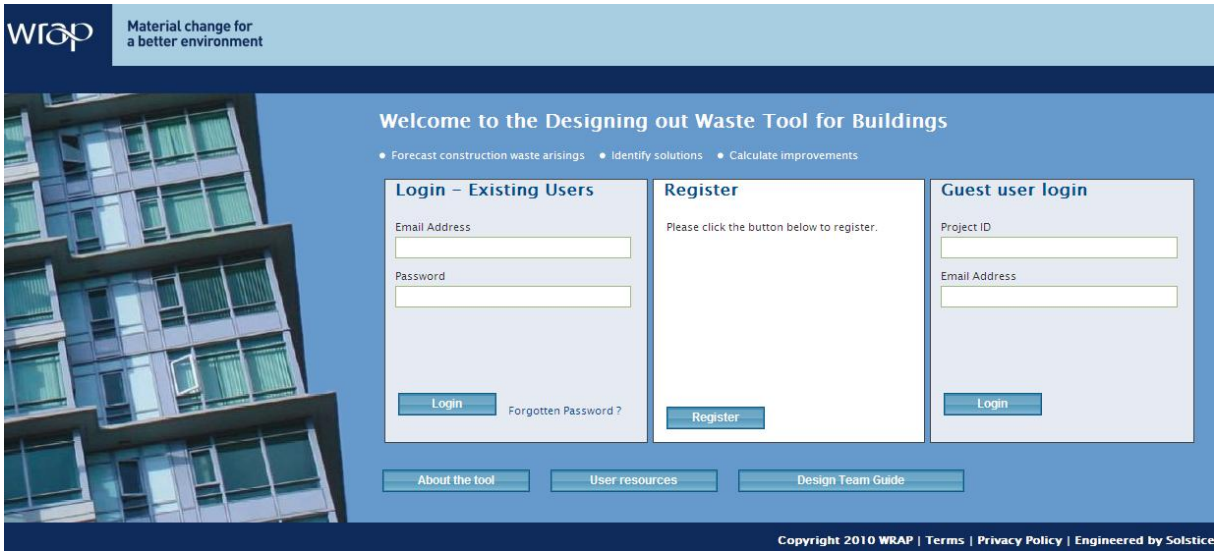
Material change for a better environment

Reference guide

Designing out Waste Tool for Buildings (DoWT-B)



A full user guide to WRAP's Designing out Waste Tool for Buildings

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ISBN:
Date: February 2010

WRAP helps individuals, businesses and local authorities to reduce waste and recycle more, making better use of resources and helping to tackle climate change.

Document reference: WRAP, 2010, Designing out Waste Tool for Buildings reference guide (WRAP Project PRO 084-001).

Written by: Cyril Sweett Ltd

Front cover photography: Homepage of the Designing out Waste Tool for Buildings

Executive summary

The Designing out Waste Tool for Buildings (DoWT-B) is a freely accessible online resource that will help you to:

- identify opportunities to design out waste in buildings projects;
- record design solutions pursued to reduce material consumption or wastage;
- calculate the impact of these solutions, including savings in project costs, waste to landfill and embodied carbon;
- compare the performance of different projects / alternative designs; and
- provide an indicative waste forecast for your Site Waste Management Plan (SWMP).

The Tool is available at http://nwtool.wrap.org.uk/, and should be used in conjunction with WRAP's Designing out Waste Guide: a Design Team Guide for Buildings, available at www.wrap.org.uk/designingoutwaste.

The Tool can be used iteratively during outline design, as different options will become relevant as the design is developed. An indicative waste forecast requires only outline project data and can be completed in approximately 10–20 minutes. Subsequent analysis of design solutions and their impacts will require more input from the design team, depending on project size. This time and effort can result in significant financial savings and environmental benefits.

Users:	■ Design team – architect
When:	■ RIBA stages A to C
Inputs:	■ Basic project details (GIFA etc) ■ Design team thinking on options to design out waste and their effects
Cost:	■ Short amount of time needed to complete analysis ■ Tool is free to use
Benefits:	■ Identify top opportunities for waste reduction and cost saving at an early stage – enabling design team to focus effort ■ Provide input for an outline Site Waste Management Plan ■ Include potential savings in tender specification so that tender prices can reflect design decisions ■ Use results to demonstrate Corporate Responsibility

Contents

Glossary

Term	Description
Designing out Waste (DoW) principle	Designing out Waste: A design team guide for Buildings, sets out 5 key principles for designing out waste: ■ Design for Reuse and Recovery; ■ Design for Off Site Construction; ■ Design for Materials Optimisation; ■ Design for Waste Efficient Procurement; and ■ Design for Deconstruction and Flexibility
Element	A major part of a construction project, e.g. a wall.
Construction cost	The construction cost of the project, including labour but excluding, demolition, design/consultant fees and preliminaries. Specialist fitout items (e.g. for healthcare or retail applications) should also be excluded.
Project	A construction type made up of a number of elements, e.g. a house.
Recycled content (RC)	At product level, recycled content is the proportion, by mass, of recycled material in a product or packaging (as defined by ISO 14021). At project level, recycled content is calculated as a proportion of the total value of materials used, by summing the total cost of each material multiplied by its % recycled content by mass.
Standard practice Recycled Content	Is the likely minimum level of recycled content in a given specification if no specific request is made for higher levels of recycled content.
Good practice Recycled Content	A higher level of recycled content which is better than that for standard products but is still readily available in the marketplace at no extra cost.
Baseline wastage rate	The percentage amount of a component (i.e. single material or product) that is likely to be wasted based on available data for current procurement and construction practice.
Good practice wastage rate	The percentage amount of a component (i.e. single material or product) that is likely to be wasted based on procurement and construction practice consistent with implementing “good practice” within a Site Waste Management Plan.
Waste stream	A group of materials that can be segregated and managed in a consistent manner (for example inert wastes, or plasterboard wastes).
OSC	Off Site Construction (OSC). Typically manufactured off-site. OSC components have much lower onsite wastage rates (reflecting increased amount of the construction process that takes place before reaching site).

1.0 Introduction

WRAP's Designing out Waste Tool for Buildings (the 'Tool' or 'DoWT-B') is a freely accessible online resource, available at www.wrap.org.uk/nwtool. The DoWT-B can be used to facilitate designing out waste in buildings projects. A separate tool is being developed for civil engineering projects (the DoWT-CE).

The DoWT-B has been designed to be used at RIBA stages A, B or C. The Tool can help you:

- generate indicative waste forecasts and prioritise waste prevention options to input to your Site Waste Management Plan (inputs which are required by the SWMP Regulations (2008) in England);
- identify the building elements that are likely to produce the most waste;
- identify opportunities to design out waste and calculate the combined impact of selected design solutions; and
- assess the impact of your chosen design solutions on the value of waste, waste to landfill, disposal cost and CO_2 from materials extraction.

The practical benefit of the DoWT-B lies in its ability to make a strong business case for waste prevention through design. The Tool then provides decision-making guidance that helps designers identify design options that will have an impact on wastage. The DoWT-B draws from the same database as the Net Waste Tool, but does not require the input of detailed quantities data to produce a waste forecast. The Tool can therefore be used at early design stages before a bill of quantities is available.

The specific benefits of the DoWT-B are that it:

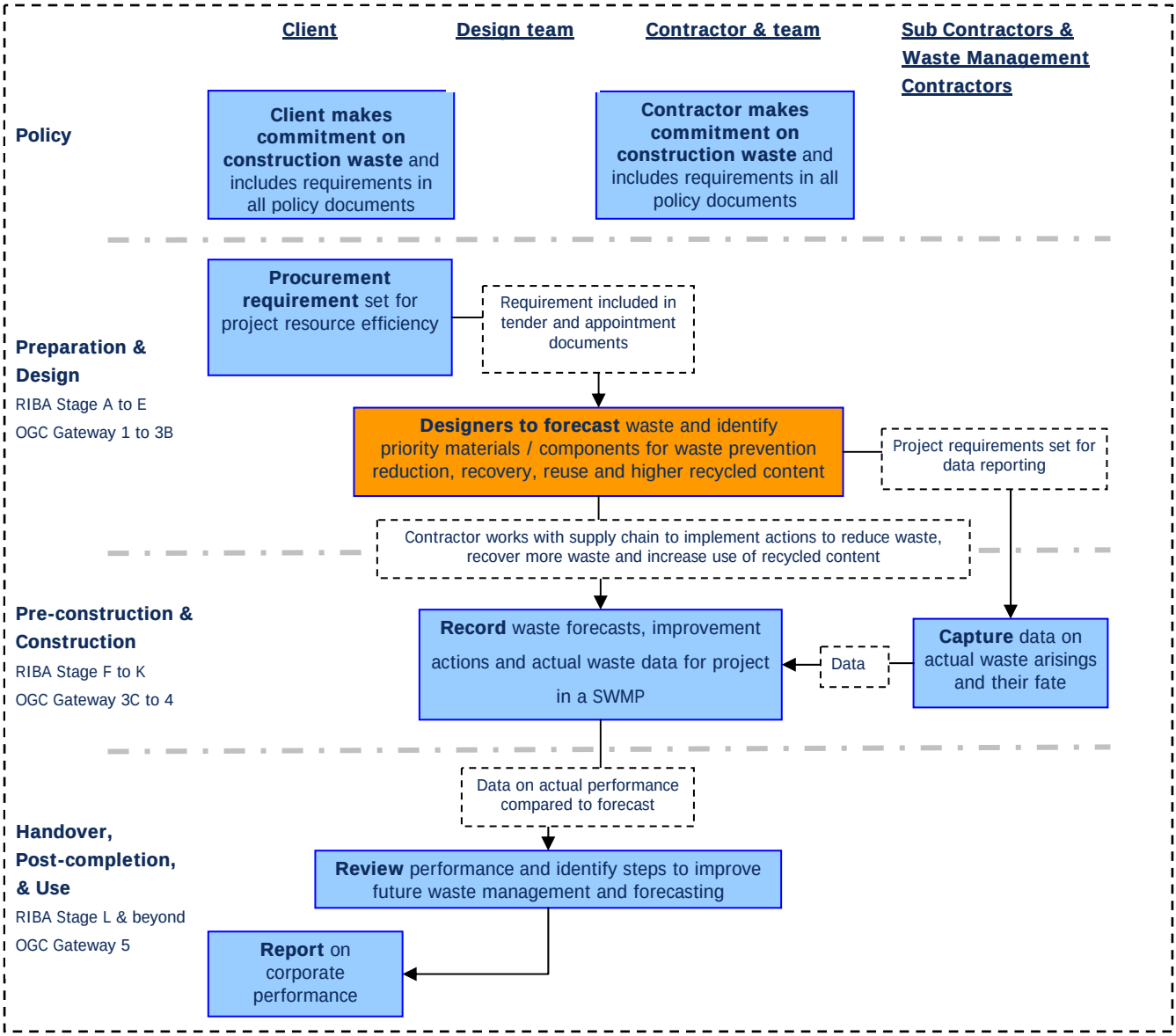
- provides a quick method for generating an indicative waste forecast;
- provides outputs based on limited input data, to inform design team decisions;
- contributes useful information to the Designing out Waste process;
- provides a business case for waste prevention (value of materials saved and reduced disposal costs); and
- helps designers assess the combined impact of their design solutions on wastage

The DoWT-B is a decision making tool, not a design tool. It can help the user identify opportunities to prevent waste through the application of design solutions, and calculate the combined impact of the chosen design solutions. The Tool does not tell the user which design solutions to pursue, or the impact individual solutions will have on wastage.

It is important to understand the key steps involved in using the DoWT-B before you begin using the Tool. The Tool requires the user to input project details and data on design options, in order to calculate the combined impact of your selected design options. Before using the Tool you may find it helpful to read the Key Steps in Section 4 of this guide.

The Tool was developed to support the designer's role in the project waste management process. The Tool should be used in conjunction with WRAP's Designing out Waste: a design team guide for buildings (available from WRAP's website: www.wrap.org.uk/designingoutwaste. The Tool and the guide together provide the necessary processes and applications. Figure 1 illustrates the role of the designer in the project waste management process.

Figure 1 The role of the designer in the project waste management process



2.0 Designing out Waste

2.1 Overview of the Designing out Waste process

Effective waste and resources management must start during the design stage of a project, when waste can be avoided at source. Waste management should not be left simply as a requirement on the principal contractor. The crucial first step is therefore for construction clients to take the lead and set clear performance requirements for their design teams, even during the earlier stages of design.

