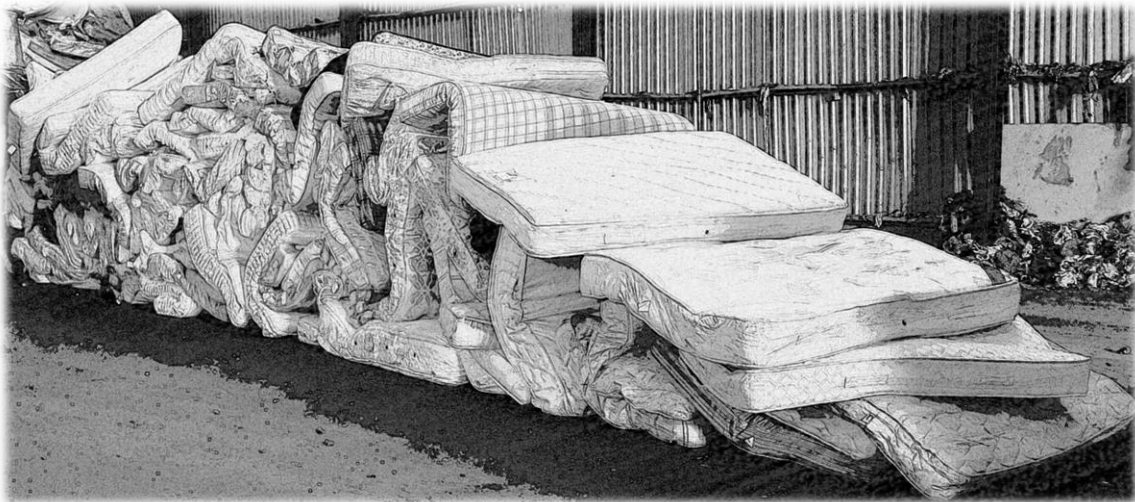


*A final report by*



*for*



# End of Life Mattress Report 2016

The results of the National Bed Federation's 2016 study into the waste treatment of end of life mattresses in the UK

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2016 study into the waste treatment of end  
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*Value-driven  
consulting*

*Science-led  
research*

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Reference: NBF-01 430 Final.docx

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## Acknowledgements

We, the authors, are very grateful for the interest and input received from stakeholders during the course of this research. Thanks especially to those that completed our surveys or took the time to be interviewed on the phone.

## Glossary

CA	Civic Amenity
EfW	Energy from Waste
EoL	End of Life
LA	Local Authority
WDA	Waste District Authorities
WDF	WasteDataFlow
WRAP	Waste & Resources Action Programme
ZWS	Zero Waste Scotland

## Units

Conventional SI units and prefixes used throughout: {k, kilo, 1,000} {M, mega, 1,000,000} {G, giga, 10<sup>9</sup>} {kg, kilogramme, unit mass} {t, metric tonne, 1,000 kg}

## Contents amendment record

This report has been amended and issued as follows:

Version	Date	Description	Author	Editor
1	18/03/2016	NBF Final Report 2016 Draft	NB	
2	05/05/2016	NBF-01 430 Final	NB	PL, SS
3	21/06/2016	NBF-01 430 Final V3	NB	DPF
4	30/06/2016	NBF End of Life Report 2016	NB	JA
5	01/07/2016	NBF End of Life Report 2016 for publication (updated to address change in active recycling capacity after input from stakeholders)	NB	JA

# Forward

by Tony Lisanti, chair of the NBF's Recycling Group

The challenges, and potentially opportunities, that surround the treatment of waste in our societies are without doubt destined to become increasingly focused on by a wide range of interested parties - including legislators, environmentalists, social scientists, manufacturers and retailers.

We are, of course, very aware of plans at EU level to require member countries to adopt the concepts enshrined within the Circular Economy Package (CEP) protocols, with its targets for the amounts of materials that are required to be reused when products reach their End of Life (EOL). We believe that simply disposing of EOL products in whatever way we choose will not be a viable option for the future. With respect to our own industry, it is clear that the disposal of EOL mattresses via, for example, landfill will not be tolerated indefinitely.

The work undertaken by the NBF Recycling Committee is now in its third year and we are gradually gaining a better understanding of the scale and complexity of mattress recycling/re-use and perhaps we are also beginning to see a way forward - but we know we have a great deal more to learn and develop.

The 2016 End of Life Mattress Report commissioned by the NBF has several objectives. It updates and improves the

previous, 2014, report on the current state of mattress recycling/re-use in the UK. It provides quantified levels of recycling as well indicating where the trends in this area are heading.

This document will become the prime repository, by some considerable way, for 'academic' research into this area. Hopefully anyone seriously interested in the matter of mattress recycling will naturally be guided to the NBF. We expect this work to allow us to engage meaningfully with legislators both in the UK and the EU, ensuring our thoughts are properly considered when legislation in this area is drawn up.

On a very practical basis we want to use the research and subsequent analysis to provide NBF members with options for the ethical, environmentally acceptable and cost effective approach to Product Stewardship and, within that, the disposal of EOL mattresses. Amongst our aims is to work with the recycling industry to ultimately be in a position whereby the NBF will endorse a network of mattress recyclers that conforms to an audited code of practice.

I am pleased therefore to present the 2016 End of Life Mattress Report produced by Oakdene Hollins to our members and others involved in this arena.



# 1 Summary

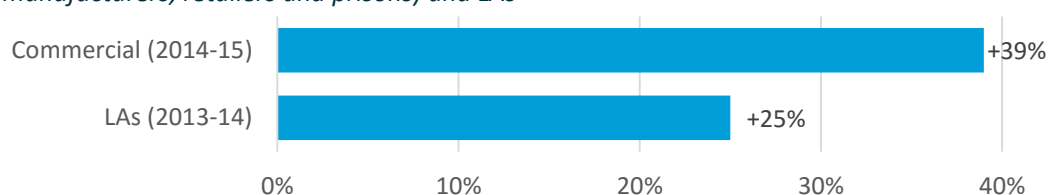
Approximately 5.9 million End of Life (EoL) mattresses, weighing an estimated 148,000 tonnes, were recovered or disposed of in the UK during 2014. We estimate that 16 % of these mattresses were recycled, 11 % incinerated with energy recovery and 73 % landfilled. Our calculations also suggest that the average age of a mattress on disposal is 11 years. Furthermore, 1.5 mattresses are recycled per year for every 100 people in the UK. These figures are based on an extensive survey of mattress manufacturers, retailers, recyclers and Local Authority (LA) representatives, in addition to analyses of trade, production and LA waste data.

Table 1: UK mattress recycling rate 2012-2014

	Old methodology		New methodology
	2012	2013	2014
Number of mattresses recycled	452,000	586,000	939,000
Replacement mattress sales	4,667,000	4,531,000	5,904,000
<b>Mattress recycling rate</b>	<b>10%</b>	<b>13%</b>	<b>16%</b>

The methodology used in the derivation of the recycling rate has been updated and, we believe, improved since the previous study. A more refined and precise analysis of the trade and production data was conducted, the mattress replacement rate derivation was fully justified, all (as opposed to a sample) of the LA reported recycling data were captured, and a more thorough poll of average mattress weight was carried out. Furthermore, the figures were sense-checked at every stage of the calculation; for example, we found that the number of mattresses recycled in 2014 is similar to the current capacity of mattress recyclers (900,000).<sup>1</sup>

Figure 1: Annual change in mattress recycling reported by commercial enterprises (manufacturers, retailers and prisons) and LAs



Because of the change in methodology, it is misleading to directly compare the 2014 recycling rate derived in this report with that for 2012 and 2013 derived in the earlier report (Table 1). However, we are confident that the upward trend in overall recycling rates is real, as the mattress recycling reported by both LAs and commercial enterprises is increasing strongly (Figure 1).

An unprecedented coverage of the UK mattress recycling sector was achieved in this study, including both commercial and social enterprises, brokers and logistics experts. This can partially be attributed to the understanding within the sector that there is a need to address

<sup>1</sup> See Table 13

its image, damaged by reports of abandoned warehouses full of mattresses, fires, and unsanitary practices such as recovering used mattress cores for resale.

LAs and commercial enterprises require, where possible, the mattress recyclers to whom they subcontract to be compliant with all the relevant legislation, and to be auditable and transparent, especially with regard to the end-fates of the recovered material. The lack of availability of compliant facilities in the local area is one of the major barriers to recycling, as reported by both commercial enterprises and LAs.

A number of recyclers stopped accepting mattresses in 2014-15, including JBS Fibre Recovery, Divert More, Envirogreen and Mid UK Recycling; we assume because of the sharp drop in prices for steel and other commodities, coupled with increases in the cost of insurance. The knock-on effect of the loss of this capacity on recycling rates will not be fully evident until the complete LA data from 2015 is available. However, the results of a straw poll of LA representatives at the National Association of Waste Disposal Officers meeting in March 2016 does not bode well: only two of the approximately 20 members who were sending mattresses for recycling 6-12 months previously were still doing so at the start of 2016.

As a result of the squeeze in mattress recycling capacity there may be a slowing or plateauing of the (currently increasing) mattress recycling rates reported between 2012 and 2014. This may be more marked for LAs than for commercial enterprises if recyclers prefer the quality of used mattresses collected through commercial take-back schemes to those from Civic Amenity (CA) sites and kerbside collections. Energy from Waste (EfW) is another, often cost competitive, treatment option for LAs wanting to divert mattresses from landfill.

In order to best understand how to counteract the threats to mattress recycling, and subsequently maintain its continued growth, the in-depth discussions with mattress recyclers were particularly instructive. Understanding how recyclers are best supported, in this period of depressed commodity prices, is fundamental to maintaining and expanding recycling capacity in the UK and, subsequently, the recycling rate.

Identifying markets for textiles was raised repeatedly as a priority of smaller recyclers in particular. The technologies available and the markets accessible to recyclers depends a lot on their size: the smallest recyclers estimated that they can't find a market for 30-50 % of the material they recover; much greater than the 7-10 % reported by the largest recyclers. The ability of recyclers to find markets for recovered materials has a direct impact on their competitiveness, in that they avoid the gate-fees associated with sending the unmarketable materials to EfW treatment.

New applications or processes to enable textiles to be hygienically used in existing applications - including, perhaps, as the felts put into new mattresses - would greatly benefit the recyclability of materials recovered from mattress recycling. Efforts should ultimately be focused on increasing mattress-derived material recycling, for which increasing mattress recycling is only one of many contributing factors. Mattress eco-design, processing technologies for the materials, and applications and markets for the materials are all also key in determining the overall life cycle environmental impact of mattresses.

Many recyclers also felt that some degree of self-regulation of the sector - through a trade body or a voluntary code of practice - would benefit them by deterring unscrupulous operators, improving the image of the sector and possibly opening up new markets for their products. This, if implemented, could be the proof that mattress recycling in the UK, now in its twelfth year, has come of age.



## 2 Background

### 2.1 Context

End of life (EoL) mattresses are widely considered to be a problematic waste stream due to their bulkiness, low material value, difficulty to process and liability to be fly-tipped. Various administrations are focusing on EoL mattress disposal as an area on which to improve. Zero Waste Scotland identified mattresses as a priority product in their 'Making Things Last' strategy, a document to be used in the Scottish Government's decision-making process on producer responsibility legislation.<sup>2</sup> The Welsh Government invested in recycling facilities and the statutory recycling targets that are in place motivate Welsh LAs to recycle materials, including mattresses, they would not otherwise consider.<sup>3</sup> There are also numerous examples in the rest of the EU of mattresses being banned from landfill, including in Denmark, the Netherlands, France and Belgium, as well as the USA.<sup>4</sup>

### 2.2 Aims

The specific aims of this second 'End of life Mattress Report' are:

- To refine the methodology used in the first report to determine the recycling rate for mattresses in 2014.
- To investigate the proportion of mattresses sent to energy recovery.
- To survey manufacturers represented by the NBF and retailers to understand how they deal with EoL mattresses.
- To present an independent, comprehensive overview of the mattress recycling sector.

### 2.3 Report structure

With the intention of streamlining the report, the full descriptions of all the data analysis carried out as part of this research have been placed in the Appendices. An overview of the methodology is included in Section 3, key findings presented in Section 4, and conclusions and recommendations in Section 5.

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<sup>2</sup> [www.gov.scot/Resource/0049/00494471.pdf](http://www.gov.scot/Resource/0049/00494471.pdf) (Accessed April 2016)

<sup>3</sup> Email correspondence with Welsh Government representative

<sup>4</sup> [www.mattressrecyclingcouncil.org](http://www.mattressrecyclingcouncil.org) (Accessed April 2016)



### 3 Methodology

#### 3.1 Scope definition

The scope of this project was to assess the flows of EoL mattresses from the point at which they are discarded by their users to their ultimate fate, be it deconstruction and material recovery, incineration with energy recovery or disposal to landfill. To this end it was instructive to map the stocks of in-use mattresses as well as their possible collection and recovery/disposal routes (see Figure 3 on the next page).

Value recovery from a mattress at its End of Life can consist of:

- **Product recovery:** the recovery of a mattress as a whole, with or without any additional treatment (remanufacture and reuse respectively).
- **Material recovery:** the recovery of the materials contained within a mattress for reuse in other applications (recycling).
- **Energy recovery:** the recovery of the energy embedded in a mattress through combustion (Energy from Waste (EfW)).

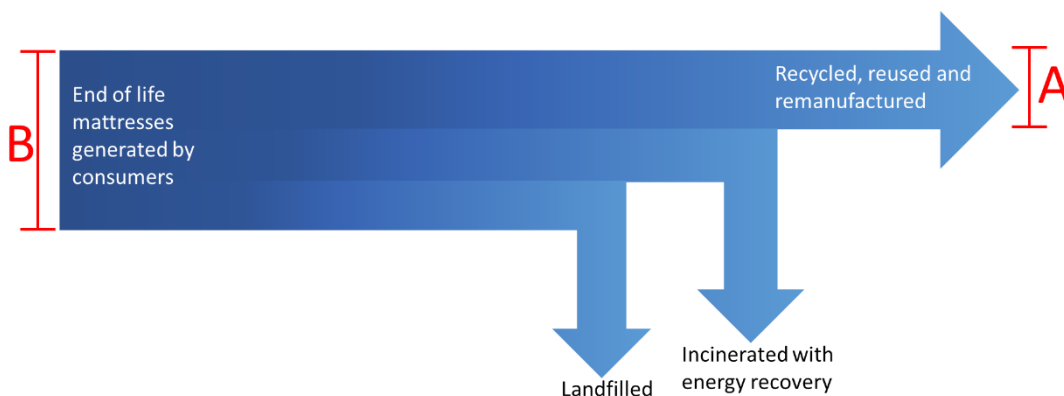
This report generally refers to ‘recycling, reuse or remanufacture’ as ‘recycling’. The decision to aggregate product recovery with material recovery was based on the granularity of the data sources available and the relatively small scale of reuse and remanufacture compared to recycling.<sup>5</sup>

Furthermore, the mattress recycling rate calculated herein (for 2014) is defined as follows:

*“The number of units recycled (or reused or remanufactured) as a proportion of the total number of end of life units generated by consumers in the year.”*

This definition of the recycling rate is depicted graphically in Figure 2.

Figure 2: The mattress recycling rate calculated in this report is the ratio of A over B, in number of units, as indicated in this schematic.

