

Introduction

It has been prepared by the GCB's Resources and Waste Task Group with the principal authors being Katherine Adams, Rob Pearce and Jane Thornback. The project received financial support from BEIS, and was in collaboration with Defra.

Aim

**Better Measurement
– Better
Management**

2040s

Context

The government's Resources and Waste Strategy (2018)¹ has the stated ambition 'to eliminate avoidable waste of all kinds by 2050' in England. This includes waste from all sectors of society including the construction sector (both buildings and infrastructure).

Constructing our built environment uses the largest flow of materials, and produces the largest waste stream by tonnage. In 2016 this amounted to 60 million tonnes of construction and demolition waste and 51 million tonnes of excavation waste. For waste from new build construction, this represents a 'true' cost of £11 billion per year and a carbon cost of potentially 3.3 million tonnes/CO₂e per year.

The purpose of this Routemap is to identify the actions to be taken right across the construction sector and by government to reduce this waste stream to zero. The Green Construction Board interprets Zero Avoidable Waste (ZAW) to mean:

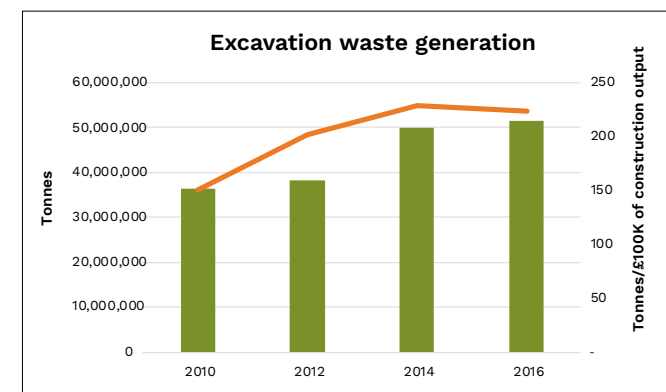
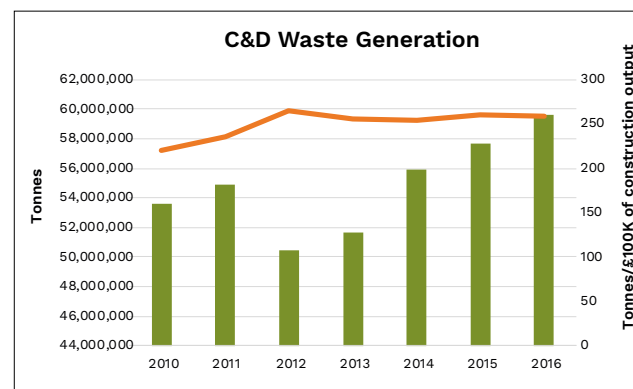
Zero Avoidable Waste in construction means preventing waste being generated at every stage of a project's lifecycle, from the manufacture of materials and products, the design, specification, procurement and assembly of buildings and infrastructure through to deconstruction. At the end of life, products, components and materials should be recovered at the highest possible level of the waste hierarchy, i.e. reused before being recycled, whilst ensuring minimal environment impact. Green Construction Board, 2020

When considering Zero Avoidable Waste in construction we need to consider two clear focal points:

- **New Build** – ensure new buildings and structures use resources efficiently, are designed for durability and longevity and safety, and are designed for deconstruction and disassembly at end of life.
- **Existing Buildings** – most of the buildings and structures we will use in the future already exist today, so at end of their current use can they be repurposed for new uses, and if not can they be demolished in a way to ensure the maximum amount of product and material is reused, recycled or recovered.

We emphasise that to meet a target of Zero Avoidable Waste we need robust measurement systems to enable consistent and regular monitoring which feeds into the development of a National Materials Strategy. Only then will we begin to realise a true circular economy.

There is much to do in progressing ZAW in the construction sector. The graphs show that for C&D waste, there has been little, if any reduction in the amount of C&D waste arising in absolute and relative terms (based on construction output). This is also the same for excavation waste (soils). This suggests that waste reduction may not currently be seen as a priority for the sector, and that action is required if the environmental targets for carbon reduction are to be addressed.



¹ Defra (2018) Resources and Waste Strategy, HM Government London.
Available at <https://www.gov.uk/government/publications/resources-and-waste-strategy-for-england>

Targets and Guiding Principles

The overall target is for “zero avoidable waste (ZAW) in the construction sector by 2050”. The working interpretation of what is meant by ZAW was produced in February 2020¹. There are a number of other targets included with the Routemap:

- By 2030 costs are reduced by 10% through designing out waste and material optimisation.
- By 2040 eliminate all but hazardous C&D waste entering landfill.
- By 2040 reduce soil to landfill by 75% based on a 2020 level and by 2050 this should be zero unless required for landfill operation purposes.

The setting of targets is also recommended for waste reduction in the Design out Waste and Procure with Zero Waste in Mind themes. As the Routemap is taken forward it is likely that other targets will be set to drive ZAW in the construction sector.

There are a number of over-arching principles which apply to the Routemap and to achieve ZAW in the sector. These are also presented in the Working Interpretation Report. These include:

- The primary objective is to prevent materials, products or components from becoming waste in line with the waste hierarchy.
- If waste cannot be prevented then the secondary objective is for waste to be kept at its highest level by following the waste hierarchy.
- The Routemap is intended to progress the implementation of a circular economy, with materials flowing round the economy.
- Choices should be based on life cycle assessment, considering the impact on energy, carbon, water, toxicity, air quality, biodiversity etc.
- The design life of a project should inform the choice of the materials, components, and elements. For example, projects with a long service life will be delivered using long life materials, and vice versa.
- Providing for adaptability in buildings and infrastructure is a fundamental principle in achieving ZAW.
- The feasibility for reuse and/or adaptation of existing structures and buildings should be a primary consideration to minimise waste production.