Designing out Waste: A design team guide for buildings, explains the workshop process and introduces out the five principles of designing out waste:

- Design for Reuse and Recovery;
- Design for Off Site Construction;
- Design for Materials Optimisation;
- Design for Waste Efficient Procurement; and
- Design for Deconstruction and Flexibility

The DoWT-B can facilitate the workshop process and the selection of design solutions, by providing useful information including an indicative waste forecast.

2.2 A tool for identifying and implementing good practice

Effective prevention of waste during design needs to be a targeted process. There is no point in attempting to generically 'design out waste' on a project; there are simply too many components and processes to consider. By estimating likely waste arisings, and then focusing only on those elements or components where the highest value of materials are being wasted, it is possible to target energies where they will make most immediate impact and show the greatest financial return. Effective waste forecasting is therefore a key starting point of any strategy for preventing waste through the application of design solutions. As a result, waste forecasting is one of the primary roles of the DoWT-B.

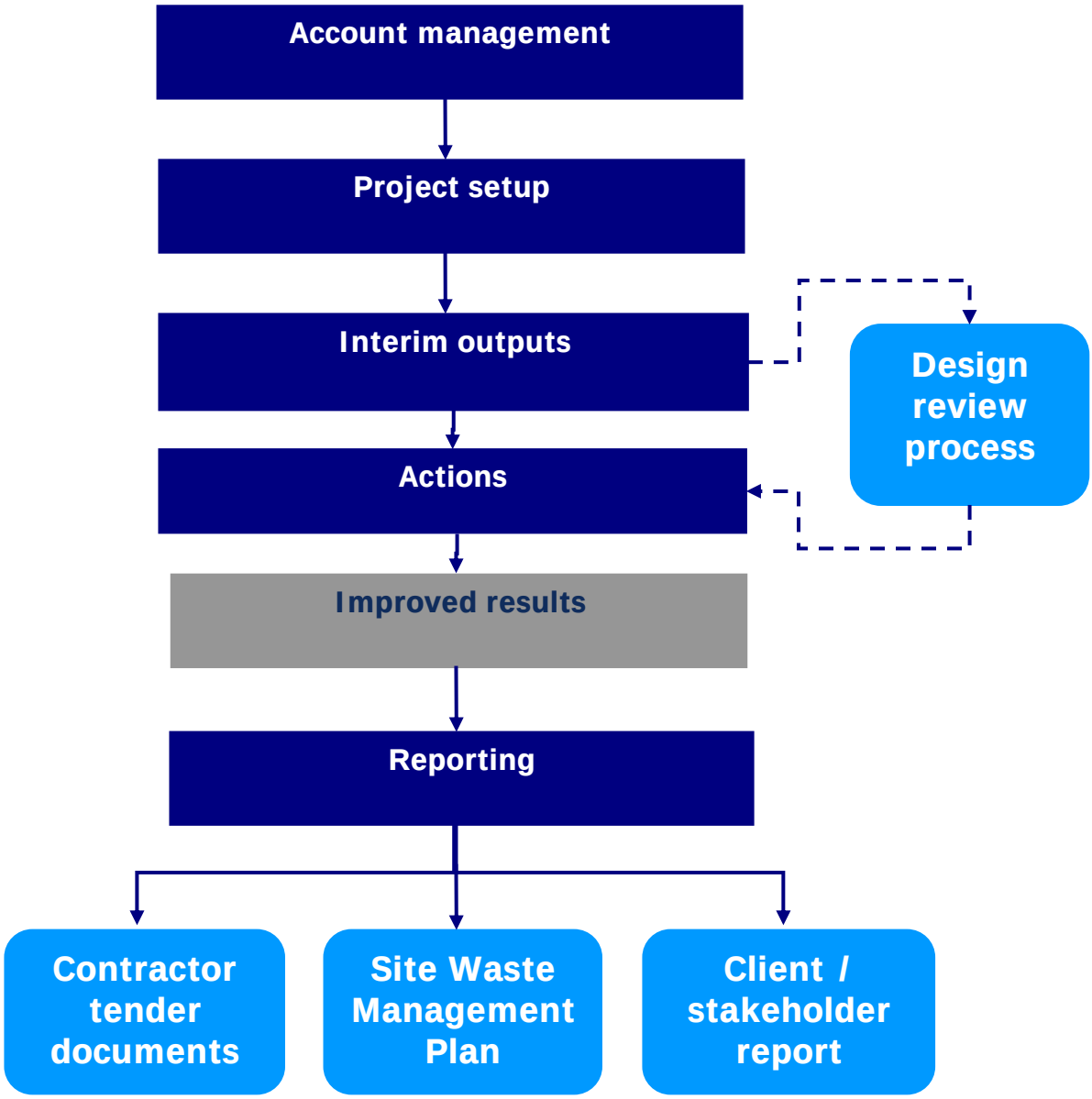
The key questions one would attempt to answer when designing out waste include:

- Business case – How much can I save?
- Opportunities – Where can I save (design out) the waste?
- Ideas – What should I consider?
- Recording actions – What will I do? What should the principal contractor do?
- Impacts – What effect will I have?
- Reporting – What are the benefits of taking actions and who needs to do what to make it happen?

Once suitable design strategies have been determined to prevent wastage, the next step is to embed these requirements within the design, within project processes in the form of contract clauses (e.g. for contractors or waste contractors), and within the SWMP. The Net Waste Tool can be used during the detailed design stage or later, when quantities data is available. The Net Waste Tool is typically used by clients or principal contractors to produce a detailed forecast of waste arisings and identify and quantify actions to reduce, segregate and recover waste.

Ultimately, processes are needed to accurately record waste arisings and their fate (e.g. landfill, recycling facility, etc) so that actual practice can be reported and compared to the original forecast. The role of the DoWT-B in the Designing out Waste process is illustrated in Figure 2.

Figure 2 The DoWT-B and the Designing out Waste Process

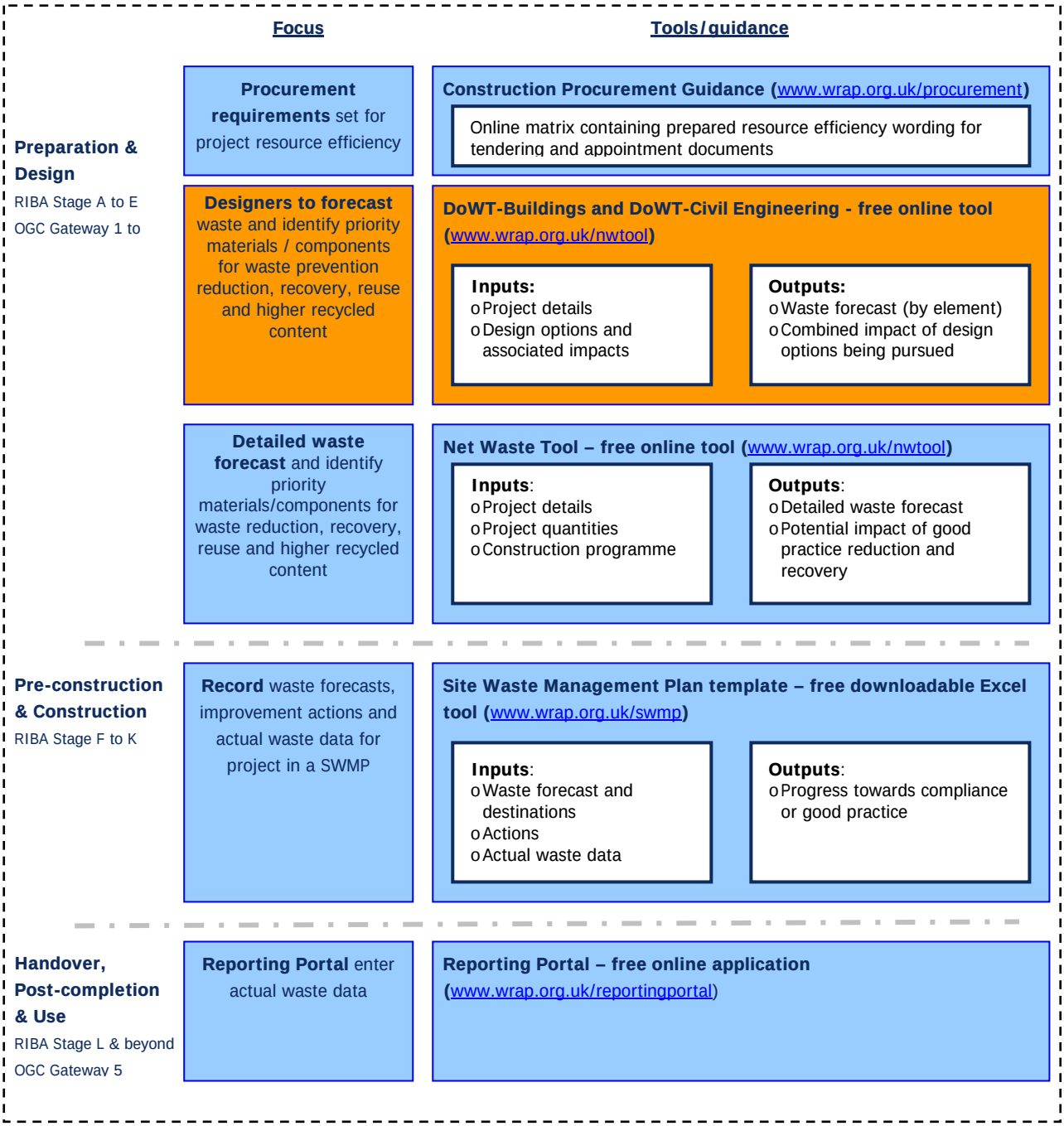


3.0 The DoWT-B in context

The suite of WRAP resources for project waste management includes the Construction Procurement Guidance, DoWT-B, Net Waste Tool, Site Waste Management Plan Template, and the Waste to Landfill Reporting Portal. These resources provide appropriate assessment methods for identifying, reducing and recording construction waste at all relevant RIBA stages.

The DoWT-B has been developed to provide an appropriate tool for designers to produce indicative waste forecasts and calculate the combined impact of design solutions. Figure 3 puts the DoWT-B in context with other WRAP resources.