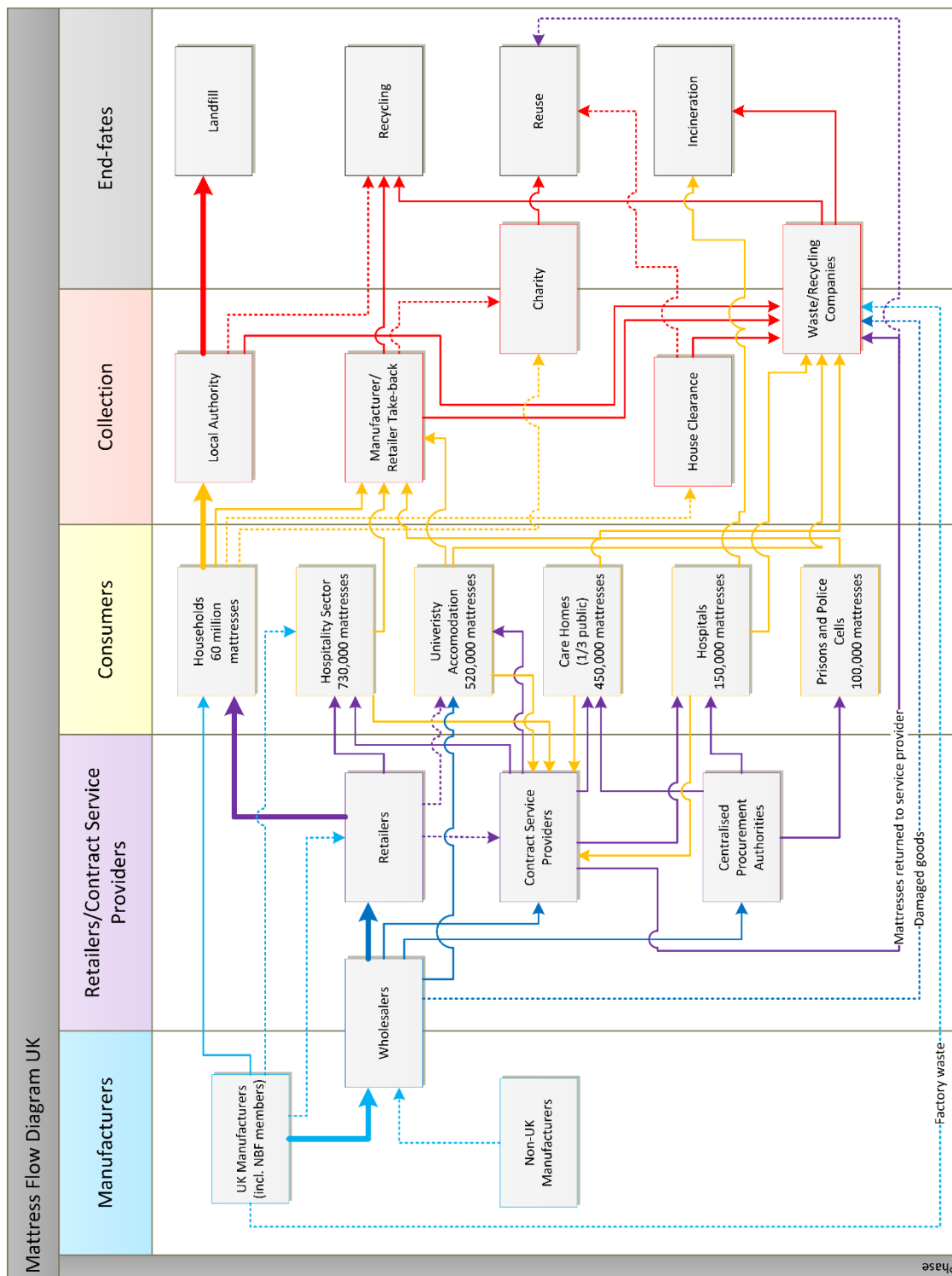


In Figure 3 the heavy arrows indicate the most important route of mattresses supply and disposal in terms of volume (i.e. through households and LAs to landfill), and thin and dashed arrows indicate intermediate and minor routes respectively. Other than this, no attempt

<sup>5</sup> The scale of reuse and remanufacturing is extremely small compared to recycling (<0.5%).

was made on this diagram to represent the relative size of mattress flows through the various routes.

Figure 3: Material flow diagram for mattresses in the UK



The derivation of the figures used for determining in-use mattress stocks is presented in Appendix I: UK stock of in-use mattresses. Using a bottom-up approach to identify and quantify this, it was estimated that 95 % of in-use mattress stock is in households. Though all in-use mattress stocks were covered (see also Appendix V: Overview of non-household mattress disposal) the research carried out in this study focused on households as having by far the largest in-use stock.

## 3.2 Research methods

The predominantly desk-based research on which this report is based was carried out between 15 February and 15 April 2016. In addition to original research, carried out as described below, relevant reports by Zero Waste Scotland (ZWS) and WRAP were also reviewed.<sup>6</sup> A full list of the publically available grey literature identified as part of this study is included in Section 6.

### 3.2.1 Commercial surveys

Online surveys tailored towards mattress manufacturers and retailers were produced and distributed to stakeholders on the NBF's mailing lists via email. The manufacturers were asked about the quantities of different mattresses they produce, what used mattresses they are involved in collecting and how the mattresses are treated and by whom. Retailers were asked similar questions but were also invited to estimate what proportion of their sales are replacement sales. The data on replacement rate, as it is used in calculating total replacement sales, is presented in Appendix II: Market data analysis, whilst the rest of the survey data is clearly laid out in Appendix IV: Analysis of commercial survey data.

### 3.2.2 Local Authority surveys

A survey designed to capture any recycling, or trials of mattress recycling, carried out by LAs was emailed as a Word.doc attachment to approximately 45 LA representatives. LAs that did not report recycling in the WasteDataFlow (WDF) database and that had relatively large populations were prioritised. In all surveys, but in the LA survey in particular, respondents were encouraged to provide estimates and partial data or even just indicate whether or not the mattresses are recycled. Even though only nine LAs completed the survey, there were 15 usable responses received in total, including email and telephone correspondence. The input from the LA surveys, combined with the analysis of the WDF database, is covered in detail in Appendix III: Local Authority data analysis.

### 3.2.3 Recycler interviews

Though a survey was developed for recyclers, it was not filled in by any of those contacted. Only one recycler responded via email with detailed responses to a short list of questions. The remaining recyclers were interviewed on the telephone or in person. The recycler interviews focused on their throughput and capacity, their clients and contracts, markets for their materials or arrangements with other recyclers, estimates for mattress weight,

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<sup>6</sup> Free mattress collection service from households for recycling (Accessed on 20/03/16 at [www.wrap.org.uk/sites/files/wrap/Collection%20of%20mattresses%20through%20bulky%20waste%20service.pdf](http://www.wrap.org.uk/sites/files/wrap/Collection%20of%20mattresses%20through%20bulky%20waste%20service.pdf)); A Business Case for Mattress Recycling in Scotland recycling (Accessed on 20/03/16 at [www.zerowastesotland.org.uk/sites/default/files/Report%20-%20A%20Business%20Case%20for%20Mattress%20Recycling%20\(MAP002-002%20Nov%202012\)\\_1.pdf](http://www.zerowastesotland.org.uk/sites/default/files/Report%20-%20A%20Business%20Case%20for%20Mattress%20Recycling%20(MAP002-002%20Nov%202012)_1.pdf)); Carpet and Mattress Recycling at HWRC Sites (Accesses on 20/03/2016 at [www.wrap.org.uk/sites/files/wrap/HWRC%20Guide%20recycling%20carpets%20and%20mattresses.pdf](http://www.wrap.org.uk/sites/files/wrap/HWRC%20Guide%20recycling%20carpets%20and%20mattresses.pdf))

estimates for how many mattresses can be manually deconstructed in a day, challenges and trends in the market and any other issues that affect them now and in the future.

### 3.2.4 Other data sources

#### **Eurostat**

Mattress-specific data for the years 2009-14 inclusive was downloaded from the PRODCOM and COMEXT databases on 16 February 2016. In these databases, information on production and trade data in the EU are compiled and country- and product-specific data extracted. The full description of the analysis of this data is included in Appendix II: Market data analysis.

#### **WasteDataFlow**

WDF is the web-based database that UK LAs use to report their municipal waste data to the UK government.<sup>7</sup> The publicly available data was downloaded on 22 February 2016 and all mattress-specific data collated and interrogated. Described fully in Appendix III: Local Authority data analysis, the methodology employed captures all the reported recycling and reuse reported by LAs between 2009 and 2014, inclusive. The 2015 data available was incomplete and was unsuitable for use in the calculation of a recycling rate.

### 3.2.5 List of assumptions

In deriving the headline figures we made the following key assumptions:

- The average weight of an EoL mattress disposed of in the UK is 25 kg (see Appendix VII: Average mattress weight estimates).
- The number of EoL mattresses disposed of annually in the UK is equal to the number of mattresses sold to replace an existing mattress.
- 93.5 % of mattresses bought in the UK are bought to replace disposed of mattresses (see discussion starting on Page 20 in Appendix II: Market data analysis).
- The only recycling happening in the UK is that recorded in WDF or reported by the retailers and manufacturers that participated in the survey.

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<sup>7</sup> [www.wastedataflow.org](http://www.wastedataflow.org)

## 4 Key findings

For further information on the research highlights presented here, refer to the detailed analyses and discussions contained in the Appendices.

### 4.1 UK overview of LA data

The data collected from LAs, predominantly from the WDF database, indicated that 820,000 mattresses left at CA sites or collected through bulky collection services were reused or recycled in 2014; 20 % higher than in 2013.

Of these 820,000 recycled mattresses, 94 % are left at CA sites and 6 % are collected through bulky or kerbside collections run by the LAs or their contractors.<sup>8</sup> If the mattresses are to be recycled, they are collected separately at the CA site, instead of being mixed with other bulky and residual waste, and ideally kept in a container or covered skip to keep them dry.

Obtaining an estimate for the proportion of mattresses sent to incineration with energy recovery was an additional objective of this research. The surveys of LA representatives and an interview with a large waste management company representative enabled us to produce an estimate that 13 % of non-recycled mattresses are currently incinerated with energy recovery.

Data quality (and accuracy) in the WDF database is maintained by the Environment Agency. Nevertheless, it is important to ensure consistency in the definition of recycling across regions and LAs. It was suggested by one recycler that most of the recycling reported in WDF in its region did not correspond to material or product recovery, as defined on Page 5, but rather the pre-treatment of the mattresses (shredding) with 100 % of the combustible material being sent for treatment with energy recovery. Differences in how 'recycling' is defined could contribute to the large regional differences in recycling rate discussed in the following section.

### 4.2 Regional breakdown of LA data

The recycling rates, or reported recycling rates, in different regions in UK are extremely variable. Only two of the 32 Scottish LAs report mattress recycling or reuse in WDF, whereas there is recycling reported in over 18 of the 22 Welsh LAs.

The availability of good quality local recyclers was identified in the LA surveys as the greatest barrier to recycling after cost constraints. In the map of recycling rates overlaid with recycler information (Figure 4) there does seem to be a correlation between mattress recycler availability and recycling rate: the Northwest and Wales with high recycling rates also have a high concentration of recyclers, whilst there are no recyclers and very low recycling recorded in the East Midlands and Eastern England.

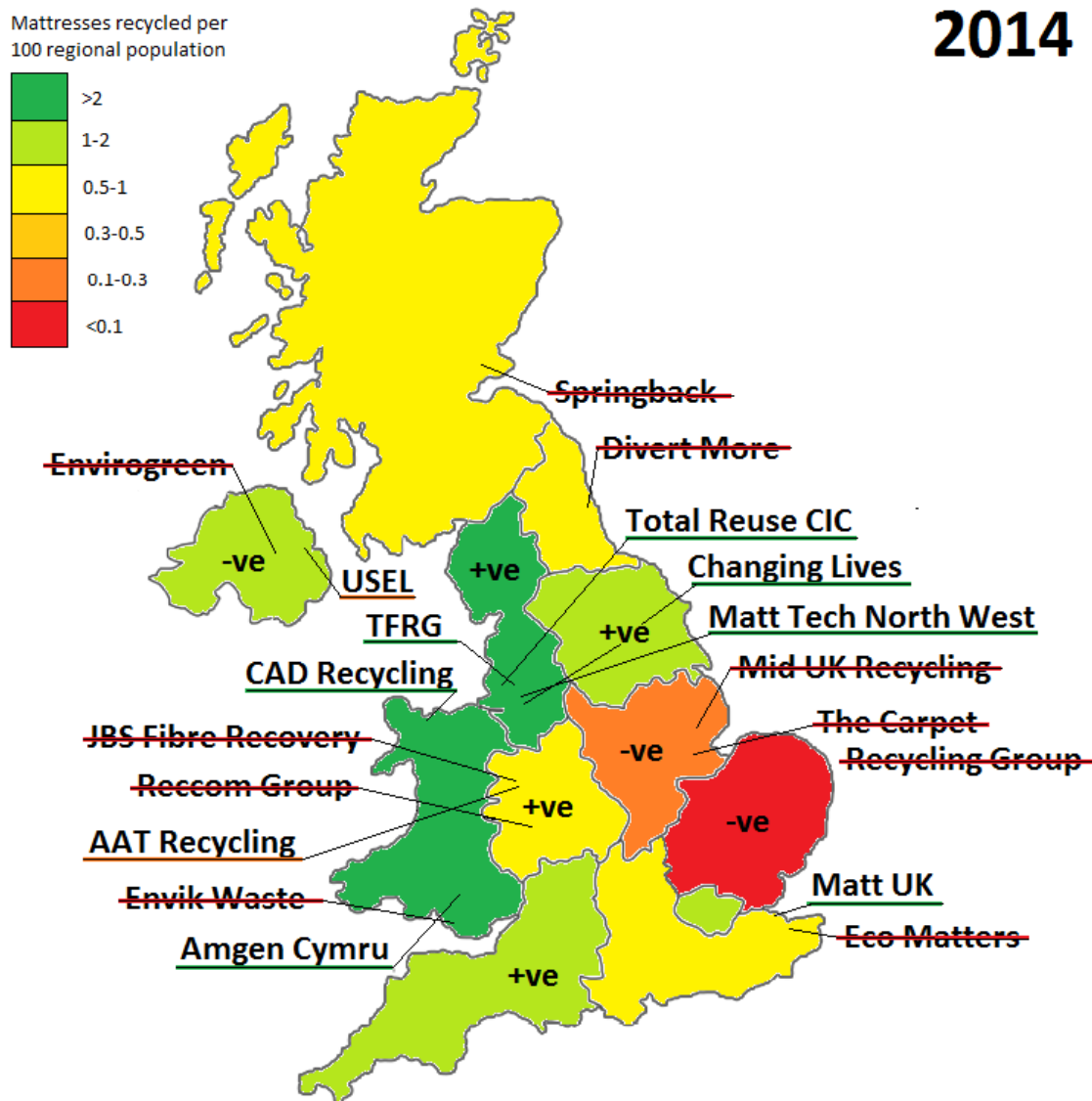
Understanding the reasoning behind the approaches of different LAs to mattress recovery and disposal - including legislative and financial pressures - is key to establishing best-practice and improving the life cycle environmental impact of mattresses in the UK. The correlation between local recycler availability and recycling rate would suggest that establishing new or supporting existing recycling infrastructure is a pre-requisite for any

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<sup>8</sup> There are also a small number of mattresses (0.4%) from commercial or 3<sup>rd</sup> sector establishments that are disposed of through the LAs.

meaningful improvements in a region’s recycling rate. Where facilities exist, EfW is an alternative cost competitive treatment option for LAs wanting to divert mattresses from landfill.

Figure 4: Summary of regional variation in mattress recycling overlaid with information of no-longer operational (red strike-through), established (green underline) and emerging (orange underline) mattress recyclers. Regions with large increases or decreases in recycling between 2013 and 2014 have been indicated (+ve/-ve).



Note: Only the headquarters are indicated on the map; some recyclers have multiple sites.

### 4.3 Mattress disposal from commercial sources

The response of retailers and manufacturers to the online survey was much higher than in the previous study (i.e. 48 usable responses up from 27). This in itself is some indication that interest in recycling in the sector is growing. This interest could merely be an appreciation that EoL mattresses are an issue that is relevant to them, or it could be driven by customer interest in recycling services, or it could stem from their own experiences of facilitating

mattress recycling for their customers. The 2014 and 2015 data collected in the survey are summarised in Table 2.

*Table 2: Mattress recycling reported by manufacturers and retailers in the survey only*

	2014 (units recycled)	2015 (units recycled)	% change (2014 to 2015)
<b>Manufacturers</b>	67,000	80,600	20%
<b>Retailers</b>	50,900	83,300	64%
<b>Total</b>	<b>117,925</b>	<b>163,937</b>	<b>39%</b>

*Note: The manufacturer data presented here is the sum of that reported in the survey and prison mattress recycling.*

The surveyed retailers predominantly sell mattresses directly to households, and this is where over 99 % of their EoL take-backs originate. Surveyed manufacturers, on the other hand, sell over 95 % of their mattresses to retailers and wholesalers but their take-back rate in this sector is only 1 %.<sup>9</sup> The take-back rate from the hospitality sector, to which the manufacturers sell 4 % of their products directly, is much higher at 30 %. This high take-back rate is attributed to hospitality establishments procuring from the manufacturer the 'service' of mattresses, including their disposal, rather than just the products. This procurement strategy, increasingly being used by large hotel chains, is a driving force for mattress recycling in the sector.

