



## End of Life Mattress Report 2019

Results of the National Bed Federation's research into  
the treatment of End of Life mattresses in the UK

July 2019

*Includes a derivation of a recycling rate for mattresses for 2016 and 2017, the findings from a survey of mattress manufacturers and retailers, and a description of current trends in the mattress recycling sector.*





# Foreword

In the five years since we published our first report on the background and rate of mattress recycling in the UK – and, indeed, since we published our last report in 2016 - much has changed. UK devolved governments are taking the need for a new approach to waste management of bulky items such as mattresses increasingly seriously. It will not be sufficient merely to divert products from landfill. Longer lifespans, the enabling of more re-use, and embracing of circular principles, are all firmly on the agenda – and for the near future, not some distant, decades-hence target. Extended Producer Responsibility for mattresses is no longer an ‘if’ but a ‘when’ across the UK, probably within the next five to six years.

Things have also changed in the industry in the past five years and particularly in the last two, as this report reveals. More sustainable business models for mattress recycling have begun to emerge and the industry has been diverting more End of Life mattresses away from landfill than ever before. More research is being done into designing mattresses for easier dismantling and into acceptable ways of using recycled materials for component parts, plus development of new components for mattresses made from recycled materials from other sources.

These are encouraging signs and underline our belief that the industry is ready and willing to work with its supply chain, the waste management sector, policy makers and legislators on ethical, environmentally acceptable and cost-effective approaches to product stewardship.

In October 2018, the NBF published its own target for diverting 75% of all End of Life mattresses away from landfill. This is ambitious, bearing in mind the current rate is, according to this latest report, around the 20% mark and it is estimated that it would take another 50 years to reach 100% if the pace of growth continued at the current rate.

At the same time the NBF also published its policy on used mattresses and components, which provides clarity on best practice in this contentious area, where there is genuine concern about illegal activity, emphasising the importance of transparency.

But we recognise that all this is not the full story and should not be the extent of our efforts. This latest report shows the real progress that has been made in the past five years, but also highlights the many challenges that still lie ahead. It is no longer just an ambition to come up with a better solution for End of Life mattresses. It is a necessity. It is no longer just an ambition to encourage our members to embrace future business models based around product stewardship and circularity. It is a necessity.

Tony Lisanti  
NBF President  
June 2019



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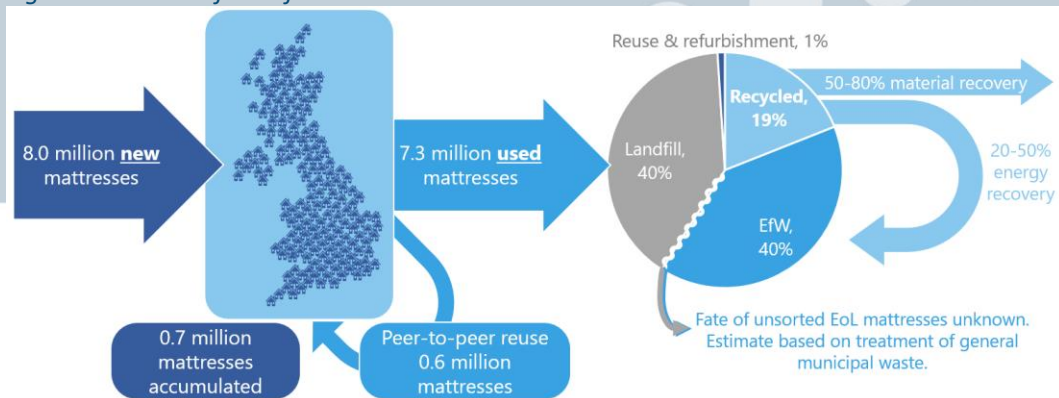
# Executive Summary

Over 7 million mattresses were disposed of in 2017 by households, businesses and service providers at great cost and effort. Mattress disposal cost households, businesses and service providers an estimated £20 million in 2017, excluding transport and handling costs.<sup>1</sup>

Mattresses are such a problematic and costly waste stream because of their weight, bulkiness, low reuse potential and the low value of the materials that can be recovered from them. Nevertheless, this report summarises how market forces are driving improved segregated collection and recycling rates for mattresses.

We have used the following definition of recycling rate: the number of waste mattresses received by recyclers, as a proportion of the total number of mattresses becoming waste in a given year. Not all materials will be recovered from mattresses entering recycling facilities: some will go to energy recovery, see Figure 1. Also, note that this recycling rate derivation is based on a combination of sources including self-reporting by recyclers, industry estimates and the authors' interpretation of the above, as well as the analysis of available statistics.

Figure 1: Material flow of mattresses in the UK in 2017



Though the methodology has changed between this 3rd NBF survey, the 2nd survey in 2016 and 1st survey in 2014, we are confident that overall mattress recycling has increased over this period, see Table 1.

Table 1: UK mattress recycling rates between 2012-2017

	1 <sup>st</sup> Survey <sup>2</sup>		2 <sup>nd</sup> Survey <sup>2</sup>		3 <sup>rd</sup> Survey	
	2012	2013	2014	2015	2016	2017
Number of mattresses recycled	452,000	586,000	924,000	879,000	1,034,000	1,363,000
Number of replacement mattress sales	4,667,000	4,531,000	5,904,000	6,822,000	6,720,000	7,260,000
<b>Mattress recycling rate</b>	<b>10%</b>	<b>13%</b>	<b>16%</b>	<b>13%</b>	<b>15%</b>	<b>19%</b>

We were not able to estimate the recycling rate for 2018, as the local authority (LA) and production data wasn't yet available, we predict that it will be in the 20-22% range, based on a 29% higher throughput reported by mattress recyclers and a 15% increase in used-mattress collection reported by surveyed retailers and manufacturers. Based on a

<sup>1</sup> 7 million mattresses is roughly equivalent to 181,500 tonnes. Estimate based on an average gate fee of £196/tonne at mattress recyclers and £96/tonne for other disposal options (landfill Energy from Waste)

<sup>2</sup> [www.bedfed.org.uk/nbf-recycle/](http://www.bedfed.org.uk/nbf-recycle/)

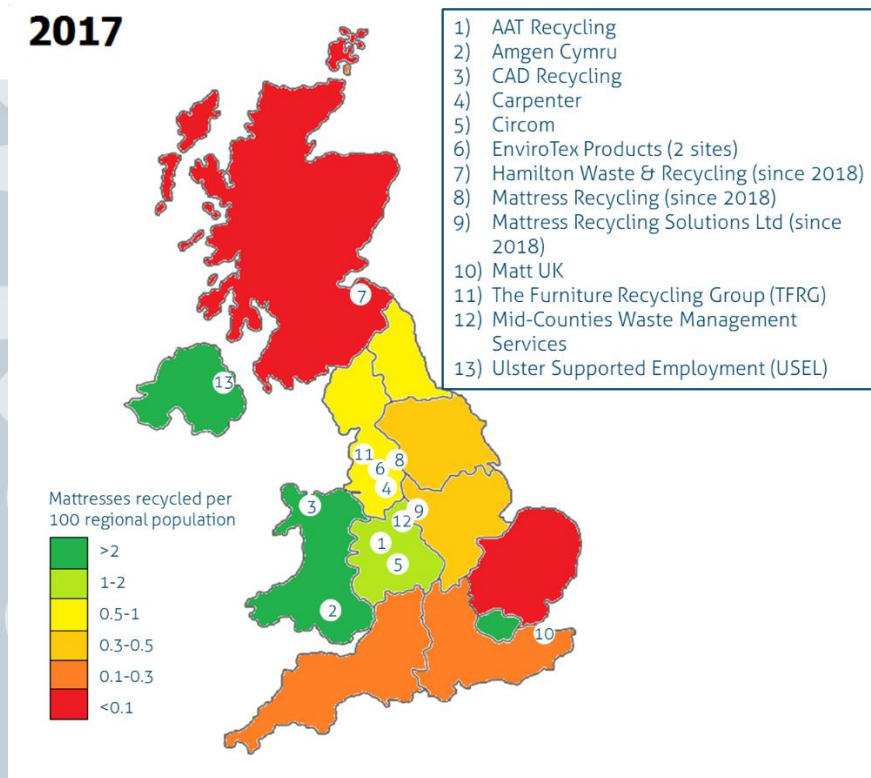
rudimentary extrapolation, at the current rate of growth 100% mattress recycling won't be achieved for another 50 years.

Reuse and refurbishment of mattresses, especially the nearly-new comfort-guarantee returns has become more established since the last survey. Indications from charity suggest there is currently an unmet demand for good quality, second hand mattresses.

Since the last survey, the number of mattresses reported as being segregated at collection and sent for recycling by LAs has decreased by 14%, due a reduction in the population covered by LAs sending mattresses for recycling and a decrease in the proportion of used mattresses LAs receive. This latter observation is based on a significant drop in the tonnage of mattresses received in 2017 in a sample of 20 LAs who have reported mattress recycling every year since 2012. It is likely, though not proven, that this decrease in the proportion of mattresses being handled by LAs is due to the wider provision, convenience and cost-competitiveness of retailer and manufacturer provided used mattress collection services.

Though LAs still send more mattresses for recycling than commercial enterprises and the service sector, by weight the LA sourced mattresses only account for an estimated 46% of the mattresses recycled in 2017. This is because LA HWRC sites receive more single and other small mattresses than are collected by retailer or manufacturer collection services or from other sources.

*Figure 2: Summary of regional variation in mattress recycling reported by LAs in 2017 overlaid with locations of active mattress recyclers*



Cost is the main reason LAs don't send mattresses to recyclers, with mattress recycler gate-fees typically twice that of other disposal methods. Provision of reasonably located mattress recyclers determines whether LAs can recycle their mattresses or not, see Figure 1.

7 new mattress recyclers have been identified since the 2016 survey they are all, with the exception of Hamilton Waste and Recycling outside Edinburgh, concentrated in the West

Midlands and North West of England. This raises questions as to the commercial viability of mattress recycling, without subsidies, in large parts of the country, most notably Scotland and the Eastern part of England.

This research involved a survey of retailers and manufacturers, with both NBF members and non-members invited to participate. Though not representative of the whole sector, these businesses reported that they were handling an increasing number of used mattresses, either returned to them due to faults or within comfort guarantee periods or collected as a service alongside the delivery of a new mattress. Most survey participants also expected to be handling even more used mattresses by 2020. Retailers are increasingly feeling obligated to provide used-mattress collection as a service offering to meet customer expectations, though not all dispose of the collected mattresses through recyclers.

The mattress recycling sector is undergoing a period of expansion with a net increase in the number of operators since 2016. In addition, interviewed recyclers reported investment in machinery, site-expansions and transportation, mostly fuelled by increasing demand for mattress recycling from the commercial and services sectors. Most recyclers manually deconstruct and segregate at least the steel, polyester wadding and foam for onward sale to material specific reprocessors. Some have automated shredders that also segregate material, though usually with higher contamination rates than achieved through manual deconstruction. Others shred all, or just the wet and contaminated, mattresses they receive to produce a mixture used in the production of refuse derived fuel (RDF).