¹ <https://www.constructionleadershipcouncil.co.uk/wp-content/uploads/2016/05/ZAW-Report-Final-Draft-25-February-2020.pdf>

Acknowledgements

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Design for End of Life

Aim: The consideration of the end of life stage is required for all major projects at the design and planning stage

2020s

- Training for Design for Deconstruction is embedded within relevant University courses and Professional CPD.
- Large metropolitan planning authorities require major projects to submit an end of life plan in planning applications.

2030s

- By the early 2030s national planning framework policy requires end of life plans for major projects.
- By the early 2030s Building Regulations require major projects to be designed for deconstruction and disassembly.

2040s

- Structures made from reusable components, easily deconstructed without compromising safety become the norm.

Act now

Government

- Government begins the policy development and consultation process to introduce this requirement by 2030s.

Industry

- Clients require end of life plans for their buildings as part of the design process.
- Design teams utilise technical guidance to assist the design for deconstruction and reuse potential for different components and elements which they commonly use.
- If flexibility and adaptability is being considered by design teams, extend this thinking to cover end of life.
- Contractors ensure that during construction, components and elements are constructed in a way that they can be disassembled at end of life.
- Design teams share their learnings and best practice on designing for deconstruction within their practices and externally through their networks.
- Design teams write up case studies on how design for deconstruction has been considered within the design process and what changed as a result.
- Other professional bodies and University Courses develop training for respective disciplines.

Guidance

There is various guidance, tools and case studies available. Relevant projects are also listed.

- [Greater London Authority Circular Economy Statement and Guidance](#)
- [Regenerate Tool for Circular Economy Design and Construction](#)
- [SEDA Design for Deconstruction Guidance \(2005\)](#)
- [ISO 20887:2020 Sustainability in buildings and civil engineering works — Design for disassembly and adaptability — Principles, requirements and guidance \(2020\)](#)
- [UK Government; Planning for the Future \(2020\)](#)
- [European Commission Circular Economy Principles for Building Design \(2020\)](#)
- [David Cheshire, Building Revolutions – Applying the Circular Economy to the Built Environment Book \(2019\)](#)
- [Building as Material Banks H2020 project, Reversible Design guidance](#)
- [Adaptable Futures – case studies and tools](#)
- [CIOB & ARUP; Designing for the Deconstruction Process](#)
- [Climate KIC Reusable Buildings, Final Report](#)
- [Alliance for Sustainable Building Products \(ASBP\) The Re-Fab project](#)
- BRE
 - [Design for Deconstruction](#)
 - [Design for Deconstruction Case Study](#)
 - [BREEAM New Construction 2018 – Credit for designing for disassembly and adaptability](#)
 - [CEEQUAL](#)
- [RICS Ska Rating](#)
- [H2020 CIRCuIT project](#)

Design out waste

Aim: The use of materials is optimised in the design of the buildings and structures and waste is designed out throughout the design and construction process

2020s

- Waste reduction targets are commonplace in most construction projects.
- Professional institutions develop training and CPD.
- BS8895 is widely adopted throughout the design process for major projects.

2030s

- By 2030 costs are reduced by 10% through designing out waste and material optimisation.

2040s

- The amount of waste generated from new build construction is minimal.

Act now

- Clients, design teams and contractors set project waste reduction targets during design and construction.
- Design teams share their learnings and best practice on designing out waste within their practices and externally through their networks.
- Design teams write up case studies on how designing out waste has been considered within the design process and what changed as a result.
- Design teams implement waste reduction practices in their design work.
- Design teams undertake material optimisation through design choices and material selection working with manufacturers.
- Professional Institutions and universities and colleges include designing out waste in training, CPD and academic courses.
- If participating in environmental certification schemes, such as BREEAM, LEED etc pursue the credits that relate to waste reduction and material efficiency.
- At project level, contractors and quantity surveyors, reduce the wastage allowances that are set for materials and do not over order.
- Contractors incentivise subcontractors to reduce waste.
- Contractors and subcontractors manage materials on site carefully to avoid damage.
- Manufacturers and contractors collaborate to implement reusable packaging schemes.



Guidance

There is some guidance specifically for reduction of waste during design and construction which is listed below. Organisations such as WRAP developed Designing out Waste guidance and tools but these have not been updated following the change in scope of WRAP.

- [BS8895 Standard on designing for material efficiency in buildings](#)
- [WRAP Designing out Waste Guidance](#)
- BRE
 - [Material resource efficiency in construction: Supporting a circular economy \(FB 85\) – \(2017\)](#)
 - [BREEAM New Construction 2018 – Credit for Construction Waste Management \(Wst0\)](#)
 - [CEEQUAL](#)
- Zero Waste Scotland
 - [Reducing Construction Waste](#)
 - [Best Practice Guide to managing waste on construction sites](#)
- [Concrete Centre guidance on material efficiency \(2018\)](#)
- [Steel Construction Institute guidance tool for optimisation of beams and columns](#)
- [CIBSE TM56: Resource Efficiency of Building Services \(2014\)](#)
- [RICS Ska Rating](#)

There are also a few case studies available:

- [Crossrail Designing out Waste](#)
- Olympics 2012
 - [NoWaste Lean Construction Training Programme](#)
 - [Waste Implementation Guidance for Project Teams and Waste Minimisation Action Reports](#)
 - [Designing out Waste in the Olympic Park](#)
- [Thameslink Case Studies](#)

2020s

- 2030s

- 2040s

Industry

- Developers and asset owners promote refurbishment and reuse in their sustainability policies.
- Developers, asset owners and design teams consider reuse in the very first stages of project appraisal.
- Design teams advise on refurbishment and adaptive reuse options for existing assets.