Figure 3 The role of the DoWT-B and other resources



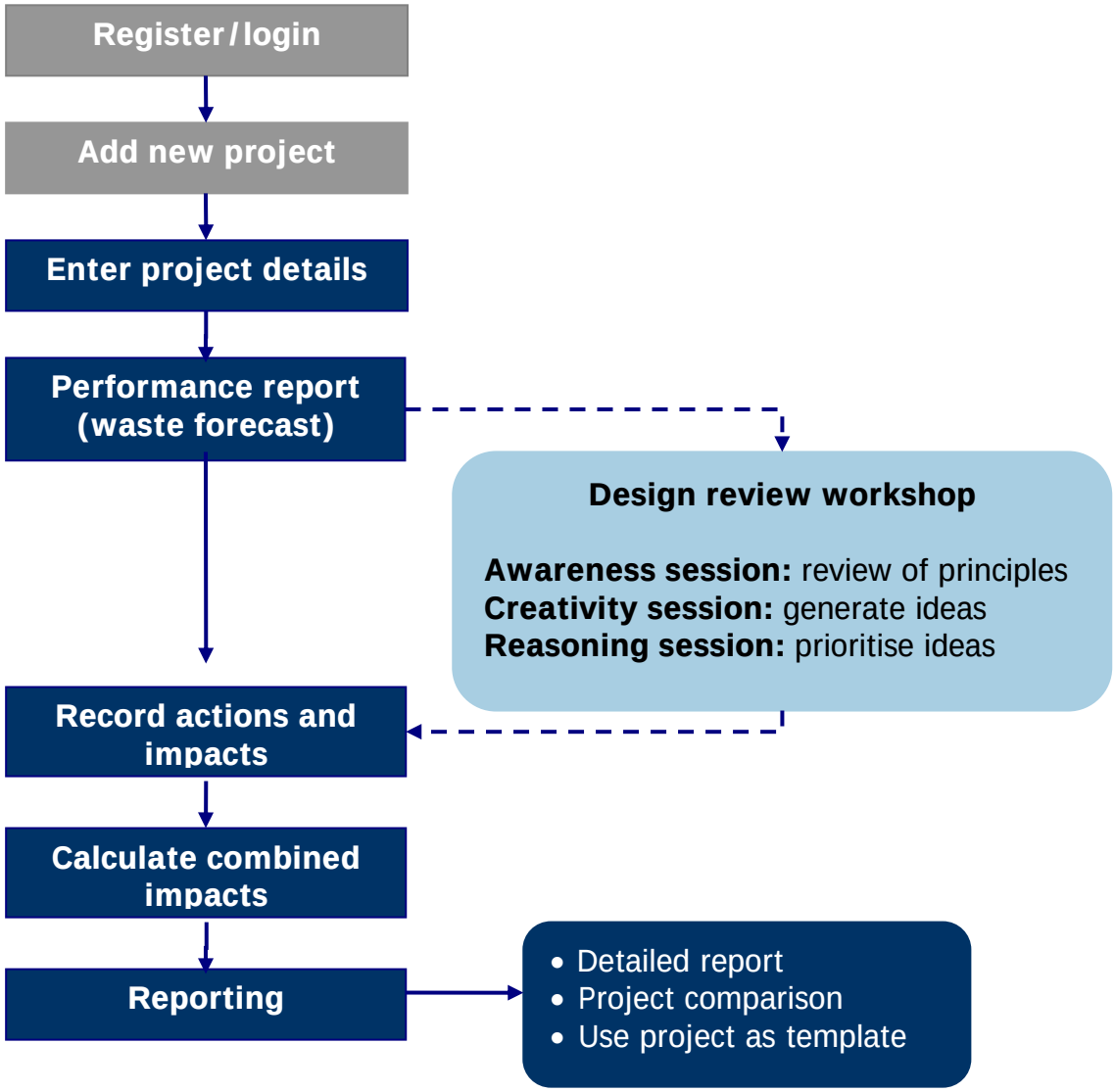
4.0 Key steps, inputs and outputs

4.1 Using the DoWT-B

The DoWT-B is a decision-making tool and has been created to support design teams in applying WRAP's Designing out Waste guidance. The Tool should be used in conjunction with WRAP's guidance. The Tool's outputs are designed to be useful in the context of the design workshops described in the Designing out Waste guide. The Tool supports decision-making through the provision of forecasts, it does not make decisions for the user.

Figure 4 provides an overview of the process of identifying and implementing design solutions to prevent wastage. This shows that the DoWT-B does not work in isolation, rather it is reliant on the design team to make independent decisions and provide data.

Figure 4 Overview of the key steps of using the DoWT-B



4.2 Inputs

4.2.1 Project details

The DoWT-B has been developed to use project information that is readily available - or easy to estimate - at an early design stage. Input details cover the site and the building. The Tool assumes a specification based on the building type entered (e.g. office), then applies the project input details to the specification to calculate an indicative forecast for construction waste. Demolition waste is estimated using the Demolition Quantities Estimator. Excavation waste is directly entered by the user.

Site details include:

- site area
- site type (greenfield or brownfield)
- demolition of existing structures
- estimated quantity of excavation waste (separately for basement/substructure, and site works)
- % soft and % hard landscaping

Building details include:

- Building type (education, residential, health, office, retail, other, mixed use)
- GIFA
- Number of storeys (number above ground, number in basement, and number occupied)
- Floor to floor height
- Building footprint and basement footprint
- Building perimeter length (exposed walls, party walls and basement perimeter)
- Glazing ratio to external walls (and atrium if relevant)

The user is asked to indicate whether the project has an atrium or a basement as these factors will affect project quantities.

4.2.2 Impacts of design options

The DoWT-B calculates the combined impact of your chosen design options. To do this, the Tool requires some input from the user. Impact data is required only for building elements targeted, under each of the five principles of designing out waste. The required inputs are explained below.

Inputs are entered on screen by first choosing the relevant building element, then choosing one of the five principles of designing out waste. Impacts can then be entered relating to all the design solutions relevant to that element and principle. Impacts are entered against components. For example, if you decide to use reclaimed aggregate in the substructure, you would enter the mass of reclaimed aggregate under substructure/design for reuse and recovery. The mass of reclaimed aggregate should be entered against the relevant component, for example you may enter a quantity for foundations and a quantity for the slab.

Figure 5 Design for Reuse and Recovery

Component	Total quantity of material required (t)	Proposed quantity of reused/reclaimed material (t)	Source of material	Type of material
Reinforced in-situ concrete ground slab, 250mm, C25 or lower	3,123.23t		On-site	Demolition
Structural screed min 50mm thick to concrete	679.80t		On-site	Demolition
Ground beams 500 x 500 strength C30 or higher	342.90t		On-site	Demolition
Cast in-situ RC CFA bored pile dia. 350, C25 or lower	188.08t		On-site	Demolition

Figure 6 Design for Off Site Construction

Component	Total quantity of material required (t)	Reduce qty required by (t)	Standard wastage rate (%)	Good practice wastage rate (%)	Off-site construction wastage rate (%)	Proposed wastage rate (%)
Reinforced in-situ concrete ground slab, 250mm, C25 or lower	3,123.23t		4.00 %	2.00 %	2.00 %	2.0 %
Structural screed min 50mm thick to concrete	679.80t		4.00 %	2.00 %	2.00 %	2.0 %
Ground beams 500 x 500 strength C30 or higher	342.90t		4.00 %	2.00 %	2.00 %	2.0 %
Cast in-situ RC CFA bored pile dia. 350, C25 or lower	188.08t		5.00 %	2.50 %	2.50 %	2.5 %

Figure 7 Design for Materials Optimisation

Component	Total quantity of material required (t)	Reduce qty required by (t)	Standard wastage rate (%)	Good practice wastage rate (%)	Proposed wastage rate (%)
Reinforced in-situ concrete ground slab, 250mm, C25 or lower	3,123.23t	0.00	4.00 %	2.00 %	2.0 %
Structural screed min 50mm thick to concrete	679.80t		4.00 %	2.00 %	2.0 %
Ground beams 500 x 500 strength C30 or higher	342.90t		4.00 %	2.00 %	2.0 %
Cast in-situ RC CFA bored pile dia. 350, C25 or lower	188.08t		5.00 %	2.50 %	2.5 %

Figure 8 Design for Waste Efficient Procurement

Component	Total quantity of material required (t)	Standard wastage rate (%)	Good practice wastage rate (%)	Proposed wastage rate (%)
Reinforced in-situ concrete ground slab, 250mm, C25 or lower	3,123.23t	4.00 %	2.00 %	2.0 %
Structural screed min 50mm thick to concrete	679.80t	4.00 %	2.00 %	2.0 %
Ground beams 500 x 500 strength C30 or higher	342.90t	4.00 %	2.00 %	2.0 %
Cast in-situ RC CFA bored pile dia. 350, C25 or lower	188.08t	5.00 %	2.50 %	2.5 %

Figure 9 Design for Deconstruction and Flexibility

Component	% of materials that can be diverted from landfill at the end of the component's life
Reinforced in-situ concrete ground slab, 250mm, C25 or lower	
Structural screed min 50mm thick to concrete	
Ground beams 500 x 500 strength C30 or higher	
Cast in-situ RC CFA bored pile dia. 350, C25 or lower	

4.3 Outputs

The DoWT-B provides three reporting options, each useful at different stages of the designing out waste process.

- The **Performance Report** has been developed to inform the selection of design solutions by providing an estimate of the potential to prevent wastage in the different building elements.
- The **Project Report** can be generated at the end of the DoWT-B analysis, and includes the solutions and impacts reported by the user, and the calculated combined impact.
- The **Project Comparison** Report can be used to facilitate 'what if' analysis of wastage from different specifications or project types.

Table 1 Description of DoWT-B reporting outputs

Report type	Output data	Type of use
Performance Report	■ Indicative waste forecast ■ Potential to improve (based on the difference between standard and good practice wastage rates) including: – potential improvement in waste arisings, cost of waste and CO2 – demolition and excavation materials available for reuse – quantity of materials consumed (by element) – potential reduction in waste arisings (by element) – potential reduction in value of materials wasted (by element) – potential increase in recycled content (by element) – potential carbon reduction (by element)	■ Can be used in design workshops to inform the selection of design solutions.
Project Report	■ Indicative waste forecast ■ Potential to improve (difference between standard and good practice wastage rates) ■ Design solutions described by the User ■ Combined impacts of design solutions	■ Provides a record of the solutions pursued and their combined impacts, for input to a SWMP or to report savings to the client.
Project Comparison Report	■ Comparison of multiple projects: ■ Specification and basic project details ■ Waste arisings by element ■ Design solutions by element ■ Combined impacts of design solutions	■ Provides a clear comparison of the waste performance of different specifications (the Tool does not allow users to change and compare the specification within a single project)

4.4 Specification and quantities

The DoWT-B allocates a default specification to each project based on the building type selected by the user. The user can view and edit this specification within a limited range of options. The default and optional specifications for each building type are shown in Appendix A.

The DoWT-B applies the project details selected by the user to estimate quantities for the default specification. Some quantities are taken directly from input data, e.g. the ground slab (m^2) is the same as the building footprint entered by the user. Other quantities are calculated using simple formulae, e.g. the quantity of glazing is equal to the exposed external wall area (perimeter x number of storeys above ground) multiplied by the glazing ratio. The formula for each of the building elements is show in Appendix B.

The DoWT-B uses a sub-set of components from the Net Waste Tool database. The data contained against each component (e.g. ground slab or internal doors) includes baseline and good practice wastage rates and recycled content rates. The DoWT-B uses these rates to forecast wastage and content.

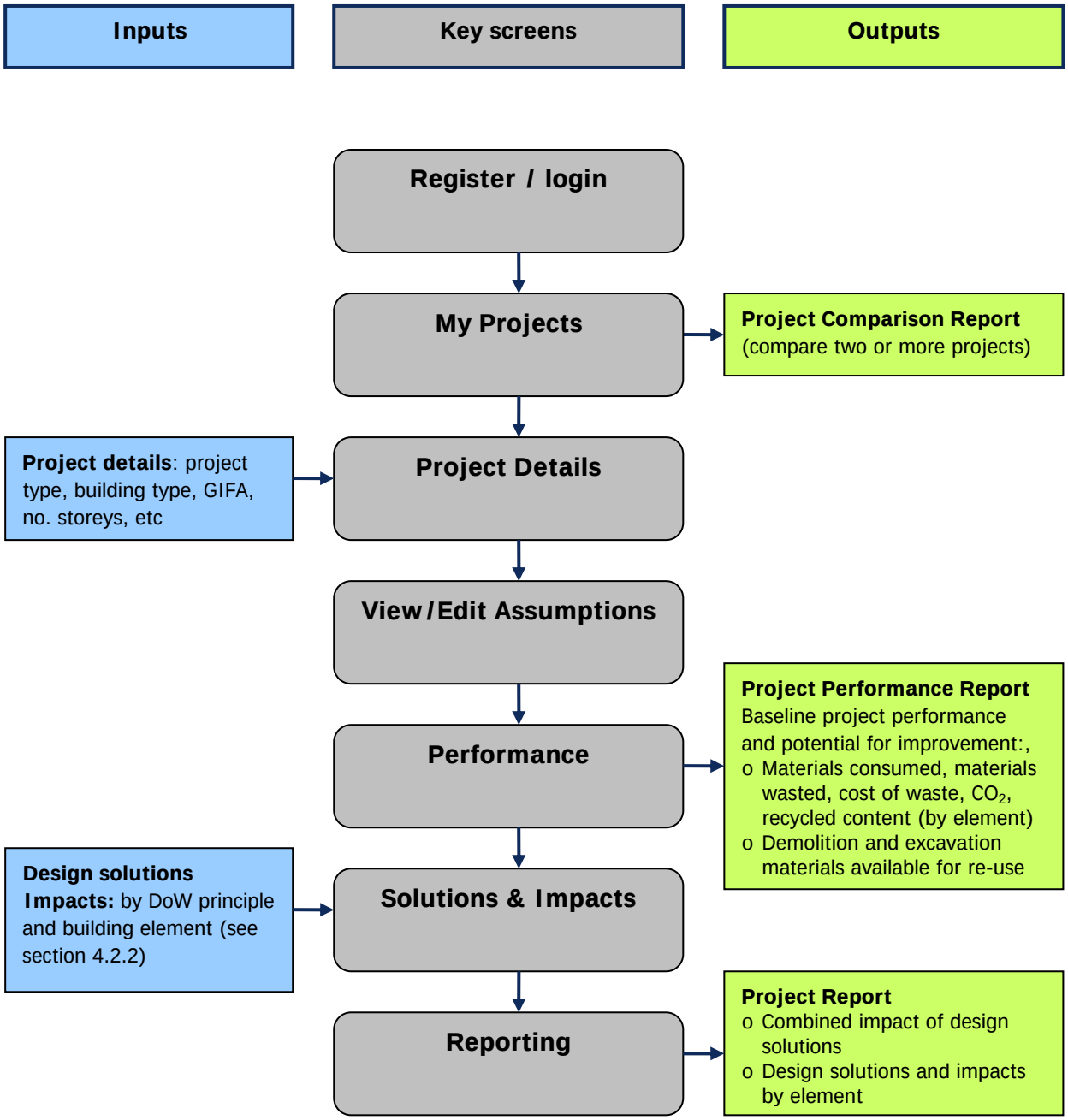
5.0 User journey and navigation

5.1 User journey

The DoWT-B utilises a linear user journey based on seven key screens. The user journey begins with user registration/login, moves through project set-up screens and analysis screens, and ends with a reporting screen. The first output is provided immediately after project set-up on the Performance screen. This report can be used to help design teams identify design options. After design solutions and impacts are entered into the Tool, a final report can be downloaded from the Reporting screen.

