



How to reduce waste and carbon emissions caused by mattresses: A review of global Extended Producer Responsibility schemes

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Date: July 2020



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European Regional Development Fund
Investing in a Smart, Sustainable and Inclusive Future

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Zero Waste Scotland:

Zero Waste Scotland exists to lead Scotland to use products and resources responsibly, focusing on where we can have the greatest impact on climate change.

Using evidence and insight, our goal is to inform policy, and motivate individuals and businesses to embrace the environmental, economic, and social benefits of a circular economy.

We are a not-for-profit environmental organisation, funded by the Scottish Government and European Regional Development Fund.

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Executive Summary

Objectives

The aim of this study is to assess whether Extended Producer Responsibility (EPR) schemes can be used to help end the climate crisis by preventing the waste of everyday goods including hundreds of thousands of mattresses across Scotland each year.

An estimated 610,000 mattresses are disposed of annually nationwide, with less than one in ten currently being reused or recycled. This waste is a key cause of flytipping and creates carbon emissions which contribute to the climate emergency.

EPR schemes offer a way to prevent waste of all kinds of household and commercial goods, including mattresses, by giving producers greater environmental responsibility right across the supply chain from design through to collection and recycling. They also provide a useful way to engage with consumers and retailers to help raise awareness of the impact of waste to in turn help change behaviours to reduce that waste.

Zero Waste Scotland was keen to understand whether an EPR scheme could be effective in Scotland by exploring existing mattress EPR schemes across the globe. By learning how these schemes operate from a practical, financial and data/information perspective, it was possible to highlight areas of best practice from which the components of a Scottish EPR scheme could be created. This allowed different options to be offered for consideration by Zero Waste Scotland.

The Organisation for Economic Co-operation and Development (OECD) defines EPR as an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle. In practice, EPR involves producers taking responsibility for collecting end-of-life products, and for sorting them before their final treatment, which ideally is reuse and recycling. EPR schemes allow producers to exercise their responsibility either by providing the financial resources required and/or by assuming the operational and organisational aspects of the process from local authorities, such as for packaging. They can do so individually or collectively through Producer Responsibility Organisations (PROs). EPR schemes can be voluntary or mandatory, and they can be implemented through a variety of instruments, such as product take-back requirements, economic and market-based instruments (such as deposit return schemes or advance disposal fees), or a combination of these.

Mandatory EPR is currently only in place across the EU for packaging, batteries, waste electrical and electronic equipment (WEEE) and end of life vehicles (ELVs). However, many EU member states have EPR for a far wider range of product groups, such as tyres, furniture (including mattresses) and textiles.

Methodology

An initial literature review was conducted to identify existing articles and documents about mattress recycling as well as the mattress EPR schemes and take-back operations around the world.

The scope of research was also extended to include EPR schemes for carpets and furniture due to these items being of a similar complexity, and because there are a limited number of EPR mattress schemes.

There has been a mandatory scheme in France for mattresses since 2013. There are also mandatory EPR schemes in three US states – California, Rhode Island and Connecticut. A voluntary EPR scheme for mattresses exists in Australia. There are a number of voluntary take-back and recycling schemes for mattresses which are implemented by individual retailers or recyclers in the UK and the Netherlands. In addition, relevant EPR schemes are also in place for carpets, notably in the US (with mandatory EPR in California) and the UK (with voluntary EPR via Carpet Recycling UK).

Desk research was supplemented by conducting telephone interviews with a number of EPR schemes to gain additional qualitative as well as quantitative data for the schemes. The data collected was then analysed to identify the key features, components and successes of these schemes including governance, finance and operational aspects with the aim of assessing the significance of these elements on the scheme's effectiveness.

These included:

- The impacts of a mandatory versus voluntary scheme on success rates
- The stages at which fees were applied and to who
- How success was measured and monitored
- How supporting activities were used as marketing and stakeholder engagement
- The operational practicalities of running a scheme
- The policy elements needed to support a scheme

From this it was possible to identify which elements should be combined to create models for a mattress EPR scheme, or similar, in Scotland.

Suggested models

The outcomes of the research and analysis led to the creation of three models that take differing approaches to an EPR scheme for mattresses, each with its own features and benefits as follows:

Model 1 – Mandatory industry-led EPR

This model uses established EPR principles, taking much of its design and structure from the French mandatory mattress EPR scheme. Key features of Model 1 include being:

- Mandatory for Scottish domiciled producers to belong to the PRO
- Industry-led using one or more PROs
- Conducted by the Scottish Government, which will have established a regulatory framework to operate within
- An incentive for eco-design using a modulated fee
- Funded using a product up-front recycling fee; transparent as a 'visible fee' to consumers at point of purchase
- Set with binding targets for collection, recycling and preparing for reuse

Model 2 – Mandatory government-led 'pseudo' EPR

This model applies some of the principles of EPR but is described as a 'pseudo' scheme due to the greater flexibility it allows to drive and incentivise circularity. This has potential for closer government control and offers less complexity by avoiding the EU Waste Framework Directive and Article 8a restrictions on what fees can be charged for, with consumers paying government directly rather than indirectly as in EPR. Key features of Model 2 include being:

- Mandatory for free take-back by retailers, costs recovered through levy charged at point of purchase
- Government-led with PRO-equivalent administration rather than industry-led
- Conducted by Scottish Government
- Funded by a product levy with an incentive for eco-design due to a modulated fee
- Transparent by having a 'visible fee' to consumers at point of purchase
- Set with binding targets for collection, recycling and preparing for reuse

Model 3 – Voluntary industry driven EPR with targets

This model allows greater flexibility but less certainty in terms of outcomes. Key features of Model 3 include being:

- Voluntary for producers to belong to the PRO
- Industry-led using a single PRO
- Funded through a membership charge (potentially banded on a market share basis)
- Set with non-binding targets for collection, recycling and reuse by industry with threat of binding targets and legislation if insufficient progress
- Transparent by having a 'visible fee' to consumers at point of purchase
- Set with transparent targets for collection, recycling and preparing for reuse

Models 1 and 2 could be difficult to implement in Scotland if market distortions at a UK level are to be avoided. For example, a levy on mattresses sold in Scotland (depending on the level set) could mean that some customers buy from England instead, although unregistered online sellers known as free-riders (companies which benefit from a scheme without paying or sharing costs) are likely to be a bigger problem in general.

In addition, it is recommended that all models should be supported by a number of complementary instruments, as follows:

- Mandatory for free take-back by retailers, costs recovered through levy charged at point of purchase;
- Minimum product requirements to be a part of any scheme model, these could be apparent within existing mattress manufacturing standards (these are 'essential requirements' for mattresses to fulfil in order to progress circularity – although probably only possible after BREXIT and UK wide). For example:
 - Performance – fitness for purpose (such as firmness and support) where appropriate;
 - Minimum 'free of charge' warranty periods as a proxy for durability and placing the onus on manufacturers rather than consumers now, potentially as an amendment to UK consumer law;
 - Hazardous material restrictions (beyond the Registration, Evaluation, Authorisation and restriction of Chemicals (REACH) regulation in a precautionary sense);
 - Recycled/ organic content targets;
 - Reparability and 'ease of recycling' requirements (around dismantling);
 - Mandatory product information ('passport') requirements around 'bill of materials' (BOM, including all chemicals), repair and recycling instructions (for businesses and consumers);
 - Mandatory product labelling (such as a new Green Furniture Mark) of:
 - The free warranty period (noted above as a minimum requirement) and potentially the 'pre-use' price of products over the free warranty period;
 - Eco-rating, such as recycled content, reparability and 'ease of recycling'. This could potentially be integrated with, or equivalent in style to, the energy label for Energy related Products (ErPs). Eco-label would remain as a separate 'gold-standard' for those companies that see a market advantage.
- Green Public Procurement (GPP) buying standards for the public sector, mandating of Whole Life Cycle Costing (WLCC) in public procurement and a progressive move towards mandatory use of core GPP criteria for mattresses (this could be done in Scotland alone);
- Continuing support for Circular Economy (CE) innovation, focusing on the sector, combined with tax breaks, grants and/ or low interest loans for Scottish CE manufacturers and recycling companies and for businesses involved in 'preparing for reuse' and potentially for remanufactured/ prepared for reuse products. This is already done to a degree through the Circular Economy Investment Fund (CEIF), which is administered by Zero Waste Scotland.

1 Introduction

1.1 Study background

Less than one in ten of the estimated 610,000 mattresses disposed of annually in Scotland is collected for re-use and recycling by local authorities – with the remaining mattresses thought to be sent to landfill. Mattresses also account for a significant amount of flytipped goods.

Zero Waste Scotland is investigating Extended Producer Responsibility (EPR) schemes to:

- Increase collection and appropriate end of life (EoL) treatment of waste mattresses;
- Improve the reuse and recycling rates of their component parts;
- Encourage eco-design to facilitate the ease of recycling mattresses and prevent unnecessary use of virgin materials;
- Engage with consumers on the importance of responsible disposal of mattresses;
- Drive circularity within the mattress industry.

The objectives of this study are to:

- Explore EPR schemes and how they would be suitable to fulfil these requirements;
- Understand the existing EPR schemes for mattresses that exist globally and how they operate;
- Identify good practice components that could be used to create a scheme in Scotland;
- Create modelled options for a mandated or voluntary scheme for Scotland.

Mandatory EPR is applied currently across the EU only in regard to packaging, batteries, WEEE and ELVs, however many member states have EPR for a wider range of product groups, such as tyres, furniture (including mattresses) and textiles. France has led the way with both the number of schemes (21) and the sophistication of those schemes using modulated fees (through adoption of a merit rating system, bonus-malus ; +/- 20% of baseline costs) to drive better product design for longevity, recyclability and use of recycled material.

There has been furniture EPR in France since 2009 and mattress recycling became a focus in 2013. There are also mandatory mattress EPR schemes in three US states– California, Rhode Island and Connecticut. A voluntary EPR scheme for mattresses exists in Australia. There are a number of voluntary take-back and recycling schemes for mattresses that are implemented by individual retailers or recyclers in the UK and the Netherlands. In addition, relevant EPR schemes are also in place for carpets, notable in the US (with mandatory EPR in California) and the UK (with voluntary EPR via Carpet Recycling UK).

1.2 Definition of EPR

According to the EU Waste Framework Directive, EPR means “a set of measures taken by a member state to ensure that producers of products bear financial responsibility or financial and organisational responsibility for the management of the waste stage of a product’s life cycle.”

The Organisation for Economic Co-operation and Development (OECD) defines EPR as an environmental policy approach in which a producer’s responsibility for a product is extended to the post-consumer stage of a product’s life cycle. In practice, EPR involves producers taking responsibility for collecting end-of-life products, and for sorting them before their final treatment, which would ideally be recycling. EPR schemes can allow producers to exercise their responsibility either by providing the financial resources required and/ or by assuming the operational and organisational aspects of the process from local authorities, such as for packaging. They can do so individually or collectively through the so-called Producer Responsibility Organisations (PROs). EPR schemes can be voluntary or mandatory. They can also be implemented through a variety of instruments, such as product take-

back requirements, economic and market-based instruments (such as deposit return schemes or advance disposal fees), or a combination of these.

This is not to say that producers under EPR have to absorb the costs. In fact, the producers will, where market conditions allow it, pass on the cost to consumers. In some cases this is mandated via the use of a 'visible fee' at point of sale. The principle is that the cost is shifted from local authorities and citizens in general to producers and consumers of particular products so as to shift the burden from general taxation, such as council tax. This principle is particularly important in allowing EPR to influence product design by incorporating a feedback loop to producers, via variable (modulated) fees for example.

1.3 Method

Eunomia conducted desk research and telephone interviews to collate and analyse the key features, components and successes of these schemes around the governance, finance and operational aspects to inform a mattress EPR scheme that could be used in Scotland. This includes identifying best practise as well as challenges and omissions that a scheme in Scotland can seek to address.

The scope of research was extended to include EPR schemes for carpets and furniture due to these items being of a similar complexity and also because there are a limited number of EPR schemes for mattresses.

Six of the schemes assessed were EPR schemes with an additional six schemes that were individual recycler or retailer led take-back initiatives, which are of less interest (not being collective EPR schemes) but potentially helpful in terms of the more operational elements.