Guidance

Sources of data are listed, as well as some of the organisations and projects that are active in this area.

- [Architects Journal, Retrofit First campaign](#)
- [UCL, Demolition or refurbishment of social housing? \(2017\)](#)
- [Greater London Authority Circular Economy Statement and Guidance](#)
- [David Cheshire, Building Revolutions – Applying the Circular Economy to the Built Environment Book \(2019\)](#)
- [Regenerate Tool for Circular Economy Design and Construction](#)
- [Adaptable Futures – case studies and tools](#)
- [Climate KIC Reusable Buildings, Final Report \(2019\)](#)
- [UK Green Building Council DEEP DIVE: The choice between demolition or reuse: developer insights](#)
- [H2020 CIRCuIT project](#)
- [Construction Leadership Council Greening Our Existing Homes National retrofit strategy A consultative document \(2020\)](#)

- Set targets for waste reduction and recovery of waste in procurement contracts.
- Use established KPIs for waste arisings (e.g. tonnes of waste/100m² of floor area).
- When the procurement route allows, early involvement of the contractor, with the design team can assist in designing out waste and the reuse and recycling of waste materials.
- If requiring BREEAM or other schemes, make sure that the relevant waste credits are part of the assessment.



Guidance

There is little current guidance specifically for construction waste and procurement- organisations such as WRAP developed procurement toolkits to encourage those procuring construction projects to set targets for zero waste to landfill and recycled content but have not been updated following the change in scope of WRAP. Examples of initiatives, guidance and relevant organisations are listed.

- [Zero Waste Scotland Procuring Resource Efficient Construction Projects \(2017\)](#)
- [Construction Innovation Hub – Procuring for Value Toolkit \(2021\)](#)
- [HM Government – Construction Playbook \(2021\)](#)
- [Construction Leadership Council \(CLC\) Procuring for Value \(2018\)](#)
- [Northern Ireland Government Construction Clients Sustainability Action Plan \(2012 – 2015\)](#)
- [NI Public Procurement \(Northern Ireland\) Procurement Guidance Notes](#)
- [London 2012 Learning Legacy Procurement](#)
- [WRAP Cymru Public Health Wales Sustainable Procurement Case Study \(2016\)](#)
- [Infrastructure and Ports Authority - Common Minimum Standards for the Procurement of Built Environment in the Public Sector \(2017\)](#)
- [UK Government Greening Government Commitments \(2018\)](#)
- [BRE BREEAM and CEEQUAL](#)
- [European Commission Green Public Procurement](#)
- [Construction Products Association \(CPA\) Procurement Guidance Tool](#)
- [Key Performance Indicators – available from BRE's SmartSite](#)
- [Chartered Institute of Procurement and Supply \(CIPS\)](#)

2020s

- Materials and products have established recovery routes at end of life.
- Manufacturers continue to develop Resource Efficiency Action Plans and/or enter into voluntary agreements with Government.
- Continued R&D on recovery options for composite materials, working with Composites UK.
- Identify and communicate end of life options for new advanced materials.

2030s

- Advanced and new materials pose no problem for the waste stream.
- Manufacturers and/or third parties offer recycling schemes, including for composite and other difficult to recover waste streams.
- No composites or advanced/new materials are sent to incineration (energy from waste) at end of life.
- New generation of materials, products and components are available with enhanced recovery routes at end of life.

2040s

- All materials and products in construction can be dealt with at end of life to retain their highest value.

Act now

- Manufacturers provide information to design teams and contractors on end of life options for their products.
- Designers and contractors use Environmental Product Declarations (EPD) to determine recycled content and end of life routes to ensure no unintended life cycle impacts.
- Design teams avoid specifying materials and products that have no known recovery route.
- Design teams, manufacturers and contractors collaborate and share knowledge on new or improved recovery routes for advanced and new materials.



Guidance

A few of the organisations working in this area are listed, together with relevant guidance and other documentation.

- [Construction Products Association and its members](#)
- [Veolia closes the loop with Knauf Insulation](#)
- [Protocol for Reusing Structural Steel](#)
- Resource Efficiency Action Plans:
 - [Zero Avoidable Waste in Flooring: Towards a Circular Economy \(2021\)](#)
 - [Bricks, Blocks and Concrete](#)
 - [Mineral Wool Ceiling Tiles](#)
 - [Decorative Paint](#)
- [Mineral Products Association Resource Reports](#)
- [TRADA Waste Reports](#)
- Composites UK
 - [Resource Efficiency Action Plan \(2013\)](#)
 - [Vision and Roadmap for Sustainable Composites \(2019\)](#)
 - [FRP Circular Economy Study \(2018\)](#)
 - [Composites Recycling – Where are we now? \(2016\)](#)
 - [What can I do with my waste?](#)
 - [Composites Strategy](#)
- [Composites Leadership Forum The 2016 UK Composites Strategy \(2016\)](#)
- [BRE Dealing with Difficult Demolition Wastes: A Guide \(2013\)](#)
- [Nanowerk](#)
- [Henry Royce Centre – UK National Institute for Advanced Materials Research and Innovation](#)

Exploit off site manufacture

Aim: The contribution of off-site/ modular construction towards ZAW is maximised

2020s

- Studies to look at total waste production, both in the factory and on site, material usage and end of life considerations.
- The efficiency benefits of using offsite/modular systems are promoted to clients and specifiers.

2030s

- Continued improvement of systems through waste reduction, and enhanced disassembly and material optimisation.

2040s

- All modular construction positively contributes to ZAW in its design, construction, operation and end of life.