A third output is available from the My Projects screen. From here, the user can choose to compare the performance of two or more projects. The user journey, including key screens, inputs and outputs is shown in figure 10.

Figure 10 DoWT-B user journey showing key screens, inputs and outputs



5.2 Tool navigation

The Tool has been designed to be as intuitive to use as possible. It runs through a web browser interface (such as Internet Explorer) and can be navigated using the breadcrumbs at the top of the screen (Welcome > My projects > ...), or the project navigation bar (once a project has been set up or an existing project selected).

The breadcrumbs are located within the header at the top of each screen. These provide links to the Welcome screen (login/registration) and the My Projects page (listing the user's projects). A third element of the crumb will appear displaying the project name immediately after a project has been set up, as illustrated in Figure 12.

When a project has been set up or an existing project selected, the project navigation bar will display underneath the breadcrumbs. The project navigation bar provides links to each of the key screens, in their correct order. If the user is entering project details, the 'Project details' link in the project navigation bar will be grey. In Figure 11, the Solutions & impacts screen has been selected.

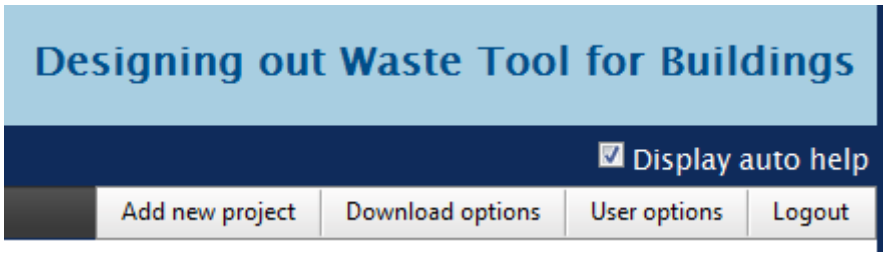
Figure 11 Breadcrumbs and project navigation bar

5.3 User options and resources

The buttons on the right hand side of the WRAP header provide access to resources (Download options) including this user guide, WRAP's Designing out Waste Guide for buildings, and the DoWT-B data report. A new project can be started at any time by clicking on 'Add new project'.

The 'Display auto help text' check-box can be de-selected at any time if the user is familiar with the Tool and would prefer not to view help text.

Figure 12 User options and resources

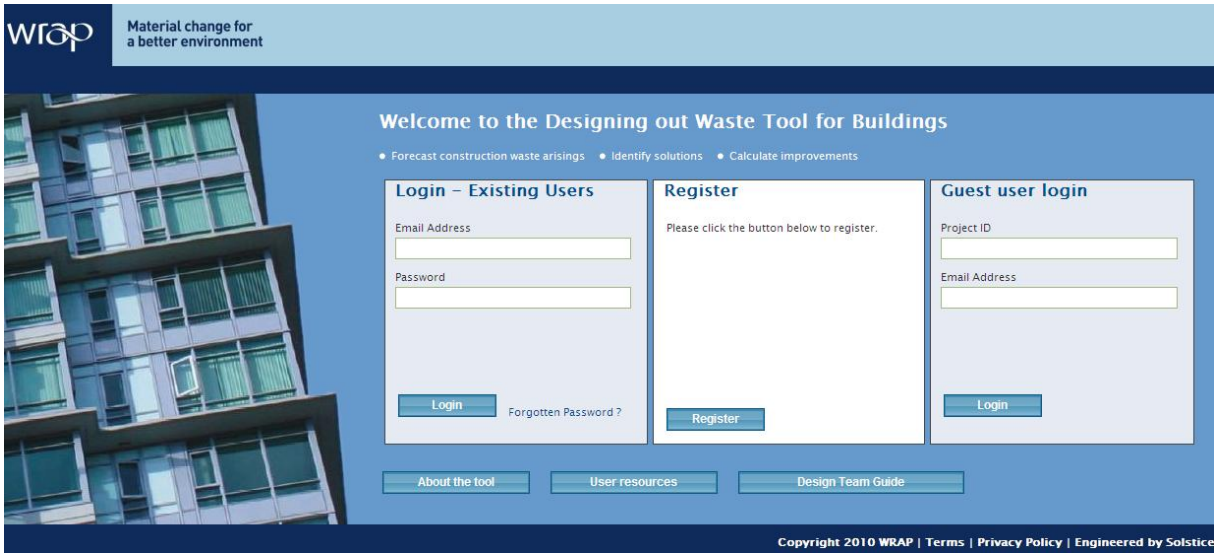


6.0 Getting started

6.1 Welcome screen

The first screen you will see after going to www.nwtool.wrap.org.uk and selecting the Designing out Waste Tool for Buildings is the 'Welcome' screen (Figure 13). This screen provides overview information about the Tool and access to resources including this User Guide, a Quick Start Guide, an Information Sheet, and a link to WRAP's website where further guidance on designing out waste can be found.

Figure 13 Welcome screen



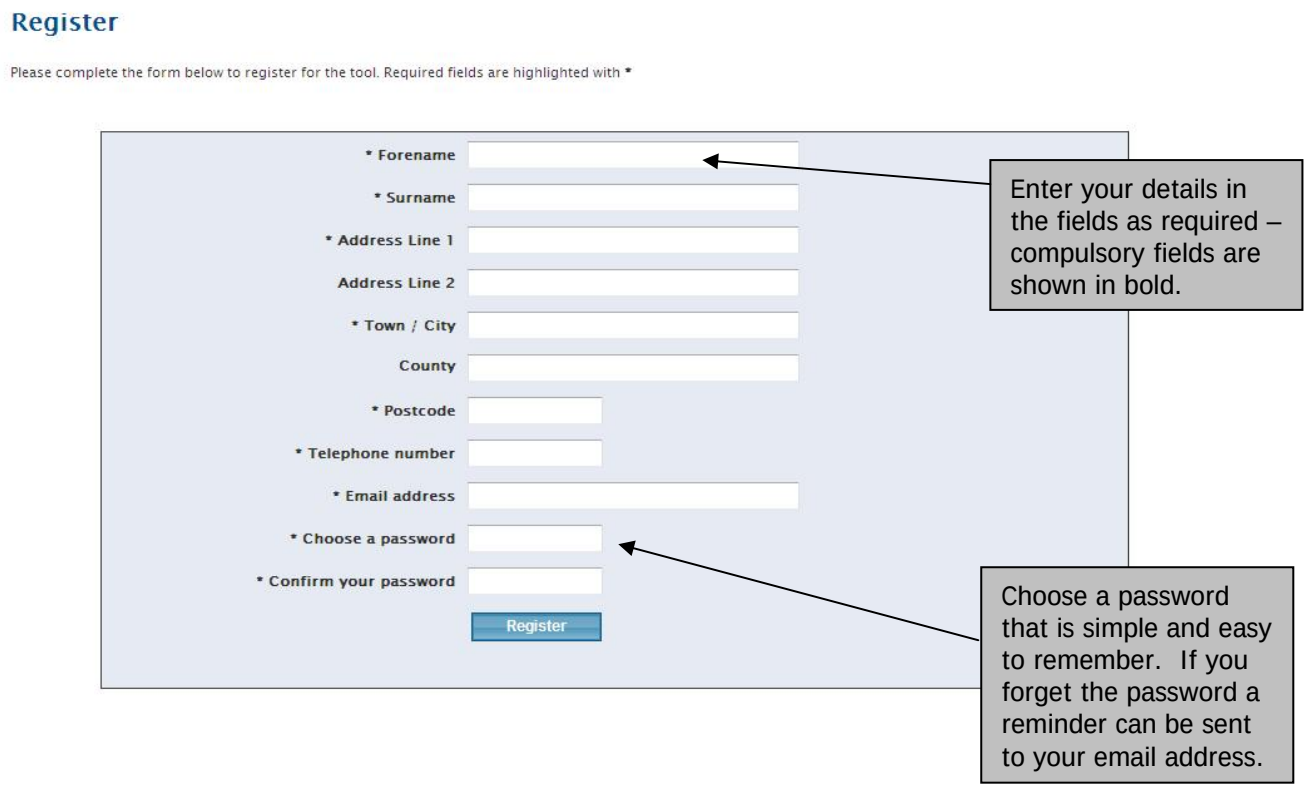
The Welcome screen allows existing users to login to the Tool, and new users to register.

6.2 Create an account

Before you can use the DoWT-B, you need to register and create a new account. Complete the basic form and you will receive an auto-generated email welcoming you to the Tool. After registering you will automatically be logged into the Tool and be able to start work.

If you are an existing Net Waste Tool user, you can use the same login for the DoWT-B. If you have not accessed the Net Waste Tool for some time, you may be prompted to update your registration details.

Figure 14 Registration page



7.0 Setting up a project

This section covers the creation and set-up of a project, including:

- creating a new project
    - from scratch; or
    - by using an existing project as a template for a new project
- accessing another user's project
- setting up a housing project
- how to view/edit the assumptions applied to your project (the assumed specification)

Subsequent Sections address project analysis (Section 8) and reporting (Section 9).

7.1 Creating a project

After login, you will arrive at the My Projects screen. From here you can:

- create a new project
- view any of your existing projects (including example projects provided by WRAP)
- compare up to three existing projects (waste arisings and impact of designing out waste)

Setup option	How to
Create a new project from scratch	Click on the 'Add new project' menu item at the top left of the screen.
Edit an existing project	Click on the project name to edit a project. You can also click on 'Use as template' to set up a new project using the existing project's data. Only the project details will be copied to the new project, not the recorded solutions or impacts.
Create a new version of an existing project	Users also have access to example projects provided by WRAP. Select the 'Example projects' tab and click on 'Use as template' to create a new project using the example project's data.
Compare project performance	Select the projects you want to compare and click on 'compare'. The Tool will generate a report comparing the indicative waste forecasts of the selected projects.

You can sort the list of projects shown on screen by project type, project name, date created or date modified.

Figure 15 My Projects screen

When you first visit this page it will contain no projects in the My Projects tab. You can begin adding projects by selecting the menu item **Add New Project**.

7.1.1 Using an existing project as a template

This method allows a registered user to select an existing project dataset as a seed for a new project, thereby creating a copy of the dataset (similar to performing a 'Save As' function). The seed project dataset may be from an existing project, either your own or an example project. This involves clicking the **Use as template** icon which is located on the My Projects page next to the project you wish to copy. The Tool will prompt you to enter a name for the new project.