Scheme	Country	Product	Type of scheme	Interview conducted
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EPR schemes				
Éco-mobilier	France	Mattresses	EPR - Mandatory	Yes
California	America	Mattresses	EPR - Mandatory	Yes
Rhode Island	America	Mattresses	EPR - Mandatory	Yes
Connecticut	America	Mattresses	EPR - Mandatory	No
Soft Landing	Australia	Mattresses	EPR - Voluntary	Yes
Carpet Recycling UK	UK	Carpets	EPR - Voluntary	No
Recycling and take-back schemes				
Auping	Netherlands	Mattresses	Take-back by Retour Matras Recycling	No – contact unavailable
Dream UK	UK	Mattresses	Take-back by Circom	No – scheme not warranted as worthy
Egans	Australia	Furniture	Product Stewardship	No – scheme not warranted as worthy
IKEA	UK	Furniture and mattresses	Take-back by Furniture Reuse Network	No – contact unavailable
Interface ReEntry	UK	Carpets	Reuse service	Yes
John Lewis	UK	Furniture and mattresses	Take-back by Furniture Recycling Group	Yes
Matras Recycling Europe	Netherlands	Mattresses	Recycler	Yes
Retour Matras	Netherlands	Mattresses	Recycler	No – declined to be interviewed

Table 1 Schemes researched

This assessment has been carried out across a number of key aspects including:

- Structure and governance – such as producer obligation, capture of online/ distance sellers, mandatory or voluntary scheme;
- Collections and treatment – who does collections, and incentives for collections, recycling routes for materials, methods of processing;
- Financing – types and level of fees, how they are determined, use of visible fee and modulation;
- Monitoring and reporting – use of any performance related incentives (PRI) and targets, internal/ external reporting;
- Compliance and enforcement – who this is done by;
- Supporting policy instruments – eco-design drivers, labelling.

These key themes have then been broken down further into key components associated with running an EPR or take-back scheme, with the aim of assessing the significance of these elements on the scheme's effectiveness. Such elements included:

- The impacts of a mandatory versus voluntary scheme on success rates;

- The stages at which fees were applied and to whom;
- How success was measured and monitored;
- How supporting activities were used as marketing and stakeholder engagement;
- The operational practicalities of running a scheme;
- The policy elements needed to support a scheme.

1.4 Mattress type and composition

There are three types of mattress available, differing by the material used to form the mattress core: foam (mostly polyurethane (PUR) foam), box sprung (steel) or pocket sprung (steel). According to a 2012 Zero Waste Scotland report, spring mattresses account for the greatest market share in Scotland at 69% of all units sold. They are followed by PUR foam and then latex mattresses, which account for 30% and 2% of sales, respectively.¹ Foam mattresses (e.g. high quality ‘memory’ foam) are growing in market share, with the convenience of buying a ‘mattress in a box’, often online.

In addition to the core, mattresses are composed of a shell enclosing the core and an outer woven layer known as the ‘tick’ or pad, both made of a number of different materials. A detailed breakdown of an average mattress material composition, showing indicative weights and percentages for the range of different materials making up a mattress, is presented in Table 2.

Material	Average Mattress Composition (kg)	Average Mattress Composition (%)
Steel	6.2	29%
PUR foam	5.3	25%
Cotton, non-woven	3.3	15%
Natural fibres (such as coconut, sisal, jute)	1.6	7%
Felt	1.6	7%
Cotton, woven	1.4	6%
Wool	0.8	4%
Polyester, non-woven	0.8	4%
Latex foam	0.6	3%
Total	21.4	100%

Table 2 Average mattress material composition

2 Findings of desk research

A review of literature and a number of stakeholder interviews were conducted; the data being collated and assessed using criteria agreed by Zero Waste Scotland using a matrix. The following section provides an overview of the key features of the various schemes considered, the subheadings reflecting the assessment criteria used, and indicating effectiveness and strengths and weaknesses of

¹ A Business Case for Mattress Recycling in Scotland (2012), Oakdene Hollins, Zero Waste Scotland, November 2012

https://www.zerowastescotland.org.uk/sites/default/files/Report%20-%20A%20Business%20Case%20for%20Mattress%20Recycling%20%28MAP002-002%20Nov%2012%29_1.pdf

schemes drawn from the evidence gathered. An overview of all key features of all the schemes assessed is presented in Table 5, section 2.4.1, with the more detailed data available in the assessment matrix in Appendix 7.2.

To set the context, any EPR scheme needs a legally compliant governance structure.

If a scheme is mandatory, it is likely that the national government has devolved powers to pass the primary and secondary legislation required to put effective and enforceable regulation in place; provide a reportable governance structure for delivery of the scheme and its actors; award a contract to deliver on one or several PROs; and provide set up capital and revenue investment.

For a voluntary scheme, led by industry, there is no legal requirement, and no regulation. However, a fair and transparent governance structure is required for an effective membership-based model.

2.1 Administration of a scheme

2.1.1 *Scheme governance and regulation*

The mandatory schemes considered all have oversight by government agencies. In France there is an EPR Commission (which includes the French Ministry of the Environment plus ADEME, the regulatory body) which effectively grants a licence to EPR PROs to operate. The PRO is awarded a five-yearly licence based on a 'bill of specification' (binding terms of reference). Within this they have the power to set fees, to address potential free-riders and implement initiatives such as encouraging eco-design through use of modulated fees or amending competition rules with recyclers to encourage cost efficiencies.

The USA has a similar system at state level. The PRO, in this case the Mattress Recycling Council (MRC), puts forward a stewardship plan for each of the three states involved, in order to meet the targets set by states under statute. Each state then authorises their operation on a five-yearly basis, with annual reviews of budget. The authorities are Cal Recycle (California Department of Resources Recycling and Recovery), the Rhode Island Resource Recover Corporation and the Connecticut Department of Energy and Environmental Protection (DEEP). In California, Cal Recycle is required to develop the state baseline amount and then a recycling goal for each of the following five years.

The Australian scheme is self-governing but it may become an accredited scheme and fall under Australian Government authority.

All of the mandated schemes require documentation from their members and can conduct audit work. The French PRO, Éco-mobilier, for example, may carry out supporting documentation checks at any time through the trader being asked to send the supporting documentation or as part of audits of sales declarations. Audits may be done within three calendar years of the products concerned having been brought to the market.

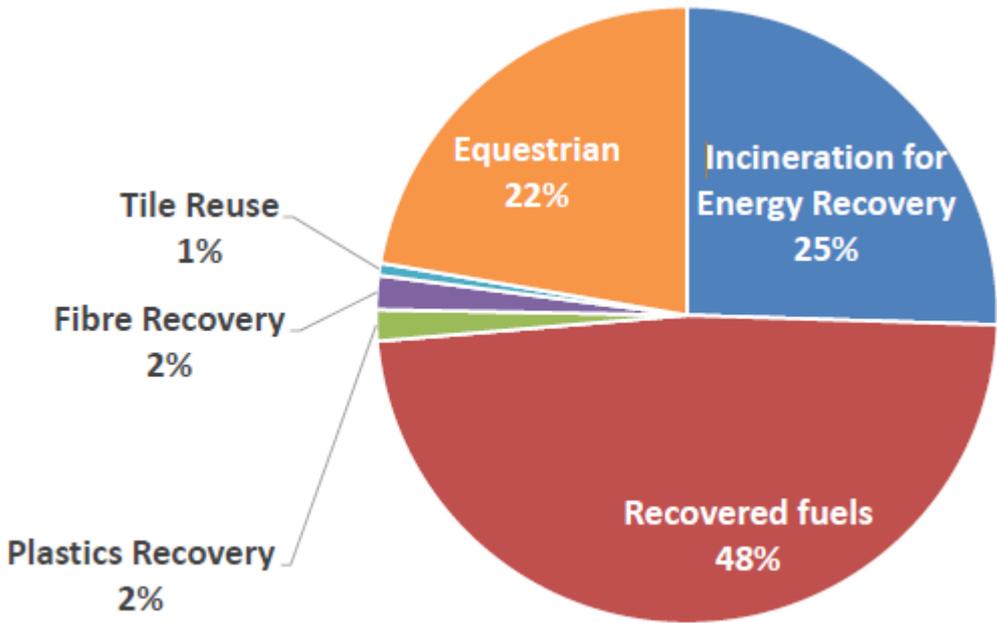
2.1.2 *Mandatory vs voluntary schemes*

Four of the five mattress EPR schemes we have considered are mandatory (in France and in the three US states) with the Australian scheme, Soft Landing, being the only voluntary one for mattresses. Despite its voluntary status, Soft Landing has been successful in getting the five key manufacturers in Australia to sign up to the scheme, including key companies in their supply chain, however this has required a lot of time and work to get engagement. In the US, the Product Stewardship Institute works to establish voluntary EPR schemes where no mandatory schemes exist. Recent discussions with them show a similar story in that encouraging companies to join a voluntary scheme is an uphill battle where there is no clear mandate other than corporate sustainability goals and consumer pressure.

Matras Recycling in the Netherlands also runs a voluntary initiative, in the context of legislation requiring mattresses to be separated and recycled. However, the government in the Netherlands is

looking to create an EPR scheme supported by producers and retailers to put in place proper structures and funding to make this happen more effectively. A government consultation with industry around the EPR began in 2019 with outcomes expected to be announced in 2020.

In the UK, there are numerous mattress recyclers, both in terms of social enterprises as well as commercial operators working with local authorities, retailers and manufacturers, but no official scheme. There are, however, several other collective but voluntary EPR schemes including one for carpets run by Carpet Recycling UK, via Axion Recycling. Core funders include leading brands such as Desso, Brintons, Milliken and ege. The scheme has made good progress in that the landfill diversion (recovery) rate (reuse, recycling and energy from waste) has increased from just 2% in 2007 to 42% in 2017, of the carpets reclaimed. However, 73% of this is in energy from waste and 22% is use in equestrian surfaces consisting of plastic latex containing various chemical substances which can be used to produce microplastics and leachate. Only 1% is carpet tile reuse and only 4% is fibre and plastics recycling.



Source: Carpet Recycling UK

Figure 1: Carpet landfill diversion in the UK

This shows that voluntary schemes can be successful but it has taken Carpet Recycling UK ten years to go from 2% to 42% landfill diversion, a rate that could have been achieved far more quickly with mandatory participation. A voluntary scheme such as this without any mandatory targets also means that the focus has remained on energy from waste as a solution rather than on recycling and reuse as a diversion from landfill solution. The role of objectives and targets is discussed further in the next section.

2.1.3 Ownership of obligation and form of scheme

Under producer responsibility, the obligations to fund the collection and treatment of items is with the producer which is usually defined as the manufacturer, brand owner, importer, distributor/ retailer or distance seller (based outside the country).

With the exception of individual take-back initiatives (such as IKEA and John Lewis), the EPR schemes considered are collective systems organised through one or more PROs. These collective schemes provide economies of scale but do not necessarily incentivise good design. There is no incentive for any one company (even with a sizeable market share) to ‘go further’ than any other, unless of course there is some incentive or market advantage to making a more ‘eco-friendly’ product.

The EPR fees in such a case simply cover costs without necessarily incentivising improvement. Producers pay fees to a PRO according to the amount of product they place on the market, picking up their share of the costs of treating the collected wastes from all sources. A good EPR system is therefore one where the collective responsibility allows economies of scale in collection and treatment, but also with individual producer incentives to drive better design. Modulated fees offer one way of doing this, as will be discussed later on.

All the EPR schemes considered are industry-led schemes which helps to ensure appropriate engagement and collaboration and potentially reduce free-riding (where a company benefits from the scheme without paying or sharing costs). It should be noted, however, that there is a balance to be reached in terms of allowing schemes flexibility, for example, in the goals and methods to be used to achieve them, and governance from public authorities to ensure that social and environmental goals are met in an effective way.

Soft Landing noted that they have followed both the Éco-mobilier and the MRC's US systems in developing their scheme.

2.1.4 *Single and multiple PROs*

For mandatory schemes, governments instigate the creation of PROs and provide a governance structure for them to have powers to operate. In general, private sector operators come forward with a proposal to operate a PRO and are licensed to do so if they meet the relevant criteria. They are not under government contract as such.