The survey data also revealed that smaller retailers, or those involved in small scale take-back schemes, were struggling to procure mattress recycling services and were sending nearly 60 % of the mattresses they collect to landfill or incineration. Comments from survey participants indicate that cost, particularly stemming from transport to distant recyclers, is the primary barrier preventing them recycling. Concerns with used mattresses contaminating new mattresses in the delivery vans was also raised as a barrier to take-back schemes in general. Mattress bags sent to customers before the take-back/delivery date is one way that take-back scheme operators avoid this type of contamination.

<sup>9</sup> Take-back rate is the proportion of take-backs relative to sales

## 5 Conclusions and recommendations

### 5.1 Conclusions

The recycling rate of EoL mattresses in the UK in 2014 was 16 %. 88 % of these mattresses were recycled on behalf of LAs, with the remainder originating in the take-back schemes of retailers and manufacturers. Though the method for determining the recycling rate has been refined significantly since the last report, our conclusion that the upward trend in mattress recycling was still robust in 2014 is supported by strong underlying growth figures in both LA and commercial mattress recycling.

The lack of recycling facilities available locally has been identified as the main barrier to mattress recycling faced by both LAs and small retailers. The issue of recycler availability has been exacerbated by the recent closure of some major facilities in 2014 and 2015, due to the low commodity prices - including, but not limited to, steel and secondary textiles. Recyclers reported that they are especially struggling to find markets for the textiles they recover.

### 5.2 Recommendations

The recommendations below are those of the authors, and not necessarily representative of those of the NBF.

1. Create a forum, such as a trade association, in which stakeholders in mattress recycling, as well as mattress recycling companies, could promote and develop the sector. This might accelerate the uptake of good practice, strengthen B2B networks and increase adoption of externally accredited quality standards in the sector.
2. Develop independent audit processes for mattress recyclers alongside new quality standards for the processing of secondary materials.
3. Monitor and learn from international mattress recycling practices including the Extended Producer Responsibility schemes in France and some US states. Consider the effect a ban on the landfilling of mattresses would have on mattress recycling and energy recovery.
4. Improve the quality of available data through consistent reporting of mattress reuse and recycling in WasteDataFlow. Any new trade association could encourage recyclers to adopt standard data reporting protocols (*including weight*) of the mattresses they process and their output materials.
5. NBF could set a *landfill diversion* target as part of its developing Product Stewardship Programme. This would place an emphasis on what is required from policy makers and industry to reduce the continuing high level of landfill disposal.
6. Foam mattresses are a small segment of the UK market but present different waste management options and barriers to recycling. This issue could be included in future surveys.
7. Update this report in the second half of 2016 to capture the 2015 LA, trade and production data. This will allow for the impact of recycling facility closures on recycling rates to be assessed.



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([www.zerowastescotland.org.uk/sites/default/files/Report%20-%20A%20Business%20Case%20for%20Mattress%20Recycling%20\(MAP002-002%20Nov%2012\)\\_1.pdf](http://www.zerowastescotland.org.uk/sites/default/files/Report%20-%20A%20Business%20Case%20for%20Mattress%20Recycling%20(MAP002-002%20Nov%2012)_1.pdf))

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## Appendix I: UK stock of in-use mattresses

Census and other data sources were used to produce an estimate of the total stock of mattresses in the UK and in what type of establishments they reside. Based on the in-use mattress stocks identified below, we estimate that there are approximately 63.3 million mattresses in the UK, of which 95 % are in households.

Table 3: Total number of household mattresses in the UK

Region	Population	Number of bedrooms/mattresses
England and Wales	56,075,000	54,922,800 <sup>†</sup>
Scotland	5,295,000	5,186,200 <sup>‡</sup>
Northern Ireland	1,811,000	1,773,800 <sup>‡</sup>
<b>Total</b>	<b>61,370,000</b>	<b>60,109,000</b>

<sup>†</sup>2011 Census Data (CT0556 - Accommodation type (excluding caravans/temporary structures) by number of bedrooms by age by tenure)

<sup>‡</sup>Calculated assuming number of bedrooms per population is the same in Scotland and Northern Ireland as in England and Wales.

According to the 2011 census data in England and Wales there is nearly 1 (0.98) bedroom per inhabitant (Table 3). If this is scaled up to the whole of the UK, it equates to approximately 60 million bedrooms which, we have assumed, contain one mattress each.<sup>10</sup> Estimates for the number of mattresses in non-household sectors are summarised in Table 4. Thus, mattresses in households, account for approximately 95 % of the in-use mattress stock in the UK.

Table 4: Other commercial in-use mattress stock in the UK

Region	Approx. number of mattresses	% EoL mattresses disposed of similarly to those from households
<b>Serviced accommodation (hotels and B&amp;Bs)</b>	730,000	34% (hotels with fewer than 25 rooms) <sup>‡</sup>
<b>Care homes</b>	450,000	30% (7,300 care homes with fewer than 30 beds) <sup>†</sup>
<b>Student accommodation<sup>††</sup></b>	520,000	0 %
<b>Hospitals</b>	150,000	0 %
<b>Prisons</b>	100,000	0 %
<b>Caravans/mobile homes</b>	1,300,000*	0 %**
<b>Total</b>	<b>3,230,000</b>	

<sup>‡</sup> Melvin Gold Consulting Data for 2013 from [www.hotel-industry.co.uk/data/hotel-data-industry-size](http://www.hotel-industry.co.uk/data/hotel-data-industry-size)

<sup>†</sup>Quote from William Laing of LaingBuisson at <http://www.ft.com/cms/s/0/630d155c-86e7-11e5-90de-f44762bf9896.html#axzz45DmbBQ1W>

<sup>10</sup> We assume that any underestimation by not taking into account twin beds and bunk beds is offset by the fact that some census respondents may have counted rooms that are being used as offices, store rooms etc. as bedrooms.

†† [www.hesa.ac.uk/stats](http://www.hesa.ac.uk/stats) - there were approximately 494,000 students in the first year of an undergraduate or foundation degree in the UK. Though some of these will not live in university accommodation, others - including postgraduate students - will.

\*2010 estimates by KPMG (reported at [www.ion.icaew.com/Tourismandhospitalityblog/post/Challenges-remain-for-the-caravan-and-holiday-parks-sector--says-KPMG](http://www.ion.icaew.com/Tourismandhospitalityblog/post/Challenges-remain-for-the-caravan-and-holiday-parks-sector--says-KPMG)) and assuming one mattress per motor home and touring caravan and two mattresses per mobile home.

\*\*Though approximately 80% of the mattresses are in privately owned caravan-type vehicles these mattresses generally do not enter the waste stream along with those from households because caravans are generally disposed of through caravan dismantlers/breakers.

The mattresses in smaller hotels (B&Bs in particular), as well as from small independent care homes, are typically disposed of in a similar manner as the EoL stock from households. The primary mattress recovery/disposal routes for households and these smaller enterprises will be LA kerbside collection or recycling sites, retailer take-back schemes, house clearance companies and charities. Larger commercial enterprises including hospitals and large hotel chains are more likely to procure the services of waste management companies, use contract beds, or arrange manufacturer- or retailer-facilitated take-back of EoL mattresses with the purchase of new products.

## Appendix II: Market data analysis

Market data for the UK annual production and sales of mattresses were obtained from two Eurostat databases managed by Eurostat:

- PRODCOM, in which estimates of product sales by manufacturers are recorded, and
- COMEXT, in which intra- and extra- European trade statistics are recorded.

By adding the number of mattresses imported to those manufactured in the UK and subtracting those exported, an estimated of the annual sales of mattresses is obtained.

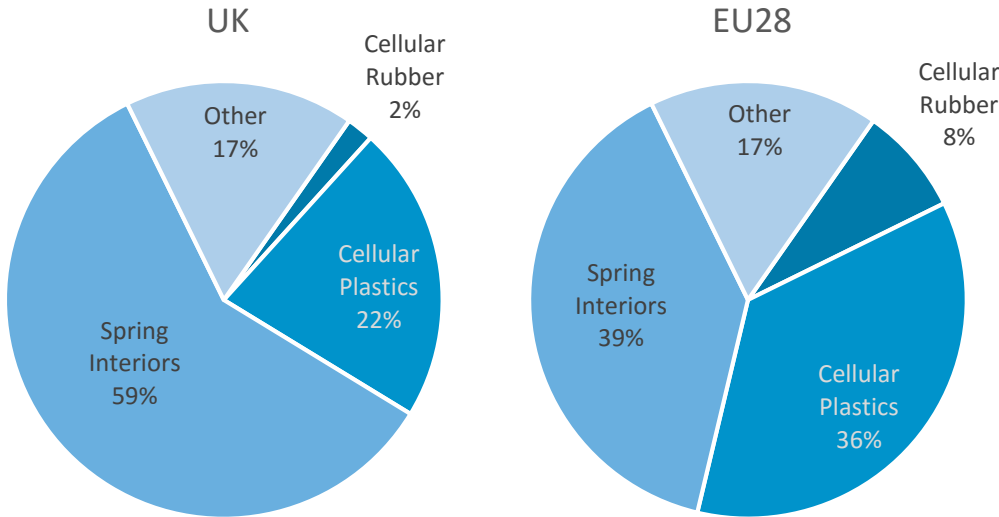
### PRODCOM production data

The PRODCOM database contains information on the quantities of units and value of mattresses produced in the UK and other EU Member States. There are four categories of mattress in the database:

- Mattresses of cellular rubber (including mattresses with a metal frame).
- Mattresses of cellular plastics (including mattresses with a metal frame).
- Mattresses with spring interiors (excluding mattresses of cellular rubber or plastics).
- ‘Other’ mattresses.<sup>11</sup>

A greater proportion of mattresses manufactured in the UK are sprung mattresses than is true for the EU-28 overall (Figure 5).

Figure 5: The type of mattresses sold by manufacturers in the UK and the EU-28 in 2014



The PRODCOM data were interrogated to obtain an average value per unit in each of the different mattress categories. This is needed for converting the import/export data in COMEXT from value into number of units.

<sup>11</sup> Mattresses (excluding with spring interiors, of cellular rubber or plastics); PRODCOM 2012

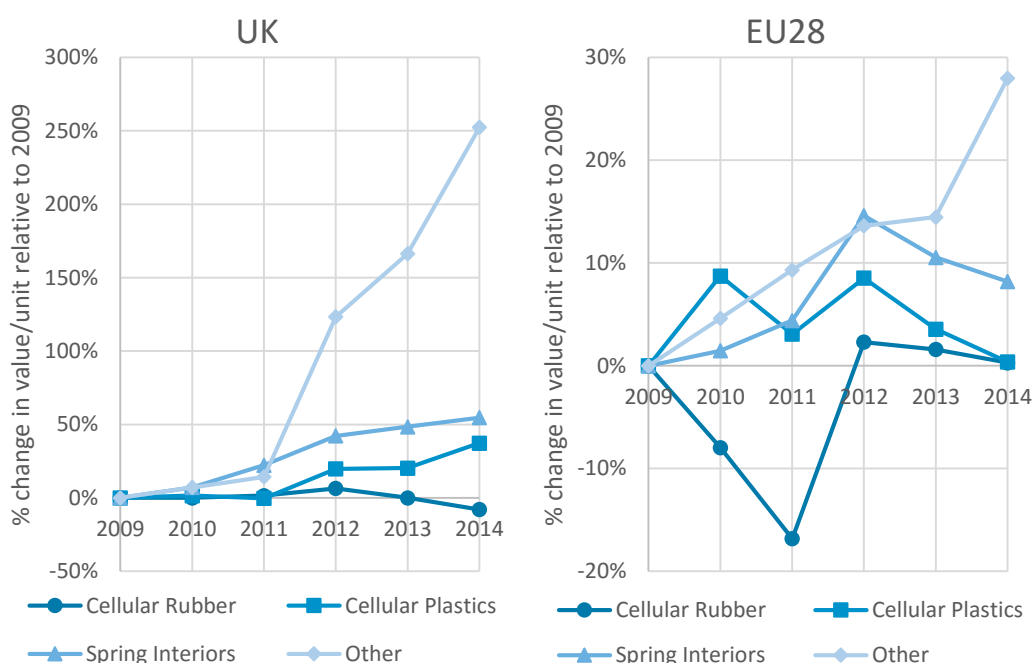
The average value per unit of each type of mattress in the UK and the EU-28 overall is listed in Table 5. Even though only 11 % of mattresses manufactured in the EU-28 in 2014 were from the UK, they represented 14 % of the market by value.<sup>12</sup>

Table 5: PRODCOM average unit values by mattress type (2014)

PRODCOM code	Mattress type	Average unit value EU-28 (€)	Average unit value UK (€)
3103-1230	Mattresses of cellular rubber	81	135
3103-1250	Mattresses of cellular plastics	70	41
3103-1270	Mattresses with spring interiors	99	138
3103-1290	Other mattresses	59	71

The average value of a UK manufactured mattress is 6 % higher than that in the EU as a whole. Mattresses with spring interiors and those classed as ‘other’ have seen the strongest increase in value since 2009 (Figure 6). One explanation for the exceptional increase in the value of mattresses classed as ‘Other’ in the UK between 2009 and 2014 (Figure 6) is inconsistent allocation of mattresses to the category.

Figure 6: Evolution, since 2009, of the value of manufactured mattresses in the UK compared to in the EU overall<sup>13</sup>



<sup>12</sup> This hasn't always been the case: between 2009 and 2011 the value of UK manufactured mattresses was lower than the EU-28 average.

<sup>13</sup> Production quantity data for the UK were not available in 2009, 2010 and 2013 for cellular rubber mattresses and in 2010 for ‘other’ mattresses. The available data were extrapolated to fill in these data gaps.

**COMEXT trade data**

The COMEXT trade data provide information on the value of mattresses imported and exported to the UK, in euros (€) but not in units. To convert from value to number of units the value per unit derived from the PRODCOM analysis is used.<sup>14</sup>

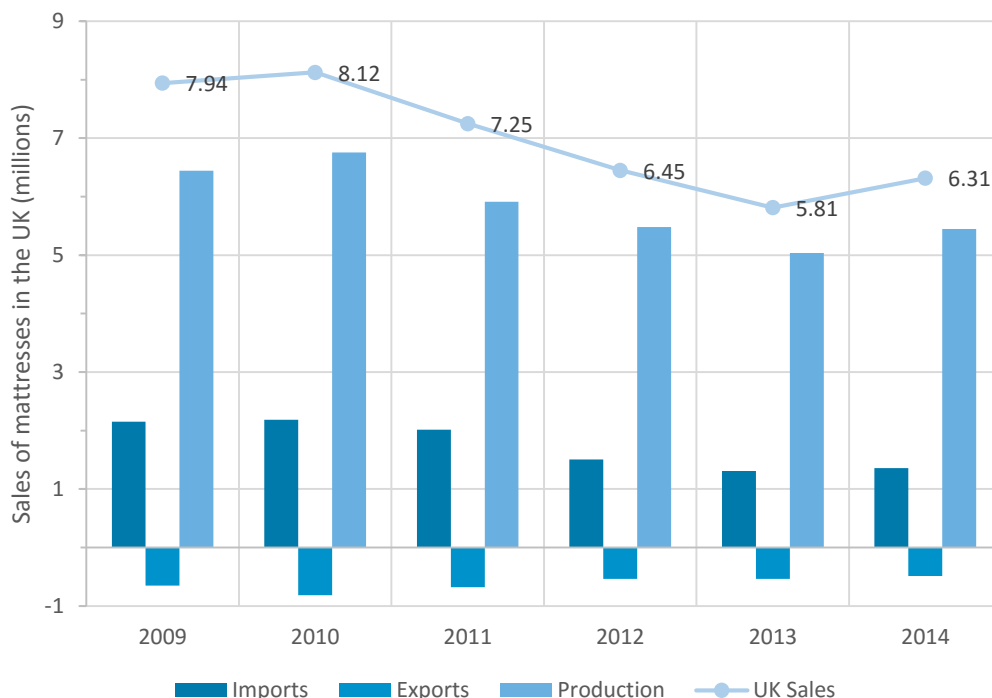
Table 6: COMEXT trade data for UK mattress imports and exports (2014)

	Total Imports	Total exports
<b>Value (€)</b>	84,563,250	40,706,820
<b>Units</b>	1,359,212	489,136

Half the mattresses exported by the UK between 2009 and 2014 were classed as ‘other’, whilst a third were sprung mattresses. The breakdown of imported mattresses more closely mirrors that of mattresses produced in the UK.<sup>15</sup>

Total UK mattress sales (Figure 7) were approximately 6.3 million in 2014. 22 % of these sales were of imported mattresses. The proportion of sales due to imported mattresses has decreased over this period by, on average, 4 % per year.