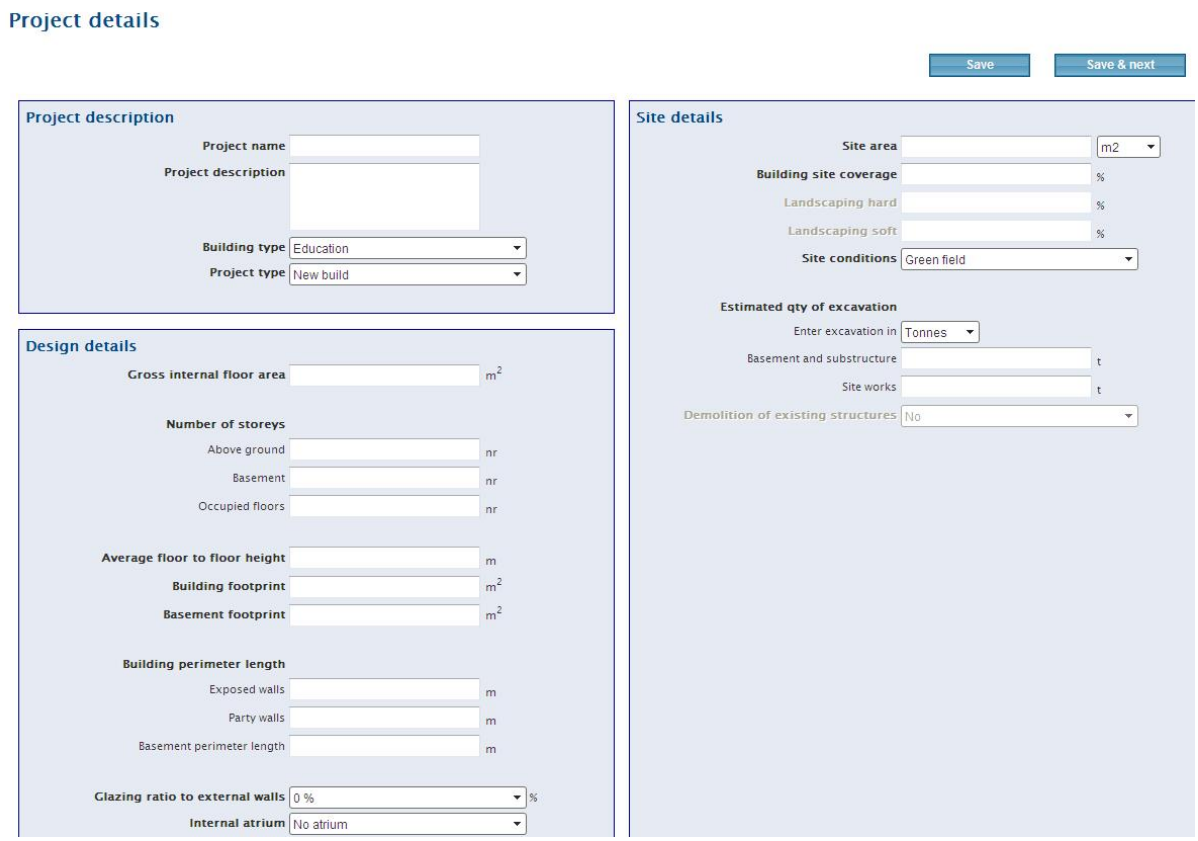
7.1.2 Setting up a new project

When you select to add a new project, the Tool takes you to the Project Details screen. Here you need to enter details including building type (e.g. office), project type (e.g. new build), GIFA, number of storeys, floor to floor height, and building perimeter length. You also need to indicate whether your project has an atrium or basement.

This screen requests details on excavation waste, and whether there is an existing building on site. If an existing building is to be demolished, the user can launch the 'Demolition Quantities Estimator' pop-up. These details allow the Tool to incorporate an estimate of demolition and excavation waste in the outputs.

The Tool will use your project details to apply a default specification to your project. The Tool will then apply wastage rates to the default specification to calculate waste arisings. The default specification can be edited (see section 7.3).

Figure 16 Project details screen



Click 'Save' and the Tool will save your details. From here you can move to the View/Edit Details screen where you can view and change the default specification.

You can choose from two project types: new build and refurbishment. Within either of these project types, it is possible to create 9 different building types, namely:

- Housing – a detached or terraced house;
- Residential – multiple dwelling buildings (e.g. apartments or sheltered housing);
- Offices – commercial office space;
- Retail – including shopping centres, supermarkets and other shops;
- Health – hospitals and primary care;
- Education – schools and higher education;
- Other – projects that do not fall within any of the above categories; and
- Mixed use – up to three different types of use within a single project.

If the building will include a mix of uses, you can select up to three use types. The Tool will ask you to indicate the proportion of floor area dedicated to each use. The Tool will then apply three default specifications for the fit-out elements of the project.

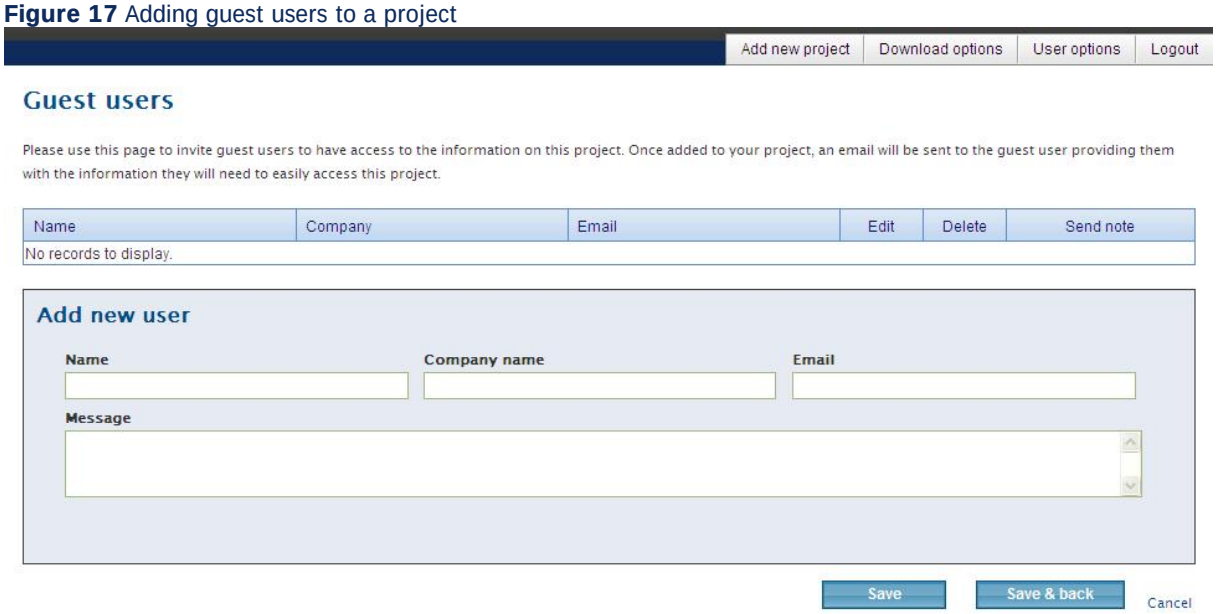
If you choose 'other' as a building type, the DoWT-B will not allocate a default specification to your project. Instead, you will be prompted to choose the specification for each element.

7.2 Accessing another user's project

Any user can give other users permission to view their projects. To do this, go to the User Options tab at the top right of the screen and select the 'Manage guest users' option. The 'Guest users' screen will appear. Add the guest user's details and click 'save'. The guest user's details will save and display in the table. After saving one guest user, you can add another. The Tool will send the guest user(s) an email telling them how to access the project.

When another user gives you access to their project, you will find the project listed on your My Projects page, on the 'My guest user projects' tab. You can contribute to their project and save the changes, or create your own (ie 'save as') version of the project. Your new version of the project will then be listed on the 'My projects' tab. If you would like to compare a guest user project with your own project, you will first need to create your own version. Only projects listed on the same tab can be compared.

Figure 17 Adding guest users to a project



7.3 Housing projects

If you select 'housing' the Tool will provide you with a simple quantities estimator to complete, as shown in Figure 18. This is a simpler approach than for other building types.

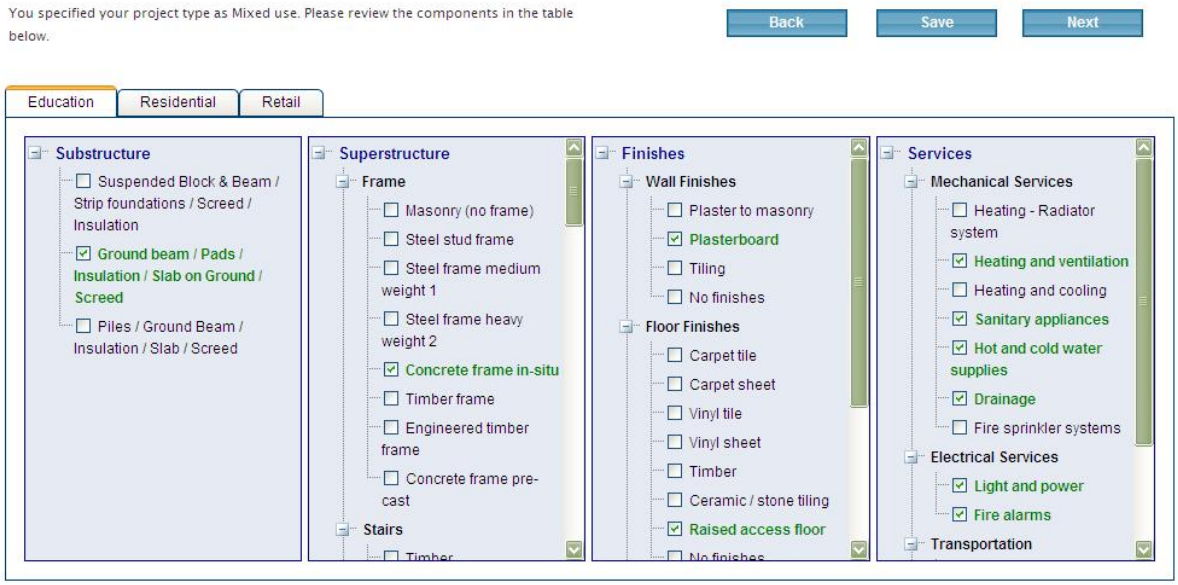
Figure 18 Simple quantity estimator for housing projects

7.4 View or edit assumptions

The Tool applies default assumptions about the project specification in order to forecast waste arisings. The Tool allows you to view or edit the default specification. For example, the Tool will assume an office project has a concrete frame, but will allow you to change this to a steel frame or masonry.

This page is set up using a 'tree' structure. You can expand and collapse elements and view or edit the default specification under that element.

Figure 19 View or edit assumptions screen



8.0 Project analysis

8.1 Project performance

The Performance screen provides a summary of your project's indicative waste forecast and the potential to reduce your project's waste impact. You can view results (comparing building elements) on screen or generate an Excel report. To understand when and how you can use these results to design out waste, refer to section 2.0. The Performance screen contains three sections – Project performance (top), Performance by element (left) and Generate a report (right).

Project performance

The table in the top section of the screen provides an overview of the project's performance, comparing standard practice with good practice. Good practice is based on the application of good practice wastage rates. Results include waste arisings, waste to landfill, value of materials wasted, cost of disposal, total cost of waste, CO_2 and recycled content.

