NBF End of Life Report for Mattresses

This report sets out the methodology used to gather and analyse data on a regular basis in order to inform and deliver a bi-annual End of Life Report for Mattresses for the NBF.

For the National Bed Federation, November 2014

NBF End of Life Report for Mattresses

A report by

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RESEARCH & CONSULTING

With foreword by Tony Lisanti, Airsprung Group

Value-driven consulting

Science-led research

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Glossary

Units

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

Contents amendment record

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Foreword

The Future of Mattress Recycling in the UK by Tony Lisanti

It is becoming increasingly clear that at some stage in the future it will be deemed to be entirely unacceptable, for either environmental or financial reasons, to simply send end of life (EOL) mattresses to landfill as a method of disposal. We have all witnessed civic refuse centres taking in old mattresses and filling containers that currently end up in landfill sites, all of which are rapidly filling. It is inevitable that at some point the spotlight of the legislators will fall on this issue and the concern is that the manufacturers will, in the future, be held accountable for the EOL product under potential Producer Responsibility laws, similar to those adopted for white goods and vehicle tyres.

It is the intention of the NBF Executive that, as and when this industry is targeted, we will be able to 'lead the way' in providing acceptable solutions to both the industry and policymakers. The Board's position is that, rather than have legislation from either the UK Government or Brussels foisted on manufacturers, we should develop recycling strategies that work for both the industry and the government. In essence, we do not want to have to deal with a bed-industry version of the white goods fiasco, whereby EOL legislation was passed that resulted in mountains of old fridges being stockpiled with no plan as to what should happen to them.

Some time ago a NBF Recycling Committee was formed in order to look at this matter and started to investigate the lifecycle of mattresses and options for recycling EOL products. There is significant complexity in this area, ranging from a lack of available data on volumes of currently recycled products, through to understanding where the constituent materials used in mattress manufacture end up, once a mattress is disassembled. Indeed there are wide variations in what different audiences consider 'recycling' actually means! In some countries legislation has been passed to ban the landfill or incineration of EOL mattresses and the Committee has endeavoured to understand how Producer Responsibility demands have been dealt with in those markets.

What became apparent from our Committee work, however, was that the scale and complexity of the project was proving to be outside the realistic resources of the group. In addition, it was concluded that for the analysis and any future proposals to be credible with legislators, the research and potential solutions needed to have been independently developed. To this end we identified Oakdene Hollins as a specialist in this area of research and the development of this type data, formatted and presented in ways most appropriate for government bodies.

Oakdene Hollins has provided us with an invaluable insight into how government would likely look at the mattress recycling issue and, therefore, how best to guide it to the optimum solutions. Our intention, through Oakdene Hollins' and the NBF's work, is that we will become the organisation that any interested party looking at mattress recycling will naturally come to for information. We intend to be the leading experts in the field, somewhere for legislators to approach when deciding policy in this area.

1 Summary

Used mattresses that have been discarded as waste by the user are being targeted as one of several products for which a higher recovery and recycling rate is required, but at present there is little reliable data on mattress waste and recycling in the UK. This report provides a new methodology to quantify and assess the current state of recovery of end of life (EOL) mattresses for recycling. It is the first comprehensive report on EOL mattresses to be published by the National Bed Federation.

It is important to set out the difference between 'recovery' and 'recycling'. In this study, the former refers to the separation of waste mattresses, either by separate collection or by their extraction from mixed wastes, whilst the latter refers to any process which converts used mattresses into materials that may be used for the manufacture of new products. Most EOL mattresses recovered from the waste stream are indeed sent for recycling and, for convenience, this report generally refers to the 'recovery of mattresses for recycling' as 'recycling'. In practice, however, a small number will be routed to other end fates such as reuse/resale or remanufacturing.

At the core of the methodology used are three surveys, conducted on behalf of the NBF, and a detailed analysis of publicly available production, sales and waste management data.

This study estimates that, across the UK, nearly 600,000 mattresses were collected for recycling in 2013. This compares to around 450,000 mattresses collected for recycling in 2012, representing an overall 30 % increase year-on-year.

Based on estimated annual replacement mattress sales, the UK recycling rate for 2013 is 12.9 % (Table 1). This represents a significant increase compared to 2012, when the recycling rate was less than 10 %.

Table 1: UK mattress recycling rate for 2012 and 2013

	2012	2013
Number of mattresses recycled	452,000	586,000
Replacement mattress sales	4,667,000	4,531,000
Mattress recycling rate	**9.7 %**	**12.9 %**

Of the 439 local authorities across the UK, only 100 currently have infrastructure in place for recovering EOL mattresses. However, since 2011, there has been a clear upward progression in the number of local authorities collecting mattresses and sending them for recycling.

There are wide regional variations in mattress recycling performance. Some local authorities that are in close proximity to mattress recycling operations appear to achieve nearly 100 % recycling levels. Many others, however, do not currently recycle any mattresses at all; here, mattresses remain in the mixed waste stream and are disposed of to landfill or to energy recovery facilities.

It is important to note that there were some key limitations in this first study that relate to on-going data gaps. These included a limited survey response from some segments of the market, and a lack of definitive information on the average weight of a mattress – a key assumption that was used to convert recycling data, given in weights, into units of mattresses.

2 Background

2.1 Context

EOL mattresses are being targeted in many countries as one of several products for which a higher recycling rate is required. It is possible that the current and on-going European Union Waste Management Policy Review Process may affect UK Government policy on mattress recycling, and that the bed industry will face - at some stage - a legislative requirement to dispose of EOL mattresses in an environmentally acceptable way. Landfill bans are under consideration, and are already in place in certain EU countries[1], and mattresses could be a target for a producer responsibility levy at a later stage.

From a policy perspective, mattresses have long been perceived as a problematic waste stream: difficult to handle, composite in nature, with components that are generally difficult to recycle and with limited markets for those components. There are also concerns over contamination, and challenges for recycling from the heterogeneous and low quality nature of the materials. Hence most of the low value material recovered with calorific value is sent for energy recovery.

The technologies available for mattress recycling in the UK tend to be basic – typically manual disassembly and segregation of the materials into the different types: fibre, steel, foam, fabric etc. The businesses that recycle mattresses are small scale, with limited capacity and investment. One major waste contractor simply grinds up all its mattresses, recovers the ferrous metals and disposes of the plastic and textile residues. More sophisticated automated technologies are available in continental Europe. However, these technologies require significant investment, high throughputs and profitable end markets for the range of recyclable materials, and the economic viability of such investment is not yet proven.

Efforts have been made to increase the reuse of EOL mattresses via Third Sector organisations, although this is limited to the highest quality returns.

At present there is little data on mattress waste and recycling in the UK with which to make an accurate estimate of current recycling rates.

2.2 Aims

This report outlines the methodology used to quantify and assess the current state of EOL mattress recovery and recycling in the UK. It is intended that lessons learned from this first study will form the basis of an improving template to be used by the NBF on a bi-annual basis to promote mattress recycling.

This first comprehensive ‘End of Life Report for Mattresses’ in the UK was required to:

- develop a methodology to survey the supply chain for EOL mattresses
- quantify current recycling rates
- understand the data gaps and lessons learned, so that they may be used to improve the methodology and accuracy of the data in future years.

[1] These include Germany, the Netherlands, Austria, Sweden, Denmark, France, Norway, Belgium and various US States and Canadian Provinces. Scotland is considering a landfill ban on waste textiles that might include mattresses. See Department of Sustainability, Environment, Water, Population and Communities – Landfill ban investigation, Final Report, Hyder, Nov 2010

2.3 Structure of this report

The body of this report sets out the methodology used and the results of the study in terms of lessons learned, estimated recycling rates and related findings.

More detailed information supporting the findings is included in the Appendices. The raw data and analysis methods are available if required.

Figure 1: Recycling of mattress components

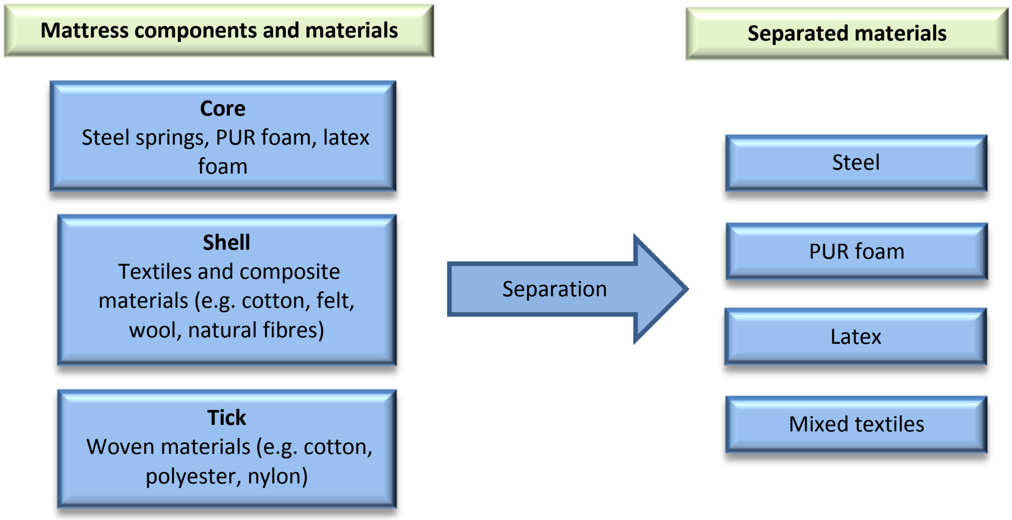
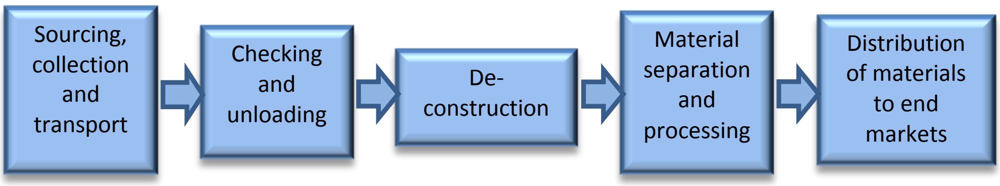


Figure 2: Mattress recycling process



3 Methodology

3.1 Scope

The scope of this project was to quantify and assess the flow of EOL mattresses in the UK from the point of discard by the user, to their recovery from the waste stream or disposal. This included assessing the sources of EOL mattresses, the collection methods used, the operators dealing with them and the end fates of the mattresses. Estimation of the quantities of materials arising from the recycling process, and analysis of the markets for recyclates, were outside the scope of this study.