There is widespread interest in a Register of Approved Mattress Recyclers (RAMR) being developed by the National Bed Federation and the Textile Recycling Association with all recyclers keen to find out more if they weren't already involved in its development. Retailers and manufacturers indicated that the inclusion of practical information such as location and price in the register would also be useful. Local Authorities would benefit from having a readily accessible list of approved companies to whom they could send out invitations to bid on contracts for mattress recycling.

Professionalism and transparency in the mattress recycling sector have improved overall, though there is still a risk to the sector's reputation from the actual or perceived use of recovered components in undeclared mattress refurbishment or manufacture. Conversely, technologies to improve the segregation of, and to hygienically treat or otherwise improve the resale value of the recovered materials and components, present a significant opportunity for the sector.

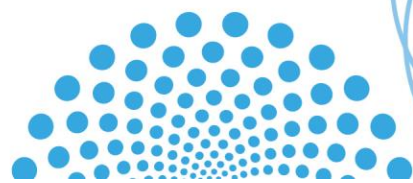
The steps NBF members are taking in providing used-mattress collection services for their customers, as well as arranging for responsible treatment through recyclers or other contractors, are very positive. However, the expectations of both the public and policy makers, in relation to what is acceptable in relation to EoL mattress treatment, are set to push firmly higher.

Policy makers are looking to Extended Producer Responsibility schemes to drive improvements in both the quality and quality of EoL mattresses, as well as their overall sustainability. Already the UK Government has committed to reviewing and consulting on measures to develop an EPR for mattresses and other bulky wastes, with some devolved administrations also interested. Though primarily designed to transfer the financial burden of the EoL treatment from the public sector to the private sector (i.e. to the manufacturers, retailers and large corporate users of mattresses), the highest environmental benefits will only be realised by a scheme with mechanisms for incentivising good practice and continual improvement as well as having the full backing of industry.



## Contents

1 How many mattresses are there in the UK? .....	2
2 What type of mattresses are they?.....	5
3 Local Authority data analysis .....	7
4 Analysis of commercial survey data .....	14
5 Overview of the mattress recycling sector.....	19
6 Recycling rate calculation.....	26
7 Conclusions and recommendations .....	27



# 1 How many mattresses are there in the UK?

## 1.1 In-use stock

To understand the flows of mattresses in the UK, we also need to derive an estimate for how many mattresses there are in-use. To estimate the number of mattresses in houses we used census population data and official statistics on accommodation type, assuming one mattress per bedroom.

In the 2011 census there were 54,922,804 bedrooms in England and Wales for a population of 56,075,912, i.e. 0.98 bedrooms per person. Scaling up for the whole of the UK and the population in 2017<sup>3</sup>, puts the number of mattresses in UK houses at 64,681,000, see Table 2.

Table 2: Total number of household mattresses in the UK, 2017.

Region	Population	Number of bedrooms/mattresses
England and Wales	58,745,000	57,535,000
Scotland	5,425,000	5,313,000
Northern Ireland	1,871,000	1,833,000
<b>All</b>	<b>66,041,000</b>	<b>64,681,000</b>

As for mattresses outside people's homes, we estimated that there are a total of 3,706,000 in the UK, based on a sector-by-sector approach summarised in Table 3.

Table 3: Number of non-household mattresses in the UK, 2017.<sup>4</sup>

Sector	Approx. number of mattresses	Notes
Hospitality	813,000	Forecast 26,000 more rooms in 2019
Care homes	454,000	Note increase in insolvency cases in 2018, possible reduction in beds
Student accommodation	555,000	2% increase in undergrads from 2016-2017
Hospitals	142,000	-
Prisons	92,000	22,000 surplus in purchased mattresses
Armed forces	140,000	3,000 surplus in purchased mattresses
Caravans/ mobile homes	1,510,000	Increasing numbers being registered since 2013
<b>Total</b>	<b>3,706,000</b>	-

<sup>3</sup> Mid-2017 population estimate from the ONS:

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletins/annualmidyearpopulationestimates/mid2017>

<sup>4</sup> Sources:

**Hotels:** PwC UK hotels forecast 2019;

**Care homes:** CMA care homes market study and article by William Eichler - "Social care crisis leads to over 80% rise in care home insolvencies";

**Student accommodation:** HESA statistics

**Hospitals:** NHS hospital bed numbers: past, present, future by The King's Fund;

**Prisons:** UK Prison Population Statistics, Briefing Paper No CBP-04334, 2018;

**Armed forces:** Email correspondence with MoD representative

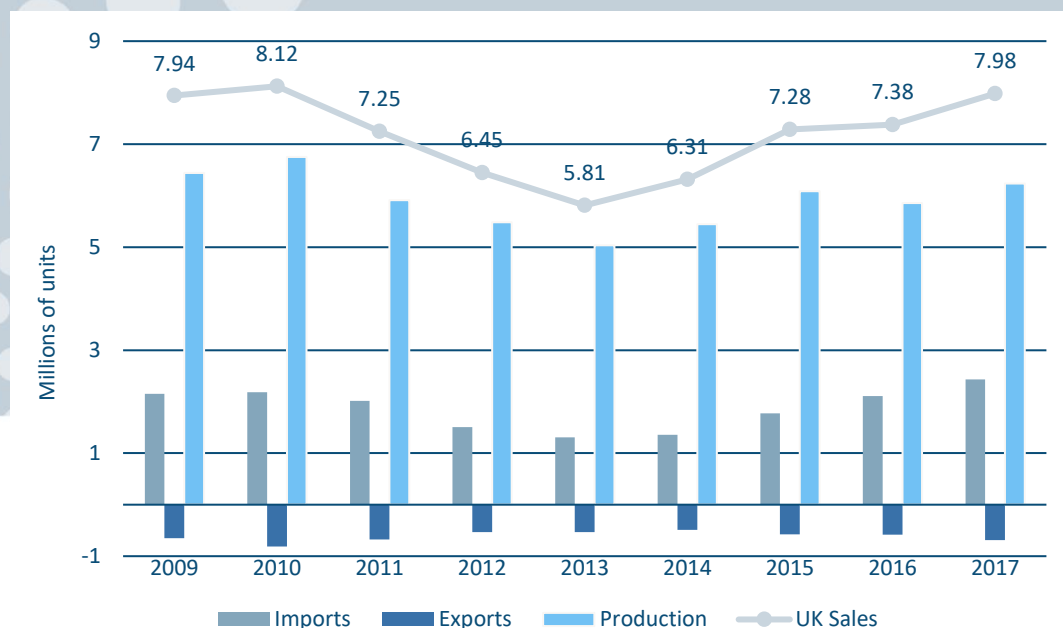
**Caravans/mobile homes:** Industry statistics by the NCC

Based on this approach we estimate that there were a total of 68,387,000 mattresses in-use in the UK in 2017, which is 2% or 1,350,000 more than in 2015.

## 1.2 New mattresses in 2017

A figure for the number of new mattresses added to the UK's in-use stock per year can be calculated from the official government statistics as reported in the Eurostat Prodcom database. New mattress sales (or apparent consumption) is the sum of the mattresses imported into the UK and those produced in the UK, minus the number exported, see Figure 3

Figure 3: Apparent consumption of mattresses (UK) calculated from Production + Imports - Exports



Source: Prodcom, Sold production, exports and imports by PRODCOM list (NACE Rev. 2) - annual data (DS-066341) - Codes: 3103-1230/1259/1270/1290

The shortcoming of this dataset is that only the value, not the weight, of the imported and exported mattresses is available. We can apply the value per unit as derived from the production data, see Table 4, though this is a big assumption.

Table 4: Average value of UK mattress production as reported in Prodcom

Mattress type	Code	2015 (€)	2016 (€)	2017 (€)
Latex foam	3103-1230	158	227	207
Polyurethane foam	3103-1250	39	36	32
Sprung	3103-1270	157	148	136
Other	3103-1290	64	64	57

At nearly 8 million units, the number of new mattress sales in 2017 was near an all-time high.

### 1.3 Mattresses disposed of

Estimating how many mattresses were disposed of in 2017 is integral to deriving a recycling rate. In the absence of comprehensive data on mattress disposal we have applied the following assumption to come up with an estimate:

$$\text{Mattresses disposed of} = \text{Apparent consumption} \times \text{Replacement rate}$$

In 2016 and 2017, 15,360,000 new mattresses were sold in the UK (apparent consumption) but only 1,350,000 additional mattresses were added to the in-use stock. This would imply a mattress replacement rate of 91% and that 6,720,000 mattresses were disposed of in 2016, increasing to 7,260,000 in 2017, see Table 5.<sup>5</sup>

Table 5: Derivation of the number of mattresses disposed in the UK, 2016 and 2017.

Year	New mattress sales	Mattress replacement rate	Mattresses added to in-use stock	Mattresses disposed
2016	7,380,000	91%	660,000	6,720,000
2017	7,980,000	91%	710,000	7,260,000
<b>Total</b>	<b>15,360,000</b>	<b>91%</b>	<b>1,370,000</b>	<b>13,980,000</b>

We estimate that 7,260,000 mattresses were disposed of in the UK in 2017 and that 91% of new mattresses sold are bought to replace a mattress being disposed of. Assuming an average mattress weighs 25 kg, this corresponds to 181,500 tonnes of mattresses disposed per year.<sup>6</sup>

<sup>5</sup> Assuming the in-stock accumulation is proportional to new-mattress sales.

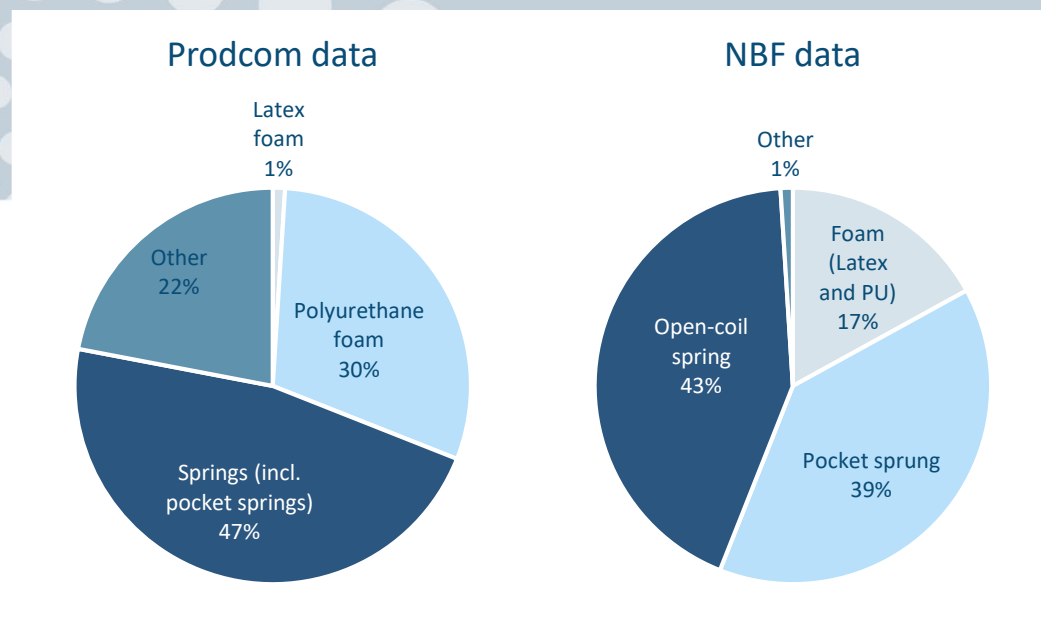
<sup>6</sup> Total waste from UK households in 2017 was 22.4 million tonnes, meaning that mattresses account for approximately 0.8% of all household waste. (Statistics on waste managed by local authorities in England in 2017/18, 11th December 2018, DEFRA)

## 2 What type of mattresses are they?

We're interested in the types of mattresses in the UK as this will impact what can be done with them at their end-of-life. For example, some recycling companies specialise in deconstructing only certain types of mattress, and others only recover certain materials from mattresses, typically the steel. Also, as many recyclers set their gate fee on a per unit basis, the size of the mattresses they get also affects their business models.