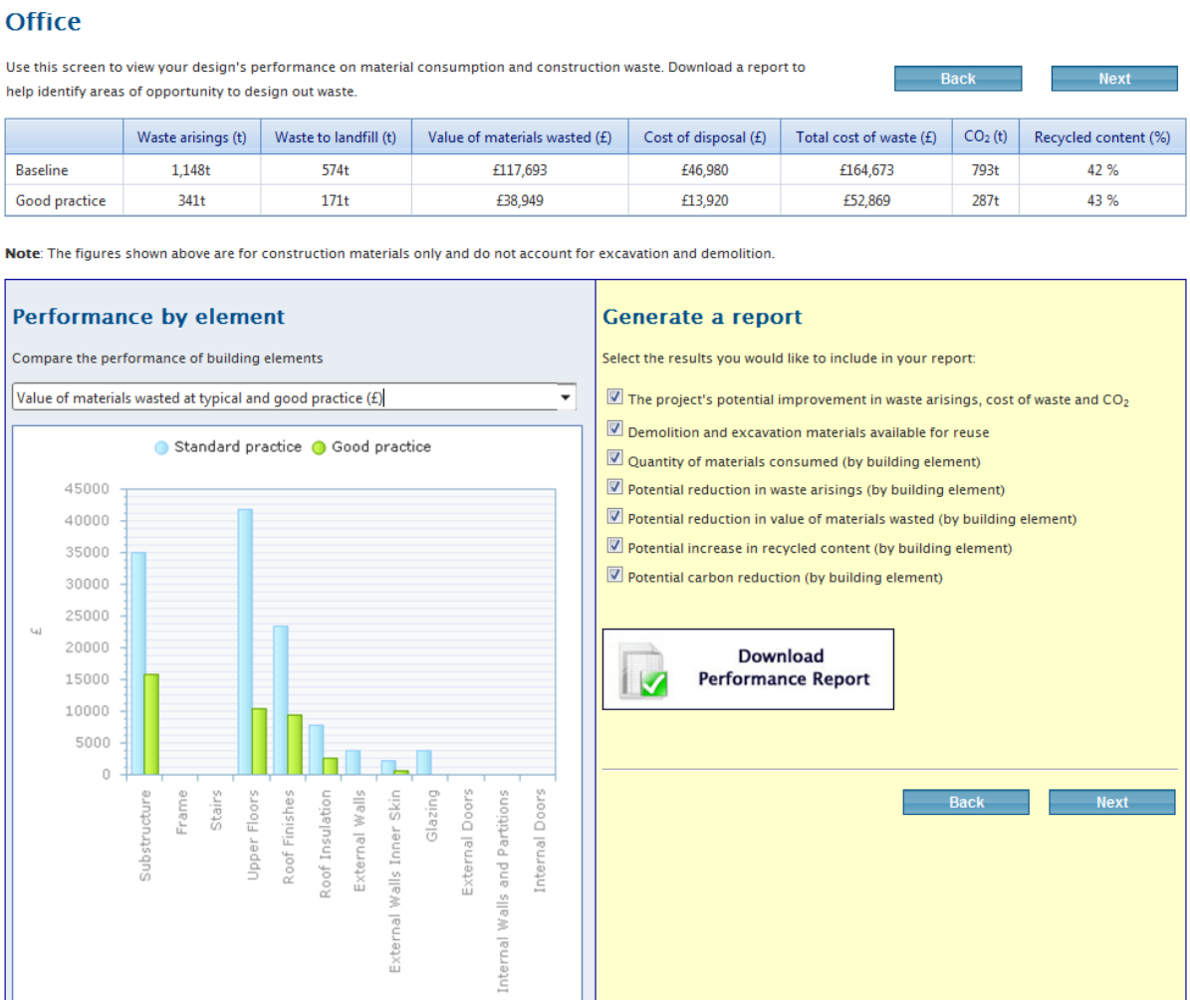
Performance by element

You can generate graphs on-screen that display forecast performance data by building element. Comparing the waste generated by different building elements can help you understand where you may be able to prevent waste through the application of design solutions.

Generate a report

The Performance screen allows you to generate a report containing your choice of several outputs (as shown in Figure 20). The report is in Excel format. The report can be used in design team meetings to identify opportunity areas and form the basis of discussions on designing out waste.

Figure 20 Project performance screen



8.2 Solutions & Impacts

This screen will help you calculate the combined impact of your design solutions on the cost of materials, cost of waste, and other metrics. Table 2 (page 25) lists and explains the impacts calculated by the tool (including the assumptions made).

The Solutions & Impacts screen helps you record and assess your design solutions by building element, then by designing out waste principle. For instance, you may choose to begin your analysis by entering the impact of your design solutions on the substructure. You would select substructure, then select the design principle under which your chosen solutions sit. For example, you may choose to look at 'incorporate reused and recovered materials'. You would then describe your relevant design solutions and enter the impact of these solutions. In this case the impact you will be asked to enter is the mass of reclaimed materials that will be incorporated in the substructure.

Refer to Section 4.2.2 to see what impacts the Tool requires for each design principle.

The screen contains three main sections: a project log (top), a performance review section (left), and a response proforma (right).

Project Log

The project log has two main functions: navigation and review. You can move between elements by clicking on the headings in the project log. The project log will display the number of solutions you have entered against each element, and whether you have entered any impacts. If you have entered impacts, the log also displays the total impact on materials consumed and materials wasted. Impacts are displayed by value for elements and by mass for demolition and excavation.

Performance

The Performance section displays similar graphical results to those found on the Performance screen. However, the results on the Solutions & Impacts screen are by material, not by element. These performance forecasts (by material) will help you identify which materials are being targeted by your design solutions. These graphs show baseline performance and do not change as you enter impact data.

Response Proforma

This section is where you describe your design solutions, and enter the combined impacts of each design solution. You need to enter the combined impacts of solutions that fall under the same DoW principle and building element. The Tool does not expect you to know the impact of an individual design solution. The impacts you are asked to enter will depend on the design principle you choose.

First choose a building element. Then select an 'area of opportunity' (these areas relate directly to the DoW principles in the Designing out Waste guide). You can now describe one or more design solutions that relate to the selected element and opportunity area. Your solutions will be saved in the table below.

The Tool will ask you for the combined impact of your solutions. The impact it requests will relate to the 'area of opportunity' you have chosen. For example, if you choose 'incorporate reused and recovered materials' the Tool will ask you to input the mass of reclaimed material you will be incorporating into the selected element. You can then click on 'calculate the impacts' and the Tool will calculate the project-level impacts described in Table 2.

Figure 21 Solutions & Impacts screen

	Demolition	Excavation	Substructure	Frame	Stairs	Upper Floors	Roof Finishes	Roof Insulation	External Walls	External Walls Inner Skin	Glazing	External Doors	Internal Walls and Partitions	Internal Doors
Consumed	50t	0t	£696,397	£7,607,395	£0	£1,939,955	£185,523	£54,308	£377,562	£13,572	£377,562	£1,576	£0	£344
Wasted	-50t	4,532t	£15,831	£0	£0	£38,038	£9,489	£2,586	£3,738	£2,262	£3,738	£16	£0	£16
Solutions			1	3		1	2	1						
Impacts			6	1		1	1	1			2			
Modified			11/02/2010 13:07:31	11/02/2010 13:32:54		11/02/2010 13:11:30	11/02/2010 13:14:21	11/02/2010 13:24:32			11/02/2010 13:25:41			

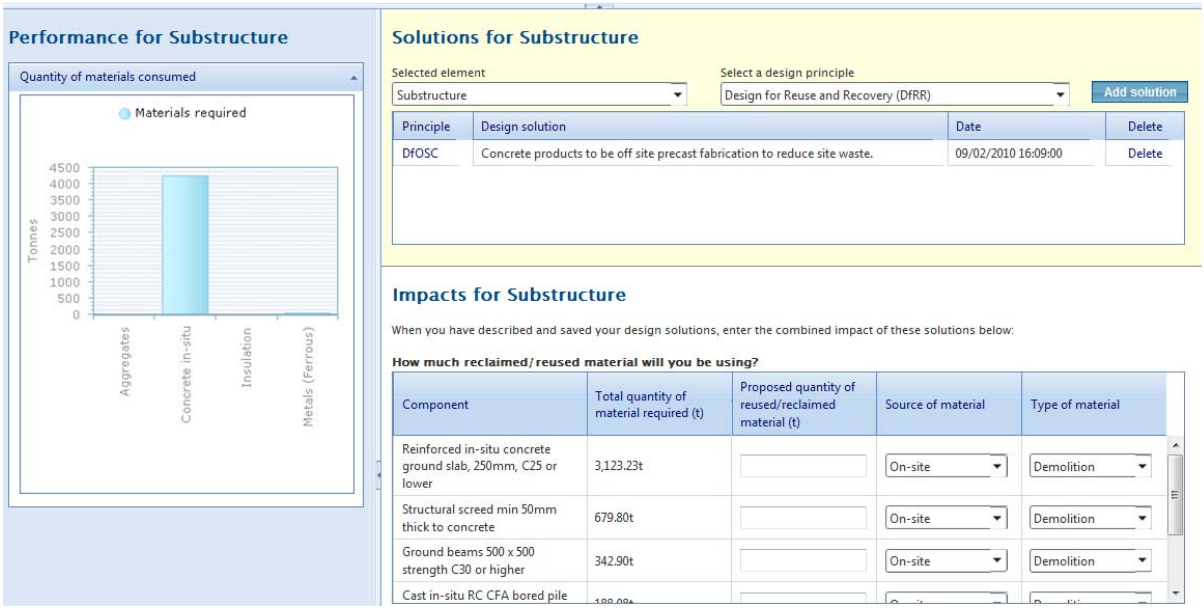


Table 2 DoWT-B project savings and future savings

Saving	Description	Assumptions
Project savings		
Material saving (£)	Value of material saved through reduced quantity specified, reuse of reclaimed materials and/or lower wastage allowances	■ Does not include the cost of processing materials for reuse. ■ Assumes reuse of reclaimed materials offsets the need to purchase new materials. ■ Assumes lower wastage rates will result in lower wastage allowances in bill of quantities.
Material saving (t)	Mass of material saved through reduced quantity specified, reuse of reclaimed materials and/or lower wastage allowances.	■ Assumes reuse of reclaimed materials offsets the need to purchase new materials. ■ Assumes lower wastage rates will result in lower wastage allowances in bill of quantities.
Disposal cost saving (£)	Disposal cost saving through waste reduction.	■ Assumes there is a cost for disposing of materials (including in-situ materials). ■ The number and cost of skips is calculated using the volume of waste and the cost of usi m3 mixed waste skips. ■ Assumes a reduction in wastage will result in a fewer mixed waste skips being used, at the cost per skip.
Total cost saving (£)	Value of materials saved plus disposal cost saving.	
Materials avoiding landfill (t)	Reduction in waste to landfill as a result of lower wastage.	■ A standard practice recovery rate for mixed waste skips (currently 50%) is applied to the qu of waste. Therefore, 50% of waste produced goes to landfill including in-situ materials not r on site. ■ Assumes the recovery rate is not changed if less waste is produced, therefore less waste pro means less waste goes to landfill.
CO_2 saved through avoided extraction (t CO_2 eq)	Reduction in embodied CO_2 as a result of reduced quantity specified, reuse of reclaimed materials and/or lower wastage allowances.	
Future savings (deconstruction)		
Potential future CO_2 saving (t CO_2 eq)	Potential embodied CO_2 saving from reducing future wastage by enabling future deconstruction.	■ Assumes all demolition material from future demolition would normally go to landfill. By div demolition material from landfill, it can be reclaimed for use in future projects. ■ The potential future CO2 saving is the embodied energy of the demolished element.
Potential future diversion from landfill (t)	Potential reduction in waste going to landfill through enabling future deconstruction and/or flexibility.	■ Assumes all demolition material from future demolition would normally go to landfill. By div demolition material from landfill, it can be reclaimed for use in future projects. ■ The potential future diversion from landfill (t) is the mass of the element designed deconstructed and therefore reused.

These impacts will accumulate as you enter solutions. A Performance Report can be generated from the Reporting screen, which provides a combined impact for each building element.

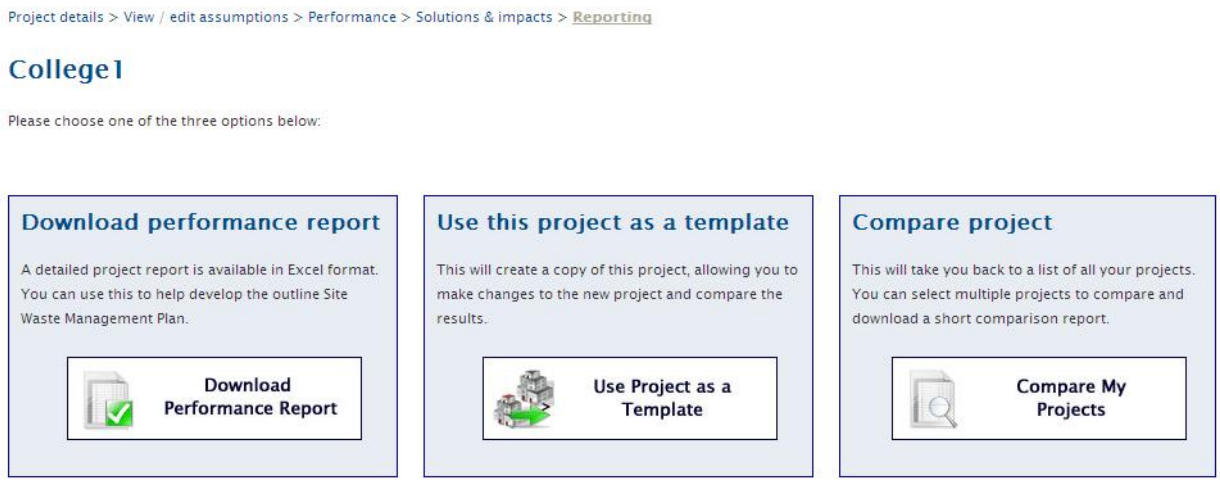
9.0 Reporting

The Reporting screen provides the option of downloading an Excel report describing you're the impacts you have recorded. You can also choose to create a new version of your project by using the project as a template for a new project. This is a useful option if you would like to compare alternative versions of the project.