All the EPR mattress and furniture schemes studied are industry-run schemes via a PRO. Four of the five schemes for mattresses that were compared use a single PRO that is paid by the producers to take on their obligations and run the scheme. In France, there are two PROs that run the EPR, but they work closely together, with one (Éco-mobilier) mostly handling 'business to consumer' (B2C) furniture and the other (Valdelia) mainly 'business to business' (B2B), with around 10% of the furniture.

In the US, a single PRO, the MRC, administers all three schemes and is mandated to be a non-profit organisation. It is governed by an eight-member board of directors composed primarily of representatives of mattress manufacturers.

In general, the PROs run the scheme in terms of data and financial management but contract other companies to do the physical collection and recycling; this is the case in the three US states and France. In some cases, the PRO is also the recycler, as is the case with Soft Landing. There are also examples in the UK where EPR schemes (for WEEE and packaging for example) are run by waste companies (such as Biffa and Veolia) with their own waste sorting centres and close links to materials reprocessors.

Having one or two closely knit PROs makes the administration and governance of the schemes simpler, however there can be competition issues. In France, the fact that most schemes are organised using a nearly 'monopolistic' model, entails a specific need for attention to avoid single PROs 'crushing' the market of service providers downstream.²

Since 1994, the French Competition Authority has investigated several cases in this respect, which helped to introduce best practice:

- PROs are now required to organise tenders in a way that is very similar to the public tender procedure;
- A PRO cannot set rules on the allocation of recovered materials that would harm competition and innovation in the downstream product market or close downstream recycling markets to new competitors. They need to perform regular tenders with sufficiently small allocation of markets to that end.

² 20 years of EPR in France; French Ministry of Environment 2014

In the Netherlands there are two main mattress recyclers: Retour Matras and Matras Recycling who both work with retailers, local authorities and individuals. They are in competition with each other – Retour Matras currently does the recycling of Auping’s take-back service (a manufacturer and retailer) but Matras Recycling has grown and now wants to vie for Auping’s custom.

It is important to note that while competition can help to reduce costs, it can result in a ‘race to the bottom’, and standards need to be put in place to ensure that appropriate collection and treatment always takes place.

2.1.5 Scheme stakeholders

There are a number of different stakeholders involved with EPR schemes, each having a different level of involvement:

Scheme	Determine fees	Pay membership fee	Pay recycling fee	Administration	Governance	Recycling or reuse
French EPR	PRO with producers	Producers, retailers	Consumers	PRO	French Ministry of Environment	Charities and recyclers
Californian EPR	PRO with producers	Producers, retailers, importers	Consumer	Mattress Recycling Council (MRC)	Cal Recycle (California Department of Resources Recycling and Recovery)	Charities and recyclers
Rhode Island EPR	PRO with producers	Producers, retailers, importers	Consumer	Mattress Recycling Council (MRC)	The Rhode Island Resource Recovery Corporation	Charities and recyclers
Connecticut EPR	PRO with producers	Producers, retailers, importers	Consumer	Mattress Recycling Council (MRC)	The Connecticut Department of Energy and Environmental Protection (DEEP)	Charities and recyclers
Australian EPR	PRO with producers	Producers, retailers, importers	Consumer	Community Resources – company that owns PRO	PRO	Charities and recycler

Table 3 Stakeholders’ roles in schemes

Table 3 demonstrates the liaison needed between many different parties within an EPR scheme, and that producers in some of the examples work closely with the PRO to determine the fees (usually calculated based on their market share or the number of mattresses they put on the market). The table also highlights that the administration of each scheme is done by different entities to the PRO, ensuring partiality whilst the governance for each scheme is done mainly by government departments. The exception to this is the Australian EPR scheme, which is voluntary, but is looking to gain government accreditation so this will change.

The key role that local charities and social enterprises play is to explore reuse opportunities (Soft Landing send 100 day return to a local charity but with support from the retailer) or get involved in the manual dismantling of mattresses (Soft Landing) or the reuse of furniture and carpets through

charitable networks (Interface for carpets, the Furniture Recycling Group for John Lewis and Reuse Network for IKEA furniture).

Soft Landing just use their own recycling capability but as they grow and need to use other recyclers, their focus will be solely on those with a social focus of providing work through manual dismantling. This also gives a higher rate of recycled content than automated machinery.

2.1.6 Objectives and targets

The US schemes all have targets for the quantity of mattresses to be collected and what percentage of the collected mattresses is to be recycled. The table below allows comparison of their actual performance against the targets set, although this is complicated by the fact that at least some of the MRC state information for California includes base units (commonly wood and fabric) which makes it far easier to obtain a higher recycling rate as wood is easily recycled. The same is true of the Australien scheme, while Éco-mobilier, Connecticut and Rhode Island only include the mattresses themselves in the figures. This would account for the large disparity in material recycling rates.

Connecticut has goals that include targets for the number of mattresses collected from each of the following sectors: accommodation (hotels, guest houses, etc), prisons, healthcare, educational institutions, and the military. Rhode Island has separate targets for collections from accommodation only. It is particularly interesting to see that California has a 'preparing for reuse' (renovation) goal for mattresses of 150,000 – more than 10% of the collection target, although this does not seem to be achieved.

Country	Target	Actual
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Scheme Name		Collected	Recycled (of collected)	Refurbish/ Reuse	Collected	Recycled	Reuse
Éco-mobilier	France	N/A	50% (target 2019 – 2023)	N/A (although there is an aspirational target)	840,000 (2015)**	52% #	N/A
Soft Landing	Australia	N/A	N/A	N/A	884,225 units (to date)	75%*	N/A
MRC	Connecticut, USA	38,500 [^] mattresses (2017)	75% 2017	N/A	51,652 [^] mattresses Overall 181,070 mattresses (2017)	61%	N/A
MRC	California, USA (2017)	1.2 million units (2017)	66% (2017)	150,000 Units (10.7%)	1.3 million Units (2017)	59%	4%
MRC	Rhode Island, USA	Not known	85% 2016	N/A	83,762 mattresses	83%	N/A
Matras Recycling Europe	<i>Netherlands</i>		95%		300,000 mattresses		
The Furniture Recycling Group	<i>UK</i>				400,000 mattresses	85%-92%	

Notes

- * The recycling rate appears to include the bed base itself – for example wooden slats, base frame
- [^] Target data only reported for retailers, hotels and independent hauliers (total of 38,500 mattresses, against which the scheme collected 51,652). But the overall number of mattresses collected from all sectors is reported at 181,070
- ** furniture and mattresses combined (55% recycling rate)
- # Mattresses only
- Units = mattresses and bed bases
- The Furniture Recycling Group – this figure is mostly John Lewis mattresses although others are treated at the site

Table 4 Scheme targets and performance

It is noteworthy that in the US, Cal Recycle is required to develop a state baseline amount and a goal for each of the following five years which increases incrementally. In terms of process, the Cal Recycle system is as follows:

It released its proposed state mattress recycling baseline and goals on August 4, 2017 and requested stakeholder comments by September 1, 2017. On August 15, 2017, the state department held a public workshop on the proposed state mattress recycling baseline and goals. Staff presented the proposed state mattress recycling baseline and goals at Cal Recycle's November 21, 2017 monthly public meeting. The state approved its mattress recycling baseline and goals on December 5, 2017 as described in its November 'Request for Approval' publication. The targets were adopted as of January 2018.

It is worth noting that California has strict definitions of recycling and the full breakdown of waste destination is shown in the table below. The MRC also runs an Illegally Dumped Mattress Collection Initiative across the states in which it operates, also funded via the product levy.

Disposition	Quantity (Lbs)	%
Total Recycled (Includes reuse & biomass)	39,294,445	59.17%
Waste-to-Energy (Transformation)	14,139,780	21.29%
Landfill	12,979,891	19.54%
TOTAL OUTBOUND	66,414,116	100.00%

Figure 2: California mattress waste treatment routes 2017³

The French scheme has no collection targets, the assumption being (on discussion with Éco-mobilier) that old mattresses must be disposed of (as they are hard to keep due to space constraints) and as long as an adequate number of collection points is provided, collection rates will be high. Based on our discussion with Éco-mobilier, however, there was a lack of clarity on collection rate, although it is thought to be over 50% of waste mattresses (an estimate). This seems a low proportion given the large number of collection points in France, although some mattresses will not be accepted if soiled or badly damaged.

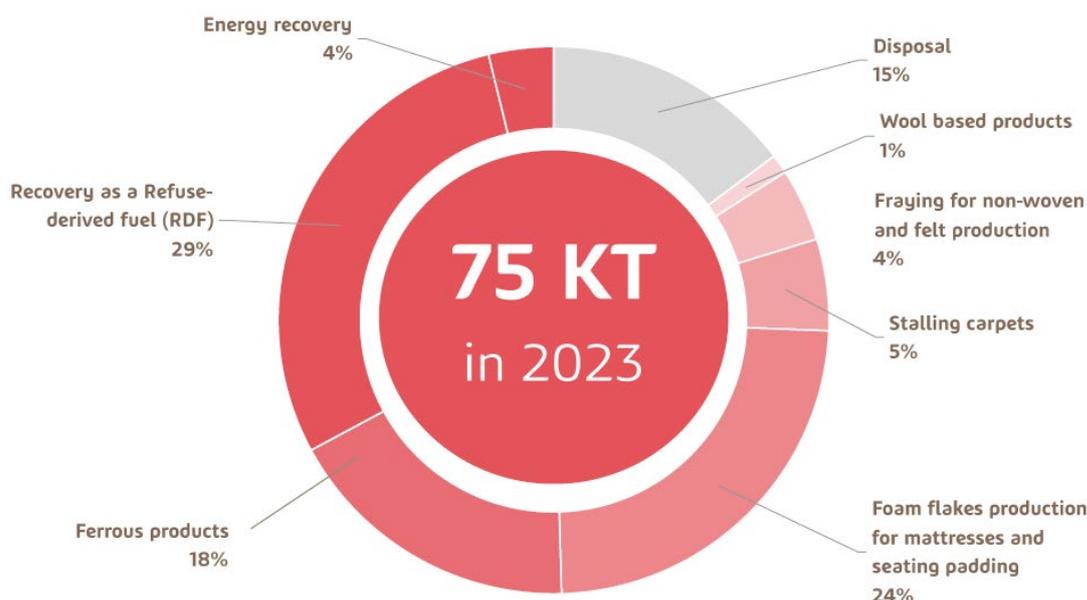
The New York Carpet America Recovery Effort scheme also gives tradeable credit to those that exceed recycling targets, incentivising increased collections.

2.1.7 Data reporting and performance

All schemes report Key Performance Indicator (KPI) data to their respective authorities on an annual basis. Data reporting of performance against targets makes it possible to see the impact the scheme is having and helps with the setting of new targets to increase scheme effectiveness. For the three US state schemes, the MRC submits annual reports which are then evaluated against targets to monitor progress. As the data in Table 4 shows, the Rhode Island scheme has the highest recycling rate whilst the other two states fell short of the targets set. MRC reports both units and weight that are collected and managed by the programme annually. It is important to note that soiled, wet and damaged mattresses are not collected and that mattresses can be rejected at the sorting plant. Care needs to be taken in subtracting the rejects from the final figures when calculating recycling rates.

Soft Landing gives annual reports to participating retailers of how much they recycled of the mattresses they received. Éco-mobilier report their data on an annual basis, the data for 2017 being shown below (the 75,000 tonne figure is a projected estimate for collections in 2023).

³ MRC California Annual Report 2017, <https://mattressrecyclingcouncil.org/wp-content/uploads/MRC-2017-CA-Annual-Report-Revised-10-22-18.pdf>



Source: *Éco-mobilier*

Figure 3: Éco-mobilier 2017 mattress treatment breakdown

Éco-mobilier noted that obtaining data from social partners, in particular to monitor quantities of reused furniture (including any mattress reuse), was time-consuming. This is an issue to consider if looking to collect data from any reuse initiatives for mattresses and processes need to be designed to facilitate this, be it from social enterprises or retailers.

2.1.8 Compliance enforcement measures

Both the French and US state EPR schemes have compliance enforcement measures in place. In France public authorities ensure that ambitious yet realistic objectives are assigned to PROs, with appropriate indicators in place (typically separate collection rate, recycling rate, and sometimes reuse rate). They also ensure that sanctions can be used when necessary, including removal of the PROs licence to operate.