Figure 7: The sales of mattresses in the UK between 2009 and 2014



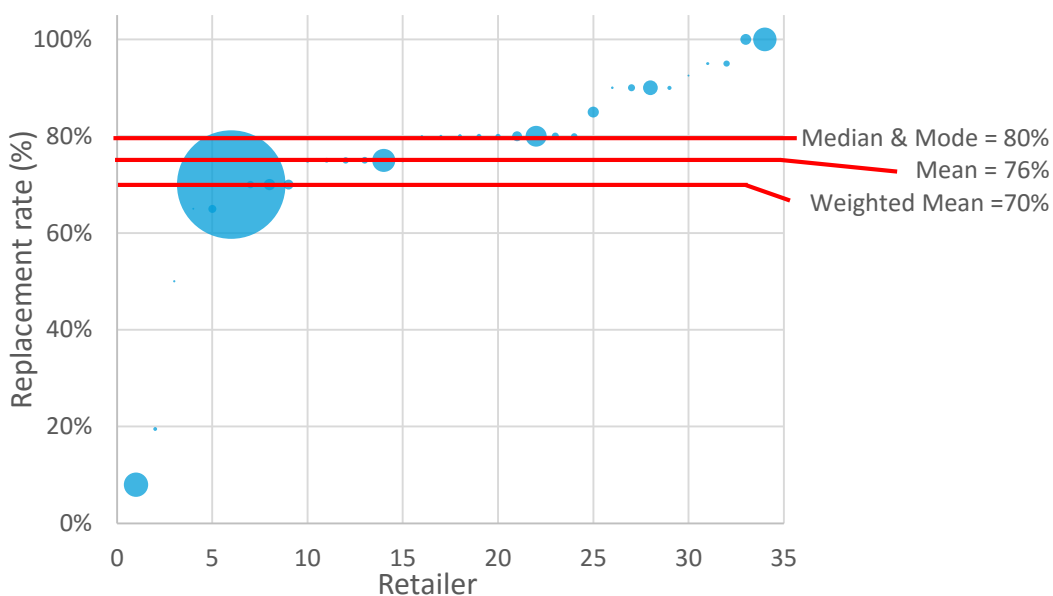
<sup>14</sup> The value per unit used will be based on UK data, and will be different depending on the year and category of mattress.

<sup>15</sup> Imports (2009-2014): 4% cellular rubber, 25% cellular plastic, 49% sprung, 22% other. Exports (2009-2014): 3% cellular rubber, 15% cellular plastic, 32% sprung, 50% other. UK production (2009-2014): 1% cellular rubber, 23% cellular plastic, 60% sprung, 15% other

### Replacement Rate

In order to estimate a mattress recycling rate we can assume that the number of mattresses disposed of annually in the UK is equal to the number of mattresses sold to replace an existing mattress. Due to home building<sup>16</sup>, a growing population<sup>17</sup> and other factors, there is a proportion of mattress sales that are not replacement sales. In the NBF's 2015 end of life mattress survey the replacement rate was estimated to be 80-85 %. In this iteration of the work we wanted to improve on this estimate. To this end, in the survey of retailers carried out as part of this work, contributors were also asked to estimate what proportion of their sales (to households) were replacement mattress sales. The sample of retailers that responded to this question (Figure 8) represents approximately 354,000 mattress sales per annum, 85 % of which is due to one large retailer.<sup>18</sup>

Figure 8: Retailers' estimates of the proportion of their sales that are to replace an EoL mattress. Size of bubble indicates the number of mattresses sold by each respondent in 2014.<sup>19</sup>



Depending on whether the responses were treated equally or weighted according to the number of mattress sales, the mean replacement rate as estimated by retailers was either 70 % or 76 %. The median and mode of this data set was 80 %. In market research carried

<sup>16</sup> According to UK government statistics approximately 145,000 new dwellings were completed in the UK in 2014.

<sup>17</sup> According to the World Bank the population of the UK is growing at a rate of 0.6% (2014) which is approximately equal to 404,000 extra people per year.

<sup>18</sup> The mattress retail market is extremely fragmented with only approximately a quarter of sales originating from large national retailers. In this respect the sample that responded to the survey is fairly representative of the market.

<sup>19</sup> Median = the middle number when the data set is ordered from smallest to largest, Mode = value that occurs most, Mean = average where each respondents estimate is equally weighted, Weighted mean = average where the respondents estimate is weighted according to the number of mattresses they sell.

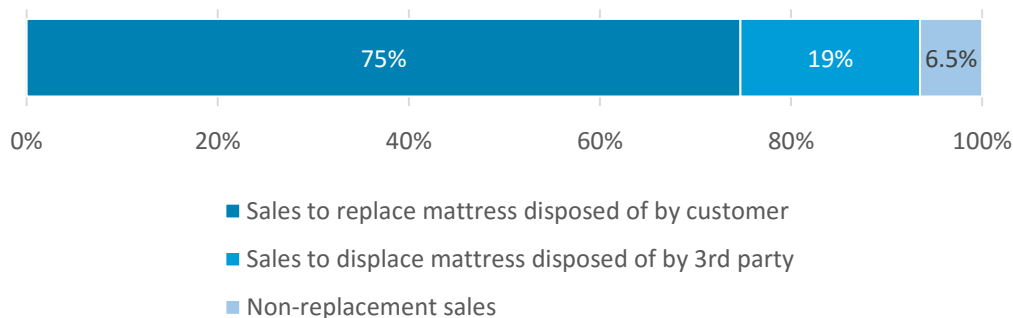


out on behalf of the NBF, the proportion of new mattress sales that were to replace existing mattresses was reported to be 90%.

Only around 394,000 of mattress sales are due to genuinely new demand resulting from the population growth the UK is currently experiencing.<sup>20</sup> The only non-household sector where there is evidence of new demand is hospitality where there were approximately 16,000 new rooms available in 2015.<sup>21</sup> This brings the estimate of annual non-replacement mattress sales to 410,000, or 6.5 % of the total sales in the UK.

In looking for an explanation for the discrepancy between this and the replacement rate quoted by retailers and in market surveys we looked at the number of mattresses that might be bought to replace a unit disposed of by a third party. Instances where this might happen include where a house is cleared before sale but the occupiers do not take the furniture with them either due to death, that they're getting rid of a second home, the suitability of the property they're moving into or 'other'. We estimate that approximately 440,000 houses with an average of 2.7 mattresses each are cleared before sale per year.<sup>22</sup> This accounts for approximately 19 % of UK mattress sales.

Figure 9: Proportion of mattress sales that are replacement sales



The breakdown of mattress sales into replacement and non-replacement units is summarised in Figure 9. For the calculation of the recycling rate, only the overall replacement rate - not the breakdown between whether the EoL mattress was disposed of by the customer or a third party - is important. In Table 7, the number of mattress replacement sales is reported, based on the estimate of the replacement rate described above and the 2013 value contrasted to that derived in the previous report. Differences in the methodologies mean that the replacement sales derived in this report are 20 % higher than in the previous report.

<sup>20</sup> We have estimated that 394,000 mattress sales are due to new demand from households: 391,500 assuming there is 0.98 mattresses per additional person in the UK or 396,000 assuming there were 2.7 mattresses per new dwelling built in the UK.

<sup>21</sup> Leisure and hospitality: Hotel Britain 2015, The Guide to the Performance of Hotels in the UK; BDO (April 2015)

<sup>22</sup> No statistics on the reason for house sales were found, as such the 440,000 figure is a very rough estimate. Approximately 440,000 people over the age of 70 die each year in the UK and there are other types of houses where mattresses will be disposed of upon sale including second homes.

Table 7: Statistics for UK mattress replacement sales

	2013 (old report)	2013	2014
<b>UK total sales</b>	5,492,649	5,811,030	6,314,680
<b>Replacement rate</b>	80-85%	93.5%	93.5%
<b>Replacement sales</b>	4,534,435	5,107,320	5,904,226

Source: PRODCOM and COMEXT databases and estimated replacement rate

## Appendix III: Local Authority data analysis

WasteDataFlow (WDF) is a web-based system for UK local authorities to report municipal waste data to the UK government. This data, along with supplementary information provided by individual LAs in response to the survey, was used to evaluate the end fates of mattresses disposed of, primarily by households, through LA recycling sites and kerbside collection schemes.

### **WDF methodology**

The WDF information used in this analysis was downloaded on 22 February 2016. The answers to questions 10, 12, 16, 17, 19 and 100 were downloaded for every LA across England, Wales, Northern Ireland and Scotland for the period 2010 to 2015 inclusive.

In these questions, LAs report, in tonnes, the quantities of mattresses either:

- Collected through kerbside schemes from household sources by LA or its contractors.
- Collected through kerbside schemes by non-contracted voluntary/community organisations.
- Collected for recycling/reuse at CA Sites operated by LA or its contractors.
- Collected from commercial, industrial or other non-household sources by LA or its contractors.

Also recorded in this database is whether the mattresses collected for reuse or recycling were actually ultimately rejected (disposed of). Finally, a relatively new question (Q.100) allows LAs to record the end destinations of the materials collected, as well as intermediary movements between treatment and processing points. However, only a few LAs seem to have completed this question with enough detail for it to be of use in this study.<sup>23</sup>

2015 data, especially that from the second quarter onwards, were only partially complete and thus not usable in this analysis. Though LAs are required to submit their waste statistics using WDF to the Environment Agency (or the equivalent Welsh, Scottish or Northern Irish equivalent body) within 1-3 months (depending on region) of the quarter's end, subsequent auditing and validation can further delay the publication of the data by another six months.

### **Survey methodology**

Local Authorities not reporting mattress recycling in the WDF database were targeted with a survey. Particular attention was given to those representing the largest populations. This survey covered: whether the LA was involved in mattress recycling; what quantity of mattresses are dealt with; the sources of the mattresses; whether the LA is involved in kerbside collection; how the mattresses are disposed and whether it is through a third party; and whether there are any further comments or information to share. The period covered by the survey was financial years 2014/15 and 2015/16, or calendar years if preferred by the respondent.

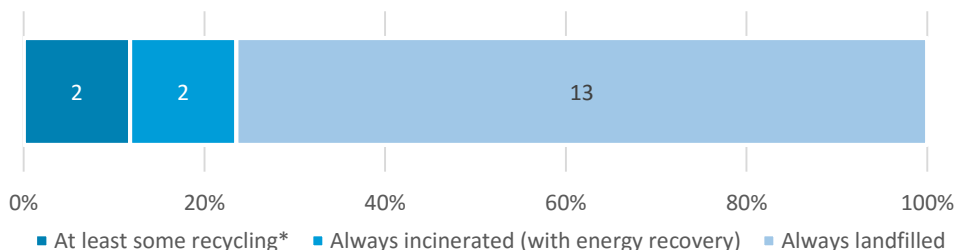
19 out of the 47 LAs surveyed responded with at least some information. There were two LAs that had carried out at least some recycling in 2014-2015, two that indicated that all

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<sup>23</sup> From the Welsh LA responses to Qu 100, a number of recyclers and other mattress disposal routes were identified.

their mattresses are processed and sent for incineration with energy recovery, thirteen that indicated that all their mattresses are sent to landfill, and two unusable responses.

Figure 10: End fates of mattresses reported by surveyed local authorities.\* This recycling was already reported in WDF.



The information provided through the survey was incorporated with the WDF analysis. Survey responses from Waste District Authorities (WDAs) were used to replace or supplement the information in WDF provided by the Borough Councils they represent.

### National overview of the Local Authority data analysis

Table 8 summarises the analysis of the WDF database and LA survey responses combined.<sup>24</sup> The conversion between tonnes and units of mattresses is dependent on a conversion factor. Justification for the 25 kg/mattress assumed here is included in Appendix VII: Average mattress weight estimates.<sup>25</sup>

Table 8: Summary of mattress recycling reported by Local Authorities

	2010	2011	2012	2013	2014
<b>No. of LAs covered (WDF and survey)</b>	47	74	91	94	104
<b>Population represented</b>	19,630,670	22,687,490	26,362,910	28,980,930	33,997,930
<b>% UK population represented</b>	31	35	41	45	53
<b>Total mattresses recycled (tonnes)</b>	3,652	8,626	13,041	17,168	20,535
<b>Total mattresses recycled (units)*</b>	146,061	345,042	521,642	686,713	821,383
<b>No. of mattresses recycled per 100 population</b>	0.23	0.54	0.82	1.08	1.30

\*Assuming 1 mattress = 25kg

Note: The recycling reported herein includes a small proportion of reuse; less than 0.5% of the total.

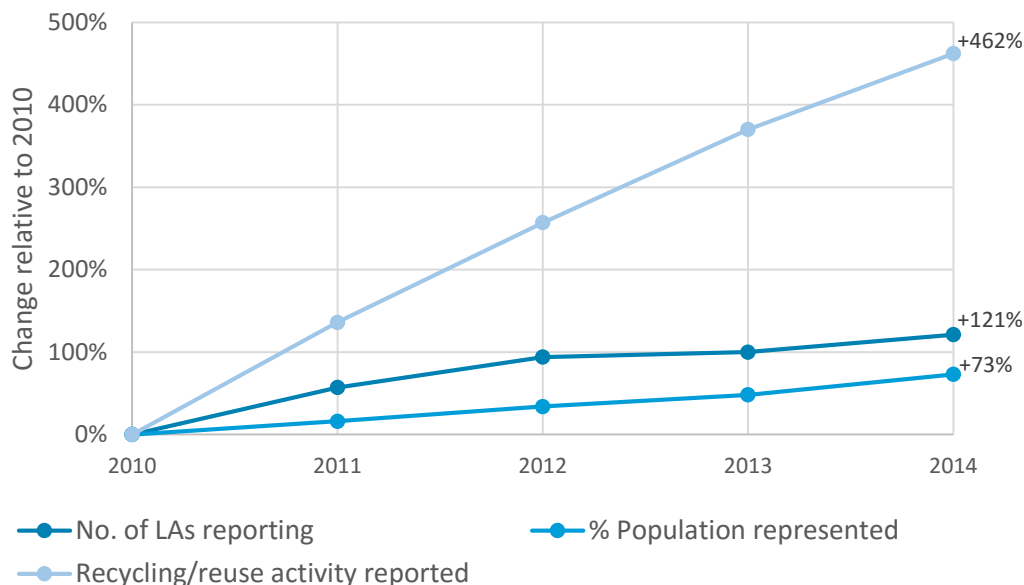
In the five years between 2010 and 2014, the increase in mattress recycling reported by local authorities has increased by over 450 % although the increase in the population of the LAs reporting this recycling only increased by less than 75 % (Figure 11). Of the mattresses

<sup>24</sup> The jump in number of LAs reporting covered between 2013 and 2014 is partially a result of the period covered by the survey

<sup>25</sup> In the previous report, 30kg/mattress was assumed.

recycled through LAs, 94 % are left at CA sites and 6 % are collected through bulky or kerbside collections run by the LAs or their contractors.

Figure 11: The change in recycling reported by local authorities between 2010 and 2015 relative to 2010



To scale up from the 53 % of the country (by population) represented in the WDF and survey analysis for 2014 to the whole country, we assumed that there was no other recycling than that recorded on WDF. This assumption is supported by the fact that none of the LAs contacted for the survey reported recycling unless they had already done so in WDF.