You can also access the 'compare projects' function from this screen. Selecting this option will take you back to your My Projects screen. From here you can select the projects you want to compare using the tick-boxes in the right-hand column. You can compare your project against other projects (regardless of building type), or you can compare your project against other versions (e.g. to compare design options).

If you would like to compare your project against other versions, first create the new versions by selecting the 'use project as a template' option on the reporting screen. You will first be prompted to enter a name for the new version. The Tool will then return you to your My Projects screen, from which you can access the project and change project details, specification assumptions and solutions and impacts.

Figure 22 Reporting screen



10.0 Data structure

The DoWT-B draws from a sub-set of the Net Waste Tool dataset. The sub-set contains both recycled content data and wastage rate data.

All of the analysis in the DoWT-B is built up from project specification information; this means that the analysis of each project is specific to the specification and quantities entered.

Data are structured in line with the following hierarchy:

1 **Components** – the most basic products or materials delivered to site (e.g. bricks, concrete, carpet, etc). (This includes pre-assembled composite products such as windows.)

2 **Elements** – a major part of a project (e.g. external walls, floors, stairs, fencing, etc).

3 **Projects** – a collection of elements making up a defined project or other construction project (e.g. a house or an office)

Each of these categories is described further below.

10.1 Components

The DoWT-B draws a sub-set of components from the Net Waste Tool database. The database contains benchmark data on over 6,000 construction components covering all aspects of building and infrastructure projects. For each component, the following information is maintained:

- unit (i.e. nr, m^2, m^3, t, etc.);
- dimensions and density;
- percentage wastage rates for the following benchmarks (see Glossary for definitions):
    - Baseline practice
    - Good practice;
- recycled content by mass for the following benchmarks (see Glossary for definitions):
    - Standard practice
    - Good practice
- material type (each component can be made from up to four different material types. These material types define the disposal costs and routes of any wasted elements of the component.);
- carbon factor (this includes the estimated carbon savings achieved from waste reduction activities, through avoided embodied energy;
- rate (i.e. installed cost including labour and materials - although for infrastructure and external works projects, data is stored as a material rate only); and
- % materials (i.e. the percentage of the overall rate that can be attributed to material cost).

To calculate waste arisings or recycled content for a project, the Tool draws on the above reference data for each selected construction component together with information on the quantity to be used.

10.2 Elements

Each of the components in the Tool is grouped within one or more project elements (e.g. external walls, windows and doors, substructure, etc).

10.3 Projects

A project is a collection of one or more elements that are grouped together to represent a discrete construction activity, e.g. a house or a hospital.

The Tool can be used to assess a variety of 'generic' construction project types both as new build projects and refurbishments, i.e.:

- houses;

- residential apartments;
- offices;
- healthcare;
- retail;
- education; and
- mixed use

In addition, an 'other' (bespoke) project type exists for projects that do not easily fit into any of the above categories.

10.4 Source of data on recycled content and costs of construction components

The data used in the Tool are based on analysis of the UK construction products and waste management markets, and have been provided to WRAP by specialist cost consultants, engineers and market research organisations.

Once an assessment has been commenced, the data used in the assessment will remain unchanged. It is possible to update the data by creating a copy of the project, as each time a project copy is created the most current materials database is used. However, the copied project will only include project details and specification and not the design solutions and impacts reported within the original project.

10.5 Data security

Project information held within the Tool is maintained on secure servers and only users that create a project or have explicitly been invited to view or enter information on a project will have access to project data.

WRAP has no access to information on individual projects but will be monitoring only high level statistics relating to the use of the website (e.g. number of projects created, impacts, etc). Your project information is therefore totally confidential.

11.0 Troubleshooting

Below are some of the questions you may have when using the DoWT-B. WRAP will extend this list where necessary in response to user feedback.

My development is complex with a variety of different building types and construction methods - how do I best use the DoWT-B?

The DoWT-B has been developed to work for individual buildings. You can analyse up to three types of use within a single building by selecting the 'mixed use' building type. If your project contains several buildings, it will be easier to create a separate project for each building. Any civil engineering components or external works elements can be analysed as separate projects within the DoWT-CE (Designing out Waste Tool for Civil Engineering projects, available April 2010).

I have an unusually shaped building, how do I use the Tool?

The simple estimates of project quantities determined using building dimensions are unlikely to be accurate where a building has unusual design features (e.g. irregular floorplates or mezzanine levels). The Tool has been designed to capture non-shape-specific building dimensions data (e.g. building perimeter and footprint area) rather than respond to different shapes which may well change as the design progresses. At an early design stage the shape of the building may not be known.

The waste forecast generated by the Tool should be taken as indicative. A more detailed waste forecast can be generated using the Net Waste Tool, i.e. when quantities data are available.

I want to understand the potential to increase recycled content in my project. How much detail can I expect from the DoWT-B?

The DoWT-B has been developed to provide estimates of waste arisings and recycled content at an early design stage. The Tool provides an indicative forecast of recycled content at baseline (standard practice) and good practice. The Performance report (generated from the Performance screen) shows the baseline and good practice recycled content for each individual building element (substructure, roof, etc). However, the Tool does not indicate which specific materials or products could be used to increase your project's recycled content.

WRAP's Net Waste Tool provides detailed waste arisings and recycled content data at the detailed design stage. When you have project quantities data to hand (e.g. a cost plan or bill or quantities) you can use the Net Waste Tool to find the top Quick Wins that would increase the recycled content of your project. Quick Wins relate to specifications e.g. plasterboard or ceiling tiles for which mainstream products are available with good practice recycled content. These products are typically available at the same price as mainstream products with lower recycled content.

I can't see some elements of the screen, how can I make the Tool render correctly?

Whilst every effort has been made to provide support for older browsers, Windows users are advised to use the Tool with Microsoft Internet Explorer version 7 or greater. Mac users are advised to use the tool with Safari version 3.2 or greater. If you are using Internal Explorer and the page isn't rendering correctly, find out which version you are using (select 'About internet explorer' in the Help menu). Internal Explorer 8 runs in strict mode by default, meaning some web controls do not render correctly. To change mode, click the compatibility icon next to the address bar.

This will then provide rendering for all sites for any technology. The icon will be displayed whenever IE8 detects that the website is not rendering as intended.

Appendix A: Default/optional specifications

Specification Defaults & Options

D = Default O = Optional

SUBSTRUCTURE	Unit	Housing	Residential	Health	Office	Education	Industrial	Retail
Suspended Block & Beam / Strip foundations / Screed / Insulation / Fill	m2	D	O	O	O	O	O	O
Ground beam / Pads / Insulation / Slab on Ground / Screed / Fill	m2	O	D	D	D	D	D	D
Piles / Ground Beam / Insulation / Slab / Screed / Fill	m2	O	D *	D *	D *	D *	D *	D *

* Default to pile foundations where building is greater than 3 storeys or 9 meters high

SUPERSTRUCTURE								
Frame								
Masonry (no frame)	m2	D	O	O	O	O	O	O
Steel stud frame	m2	O	O	O	O	O	O	O
Steel frame medium weight [1]	m2	O	O	O	D	D	D	D
Steel frame heavy weight [2]	m2	O	O	O	O	O	O	O
Concrete frame generic	m2	O	D	D	O	O	O	O
Timber frame	m2	O	O	O	O	O	O	O
Engineered timber frame	m2	O	O	O	O	O	O	O

[1] Default for buildings up to 20m high

[2] Default for buildings over 20m high

Stairs								
Timber	nr	D	O	O	O	O	O	O
Precast concrete	nr	O	D	D	D	D	D	D
Steel	nr	O	O	O	O	O	O	O
In-situ concrete	nr	O	O	O	O	O	O	O

Upper Floors								
Timber framed and lined	m2	D	O	O	O	O	O	O
In-situ concrete slab	m2	O	D	D	D	D	O	D
Pre-cast concrete	m2	O	O	O	O	O	O	O

Roof Structure *								
Timber framed	m2	D	O	O	O	O	O	O
Steel framed	m2	O	O	O	D	D	D	D
In-situ concrete	m2	O	D	D	O	O	O	O
Pre-cast concrete	m2	O	O	O	O	O	O	O

* Default option will depend on frame type selected

Roof Finishes								
Composite roof cladding panel	m2	O	O	D	D	D	O	D

Composite double skin w/ insulation and roof lights	m2	O	O	O	O	O	D	O
Asphalt / insulation / aggregate	m2	O	O	O	O	O	O	O
Concrete / Clay / Slate tiles	m2	D	D	O	O	O	O	O
Green roof	m2	O	O	O	O	O	O	O
Rain water goods	m2	Incl	Incl	Incl	Incl	Incl	Incl	Incl

Roof Insulation

Glass wool	m2	D	D	D	D	D	O	D
Mineral Wool	m2	O	O	O	O	O	O	O
Cellulose fibre	m2	O	O	O	O	O	O	O
Sheeps wool	m2	O	O	O	O	O	O	O
Urethane board	m2	O	O	O	O	O	O	O

External Walls

Masonry Brickwork	m2	D	D	D	D	D	O	D
Composite cladding panels	m2	O	O	O	O	O	D	O
Timber	m2	O	O	O	O	O	O	O
Double glazed curtain walling	m2	O	O	O	O	O	O	O
SIPS	m2	O	O	O	O	O	O	O
Stone / Precast panels	m2	O	O	O	O	O	O	O

Party Walls

Masonry Brick / blockwork	m2	D	D	D	D	D	D	D
SIPs	m2	O	O	O	O	O	O	O
Timber stud	m2	O	O	O	O	O	O	O

External Walls - Inner Skin

Masonry Blockwork	m2	D	D	D	D	D	O	D
Framed and lined	m2	O	O	O	O	O	O	O

Glazing

Framed windows - uPVC	m2	D	D	O	O	O	O	O
Framed windows - Timber	m2	O	O	O	O	O	O	O
Framed windows - Aluminium	m2	O	O	D	D	D	D	D
Glazed curtain wall	m2	O	O	O	O	O	O	O

External Doors

Steel doors and frame	nr	O	O	O	O	O	D	D
Timber door and frame	nr	D	D	D	D	D	O	O
Glazed screens and doors	nr	O	O	O	O	O	O	D
Steel roller shutter	nr	O	O	O	O	O	D	O

Internal Walls and Partitions

Masonry Blockwork	m2	D	D	D	D	O	O	D
In-situ Concrete	m2	O	O	O	O	O	O	O
Stud framed and lined	m2	O	O	O	O	O	O	O

Internal Doors

Timber door and frame	nr	D	D	D	D	D	O	D
Glazed screens and doors	nr	O	O	O	O	O	O	O

FINISHES

Wall Finishes

Plaster to masonry	m2	D	D	O	O	O	O	O
Plasterboard	m2	O	O	D	D	D	O	D
Tiling	m2	O	O	O	O	O	O	O

Floor Finishes

Carpet tile	m2	O	O	O	D	O	O	O
Carpet sheet	m2	D	D	O	O	O	O	O
Vinyl tile	m2	O	O	O	O	O	O	O
Vinyl sheet	m2	O	O	D	O	D	O	O
Timber	m2	O	O	O	O	O	O	O
Ceramic / stone tiling	m2	O	O	O	O	O	O	D
Raised access floor	m2	O	O	O	O	O	O	O
Marmoleum / linoleum	m2	O	O	O	O	O	O	O

Ceiling Finishes

Suspended grid mineral tiles	m2	O	O	D	D	D	O	O
Suspended grid metal tiles	m2	O	O	O	O	O	O	O
Suspended flush plasterboard	m2	D	D	O	O	O	O	D

SERVICES

Mechanical Services

Heating - Radiator system	m2	D	D	O	O	O	D	O
Heating and ventilation	m2	O	O	O	O	D	O	D
Heating and cooling	m2	O	O	D	D	O	O	O
Sanitary appliances	nr	D	D	D	D	D	O	D
Hot and cold water supplies	m2	D	D	D	D	D	O	D
Drainage	m2	D	D	D	D	D	D	D
Fire sprinkler systems	m2	O	O	O	O	O	O	O

Electrical Services

Light and power	m2	D	D	D	D	D	D	D
Fire alarms	m2	O	D	D	D	D	D	D

Transportation

Passenger and goods lifts	nr	O	O	O	O	O	O	O

Appendix B: Quantity calculations

The Tool generates default quantities for components calculated using the formulae listed in this Appendix. The example below demonstrates this for the concrete strip component. This component is measured as the perimeter of external walls – 30m in this case (shown under Default QTY) Formulae calculate typical measurements for components; however default quantities can be overridden using the User QTY box if more accurate measurements are available for a project.