In the US, each state environmental regulatory authority is responsible for ensuring that MRC and individual programme participants are complying with the state statute and any regulations that may have been enforced. Cal Recycle has initiated enforcement activities against retailers who have failed to register and remit fees (detail of this is not public). The agency has also engaged in enforcement activities for recyclers/renovators who have failed to register and/or report.

The level and complexity of compliance measures and monitoring needed for the national EPR schemes in the US and France is far more intricate because these schemes are mandatory, imposing legal obligations on the parties involved.

2.1.9 Scheme communications and engagement activities

The benefits of engaging all stakeholders have included a collaborative approach to improving scheme design. All five EPR schemes undertake engagement activities but with different audiences. Éco-mobilier appears to focus on engagement with key stakeholders to improve the design of the scheme and has created guidelines and safeguards to support recyclers. The Australian Soft Landing scheme uses engagement activities with stakeholders to encourage involvement both at the start of the scheme and to help it grow. This is in the form of workshops and roadshow breakfast briefings with a focus on engagement with more manufacturers and retailers, most of which are franchisees. It

is very labour intensive and costly to approach organisations individually so workshops are organised in an attempt to make the process more efficient and generate a 'buzz' about recycling.

The three US state schemes on the other hand have placed much emphasis on consumer communications and engagement programmes due to mattress recycling not being common place in the US, creating a need for continual education. For example, the MRC has created a separated outreach education brand (byebyemattress.com), serving as an information point for consumers, for example helping people identify collection locations. This has also been used to promote the programme and encourage participation. The MRC reported spending approximately £1.4 million on communications in 2017, which in part addresses the essential need for outreach for non-English speaking communities.

There are no observed dedicated consumer campaigns for other schemes in the UK and Netherlands which seem to rely on their websites or retailers (such as IKEA and John Lewis) to increase public awareness.

2.2 Financing of a scheme

Elevating the responsibility for financing and organisation of waste management as high up the hierarchy as possible is the key role of any EPR scheme.

EPR transfers the cost of waste management from local authorities, which often struggle to find adequate funds from sources like council tax, to manufacturers and retailers.

This is essentially done in one of two ways:

- Upfront unit charges on new items, estimated and regularly updated to fully fund the waste management of old items being recovered. This can be shown as a 'visible' recycling fee that is charged to the consumer, as in France;
- Recovery of actual waste management costs as incurred, with the PRO charging producers a lump sum relative to their market share within a given category.

A separate membership fee is also generally charged to cover the administrative costs of running a scheme. In some cases, the administration costs are rolled into the waste management costs, which are ultimately covered by the recycling fee charged to the consumer within an increased new-product cost.

It is perfectly legitimate for the EPR to be recouped by the producer, in part or in full, by passing on the costs to the consumer, although in a very competitive market, the additional cost may need to be at least partially absorbed by producers.

2.2.1 *Membership fees*

Membership fees are charged under the French scheme but not the US schemes, which are entirely financed (including the administration) by the product levy. In France, Éco-mobilier calculates the financial contribution dependent upon the volume of products an organisation produces (a 'banded admin' charge). Note that this is quite separate to the fees applied per mattress which are addressed below.

The Australian Soft Landing scheme charges a fee based on the size of organisation (turnover). Carpet Recycling UK has sponsors in the form of the large carpet companies rather than a set fee structure.

2.2.2 *Collection/recycling fees and visibility*

The fees typically cover the cost of collection, dismantling and material recycling related to the mattresses. Under EPR collection should be free for consumers. Example fees (under EPR or for collection) include:

Applied at point of sale

- Éco-mobilier, France – €1.67 for a single mattress; €3.33 for a double mattress (2014 prices)
- California, US - \$8.03 per unit (2019 prices)
- Connecticut, US - \$12.23 per unit following increase from \$7.64 per unit
- Rhode Island, US - \$6.88 per unit

The point at which the fee is added is important: the French and US state EPR schemes charge the fee at point of sale so it is on all mattresses sold, typically shown on the receipt, invoice or website. The Rhode Island scheme even goes as far as having a brief description of the fee.

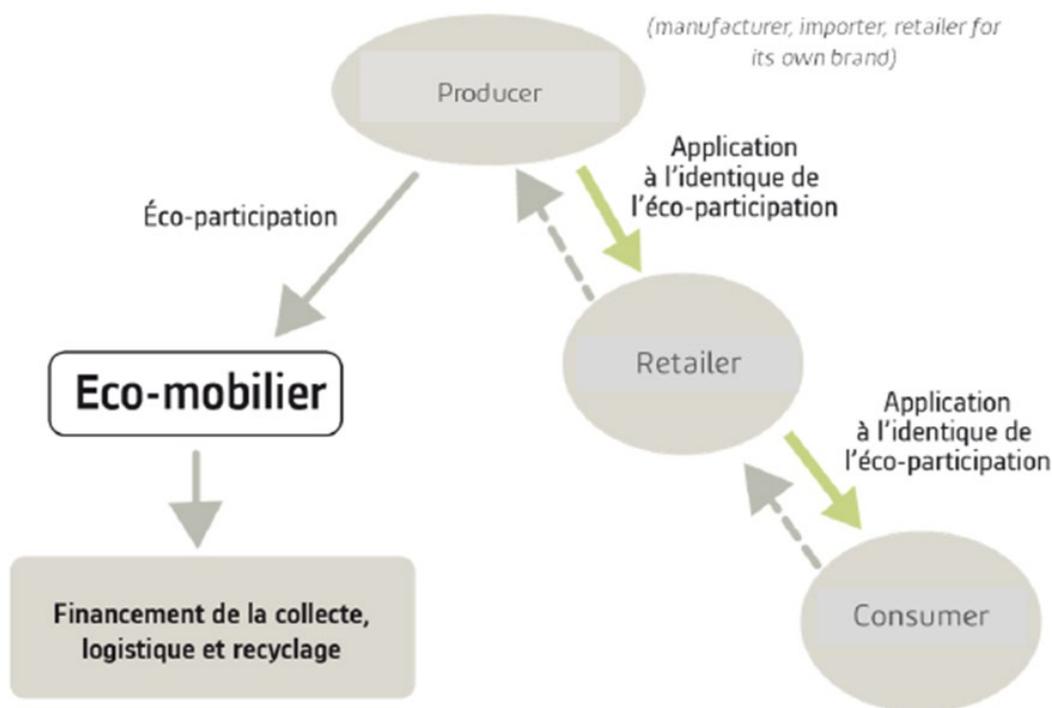
Schemes such as Soft Landing in Australia and the UK IKEA scheme charge individual consumers for collection and recycling (£20 per unit for IKEA, \$20 or \$50 Australian dollars for Soft Landing) . These schemes are not EPR as they simply charge a particular fee to the consumer directly for a recycling service for a given mattress. EPR fees are different in that they support the whole system and allow free collection to incentivise separate collection.



Source: Éco-mobilier

Figure 4: Advertising the Éco-mobilier ‘visible fee’ as introduced at IKEA

The flow of money in the French scheme is shown below (grey arrows), with the consumer ultimately paying.



Source: Éco-mobilier

Figure 5: Éco-mobilier funding flow

Other schemes, including Soft Landing, apply a cost recovery approach related to the waste management costs incurred at end of life which is only charged in relation to the mattresses that are collected separately. This is the approach generally taken in UK EPR schemes with cost recovery via producers essentially using a market share model (such as for WEEE and packaging). Soft Landing has calculated that if they changed to applying a fee at point of sale to every mattress made in Australia, it would need to be \$17 Australian dollars. As discussed in Section 2.2.5, one Australian online retailer absorbs the cost of collection rather than passing it on to the consumer.

2.2.3 Determining the level of fees

In the French Éco-mobilier scheme, fees are determined by an administrative council of leading producers within the scheme, using a formula that reflects the actual costs of the collection and recycling contracts. The government bodies have no say in the fee setting, however it should be noted that it is in the interests of producers to keep the fees as low as possible to avoid reducing sales. The scheme is governed more broadly by its authorisation, however, and it is stipulated that the PRO is not allowed to pursue profit-making and must only cover the actual waste management costs.

In the US, eligible costs are identified for the programme and approved by the state as part of the stewardship plan. Each annual budget and fee amount is analysed by the MRC prior to final authorisation via the state authorities, such as Cal Recycle in California. Soft Landing held a number of workshops which industry participants in order to come up with their fee structure.

For all the schemes, the revenue generated from the recycling of mattresses is highly variable, dependent upon commodity markets and insufficient to independently sustain a recycling programme. In other words, there is a net cost. Without EPR support this would mean a gate fee that would deter recycling, where, for example, energy from waste or landfill were possible and cheaper. In France EPR fees have enabled the mattress recycling sector to grow substantially.

2.2.4 Modulation of fees and eco-design

Only the French *Éco-mobilier* scheme uses modulated fees which were introduced in 2016 in relation to furniture design. The level of modulation is reflective of the design of a product and its consequential impact on the environment. Similar to the bonus-malus approach mentioned in section 1.1, a producer would be rewarded (bonus) for designing a product that mitigates its environmental impact, and disincentivised (malus) for creating a more environmentally impactful product. For furniture which is made almost entirely from wood or metal (without upholstery) and items that are modular and 'scalable', lower fees are applied, with a discount of approximately 20%. Eco-modulation is not yet applied to mattresses and current pricing is based only on basic mattress type and size from a recycling cost perspective.

In France it is noted⁴ that stakeholders generally find these 'differentiated fees' attractive, especially as they help create dialogue between producers and waste management operators. Some also point out that such criteria would be more efficient if harmonised at a European, or greater, scale. In theory, the additional amount should faithfully reflect the extra end-of-life costs associated with the difference in design (such as an additional cost if a product will be more expensive to recycle), in order to provide a direct price signal to marketers. In practice however, it is often difficult to establish the specific value of such an extra cost, which leads to a 'negotiated' price rather than an exact price.

Under the *Éco-mobilier* scheme fees for mattresses range from €0.18 for an inflatable mattress, to €1.10 for a topper, and €6 for a full size 'regular' mattress. This is a small additional cost on a traditional mattress that could have a pricetag of several hundred euros (for example, even €6 is only 1% on a €600 mattress). That said, for a large producer, the overall difference in costs could be very significant even where the absolute cost variation for a single mattress is small. As noted earlier, where market forces allow it, this additional cost can be passed on to the end consumer quite legitimately under EPR.

In order to identify the eco-modulation criteria for furniture in general, *Éco-mobilier* undertook an extensive consultation with stakeholders (members, professional associations, social economy and charity sector, furniture waste management operators, technical centres). All criteria selected were validated by the public authorities and accepted by consensus at the working group coordinated by *Éco-mobilier* since July 2013. Records of which products receive the eco-modulation discount and the supporting evidence of meeting the relevant criteria must be kept by producers. Where this is not available during an audit, any outstanding contributions in respect of eco-modulation will be payable to *Éco-mobilier*.

Although not a mandatory element of the French EPR scheme, *Éco-mobilier* published an eco-design guidance in 2016 to provide information and raise awareness for key actors in the industry on recyclability issues. *Éco-mobilier* has also run eco-design workshops for SME furniture producers. This, in tandem with the modulated fees for furniture in general, was aimed at increasing recyclability (although noting that modulated fees do not apply to mattresses). There is no data on the impact of the eco-design guidance and there are no consequences for producers of not improving product design, other than having to pay the higher (un-modulated) fees.

The *Éco-mobilier* scheme representative interviewed believed, however, that even where modulated fees had been applied for furniture, this had not been very effective as a 20% discount on a relatively small fee was insufficient to influence buyers so it had little impact on producers. A review of fees is being undertaken at present aimed at better reflecting the recyclability of materials (such as wood versus chipboard) and to include post-consumer recycled content, although this has not yet been finalised.

Soft Landing is also intending to explore eco-modulation as a future development of its scheme but was unable to share the details of its plans at the time of interview due to confidentiality. The US EPR

⁴ 20 years of EPR in France: achievements, lessons learned and challenges ahead, French Ministry of Environment 2014

schemes do not use modulated fees and in fact no US EPR schemes of any kind have any form of variable charge to reflect eco-design features such as recyclability.

This is not to say that private companies are doing nothing. Eunomia has been working with a large UK mattress manufacturer that is developing a more modular mattress design, and Auping in the Netherlands is designing their product for disassembly and to be 100% recyclable.