Figure 3 (overleaf) illustrates the potential supply chains for EOL mattresses from source, through method of collection, to end fates. It also indicates the many different bodies involved in the chains.

3.2 Research

Initial desk research was conducted to review relevant data sources, identify contacts and design sample surveys. This included using existing publicly available studies and data to understand what information and sources were readily available, and where there were likely to be gaps. Relevant past reports included a study by Zero Waste Scotland[2]. Key to the quantification of national and regional recycling rates were the local authority quarterly waste returns, reported in WasteDataFlow, and the production and sales figures, provided by Eurostat. The data obtained from these publicly available sources were sense-checked against data obtained from the surveys and from other sources.

3.3 Data

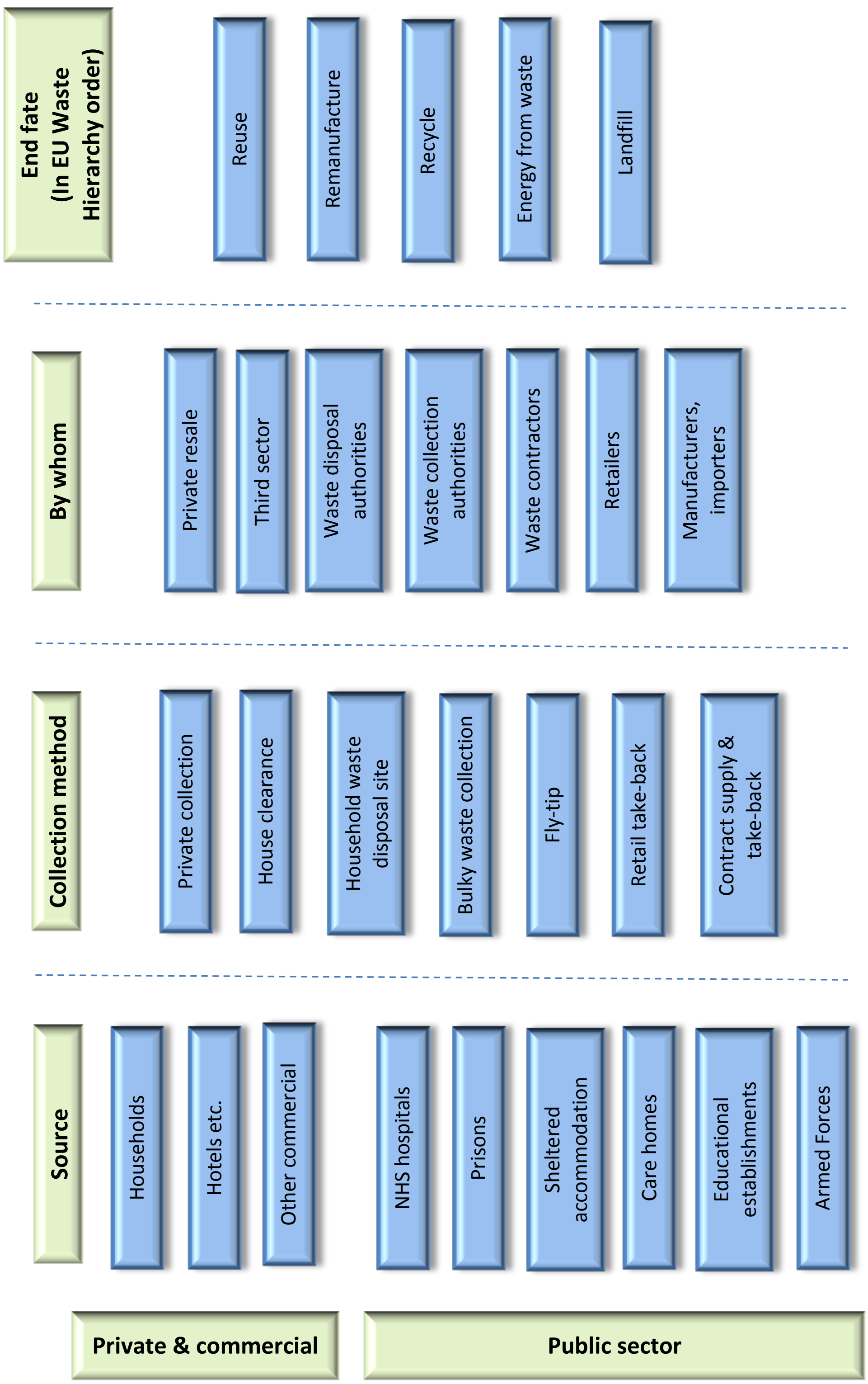
3.3.1 National surveys

Three sample surveys were created to capture data on mattress production, sales and disposal routes throughout the UK. These were directed at NBF members, bed retailers and local authority waste disposal officers, respectively.

1. **NBF members**: A survey was sent to 53 NBF members. According to the NBF, its members represent approximately 70-75 % of total UK production. The survey requested data for units produced, imports and exports, sales, and returns of EOL mattresses via 'take back' schemes. Responses were received from approximately half of the NBF members surveyed.
2. **Retailers**: 55 leading UK mattress retailers, recommended by NBF members, were surveyed and data were requested for units of new mattresses sold and for replacement of EOL mattresses collected via 'take back' schemes. Just over 30 % of retailers surveyed responded.
3. **Local authorities**: Members of the National Association of Waste Disposal Officers (NAWDO) - 90 Waste Disposal Authorities and Unitary Authorities - were surveyed and data were requested on sources of EOL mattresses, quantities collected and their disposal routes. Responses were received from just under 30 % of the local authorities surveyed.

[2] Zero Waste Scotland (2011), A Business Case for Mattress Recycling in Scotland

Figure 3: EOL mattress supply chain



For this first report, the quantitative survey data received were expected to be a mix of information relating to both calendar and financial years, and to be in either units (number of mattresses) or tonnes (weight of mattresses). Therefore, data were sought for two calendar years (2012 and 2013) and for two financial years (2012/13 and 2013/14) and in both units and tonnes. This was requested to maximise the accuracy of the results and to attempt to capture reasonably accurate conversion factors for each mattress type. In the event, the spread of data obtained also enabled a better understanding of the growth in mattress recovery rates and recycling activity levels.

Optional questions were included in all three surveys in order to inform the wider debate on EOL mattress recycling in the UK. These related to the barriers to mattress recycling and policy changes that might promote greater mattress reuse and recycling. The surveys also captured the names of recyclers and waste contractors currently being used by NBF members, retailers and local authorities (see Appendix D: List of recyclers and waste contractors).

3.3.2 Telephone interviews

From the initial desk research undertaken and the survey information received, a list of recyclers and waste contractors was identified for interview. Recyclers were interviewed by telephone for data on the quantity of EOL mattresses processed, the sources of these mattresses, their disposal routes and the products reclaimed.

3.3.3 Other data

The two main public sources of data used in this report were:

- Eurostat (PRODCOM and COMEXT databases) for production, trade and sales data of the number of new mattresses in the UK each year (see Appendix A: Market data analysis.)
- WasteDataFlow, a web-based system for municipal waste data reporting by UK local authorities, which includes tonnages of mattresses recycled by local authority. These data were converted into units using an assumed average weight per mattress. (See Appendix B: WasteDataFlow analysis.)

4 Data accuracy and gaps

As was expected at the outset of this study, it was not possible to obtain comprehensive and accurate data from the many players in the EOL mattress supply chain, as set out in Figure 3. In the event, a number of assumptions had to be made in order to gross-up the available data to the national level.

The accuracy of the data presented in this report was subject to the reliability of two key ratios:

- the percentage of new sales of mattresses that are replacement sales, and
- the conversion rate from units of mattresses to weights - this figure was key to arriving at a headline recycling rate, as the survey results and the waste arisings were mostly given in units, and the recycling data were in tonnes.

The first of these ratios was required to calculate EOL mattress arisings. We used the annual sales of mattresses that were deemed to be replacement sales, with each new sale generating a waste mattress. The top level figure was based on the NBF's assessment that consumer market sales of mattresses in the UK are around 80-85 % replacement sales. The balance, 15-20 %, which do not generate waste units and thereby increases the UK's national stock of mattresses, may be attributed to a number of factors such as population growth, increasing affluence, more low occupancy homes (e.g. single residents and small families with spare bedrooms), and a growing housing stock. The waste arisings figure used in this report was, therefore, taken as 82.5 % of all sales.

The second ratio, namely the average weight of a mattress, was used to convert units to weights. Clearly, given the wide range of mattress sizes (from 'single' to 'super-king size'), construction types (from fibre and foam, to spring-supported) and qualities of the mattresses produced, estimates of the average weight of a mattress vary considerably. We made an estimate of the average weight of a mattress based on data obtained through a number of sources, as follows.