Mattresses range in size from cot and narrow caravan mattresses (typically 10-15 kg) to super-king size mattresses and above (which can weigh anywhere from 50 to 100 kg). In terms of construction, they are generally classified by what their core is made of, i.e. either a traditional open coil spring set, a pocket-spring set, a polyurethane foam block or a latex foam block.

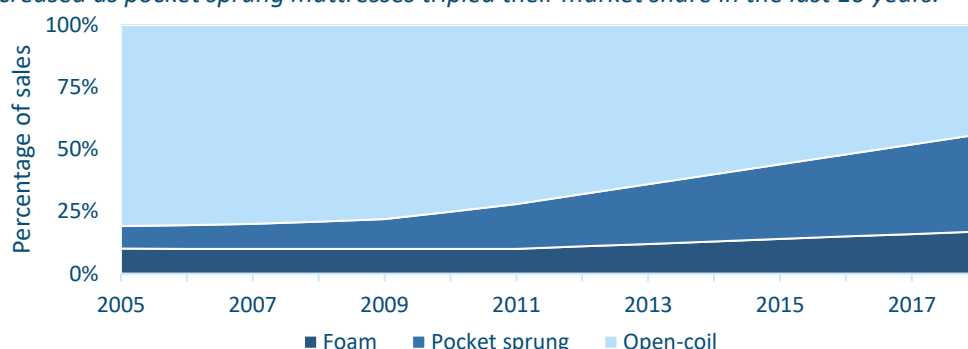
Figure 4: Information on the composition of mattresses made in 2017 from official government statistics (Left) and from a survey of NBF members (Right).<sup>7</sup>



Mattresses are typically between 5 and 15 years old when they are disposed of. As such it is historical mattress composition, and how it is changing that is of interest to mattress recyclers. The big change in the last decade is the growth in pocket spring use, as well as a modest increase in mattresses with foam cores (especially with the recent popularity of bed-in-a-box designs), see Figure 5.

<sup>7</sup> The government statistics on production and apparent consumption (production + imports - exports), as reported in the Eurostat Prodcom database. We suspect that discrepancies between Prodcom data and that reported by NBF members (who represent over 75% of the sector) is due to mattresses being mis-categorised, i.e. classified by their comfort layer as opposed to their core.

Figure 5: Plot indicating how the proportion of open coil sprung mattresses sold in the UK has decreased as pocket sprung mattresses tripled their market share in the last 10 years.



Source: This plot is based on estimates from industry representatives and is intended to indicate overall trends only.

Recyclers are already noting increases in the proportion of pocket sprung mattresses they are receiving. The textile content of pocket springs can impact on the quality, and hence price realised by the steel fractions recyclers recover. Pocket springs also tend to be lighter than open-coil spring-sets, for the same level of mattress, meaning there's less steel to recover by the recycler. The equipment and space the recyclers have to a large extent determine what they're able to do with the pocket springs.

The big change in mattress composition in the last decades has been the increase in use of pocket springs, from less than 10% of the market 15 years ago to nearer 40% today, with most of this growth in the last 10 years.

## 2.1 Mattress composition estimates

We've derived a refined estimate of the materials in mattresses reaching their end of life. This has been developed from existing published estimates, comments from mattress recyclers and WasteDataFlow data.

Table 6: Composition of mattresses reaching their end of life in 2017, estimate

Material	New mattresses 2010*	Mattresses for recycling 2010*	Mattresses for recycling 2017 (New estimate)
Steel	29%	50%	50%
Foam (PU and Latex)	28%	5%	15%
Non-wovens (felt/flock/shoddy)	22%	20%	12%
Polyester wadding (non-woven)	4%	5%	5%
Mixed cover textiles	6%	10%	8%
Other (coir, wood, wool, film, packaging & rigid plastic)	11%	10%	10%

\* Carpet and Mattress Recycling at HWRC Sites, WRAP, 2015

A better understanding of typical EoL mattress composition, and how it is changing, is important to mattress recyclers, whose businesses are partly dependent on the income from selling the segregated materials. Mattress manufacturers and their component suppliers could support mattress recyclers by producing regular sector wide material inventories.

## 3 Local Authority data analysis

Most mattresses, upon disposal, are handled by local authorities, either at household waste and recycling centres or through kerbside collection services. Thus, quantifying these flows is key to deriving a reliable recycling rate for mattresses in the UK.

### 3.1 Methodology

In order to understand Local Authority's (LA's) experiences of mattress recycling we surveyed LA representatives as well as analysing the publicly available data on municipal waste collection and treatment.

### 3.2 WasteDataFlow

LAs report on their handling and treatment of municipal waste through the web-based WasteDataFlow database. This data is checked by the Environment Agency, prior to publication. Currently,<sup>8</sup> the most recently available data is from the 2017/18 financial year.

LAs report recycling (and reuse) of mattresses through a number of questions (Q.s 10, 12, 16, 17 and 19) targeting:

- 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

However, since the start of 2015 a new question has been introduced (Q.100) designed to record all the treatments and end destinations of waste, partially replacing some of the above questions.

For this analysis we primarily used Q.100, except for the first quarter of 2015 where this question was not always completed. In general, the recycling reported in Q.100 matched well with the reported data in the older-style questions used in the previous analysis, see Table 7. The overall discrepancy between the new and old analyses of the 2015 data was less than 6%, which was mostly due to the City of Edinburgh data from 2015 not having been available when we did the first analysis.

We also double checked with the City of Edinburgh and South Lanarkshire Councils (the only Scottish Councils to have reported mattress recycling in other years) that the value of zero mattresses sent to recycling in 2017 was accurate. The lack of reported recycling in 2017 can be attributed to the fact that there weren't any mattress recyclers operating in Scotland in the 2015-2017 period, so procuring mattress recycling services would have been difficult. New in 2018, Hamilton Waste and Recycling Ltd based outside Edinburgh reported that they recycled approximately 28,000 mattresses from Local Authorities in 2018, equivalent to approximately 560 tonnes.

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<sup>8</sup> February 2019

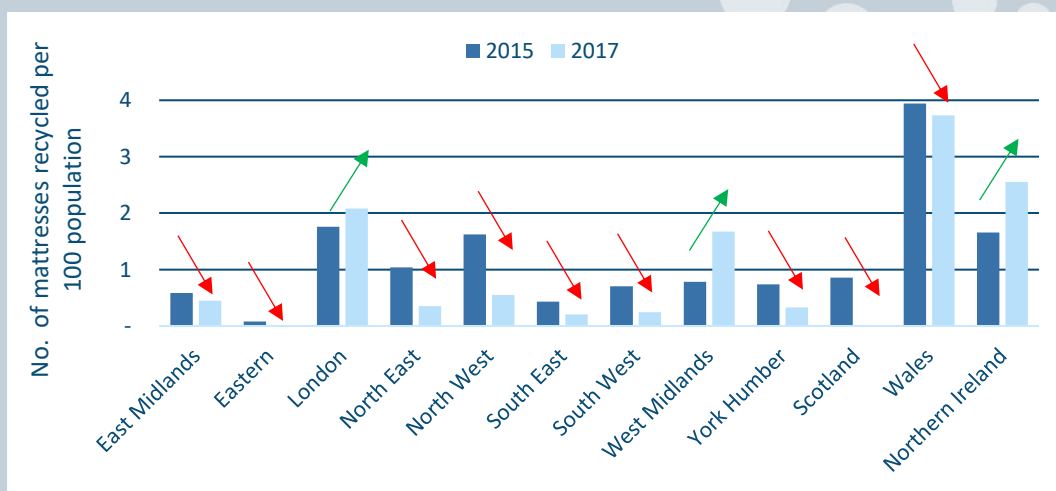
Table 7: Summary of the tonnage of mattresses recycled by UK region, as reported by LAs in WasteDataFlow.

Region	Old analysis	New analysis		
	2015	2015	2016	2017
East Midlands	711	781	864	635
Eastern	103	122	0	0
London	3,643	3,658	3,843	4,606
North East	634	686	332	247
North West	2,875	2,914	3,204	1,050
South East	967	947	246	476
South West	947	947	1,002	351
West Midlands	1,166	1,117	1,988	2,539
York Humber	996	996	388	472
Scotland	348	1,159*	632	0
Wales	3,049	3,051	2,988	3,094
Northern Ireland	770	768	816	1,258
<b>Total (tonnes)</b>	<b>16,209</b>	<b>17,146</b>	<b>16,303</b>	<b>14,728</b>

\* The difference between the two WasteDataFlow analyses of Scottish mattress recycling in 2015 is due to City of Edinburgh data, which wasn't available when the first analysis was done.

In the 12 UK regions, the number of mattresses LAs report as being recycled decreased between 2015 and 2017 in all but four regions. When normalised for population and taking into account population growth between 2015 and 2017, the number of mattresses reported as being recycled per head of population has decreased everywhere except for London, the West Midlands and Northern Ireland, see Figure 6.

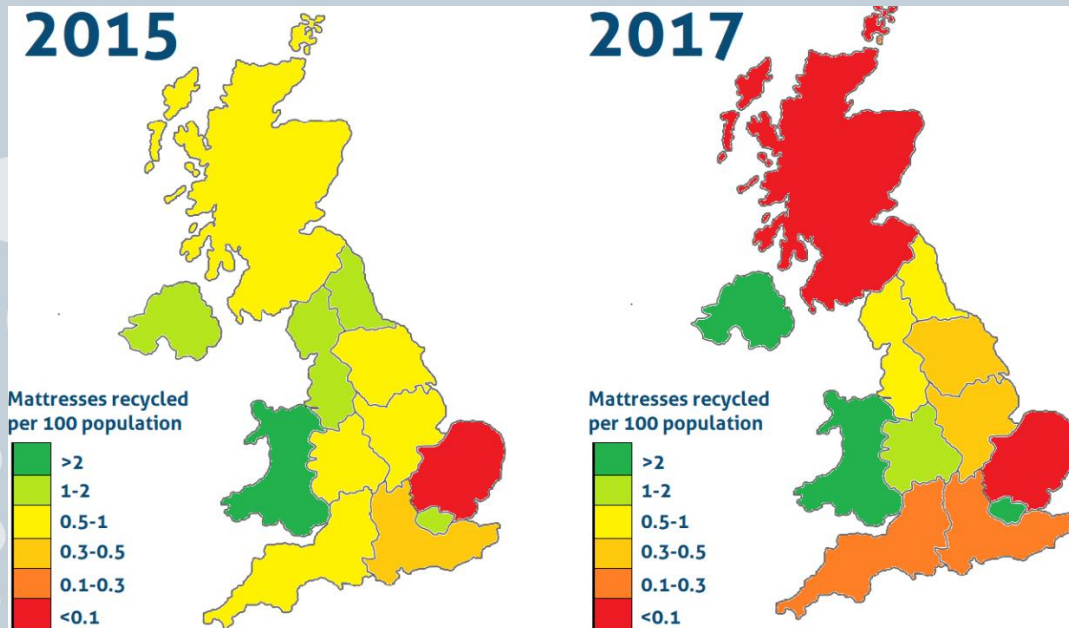
Figure 6: Regional mattress recycling rates (per 100 population) in 2015 and 2017.