Of the mattresses passing through LA facilities that are not recycled, we estimate that 87 % go to landfill and 13 % to incineration with energy recovery. This estimate is based on three sources:

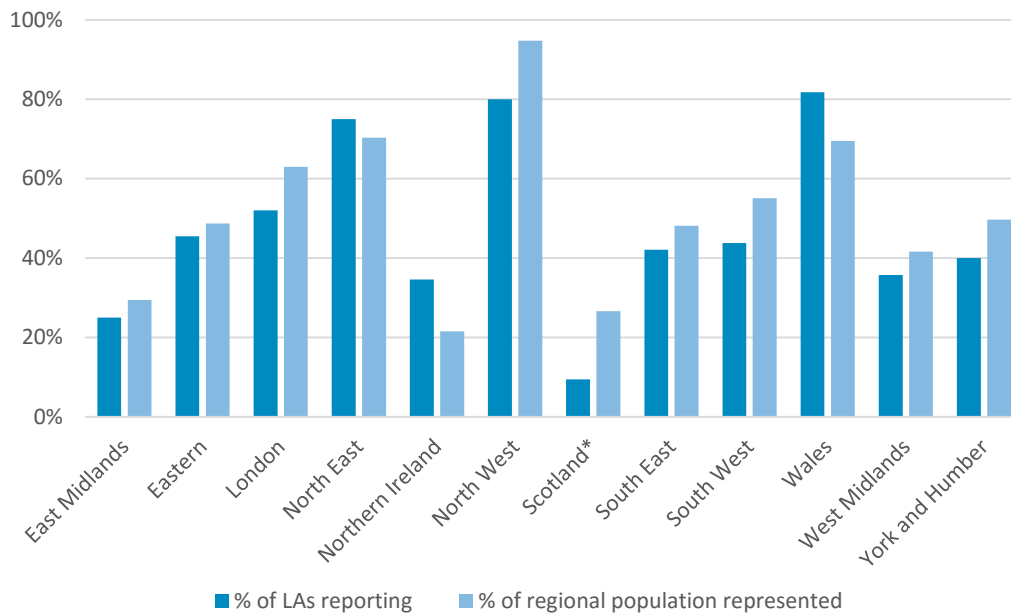
1. An industry expert (representing a large waste management company) estimated that 10-15 % of EoL mattresses in the UK that are not recycled, are incinerated with energy recovery.
2. Two out of the 15 (or 13 %) of the non-recycling LAs that responded to the survey disposed of mattresses through incineration with energy recovery.
3. 12 % of the take-back mattresses that were described as either landfilled or incinerated by surveyed retailers in 2014-2015 were, in fact, incinerated.

**Regional breakdown of the Local Authority data analysis**

The wide variation in regional mattress recycling rates and reporting was one of the key findings of the previous report. This is still very much the case in 2014 (Figure 12).



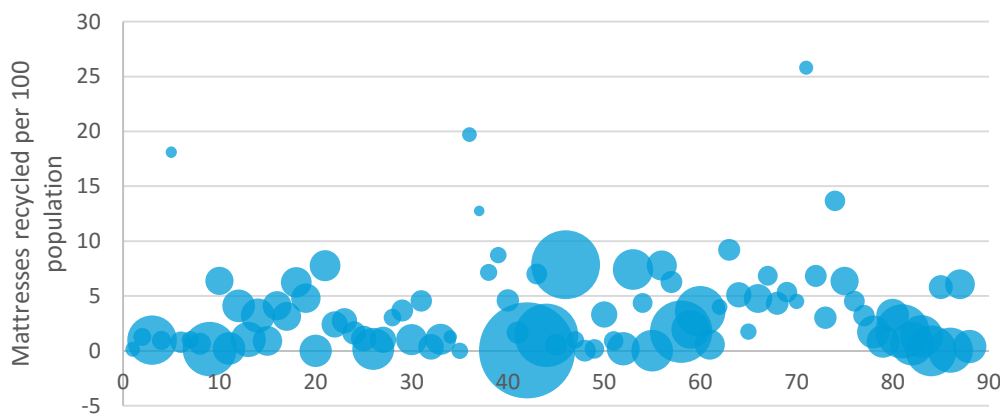
Figure 12: Regional variation in the number of population represented by the combination of WDF data and survey responses for 2014



\* Edinburgh City Councils' reporting of 752 tonnes of mattresses collected for reuse in 2014 is questionable.<sup>26</sup>

Of the 88 local authorities that reported mattress recycling in WDF in 2014, there is a huge variation in the number of mattresses recycled per 100 people (Figure 13). The weighted average number of mattresses recycled per 100 people in these local authorities is 2.6. Overall, there are 1.5 mattresses recycled per year for every 100 people in the UK.

Figure 13: Number of mattresses recycled per 100 in the population with the size of the bubble corresponding to the population of the reporting LA (2014)

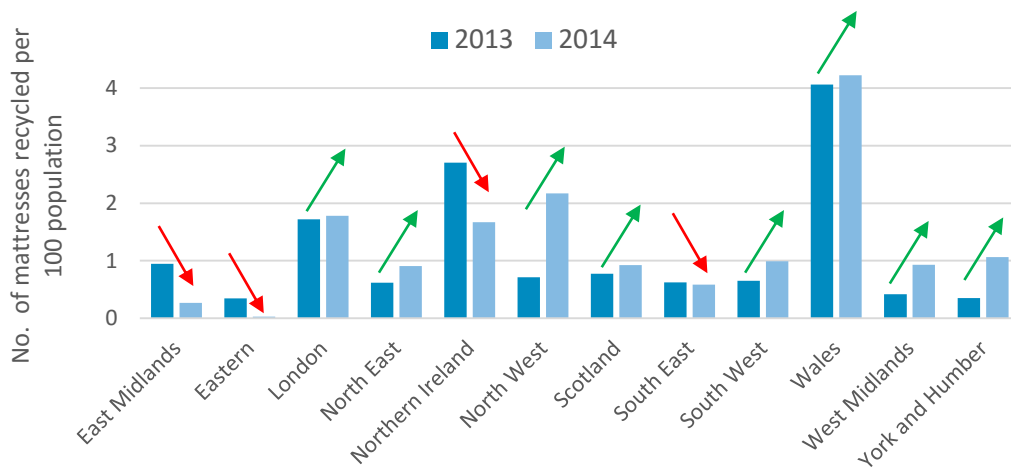


Some of the exceptionally high recycling rates in Figure 13 can be explained by the location of centralised LA ran recycling facilities that serve a larger area. Merthyr Tydfil County Borough Council has the highest recycling rate for its population (26 mattresses per 100

<sup>26</sup> We attempted to contact a representative from Edinburgh City Council for further comment but did not get a reply.

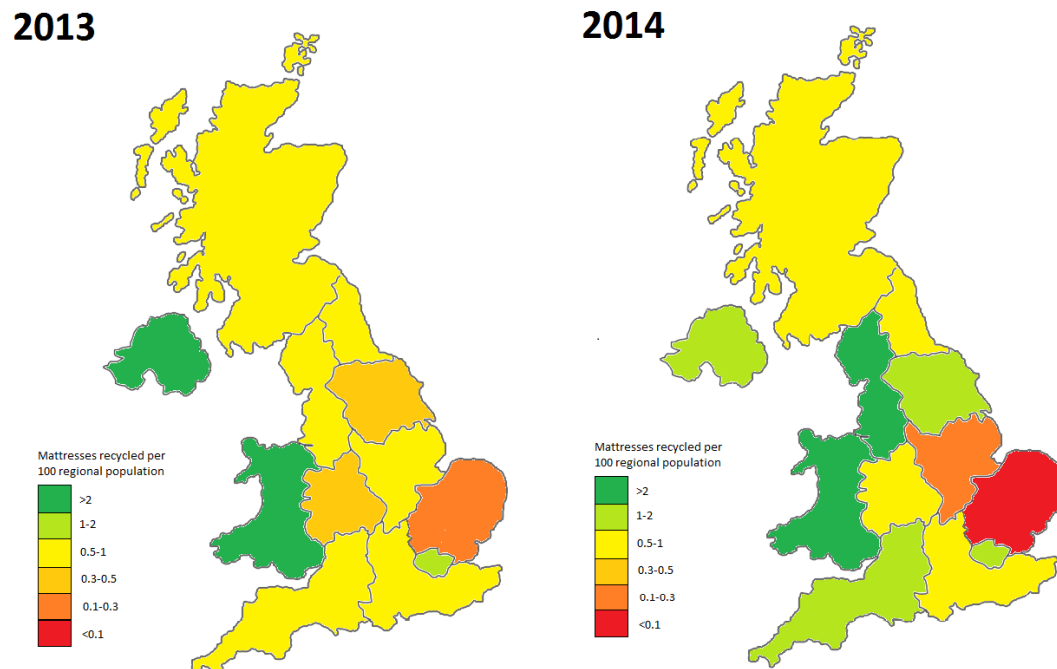
people) likely because it is relationship with Amgen Cymru, an LA-owned company carrying out mattress recycling located in the adjacent Rhondda Cynon Taf Borough Council (6 mattresses per 100 people). Another reason for exceptionally high recycling rates is that mattress recycling from multiple LAs, especially those within the same WDA, might all be allocated to only one LA for reporting purposes. Inconsistencies in WDF reporting practices such as this detract from the overall accuracy of the LA reported mattress recycling.

Figure 14: Regional mattress recycling rates (per 100 population) in 2013 and 2014.



Of the 12 UK regions, the mattress recycling rate had decreased in four and increased in eight (see Figure 14 and maps in Figure 15). Wales had by far the highest rate of mattress recycling recorded, whilst the Eastern part of England had the lowest.

Figure 15: Mattress recycling by UK region in 2013 and 2014



To better understand the regional differences depicted in Figure 15, and the reasons behind changes in the recycling rate between 2013 and 2014, we probed the comments and insights

of LA representatives contacted during the course of this research. The responses of LA representatives are listed in Table 9, but the main barriers to recycling identified can be summarised as:

- Cost, and the need to get the best value for public money.
- Transport, including costs of and issues with the types of vehicle preferred by recyclers.
- The availability of suitable local recyclers, complying with Environment, Health & Safety and other procurement requirements.

Table 9: Comments made by LA representatives on the type of barriers that prevent or limit their involvement in mattress recycling

Type of barrier	LA representative's comments
<b>Not segregated</b>	We don't count mattresses on CA sites, but some go to landfill, and others to scrap metal dealers if the site staff decide to strip the material from the springs. None go for incineration because the springs get caught in the moving grates within the incinerator.
<b>Not segregated</b>	We do not separate mattresses, so I'm afraid we do not have any information to provide. Mattresses are placed into the bulky waste stream, which is currently sent to landfill
<b>Quality</b>	The number of mattresses collected through our bulky waste collection service is recorded, though the mattresses are not recycled. I am told that the odd one of exceptional quality (which is rare) may be reused.
<b>Cost and availability of local recycler</b>	We currently no longer recycle mattresses as all proposals cost more than actual landfill. We used to use a social enterprise but they went out of business and alternatives were no longer cost effective. The social enterprise's demise meant a difficult decision was avoided as even their processing/recycling costs were about double landfill tax costs (approx. £180/t). And the current / future LA budget pressures meant we can only consider initiatives that are cheaper than landfill tax costs – including storage/transport/disposal/recycling.
<b>Lack of markets for recycled products</b>	It is not considered that markets for recycling mattresses are sufficiently well developed in the UK currently to make this a viable activity.
<b>Transport</b>	We have trialled mattress recycling more than once, in 2012 and then in 2014/15. We have since stopped mattress recycling because the haulage (moved to RoRo) made it much too expensive even though the recycling processor was very local in Bristol. Was more than the cost of landfill.
<b>Cost</b>	In 2012 there was a small trial of segregation of mattresses. Unfortunately, the cost of the trial was uneconomic to continue. The mattresses that are collected through the HRC sites are segregated from the residual household waste at the HRC sites as bulky waste and currently disposed of to landfill.
<b>Cost</b>	The cost of disposal is prohibitive as it's not significantly cheaper than landfill/energy from waste.
<b>Cost</b>	We have been seeking an alternative to landfill for mattresses for a number of years. However, we are yet to find a viable, affordable solution. All of the issues raised above – storage, transport, composition etc. – contribute to the cost per mattress (converted to



Type of barrier	LA representative's comments
	<p>cost per tonne for our purposes) for recycling ranging from unachievable to extravagant. As there is no suitable outlet for recycling, we have recently begun sending them for incineration with energy. Mattresses are not separated from residual bulky waste - the bay is undercover though so mattresses don't get wet. Decision made with waste management contractor, based around fact that in their particular case (possibly because of some subsidy/deal) EfW is now cheaper.</p>
<p><b>Availability of local recycler of sufficient quality</b></p>	<p>Having completed a number of due diligence visits of prospective mattress recyclers – none have passed on H&amp;S concerns regarding the processes. Lack of nearby compliant recycling processes precludes recycling on a cost basis – particularly with regard to haulage costs.</p>
<p><b>Availability of local recycler of sufficient quality</b></p>	<p>The mattress recycler we used stopped accepting mattresses in June 2015 so we are no longer using this facility and haven't been able to recycle mattresses. In February 2016 a test load was sent to a new facility identified but this is currently a trial in its infancy as we are having problems being able to meet their acceptable criteria in conjunction with our operational needs. The problem with the new mattress recycler is that we use walking floor vehicles and they ideally want hand loaded vehicles, but we do not have the staff capacity and have issues around the Health and Safety to load in this way.</p>

*Note: Only the last comment is from a LA that had some recycling in 2014.*

## Appendix IV: Analysis of commercial survey data

As part of this research, a set of survey questions was developed for mattress manufacturers and retailers as well as for mattress recyclers and LAs. The responses of LAs were to supplement and expand on the data recorded in the WDF database and are thus included in the previous Appendix. The survey format was also found not to be an effective way of contacting the recyclers (Table 10). Phone interviews and email were in general much more successful. The outcome of this part of the research is presented in full in Appendix VI: Overview of mattress recycling sector.

Table 10: Response rate to the surveys sent out<sup>27</sup>

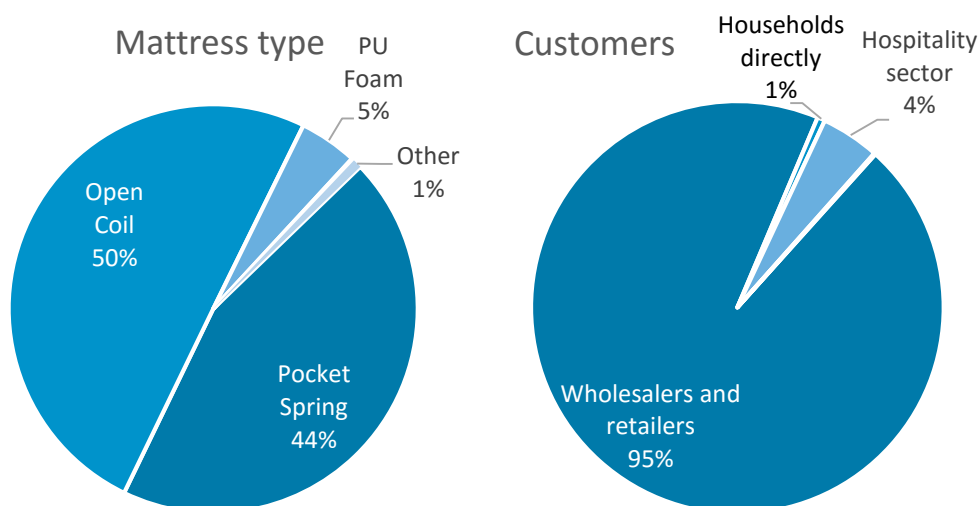
	Number of responses to surveys
<b>Manufacturers</b>	10
<b>Retailers</b>	40
<b>Local Authorities</b>	19
<b>Recyclers*</b>	1

\*In-person and telephone interviews were more effective for contacting recyclers than the survey.

### Manufacturer survey

The UK mattress sales of the 10 manufacturers that responded to the survey account for nearly 45 % of all the mattresses sold in the UK.<sup>28</sup>

Figure 16: The type of mattresses sold in the UK by surveyed manufacturers in 2015 and who those mattresses were sold to



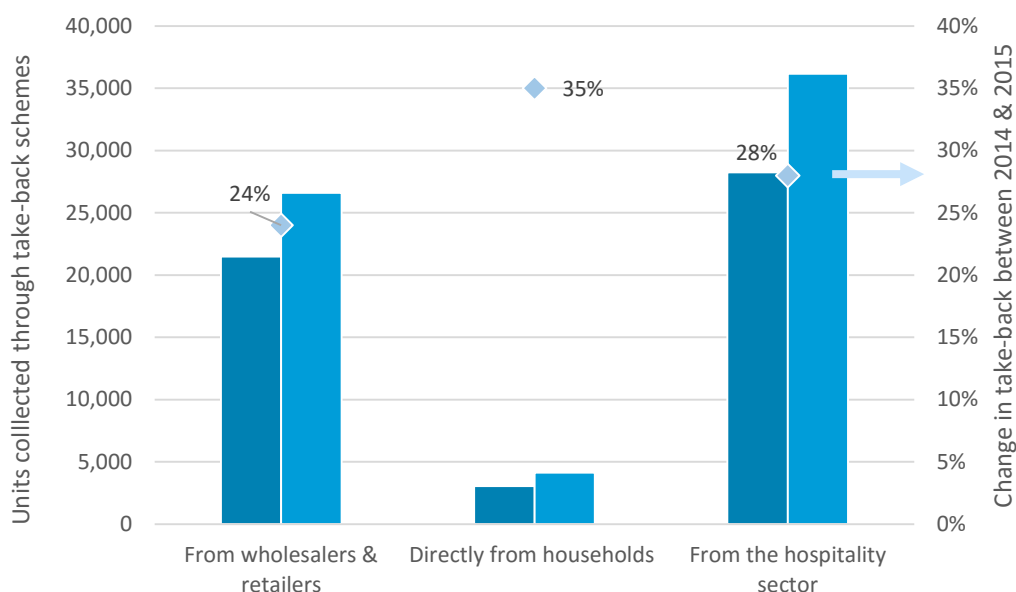
<sup>27</sup> Invitations to participate in the survey were emailed out by the NBF to their members (manufacturers) and the retailers on their mailing list.