- From an NBF member, who enjoys significant sales and who provided both units and weights across a wide range of mattresses, we obtained a figure of 26 kg.
- The Furniture Reuse Network (FRN) publishes average weights of a range of furniture items, including mattresses. Taking its 2009 figures for a single mattress (21 kg), a double mattress (40 kg) and a king size mattress (50 kg), and an assumed mix of each in the waste stream, we arrived at an average weight of 34 kg.
- Local authorities that responded to the question on conversion rates provided answers of between 24 and 32 per tonne – a simple average of 36 kg.
- One major waste contractor, who collects and recycles mattresses, gave us an estimate of 30kg per mattress as an average.

The conversion rate from units to weights in this study was therefore based on a 30 kg average weight.

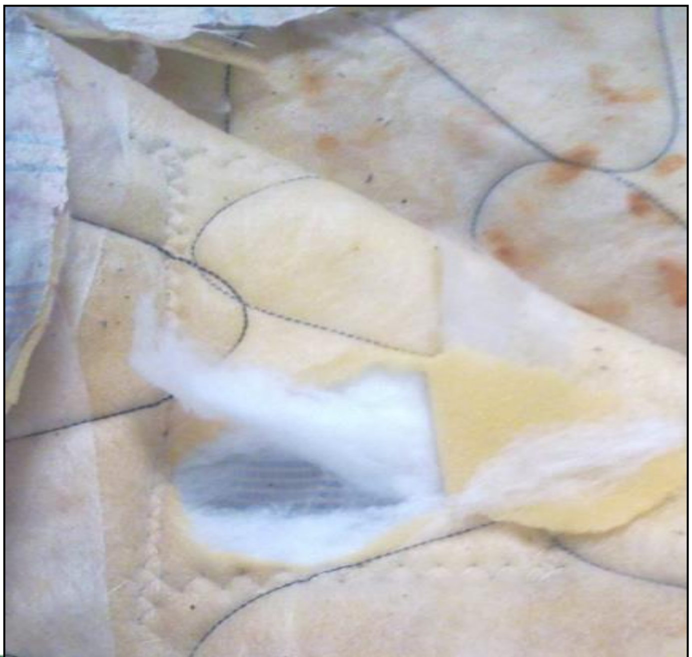
Eurostat sales data (from PRODCOM and COMEXT) are assumed to be reasonably accurate, albeit with one key assumption made in order to obtain mattress production data across the range of mattresses produced in the UK and sales data for the UK (see Appendix A: Market data analysis).

Whilst EOL mattress recycling data provided by WasteDataFlow for local authorities are believed to be reasonably comprehensive and accurate, data on mattress returns from the manufacturers and retailers (which was necessary in order to assess mattress returns that do not go through local authority routes) were poor. These figures, presented as 'Industry Returns,' are the actual figures reported in the NBF members and Retailers surveys, and hence, actuals will be higher (see Appendix C: Survey data analysis). Very little data were gleaned from the recycling companies themselves.

It follows, therefore, that the data presented in this report have generated a recycling rate which is at the low end of the range, and that the actual rate might be slightly higher if all manufacturers and retailers - that have take-back schemes - had reported. Notwithstanding these issues, considerable sense-checking was possible - both from the surveys and from other sources - and this has enabled optimisation of the results.

To summarise, the key gaps in the data included:

- No returns were obtained from the Third Sector (e.g. charities).
- Virtually no data were obtained from the mattress recyclers themselves. Some were not contactable, and others, that were interviewed, were unwilling to divulge any quantitative information.
- Very little data were obtained from the surveys on end fates of mattresses, in particular the quantity of mattresses that were collected for resale and reuse, and those that might be remanufactured. However, from other studies, we believe that this percentage is very low and that the vast majority of EOL mattresses that are collected are either recycled (including energy recovery) or go to landfill.



5 Analysis

5.1 UK overview

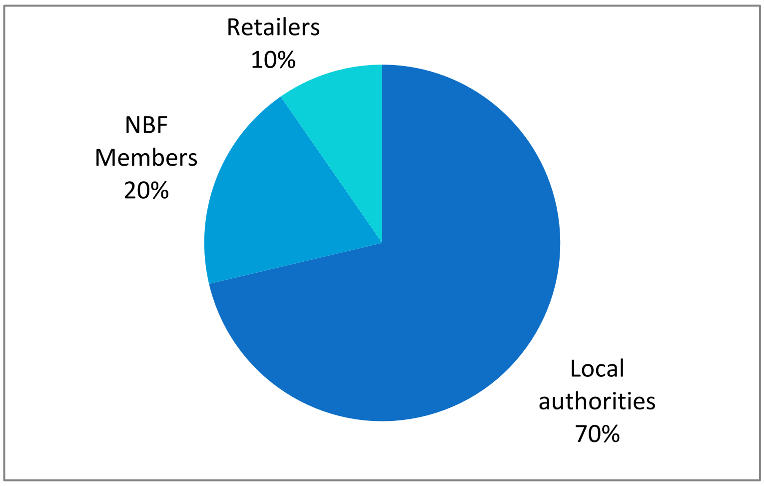
This study estimates that, across the UK, nearly 600,000 mattresses were collected for recycling in 2013. This compares to around 450,000 mattresses collected for recycling in 2012 - an overall 30 % increase year-on-year (see Table 2).

In terms of the EOL management route, 70 % of the mattresses collected for recycling were sourced from local authorities, primarily at Household Waste Recycling Centres (HWRCs). However, direct returns of mattresses to the industry totalled nearly 170,000 mattresses in 2013, and accounted for around 20 % of the total number of mattresses collected for recycling in the UK. The split between NBF members, local authorities and mattresses retailers is shown in Figure 4.

Table 2: Number of mattresses collected for recycling (units)

Management route	2012	2013	% change
Local authorities	311,000	418,000	34 %
Industry returns	141,000	168,000	20 %
Total	**452,000**	**586,000**	30 %

Figure 4: EOL Management routes for recycled mattresses (2013)



Around half of the NBF members that responded to the survey currently operate take-back schemes for mattresses, and three quarters of mattress retailers that responded operate such schemes. Return rates for some companies exceeded one third of total sales, and were notably higher for sales directly to consumers or the hospitality and services sectors. What's more, industry returns of mattresses for recycling have been growing rapidly.

Based on UK annual replacement mattress sales of around 4.5 million per year, the UK mattress recycling rate for 2013 is estimated at 12.9 % (see Table 3). This represents a significant increase on 2012, when the recycling rate was less than 10 %.

Table 3: UK mattress recycling rate for 2012 and 2013

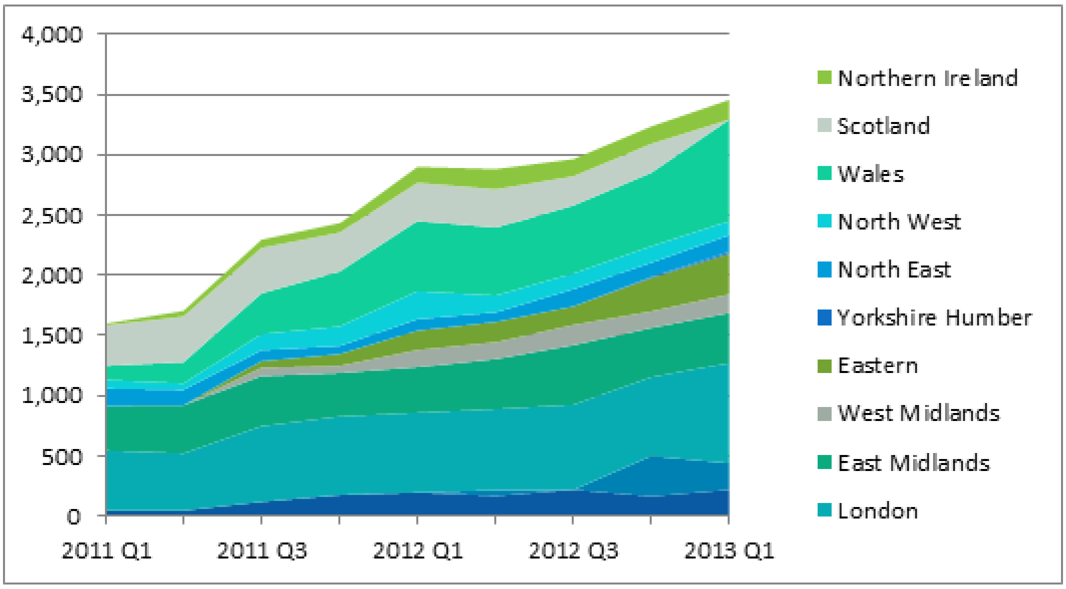
	2012	2013
Number of mattresses recycled	452,000	586,000
Replacement mattress sales	4,667,000	4,531,000
Mattress recycling rate	**9.7 %**	**12.9 %**

5.2 Regional performance

Across the UK, only 100 local authorities currently have any infrastructure in place for recycling EOL mattresses (according to submissions of data by local authorities to WasteDataFlow). This is less than one quarter of the total 439 local authorities in the UK.

However, there has been is a clear upward progression of mattresses recycling by local authorities since the beginning of 2011, both in terms of the number of local authorities collecting mattresses for recycling and the tonnages reported (see Figure 5). The quantities of mattresses collected by local authorities has doubled over this period, representing a 10 % quarter-on-quarter growth rate. Preliminary data suggest that further increases might be achieved in the future.