This population normalised information on LA reported mattress recycling is also presented in the maps in Figure 7. With no mattress recycling at all reported in Scotland and the Eastern region of England in 2017, these regions are coloured in red. The best performing regions, with over 2 mattresses recycled per 100 people in the regional populations, are London, Wales and Northern Ireland.



Figure 7: Population normalised LA reported mattress recycling by UK region in 2015 and 2017.



The population covered by Local Authorities reporting mattress recycling decreased by 20% between 2015 and 2017, see Table 8. In 2017 less than a third of the UK population are in LAs reporting mattress recycling. Over the same period the total tonnage of mattress recycling reported by Local Authorities decreased by 14%. As well as decreasing population coverage there is also some evidence to suggest that the public may be using LAs' HWRC sites and kerbside collections less, see Figure 9, perhaps due to the increase in commercial take-back services on offer by retailers and manufacturers.

Table 8: Summary of mattress recycling reported by Local Authorities, 2015-17.

	2015	2016	2017	% Change 2015-17
No. of LAs reporting recycling (WDF)	86	72	81	-6%
Population represented	24,691,220	19,730,750	19,686,720	-20%
% UK population represented	38%	30%	30%	-20%
Total mattresses recycled (tonnes)	17,145	16,303	14,727	-14%
Total mattresses recycled (units)*	857,250	815,150	736,350	-14%
No. of mattresses recycled per 100 (total UK) population	1.05	0.99	0.89	

\*Assuming 1 mattress = 20kg

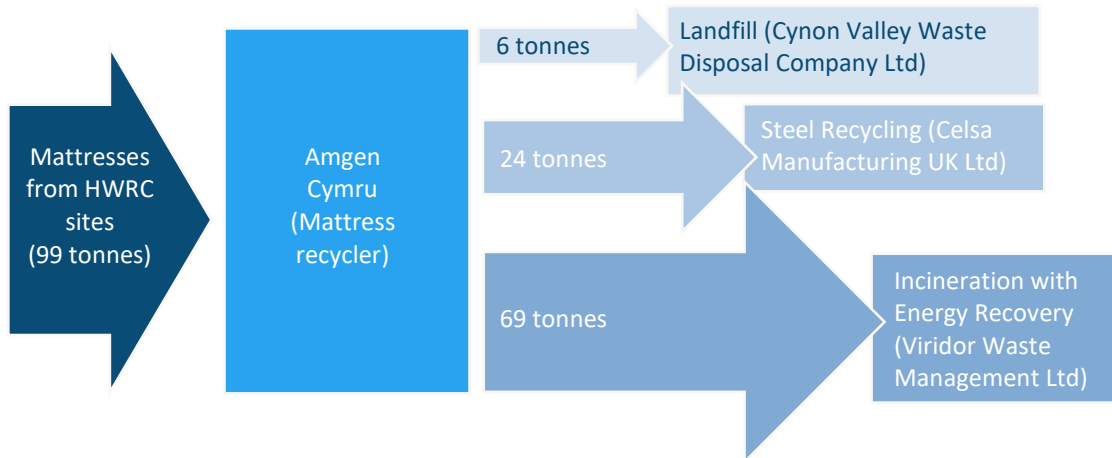
Note: The recycling reported herein includes a small proportion of reuse; less than 0.5% of the total.

The 14% drop in mattress recycling reported by Local Authorities can be attributed to a decrease in the size of the population covered by the LA facilitated recycling services, though may also indicate that fewer mattresses are being taken to HWRC sites.

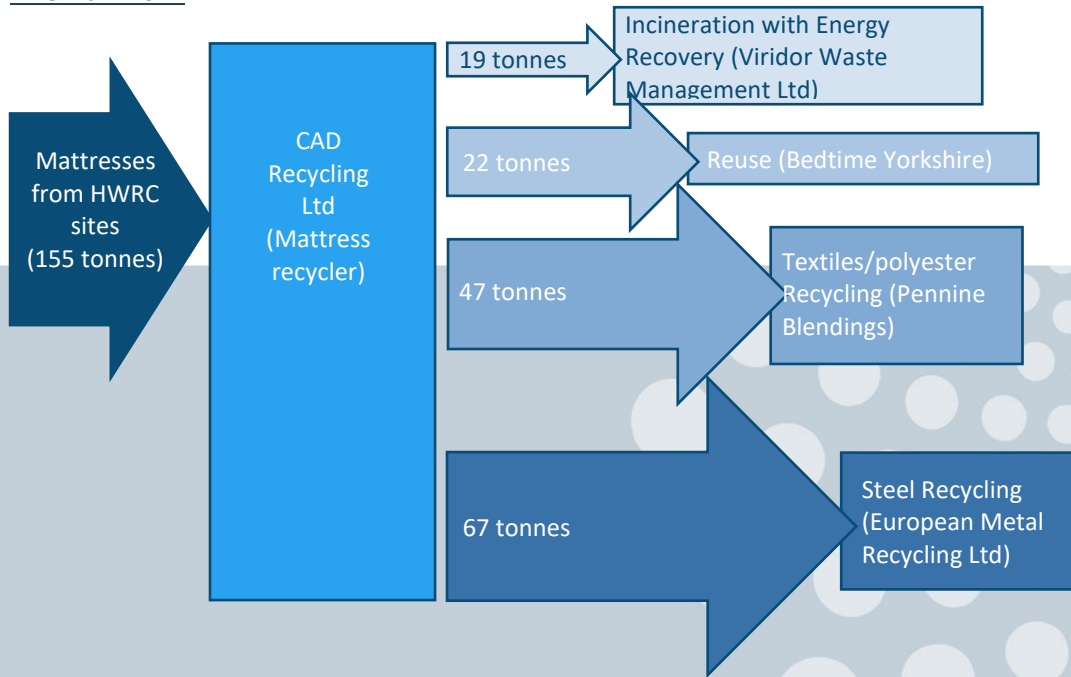
The benefit of the Q.100 reporting format in WasteDataFlow is that it enables LAs to record all the treatments and end destinations of the wastes, including details of what businesses treat the waste and what they do with it. However, in practice only 3 LAs have provided enough information for us to understand the flow of materials through mattress recyclers and to the end markets for the recovered materials. These were Blaenau Gwent, Gwynedd and Wrexham.

Figure 8: Mass flows of materials from 3 LAs, through their contracted mattress recyclers to the end markets for the recovered materials

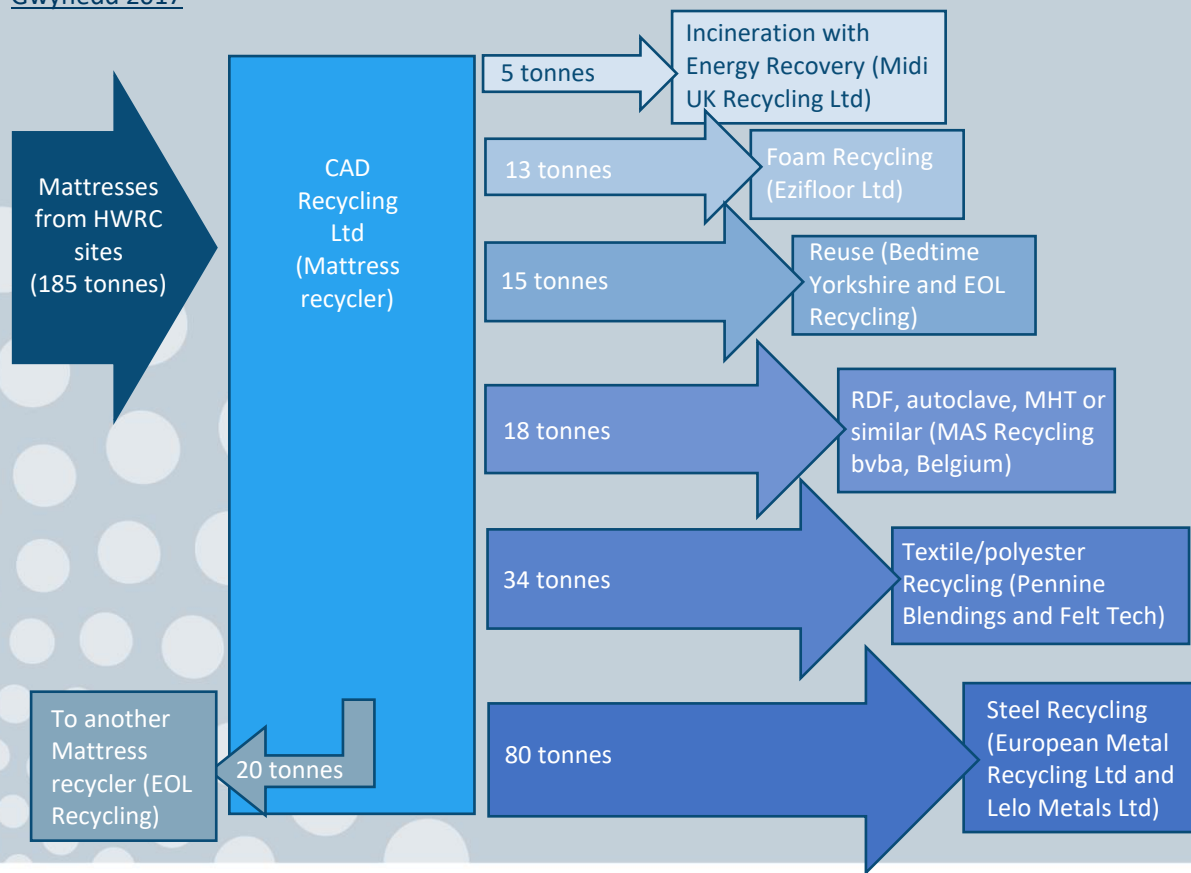
Blaenau Gwent 2017



Wrexham 2017



Gwynedd 2017



Material and component trackability after mattress deconstruction were raised as a priority by interviewees involved in procuring mattress recycling services in both the private and public sectors. LAs and businesses procuring mattress recycling services want assurances that the materials and components recovered from their mattresses aren't used illegally in, for example, constructing new mattresses without the proper hygienic treatment.

The information transparency demonstrated in the above Local Authority examples exemplifies current best practice. We understand that many mattress recyclers do, as standard, provide their customers with this level of detail, however it is rarely reproduced in a public format. If mattress recyclers don't already have systems in place to report on material flows through their plants, we expect that client requests and requirements of the Register of Approved Mattress Recyclers (RAMR), will soon change this.

Information on the recovery and further processing of materials from mattress deconstruction is generally available and can be used to assure customers of the responsible treatment of their used mattresses.

