

## Assessing the costs and benefits of reducing waste in construction

### Social housing refurbishment



	Value	Percentage of £1.5m construction cost
<b>Cost saving potential</b>	<b>£13,600</b>	<b>0.9%</b>
<b>Additional costs to achieve these savings</b>	<b>£6,300</b>	<b>0.42%</b>
<b>TOTAL POTENTIAL COST SAVING</b>	<b>£7,300</b>	<b>0.48%</b>

#### Introduction

The refurbishment of social housing stock to the standards of Decent Homes (England, Northern Ireland), WHQS (Wales) or SHQS (Scotland) results, unavoidably, in a large amount of waste. All of the obsolete kitchen units, bathroom suites, boilers, and other materials quickly add up to a large waste stream. But added to this relatively fixed waste stream is additional waste associated with the supply, cutting and installation of new materials, along with their packaging. Both of these sources of waste carry a cost, and yet both provide opportunities for cost savings.

This cost-benefit analysis identifies what these base costs are likely to be for a programme of improvements to 100 houses up to the Decent Homes standard. It also identifies what the possible savings might be from waste reduction and segregation, and what costs might have to be incurred to realise these savings.

This analysis is based upon a stock of 100 dwellings requiring a total capital investment of £1.5m to reach the required standard (£15,000 per dwelling). This analysis is based upon a typical investment profile, where 80% of bathrooms are replaced, 90% of kitchens, windows and doors and heating systems, and 10% of roofs.

#### Improvement potential

Significant savings can be made by targeting good practice wastage rates for the 10 or so components offering the biggest savings in the value of materials wasted. Below is a summary of these improvement possibilities.

	Value of materials wasted	Cost of waste disposal	Total cost of waste	Total cost of waste as % of construction value
Baseline practice	£6,400	£16,800	£23,200	1.5%
Good practice (all components)	£2,100	£5,900	£8,000	0.5%
Targeted practice (top opportunities)	£3,100	£6,500	£9,600	0.6%
<b>Improvement over baseline</b>	<b>£3,300</b>	<b>£10,300</b>	<b>£13,600</b>	<b>0.9%</b>

A contractor's tender will include an allowance both for wasted materials and also for waste disposal. It would be rare for either the tender, or the schedule of rates to contain specific cost items for waste. Instead these would be calculated from historic performance and included within the price. So this means that the client will usually bear the cost of this waste, often with little evidence of the actual costs charged.

However, if the contractor and the client take the opportunity to discuss waste, there may be opportunities to reduce this cost, and both share in the savings. The contractor should reduce their direct costs, whilst the client may benefit from a reduced price charged by the main contractor.

In addition to financial benefits, being more resource efficient also delivers the following improvements in environmental performance:

	Total waste arisings (t)	Waste sent to landfill (t)	Recovery rate
Baseline	183	90	50%
Good practice	181	47	74%
Targeted	182	52	71%
<b>Improvement over baseline</b>	<b>1 (0.5%)</b>	<b>38 (42%)</b>	<b>21%</b>

### Understanding the costs and benefits

WRAP's Net Waste Tool has been used to estimate the extent of the cost savings possible, and to select the top improvement opportunities. The waste reduction and recovery actions needed to deliver these targeted savings were then identified, and their implementation costs estimated. Costs and benefits are shown in the Tables below.

Achieving cost reductions (BENEFITS)	Baseline	Targeted practice	Improvement
<p><b>Value of materials wasted</b> Construction materials are a valuable resource, yet it is common to see high levels of waste through damage on site, off-cuts, over-ordering of materials and the need for rework. Reducing this waste saves money. In refurbishment works there is likely to be a high proportion of site-cut materials, and opportunities exist to look after materials during transport and to use off-cuts where possible.</p>	<b>£6,400</b>	<b>£3,100</b>	<b>£3,300</b> <i>(0.44% of construction value)</i>
<p><b>Cost of waste disposal</b> Every skip or container of waste carries a cost. Whilst segregated metals are often removed at little or even zero charge, the majority of wastes carry substantial costs – and these are set to rise with the annual increase in Landfill Tax. However, waste disposal costs aren't fixed. Whilst this case study has assumed a fixed quantity of waste (resulting from the strip out), there are cost savings achieved through segregation of that waste, and a resultant increase in the value of the waste streams that are removed.</p>	<b>£16,800</b>	<b>£6,500</b>	<b>£10,300</b> <i>(0.68% of construction value)</i>
<b>Combined savings</b>			<b>£13,600</b>

These savings will only be achieved by taking specific management actions to change behaviour during design and site practice.