2.2.5 *Free-riding and capture of online and distance sellers*

Free-riding is an issue whereby producers avoid their obligations under EPR. Where companies have a physical presence in a country it is relatively simple for the PRO or state authorities to track them down and require registration with the PRO, where there is a mandatory scheme. However it is a growing problem given the ease of 'distance-selling' online of memory foam 'mattress in a box' products. According to a recent UK National Bed Federation (NBF) survey, more consumers are now purchasing their mattresses online than in a store. The survey⁵, carried out on a sample of 500 people who had purchased a mattress between September 2017 and February 2018, showed that 51% of purchases were made online.

Éco-mobilier noted (surprisingly given UK data) that this is not seen as a large problem in France, although the French have been considering action against multi-seller platforms in terms of other product groups, making the platform take on producer responsibilities where the seller is not registered. In the UK, Defra is consulting on an idea to make anyone who 'facilitates import' (such as an online platform that undertakes fulfilment) the producer under UK packaging regulations.

In California, all retailers (including remote sellers) are required to register with the MRC as part of the mandatory EPR scheme and MRC contacts online retailers to inform them of their responsibilities. This will now be aided by a recent US Supreme Court decision in June 2018, under which states are now empowered to collect sales taxes from online retailers. This development will extend the reach of state authorities to ensure that other state-enabled fees (such as those for EPR programmes) are collected as well.⁶

In Australia, Soft Landing has succeeded in getting one of the country's largest online retailers, Koala, to join the scheme voluntarily and collect old mattresses at no cost to the consumer as part of a marketing initiative.

2.3 Mattress collections and treatment

2.3.1 *Collections and incentivised returns*

Under the French Éco-mobilier scheme, 4,038 collection points are now supported across France via municipal collection points (2,394), retailers (1,253) and social enterprises (391). Incentivising collection (through a small payment or voucher scheme, for example), does not appear to be an element of the French EPR scheme. It is probably not needed since it is free to drop off at these sites and the density of them makes this relatively convenient.

In California, by law, a retailer must offer to pick up a consumer's old mattress at no cost to the consumer when it delivers a new mattress (provided delivery is not by common carrier). The more that retailers do to fulfil their pick-up obligations, the more accessible the programme is to consumers, and the less that the programme needs to rely on other options for collecting discarded mattresses for recycling. By the end of 2017, a total of only 239 mattress collection sites and events throughout California accepted mattresses from consumers free of charge.

⁵ <https://www.bedfed.org.uk/online-overtakes-instore-mattress-purchases/> accessed 31/03/19

⁶ Judgement of June 21, 2018, *South Dakota v. Wayfair Inc., et al*, Certiorari to the Supreme Court of South Dakota, No.17-494
https://www.supremecourt.gov/opinions/17pdf/17-494_j4el.pdf

On the plus side, the California scheme offers a financial incentive that encourages consumers to deliver discarded mattresses directly to recyclers, as opposed to free collection at an MRC drop-off centre. California residents may drop off discarded mattresses at an MRC-contracted recycler and receive \$3US per unit for up to five units per vehicle per day. The incentive is not available to businesses or government collectors. MRC collected 20% of the units recycled in 2017 directly from residents through this incentivised collection channel. This could therefore act as a supporting element to a Scottish EPR scheme to increase engagement with consumers who have the capacity to deliver mattresses themselves to a processing/collection point. This is more likely to be possible in rural areas for individuals with suitable vehicles than in cities. This could also help to discourage flytipping.

The Australian Soft Landing scheme has future plans to incentivise collections but was unable to say what form this would take. The take-back initiatives involving individual producers and retailers usually apply a charge (to collect on dropping off a new item) which is similar to local authority bulky waste charges, making it a disincentive.



Source: Éco-mobilier

Figure 6: Éco-mobilier collection and recycling scheme

IKEA in Japan is unique in offering a buy-back service for IKEA furniture which at the end of its life can be exchanged for a store refund card based on the condition of furniture, which is refurbished and resold in store.

2.3.2 Re-use

Whole mattresses can also be reused, either with or without some preparatory refurbishment or remanufacture - so-called 'Preparation for Re-use' (PfR) as defined under the EU Waste Framework Directive. Specific parts can also be reused after disassembly, most notably the springs.

PfR targets already exist in certain countries at a national/regional level, in Spain (furniture, textiles, WEEE) and Flanders (household) but there are no formal targets in any of the EPR schemes studied.

That said, a key requirement under the French furniture EPR law includes fostering PfR, with an aspirational target to increase the total volume of goods that have been prepared for reuse being placed back on the market by 50% by 2017. This approach sees the efforts of the operator of the B2C EPR scheme, Éco-mobilier, working in partnership with a range of social economy actors, to increase the transfer of used furniture to be prepared for re-use. We understand that this essentially involves inspection and steam cleaning rather than re-upholstery.

Case Study – Preparation for Re-use targets, Spain

Spain is the first European country to set a mandatory, national Preparation for Re-use target – for example the Spanish Royal Decree 110/2015 for WEEE. The Spanish Waste Plan 2016-22 requires that 2% of all furniture, textiles, electrical appliances, and other suitable goods, must be sent for repair and resale. Spain has also shown support for the social sector, with the Spanish Waste Plan also specifying that preferential access should be granted to the social sector to access municipal waste collection points to source these goods.

Other than California, the US State programmes do not require re-use and there are of course sensitivities around hygiene and liability. Soft Landing in Australia does not incorporate re-use into its scheme unless a retailer is willing to take on the liability – this is currently done with one retailer for 100 day returns which are sent to a local charity for re-use rather than resold.

A UK study for the National Bed Federation⁷ noted that in regard to the UK:

Considerable resale for re-use of whole mattresses is occurring, especially with retail returns which are seen as ‘nearly new’. Also, sale of components for re-use in new mattresses is also occurring - again, where components such as spring sets and foam pads can be recovered in an ‘as new’ condition for re-manufacturing.

It’s possible to imagine modular designs that would require only certain components to be replaced and others to be steam cleaned to allow re-use as a refurbished item. IKEA has plans to rent/lease some furniture types, including whole kitchens (a trial is taking place in Switzerland), although it’s understood mattresses are not yet being considered.

2.3.3 Disassembly

While there has been some investment in semi-automated treatment (for example by Éco-mobilier in France; Retour Matras and Matras Recycling in the Netherlands) much of the dismantling is done manually. Australia’s Soft Landing, and The Furniture Recycling Group in the UK, note their social focus of providing employment and training for disadvantaged groups through their schemes, which makes manual disassembly preferable. Manual processes also tend to result in higher levels of material recovery. However, The Furniture Recycling Group is planning to automate in the next few years, having designed and patented a pocket spring recycling machine and an automatic mattress stripper. The driver here is cost reduction.

Éco-mobilier uses seven contractors across France to reduce transport impacts and reduce costs.

⁷ Mattress Component Recycling: A study of the degree to which components arising from the deconstruction of used mattresses are sent for re-use or recycling. Prepared by Oakdene Hollins for the National Bed Federation, February 2018



Source: Eco-Mobilier

Figure 7: Location of French mattress dismantlers

A UK study for the National Bed Federation⁸ noted that in regard to the UK:

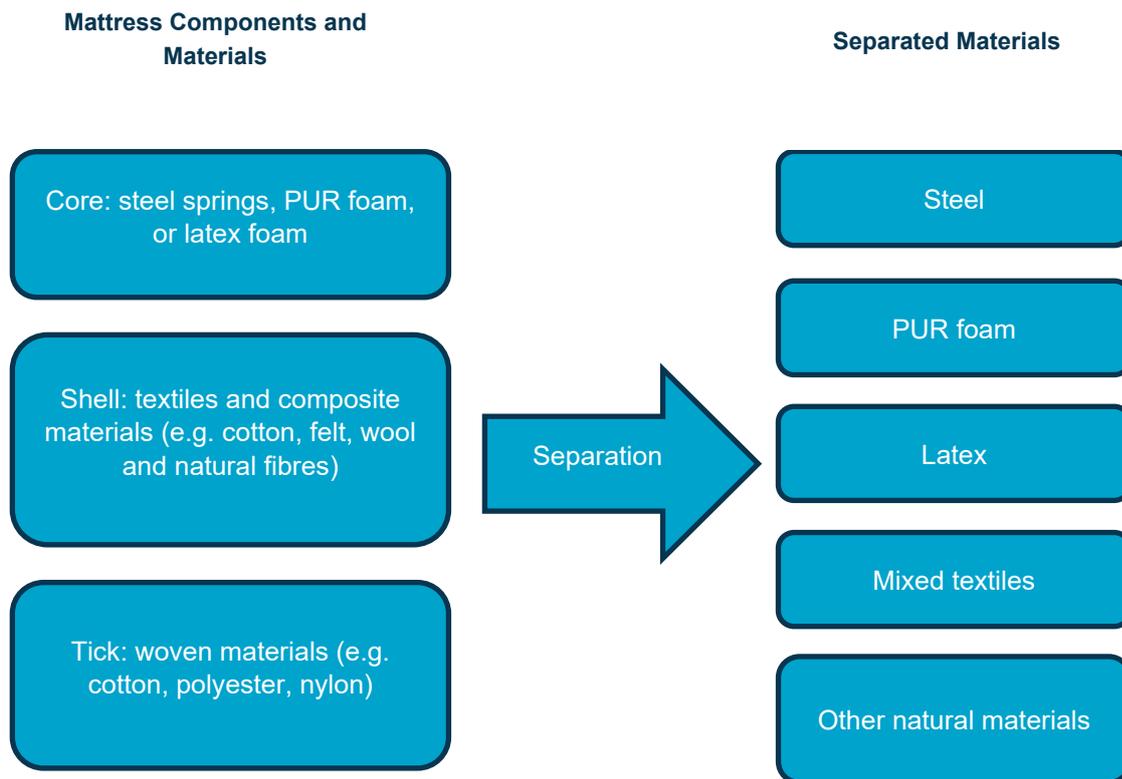
There are just eight significant, and apparently compliant [with NBF requirements], mattress recyclers in the UK. A number of smaller collectors process small quantities but, historically, there have also been a number of 'rogue operators', who were clearly non-compliant. Others, identified in earlier reports, have gone out of business, presumably because they failed to achieve a positive financial return on their operations.

Manual deconstruction of mattresses using knives is seen by some operators as unsafe. Where this is carried out, however, full personal protective equipment (PPE) is used to ensure safe operation, and this appears to be successful. There is no fully automated machine that can cleanly deconstruct the wide variety of mattress types and sizes found in the waste stream. (Anecdotally, we were told that the machine that has been built in The Netherlands for this purpose only handles foam mattresses – and its efficiency is doubtful). Some recyclers have devised part-mechanical systems, although these damage some of the components, particularly foam pads, in the process. The alternative for other recyclers is to simply export the mattresses whole for deconstruction overseas.

2.3.4 Market routes and recovered materials

Figure 8 shows the common material composition of the three main sections of a mattress construction and the material streams generated in the separation process prior to recycling.

⁸ Mattress Component Recycling: A study of the degree to which components arising from the deconstruction of used mattresses are sent for re-use or recycling. Prepared by Oakdene Hollins for the National Bed Federation, February 2018



Source: Zero Waste Scotland⁹

Figure 8: Material Composition of Mattresses and Separated Materials

Potential end markets for the range of key recovered materials include:

- PUR foam
 - Underlay and insulation materials (Retour Matras – Netherlands)
 - Carpet underlay (Soft Landing – Australia)
 - Manufacture of judo mats – (Auping – Netherlands)
 - Foam manufacturers (Matra Recycling Europe – Netherlands)
 - Manufacturers of carpet pad (Mattress Recycling Organisation – California, Connecticut and Rhode Island)
- Textiles
 - Separated into bales and used open-loop recycling in textile industries (Retour Matras – Netherlands)
 - Research and development (R&D), end use products such as acoustic panelling (Soft Landing – Australia)
- Latex
 - Filling material in furniture industry (Retour Matras – Netherlands)
- Steel springs
 - Roof sheeting (Soft Landing – Australia)
 - Sold to Tata Steel (Auping – Netherlands)
 - Recovered metals market (Mattress Recycling Organisation – California, Connecticut and Rhode Island)

⁹ ZWS A Business Case for Mattress Recycling in Scotland, https://www.zerowastescotland.org.uk/sites/default/files/Report%20-%20A%20Business%20Case%20for%20Mattress%20Recycling%20%28MAP002-002%20Nov%202012%29_1.pdf

- Wood
 - Mulch and animal bedding (Soft Landing – Australia)
 - Mulch, compost or may be diverted for biofuel (Mattress Recycling Organisation – California, Connecticut and Rhode Island)
- Husk
 - Weed matting and mulch (Soft Landing – Australia)

Figure 9 shows the recycling process and end destinations utilised by Australian mattress recycling company and social enterprise Soft Landing.