### 3.3 Survey of NAWDO members

In the 2016 research into mattress end-fates it was difficult to identify the right individuals with LAs to contact. This time we avoided this inefficient process by reaching out to the National Association of Waste Disposal Officers (NAWDO) directly. NAWDO generously agreed to distribute and promote our survey across their membership in March 2019. We received 13 responses, the insight from which is summarised below.

Of the 13 LAs with waste disposal responsibilities surveyed only one was currently sending mattresses for recycling, and this was only on a trial basis. Others had investigated the feasibility of mattress recycling in the past but had not committed to it for the following reasons:

- Cost of mattress recycling overall, or just the cost of haulage to mattress recyclers' sites.
- No space to separate containers for mattresses at the HWRC sites.
- Could only find RDF manufacturing processors, not genuine recyclers.
- Mattress reprocessors and recyclers didn't pass the LA's health and safety audit.
- A previously used mattress recycler had been unable to dispose of the mattresses they were contracted to recycle.

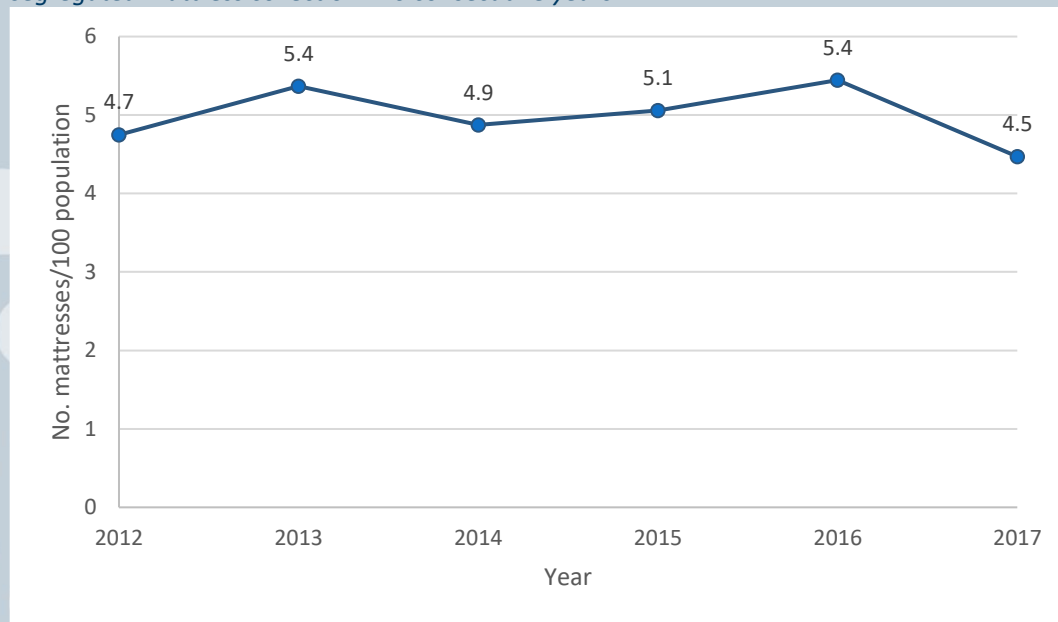
The main concerns of LA's with procuring mattress recycling services – cost (and value), space, H&S, and other reputational risks – this has not changed since the 2016 study.

Other interesting insights from the study include:

- One LA estimates that in 2018 mattresses made up around 4% of the general waste at their HWRC sites, down from 7% in 2009.
- Another LA estimated that of the mattresses they receive, 4.2% are from kerbside bulky collections, 0.3% from fly tipping events, and 95.5% from HWRC sites.
- Some LAs are contracting out their bulky kerbside collection services.
- Some survey respondents feel that mattresses (and carpets) are the most suited to 100% manufacturer/retailer take-back schemes.
- One survey respondent reported that 17% of the mattresses they collect are from fly tipping.

In order to explore whether the first point that of decreasing mattress numbers in the HWRC's of one LA, could indicate a larger trend, we went back to LA authority data and looked at the tonnages reported from a sample of LAs that had consistently reported mattress recycling over the entire 2012 to 2017 period. According to these LAs, see Figure 9, segregated mattress collection in 2017 was at the lowest level since before 2012.

Figure 9: Change in mattress collection rates at a random selection of 20 LAs who reported segregated mattress collection in 6 consecutive years.



Source: WDF: the LAs in the sample are Bexley LB, Blackburn with Darwen Borough Council, Buckinghamshire County Council, Carmarthenshire County Council, Devon County Council, Ealing LB, Fermanagh and Omagh District Council, Gwynedd Council, Hartlepool Borough Council, Hounslow LB, Hounslow LB, Lancaster City Council, Lewisham LB, Lincolnshire County Council, North Lincolnshire Council, Pendle Borough Council, Redcar and Cleveland, Borough Council, Richmond upon Thames LB, Rutland County Council, Slough Borough Council

Though this observation is based on a small sample, 20 LAs representing 7.5% of the UK population, the WDF data could indicate that the wider availability of commercial take-back services is already diverting some mattresses away from LAs. Exploring this further would require access to geographical data on the take-back services of retailers and manufacturers and has not been attempted.

## 4 Analysis of commercial survey data

As part of this research a survey was developed and sent to manufacturers and retailers covering the collection and treatment of mattresses returned to them. This survey was carried out over January and February 2019, with manufacturers and retailers identified and contacted directly by the NBF.

For the manufacturing survey the market coverage of respondents was less than half that of the 2016 survey, see Table 9. Conversely, we received far fewer responses from retailers, than in 2016, though the market coverage of the sample was higher.<sup>9</sup>

*Table 9: Comparison of survey respondents to that of the 2nd NBF report*

Survey Group	No. of survey responses		No. of repeat respondents	No. of units mnfct/sold by respondents ('000s)	
	2016	2019		2016	2019
Manufacturers	10	11	3	2,760	1,080
Retailers	40	24	5	520	700

With only 8 businesses having taken part in both the 2016 and 2019 surveys, there were insufficient repeat responses to do a robust analysis of trends between 2016 and 2019. For example, though take-back of mattresses reported by manufacturers in 2019 is nearly 40,000 units less than in 2016, we can't conclude anything about how the level of manufacturer facilitated take-back has changed because we've surveyed a different sample of businesses. Also, because of the small sample size, and the fact that survey participants are by nature self-selecting, we appreciate that the survey findings aren't representative and have made no attempt to scale up to sector level.

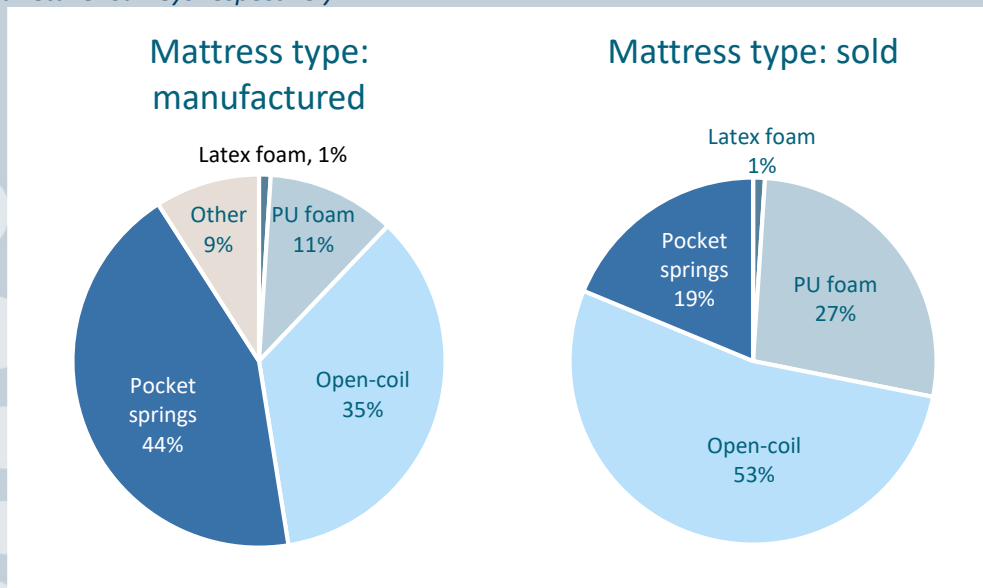
Nevertheless, there were some interesting findings from the survey responses including the type of mattresses produced and sold, changes in take-back schemes between 2016 and 2018 and how manufacturers and retailers dispose of their used mattresses.

The type of mattresses produced and sold in the UK as reported by surveyed manufacturers and retailers, see Figure 10, agrees better with the NBF data than the Prodcom data in Figure 5.<sup>10</sup> The discrepancy between mattress composition reported by manufacturers and retailers is not surprising given that the surveyed samples are not representative. However, it is also likely that mattresses being mis-categorised (by their comfort layer, rather than their core) may have contributed to the discrepancy as well as the higher proportion of foam mattresses imported, relative to sprung mattresses.

<sup>9</sup> We estimate that the market coverage of the manufacturing survey is 17% and that of the retailer survey is 9%

<sup>10</sup> This further supports our conclusion that inferring the market share of mattress types from Prodcom data is flawed, because of a systematic mis-categorisation of mattresses by their comfort layer (instead of core).

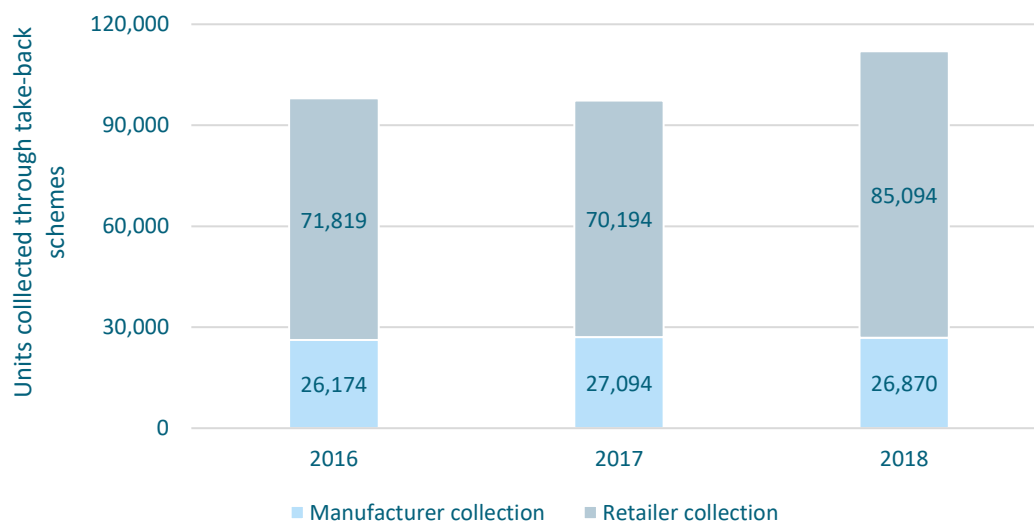
Figure 10: Types of mattress produced and sold in the UK, as reported in the manufacturer and retailer surveys respectively.



The manufacturers who responded to the 2019 survey reported higher direct sales, i.e. not through retailers and wholesalers, than in the previous survey: 8% up from 5%. Not unexpectedly, over 99.5% of the surveyed retailers' sales were direct to households.