<sup>28</sup> Only members of the NBF were surveyed, who, according to the NBF, represent 70-75% of UK production.

As part of this research the manufacturers were surveyed on the type and quantity of mattresses they manufacture, who they sell to, whether they are involved in the collection and disposal of used mattresses and, if so, how are these mattresses are disposed of.

The type of mattresses manufactured and who the mattresses are sold to did not change much between 2014 and 2015 for those manufacturers who responded to the survey. Only the 2015 data is presented in Figure 16. From a comparison to Figure 5, it is evident that manufacturers of sprung mattresses are over-represented in this survey.

Figure 17: Number of mattresses collected by manufacturers from various sectors in 2014 and 2015 and the percentage increase in take-backs in the period



Eight out of the 10 manufacturers surveyed stated that they dealt with the collection and/or disposal of used mattresses in 2014 and 2015. One of the non-recycling manufacturers cited concerns about unscrupulous sections of the trade reusing old springs and fillings, and insufficient control of the recycling sector in general, as a reason for their non-involvement.

For those manufacturers that are involved with the collection and/or disposal of used mattresses, the volumes of mattress collected per sector are shown in Figure 17. The total number of used mattresses dealt with by these manufacturers increased by 27 % from 52,800 in 2014 to 66,900 in 2015.

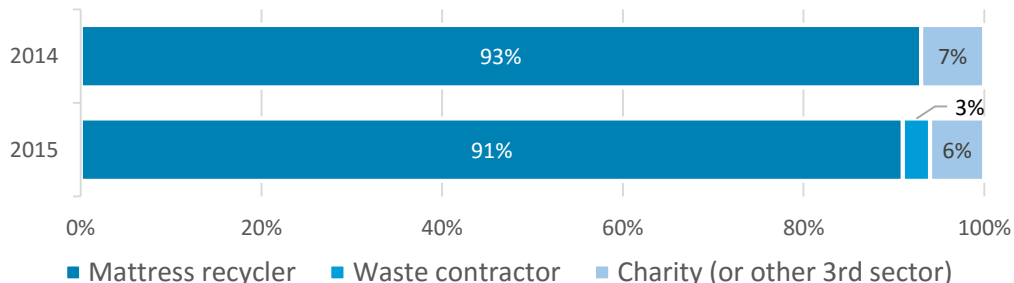
The overall take back rate (i.e. the number of mattresses collected divided by the total number sold) was low at only 2-3 %. However, there were large differences in the take-back rate in the various sectors, with take-back from wholesalers and retailers unsurprisingly, being much lower (1 %) than those from households (20 %) and the hospitality sector (30 %).<sup>29</sup>

The proportion of the collected mattresses ultimately recycled, on behalf of the manufacturers, was extremely high at over 90 % (Figure 18). This means that the total

<sup>29</sup> These figures correspond to the sales-weighted average take-back from only those 8 manufacturers involved in take-back schemes at all.

number of mattresses recycled by mattress manufacturers in 2014 was 49,100 (52,800 multiplied by 0.93).

Figure 18: Proportion of manufacture collected used mattresses that are recycled or otherwise

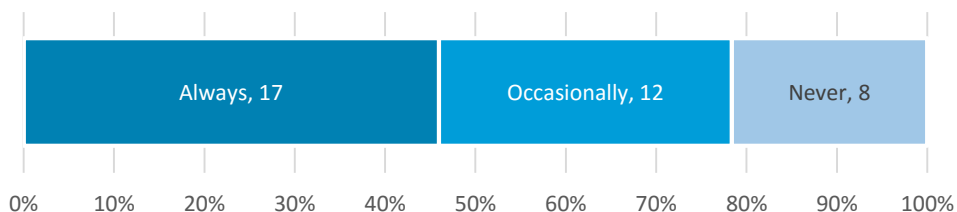


### Retailer survey

The online survey was completed (at least partially) by 40 mattress retailers, representing 485,820 mattress sales, or 8 % of the UK total. These retailers were primarily involved in selling mattresses to households: 92 % of the 2014 sales of the 35 retailers that answered this question were selling directly to households.

Over three quarters of the retailers that responded to the survey indicated that they collected or arranged the collection of used mattresses through take-back schemes (Figure 19) at least on occasion. Based on the surveys carried as part of this and the previous study, the proportion of retailers involved in take-back schemes does not seem to have changed between 2013 and 2014/15.

Figure 19: Disposal route of mattresses collected through retailer take-back schemes

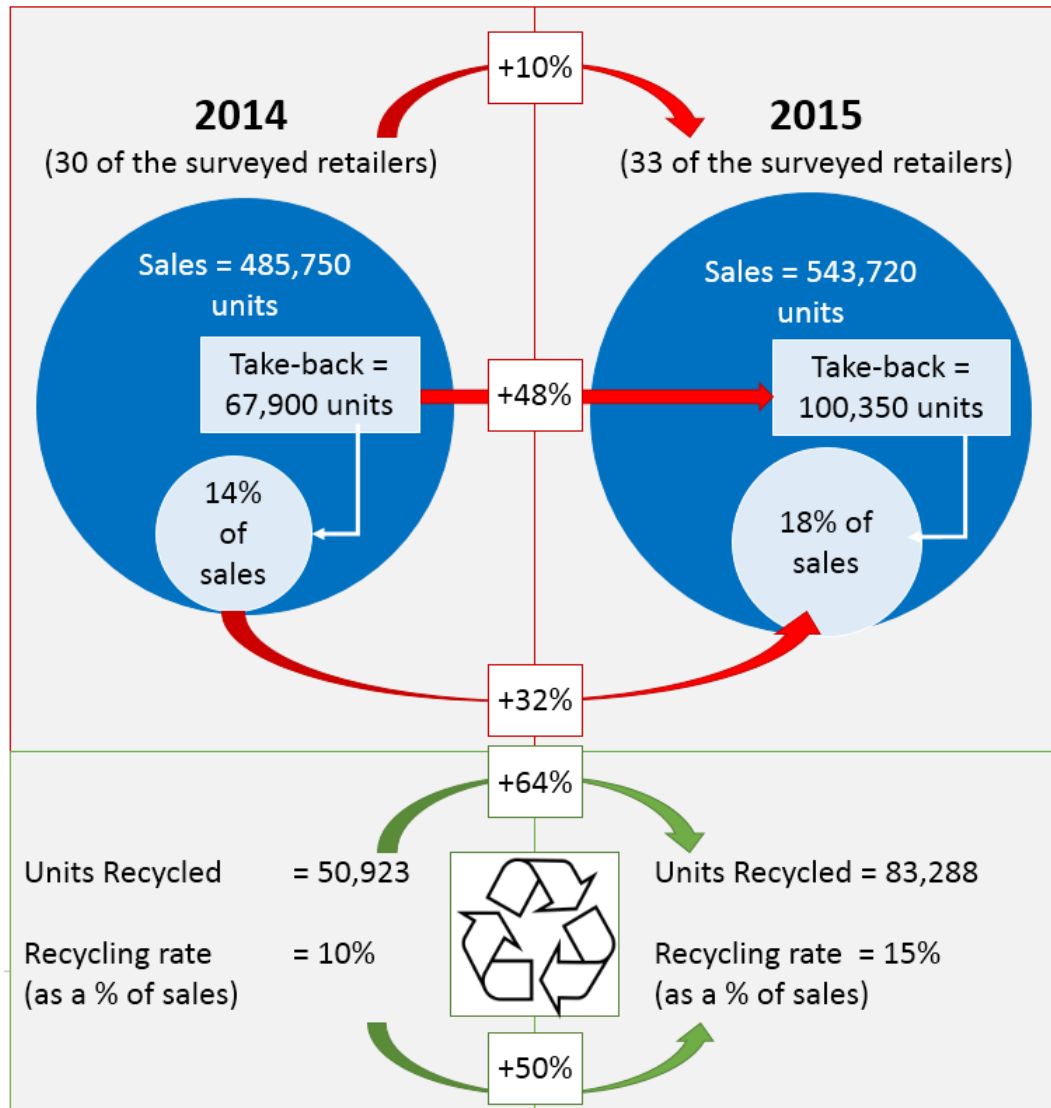


Retailers were also asked about the number of EoL mattresses they collected (or that were collected on their behalf) in 2014 and 2015, as summarised in Figure 20.

Although only 10 % more retailers carried out EoL mattress collection in 2015 than in 2014, the number of units collected increased by nearly 50 %. The proportion of EoL mattresses collected, relative to new units sold, also increased from 14 % in 2014 to 18 % in 2015.<sup>30</sup>

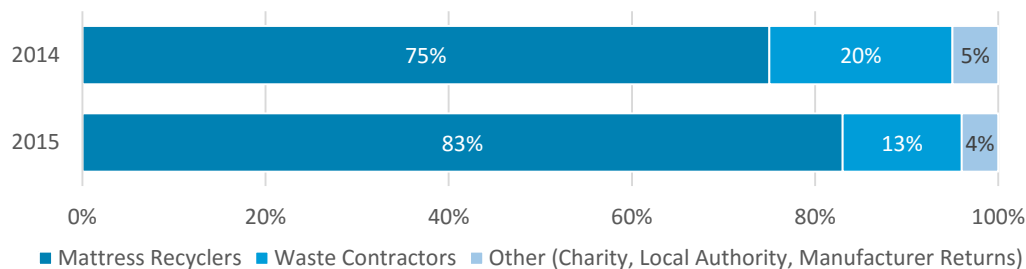
<sup>30</sup> Over 99% of the EoL mattresses collected by these retailers were directly from households, rather than from the hospitality and service sectors.

Figure 20: Summary of EoL mattress take-back schemes reported by the surveyed retailers



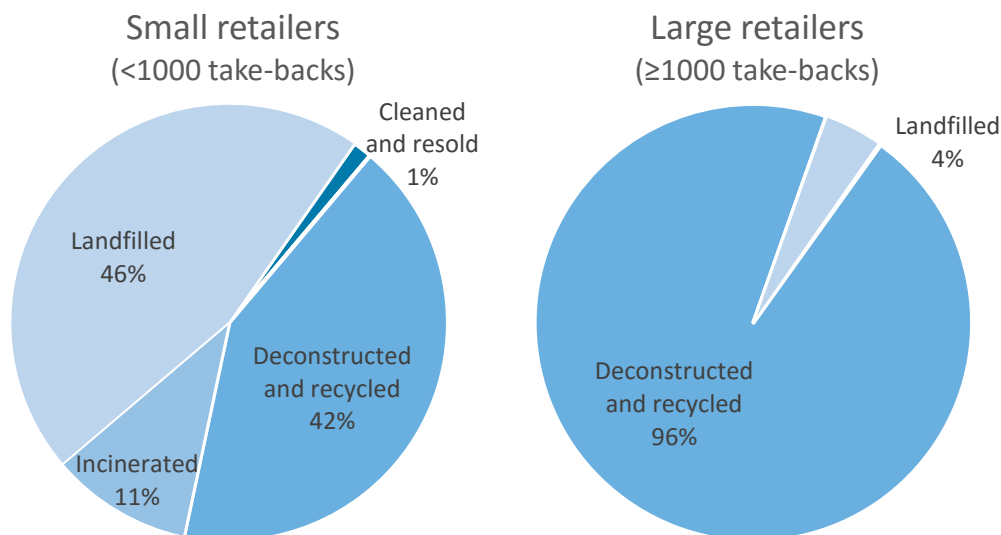
Most of the retailers reporting take-back schemes also indicated the route by which the mattresses they collect were disposed of in 2014 and 2015. In 2015, 83 % of the take-back mattresses from surveyed retailers were processed by mattress recyclers. Furthermore, in 2015 mattress recyclers appear to have captured some of market previously belonging to waste contractors (Figure 21).

Figure 21: Disposal route of mattresses collected through retailer take-back schemes. Based on 31 survey responses.



The end-fates of the mattresses collected through retailer take-back schemes were found to depend on the size of the organisation: large retailers who take-back at least 1,000 used mattresses per year are more likely to recycle than smaller organisations (Figure 22).

Figure 22: The end-fates of mattresses collected through small and large retailer take-back schemes in 2014 and 2015 combined. Based on 32 survey responses.



A better understanding of the barriers to mattress recycling faced by small retailers, in particular, was garnered from the comment section of the online survey. To an open invitation to make comments or provide other information, 17 retailers (15 with no or less than 1,000 take-backs per annum) responded with information on the barriers to mattress recycling they face (Table 11). The main barrier to recycling is, unsurprisingly, cost - and much of the costs are associated with transport and avoiding contamination. The lack of local mattress recycling facilities is another reason why retailers do not offer take-back and recycling services (Figure 23). Also, even though retailers can charge customers up to £30-40 for the take-back of a mattress, the retailers' provision of a collection and recycling service is not profitable in all cases.

Figure 23: Main barriers preventing or limiting the involvement of the surveyed retailers in mattress recycling.

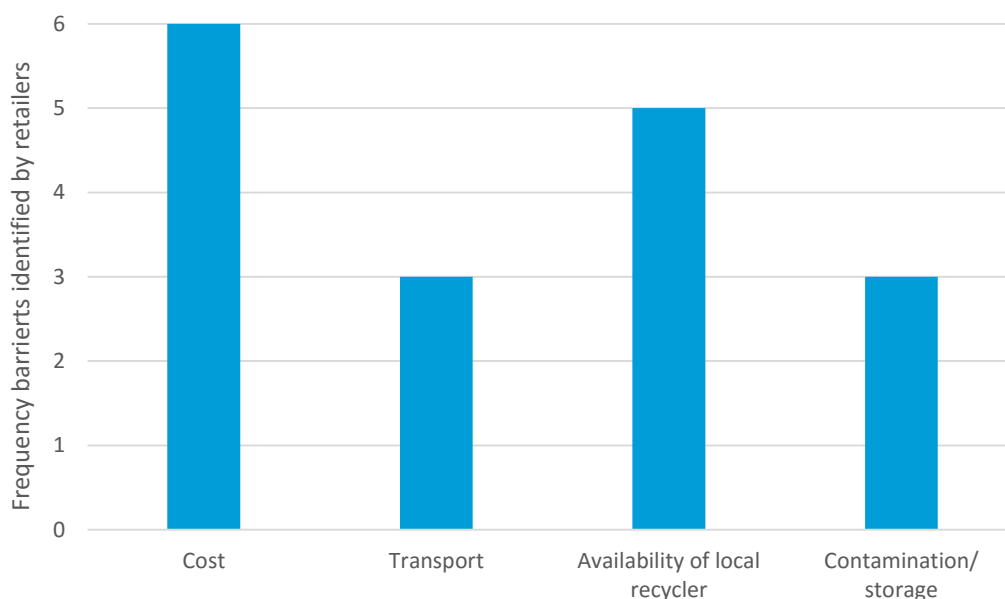


Table 11: Comments made by retailers on the type of barriers that prevent or limit their involvement in mattress recycling

Type of barrier	Retailers' comments	Take-backs in 2014-2015 (Recycling rate %)
<b>Transport</b>	I do not know of any mattress recyclers in our area. Hence, we advise the customer to contact their local council and arrange collection.	3 (0 %)
<b>Cost</b>	Will not recycle, far too costly.	1,100 (0 %)
<b>Availability of local recycler</b>	We would happily recycle if a source could be found that would take them.	225 (0 %)
<b>Availability of local recycler</b>	We do not have any mattress recycling facilities and refer customers to their local authority for assistance	0 (N/A)
<b>Transport</b>	The main problem we experience is being in the middle of an area with no local mattress recycling, our recyclers make a 100 mile round trip (back-loaded to reduce this) but even so a lot of fuel is used to meet 'green' targets.	0 (N/A)
<b>Availability of local recycler</b>	We collect customers' old mattresses and take them to a waste disposal site for landfill. We pay £50 to get on site. We have no other option.	270 (0 %)
<b>Contamination/storage</b>	We pay £80 per tonne to dispose of mattresses, this would represent on average about 20 mattresses, we do charge £10-£20 for disposal. Even though this shows a profit, we do not like handling them, storage and potential cross contamination.	1,600 (0 %)