Table 3 Formulae for estimating default quantities on building projects

Project Element	Formula
Substructure	
Foundation and Drainage (m)	= perimeter Length
Ground Beams and Ground Slabs *m2)	= building footprint
Basement walls (m2)	= basement perimeter length x average floor to floor height
Piles	Applicable if >2 storeys or 9m in height
Frame	
Frame (m2)	= Gross Internal Floor Area
Upper Floors	
Upper floors (m2)	= Building footprint x number of storeys above ground
Roof	
Roof structure, roof finishes and roof insulation (m2)	= Building footprint less atrium area
Atrium roof (m2)	= width x length of atrium (if enclosed)
Stairs	
Internal Stairs	= 6 x No storeys
External Stairs	= 6 x No storeys
External Walls	
External walls (m2)	= area of external walls (building perimeter x floor-to-floor height x No storeys above ground), less glazing (1 minus glazing ratio)
External walls – inner skin (m2)	= internal wall finishes (occupied floors x floor-to-floor height x (exposed walls + party walls), less glazing (length of exposed wall x floor-to-floor height x storeys above ground x glazing ratio to external walls)
Party walls	
Party walls (m2)	= party walls perimeter length x floor-to-floor height x storeys above ground
External windows and doors	
Glazing (m2)	= exposed wall perimeter length x floor-to-floor height x storeys above ground x glazing ratio
Glazing to atrium walls (m2)	= atrium area (atrium width x length) x 2) x floor-to-floor height x occupied floors x glazing ratio to atrium walls
External doors (nr)	Defaults to 2
Internal walls and partitions	
Internal Walls and partitions (m2)	= GIFA x % floor area internal partitions (based on building type % internal partitions x floor-to-floor height). Assumes no internal walls for industrial. Assumes offices are open plan (only 2.5% GIFA is internal

Project Element	Formula
	walls and partitions)
Walls, floors and ceiling finishes	
Wall finishes	Function of internal walls and partitions
Floor finishes	= occupied floors x building footprint
Ceiling finishes	= occupied floors x building footprint
Services	
Mechanical services (m2)	= occupied floors x building footprint
Sanitary appliances (nr)	Based on Building Regulations for occupancy rates per building type
Fire sprinklers (nr)	Based on requirement for sprinklers determined by building area and/or height
Electrical	
Electrical (m2)	= occupied floors x building footprint
Transportation	
Transportation (nr)	Based on building type, height and occupancy levels

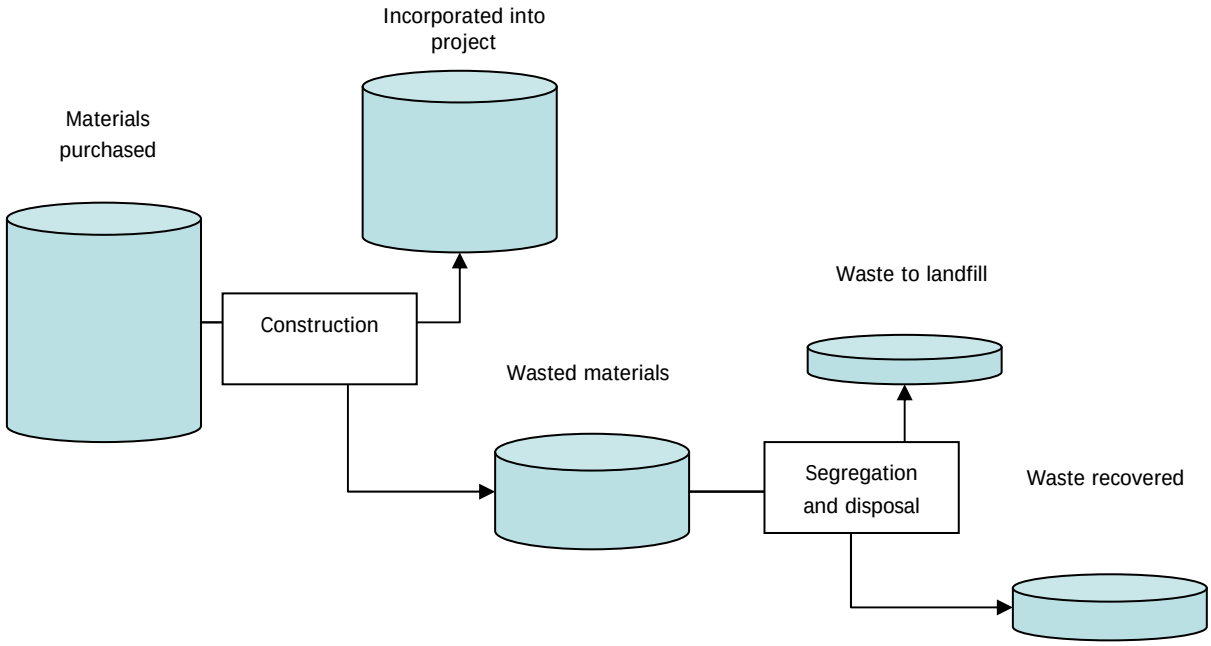
Appendix C: Waste calculations

The figure below summarises the key flows of construction materials on a project and the key data estimated by the waste module. This includes information on:

- level of project wastage (mass and value);
- the amount of this waste going to landfill (mass and volume); and
- the approximate carbon benefits of waste reduction and recovery measures.

This core information can be used to calculate a range of KPIs such as the project wastage rate, recovery rate, volume of waste per m^2 construction area or per £100k of construction value.

Figure 23 Summary of key material flows



11.1 Wasted materials

The value and mass of wasted materials is calculated using the project specification and applying component wastage rates (i.e. the percentage of the component that will be wasted). For example, if the wastage rate for bricks is 20% then for every £100 of bricks bought it is assumed that £20 will be wasted; if this £100 of bricks has a weight of 500kg then it is assumed that 100kg will be wasted.

By taking this bottom up approach to waste estimation, the wastes forecasted for a project are specific to both the type and quantity of the components used. This is important because the major sources of waste on one project (e.g. bricks) may be completely absent in another (e.g. if cladding panels are used rather than bricks).

The Tool contains information on the typical levels of construction wastage for each of the components in the database. Data is held on both the 'baseline' levels of wastage and a lower wastage level that could be achieved by adopting good practices for waste reduction. Using the brick example above, if the baseline wastage rate is 20%, and the wastage rate after good practices have been adopted is 10%, then the potential saving in materials value and mass is £10 and 50kg respectively. By forecasting the value and mass of wasted materials for all of the components on a project, the Tool can identify the most significant sources of waste, i.e. those where the adoption of waste reduction good practice would be most beneficial.

11.2 Carbon benefit

Using published data on the carbon embodied in construction materials, the Tool estimates the carbon benefits associated with specifying lower quantities of materials, reusing reclaimed materials and applying lower waste allowances[1]. Based on the user's intention to specify lower quantities, reduce waste and use reclaimed materials, the Tool can therefore estimate the potential benefit in terms of reducing the project's embodied carbon. This does not include transportation or other carbon impacts.

[1] *It should be recognised that at present this information is purely indicative and further work is required to further develop the evidence base on carbon reductions from resource efficiency (this work is ongoing).*

Appendix D: Recycled content analysis

Recycled content by value is a function of the material value of a component (i.e. its total cost excluding the cost of construction labour), the quantity used and the percentage of the component by mass that is derived from recycled content. Thus, if a material costs £100 per m^2 and has 20% recycled content by mass, the recycled content by value of 10 m^2 would be:

$$£100 \text{ (per } m^2\text{)} \times 10 \text{ } (m^2) \times 20\% = £200$$

The sum of the recycled content by value of all of the components in a project determines the total recycled content by value for the projects. When this is divided by the total value of all of the materials in the project, it gives the percentage recycled content by value, i.e.:

$$\frac{\text{Total recycled content by value (£)}}{\text{Total material value (£)}} \times 100 = \text{Recycled content by value (\%)}$$

The table below provides an example of how recycled content by value would be calculated for a whole project (units and prices are purely illustrative).

Table 3 Example recycled content calculations

Bricks	2,000	£250/1000	£500	15%	**£75**
Dense blocks	50m^2	£8/m^2	£400	50%	**£200**
Plasterboard	50 m^2	£2/m^2	£100	80%	**£80**
Insulation	20 m^2	£10/m^2	£200	80%	**£160**
Type I fill*	100m^3	£10/m^3	£1,000	100%*	**£1,000**
Unaccounted			£2,000	0%	**£0**
Total (£)			£4,200		**£1,515**
Total (%)					**36% (£1,515/£4,200)**
Note * in this example the Type I fill used in the project is from reused demolition waste, it is therefore considered to be 100% 'recycled' and its cost is taken as being equal to the purchase price of an equivalent quantity of product from the open market.					

Because it would be unnecessarily time consuming to account for every single component in a project (particularly complex projects such as hospitals or shopping centres), it is possible to include components in a generic 'unaccounted' category. The material value of these components is included in the total material value but does not contribute to the overall recycled content value of the project. The Tool calculates the level of 'unaccounted' components automatically using information on the predicted construction cost of the project.

Appendix E: The importance of materials resource efficiency

The construction sector is the largest consumer of materials in the UK. It generates more than one-third of waste materials, and only half of construction and demolition wastes are reused or recycled within the sector. Each year around 20 million tonnes of construction waste is sent to landfill.

More efficient use of materials would make a major contribution to reducing the environmental impacts of construction – including landfill and the depletion of finite natural resources – whilst also contributing to the economic efficiency of the sector and of the UK as a whole.

Fortunately it is possible to make major improvements in materials efficiency relatively easily and without incurring additional cost, by proactively managing waste and by using construction products with a higher level of recycled content.

Proactive Waste Management

Adopting the principles of good practice waste management on a project can demonstrate commitment to sustainable construction. If implemented correctly, good practice waste management can be a straightforward process that can deliver a range of benefits in addition to improvements in materials resource efficiency. Key benefits include:

- *Reduced material and disposal costs* – less waste generated means that a reduced quantity of materials will be purchased, and less waste taken to landfill will reduce gate fees for disposal. Cost savings will stimulate the adoption of improved recovery practices and motivate a sustained change in waste management practice;
- *Increased competitive differentiation* **–** benefits both developers and contractors, particularly where this will help to meet prospective clients sustainability objectives;
- *Meeting planning requirements* – planning authorities are increasingly setting conditions for environmental performance as part of the development process.

Increasing recycled content

Increasing the proportion of the materials used in a project that come from a recycled source is a relatively simple, practical and cost-neutral way of showing a commitment to more sustainable construction. Key benefits include:

- *Increased performance against CSR objectives* – quantified performance thereby meeting expectations of external stakeholders and employees;
- *Reduced materials costs* **-** reusing materials and products or the use of locally sourced construction and demolition waste is often cheaper than using virgin materials;
- *Driving down the cost of waste management*. In the medium to long term, the increased use of recycled material will enhance its value and thereby make it more cost effective to recycle (as is the case with most metals). This will ultimately help to reduce costs of managing construction waste because more of the waste arisings will be recycled and less sent for disposal in landfills.

Neither proactive waste management nor use of products with high recycled content should have any adverse impact on project costs and it is likely that better materials management should result in cost savings, for example from reduced costs of materials purchase and waste disposal.

Waste & Resources Action Programme

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