In the survey, manufacturers and retailers were asked to provide data or estimates on the number of used mattresses that were returned to them in 2016, 2017 and 2018, and what ultimately happened to them. The absolute level of used mattress returns and collection reported, as plotted in Figure 11, was 14% higher in 2018, than in 2016. This growth was wholly due to retailers, where the level of used mattress returns and collection grew from 10% to 13% of sales.

Figure 11: Total mattresses collected by or returned to the surveyed mattress manufacturers and retailers in 2016, 2017 and 2018.

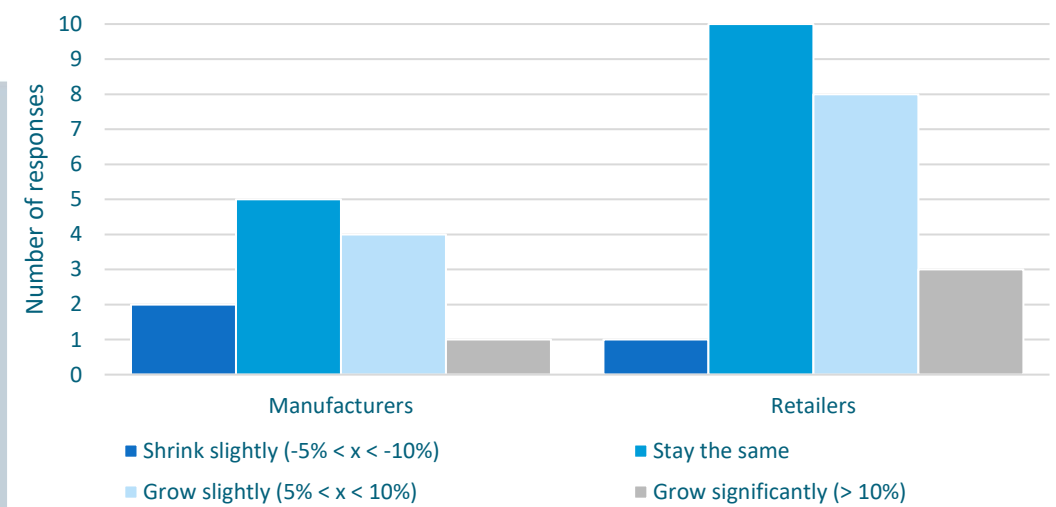


For the sample matched group of 8 manufacturers and retailers, who contributed data to both this and the previous survey, the number of used mattresses collected/returned increased from 2% to 7% of total production/sales, between 2014 and 2018. Furthermore:

- Nearly half of all this year’s survey respondents expect an increase in the number of used returned/collected mattresses they’ll handle by the end of 2020 see Figure 12.
- Less than 50% of survey respondents answered that they were completely sure of what the end fates of the mattresses they dispose of were, and about a third were mostly sure.
- Of those that were able to provide information on end-fates, >80% of respondees indicated that there was at least some recycling, though four indicated that all their collected mattresses were landfilled. Nine businesses also reported some refurbishment or cleaning for resale of the mattresses they collected or that were returned to them. See Table 10 for summary of which end-fate business indicated was the main one for the mattresses they collect. Cost is the main barrier to facilitating mattress recycling, given by the manufacturers and retailers who completed this survey, see Table 12.

Most retailers expecting an increase in used mattress collection gave ‘changing customer expectation’ as a reason for this assertion. One retailer mentioned they expected to see collections increase due to them actively marketing this service to their customers, while another thought that increased collection charges by local authorities would drive even higher collection rates.

Figure 12: Business expectations as to the trend in collected/returned used mattresses they’ll handle by 2020



The only used mattresses manufacturers, who don’t sell directly to customers or supply contract furniture, generally handle those which are returned to them due to manufacturing faults or within a comfort guarantee period. As such, some manufacturers deconstruct returned mattresses to understand the fault for which it was returned, though they also report difficulties with disposing of the materials recovered. Manufacturers expecting shrinking used mattress returns did so because they were improving training and internal quality checks in order to reduce manufacturing faults.

19 businesses reported having a collection service for used mattresses, 13 retailers and 3 manufacturers. Some general observations on these schemes are:

- The average price charged for the collection of a used double mattress is £23.
- A third of respondees indicated that they’d increased the collection charges since 2016 because of higher costs for recycling, or otherwise disposing of, the mattresses.



- 90% of these schemes charge a flat price per item collected.
- 17% of the surveyed businesses have used their collection scheme as a promotional tool.
- All reported schemes collect other parts of beds as well as mattresses.
- The demographics of customers using the collection service was reported as being mixed, though some respondents indicated that the service was particularly popular with time-poor and older customers.

Also, as part of the survey, businesses were asked about whether they'd find an independently audited list of approved mattress recyclers useful. 19 of the 20 businesses who answered this question said that they would and indicated that price and location information would be useful.

The survey also probed what happens to the used mattresses after return to or collection by the manufacturers and retailers. The key findings from these responses are:

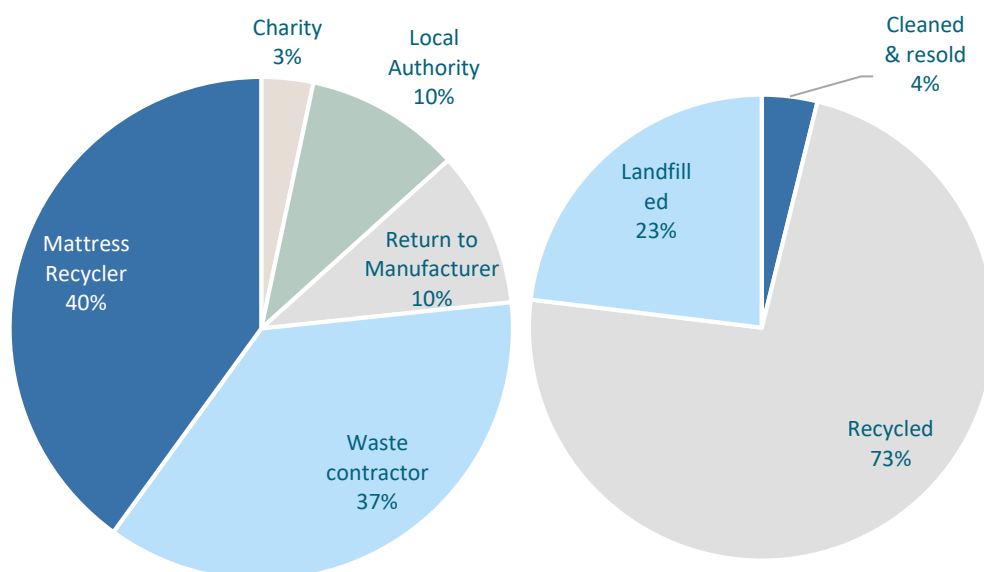
- Over 50% of surveyed businesses have partnered with charities to re-use returned mattresses where appropriate, see Table 10.

*Table 10: Summary of disposal routes for used mattresses reported in the survey.*

	Number of retailers (Total = 33)	Number of manufacturers (Total = 10)	% of all respondents
Charity	10	7	52%
Local Authority	6	6	36%
Waste contractor	14	4	55%
Mattress recycler	13	6	58%
Return to manufacturer (applicable to retailers only)	13		57%

- Of the surveyed businesses, 40% use mattress recyclers to dispose of most of their returned/collected mattresses, relative to 37% who use waste contractors.
- Less than 50% of survey respondents answered that they were completely sure of what the end fates of the mattresses they dispose of were, and about a third were mostly sure.
- Of those that were able to provide information on end-fates, most respondents (>80%) indicated that there was at least some recycling, though four indicated that all their collected mattresses were landfilled. Nine businesses also reported some refurbishment or cleaning for resale of the mattresses they collected or that were returned to them. See Figure 13 for summary of which end-fate business indicated was the main one for the mattresses they collect.

Figure 13: Summary of the main disposal routes (left) and end-fates (right), where known, for used mattresses, as reported by survey participants.



Cost is the main barrier to facilitating mattress recycling, given by the manufacturers and retailers who completed this survey, see Table 11. Some small retailers also listed lack of storage space, for consolidating used mattresses as a barrier to arranging for mattress recycling. Availability of mattress recycling in some parts of the country was also raised as a barrier, see Figure 2. Larger retailers also expressed concern about the risk to their brands and reputation due to lack of transparency and regulation in the mattress recycling sector.

Table 11: Barriers to recycling highlighted by retailers in survey responses

Type of barrier	Retailers' comments
Cost	It is very costly to recycle, which sometimes is borne by the consumers. Assistance in reducing recycling costs would help.
Cost, Accessibility	I am told by my waste carrier that mattresses are recycled, and they charge me a high premium for this, I have no proof of what actually happens to them. I have tried to find a local to me mattress recycler but have not found one that covers my area.
Cost	Costs are the overriding factor for any retailer
Cost	We need factories to handle [mattress recycling] and they will have to be able to charge enough to make a profit. This will clearly be very expensive. I cannot see how any small enterprise could undertake it.
Accessibility	There are very few companies in the North of Scotland who are prepared to recycle mattresses. Our waste disposal company regularly tries to source recycling companies rather than disposal, but have not found a mattress one yet.
Cost	We have made a business decision for the [mattress recycling] service to cover costs of collection and recycling only, not to be a profitable option.
Policy, Cost, Accessibility	Despite the encouraging growth in recycling uptake we've seen over the years, there is still so much to be achieved on an individual and societal level. Safe, sustainable manufacture and disposal must become the norm across every industry. A joined-up approach across government, manufacturers, retailers and the end user is key to achieving this. Incentivizing 100% recycling uptake could be possible if all barriers (namely policy, cost, accessibility and challenging views on recycling as being a choice) were removed.

## 5 Overview of the mattress recycling sector

Mattress recyclers were identified from the WasteDataFlow database, the survey of mattress manufacturers and retailers, as well the previous (2016) report. We have listed the enterprises we consider as the ‘main’ mattress recyclers in Table 12. These enterprises either have mattress recycling as a core part of their business offering and/or were recycling mattresses in 2017 and in at least two other consecutive years.

Note that the companies listed Table 12 or otherwise mentioned in this report are in no way endorsed by the NBF and their inclusion below is meant only to provide some more information on the sector.