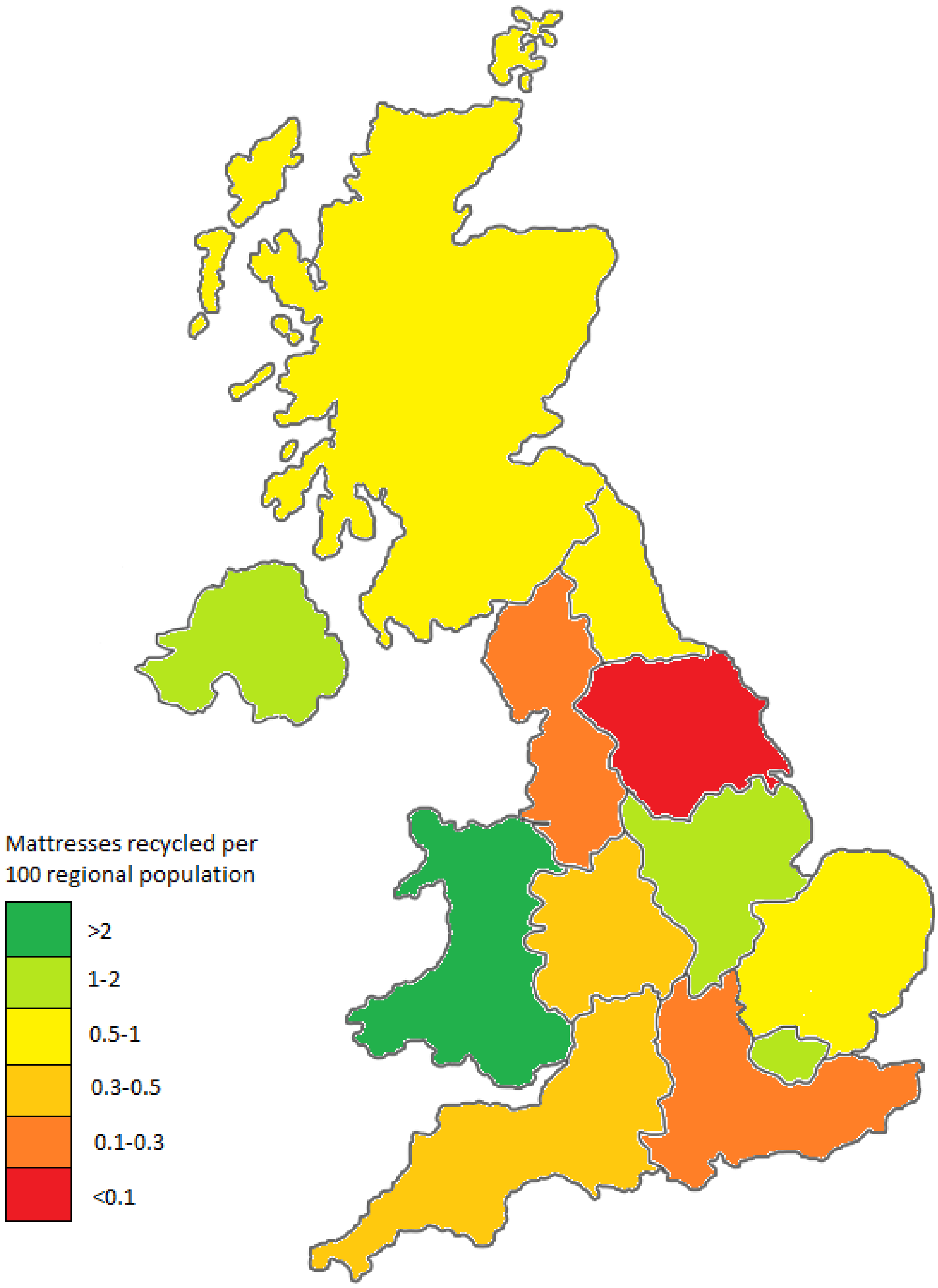
Figure 5: Recycling of waste mattresses by local authorities (tonnes per quarter)



Source: WasteDataFlow

The data reveal large differences in mattress recycling performance between different UK regions. This is summarised in the map in Figure 6 which shows the number of mattresses collected for recycling as a ratio of the regional population (assumed to be approximately proportional to mattress waste arisings).

Figure 6: Mattress recycling by UK region, 2013



Source: WasteDataFlow using ONS Population Data

Wales demonstrates the strongest recycling performance of all the UK nations and regions, with more than two mattresses collected for recycling per 100 people per year. Strong performance is also evident in the East Midlands, London and Northern Ireland. The weakest performance is witnessed in Yorkshire and Humber, where almost no mattresses were collected for recycling. Clearly, there is considerable room for improvement in most of the English regions.

Interestingly, in Scotland there was a good mattress recycling rate in FY2012. However, it's two mattress recycling facilities both appear to have closed during 2012 - one because of financial difficulties and the other due to a fire.

Looking more closely at local authority performance and, again, taking population served as an indicator of the level of waste arisings, we found that some local authorities demonstrated very high levels of mattress recycling. The four best performing local authorities (Rutland, Fermanagh, Cookstown and Merthyr Tydfil) all collected around 10 mattresses per 100 people. Assuming an average lifetime of a mattress of 8 to 10 years, this corresponds to a near-100 % mattress recycling rate by these authorities.

The top ten performing local authorities for mattress recycling are shown in Table 4. Most of these local authorities have one major factor in common – all are in close proximity to an operating mattress recycling facility. It is therefore likely that the lack of access to a mattress recycling facility is a major barrier to improving mattress recycling rates.

Encouragingly, within the top ten performing local authorities, there is a spread of different types of local authorities, including one large rural county council (Lincolnshire) and one London Borough (Bexley), as well as many smaller unitary local authorities.

Table 4: Top ten performing local authorities for mattress recycling (units/population)

#	Authority	UK Nation/Region	No. mattresses recycled per 100 population
1	Rutland County Council	East Midlands	12.3
2	Fermanagh District Council	Northern Ireland	11.8
3	Cookstown District Council	Northern Ireland	9.8
4	Merthyr Tydfil County Borough Council	Wales	9.6
5	Lincolnshire County Council	East Midlands	7.4
6	Omagh District Council	Northern Ireland	7.3
7	Bridgend County Borough Council	Wales	6.7
8	Hartlepool Borough Council	North East	6.6
9	Bexley London Borough	London	6.4
10	Flintshire County Council	Wales	6.2
-	**UK Average Performance**	**UK Average**	**0.6**

Source: WasteDataFlow using ONS Population Data

6 Conclusions

6.1 Headline findings

The first key finding of this study was that the mattress recycling rate currently being achieved in the UK is very low, at approximately 13 % in 2013. However, there appears to have been a significant growth rate in mattress recovery activity by local authorities between 2011 and 2013, driven by an increase in the number of authorities collecting mattresses separately from other bulky wastes.

Secondly, there is a very wide range of mattress recycling rates between local authorities, based on the number of mattresses recycled by the local authority per head of population within the authority's boundary. Recycling rates range from zero to over 12 mattresses per 100 head of population. The reasons for this are outside the scope of this report, but one major cause is likely to be the lack of a local recycling facility. A clear example is the recovery rate in Scotland, which was running at a relatively high level until its two recycling facilities were closed.

Thirdly, manufacturers that sell directly to consumers or the hospitality sector, achieve high rates of EOL mattress returns, at greater than 50 % of sales. Very few manufacturers' returns (around 2 %) are from wholesalers and retailers, and these returns are mostly faulty or damaged mattresses.

Finally, the qualitative survey data indicated that a clear cause of poor recycling rates is the low financial return achieved by mattress recyclers. This in turn causes facilities to close, thereby reducing the demand pull for EOL mattresses.

6.2 Lessons learned

6.2.1 Overview

The key lesson from the three surveys carried out to collect data on mattress returns was that response rates were poor. This may have been a result of the number of questions asked in each survey, and therefore future surveys would need to be made simpler. It may also be because of the low level of interest in the subject, particularly by retailers who are, in the main, concentrating on recycling (or the avoidance of landfill) of operational wastes. The collection of used mattresses from customers tends to be a service issue rather than part of a CSR policy. Future surveys should be more directly targeted.

As a result of the poor survey response, there were considerable data gaps. The following paragraphs provide more detail.

6.2.2 NBF survey

- The initial response from the NBF survey was slow and required prompting from the NBF Secretary.
- Some of the smaller producers did not keep records and would have required more time to provide data due to their size and manpower restrictions.
- The survey data did not yield a reliable average conversion rate between units and weights of mattresses, either overall or by type of mattress. Three NBF members provided both tonnes/kilos and units, but these figures showed wide ranges of average weights, even for similar types of mattress.

6.2.3 Retailer survey

- The retailers surveyed, and contact names, were selected mainly from NBF members' recommended customer lists. Of the 55 retailers surveyed, only 17 (31 %) responded and, of these, just 7 % provided data. The poor response rate for the retailer survey reflected the difficulty of engaging retailers.
- Only one of the major supermarkets that sell mattresses and one department store responded to the retailer survey. Data from one major national beds retailer were obtained from another source.

6.2.4 Local authority survey

- NAWDO sent the survey to its members, hence the specific regions represented by these WDAs and Unitary Authorities were not known.
- Local authorities report quantities of mattresses to WasteDataFlow in tonnage, not units, which required an assumption on the average weight of a mattress so that data could be compared back along the supply chain.
- There does not appear to be a standard conversion rate between tonnes and units across local authorities (e.g. this varied from 24 to 32 mattresses per tonne).
- Some local authorities estimated mattress tonnage as a proportion of Household Waste and Recycling Centre (HWRC) residual waste from payload. However, HWRC residual waste was not recorded in the survey.
- Local authorities do not record mattresses by type – even though this is an important issue for the recycler. They tend to be bulked for recycling as a mixed load.
- End fates of mattresses are not clearly defined. Whilst it may be assumed that those authorities collecting mattresses separately from residual bulky waste are largely shipping these to recyclers, this may not always be the case. High quality returns may be re-sold or remanufactured. At the other extreme, soiled mattresses may require to be landfilled or sent for energy recovery.