Act now

Industry

- Modular and offsite providers ensure that disassembly is designed into their processes and procedures.
- Modular and offsite providers and contractors measure and report on the type and amount of waste generated from this method, including waste that is generated in the factory and onsite.
- Modular and offsite providers engage with demolition contractors, through the National Federation of Demolition Contractors (NFDC) MMC working group and the Institute of Demolition Engineers to understand demolition processes and recovery routes at end of life.
- Modular and offsite providers and design teams undertake whole life carbon studies and life cycle assessment of offsite systems.
- Modular and offsite providers produce case studies, demonstrating how systems may be suitable for reuse, through for example reconfiguration or relocation. This should include any economic, environmental, and social benefits.



Guidance

Some guidance and case studies are available for offsite construction and reducing waste, though most of these are over 5-10 years old. Key organisations are also listed.

- [Construction Innovation Hub \(CIH\)](#)
- [Manufacturing Technology Centre](#)
- [Build Offsite](#)
 - [Offsite Construction – Sustainability Characteristics \(2013\)](#)
- NHBC Foundation:
 - [Modern Methods of Construction – who is doing what? \(2018\)](#)
 - [Modern Methods of Construction – views from the industry \(2016\)](#)
- [BRE – Dealing with Difficult Demolition Wastes: A Guide \(2013\)](#)
- [BSI – The role of Standards in Offsite Construction \(2019\)](#)
- [Offsite Hub – Has a number of WRAP case studies on reduction of waste](#)
- [RICS – Modern Methods of Construction A forward-thinking solution to the housing crisis? \(2018\)](#)
- [WRAP – Current Practices and Future Potential in Modern Methods of Construction \(2007\)](#)
- Zero Waste Scotland Case studies:
 - [New South Glasgow Hospital](#)
 - [Resource Efficient House Case Study \(2014\)](#)
- [London Olympics Learning Legacy Case Study – McDonald's: embedding sustainability into the design, construction and disassembly of their Olympic Park restaurant \(2012\)](#)

Reduce volume of soil to landfill

Aim: Reduction of soils to landfill to zero except for when needed for landfill operation purposes

2020s

- Design Teams and contractors always seek to eliminate soils going to landfill.
- Analysis is made of the apportionment of soils to landfill between the building and infrastructure sectors.
- The institutions of respective sectors develop action plans and training to minimise or eliminate soils.
- Government to review the definition of waste for soils and other legislation to aid its reuse.
- Government to review Landfill Tax bands for different types of soils.
- Defra with local authorities to trial local intermediate storage sites for soils.

2030s

- Specific soils legislation is drafted with the aim of protecting it as a resource.
- A levy to be introduced by HMRC which is tiered based on the reuse options and benefits.

2040s

- By 2040 actions and improved practices result in soils going to landfill being reduced to 75% of 2020 level, zero by 2050.

Act now

With such a large waste stream there are many opportunities for reduction. With the obvious exception of a small number of types of site (e.g. constrained sites in inner city areas) much can be done in design and construction to reduce the volume of material removed off site to landfill.

Government

- There is a clear need to understand how the generation of soils is apportioned between the two principal sectors generating this waste - Building and Infrastructure. This will enable each sector to develop its own action plan.

Local authorities

- Within design codes consider the location of buildings and how they relate to land use and the generation of excavation materials such as soils.

Industry

- Respective sectors can begin, ahead of accurate analysis, to form tailored action plans for improvements in both Infrastructure and Building.
- Design teams on projects of all sizes can consider appropriate site levels to optimise cut-and-fill, thereby eliminating the requirement to move soils to other sites, or landfill.
- Clients and design teams develop site layouts and landscape schemes that can retain excavated material on site.
- Civil engineers and contractors design and build foundations and drainage to minimise removal of excavated material from site.
- Contractors use CL:AIRE's The Definition of Waste: Development Industry Code of Practice (DoWCoP), which provides a management process for soils ceasing to become a waste.
- Clients and design teams allocate land within the development site for the storage of soils during the construction phase. This is important as soils are not classified as a waste until it leaves site.

Guidance

There is some guidance on how soils should be managed and when it is a waste; this includes:

- [Association of Geotechnical and Geoenvironmental Specialists Waste Classification for Soils – A Practitioners’ Guide \(2019\)](#)
- [Capita Symonds Construction, demolition and excavation waste arisings, use and disposal for England 2008; CON900-001: Final Report, WRAP \(2010\)](#)
- [Society of the Environment Soil sand Stones Task Group - Soils and Stones Report: Sustaining Our Future by Influencing Change in the UK and Beyond \(2021\)](#)
- [CECA Waste Classification & Permitting In Construction Guidance for the construction industry on the Waste Permitting Regime \(2019\)](#)
- CL:AIRE
 - [Definition of Waste: Code of Practice](#)
 - [The Definition of Waste: Development Industry Code of Practice \(2011\)](#)
- [Defra Construction Code of Practice for the Sustainable Use of Soils on Construction Sites \(2009\)](#)
- IEMA (2021) IEMA GUIDE: A New Perspective on Land and Soil in Environmental Impact Assessment – to be published shortly.

There are also some case studies:

- CrossRail
 - [The restoration of Wallasea Island \(2017\)](#)
 - [Excavated Materials Story \(2017\)](#)
 - [The transport and beneficial reuse of Crossrail excavated material \(2015\)](#)
- [HS2 Excavated materials strategy \(2017\)](#)
- [National Grid London Power Tunnels – Soil reclamation and reuse](#)
- [London Olympics Waste Recovery Licenses \(2011\)](#)

More reuse and recycling of new build construction waste

Aim: The reuse of surplus products and materials from new build construction, and recycling of waste into the same products or products equivalent in value is standard practice

2020s

- Targets are within contractual documentation for the reuse and recycling of key products and waste materials.
- Improved training of the construction work force for the separation of materials on site.
- Resource Management Plan for most projects in place including commitments for reuse and recycling.
- Extended Producer Requirements by Government are in place for suitable materials by the mid 2020s.
- New venture businesses that reuse and recycle construction waste are stimulated through start-up support schemes.