Source: Soft Landing¹⁰

Figure 9: Recycle material routes used by Soft Landing

The Oakdene Hollins report for the National Bed Federation¹¹, shows the fate of components from recycled mattresses in the UK. Given hygiene concerns, the perhaps surprising result is the high levels of re-use of non-woven and polyester materials.

¹⁰ Soft Landing website, accessed 27/03/2019
<https://www.softlanding.com.au/the-recycling-process/>

¹¹ Mattress Component Recycling A study of the degree to which components arising from the deconstruction of used mattresses are sent for reuse or recycling. Prepared by Oakdene Hollins for the National Bed Federation, February 2018

Component category	Reuse	Recycle	RDF/EfW
Springs	4%	96%	0
Nonwovens	52%	0	48%
Foam	5%	85%	10%
Polyester	43%	31%	26%
Woven textiles	0	42%	58%

Figure 10: UK data for recycled mattress component fates

This demonstrates that there are extensive recycling and even re-use opportunities for the component parts of a mattress, once they have been separated. There are currently limited options for closed loop recycling (where components can be recycled back into the same manufacturing process to reduce reliance on virgin materials) but this can be aided by better design. For example, mattresses that are designed to eliminate the use of hazardous chemicals such as brominated flame retardants, and for ease of disassembly, could facilitate greater component re-use.

2.4 Conclusions on key elements and effectiveness of schemes

2.4.1 Summary of scheme features

A summary of the main features of the schemes is detailed below.

Scheme	Éco-mobilier	California*	Rhode Island**	Connecticut***	Soft Landing	Carpet Recycling UK
Country	France	US	US	US	Australia	UK
Product	Mattresses	Mattresses	Mattresses	Mattresses	Mattresses	Carpets
Is it industry led?	✓	✓	✓	✓	✓	✓
Is it mandatory?	✓	✓	✓	✓	✗	✗
Is there government oversight?	✓	✓	✓	✓	✗	✗
Target for collection?	✗	1.2 million units	Not known	38,500 [^] mattresses	✗	✗
Target for recycling?	✓	66%	85%	75%	✗	✗
Target for re-use?	✗	150,000 units	✗	✗	✗	✗

Is there a membership fee?	✓	✓	✓	✓	✓	✗
Is the recycling fee visible?	✓	✓	✓	✓	✓	✗
Is processing manual or semi-automatic?	Semi-automatic	Semi-automatic	Semi-automatic	Semi-automatic	Manual	Semi-automatic
Collection units per year	840,000#	1.3 million units	83,762 mattresses	181,070 mattresses^	884,225~	
Recycling rate	55%	56%	83%	61%	75%	
Is there a penalty on performance or compliance enforcement measure?	✓	✓	✓	✓	✗	✗
Notes	<p>*2017 data and includes bed bases and mattresses</p> <p>**2016 data and is mattresses only</p> <p>***2017 targets data and is mattresses only</p> <p>#2015 data and includes furniture and mattresses</p> <p>~this is number of mattresses to date (since 2010 launch)</p> <p>^ Target data only reported for retailers, hotels and independent hauliers (total of 38,500 mattresses, against which the scheme collected 51,652). But the overall number of mattresses collected from all sectors is reported at 181,070</p>					

Table 5 Assessment of EPR scheme features

2.4.2 Effectiveness

The schemes reviewed are difficult to assess in terms of their overall effectiveness, let alone their cost-effectiveness, given the varying types of approach and what is and is not included in the KPI data.

Firstly, collection rates are difficult to assess. Éco-mobilier reported that in 2013/14 only 30% of waste mattresses were collected, although they estimate that this is now over 50%. This is despite the data on waste mattresses arising not being accurate. In California in 2017 there were 363,185 units from retail take-back schemes and 884,092 from other collection sites and events (1,247 million in total). Registered retailers and other sellers reported California sales of 4,046,014 units, and while this is only an approximation of the mattress waste arisings (as there will be a lag of many years before mattresses become waste), this implies a collection rate of around 31%, far lower than the current figure for France.

In France, Éco-mobilier supports over 4,000 collection points for furniture (including mattresses) via municipal collection points (2,394), retailers (1,253) and social enterprises (391). By comparison, at the end of 2017, only 239 mattress collection sites and events throughout California accepted mattresses from consumers free of charge. France is around the same size as California; California

being approximately 403,882 sq km, while France is approximately 551,500 sq km. The population of California is ~37.3 million people - 29.9 million people fewer than those living in France, and more concentrated around the San Francisco, Los Angeles and Central areas. The density and location of collection sites could therefore be a significant factor in determining the differences.

The 2018 NBF study¹² in the UK estimates that some 1.4 million mattress units per year are currently being put through the major recyclers, and that the numbers are increasing. This compares with a figure of just below 1.0 million reported based on 2015 data. In the UK the NBF estimate that in 2018 recycling rates are only around 15% to 20%, so potentially (subject to how comparable the data are) behind what is being achieved under EPR in France.

All of the schemes are achieving reasonably high levels of material recycling from the mattresses that they collect, but this is confused by what is included in the targets. Soft Landing (75%) and Rhode Island (83%) have very high recycling rates for the materials but this seems to include wood from the bed bases. A more realistic figure is that achieved by California and France, at 50% to 60% of material recycling, i.e. a 25% to 30% overall recycling rate when collection rate (assuming 50%) and recycling rate are combined. California appears to be managing 4% mattress re-use against a target of over 10%. It appears that the UK is also reusing whole mattresses as well as mattress components, although the data is fragmented.

These figures (collection and recycling) could be far higher with improved (perhaps incentivised) collection approaches and design for re-use and recyclability. Auping in the Netherlands, for example, has a mattress designed to be 100% recyclable, while we know of a UK manufacturer that has eliminated flame retardant chemicals and focused on a single pad material to help maximise recyclability.

3 Findings of desk research

3.1 EU legislation

EPR is considered, at the EU level, to be a fundamental cornerstone of circular economy policy for products. The EPR systems developed over the last 20 years have been effective up to a point in covering at least part of the costs of collection and treatment of products once they have become waste. However, cost-coverage has often been incomplete and there has been little to incentivise better product design; individual producer responsibility (whereby the producer deals with its waste obligations directly) has been impractical and eco-modulation rarely used.

The second generation of EPR legislation, driven by changes set out in Article 8a of the new EU Waste Framework Directive (WFD)¹³ on minimum requirements for EPR, should make producers truly responsible for the products they place on the market, creating secure revenue streams for collection and recycling infrastructure to operate effectively and to incentivise product innovation towards better design, with penalties for less sustainable practices.

The revised Waste Framework Directive requires that (Article 8a (4)):

“Member States shall take the necessary measures to ensure that the financial contributions paid by the producer of the product to comply with its extended producer responsibility obligations:

¹² Mattress Component Recycling; A study of the degree to which components arising from the deconstruction of used mattresses are sent for reuse or recycling. Prepared by Oakdene Hollins for the National Bed Federation, February 2018

¹³ DIRECTIVE (EU) 2018/851 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 May 2018 amending Directive 2008/98/EC on waste

(a) cover the following costs for the products that the producer puts on the market in the Member State concerned:

— costs of separate collection of waste and its subsequent transport and treatment, including treatment necessary to meet the Union waste management targets, and costs necessary to meet other targets and objectives as referred to in point (b) of paragraph 1, taking into account the revenues from re-use, from sales of secondary raw material from its products and from unclaimed deposit fees,

— costs of providing adequate information to waste holders in accordance with paragraph 2,

— costs of data gathering and reporting in accordance with point (c) of paragraph 1.

(b) in the case of collective fulfilment of extended producer responsibility obligations, are modulated, where possible, for individual products or groups of similar products, notably by taking into account their durability, reparability, re-usability and recyclability and the presence of hazardous substances, thereby taking a life-cycle approach and aligned with the requirements set by relevant Union law, and where available, based on harmonised criteria in order to ensure a smooth functioning of the internal market; and

(c) do not exceed the costs that are necessary to provide waste management services in a cost-efficient way. Such costs shall be established in a transparent way between the actors concerned.

Where justified by the need to ensure proper waste management and the economic viability of the extended producer responsibility scheme, Member States may depart from the division of financial responsibility as laid down in point (a), provided that:

ii) in the case of extended producer responsibility schemes established on or after 4 July 2018 to attain waste management targets and objectives solely established in Member State legislation, the producers of products bear at least 80 % of the necessary costs;

and in addition, Article 5 and 6 state that:

5. Member States shall establish an adequate monitoring and enforcement framework with a view to ensuring that producers of products and organisations implementing extended producer responsibility obligations on their behalf implement their extended producer responsibility obligations, including in the case of distance sales, that the financial means are properly used and that all actors involved in the implementation of the extended producer responsibility schemes report reliable data.

Where, in the territory of a Member State, multiple organisations implement extended producer responsibility obligations on behalf of producers of products, the Member State concerned shall appoint at least one body independent of private interests or entrust a public authority to oversee the implementation of extended producer responsibility obligations.

Each Member State shall allow the producers of products established in another Member State and placing products on its territory to appoint a legal or natural person established on its territory as an authorised representative for the purposes of fulfilling the obligations of a producer related to extended producer responsibility schemes on its territory.

For the purposes of monitoring and verifying compliance with the obligations of the producer of the product in relation to extended producer responsibility schemes, Member States may lay down requirements, such as registration, information and reporting requirements, to be met by a legal or natural person to be appointed as an authorised representative on their territory.

6. Member States shall ensure a regular dialogue between relevant stakeholders involved in the implementation of extended producer responsibility schemes, including producers and distributors, private or public waste operators, local authorities, civil society organisations and, where applicable, social economy actors, re-use and repair networks and preparing for re-use operators.

So many of the good practices identified in previous studies (including the OECD guidance noted below) are essentially mandated under the WFD, and something that the UK says it will adhere to irrespective of Brexit outcomes.

These requirements are the minimum and Member States can go further in some areas, although it should be noted that, as well as being necessary as in 'cost efficient', fees can only cover cost recovery. Other environmental and health externalities should be addressed in different ways, for example through taxes. This therefore constrains, to an extent, the potential impact of modulated fees.

3.2 OECD (Organisation for Economic and Cooperative Development) Guidance

The OECD 2016 EPR Guidance¹⁴ notes that the design and governance of EPR are crucial to their performance. The issues range from target setting and monitoring and enforcement, to free-riding and financing.

- The targets of EPR policies should be periodically reviewed and adjusted, taking account of changes in market conditions and technology.
- In mandatory systems, governments should establish consistent and credible means for enforcing EPR obligations, including registers of producers, official accreditation of producer responsibility organisations (PROs) and appropriate sanctions.
- Adequately resourced monitoring systems need to be established; the performance of EPR operations should be regularly audited, preferably independently. In the same jurisdiction, EPR systems should be harmonised to the extent possible, and a means for checking the quality and comparability of data established.
- Free-riding, which still is a challenge to many EPR systems, should be addressed through peer pressure and strict enforcement.
- Governments should identify ways in which EPR systems can be financed in a sustainable manner. This should include analysis of how risks such as price volatility and leakage could be managed.
- Modulated fees should use criteria which are objective, verifiable and discriminating and a simple process for businesses.

Concerns persist about collusion among producers and about the potential abuse of vertical agreements between PROs and companies involved in downstream operations. An important means for minimising anti-competitive behaviour is to consult competition authorities when EPR systems are being established.

- Services such as waste collection, sorting, as well as material recovery and disposal should be procured by transparent, non-discriminatory and competitive tenders.

¹⁴ Extended producer responsibility; Updated guidance for efficient waste management, OECD 2016

- EPR schemes should allow single PROs only when it can be demonstrated that the benefits (such as the capacity to manage the waste would otherwise not be built) outweigh the costs of less competition.