Investing to save (COSTS) <sup>1</sup>	Costs
<b>Develop quality SWMP</b> – Additional time beyond minimum legal compliance (England only) to develop plan with quality forecasts (including using the Net Waste Tool) and robust management actions.	<b>£1,280</b>
<b>Site training</b> – Time to provide training, and site operatives' time to receive training (12nr ½hr briefings for 10 operatives per session)	<b>£950</b>
<b>Materials storage</b> – Nominal allowance for temporary shelter for materials (or cabin hire)	<b>£1,200</b>
<b>Management time</b> – Additional time required to ensure SWMP is adhered to, including materials handling, re-use of materials on site, efficient installation and waste segregation (2.5hrs per week for ¾ of the programme)	<b>£2,250</b>
<b>Updating SWMP</b> – The SWMP needs to be reviewed and updated throughout the project. This cost allows for a 4 hour review every 3 months.	<b>£640</b>
<b>Combined costs</b>	<b>£6,320</b>

### Sharing the costs and benefits

On paper there are possible savings of £13,600 but to achieve these savings an estimated £6,320 in costs must be incurred. Whilst this does not reveal major cost savings, it does show that more sustainable refurbishment works can be achieved at no additional cost to the project.

This Section identifies how to achieve these benefits, who receives the benefits from these savings, and who pays for the improvements.

### The benefits

A total saving of £13,500 should be achievable through reducing material waste, and through waste segregation. The largest contributor to this saving is segregation, simply because the strip-out and disposal is such a major element of refurbishment works. Below is a summary of these wastes, showing the relative quantities (volumes) within each waste stream (note that these volumes include an allowance for bulking).

	Metal	Timber	Mixed
<b>100 houses</b>	38m <sup>3</sup>	116m <sup>3</sup>	90m <sup>3</sup>
<b>1 house</b>	0.38m <sup>3</sup>	1.16m <sup>3</sup>	0.90m <sup>3</sup>

By far the largest waste stream is timber, this being driven by the disposal of kitchen units. The majority of these units and worktops would be constructed of chipboard cores, as opposed to solid wood. Whilst the market for reprocessing waste chipboard and MDF is less mature than for wood, there are still end uses for this material. What this study highlights, however, is that contractors involved in the refurbishment of social housing stock need to focus on this material and other high waste streams, identifying end-users who can receive it. The stronger the demand for these waste materials, the less the cost of disposal.

The second largest waste stream is the mixed waste. Much of this is often made up from packaging (pallets, cardboard, plastics, tins). Here again the contractor has an opportunity to consult with the supply chain and identify ways in which packaging can be reduced, including:

- take back schemes;
- reused packaging; and an
- absolute reduction in packaging.

<sup>1</sup> These costs are based upon estimated durations, and have been reviewed with selected contractors.

#### *Who saves?*

The main contractor would normally pay for waste disposal on the basis of volume (and type) of waste removed, therefore these savings would normally accrue to the main contractor. The client's ability to share in these savings is determined by the procurement route. Where a form of renegotiated or open book payment structure is used, there should be an opportunity to share in these cost savings. In competitive tendering, the client should identify good waste disposal practice in project requirements in order to encourage contractors to submit competitive tender prices.

#### The costs

Most of the costs required to reduce waste or increase recovery are borne by the contractor. These costs are divided into two parts: planning costs and management costs.

**Planning** for waste is a low cost / high impact activity, highlighting the big opportunities such that effort can be focused on these. For example, by planning you might identify that you need better materials storage, hence the allowance of £1,200.

During construction, the **management** of wastes is important to ensure that the plan is delivered. Additional management time will be incurred to oversee the waste management process including material deliveries, material storage, installation and waste disposal (£2,250).

#### Conclusion

Social housing refurbishment is a large source of construction waste. Every new kitchen results in another kitchen being disposed of. Multiply these figures at a national level and it can be seen that there is a large environmental burden, and cost.

But rather than approaching this as an environmental problem, it should be treated as a commercial opportunity. Contractors are able to forecast the types and quantities of waste that they will generate, and with these forecasts, identify the likely cost of disposal. This information can be used by the contractor to help identify which materials to focus upon, and identify alternative (non-landfill) destinations for wastes. If the contractor addresses these issues at a programme level, as opposed to relying upon the waste contractor, then it is likely that new opportunities will be identified and costs can be reduced.

Therefore:

- Clients (RSLs) need to instruct contractors to reduce waste wherever possible, and identify non-landfill destinations for each of their waste streams. This information should be presented in the form of a programme-wide SWMP.
- Contractors need to develop a quality SWMP which addresses:
  - materials logistics;
  - packaging reduction;
  - waste forecasts;
  - waste segregation strategy, plus end-destinations for waste; and
  - forecast recovery rate for the scheme.

#### Methodology

*This cost benefit analysis has been conducted using data taken from WRAP's Net Waste Tool. The Tool is freely accessible on the web at [www.wrap.org.uk/nwtool](http://www.wrap.org.uk/nwtool), and helps project teams to forecast the waste that would be expected on different projects. The Tool works by setting up basic cost plan information to which baseline and good practice industry wastage rates are applied. The analysis identifies which components and specifications offer the greatest opportunities for waste reduction, and proposes a least cost segregation strategy. The Tool forecasts the overall quantities and costs of waste at baseline, good and user-targeted levels of performance, including the value of wasted materials and the cost of waste disposal.*