Table 12: List of main mattress recyclers identified in this study

Company*	Size of operation†	Location
AAT Recycling Ltd <a href="http://www.aatrecycling.com">www.aatrecycling.com</a>	Medium	Telford
Amgen Cymru <a href="http://www.amgen-cymru.com">www.amgen-cymru.com</a>	Small	Aberdare
CAD Recycling Ltd <a href="http://www.cadrecycling.co.uk/">www.cadrecycling.co.uk/</a>	Medium	Deganwy
Carpenter Ltd <a href="http://www.carpenter.com/uk">www.carpenter.com/uk</a>	Small	Glossop
Circom Ltd <a href="http://www.circom.co.uk">www.circom.co.uk</a>	Medium	Coventry
EnviroTex Products Ltd <a href="http://www.envirotex.uk">www.envirotex.uk</a>	Medium	Accrington/Darwen
Hamilton Waste & Recycling Ltd (since 2018) <a href="http://www.hamiltonwaste.com">www.hamiltonwaste.com</a>	Small	Musselburgh
Mattress Recycling Ltd (since 2018) <a href="http://www.mattressrecyclingltd.co.uk">www.mattressrecyclingltd.co.uk</a>	Small	Batley
Mattress Recycling Services Ltd (since 2018) <a href="http://www.mattressrecyclingservices.co.uk">www.mattressrecyclingservices.co.uk</a>	Small	Ripley
Matt UK Ltd <a href="http://www.matt-uk.co.uk">www.matt-uk.co.uk</a>	Large	Chatham
Mid-Counties Waste Management Services Ltd <a href="http://www.midcountieswaste.co.uk">www.midcountieswaste.co.uk</a>	Medium	Burton-on-Trent
Recycling Waste Solutions†† <a href="http://www.rwsrecycling.co.uk">www.rwsrecycling.co.uk</a>	Small	Dewsbury
The Furniture Recycling Group (TFRG) <a href="http://www.tfrgroup.co.uk">www.tfrgroup.co.uk</a>	Large	Darwen
USEL (Ulster Supported Employment Ltd) <a href="http://www.usel.co.uk">www.usel.co.uk</a>	Small	Belfast

† Recyclers are described as having a large operation if they had a throughput in 2017 of >250,000 mattresses per year, medium operation if they had one between 50,000 and 250,000 and a small if they do less than 50,000 a year.

†† Information on this company received too late for inclusion into map in Figure 2.

\* A new medium mattress recycler, trading as Textile Reclamation Ltd, is planning to begin operation in the Huddersfield area in May 2019. No website yet, contact at 0207 470 9223

We also have a list of enterprises, mostly identified from the WasteDataFlow database, which have done at least some mattress recycling in 2016/17 but don’t fall under the classification of ‘main’ recycler above. We also tried to identify businesses refurbishing mattresses but were largely unsuccessful. These additional organisations are listed in Table 15 at the end of this section. All discussion below pertains only to the ‘main’ mattress

recyclers, as these account for most of the mattress recycling. Most of the main mattress recyclers also provided input for this research, as presented in anonymised and aggregated form below.

Based on extensive interviews we've estimated that the mattress recycling sector received over 4 million mattresses between 2016 and 2018. This is based on self-reporting by mattress recyclers. Appreciating that recyclers may tend to overstate the size of their operations, we sense checked the recycling reported by asking recyclers to comment on each others' numbers.

*Table 13: Number of mattresses received by main mattress recyclers*

Source	2015*	2016	2017	2018
No. of mattresses received by recyclers	900,000	1,034,000	1,363,000	1,753,000
Year-on-year change		15%	32%	29%

\* From 2016 report

For 2017, the overall proportion of mattresses received by mattress recyclers from various sources was estimated, as recorded in Table 14. Note, however, that 4 of the 14 recyclers listed above don't process any mattresses from LAs, while 3 only source mattresses from LAs.

*Table 14: Estimate, derived from input from recyclers, as to the source of the mattresses handled by the sector.*

Source	Local Authorities	Retailers & manufacturers	Other commercial & services	Total
Number of units	746,000	396,000	221,000	<b>1,363,000</b>
% of total units	55%	29%	16%	
Average weight (kg/mattress)	20kg	30kg	25kg	Weighted average = 24kg
Tonnes	14,917t*	11,885t	5,525t	<b>32,327t</b>
% of total weight	46%	37%	17%	

*Note: Justification for using different average mattress weights from estimates that LA sourced mattresses are typically lighter (18-22 kg), than those from retailer/manufacturer take-back schemes (25-35kg) and that mattresses sourced from 'other commercial and services' vary widely (so average of 25kg chosen).*

*\*This is in the same range as that reported in the WasteDataFlow database (14,727t), see Table 7.*

Local Authorities are the main source of mattresses for recycling by number, but not by weight: total commercial used mattress recycling is 17% higher based on weight.

## 5.1 Mattress recycling technologies and material recovery

No two mattress recyclers are the same, in terms of the equipment they use and whether, and how, they segregated the materials from the mattresses.

Mattress recycling processes can broadly be categorised as either deconstruction or shredding though many mattress recyclers do both. Though deconstruction, either semi-automated or manual, results in cleaner, higher valued streams of recovered materials, shredding has the advantage of being able to economically deal with lower quality mattresses. Shredding means that many mattress recyclers are now able to accept wet and contaminated mattresses, such as is typical of those collected in uncovered HWRC sites.

Steel springs and polyester wadding were cited as the most valuable materials recovered from mattresses, on a weight basis. There are also onward markets for the polyurethane foam, textiles and natural fibres, though some small-scale operators have difficulties accessing all these markets due to the low volumes they have to trade. Larger companies typically have the advantage of having more space in which to store recovered materials, meaning they can stockpile and benefit from price fluctuations in the market.

Mattress recyclers are facing a challenge in relation to the increased number of pocket-sprung mattresses they're receiving (see discussion on this trend around Figure 5). Though the textile contamination was described to me as mostly an 'aesthetic problem' by a metal recycler, it meant that they would typically only pay £50-£120 per tonne for used mattress springs. While one mattress recycler has an automated pocket spring recycling machine, others manually take the springs out of the pockets. One mattress recycler currently rejects all pocket sprung mattresses so as not to contaminate their recovered metal fraction, though they are investigating ways to avoid having to do this. Shredding the pocket springs twice liberates more of the textile contaminant, but it is unclear whether this is cost effective.

Polyester wadding recovered from used mattresses is almost exclusively bought by one UK-based specialist company who processes and treats the material for use in applications including technical felts and pet beds.

The polyurethane foam recovered is mostly used to produce carpet underlay. Much of this material is exported, to European countries and further afield, though there are also some underlay manufacturers in the UK sourcing it. There is also ongoing research into ways of hygienically treating the foam from mattresses to allow it to be used in higher value applications, potentially even new consumer items. A European research project aimed at achieving chemical recycling of post-consumer polyurethane foam, i.e. the recovery of the chemicals from the foams in order to produce new foams, is also underway.<sup>11</sup>

The textile ticking from used mattresses, generally made of heavyweight, light-coloured polyester and cotton fabrics, has limited reuse and recycling potential because of its significant hygiene issues. The textiles are sometimes shredded and used in horse manèges (if all staples and other contaminants are removed) but more often than not it is incinerated directly or used in the production of RDF.

Coir (coconut fibres) is often given away free to nurseries and garden centres for use in hanging baskets. Wool, though sometimes difficult to recover from mattresses, is marketable when collected in high enough volumes. Latex foam is sometimes accepted as a contaminant in the polyurethane foam fraction, as it only makes up around 5-10% of the foam in mattresses. Otherwise, it has no second-life applications other than energy recovery.<sup>12</sup>

Sending wet and contaminated textiles, foams and other recovered mattress fillings to refuse derived fuel (RDF) appears to be the industry standard. Exporting the material, mostly to the Netherlands, is often a cheaper option than either disposing of it via energy from waste or landfill in the UK. As such, most UK mattress recyclers avoid landfilling any of the materials from the mattresses that they receive. Based on the average mattress composition in Table 6 we estimate that approximately 20-25% by weight of the material recovered by mattress recyclers is used for RDF production or otherwise disposed of.

<sup>11</sup> PUReSmart project: <https://cordis.europa.eu/project/rcn/220032/factsheet/en>

<sup>12</sup> Two of the nine innovation projects funded by Eco-mobilier (the French EPR scheme) in 2019 are targeted at latex (<https://www.eco-mobilier.fr/nine-innovative-and-ambitious-projects-in-order-to-find-new-ways-of-recycling-and-recovering-materials/>). Note that latex mattresses are more common in France than in the UK.

There are also differences in how mattress recyclers get the mattresses to their sites, if transport is part of their service offering. One large company uses refuse collection vehicles (bin lorries) to compact the used mattresses, meaning they can transport 200-300 mattresses at a time. Another recycler has a system allowing them to carry 600 mattresses on standard 40-foot trailers, which would otherwise be only able to carry around 90 uncompacted mattresses. Most other recyclers transport uncompacted mattresses in Luton vans or similar.

The average gate-fee in the sector is £4.90 per unit, weighted by recycler throughput, the median gate-fee is £5.50. With transport, this can go up to £9-11 per unit.

## 5.2 Mattress recycling sector organisation

The mattress recycling sector in the UK has seen some explosive growth in the last few years, see Table 13, with both new companies being established and existing companies expanding. Our estimation of the overall throughput of the sector is based on self-reporting by the recyclers who, we acknowledge, are susceptible to exaggeration. However, we consider their input as a good estimate of the overall mattress recycling sector, given that we haven't included a number of smaller mattress recyclers, including those in Table 15, in our estimate.

Most mattress recyclers are optimistic about the future of the sector. Half of the companies in Table 12 are intending to expand their operations in 2019, through investing in equipment, building on their existing sites or through opening new sites.

One structural change of note in the mattress recycling sector since the last survey is the increased importance and complexity of the logistics involved. Though some mattress recyclers do provide the option of collection and transport of the used mattresses, many don't. Mattress take-back from households and businesses can include multiple journey-legs and specific handling and storage procedures. As such specialist logistic companies, such as DHL (with its Enviro Solutions offering), Rhenus Home Delivery Ltd (of which collectyouroldbed.com is now a part), Hermes and UPS, all have reverse logistics offerings being used in mattress recycling. Innovation in used mattress logistics will drive further growth in mattress recycling, especially considering how geographically concentrated the current mattress recyclers are, see Figure 2.

There are still rumours of undesirable activity in the sector: including bailing and exporting whole mattresses and selling mattress components (mostly PU foam) and whole mattresses for undeclared refurbishment.<sup>13</sup> However, as a whole, the level of professionalism in the sector is much improved. The issue of new operators getting into difficulty and abandoning warehouses full of used mattresses also seems to have declined.<sup>14</sup> We attribute the increased professionalism and maturity in the sector to:

- Customer expectations: both Local Authorities and the private sector are demanding demonstratable high material recycling rates in order to justify the cost of mattress recycling.

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<sup>13</sup> It is also likely that spring sets, with or without the insulator pad still attached, are being targeted by illegal refurbishers. However, enquiries from people trying to source PU foam was reported by recyclers as being most prevalent.

<sup>14</sup> Though there is one site in Wednesbury that a number of recyclers have been contacted by the Environment Agency recently for quotes to clear an estimated 10,000-25,000 mattresses. It is unclear whether this site has been cleared yet.

- Recyclers appreciating the importance of trust in building long-term relationships with their commercial customers and taking steps to address this.
- Increased investment in the sector and interrogation of business cases by external parties.

One potential risk to the sector is their actual or perceived employment practices. The direct employment provided by the sector is approximately 120-150 full time equivalents, according to recycler interviews. However, a significant proportion of this employment is for people manually deconstructing the mattresses and handling the recovered materials. The turnover in this role is typically high, despite companies supplementing wages with bonuses linked to the number of mattresses processed. Like other sectors (such as textile recycling, hospitality, agriculture, and food processing) which struggle to attract workers because of the demanding nature of the work and who rely in a large part on agency staff, mattress recycling is at risk of poor employment practices.

In terms of sector organisation, progress is being made on the establishment of a register of approved mattress recyclers (RAMR). The aim of the register is to provide assurance to those wanting to procure mattress recycling services. An audit process has been developed by a stakeholder panel including the NBF and the Textiles Recycling Association. Pilot audits are currently underway, and the intention is to launch the scheme later in 2019. Anyone wishing to join the register will have to pass an independent audit process covering EH&S as well as employment and business processes. In time this may develop into a full trade body for mattress recyclers: a forum for members to share ideas and develop ways to improve the industry.