2030s

- Updating of Extended Producer Responsibility Requirements.
- A mature supply chain of businesses reusing products and recycling waste streams.

2040s

Act now

Contractors

- Prioritize reuse over recycling for suitable products and materials.
- Find out what is happening to your waste, once it enters a waste transfer station; for example, where is it being sent and how it is being recycled.
- Put requirements for reuse of products and recycling of key materials into your subcontractor and waste contracts.
- Identify which materials are being downcycled (losing their value) and establish the reasons why; is there anything you could do differently to enable them to be upcycled?
- Make use of opportunities to reuse and recycle materials such as third-party specialists, manufacturers take back schemes and social enterprises.
- Share best practice for waste materials, in the form of case studies where they have been reused or recycled back into the same product or into a new one.

Government

- Consult and request proposals from industry for new ways of dealing with the construction waste stream from both existing manufacturers and suppliers, and also from potential new entrants.
- Review the fiscal and logistical incentives that could be offered to enable both new start-ups in this sector, and existing operators to increase reuse and recycling operations.
- Work with the industry to determine barriers for reuse and recycling and how these might be overcome from a Regulation perspective.



Guidance

Much guidance and case studies have been produced on construction and demolition waste management including from WRAP, but these have not been updated following the change in scope of WRAP. There was also much guidance produced for undertaking Site Waste Management Plans. Some of the key ones are listed. More information on Reuse is within the [Better waste services for smaller companies](#) section.

Best Practice Guidance

- [EU Construction & Demolition Waste Management Protocol \(2018\)](#)
- BRE
 - [Material resource efficiency in construction: Supporting a circular economy \(FB 85\) – \(2017\)](#)
 - [BREEAM Construction Waste Management Credit](#)
 - [CEEQUAL](#)
- [Environment Agency and WRAP Quality Protocol Aggregates from Inert Waste \(2013\)](#)
- [CIWM Construction and Demolition Waste Forum What is Waste Guide \(2019\)](#)
- [Civil Engineering Contractors Association \(CECA\) Waste Classification & Permitting In Construction Guidance for the construction industry on the Waste Permitting Regime \(2018\)](#)
- [CIRIA's Environmental good practice on site guide \(C741\) \(2015\)](#)
- [Zero Waste Scotland Maximising reuse of materials on-site](#)
- [Zero Waste Scotland Best practice guide to improving waste management on construction sites](#)

- Supply Chain Sustainability School
 - [Waste information including map of material exchange schemes](#)
- [NetRegs Environmental guidance for businesses in Northern Ireland & Scotland](#)
- [Crossrail Recycled Content in Construction materials \(2017\)](#)

Site Waste Management Plans

- [Defra The Site Waste Management Plans Consultation \(2013\)](#)
- [Defra Public Consultations. Proposed repeal of construction Site Waste Management Plan Regulations \(2008\) Summary of responses and Government response \(2013\)](#)
- [NetRegs Site Waste Management Plans](#)
- [BRE SmartSite tool](#)
- [Zero Waste Scotland SWMP Lite](#)
- [NHBC Foundation Site waste management: guidance and templates for effective site waste management plans \(NF8\) \(2008\)](#)

Reduce waste from temporary works

Aim: There is no waste landfilled from temporary work on-site such as fencing panels, hoarding, shuttering, crane bases, protection etc; reuse is the norm

2020s

- The reuse of temporary works items across construction projects is common practice, suppliers providing reuse services and contractors requiring these.
- Manufacturers of temporary systems to design for reuse through modularization and standardisation, for example, steel support structures.

2030s

- The reuse of temporary works items via leasing and buy/take back models is the norm.
- Products which are used for temporary works are designed to be reused and repaired.

2040s

Act now

Contractors

- Measure and report on the amount of waste generated from temporary works and how much is reused, recycled, recovered, or sent to landfill. Develop a list of items where there is the most potential for reuse.
- Engage with suppliers to understand if you can lease temporary work items such as hoarding, which can be returned for reuse.
- Provide space to store reusable temporary work items and a management system to track their delivery to site, uses and subsequent return.
- Use schemes such as material exchanges, local websites etc., if items cannot be reused on your other sites or cannot be returned to suppliers.
- Establish the types of equipment, plant and tools that should be prioritised for repair rather than disposal and engage with specialist suppliers for support.
- Write up case studies, demonstrating the environmental and economic benefits of reusing temporary work items.



Guidance

There is no guidance currently available specifically on temporary works and reduction of waste; however, the following organisations do provide information that may be useful and relevant:

- [Temporary Works Forum](#)
- Considerate Construction Scheme case studies:
 - [Hoarding made from recycled U-PVC](#)
 - [Hoarding reused at a local school](#)
 - [Hoarding reused from one contractor to another](#)
 - [Reuse of a shuttering system](#)
 - [Repurposing of scaffolding](#)
 - [Closed loop recycling or temporary protection](#)
- [Supply Chain Sustainability School – Map of material exchange schemes](#)
- [Construction Plant-hire Association](#)
- [CITB – Temporary Works Co-ordinator Training Course](#)
- [Institution of Civil Engineers Temporary Works: Principles of design and construction Book](#)
- [Institution of Structural Engineers – Temporary Works Toolkit](#)

Better waste services for smaller companies

Aim: Improved waste management services for smaller companies in the construction sector are available to lever ZAW in this sector

2020s

- Establish the size and nature of the SME construction waste stream.
- Innovative trials and mechanisms to help SMEs to better manage their waste are developed and improvements rolled out.
- A number of local initiatives are available for SMEs to reuse and recycle waste.