Key insights from a 2015 OECD study¹⁵ on EPR note a few further points around effectiveness:

- First, in selecting policies within the EPR framework, multi-instrument policies, such as deposit/refund, are likely to be more efficient than single instrument policies such as an advance disposal fee.
- Second, while collective PROs may be attractive in terms of taking advantage of economies of scale and reducing the need to monitor individual firms, care should be taken that market power is not exploited.
- Third, while most EPR policies provide Design for the Environment (DfE) incentives, policies that directly target product characteristics (weight, recyclability, etc.) will provide the most direct incentives.

4 Findings of desk research

The key elements below are utilised in differing ways in Models 1, 2 and 3 as fully detailed in Section 5.

4.1 Form of scheme: industry-led, mandatory or voluntary

While there is no definitive answer, it seems sensible to allow the producers to run an EPR scheme as they are well-placed to determine what is best from a cost-efficiency point of view, i.e. one PRO or more and whether this should be not-for-profit. The producers and retailers have a large influence in the market, control design and are able to capture the mattresses on take back. Their ability to work with other collectors to coordinate logistics and share knowledge can enable a more efficient approach.

The track record of voluntary agreements in terms of delivering strong waste management in the EU is not good, most resulting in diversion to energy from waste and downcycling rather than recycling (for example the Carpet Recycling UK voluntary EPR initiative). Voluntary schemes can be successful but a) require a lot of work to gain traction because there is often no clear incentive for businesses to participate, resulting in high levels of free-riding and b) need clear and appropriate objectives and targets, with the threat of regulation and enforcement action if quick progress is not made.

4.2 Single or multiple schemes?

The use of a PRO to run a collective scheme for multiple producers enables the scheme to be run in a controlled and coordinated manner with proper process and transparency. The argument goes that the more PROs, the more competition and the lower the compliance costs, however the UK is unusual in having quite so much competition (for example, 28 schemes for WEEE) and some of it is not managed by the producers but by waste management companies and other for-profit organisations, which could be of concern from a competition and conflict of interest perspective.

France has two schemes, the main one being Éco-mobilier, which is not for profit and owned by the furniture manufacturers and retailers and achieves cost efficiencies by contracting various collection organisations and recyclers who are in competition. It is worth noting that having for-profit companies,

¹⁵ WHAT HAVE WE LEARNED ABOUT EXTENDED PRODUCER RESPONSIBILITY IN THE PAST DECADE? A SURVEY OF THE RECENT EPR ECONOMIC LITERATURE Daniel Kaffine and Patrick O'Reilly, OECD, January 2015

such as waste companies, run schemes could imply a conflict of interest where they also control a relevant recycling business and restrict access of these to the wider market.

As the OECD data in Figure 11 shows, the PRO administration element of EPR schemes tends to be 5% to 10% and hence the lost competition from having a single scheme only affects this very small part of the overall costs. So long as competitive and transparent tendering takes place in regard to the collection and recycling aspects, at least 90% of the costs will be minimised. Éco-mobilier, for example, has 574 contracts with local collection organisations organising collections from retailers and local authority sites for delivery to dismantlers and hence there is plenty of scope for competition in this regard.

A counter argument is that where multiple schemes do operate, costs do tend to be lower than where there is a single scheme, although in some cases this is because a single scheme tends to be able to do more and to a higher standard. Models 1 and 3 are shown with a single PRO that manages multiple contractors/reprocessors, although two or more could be considered. In this instance high standards would need to be set for the schemes so as to avoid a 'race to the bottom' on costs to attract producers as members.



Source: OECD, 2016

Figure 11: EPR scheme cost breakdown

Organisations such as the Community Resources Network Scotland (CRNS), who are already involved in mattress recycling in Scotland, could certainly be contenders for involvement in a PRO to drive a mattress EPR system in Scotland.

Whatever the exact form, a PRO is a key element of Model 1 (mandatory EPR) and 3 (voluntary). Model 2 gives the option of creating a system which is government-led rather than industry-led.

4.3 Objectives and targets

Whether voluntary or mandatory, EPR schemes need a clear purpose and progressive targets that send the right signals to the market and allow a steady increase in collection, preparing for re-use and recycling. Stability should be provided, for example through five-year plans that provide a clear roadmap.

The Californian system for mattresses seems a good model in that it sets collection targets as well as material recycling and preparing for re-use (PfR) targets. The WEEE Directive is similar in that collection and recycling targets are set, although there are no PfR targets. It could be argued that no collection target is required since mattresses have to be disposed of rather than stored by the household wishing to dispose of it, however the French experience suggests otherwise, with only a 50% collection rate despite the large collection network.

The California Carpet Stewardship law offers a salutary tale on the importance of separate recycling targets rather than overall recovery targets (including EfW). In the original California Act ([AB 2398](#)) and Stewardship Plan allowed the Carpet America Recovery Effort (CARE), to focus on 'landfill diversion' which led to very slow progress spanning over 15 years - with most of the landfill diversion (around 10%) being energy from waste. Recent changes to the law ([AB 1158](#)) have now set recycling targets.

It is important to differentiate between high-value (if not closed loop) recycling and downcycling; the latter often resulting in less desirable environmental outcomes. Remanufacture, so that component parts can be refurbished or replaced, such as using the pocket springs in the core of a 'new' mattress, offers one additional recycling avenue. Direct re-use (without necessarily being discarded), for example in sharing initiatives or when products are gifted, and 'preparing for re-use' (PfR, i.e. some degree of refurbishment), are fundamental elements of many circular economy business models and hence need to be encouraged. Measuring direct re-use is difficult in many cases, however, PfR usually involves some sort of treatment centre where waste is refurbished for re-use and hence is simpler to track.

While re-use of mattresses is a contentious issue, not least due to hygiene concerns, hotel mattresses are of course continuously 'reused' in a sense and product returns to retailers are also resold. Modular design, for example allowing the outer shell to be removed and the 'core' springs to be reused, is one option here.

Other incentives for producers adopting re-use and leasing models, either directly or after 'preparing for re-use', could be the exemption of these products from EPR charges, when placed on the market. This is one way that re-use is encouraged under the UK Producer Responsibility Obligations (Packaging Waste) Regulations. For example, there is no producer charge for reused packaging, such as refurbished or lease pallets (charges only apply to the new item placed on the market for the first time).

In November 2018 the UK National Bed Federation (NBF) announced an aspirational target of 75% of all new mattresses sold to be diverted from landfill by 2028.

4.4 Governance

Having governmental oversight and accreditation gives a collective EPR scheme accountability, ensures that proper processes are followed and provides the authority to ensure full engagement with producers. Establishing a legitimate scheme in the eyes of industry and the consumer, adds confidence and credibility.

That is not to say that an industry-led scheme cannot be effective; in fact, this is generally the preferred option but with some degree of governmental oversight – such as to approve PRO stewardship plans, targets and fees, and, in the case of voluntary initiatives, to track progress and threaten regulation where progress is too slow.

All three suggested models therefore include public sector governance to a greater or lesser degree, with Model 2 being the only one that is entirely government-led.

4.5 Stakeholder engagement

Stakeholder engagement is needed for setting up, managing and monitoring the scheme. The style and type of engagement needs to be carefully considered depending on target market – online marketing is especially important with current buying habits, but equally in-store marketing supports customer-facing initiatives. For industry, the need to share the message in a practical and cost-effective manner leads to the use of industry forums, networking workshops and trade shows.

Engagement with social enterprises and charities are key to opening up re-use opportunities. All models therefore require a suitable organisation to utilise any existing network and capabilities and to facilitate the re-use of mattresses by disadvantaged groups.

4.6 Modulated fees

While their efficacy may be doubtful, they are mandated under Article 8a. The modulated fee is allowed to cover the factors listed under Article 8a (4b), i.e. durability, recycled content, recyclability, etc. Any one or more of these could be considered, depending on the product, how easy it is to operationalise, and arguably, how it bears relation to the costs which EPR schemes have to cover. It is clearly very important that the variation in cost to the producer, and hence as passed on to the consumer, is substantial so as to provide a real incentive for more circular products; however, as noted above, there is a question as to what degree modulation can shift behaviour when the main objective of EPR is cost recovery.

This is of particular concern where the modulated fee is being used in regards to a parameter that does not have any minimum 'essential' requirements. It is also important to note that the modulated fee factor must be relatively easy to calculate and validate so as not to create too much of an administrative burden. The modulated fee approach is therefore recommended to complement a set of mandatory minimum ('essential') requirements rather than as a complete alternative - to offer an incentive to go beyond these minimum requirements (i.e. to drive innovation and faster progress). See Appendix 7.1.

When considering criteria for mattress modulated fees, these could potentially include some or all of the following:

- Size: single, double, king/ queen
- Type: full, topper, futon, baby mattress, inflatable (air water)
- Style: foam, pocket-sprung, box-sprung
- Eco-design: hazardous materials, recycled/ organic content, design for re-use, design for recycling

Alternatively, the modulated fee could be calculated based purely on the actual recycling costs for a given category, although this then does not incentivise some aspects of circularity such as low hazard, durability and reusability.

4.7 Collection and take-back under EPR

In line with EPR principles, collection from households, businesses and designated collection points (such as household waste recycling centres) should be free of charge to the consumer, with the collection and administration costs covered by the relevant PRO or via the producer or their designated contractor where individual take-back is provided for.

A deposit return scheme (DRS) could also be used as an option to support EPR if return rates do not meet expectations. Although the relatively long life of a mattress may mean that people have not kept the original receipt when it comes to dispose of it, the EPR scheme could be set up to still refund the equivalent of the deposit paid to anyone returning a mattress. Alternatively, some other incentive (such as a financial payment or voucher of some sort to be redeemed at participating retailers) could still be paid and funded via the producer fees or product levy. This is done in one of the US states,

albeit only to offset the transport cost from collection point to reprocessor, although this is quite effective and proves the principle.

4.8 Proximity and export

It is important to have a good geographical spread of mattress recyclers to minimise transport impacts and costs related to movement of whole mattresses. Éco-mobilier has contracts with seven mattress recyclers across France, reasonably well spread to deal with this issue. All three EPR models proposed in this report suggest the utilisation of existing networks across Scotland for reuse opportunities; and established logistical and recycling companies to collect mattresses and send to local recycling/re-use facilities.

In some EPR systems (such as for packaging and WEEE plastics), much of the obligated waste has been exported (in particular to Asian markets) as reprocessing can be done more cheaply overseas and the markets for secondary materials have been strong. Whilst a lot of very valuable and legitimate reprocessing does go on outside the EU, this means that fewer facilities are developed in the EU and economic growth and job creation is reduced. Secondly it can be difficult to audit practices overseas to ensure that bogus reprocessing is not occurring (a problem with WEEE in particular). Thirdly, the transport of waste, particularly in its bulky un-reprocessed state, reduces the benefit of recycling (due to transport impacts). So, while export makes sense for mattress components, this should not be done for whole mattresses.

It is interesting to note, in this context, that Norway has proposed to amend the Basel Convention to address problems arising from the export of plastic waste (which could include polyester from mattresses for example) to countries unable to manage the waste in a sound manner. The proposal was discussed at the Convention's Open-Ended Working Group meeting in Geneva in the first week of September 2018. The proposed amendment would reclassify plastic waste under the Basel Convention.

4.9 Funding arrangements, visible fees and free-riding

In France, the furniture EPR scheme uses an upfront 'visible fee' that is shown as a separate item on the product price and receipt, and reflects the recycling fee that the consumer is charged and is passed back to the PRO, Éco-mobilier, to arrange collection and reprocessing. It is worth noting that the 'visible fee' is one way of indicating a legitimate producer and retailer that are registered and this is recommended for a Scottish scheme, as shown in Model 1 and 2. The fee is easily modulated by changing the pricing for a given product category.

This can, however, be a complication when there are multiple PROs and individual producer responsibility is allowed, for example for a large mattress company. The whole idea of competition is that fees vary and hence a visible fee (shown by the retailer) would have to be shown as a band of costs depending on the PRO in question.