Type of barrier	Retailers' comments	Take-backs in 2014-2015 (Recycling rate %)
<b>Cost</b>	Cost is prime factor. Deconstruction method: this needs to be simplified and research on the cost effectiveness needs to be increased.	6,000 (0 %)
<b>Cost</b>	With already excessive disposal costs we would not be interested in recycling old mattresses unless the process was extremely easy and cost effective. A mattress cannot be recycled into another mattress as the springs are unsuitable for reuse.	600 (0 %)
<b>Cost</b>	Costs to take mattresses to landfill sites is £10 a mattress plus VAT as we cannot tip mattresses for free anymore.	1,000 (0 %)
<b>Availability of local recycler</b>	We have tried hard to find suitable recycle companies but are unable to source any. It seems to be a real environmental issue that continues to plague the industry.	65 (0 %)
<b>Contamination/storage</b>	Wet mattresses cannot be recycled due to the extraction process. It is also difficult to store due to size; contamination posing health and safety issues; very little demand for used mattresses.	1,600 (100 %)
<b>Contamination/storage</b>	I will never allow my van to carry an old mattress with a customer's new mattress nor can I afford to employ two vans. To offer this service we give customers the number of a local chap who has the relevant green licence to dispose of mattresses.	0 (N/A)
<b>Cost</b>	Costs - many options are prohibitively expensive!	720 (80 %)
<b>Cost</b>	Would like to be able to offer customers the option of collection & disposal of their old mattress, either when delivering new or at later point. This type of service doesn't appear to be readily accessible & when it is, it is costly which puts consumers off.	2,650 (100 %)
<b>Availability of local recycler</b>	I would love to find a contractor to take away 100 % of our old mattresses, but we seem to struggle to find reliable long term methods of disposal.	20 (60 %)
<b>Transport</b>	We used to collect & dispose of customers' old beds / mattresses up to about 5 or 6 years ago but stopped due to spiralling costs. We have also found that though there are more charities willing to take mattresses they often do not offer, or have the capacity, to collect them. Not offering collection can be seen as a barrier to the sale so, if we were able to collect them but no longer suffer the cost of disposal, i.e. have our costs covered by the bed/mattress being collected for recycling, this would be good.	0 (N/A)



### Estimate of all commercial (non-LA) recycling

In order to estimate an overall UK mattress recycling rate, it is necessary to first estimate the number of mattresses from commercial sources that are being recycled. This is to capture all mattresses that are recycled but do not pass through LAs or LA contractors. Table 12 summarises the commercial mattress recycling reported by stakeholders as part of this survey. The volume of prison mattress recycled was obtained (as described in Appendix V: Overview of non-household mattress disposal) by using a freedom of information request to the Ministry of Justice.

Table 12: Summary of commercial mattress recycling reported in 2014

	Units recycled	% of market captured	Reference
<b>Manufacturers</b>	49,082	45	Figure 17 & Figure 18
<b>Retailers</b>	50,925	8	Figure 20
<b>Prisons</b>	17,925	90	Figure 24
<b>Total</b>	<b>117,932</b>		

No attempt was made to scale up the data collected from the survey, taking into account the market share of the retailers and manufacturers, as we were not confident that the samples were representative of the sector. Also not captured in this methodology are the mattresses that reach mattress recyclers from commercial sources but not through retailer- and manufacturer-facilitated take-back schemes. Facility management companies and contract mattress providers, who do not also manufacture the mattresses, may organise the recycling of large quantities of mattresses (as produced during halls of residence, hotel or hospital refurbishments) directly with the recycler or through waste contractors. The low coverage of large waste management companies is one of the shortcomings of this research.

## Appendix V: Overview of non-household mattress disposal

Mattresses in the service, hospitality and other non-household use only account for approximately 5 % of in use stock of mattresses in the UK (Appendix I: UK stock of in-use mattresses). However, in some of these sectors the mattress replacement rate is at least twice that of households. Though the research in this study was focused on households - the source of most EoL mattresses - short descriptions of EoL mattress disposal practices in hospitals, prisons, hotels, university accommodation and care homes are presented below.

The size of the establishments discussed below, the homogeneity of their mattresses and the volumes of EoL mattresses they produce could make them amenable to achieving high recycling rates. Due to their size and purchasing power they are also in a strong position to negotiate with their supply chain and other contractors. Customer facing establishments, especially hotels, may also use mattress recycling as a way to boost their green credentials and differentiate themselves from their competitors. However, in general, the available data did not allow sector-specific recycling rates to be determined.

### Hospitals

There are approximately 150,000 beds in hospitals in the UK, as well as gurneys, which often have thin plastic-covered foam toppers. The mattresses on hospital beds are almost always foam, latex or polyurethane, and have thick washable, sometimes removable, plastic covers to avoid cross-contamination. If this cover is punctured and the mattress core contaminated it is recommended that the mattress is either decontaminated according to manufacturer instructions or disposed of with other contaminated waste, generally via incineration.<sup>31</sup>

In a review of NHS Trusts' waste management manuals and policies, we found no evidence that any EoL mattresses from UK hospitals are recycled.<sup>32</sup> (A waste management co-ordinator from one NHS Trust did indicate that there was manufacturer take-back of non-contaminated mattresses but that none of these mattresses was thought to be recycled.) Contaminated mattresses seem to always be incinerated whilst some Health Trusts report that 'clean' EoL mattresses are landfilled.

Hospital mattresses might be a target area for increasing mattress recycling in the future. Recycling of hospital mattresses could benefit from:

- the recyclability of mattresses being considered at the purchasing stage
- a strategy for separating contaminated from non-contaminated EoL mattresses
- hospitals understanding the non-negligible material value of the foams they are disposing of.

### Prisons

There are approximately 100,000 prison (and police holding cell) beds in the UK which are provided with a plastic-coated, flame-retardant foam mattress. Carpenters Ltd supplies

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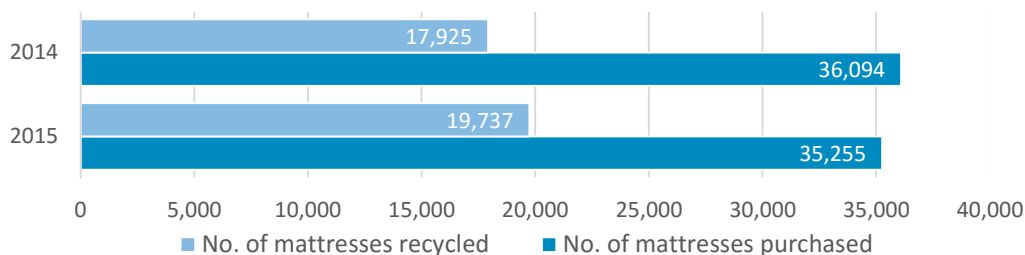
<sup>31</sup> <https://www.gov.uk/drug-device-alerts/medical-device-alert-all-types-of-bed-mattresses-contamination-through-damaged-mattresses-or-covers>

<sup>32</sup> Information reviewed from Doncaster and Bassetlaw Hospitals, Southern Health, Worcestershire Acute Hospitals, Pennine Care, Mid Essex, Cardiff and Vale University, Hywel Dda Health Board.

mattresses to all public sector Prisons, Young Offenders Institutions and National Offender Management Service (NOMS) managed Immigration Removal Centres in England and Wales.<sup>33</sup>

The number of prison mattresses purchased and recycled in 2014 and 2015 is presented in Figure 24. Assuming there was no new prison capacity in 2014 and 2015, meaning that all the mattresses purchased were to replace disposed of EoL mattresses, this would correspond to a recycling rate for prison mattresses of 50 % in 2014, and 55 % in 2015.

Figure 24: Number of prison (and other correctional/holding facility) mattresses purchased from Carpenter in England and Wales.



Her Majesty’s Prison Service (HMPS) has had a zero waste mattress system in place since 2009.<sup>34</sup> Through its procurement strategy, the HMPS put pressure on its supply chain to also provide it with an EoL mattress recycling service. HMPS also identified reducing the number of mattresses disposed of as hazardous or clinical waste as another important target, to maximise recycling and reduce costs.

#### Hotels and other serviced accommodation

In the UK, there are approximately 700,000 beds in the serviced accommodation sector (i.e. hotels and B&Bs but not self-catering accommodation such as mobile homes, holiday parks and holiday cottages). The market can be divided into three segments with roughly equal numbers of beds: small independent hotels and B&Bs with fewer than 25 rooms, mid-size and large independent hotels, and large hotel chains. Due to their small size the small, independent establishments dispose of mattresses in the same way as households do, i.e. through local authorities. Mattress disposal from these small hotels is not discussed in any more detail here, and the discussion in Appendix III: Local Authority data analysis is more relevant.

Typically, the larger the hotel, or hotel group, the more options it has for disposing of its EoL mattresses, partly because it can put more pressure on its supply chain and partly because the number of EoL mattresses it produces makes transporting them economically viable (approx. 350-400 compacted mattresses in a refuse collection vehicle). Most mid-sized and large hotels employ waste management companies to dispose of their EoL mattresses, which are usually produced along with a lot of other waste when the hotel, or a part of a hotel, is refurbished.

There is also some evidence of a trend towards the servitisation of mattresses in the hospitality sector, i.e. mattress manufacturers and wholesalers providing the hotels with the ‘service’ of a mattress rather than a mattress ‘product’. As part of this type of service, the

<sup>33</sup> A Freedom of Information request to the Ministry of Justice was the main source of data on EoL prison mattresses. Over 90% of mattresses in prisons, and it is assumed, prison beds are in England and Wales

<sup>34</sup> [http://www.motiva.fi/files/4756/HM\\_Prison\\_Service\\_Zero\\_Waste.pdf](http://www.motiva.fi/files/4756/HM_Prison_Service_Zero_Waste.pdf)



service provider may include regular testing to decide whether the mattress needs replacing and disposal if necessary.

Some large hotel chains are starting to address mattress recycling, and communicate this to their customers as part of their corporate social responsibility strategy. The Hilton Group started an international programme in 2013 with the aim of recycling 85 % of the mattresses from its hotels.<sup>35</sup> In its current (2015) report on its environmental impacts the Group estimates that its recycling rate of mattresses and box springs is now 95 %.<sup>36</sup> The Radisson Blu Edwardian, a chain of 12 mostly London based hotels, uses (and advertises the use of) fully recycled mattresses.<sup>37</sup> However, according to one retailer selling into the hospitality sector, the cost of a mattress is still more important to hoteliers than its environmental credentials in 90-95 % of cases.

### **University accommodation**

EoL mattresses from university accommodation are generally disposed of in the summer. (Hotels tend to dispose of mattresses when they are quietest, in the winter, and households in the spring, particularly at Easter and after sales at major retailers.)

There are approximately 520,000, mostly single, mattresses in use in UK university accommodation.<sup>38</sup> Their disposal is primarily organised by individual universities though waste management contractors, who may, if required to by landfill avoidance targets, send the mattresses to mattress recyclers. Alternatively, and especially if there is a mattress recycler relatively close, the university may deal directly with the recycler. A third option is the use of contract mattresses, whereby the service provider deals with the EoL mattresses as part of their contract with the university.

We were unable to obtain an estimate of the mattress recycling rate for university accommodation, though we have anecdotal evidence from various mattress recyclers that at least some of these mattresses are recycled.

### **Care homes**

90 % of the care homes for the elderly in the UK are privately owned, with a mere 10 % remaining the responsibility of LAs. We estimate that the stock of mostly single mattresses in care homes is approximately 450,000. In a similar way to hospitality, approximately 30 % of the beds in care homes are in establishments with fewer than 30 beds apiece. These small, independent establishments dispose of mattresses similarly to households, i.e. through LAs.

Not much information on the mattress disposal practices of care homes was found during this research. We assume, therefore, that larger establishments and chains of care homes may dispose of mattresses through facilities management contractors or waste disposal contractors, in a manner similar to large hotel chains.

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<sup>35</sup> <http://www.useitagain.org.uk/hilton-hotel-group-start-to-recycle-their-old-mattresses/>

<sup>36</sup> [http://cr.hiltonworldwide.com/download/Hilton\\_CRReport\\_Waste.pdf](http://cr.hiltonworldwide.com/download/Hilton_CRReport_Waste.pdf)

<sup>37</sup> [http://www.radissonblu-edwardian.com/rad/edw/PDFs/80505\\_EGL\\_RESPONSIBLE\\_BUSINESS\\_REPORT\\_2014\\_FV.pdf](http://www.radissonblu-edwardian.com/rad/edw/PDFs/80505_EGL_RESPONSIBLE_BUSINESS_REPORT_2014_FV.pdf)

<sup>38</sup> <https://www.hesa.ac.uk/stats> and assuming only 1st year undergraduates and foundation course students live in halls of residence (494,000 in 2014/15), and 10% of first year postgraduates (23,400 in 2014/15)

## Appendix VI: Overview of mattress recycling sector

In the research for this study we made a particular effort to identify and contact as many mattress recyclers as possible. The information summarised below was collected through telephone interviews and site visits with active mattress recyclers and others who deal directly with them, including brokers, transport specialists and retailers.

### Overview

It is important to stress that the mattress recycling industry in the UK is very young. SpringBack, a Fife-based social enterprise set up with funding from the then Scottish Executive, started in 2004 and closed in 2012. The first commercial mattress recycling enterprise, Matt UK, only started in 2008.

In this research we were only able to identify a dozen currently operational UK based mattress recyclers (Table 13) though the actual number could be double this. There will be small, local enterprises that primarily partner with larger recyclers or waste management companies and, as such, are not easily identifiable through internet searches. Others will only recycle mattresses on occasion and may primarily identify themselves as another type of waste management company.

Table 13: List of active recyclers identified in this study

Company	Size of operation†	Location
AAT Recycling	Not known (capacity)	Telford
Amgen Cymru	Small	Aberdare
CAD recycling	Medium	Deganwy
Carpenters (prison mattresses)	Small	Glossop
Changing Lives (Social Enterprise)	Small	Winsford
Circum (previously Wastecraft) – Broker only	N/A	Sheffield
Collect and Recycle (Network4/ collectyouroldbed.com) – Collection only	N/A	Northwich
Eco Mattress Recycling Ireland (Social Enterprise)	Small	Dublin
Matt Tech North West	Medium	Stalybridge
Matt UK	Large	Chatham
SITA	Medium	Exeter
The Furniture Recycling Group (TFRG)	Large (estimate)	Darwen
Total Reuse CIC (Social Enterprise)	Small	Skelmersdale
USEL (Ulster Supported Employment Ltd)	Small (capacity)	Belfast
<b>Total Capacity</b>	<b>900,000</b>	

†Recyclers are described as having a large operation if they have a capacity, or throughput in 2014, of >250,000 mattresses per year, medium operation if they have between 50,000 and 250,000 and a small

operation otherwise. (All recyclers, apart from Carpenters, contributed to this research via email, phone or in-person interview.)

There is also, unfortunately, a minority of unscrupulous operators in the sector who are involved in practices such as filling warehouses with mattresses and disappearing, recovering old mattresses and selling them as new, or claiming recycling but actually otherwise disposing of the mattresses. Nearly all of the genuine mattress recyclers interviewed mentioned they had been contacted by individuals who they thought might be involved in this type of dishonest material or mattress reuse. Though the recyclers are often desperately in need of markets for some of the materials they recover, they conscientiously try and avoid these black-market operators.

There are also a number of enterprises that have ceased recycling mattresses or have gone out of business completely (Table 14). Some of these are primarily carpet recyclers that tried to also recycle mattresses but then stopped. Others had fires, or were forced to clear their backlog by the Environment Agency. There seemed to be a spike in mattress recycling facility closures in 2015. This coincides with the period when scrap steel prices fell dramatically but may also have been a result of increasing regulatory and reporting standards in the sector.