2030s

- Widely available services across England by 2030.

2040s

Act now

Building merchants

- Set up easy to use and cost effective sale and return services for builders to use.

SME contractors

- Utilise schemes such as Community Wood Recycling and online material exchanges for products that may be able to be reused.
- Share both excess materials and recovered materials and products on local platforms and networks for reuse.
- Use your sale or return service for surplus materials provided by local builder's merchants.
- Use local authority recycling routes for waste materials in the local area.
- Use suitable containers/ bags for smaller amounts of waste, to segregate materials that can be sent directly for recycling e.g. timber, plasterboard and metals.

Government & Industry

- There is a need to establish the amount and composition of SME construction waste, and what is going to landfill. This will inform the next stage of action planning with the sector.



Guidance

There is some guidance available for SMEs with regard to construction waste; though a lot of it is quite old. Relevant organisations have also been listed.

- Envirowise
 - [Reducing your construction waste: Guidance for small and medium sized contractors](#)
 - [Managing packaging waste on your construction sites](#)
- [NetRegs – Environmental guidance for businesses in Northern Ireland & Scotland](#)
- [Zero Waste Scotland Construction Waste Resources](#)
- [Environmental Services Association Right Waste Right Place Campaign](#)
- [Civil Engineering Contractors Association \(CECA\) Waste Classification & Permitting In Construction Guidance for the construction industry on the Waste Permitting Regime \(2018\)](#)
- Supply Chain Sustainability School
 - [Waste information including map of material exchange schemes](#)
- [EnTRESS project – support to SMES on low carbon and resource efficiency in the Black Country, Stoke and Staffordshire](#)
- [Finishes and Interiors Sector \(FIS\) Sustainability Hub](#)
- [Defra; Duty of Care: Code of Practice \(2018\)](#)
- [CIRIA's Environmental good practice on site guide \(C741\) \(2015\)](#)
- [Constructing Excellence](#)
- [Local Recycling Advisory Committee \(LARAC\)](#)

2020s

- The reuse of products and materials from commercial refurbishment is the preferred recovery route.
- Pre-refurbishment audits become best practice on all major refurbishment projects.
- The waste implications from retrofit policies are understood and do not add to landfill.
- Pilot projects to trial the leasing of many of the components of short/medium lease tenancies – aligning leasing of fit out with lease of space.

2030s

- Pre-refurbishment audits become best practice on most refurbishment projects.
- Leasing models dominate the procurement model for suitable interior products.

2040s

- Fit out products commonly stay in place when the tenant changes.

Act now

- Make sure a pre-refurbishment audit is undertaken as early as possible.
- Set targets for the reuse of products in refurbishment contracts.
- Utilise one of the growing organisations that can help with finding reuse routes.
- For commercial tenanted buildings optimise the scope of Cat A vs Cat B fit out to minimise waste when tenancies change.
- Check your tenant contracts, from a waste perspective – having to ‘make good’ to items which the next tenant may remove will create waste that could be avoided.
- Certain items may be able to be leased in, such as lighting, carpet tiles and returned to the manufacturer or third party for reuse/remanufacture.



Guidance

There is limited guidance and case studies in this area. Information on reuse has also been included.

Best Practice Guidance

- Better Building Partnerships
 - [Responsible Property Management Toolkit](#)
 - [Strip out waste guide \(2015\)](#)
- RICS Ska Rating
- BRE BREEAM Refurbishment and Fit Out Standard
- [Finishes and Interiors Sector \(FIS\) Client Guide to Office Fit out and Refurbishment \(2018\)](#)
- [CIRIA, Fit-out environmental good practice on site guide \(C757\) \(2016\)](#)
- [British Council for Offices \(BCO\) Fit Out Guide \(2011\)](#)
- [UK Green Building Council \(UKGBC\) – Implementation Packs for leasing and reuse \(2020\)](#)
- Crown Estate
 - [Fit Out Guide for Offices](#)
 - [Fit Out Guide for Leisure and Retail](#)
- [Grosvenor Sustainable Refurbishment: a Toolkit for Going Green \(2013\)](#)
- [BRE Code of Practice for a Pre-redevelopment audit \(2017\)](#)

Reuse information

- [Salvo, Architectural Salvage](#)
- [Bioregional and WRAP \(2008\) Reclaimed Building Guidance](#)
- Supply Chain Sustainability School
 - [Waste information including map of material exchange schemes](#)
- [Zero Waste Scotland Maximising reuse of materials on-site](#)

Less down cycling of waste from Demolition

Aim: Materials arisings from demolition are reused or sent for open/closed loop recycling

2020s

- Pre-demolition audits are undertaken on all major projects, preferably through requirements in Building Regulations.
- Reuse of products is required to be considered for all major projects as part of the demolition permitting system.
- More materials arising from demolition can be sent for open or closed loop recycling.
- End of waste criteria and quality protocols are reviewed for existing materials and developed for other materials to enable more recycling.

2030s

- Pre-demolition audits are undertaken on most projects, preferably through requirements in Building Regulations.
- Reuse of products is required to be considered for most projects as part of the permitting system.

2040s

Act now

Building owners

- Make sure a pre-demolition audit is undertaken as early as possible so the recommendation can feed into the design process and/or markets can be found for reuse.
- Set targets for the reuse of products in demolition contracts.
- Set targets for open and close loop recycling of materials within demolition contracts.
- Have early involvement of the demolition contractor.

Demolition contractors

- Discuss and plan with the client and/or contractor the reuse and recycling routes for products and materials.
- Advise the client and/or contractor on the value of materials at end of life.
- Make use of the growing number of reuse organisations and architectural salvage companies.