### 5.3 Mattress and mattress component reuse

The NBF supports refurbishing and reusing mattresses and their constituent parts as long as the used or reconditioned mattresses are clearly labelled and described as such at the point of sale. The NBF policy is clearly laid out, along with definitions of what constitutes used and reconditioned mattresses, on their website.<sup>15</sup>

As part of this research we identified a number of organisations involved in these activities, including:

- The bed-in-the-box manufacturers Simba, Eve and Otty are selling refurbished (or rejuvenated) products on Ebay. Dreams Beds also has a large selection of beds and mattresses, some refurbished and some end-of-line products, for sale through their Ebay shop.
- British Heart Foundations' free furniture collection service is promoted at point of sale by Bensons for Beds, thus encouraging reuse. British Heart Foundation also receive donations from retailers of mattresses returned due to minor-faults or within their comfort guarantee periods.
- Better Re-use works with universities and other businesses to organise the reuse of large volumes of furniture, including mattresses, generated during refurbishments. They recently cleared a hall of residence of 82 mattresses, 13 of them were suitable for reuse and the remainder recycled.<sup>16</sup>

<sup>15</sup>NBF Policy on the Sale of Used & Reconditioned Mattresses, Used Components and Materials - <https://www.bedfed.org.uk/nbf-recycle/nbf-used-and-reused-policy/>

<sup>16</sup> [www.better-reuse.co.uk](http://www.better-reuse.co.uk)

- Kingston Community Furniture collect approximately 3,000 take-back mattresses a year from 15+ small local retailers, which are collected weekly from their site by a mattress recycler. A small number of the mattresses they collect, about 2-3%, are diverted from recycling for reuse.
- The reuse of relatively new mattresses is being arranged through online trading platforms such as Globechain, who are named as a recycling partner by a London hotel chain. They estimate that they've facilitated the reuse, of over 2,000 mattresses.

Charities are the linchpin of all product reuse in the UK: their charity shops and wider networks facilitate the reuse of items ranging from jewellery and clothes, to electronics and furniture. The largest national charity handling furniture is the British Heart Foundation, though many smaller local charities also accept donations of furniture. As well as offering a furniture collection service for households, some charities are involved in refurbishing furniture, though generally not mattresses. Charities do sometimes have mattresses professionally cleaned before resale though, and the premium this allows them to sell the mattresses at easily covers the additional cost of cleaning.

Large charities selling furniture sometimes supplement their stock with new-items so that they can offer their customers a full range of product. Mattresses are one such item: charities sometimes feel the need to supplement their used-mattress donations with the purchase of new mattresses so that customers have the option of buying complete bed-sets.

The trust the general public have in charities, as well as their expertise in marketing second-hand products, suggest they would be well placed to drive increased mattress reuse, either themselves or in partnership with others.

Refurbished mattresses are currently just a niche offering as most declared refurbishing is being done to nearly-new mattresses (i.e. those returned to manufacturers during the comfort guarantee period). Expanding responsible refurbishing to less-new mattresses faces considerable technical and marketing challenges including:

- Improving material and product traceability after the point of sale: actual age of product would be known if refurbishment is being considered.
- Developing testing protocols to screen used mattresses for both hygiene and mechanical performance.
- Building trust in mattress refurbishment by demonstrating excellence in service, transparent pricing and unquestionable ethics.

## 5.4 'Minor' mattress recyclers

*Table 15: Other recyclers who we've classified as 'minor' because of their size, the range of their operations or an uncertainty as to what type of recycling they do.*

Company	Location	Notes
CWM Environmental Ltd	Carmarthen	
Divert Recycling	Knowsley	120 tonnes for Lancashire County Council in 2017
Envik recycling	Bridgend	Over 1,100 tonnes recycled for LAs in 2016-2017, but since dissolved
G D Environmental Services Ltd	Newport	Recycled approx. 225 Cardiff City Council mattresses 2016/2017
J&B Recycling Ltd	Hartlepool	



Ron Hull Ltd	Rotherham	
S&B Waste Management & Recycling Ltd	Wolverhampton	
Textile Reclamation Ltd (from May 2019)	Huddersfield	

## 6 Recycling rate calculation

We have used the following definition of recycling rate:

*The number of waste mattresses received by recyclers, as a proportion of the total number of mattresses becoming waste in a given year.*

The recycling rate was calculated using the equation:

$$\text{Recycling rate (RR)} = \frac{N_{LA} + N_C}{X \times N_S}$$

where:

	Input	Source	2016	2017
$N_{LA}$	Number of LA-sourced mattresses received by mattress recyclers	Based on recycler interviews and analysis of LA data as reported in the WasteDataFlow database	$N_{LA} + N_C = 1,034,000$ units	746,000 units
$N_C$	Number of mattresses from commercial sources and services received by mattress recyclers	Based on recycler interviews and sense checked using input from the survey of mattress manufacturers and retailers.		617,000 units
$N_S$	UK mattress sales (production + exports - imports)	Analysis of PRODCOM and COMEXT databases presented in Section 1	7,380,000 units	7,980,000 units
$X$	Mattress replacement rate	Section 1	91 %	91 %
$RR$	As calculated	See equation above	15%	19%

# 7 Conclusions and recommendations

## 7.1 Conclusions

Mattress recycling in the UK has developed significantly in the 3 years since the previous research carried out in the Winter 2015-16. Not only has there been an increase in the number of mattresses being recycled, with a 55% increase between 2015 and 2017, but there is evidence that this growth will continue in the near term:

- Mattress recyclers reported that their throughput in 2018 was 29% higher than in 2017.
- Nearly half of surveyed retailers and manufacturers expect the number of used returned/collected mattresses they handle to increase by 2020.

With this level of optimism in the sector it is no surprise that half of the 13 mattress recyclers identified have (or are planning in 2019) invested in new technology or otherwise expanded their operations.

While overall mattress recycling is increasing, as is mattress recycling carried out by the commercial and service sectors, there has been a notable (14%) decrease in the number of mattresses collected for recycling by Local Authorities. We attribute this drop to both a decrease in the provision of mattress recycling by LAs, but also to a decrease in the proportion of used mattresses disposed of through LAs, as households increasingly see the collection services provided by retailers and others as being more convenient and cost effective.

The mattress recycling sector appears to be commercially viable at the scale it is now, i.e. 19% recycling rate, without any voluntary or statutory subsidies involved. While it is notable that currently all recyclers have a different business approach to generating the best financial returns from their mattress activities we anticipate that the range of viable business models will narrow as the sector matures. Whether enough mattress recycling is possible, in combination with EfW, to achieve the NBF's 2028 target of 75% landfill diversion is still to be seen.

## 7.2 Recommendations

Our overarching recommendation is that recycling and other EoL mattress treatment is integrated more closely with the provision of mattresses for sale and leasing. Only through cooperation can systematic improvements in the sustainability of mattresses be achieved. Cooperation, built on an acceptance of responsibility, trust and proactive work programmes, could strengthen the sector against economic downturns and reduce other risks (such as reputational risks to retailers if materials recovered from mattresses are used illegally).

Our specific recommendations for ways in which to improve the EoL fate of mattresses are as follows:

1. **Apply eco-design principles to improve the impact, including that at EoL, of mattresses.** The variety and complexity of mattress construction methods increase cost

and reduce the quality and quantity of materials recovered in recycling. The NBF could lead by preparing guidance to their members on this.

2. **Engage with the UK and regional devolved administrations to design an Extended Producer Responsibility Scheme (EPR)** that would have industry support and that will support continual improvement in the sustainability of mattresses, including but not limited to their EoL.
3. **Improve trust within and in the sector through increased transparency and accountability.** The Register of Approved Mattress Recyclers (RAMR), under development, is anticipated to go some way in addressing this point. Widely welcomed by stakeholders, the launch of RAMR should be expedited if possible.
4. **Target R&D at improving the overall sustainability of mattresses** including material, choice, product design, information management,<sup>17</sup> and technologies to support the valorisation of used mattresses including, but not limited to, their recycling. Efforts should also be made to develop techniques for reconditioning spring sets and in developing criteria and testing protocols to ensure acceptable hygiene and technical performance of these and other used components.
5. **Prepare for and respond to innovation in bedding products and disruptive business models improving the sustainability of mattresses.** Innovation could include mattress constructions to support recycling, leasing models for bedding products and an expansion of responsible component refurbishing. Involving the supply chain in discussions at an early stage will support any transition.

In terms of future work, establishing the baseline and means to monitor progress towards the NBF's target of 75% landfill diversion, for new mattresses sold, by 2028 should be a priority. Information on the treatment of non-segregated mattresses (i.e. mattresses collected alongside other bulky household waste in HWRC sites) will be key to this metric. Based on a cursory review of WasteDataFlow, data completeness may be a barrier to a thorough derivation of the proportion of mattresses treated for energy recovery, versus landfill.<sup>18</sup> Energy from Waste (EfW) capacity is expanding rapidly, with an increase of 45% forecast between 2017 and 2022.<sup>19</sup> This, combined with increasing landfill costs, should support the NBF in achieving its target.

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<sup>17</sup> e.g. tagging/labelling products to convey relevant information to customers (i.e. production date) and allow recyclers to easily identify the constituent materials

<sup>18</sup> If we were to assume that bulky wastes were treated the same as general residual waste, then the landfill diversion could already be roughly 59% (19% recycled, 40% EfW, 41% landfill) though this method is far from robust.

<sup>19</sup> <http://www.tolvik.com/wp-content/uploads/Tolvik-UK-EfW-Statistics-2017.pdf>

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### **Mattress Recyclers**

AAT Recycling Ltd

Amgen Cymru

CAD Recycling Ltd

Circom Ltd

EnviroTex Products Ltd

Hamilton Waste & Recycling Ltd

Mattress Recycling Ltd

Mattress Recycling Services Ltd

Matt UK Ltd

Mid-Counties Waste Management Services Ltd

Recycling Waste Solutions

USEL (Ulster Supported Employment Ltd)

### **Reuse organisations**

Better Reuse

British Heart Foundation

Globechain

Kingston Community College





**Local and National Authorities**

Environment Agency

NAWDO and its members

Northern Ireland Environment Agency

**Others**

Rhenus Home Delivery Ltd

Lancaster University

Ministry of Defence

Ministry of Justice

Veolia

WasteDataFlow helpdesk



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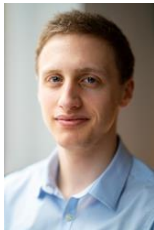
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A founder Director of Oakdene Hollins, David's strength is in the application of economic instruments to environmental policy objectives and in analysis of market opportunities for environmental technologies. He has peer reviewed LCA papers on waste management options for paper, glass, plastics, wood, aggregates, steel and aluminium, and co-written major papers on resource efficiency, CO<sub>2</sub> reduction and energy from residual wastes.



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Huw graduated last year from Lancaster University with a Master's in Physics with Astrophysics and Cosmology, demonstrating a keen eye in report writing and research ability in his dissertation topic. He has come into Oakdene Hollins this year and has already contributed to numerous high impact projects.



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