7 Appendices

Appendix A: Market data analysis

Appendix B: WasteDataFlow analysis

Appendix C: Survey data analysis

Appendix D: List of recyclers and waste contractors

Appendix E: List of NBF members

Appendix F: List of mattress retailers

Appendix A: Market data analysis

Market data for the UK annual production and sales of mattresses were taken from two Eurostat databases – PRODCOM and COMEXT. PRODCOM data provided the total quantity of mattresses (grouped into four types of mattresses) produced in the UK.

PRODCOM production data

PRODCOM production data lists the number of units of mattresses produced in the UK in 2012 and 2013 (the latest data available). Unit production data is provided for three of four types of mattresses reported to PRODCOM. These were:

- 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.[3]

However, for one group of mattresses, 'Mattresses of cellular plastics', the quantity produced in the UK was not given and therefore had to be estimated using the EU27 unit value for this group of mattresses, €73.69 (see Table 5), and the value of these mattresses, €45,761, to give an estimated quantity of 621,000 units produced. We therefore estimated that 5 million mattresses were produced in the UK in 2012 (see Table 6).

Table 5: PRODCOM unit values by mattress type (2012)

PRODCOM code	Mattress group	Unit value EU27 (€)
31031230	Mattresses of cellular rubber	67.67
31031250	Mattresses of cellular plastics	73.69
31031270	Mattresses with spring interiors	104.11
31031290	Other mattresses	50.33
Average unit value		**73.95**

Table 6: PRODCOM units produced (2012)

PRODCOM code	Mattress group	Units produced (000s)
31031230	Mattresses of cellular rubber	74
31031250	Mattresses of cellular plastics (including with a metal frame)	621
31031270	Mattresses with spring interior	3,171
31031290	Other mattresses	1,146
Total		**5,013**

[3] Mattresses (excluding with spring interiors, of cellular rubber or plastics); PRODCOM 2012

COMEXT trade data

COMEXT trade data provided estimates for the units of mattresses imported and exported to the UK for each of the four types of mattresses in 2012, in kilos and euros (€).

To obtain the unit quantity of mattresses imported and exported, the € value of total imports and exports was converted into total units using the average unit value of a mattress for the EU27, €73.95 (see Table 7). This avoided having to make an assumption about the average weight of a mattress.

Table 7: COMEXT trade data for UK mattress imports and exports

COMEXT	Total imports	Total exports
Values (€)	78,884,330	31,270,624
Units	1,066,771*	422,880*

**units derived from values using an average unit value of €73.95*

Net imports of mattresses sold in the UK were aggregated with PRODCOM units produced. Total UK sales of mattress, which includes units of mattresses produced in the UK (PRODCOM) as well as imports less exports (COMEXT), was estimated at 5.7 million in 2012 (see Table 8). The same approach was taken for 2013 to derive at total UK sales of 5.5 million for 2013, which represented a small decline year-on-year.

Table 8: Total UK mattress 'sales' (units)

Year	Production	Imports	Exports	UK sales
2012	5,013,123	1,066,771	422,880	**5,657,014**
2013	4,996,140	987,240	490,731	**5,492,649**
% change	-0.3 %	-7.5 %	16.0 %	**-2.9 %**

Replacement mattress sales

The NBF believes that mattress consumer sales in the UK are around 80-85 % replacement sales. This implied that some 15-20 % of mattresses entering the market in any year will not be discarded in the year (because of population growth, home building etc.) This adjustment was required to calculate the mattress recycling rate. Using this assumption, replacement mattress sales were approximately 4.5 million units in 2013 and at 4.7 million units for 2012 (see Table 9).

Table 9: Statistics for UK mattress replacement sales

	2012	2013
UK total sales	5,657,014	5,492,649
Replacement rate	80-85 %	80-85 %
Replacement sales	4,667,037	4,531,435

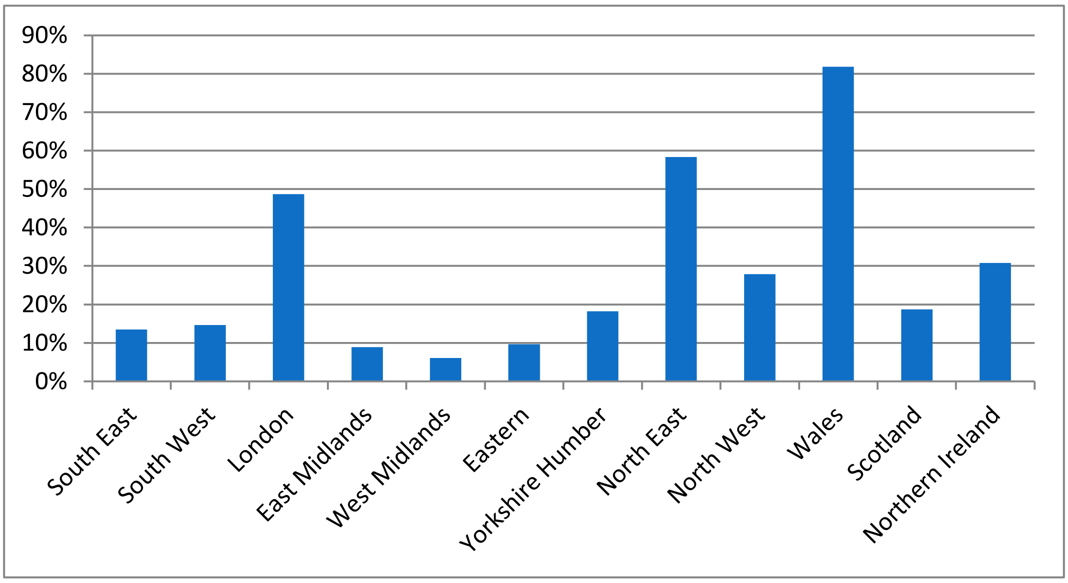
Source: PRODCOM and COMEXT, with NBF assumptions

Appendix B: WasteDataFlow analysis

WasteDataFlow (WDF), a web based system for municipal waste data reporting by UK local authorities, provided data for the total quantities of EOL mattresses recycled by local authorities in England, Scotland, Wales and Northern Ireland.

A search was performed to obtain the number and regional spread of local authorities that collect (from kerbside and at HWRCs), separate and recycle mattresses, and the tonnage of mattresses recycled by these local authorities. In total, 100 local authorities reported data on mattress recycling across the UK (less than a quarter of the total). The proportion reporting data was highest in Wales, the North East and London (see Figure 7).

Figure 7: Local authorities reporting mattress waste data to WDF (% by region)



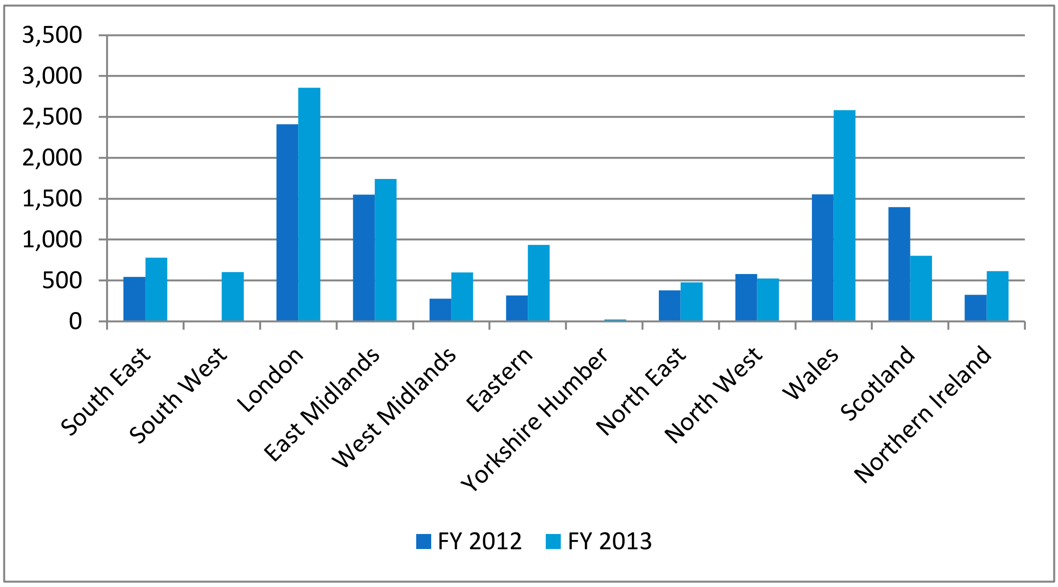
Source: WasteDataFlow

Using WDF data, the tonnage of EOL mattresses recycled by local authorities in the UK was estimated at 9,329 tonnes for the fiscal year 2011/12, and 12,533 tonnes for 2012/13. The results are summarised by region in Figure 8. Except for Scotland and the North West, all regions increased the tonnage of mattresses recycled between the two years.

Preliminary data for the first two quarters of 2013/14 suggest that this increasing trend may continue, but not enough data is available to produce robust estimates, as not all authorities have reported to WDF (for example no local authorities from Scotland, Wales or Northern Ireland have yet reported for 2013/14).

One assumption made here is that only those local authorities reporting to WasteDataFlow actually recycle mattresses, i.e. that the WDF data is comprehensive. This implies all other mattresses collected by local authorities are not recycled, even if the specific tonnages are not reported. This assumption was sense-checked with the results of the local authorities' survey and other data collected and reviewed in this study.