Government

- Work with the industry to determine barriers for reuse and recycling and how these might be overcome from a Regulation perspective.
- Fund a study to understand the levels and related trends of reuse for different types of construction products.

Guidance

Much guidance has been produced on construction and demolition waste management including WRAP guidance and case studies – but these have not been updated following the change in scope of WRAP. There was also much guidance produced for undertaking Site Waste Management Plans. Some of the key ones are listed, as is information for reuse.

Best Practice Guidance

- [NFDC Demolition Refurbishment Information Datasheets](#)
- [Bioregional Reuse and Recycling on the London 2012 Olympic Park \(2012\)](#)
- [EU Construction & Demolition Waste Management Protocol \(2018\)](#)
- [BRE Material resource efficiency in construction: Supporting a circular economy \(FB 85\) – \(2017\)](#)
- [Environment Agency and WRAP Quality Protocol Aggregates from Inert Waste \(2013\)](#)
- [CIWM Construction and Demolition Waste Forum What is Waste Guide \(2019\)](#)

Pre refurbishment and demolition audits

- [European Commission Guidelines for the waste audits before demolition and renovation works of buildings \(2018\)](#)
- [BRE Code of Practice for a Pre-redevelopment audit \(2017\)](#)
- [VTT Pre-demolition audit – overall guidance \(2019\) document](#)

Reuse information

- [Steel Construction Institute \(SCI\) Protocol for reusing structural steel \(2019\)](#)
- [Salvo, Architectural Salvage](#)
- [Bioregional and WRAP \(2008\) Reclaimed Building Guidance](#)

Supply Chain Sustainability School

- [Waste information including map of material exchange schemes](#)
- [Zero Waste Scotland Maximising reuse of materials on-site](#)

Site Waste Management Plans

- [Defra The Site Waste Management Plans Consultation \(2013\)](#)
- [Defra Public Consultations. Proposed repeal of construction Site Waste Management Plan Regulations \(2008\) Summary of responses and Government response \(2013\)](#)
- [NetRegs Site Waste Management Plans](#)
- [BRE SmartSite tool](#)
- [Zero Waste Scotland SWMP Lite](#)

Accurate asset information available in digital form

Aim: Widespread availability of digital information on construction assets, giving easy access to material and component data facilitating reuse and recycling to deliver ultimately a circular economy

2020s

- Hackitt Review Golden Thread / digital twin of buildings implemented.
- Location and method of data storage reviewed on a national basis, working practice in place by 2025.
- Consultation with multiple property owners and agreement on asset record format in place by 2025.
- Data security protocols and working practices for holding BIM models are discussed and agreed by 2030.
- Benefits to specifiers, insurers and owners communicated widely.

2030s

- From 2030, access to data about buildings and infrastructure is accessible with secure protocols.

2040s

Act now

Industry

- Designers and contractors obtain information on end of life options from Environmental Product Declarations (EPD).
- Design teams and contractors review the compatibility of BIM software to store relevant product information.
- Contractors include end of life data in the handover information and in the O&M manual.
- Facility managers and asset owners can make sure BIM models are kept up to date.



Guidance

Sources of data are listed, as well as some of the organisations and projects that are active in this area.

- [Centre for Digital Built Britain](#)
- [Construction Innovation Hub \(CIH\)](#)
- [Construction Products Association and BRE Lexicon](#)
- [Construction Products Association](#)
- [Market Integrity Group](#)
- [Code for Construction Product Information \(CCPI\)](#)
- [UK Government Hackitt Review \(2018\)](#)
- [Draft Building Safety Bill](#)
- [CIOB and i3PT Golden Thread Report \(2020\)](#)
- [Construction Leadership Council Digital Network](#)
- [Buildings as Material Banks – Material Passports](#)
- [Structural Steel Reuse Protocol](#)

Joint plan to reduce waste to landfill by 2040

Aim: Eliminate all but hazardous C&D waste entering landfill by 2040

2020s

- Government and Industry produce an Action Plan to first reduce, and then potentially eliminate, C&D wastes entering landfill based on the evidence study.
- Annual reporting is continued to track progress and for joint Government and Industry action to identify improvements required.
- Analysis is made of the apportionment of C&D waste to landfill between the building and infrastructure sectors.

2030s

- Action Plan updated periodically to identify actions required to continue reduction of C&D waste to landfill.
- Consideration is given to Regulatory and/or Fiscal measures that may be required to reduce this stream.
- During the second half of the decade, if required, Regulatory and/or Fiscal measures are introduced.

2040s

- Government and industry has developed their approach so that only hazardous C&D waste items which cannot be eliminated at source or recovered are landfilled.

Act now

Government

- Industry and Government should work together to produce an action plan and targets for the reduction of waste to landfill.

Industry

- Industry working group is established to identify priority actions to begin the process of waste reduction to landfill, and their work is disseminated across the supply chain.
- Case studies are produced of the current best practice, recognising that a few clients and supply chains have begun making progress.
- There is a clear need to understand how the generation of C&D waste is apportioned between the two principal sectors generating this waste – Building and Infrastructure. This will enable each sector to develop its own action plan.





Guidance

Relevant organisations and examples are listed.

- [Defra](#)
- [Environment Agency](#)
- [HMRC](#)
- [Construction Leadership Council](#)
- [WRAP had a programme of encouraging companies to commit to halving their waste to landfill; this no longer exists](#)

Analyse and report waste to landfill

Aim: Waste being landfilled from the construction sector is properly understood

2020s

- The constituent parts of construction and demolition waste to landfill are identified by Government and the reasons for them entering landfill understood.
- Industry responds to the findings by seeking ways of eliminating material in this waste stream.
- Use of a regularly updated national dashboard for waste to landfill with key materials displayed.

