building Research Establishment www.bre.co.uk
BREW	Business Resource Efficiency and Waste (Programme) www.defra.gov.uk/Environment/waste/brew
CLG	[Department for] Communities and Local Government www.communities.gov.uk
Constructing Excellence	www.constructingexcellence.org.uk
CRWP	Construction Resources and Waste Platform www.crwplatform.co.uk
CT	Carbon Trust www.carbon-trust.org.uk
Defra	Department for Environment, Food and Rural Affairs www.defra.gov.uk
EA	Environment Agency www.environment-agency.gov.uk; see also NetRegs website www.netregs.gov.uk
Envirowise	www.envirowise.gov.uk
MTP	Market Transformation Programme www.mtprog.com
OGC	Office of Government Commerce www.ogc.gov.uk
SMARTWaste	www.smartwaste.co.uk
WRAP	Waste and Resource Action Programme www.wrap.org.uk

8. Glossary

Definitions are important to understand what is meant throughout this report and why certain issues are considered important. The table below summarises and defines (for the purposes of this report) aspects of construction resource efficiency.

Term	Meaning	Relevance
Adaptable, flexible, relocatable	Adaptable and/or flexible buildings can be easily changed to cope with changing requirements of a building. Relocatable buildings can be taken apart and reconstructed with minimal waste. This links to durability, i.e. has to be structurally sound and durable to make these options worthwhile	Demolition waste can be avoided if buildings can be adapted or moved
Carbon equivalence	This equates overall life cycle data to an equivalent amount of carbon. To do this, all non-energy-related impacts have to weighted and converted	Enables resource used, wasted and/or recovered to be quntified/ compared in carbon terms
Construction resource efficiency	Better use of all materials and products, from construction, demolition, refurbishment. Also including waste reduction, reuse, recycling, recycled content, energy from waste. Does not consider all resources,e.g. fossil fuel, water	Holistic approach to managing material resources and waste
Deconstruction, disassembly	Often linked to design for deconstruction or disassembly, this relates to the ability for components, products and/or materials to be removed – principally for reuse. For example, a composite structure that has been glued together will not be easily deconstructable; whereas a frame that has been bolted together can be disassembled with minimal damage	Reuse requires products and materials to be removed with minimal damage. This often has to be designed in
Embodied energy	This represents the amount of energy needed to produce and distribute products/materials. For example, a tonne of aluminium will typically have more embodied energy than a tonne of timber due to the large amount of primary energy needed for the manufacture of aluminium	Enables products and materials to be compared in terms of their energy impact/value
Hazardous	Product or material may have content of a hazardous nature. This product/material could then be classified as a hazardous waste. Detailed technical guidance on hazardous waste can be accessed from the Environment Agency's NetRegs website (www.netregs.gov.uk). It can be difficult to identify hazardous wastes, especially those arising from refurbishment or demolition, unless detailed maintenance records have been kept. Anyone who produces hazardous waste (apart from very small amounts) has to be registered with the EA	Recovery options are limited for hazardous waste, which is also very expensive to dispose of with added administrative requirements. Failure to dispose of it correctly presents greater risk of pollution than for non-hazardous waste
Landfill	Putting waste into holes in the ground. These are typically well engineered to prevent air/water pollution and best suited for residual waste, i.e. where it is not practical to dispose of it in any other way. Restrictions on types of waste accepted at landfills are in place, especially for hazardous	Landfill space is limited and increasing restrictions/taxation applies The landfill tax is increasing for active and inactive wastes

Continued

Term	Meaning	Relevance
	waste. Pretreatment of all waste is required prior to landfilling. Landfill gas can be collected for heating or electricity production. Alternatively, it is 'flared' to prevent methane escape	
Reclaimed products and materials	See 'reuse or reclamation' below	Market demand needed
Recovered products and materials	Products of a recovery process. For example compost	Market demand needed
Recovery	Usually used when neither reuse or recycling apply. For example, composting wood-based materials or using waste plasterboard as a soil conditioner. Other forms of recovery could be through pyrolysis, anaerobic digestion, conversion to biodiesel etc. Energy recovery relates to when material is burnt for space/water heating or electricity generation. Recovery is usually considered the next best option to recycling in terms of environmental impact reduction and diversion from landfill Can also be used as a general term to embrace reuse, recycling and recovery	
Recyclable, reusable, recoverable	This is an indicator of the waste management routes open to a particular product or material. Usually relates to technical viability, i.e. there might not be suitable recycling facilities for products labelled 'recyclable'	Key consideration in terms of establishing the end-of-life resource options for product/materials at the point of installation
Recycled products and materials	This relates to manufactured products and bulk materials. The recycled content of a product relates to feedstock that has been derived from recycling waste. A 'rule of thumb' definition of recycled content has been developed by WRAP, along with recycled content toolkits etc	Markets for recyclate (materials resulting from recycling processes) are needed to make recycling viable
Recycling	Typically requires reprocessing. For example, taking a brick from a demolished building, putting it through a crusher and using the material as an aggregate replacement	Recycling is usually considered the next best option to reuse in terms of environmental impact reduction and diversion from landfill
Reduced environmental impact	Lower impact as determined by life cycle assessment (LCA). Includes resource efficiency amongst other issues, such as fossil fuels and water usage. Covers life cycle – from manufacture through to demolition	Improving one impact may increase another, so LCA is an important decision making tool
Resource management	Generally includes collection and processing in support of and including reuse and recycling. This also reflects an opinion that 'waste' that can be recovered should be reclassified as 'resource' to change attitudes and encourage reuse, recycling and recovery	Most waste management contractors are also resource management contractors – involved with managing resources
Reuse or reclamation	Typically means using products and materials without reprocessing. For example, taking a brick from a demolished building and using it as a brick in a new one	Reuse is usually the next best option to reduction in terms of environmental impact reduction and diversion from landfill
Waste	Anything that is discarded or surplus to requirements can be considered a waste	Anything classified as 'waste' has to be treated in accordance with relevant legislation
Waste minimisation	This term is generally taken to mean waste reduction, rplus ecycling, and can mean reducing the amount of non-segregated waste leaving a site. For example reusing surplus bricks in a landscaping application	Encourages reuse/recycling on site and diversion of waste from landfill

Continued

Term	Meaning	Relevance
Waste reduction	Preventing waste from being created at any/all points in the supply chain. For example, ensuring only the amount of bricks required is delivered to site – avoiding surplus materials. This means that the overall amount of waste generated is less when compared to amount of activity. Monitoring of waste reduction can be through wastage rates and/or environmental performance indicators such as m^3 of waste per 100 m^2 floor area	Waste reduction is the top priority in construction resource efficiency, in terms of reducing cost, environmental impact and avoiding landfill
Zero net waste; waste neutral	Waste neutrality describes the scenario where the wastage of materials on a construction project is offset by the incorporation of reclaimed and recycled products and materials. WRAP's interpretation measures net waste as the difference between the value of materials wasted and the value of additional recovered materials incorporated in the construction works or in off-site applications. Other interpretations may be based on mass or volume, and may focus on waste to landfill rather than total waste	Also a difficult term, which can include offsetting with recycled content. The term is increasingly discussed, however
Zero waste	Should mean that no waste is produced but tends to be used in the context of diverting waste from landfill, i.e. no waste will go to landfill from a site. Aspirations to reduce waste may or may not be included	A difficult term to apply – definitions vary

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