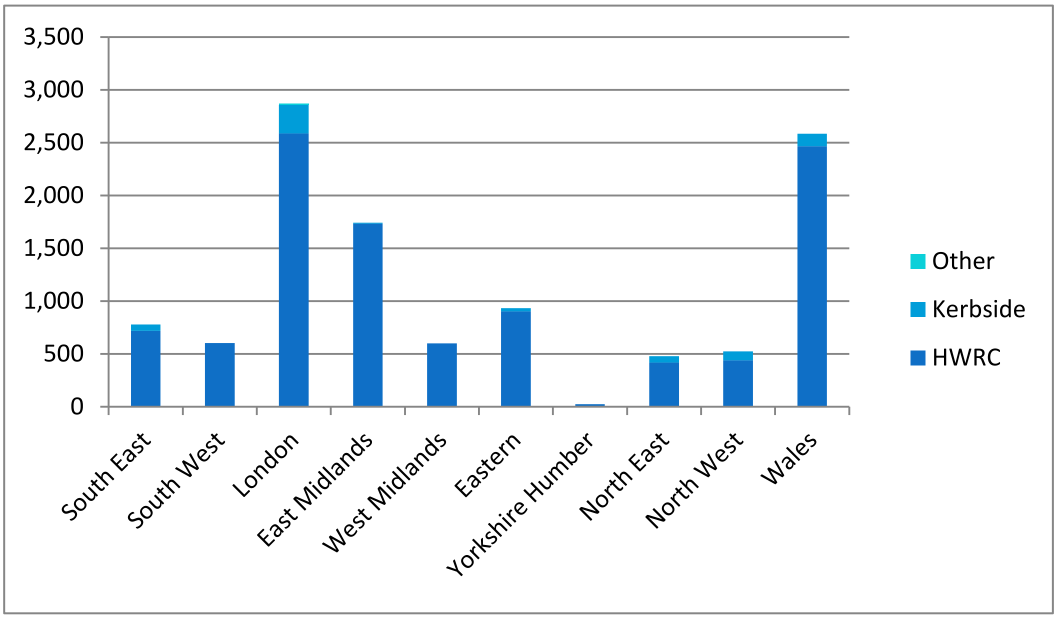
Figure 8: Tonnage of mattress waste reported by local authorities to WDF



Source: WasteDataFlow

WDF figures suggest that HWRCs, rather than kerbside collection, are the main source of mattress waste (Figure 9). However, it is possible that some local authorities collect from kerbside but do not report to WDF nor record the tonnages they recycle; or collect from kerbside but do not separate mattresses from other bulky waste and dispose of them as residual waste.

Figure 9: Sources of EOL mattresses – Kerbside and HWRC tonnage FY2013



Source: WasteDataFlow

Appendix C: Survey data analysis

NBF Members Survey

53 NBF members were surveyed, half of whom responded. Of the respondents, 36 % and 38 % respectively for 2012 and 2013, provided mattress production and sales data. NBF mattress producers range from small producers (manufacturing fewer than 2,000 mattresses) to very large producers (manufacturing over 500,000). A sample of 10 (2012) and 11 (2013) of these NBF members provided data on the number of units returned and their disposal routes. Other responders provided no data on mattresses, albeit some were accessory/component suppliers only.

Table 10: NBF Members Survey response rate

	NBF members	Responded to survey	Responded with data*	Response rate
2012	53	27	19	36 %
2013	53	27	20	38 %

**on production and sales*

By way of sense checking these returns, sales of mattresses in the UK were estimated at 5.7 million units in 2012 (from PROCOM and COMEXT data). If NBF members represent approximately 72.5 % of total UK production[4], or 4.1 million mattresses, then the figure we received from the survey (i.e. 1.6 million units produced in 2012) is 39 % of this, roughly equating to the percentage of members responding with data.

Some details of NBF members' returns relating to imports and exports are presented in Table 11.

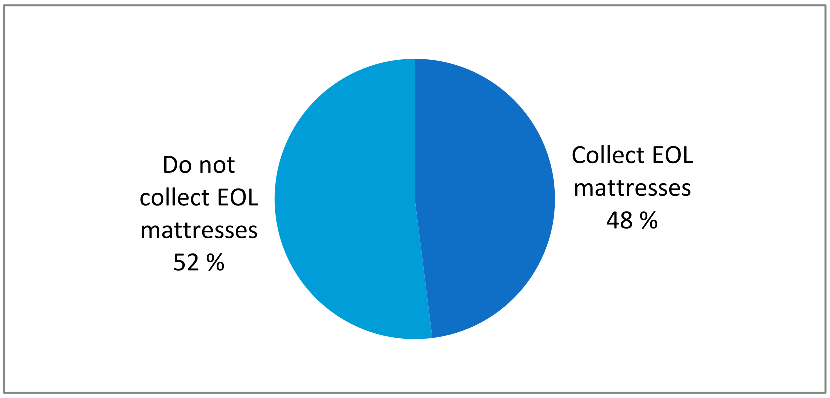
Table 11: Total sales by NBF members

NBF	Production	Imports	Exports	Total sold
2012	1,674,296	28	30,908	1,643,416
2013	2,157,601	22	85,799	2,071,824

Almost half of the NBF members deal with mattress returns (see Figure 10). Returns (including damaged stock and cancelled orders) represented 5 % and 4 % of all mattresses sold in 2012 and 2013 respectively, (based on the data provided by the sample of NBF members that collected used mattresses and provided data).

[4] According to the NBF, NBF members represent between 70 – 75 % of UK production

Figure 10: Mattress collection by NBF members



Returns are considerably higher when mattresses are sold direct to consumers – for 2012 and 2013, approximately 80 % of mattresses were collected from direct sales to consumers, 30 % from the hospitality sector (hotels, private care homes, youth hostels, B&Bs, etc.) and 50 % from the service sector (prisons, care homes, hospitals, armed forces, sheltered accommodation, etc.). Very few (less than 2 %), and mostly faulty or damaged mattresses, were returned from wholesalers and retailers (see Table 12, Table 13 and Figure 11).

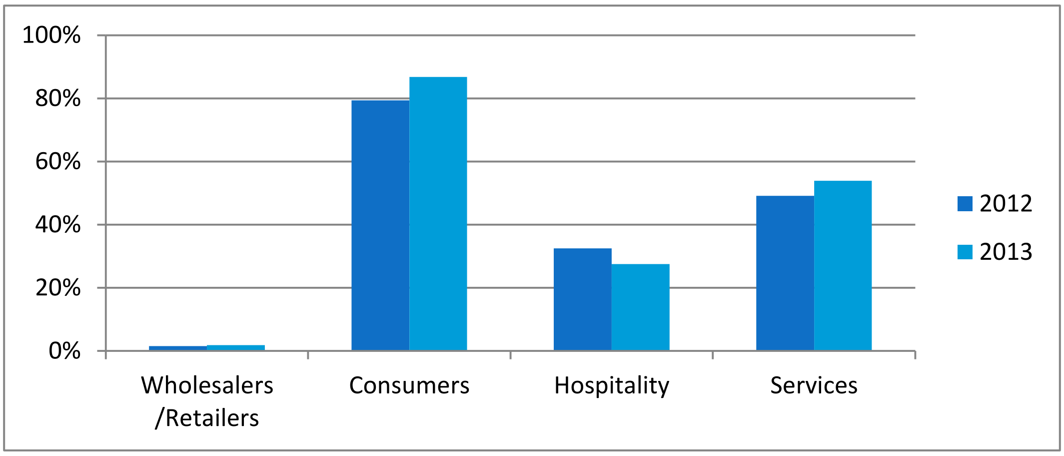
Table 12: Mattress sales to market sectors

	Wholesale / Retail	Direct sales			Total
		Consumers	Hospitality	Services	
2012	1,207,224	6,106	108,188	5,089	1,326,783
2013	1,238,177	10,214	143,239	5,567	1,897,407

Table 13: Mattress returns from market sectors

	Wholesale / Retail	Direct returns			Total
		Consumers	Hospitality	Services	
2012	18,255	4,847	35,100	2,500	60,702
2013	22,389	8,863	39,350	3,000	77,270

Figure 11: Mattress return rates by market sector



Almost all mattresses collected by NBF manufacturers were recovered via a direct EOL mattress management route and less than 10 % are managed and recovered indirectly through a charity (see Table 14: EOL management routes. Recycling among these members has risen 31 % over the two years. The average mattress recovery rate, for the NBF members that provided data, was 14 %.

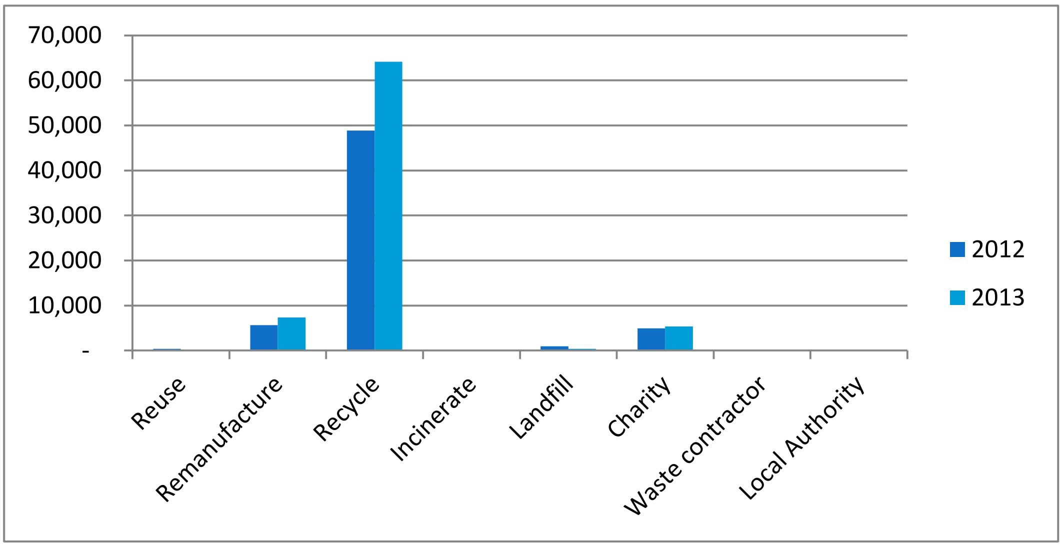
Table 14: EOL management routes

	Total Returns*	Reuse	Remanu-facture	Recycle	Incinerate	Landfill	Charity	Waste contractor	Local Authority
2012	60,702	360	5,631	48,887	-	925	4,899	-	-
2013	77,270	120	7,322	64,117	-	370	5,342	-	-

*excludes damaged stock, cancelled orders and other (e.g. prototypes)

However, it is likely that a high proportion of mattresses that were 'recycled' were disposed of via an indirect route using a waste contractor, where the end fate of the mattress is less certain.