2030s

- Annual government monitoring and dashboard becomes part of a National Materials Strategy.
- Industry develops improved ways to drive further reductions in this waste stream.

2040s

- Annual government monitoring and dashboard.
- By 2040 eliminate all but hazardous waste entering landfill.

Act now

This is a strategic, over-arching action on national waste statistics which is for Government to undertake.

Contractors

There are smaller scale, tactical actions which contractors can take:

- Ask waste management contractors, what types of waste are being landfilled from your projects and why. This could be part of your procurement and waste audit processes. This may differ geographically, by types of project (e.g. new build vs demolition) and by waste contractor.
- Specify the use of PAS 402:2009 Waste resource management – Specification for performance reporting which acts as a framework to provide better reporting at waste facilities.
- Provide more detail on the types and amounts of wastes that are being landfilled in your annual reporting and the reasons for this.
- Develop company action plans to reduce key waste streams that are being landfilled.
- Liaise with landfill operators to understand what type of waste materials are being used for landfill engineering and cover purposes.

Guidance

There are a number of sources of waste statistics which include information on C&DW listed. Relevant organisations are also listed.

- Defra
 - [UK Statistics on Waste](#)
 - [Digest of Waste and Resource Statistics \(2018\)](#)
- Environment Agency
 - [Waste Data Interrogator \(2019\)](#)
- EuroStat
 - [Waste database \(which UK reports into\) \(2018\)](#)
- Green Construction Board with BEIS and Defra
 - [Zero Avoidable Waste in Construction – What do we mean by it and how best to interpret it. A recommendation from the Green Construction Board. \(2020\)](#)
- [Mineral Product Association From waste to resource – a UK Mineral Products industry success story \(2019\)](#)
- [HMRC](#)
- [NFDC](#)
- [CECA](#)
- [CIWM C&D Waste Forum](#)

Report on waste at project and company level

Aim: The generation, true cost and recovery routes for all construction waste streams is known in detail

2020s

- CLC to require standard and consistent reporting for major projects from 2022.
- Contractors to develop key performance indicators and benchmarks for all building and waste types by 2024.
- The true cost of waste is starting to be measured and reported on major projects.

2030s

- CLC to require standard and consistent reporting for medium sized projects from 2030.
- CLC works with industry to agree voluntary waste reduction targets.
- Refinement of key performance indicators and benchmarks.
- True cost of waste is commonly measured for most projects.

2040s

Act now

Clients

- Work with other clients to ensure consistency with waste reporting requirements.

Contractors

- Provide more detailed information by reporting on waste arisings and recovery for key waste streams and share through appropriate forums and bodies.
- Analyse project data to develop KPIs and benchmarks for waste generation and recovery by building/infrastructure type and waste type.
- Work out how much waste is costing you, including the materials you are wasting.
- Work with waste management companies to generate better data from waste facilities by requiring the PAS402: Waste resource management – Specification for performance reporting Standard.

Software providers

- Work with contractors to review data inputted on waste and develop key performance indicators.



Guidance

Sources of data are listed, as well as some of the organisations and projects that are active in this area.

- [BRE SmartSite System](#)
- [ENCORD, Construction Waste Measurement Guide \(2013\)](#)
- [Zero Waste Scotland, True Cost of Waste, Pilot Study](#)
- [BSI, PAS402: Waste resource management. Specification for performance reporting \(2013\)](#)
- [Defra; electronic waste tracking project](#)
- [CIWM Construction and Demolition Waste Forum](#)
- [National Federation of Demolition Contractors](#)
- [Environment Agency](#)
- [WRAP encouraged contractors to report in the past through a tool called Measure \(no longer available\)](#)
- [BREEAM](#)
- [CEEQUAL](#)
- [Ska Assessment](#)
- [Construction Leadership Council](#)

Software tools:

- [BRE SmartSite System](#)
- [Credit360](#)
- [QFlow](#)

2020s

- Government has initiated a National Materials Strategy.
- Government funded research into understanding construction material use and flows.
- Clients and design teams to develop material intensity benchmarks and targets for common building and infrastructure types.
- Development of local material resource matching tools, supported by local and regional authorities.

2030s

- Annual monitoring of a National Materials Strategy
- National Materials Strategy is linked to planning considerations for buildings and infrastructure.
- Material intensity targets required as part of planning applications.

2040s

- Annual monitoring of a National Materials Strategy.

Government

- Government through the UKRI support research into understanding construction material use and flows with industry collaboration.

Industry

- Clients work with design team and contractors to record the amount and types of materials on a project throughout the design, procurement and construction stages.
- Design teams use material quantities data from whole life carbon assessments to understand better material use at a project level.
- Clients, design teams and contractors share relevant data such as material quantities, design drawings, BIM models with the research community to enable them to develop resource use models.

Research community

- Research community share findings with key stakeholders in an accessible manner.



Guidance

Sources of data are listed, as well as some of the organisations and projects that are active in this area.

- Office for National Statistics
 - [Environmental accounts](#)
 - [Material flow accounts](#)
- BEIS
 - [Building materials and components: monthly statistics Consultative Committee on Construction Industry Statistics \(CCCIS\)](#)
 - [PRODCOM data](#)
- [Eurostat – European Statistics](#)
- UK Research and Innovation
 - [Circular Economy Research Hub \(CE-Hub\)](#)
 - [Interdisciplinary Circular Economy Centre for Mineral-based Construction Materials](#)
 - [Circular Centre for Metals](#)
- [H2020 CIRCuiT project](#)
- [REBUILD project](#)
- [University of Sheffield](#)
- [CVORR Project](#)
- [Leeds University](#)
- [International Synergies](#)