Table 14: List of recyclers identified that have closed or stopped recycling mattresses

Company	Location	When they stopped
Reccom Group	West Midlands	<b>2016</b>
Envirogreen	Northern Ireland	<b>2014</b>
Springback (Social Enterprise)	Scotland	<b>2012</b>
Divert More Ltd	North East	<b>2015</b>
Envik Waste	Bridgend	?
Eco Matters <sup>†</sup>	Kent	?
Mattress Recycling Group (Carpet Recycling Group)	Grantham, E.Mids	<b>2015</b>
Mid UK Recycling	Lincoln	<b>2015</b>
JBS Fibre Recovery	Telford	?
London Reuse (Social Enterprise) <sup>‡</sup>	London	<b>Never started</b>

<sup>†</sup>Still reportedly operating but currently clearing a backlog.<sup>39</sup>

<sup>‡</sup>Mattress recycling facility, for which funding was available, never started because of, amongst other things, difficulty finding warehousing space in London, identifying markets for the recovered textiles and EH&S.<sup>40</sup>

### Recycling technologies

Manual deconstruction is still the most widely used method of separating the materials in mattresses for recycling or other end-uses. Amgen Cymru uses a machine to de-slip the mattresses before they are manually deconstructed. Various other recyclers use shredders, but primarily only for the low quality mattresses. Because the material separation is better when manually deconstructed, meaning more of the material value can be retained, it is still

<sup>39</sup> [www.bbc.co.uk/news/uk-england-kent-32979096](http://www.bbc.co.uk/news/uk-england-kent-32979096) (Accessed April 2016)

<sup>40</sup> [www.londonreuse.org/mattress-recycling-centre](http://www.londonreuse.org/mattress-recycling-centre) (Accessed April 2016)

the most economical approach for recycling the higher quality feedstock. Shredders, in general, also struggle with the springs in mattresses, which leads to a lot of machine down-time. The Furniture Recycling Group reported it had a new design of shredder which does not have the same issues and is a lot more reliable.

Figure 25: Diagram of typical mattress recycling process flow



### Markets for recovered materials

Many recyclers stated they were having difficulties in finding markets for their textiles in particular. Some smaller recyclers do not produce the quantities that would be of interest to the prospective market or do not have enough storage space in which to amass the amount of material that could be marketable. Larger recyclers sometimes act as middlemen in the marketing of the recovered materials on behalf of smaller recyclers. One small recycler felt that it was being priced out of the market by this type of arrangement.

Mattresses can be as simple as a 10 kg piece of foam in a zippable cover or as complicated an 80 kg super king-size with 20-30 layers including a gel topper. A third of the weight of a sprung mattress can be from the steel, and two-thirds from the wood, textiles, foams and other fibres. The marketability of the textiles will depend on the quality of the mattress. In cases where there is no market (i.e. for wet, soiled or musty ticking and shoddy) EfW is generally the best treatment option. Some small recyclers also find that in the current

market they are having to pay a substantial gate fee to dispose of such materials through this route. White cotton and polyester, either separated or mixed as it is in 'flocking', can be decontaminated, mechanically shredded and re-blended to obtain recycled materials of various quality.

The foams found in mattresses are also marketable; the polyurethane (PU) foams more so than the latex foams. Bonded foam, as used in carpet underlay and furniture, is one application for these foams. However, even the larger mattress recyclers struggle with amassing enough material to interest those in this market. PU foam being recovered from UK mattresses also ends up in deserts in Middle Eastern countries where it is shredded and used to improve the water retention in the poor sandy soil.

Mattress recyclers generally reported selling the springs they recover to be used as remelt in steel production. Some metal processors will not accept springs contaminated with fibres, or will pay significantly less for them. This type of contamination is significantly higher with pocket spring mattresses, compared to traditionally sprung mattresses. Transporting unprocessed springs can also be uneconomical as they take up a lot of volume for the amount they weigh.

### **Organisation and regulation of the sector**

Customers, both LAs and commercial enterprises, are demanding better reporting, more transparency, higher standards of health and safety and due diligence from mattress recyclers. The statutory recycling targets in Wales and the associated stringent reporting requirements are drivers for the exceptionally high (>4 mattresses per 100 people) recycling rates recorded in the region. However, a number of the LA representatives that responded to the survey carried out as part of this research detailed how they had struggled, or completely failed, to procure mattress recycling services because of regulatory or health and safety failures.

Additionally, retailers and manufacturers that associate their brand with a take-back and recycling scheme, want to ensure that their sub-contractors are responsible and compliant with all the relevant regulations. An industry expert commented that traceability in the mattress recycling industry could be improved by learning from that achieved in other waste streams. Using an auditable unit of measure across the industry would be a start: tonnage could be measured using a conventional weighbridge, whereas the currently employed units, bails and trailers are too variable to be accurately audited. The most complete and transparent reporting method that could be employed is a mass flow analysis, where all the mass in the mattresses being collected is then accounted for in the recovered materials.

Some brokers, including Circom, provide their commercial clients with the assurance that all the mattresses whose recycling they facilitate are processed by legally compliant organisations. In order to achieve this, they audit the recycling facilities they use and check all the documentation provided by the recycler.

There is ongoing discussion of mattress recyclers setting up their own trade association to represent their interests as well as provide assurance to their clients that they meet the relevant regulatory standards. Details of the nature and exact purpose of any association of this type are under discussion.

### **Recycler profiles**

Some mattress recyclers were interested in contributing short informative profiles to this report. The profiles, see below, include those of social enterprises, LA and privately owned



companies involved in mattress recycling. **These companies are in no way endorsed by the NBF and the profiles below are merely included to provide some more information on the sector.**

**Company:** Amgen Cymru  
**Website:** [www.amgen-cymru.com](http://www.amgen-cymru.com)  
**Location:** Aberdare, Rhondda Cynon Taf  
**Major Clients:** Local authorities including Rhondda Cynon Taf, Neath Port Talbot, Caerphilly, Torfaen and Blaenau Gwent  
**Throughput:** 35,000 mattresses/year (2015)  
**Process:** Semi-automated process  
**Landfill avoided:** 100 %



“At Amgen Cymru we have made significant progress in addressing the labour risks in mattress deconstruction. Our next major challenge is getting the comfort layers and fabrics into the circular economy.”

**Mr Lee Foulkes**



**Company:** Matt Tech North West Ltd  
**Website:** [www.matt-tech.com](http://www.matt-tech.com)  
**Location:** Stalybridge, Greater Manchester  
**Major Clients:** Dreams and Bensons for Beds  
**Throughput:** 80,000 mattresses/year (2015)  
**Process:** Bench-top deconstruction  
**Landfill avoided:** 100 %

“It’s time to stop burying our heads in the sand when it comes to End of Life mattresses. Landfilling is unsustainable and needs to be costed accordingly. The shredding required before incineration is problematic. Recycling is the only socially responsible solution.”

**Mr Steven Fawcett**





- Company:** Eco Mattress Recycling Ltd
- Website:** [www.ecomattressrecyclingireland.com](http://www.ecomattressrecyclingireland.com)
- Location:** Glasnevin, Dublin 11
- Major Clients:** Local councils, waste companies, bed manufactures and retailers
- Throughput:** 12,000 mattresses/year (2015)
- Process:** Organised manual work processes
- Landfill avoided:** 100 %

“Our mission statement is to provide long term unemployed people with the opportunity to gain valuable work experience and training skills that may lead to full time employment and to prevent bulky waste items (mattresses and bed bases) going to landfill.”

Mr Gerry O’Brien



- Company:** Collect and Recycle Ltd & Network 4 Ltd
- Websites:** [www.collectandrecycle.com](http://www.collectandrecycle.com) (commercial) and [www.collectyouroldbed.com](http://www.collectyouroldbed.com) (households)
- Location:** HQ in Northwich (Cheshire West) with other depots in Storrington (West Sussex) and Carlisle (Cumbria)
- Major Clients:** Manufacturers and retailer take-back schemes (including Dormeo) and individual households
- Throughput:** 26,000 mattresses/year (2015)
- Process:** Two-man furniture delivery specialist also offering take-back schemes for commercial deliveries and the collection of EoL mattresses from households en-route. The mattress recycling is carried out by partner organisations, including Matt-UK.



“Interest from consumers in the take-back services we facilitate for retailers and manufacturers was strong so we wanted to roll out the service to all households. We have an easy-to-use online system where customers can see when our vans are in their area, get a quote covering the collection and recycling facility gate fee, and book the service.”

Mr Vinny Riley



**Company:** AAT Recycling  
**Website:** [www.aatrecycling.co.uk](http://www.aatrecycling.co.uk)  
**Location:** Telford, Shropshire  
**Major Clients:** Local Authorities  
**Capacity:** --  
**Process:** Manual deconstruction  
**Landfill avoided:** 100%



“Mattress recycling is a new area for us but we have a clear plan of action, having already identified second use markets for the recovered materials. We also aim to raise awareness of the benefits of using recovered materials and fibres.”

**Mr Allen Jackson and Mr Andrew Yeoman**

**Company:** Total Reuse CIC  
**Website:** [www.totalreuse.co.uk](http://www.totalreuse.co.uk)  
**Location:** Skelmersdale, near Wigan  
**Major Clients:** Local councils, waste companies, bed manufacturers and retailers, Universities  
**Throughput:** 5,200 on average per year  
**Process:** Manual deconstruction  
**Landfill avoided:** 100 %



“We currently deconstruct mattress and sofas for a number of clients including John Lewis and IKEA, (in partnership with the Furniture Reuse Network), and are finding more of the independent retailers, such as Benson's for Beds, are using deconstruction as an alternative to landfill. What we need to do now is invest in the research to find alternative uses for the component materials generated through deconstruction. The solutions are out there; we just need to find them”.

Mr Martin Gamester

**Company:** Ulster Supported  
Employment Ltd

**Website:** [www.usel.co.uk](http://www.usel.co.uk)

**Location:** Belfast

**Major Clients:** Belfast City Council

**Capacity:** 20,000

**Process:** Manual deconstruction



**Landfill avoided:** 100 %

“Since October 2015, we have been deconstructing the mattresses from Belfast City Council’s recycling centres. We would like to minimise the amount of material we recover being sent to EfW. For this we need a process to clean and decontaminate the felt and shoddy, perhaps to a point where it could even be used in new mattresses.”

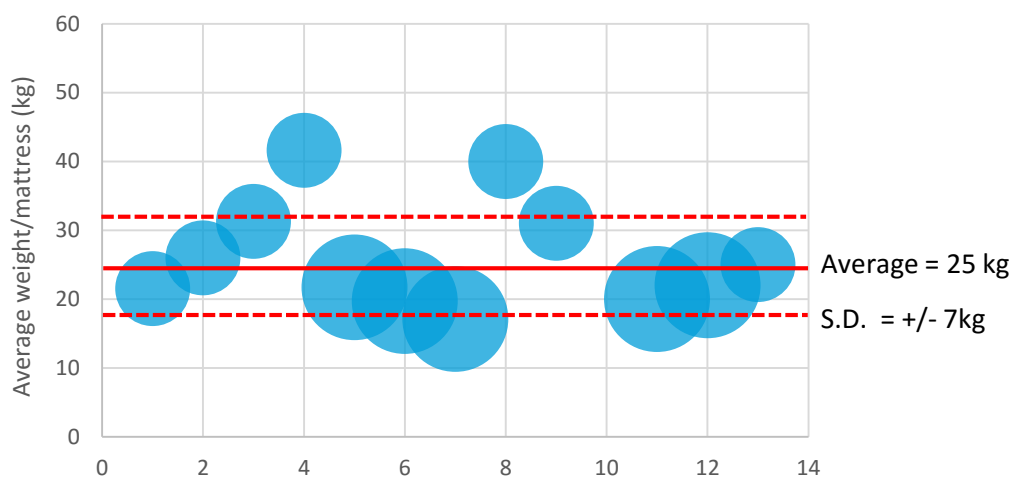
**Mr Terry Fuller**

## Appendix VII: Average mattress weight estimates

An important conversion factor used in calculating the mattress recycling rate is the average weight of an EoL mattress in the UK. This number is used in converting the information on mattress recycling collected by LAs, in particular, from tonnes into units. Mattress recyclers, retailers and manufacturers tend to record recycling and other mattress handling operations in terms of number of units rather than tonnage.

All the estimates of average mattress weight collected during this research are summarised in Figure 26 and Table 15. The responses highlighted in bold text in the table are derived from a substantial amount of recycling or logistics data from current mattress recycling activities or analysis of past mattress recycling trials. These data-based estimates were considered to be twice as important as the others for calculating the (weighted) average. Using this methodology, the average weight of a mattress came to 25 kg. However, it is worth noting that the spread of the data, the weighted standard deviation being 7 kg, is large.

Figure 26: Summary of estimates used in the calculation of the average mattress weight used in this study



In collecting these average mattress weight estimates it became evident that relatively few people involved in EoL mattresses had this conversion factor in mind. This is in spite of its relevance in the sector: gate fees at mattress recyclers are often set on a per mattress basis and local authorities generally record mattresses in tonnes (which facilitates cost comparisons with landfill cost).

For LAs, in particular, the main reason for not knowing the conversion factor is that mattresses are not separated from other bulky wastes. Another issue is that mattress recyclers, who are probably those best placed to collect this data, generally do not, perhaps because their clients do not ask for this level of information.<sup>41</sup> This average value might also be of limited real-world use given the large variation in EoL mattress weights. Anecdotal evidence of variation in average mattress weight as a result of season, region and collection

<sup>41</sup> 3 of the 4 LAs reporting data used the same mattress recycler, at least at some point.

and storage methods was shared by various industry stakeholders interviewed as part of this research. One mattress recycler indicated that mattresses from LAs weigh on average 20 kg, whilst those collected through retailer take-back schemes tend to be heavier, with an average weight of 33 kg.

Table 15: Estimates of average mattress weight in the UK

	Source of estimate	Average weight/ mattress (kg)	Weighting
Estimates from other research	ZWS report <sup>42</sup>	21.5	1
	Veolia in WRAP report <sup>43</sup>	26.0	1
	London Re-use in WRAP report (using FRN estimates)	31.3	1
LA estimates collected in this research	Central Bedfordshire Council	41.6	1
	<b>Cambridgeshire County Council</b>	<b>21.7</b>	<b>2</b>
	<b>West London Waste Authority</b>	<b>19.7</b>	<b>2</b>
	<b>South Gloucestershire Council</b>	<b>17.1</b>	<b>2</b>
	East London Waste Authority	40.0	1
	<b>Lewisham Council<sup>44</sup></b>	<b>31.0</b>	<b>2</b>
Other stakeholder estimates	<b>Waste Management Company Representative</b>	<b>20.0</b>	<b>2</b>
	<b>Mattress Recycler (Commercial)</b>	<b>22.0</b>	<b>2</b>
	Mattress Recycler (Social Enterprise)	25.0	1
	Manufacturer of high-end and custom mattresses	50.0	0*
<b>Weighted average =</b>		<b>25 kg</b>	
<b>Weighted standard deviation =</b>		<b>7 kg (+/- 28%)</b>	

\* This estimate was excluded from the analysis because it was felt not to be representative of EoL mattresses.

<sup>42</sup> A Business Case for Mattress Recycling in Scotland: A Business Case for investment in infrastructure, ZWS (2012). Accessed at [www.zerowastescotland.org.uk/sites/default/files/Report%20-%20A%20Business%20Case%20for%20Mattress%20Recycling%20\(MAP002-002%20Nov%2012\)\\_1.pdf](http://www.zerowastescotland.org.uk/sites/default/files/Report%20-%20A%20Business%20Case%20for%20Mattress%20Recycling%20(MAP002-002%20Nov%2012)_1.pdf)

<sup>43</sup> Carpet and Mattress Recycling at HWRC Sites, WRAP, (2015). Accessed at <http://www.wrap.org.uk/sites/files/wrap/HWRC%20Guide%20recycling%20carpets%20and%20mattresses.pdf>

<sup>44</sup> <https://www.lewisham.gov.uk/myservices/wasterecycle/dispose-of/Pages/free-mattress-recycling.aspx>

## Project Team



Nia Bell PhD MPhys, Technical Consultant

With a degree in Theoretical Physics and a PhD in Materials Science, Nia's background is in nanomaterial research at the UCal San Diego and at the NPL, UK. She has a critical and thorough approach to analysing complex technical data sets, and the ability to concisely communicate complex topics. Recent work has been on which metals are critical to the EU defence sector, minor metals by-production, and an EU-wide project to assess the impact of nanotechnology funding.



Peter Lee PhD, Principal Consultant

Peter has project-managed and written major studies on resource efficiency, sustainability, carbon reduction and energy, with much of his focus being on the food manufacturing and retail sectors. His specialisms include: waste prevention, waste logistics and reverse supply chains, packaging and waste management in the food and drink industry, environmental impact assessments, and recycling technologies. , An expert in Lean techniques, he has worked with manufacturing clients to implement waste prevention.



Stephen Slater MA, Principal Consultant

Much of Steve's consultancy experience has involved leading research and analysis projects for key public and private sector organisations in the field of waste management, resource efficiency and sustainable technologies. He has advised a major national retailer in its commitment to eliminate landfilling of operational waste and has been directly involved with the client in implementing its plans.

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