Figure 12: EOL mattress management routes



Despite the increase in mattress recycling by NBF members, cost appeared to be the most significant barrier to mattress recycling, with landfill remaining the cheaper option.

Other barriers included:

- lack of outlets for recovery of complete or deconstructed mattresses or components(particularly pocket springs)
- the design and material composition of a mattress
- reluctance of retailers to offer and charge for a recycling service
- reliance on local authorities for recycling (most of whom treat mattresses as residual waste)
- no local recycler or waste contractor (this was particularly the case in Scotland, where one NBF member said that they had enquired to Zero Waste Scotland (ZWS), local authorities, etc. and “no one was interested in taking our mattresses so it was cheaper to send them to landfill”)
- lack of on-site storage space to make it worthwhile for a recycler to collect EOL mattresses or for the company itself to deconstruct the mattresses (NBF members that had a contract with a waste contractor tended to recycle more EOL mattresses).

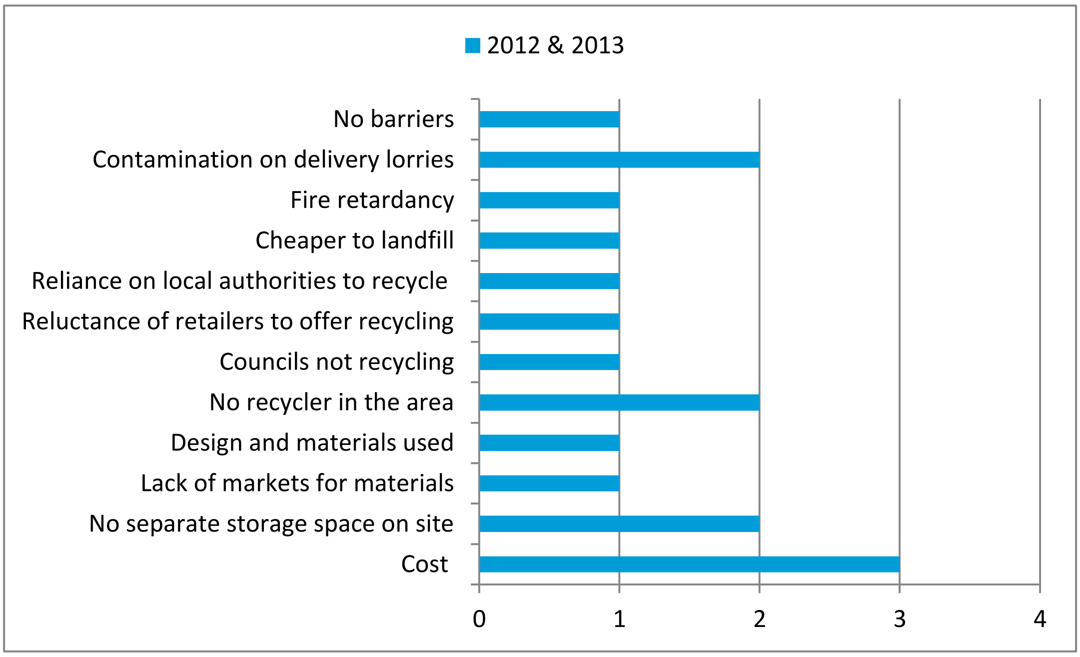
Some NBF members are governed by a company policy to recycle all returned mattresses, either via a waste contractor or an in-house facility. One NBF member reported that it’s returned mattresses were “stripped and the fabrics and materials recycled via a company that manufactured dog beds, and the metal springs were sent to a metal recycling centre”.

Policy changes that some NBF members suggested could help to promote more mattress recycling in the UK included:

- Banning mattresses from landfill
- Legislation to govern mattresses, similar to current legislation that applies to Waste Electrical and Electronic Equipment (WEEE)5
- Levying a collection and management fee
- Requirement that all councils offer a recycling service
- Allow delivery/collection vans to take mattresses direct to a recycler with no restrictions or costs involved.

[5] The aim of WEEE was to ensure that retailers played a part in helping users dispose of EOL electrical equipment in an environmentally sound way. Retailers can either join a Distributor Take-back scheme (DTS) or offer in-store take back free of charge or offer an alternative accessible free take-back service; http://www.dft.gov.uk/vca/enforcement/weee-enforcement.asp

Figure 13: Main barriers to NBF members increasing mattress recycling



Retailers Survey

The response rate from the retailer survey was 31 %. Of these respondents, 13 % provided EOL mattresses management data. Mattress retailers varied in size, in terms of sales, from 440 mattresses sold to over 150,000 sold per year. The majority of UK sales were pocket sprung mattresses, sold direct to consumers.

Table 15: Retailers survey response rate

	Retailers surveyed	Responded to survey	Responded with data*	Response rate
2012	55	17	7	31 %
2013	55	17	7	31 %

**provided data on EOL mattress management*

Figure 14: Retail survey sales by mattress type

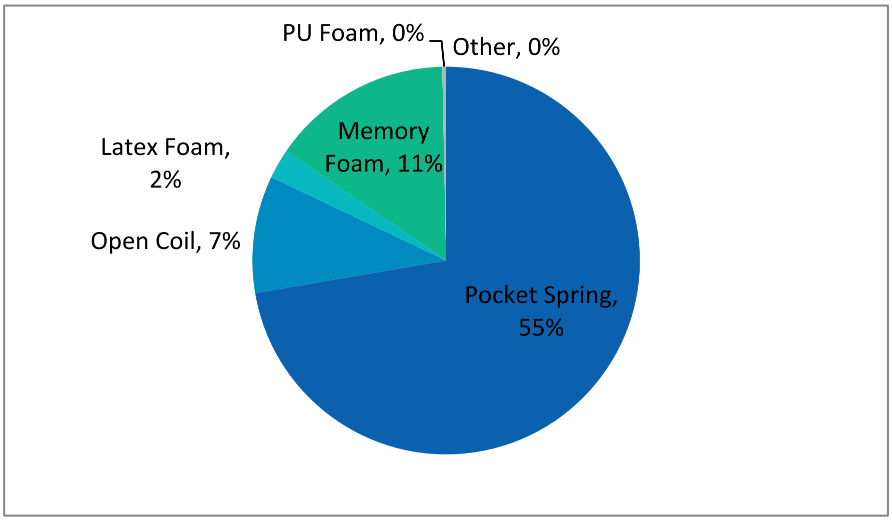


Table 16: Mattress sold by market sector

	Consumers	Hospitality	Services	Total Sales
2012	315,320	395	58	315,772
2013	350,190	375	20	350,584

More than three quarters of the retailers surveyed collected EOL mattresses, although very few provided data for the quantities collected and EOL management methods adopted for these mattresses.

A limited sample of retailers provided EOL management data (seven of the retailers surveyed) representing 11 % of total survey sales. These retailers recovered just 1 % of EOL mattresses via recycling, charity or waste contractor routes in 2013. The quantity of mattresses recycled per annum was approximately 2,000, but data provided by one retailer subsequently increased this quantity by 50,000 mattresses.

Figure 15: Mattress collection by retailers

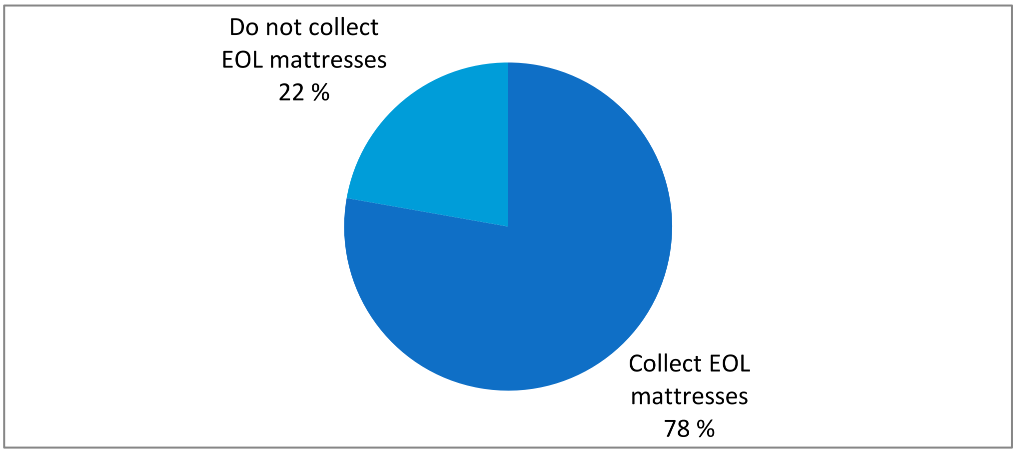


Table 17: Mattress returns and EOL recovery rates

	Sales	Returns	Mattresses recovered *	Mattresses landfilled	% Recovered
2012	315,772	5,507	3,099	625	2 %
2013	350,584	4,751	2,838	695	1 %

**includes EOL mattresses recovered through recycling, a charity or a waste contractor*

Comments made by retailers on the barriers to more mattress recycling, included:

- "No barriers as yet and we are aiming to launch a mattress recycling scheme by end 2014."
- "We transport the used mattresses to the waste contractor and are charged £128.00 per tonne, plus £10.00 per mattress; cost is the main issue, and we have no recycling in our area."
- "Costs, storage issues, health & safety and hassle of disposal."
- "Costs, collection issues, material composition, existing deconstruction method, design and markets."
- "I can see that a lot of retailers still will not collect old mattresses, which would usually mean the customer is likely to take it straight to the nearest tip, which we know is bad for the environment, and some of these are recovered and re-used by criminals."
- "Costs and awareness to the customer. If this was a free service offered when a new product is delivered there would be a larger take up by consumers."

Policy changes noted by retailers to promote more recycling focussed on dealing with the cost of recovering mattresses. These included:

- "Regular collection by councils or waste collection companies at minimal cost to ourselves."
- "If our company vans were allowed into the recycling depot without time zones, with free disposal facilities, without having to break the product down, i.e. remove metals, etc., we would offer a chargeable collection and disposal service."
- "Promote retailer and consumer awareness – this could be good one for the Sleep Council (The Sleep Council is funded by the National Bed Federation, the trade association for British bed manufacturers; established since 1995, it is the consumer education arm) - 'if you purchase a NBF member's bed or mattress we will collect and 100 % recycle your old one for £xx ?' - as a national drive through multi-channel could work well. It could also be used to educate what the alternative means… landfill and/or back to market? As a national Sleep Council message it would be powerful."

Local Authorities Survey

The local authority survey was sent by NAWDO to 90 Unitary and Waste Disposal Authorities (WDAs) across the UK. 25 local authorities responded and 16 % provided estimates of the quantities of mattresses handled. These were either derived from compositional studies at one HWRC for a particular year or estimated from total bulky residual waste.

Table 18: Local authorities survey response rate

	Local authorities	Responded to survey	Responded with data*	Response rate
2012	90	25	14	16 %
2013	90	25	14	16 %

**estimated mattress tonnage*

The estimated mattress tonnage handled by the 14 local authorities varied between 1 % and 5 % of total HWRC waste. Most waste mattresses (> 80 %) were sourced from HWRCs, the remainder from fly tipping and kerbside. One local authority sourced mattresses from the service sector and from a waste contractor.

Many of the local authorities surveyed appeared to be actively monitoring the options for mattress recycling and/or were conducting trials. Those that had previously trialled mattress recycling, reported that it was currently not cost effective compared to other options. The major barriers noted included the cost of haulage (often the result of not having a local processor), storage costs and space issues, low gate fees (which made recycling uncompetitive compared to landfill) and uncertain end markets. These discouraged long term investment in mattress recycling. Other barriers noted included:

- lack of (dry) storage space on-site
- requirement of some processors to manually separate and bulk mattresses by type prior to haulage
- extra staff costs
- poor condition of mattresses collected
- capacity restrictions
- limited markets for recyclates (particularly for low grade textiles), except scrap metal
- stability of end markets.

Policies that local authorities most frequently noted that would encourage mattress recycling included:

- engaging with a waste contractor
- expanding end markets
- educating and engaging the industry
- ensuring mattress recycling was cost effective against other disposal routes
- mattress design changes to make them easier to mechanically deconstruct into separate components
- a landfill ban
- producer responsibility to fund separation, storage, haulage and recycling infrastructure
- promotion of the waste hierarchy that emphasises reuse and recycling
- engaging with local reuse groups that collect mattresses

- cheaper gate fees
- educating the public
- closer proximity to a recycling facility / more recyclers throughout the UK – this would reduce haulage costs and increase competition resulting in lower gate fees
- encouraging the reuse of mattresses (by charities) by dispelling the public perception that mattresses are dirty.

The key issue for local authorities, therefore, was how the overall costs of recycling mattresses compared to landfill costs. Proximity to a local recycler was an important determining factor.

Appendix D: List of recyclers and waste contractors

Name	Location
BIFFA UK	HQ: High Wycombe, Bucks, HP123TZ
Brett's	Brightwell, Ipswich, IP10 0BL Faversham, Kent ME13 7UD
CAD Recycling ltd	Denbigh, North Wales, LL6 5TA
Carpenter	Glossop, Derbyshire, SK13 6LE
DivertMore	Cramlington, Newcastle, NE23 1WG
Envirogreen	Slough, Berkshire, SL1 4JW
GBM Waste	HQ: Louth, Lincolnshire LN11 0YB
Go For Greener	Nottingham, NG6 8WA
London Reuse Network	Greenford, London, UB6 8PW
Mattress Recycling/Matt UK	Deptford, London, SE14 5RS
MDJ Light Bros	HQ: Lewes, East Sussex, BN8 6JN
Mick Gannon	Batley, West Yorkshire
Mid UK Recycling	Sleaford, Lincolnshire, NG34 8RT
Ron Hull Group	Rotherham, South Yorkshire
SITA UK	Telford, Shropshire, TF2 9PB
The Furniture Recycling group (TFR)	North West Facility: Preston, Lancashire, BB3 1QJ East Midlands facility: Ilkeston, Derbyshire, DE7 4QU South West facility: Brislington, Bristol, BS4 5PS
Waste Recycling Solutions Limited	Barnsley, South Yorks, S75 1JL
Wastecycle UK	Nottingham, NG4 2JT
West Lancashire Recycling Centre	Skelmersdale, Lancashire, WN8 9SX
Worksop Waste	Worksop, Nottinghamshire S80 1TN

Table 19: Recyclers telephone interview response rate

	Recyclers	Responded to interview	Responded with data*	Response rate
2012	9	8	4	44 %
2013	9	8	4	44 %

* provided data on quantities of mattresses processed

Appendix E: List of NBF members

Airsprung Group PLC	Kayfoam Woolfson Ltd
Beds Direct	Kelletts (Oldcastle) Ltd
Beevers Beds Ltd	Kintech Ltd
Breasley Consumer Products	Kyoto Futons Ltd
Burgess Beds	Mansion House Bedding Co Ltd
Churchfield Sofa Bed Company	Palatine Beds
Deluxe Beds Ltd	Platinum Enterprise (UK) Ltd
Dream World Bedding Ltd	Regency Bedding Ltd
Dura Beds Ltd	Relyon Ltd
Duvalay	Seetall Furniture Ltd
Elite Bedding Co Ltd	Shire Beds Ltd
Excellent Relax Bedding Co	Signature Beds Ltd
Express Foam	Silentnight Group
Furmanac Ltd	Silentsleep Beds Ltd
GNG Group	Simmons Bedding Group PLC
Halcyon Beds Ltd	Sleep Marketing LLP
Harrison Spinks Ltd	Softheads Ltd
Headboards Ltd	Steinhoff International
Healthbeds Ltd	Stuart Jones Ltd
Highgate Beds	Swanglen Metal Products Ltd
Highgrove Beds Ltd	Sweet Dreams (Nelson) Ltd
Hypnos Ltd	The Foam Company Ltd
Icon Designs Ltd	Ulster Supported Employment Ltd
Jaybe	Vi-Spring Ltd
Kayfoam Ltd	Vogue Beds Ltd
A J Foam Ltd	Willowbrook/Erinstar
Adjustables Ltd	Kayfoam Ltd

Appendix F: List of mattress retailers

Beds Direkt	Mr Beds
North Wales Beds	Simply Beds
BEDS4U	Richard Eade & Sons Ltd
Newbridge St Bedding Cte	Argos Limited
Bed Warehouse	Bensons Bed Centre
Dreamland Bedding	Dreams Plc
Bed Shop	Furniture Village
Hafren Furnishers	Grattan PLC
The Bed Shop	J D Williams & Co Ltd
Bedworld	John Lewis Partnership
Cartergate Beds	Shop Direct Group
Toons	Bedworld
Sherwood Bed Centre	FGS
The Bed Chambers	Mattressman
Style Furniture	Sleeping Solutions
Artertons	The Bed Shop (mattressonline)
Hi Sell Direct	Worldstores
Sound Sleep Beds	Levine Bros (Home Furniture) Ltd
Butterfills	Bedz Bedzz & Bedrooms Ltd
DS Furniture	Lenleys
Sweet Dreams	Heals
Somerset Beds & Mattresses	Alan Ward Ltd
Swindon Bed Centre	Barker & Stonehouse Ltd
Braddicks	Tesco
HFSM	Asda
Bournemouth Bedding Centre	Express Gifts
Worthing Bedding Centre	H Ponsford Ltd
Gillies Ltd	Marks & Spencer

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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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With a BSc in economics from LSE, a diploma from Cambridge University and an MSc in agricultural economics from Oxford University, Jane worked as an equity research analyst and for the Economist Intelligence Unit and Oxford University Press. She works in economic and technical analysis and synthesis of information, especially in the food, textile and metals supply chains

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Peter has a degree in economics from the LSE and an MSc from University College London. Peter has considerable experience in developing an evidence base for government policy or business strategy, providing specific economic inputs on the functioning of recycling markets. He has particular expertise in techno-economic studies, market analysis and economic valuation.

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The National Bed Federation is the recognised trade association representing UK manufacturers of beds and their suppliers. Founded in 1912, its members today account for about 75% of the total UK bedding turnover.

Our Aims and Objectives – in short

- To be the voice of the UK bed industry, both nationally and internationally.
- To ensure ethical and fair dealings.
- To educate, and further the interests of the UK bed industry.
- To promote awareness of the benefits to health and wellbeing of quality sleep.
- To improve knowledge of British and European standards and legislation.
- To ensure Members' views are represented clearly.
- To offer members a first class service.
- To provide a platform for industry networking.
- To provide an effective platform for the exchange of information.
- To deliver best value to Members collectively.
- To work closely with other, non-competing organisations also serving the furniture industry.
- To investigate cases of unfair or fraudulent trading.

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