An alternative model is a physical allocation model or a cost recovery model rather than an upfront fee model. In the UK WEEE system, the physical collections are allocated to different PROs based on the collective market share of the scheme members, and the PROs arrange collection from collection points (Designated Collection facilities under WEEE) for appropriate treatment. There is an annual 'settlement' to correct for over or under recovery based on aggregated PRO member obligations for each scheme. This approach is complicated where modulated fees have to be used, although potentially the physical allocation can be 'modulated'.

Alternatively, where a third party (such as a local authority) arranges collections and treatment, the costs can be charged back to producers on a quarterly basis, based on actual collection and recycling costs, using PRO member market share to apportion the costs as noted above. This is simpler in terms of applying the modulated fee.

The largest UK company is Silentnight Group and they only have an approximate 10% market share. Silentnight Group and other large suppliers may well be happy not to make their own arrangements but rather to benefit from the economies of scale offered by a collective scheme. It is worth noting that making it mandatory to register with a PRO (as is the case with UK WEEE Regulation having originally allowed individual registration with the environment agencies), and only having a small number of PROs, reduces the regulatory burden. Having a single public electronic register makes it easier to detect free-riding and peer supervision and thus is a feature of Model 1.

As noted earlier, Defra is consulting on an idea to make anyone that 'facilitates import' (such as an online platform that undertakes fulfilment) the producer under UK Packaging Regulations and this approach could be used to also reduce free-riding from online sales of mattresses under EPR. String enforcement powers would still be needed, however having only a few large platforms to regulate would be far simpler than dealing with hundreds if not thousands of distance sellers online.

4.10 Infrastructure support

The infrastructure required to meet the expected increase in preparing for re-use and recycling needs should be further developed in Scotland and the UK more widely. The capital cost of this infrastructure (as well as the actual operational costs of collection and recycling) can be recouped through EPR Fees, unclaimed deposits (where DRS is applied) or potentially additional taxes (for example on new products or incineration for example). Additional funding may also be necessary in the way of grants and low interest loans from governments and green investors to support the infrastructure development in advance of EPR scheme operation.

4.11 Consumer and business guidance

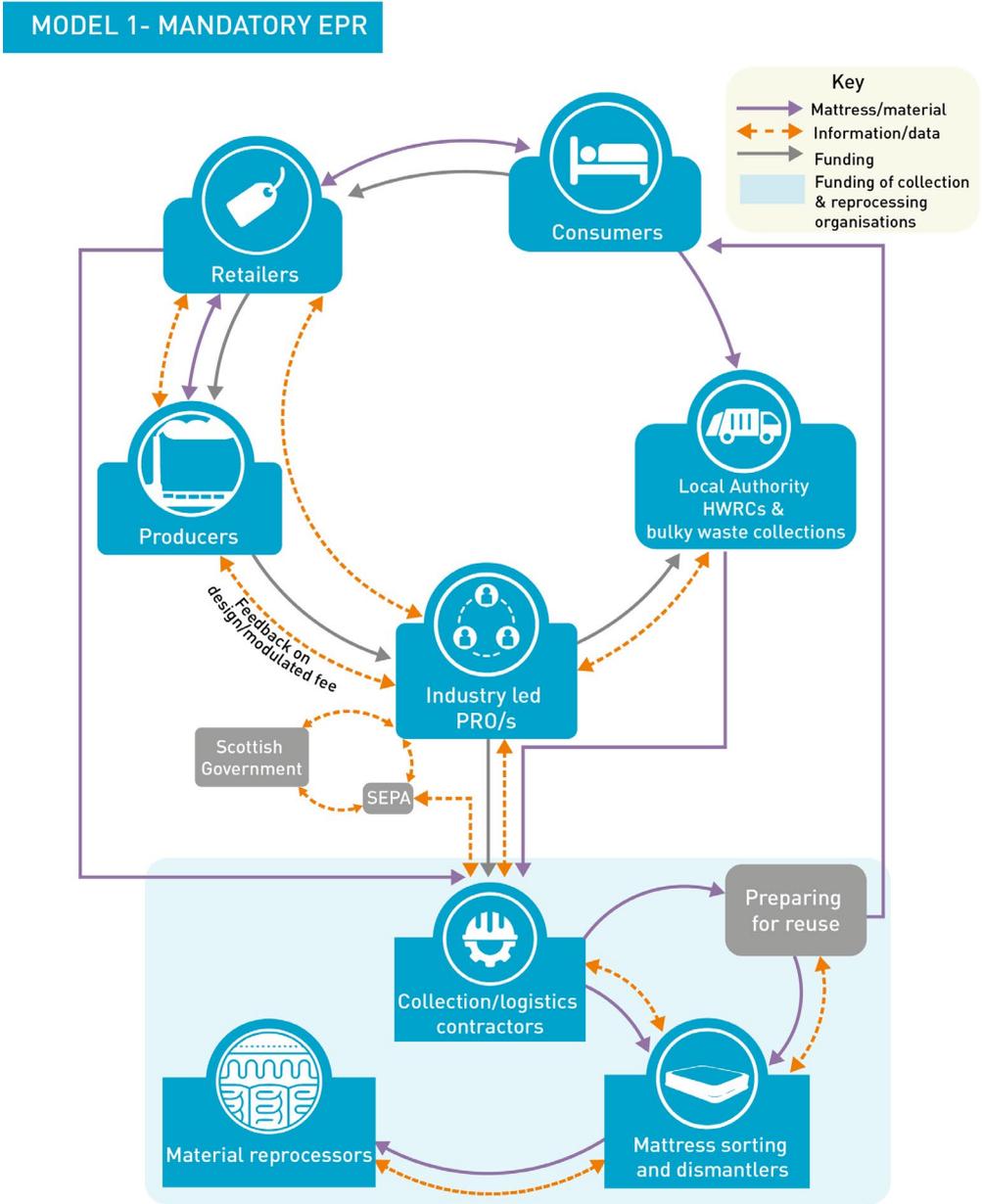
Clear guidance for private consumers and businesses is of course helpful in order to raise awareness of the need to return mattresses for separate collection and the means available to do that.

5 Suggested models

The following three 'models' are suggested, going from a mandatory and fully comprehensive system (similar to that already in place in France), via a government-led Pseudo EPR scheme, to a voluntary industry-led approach. The first should offer a strong probability of an outcome via EPR principles. The second allows closer government control potentially and with less complexity, but without strictly being an EPR scheme (with consumers paying directly rather than indirectly as in EPR), while the third offers industry greater flexibility but less certainty in terms of outcomes.

The first and second may be more difficult to implement at the Scotland level if market distortions are to be avoided. For example, a levy on mattresses sold in Scotland (depending on the level set) could mean that some customers buy from England instead, although unregistered online sellers (free-riders) are likely to be a bigger problem in general.

5.1 Model 1: Mandatory EPR (based on the French model)



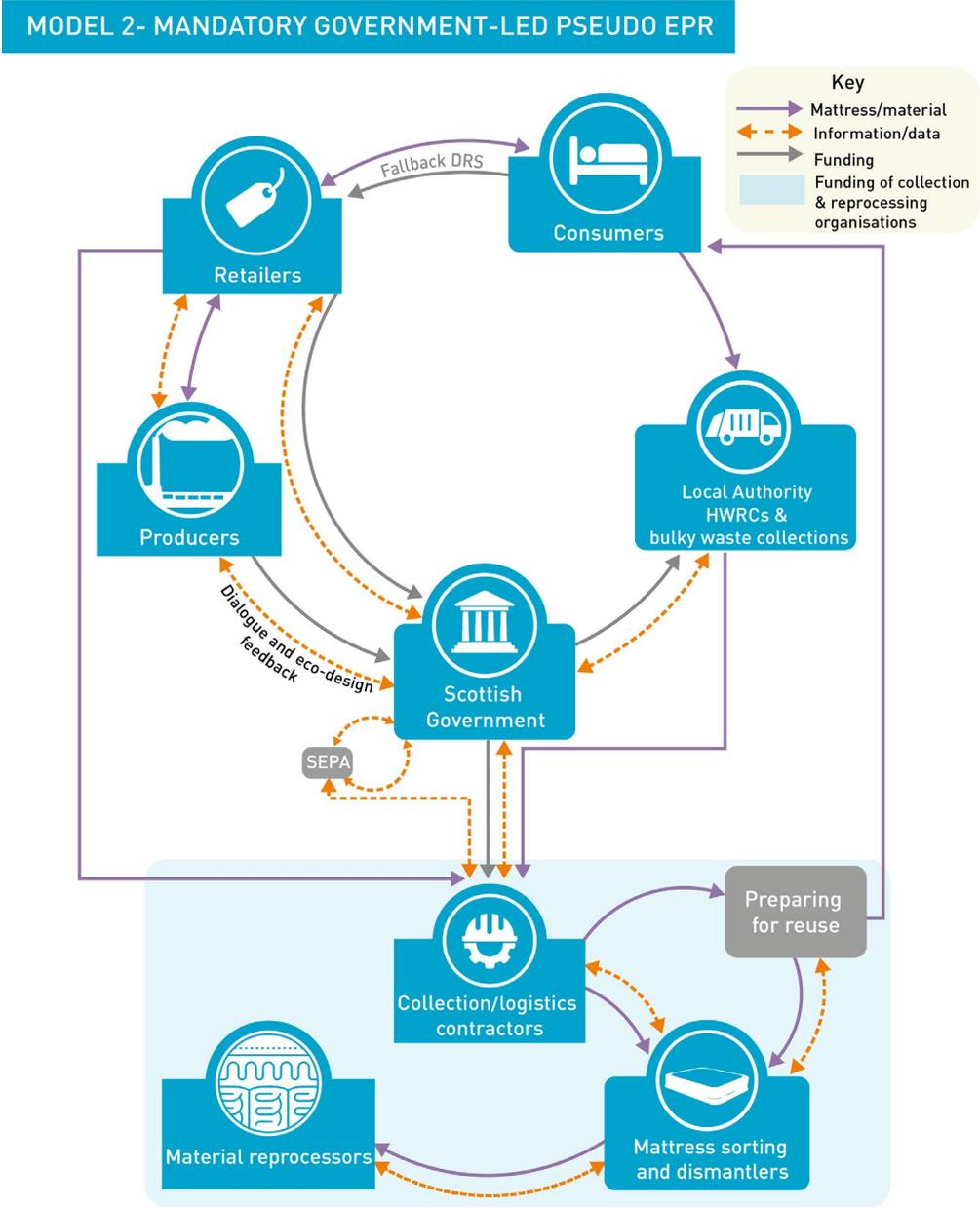
FEATURES AND BENEFITS

- Industry-led PRO/s – simplicity, producer incentive to minimise fees.
- Governance via Scottish Gov't – approval of PRO 5 year plan (including targets), approval of fees annually.
- Online multi-seller platforms – act as producer where 'facilitating import'.
- Separate collection, recycling and preparing for reuse targets – progressively increasing.
- Mandatory belonging to a PRO – helps reduce regulatory burden.
- Single electronic register – helps track free-riding.
- Modulated fees – to help incentivise eco-design.
- Visible fee – clarity for consumers; helps highlight free riding; but greater complexity in showing modulated fees.
- Commercial collection and recycling – contracted under public sector style competitive tendering.
- A suitable organisation to lead on preparing for reuse.
- SEPA- authorisation/auditing of processing sites and electronic register.
- Ongoing stakeholder dialogue.

Model 1 uses Mandatory EPR legislation, including:

- One (or potentially more) collective PROs (compliance schemes); producer-owned and working with commercial collectors and recyclers to minimise costs;
- Governance via Scottish Government – approval of PRO five-year plan (including targets); approval of fees annually;
- Online multi-seller platforms act as producer where ‘facilitating import’;
- Separate collection, recycling and preparing for re-use targets – progressively increasing;
- Cost recovery to include flytipping
- Mandatory producer participation by belonging to a PRO – helps reduce regulatory burden;
- Single electronic register – helps track free-riding;
- Modulated fees – to help incentivise eco-design;
- Visible fee – clarity for consumers; helps highlight free-riding; but greater complexity in showing modulated fees;
- Commercial collection and recycling contracted under public sector style competitive tendering;
- Free take-back (covered by full cost recovery under EPR fees) by retailers/ distributors plus collection network;
- A suitable organisation to lead on preparing for re-use;
- SEPA authorisation/ auditing of processing sites and electronic register;
- Ongoing stakeholder dialogue.

5.2 Model 2: Mandatory government-led Pseudo EPR



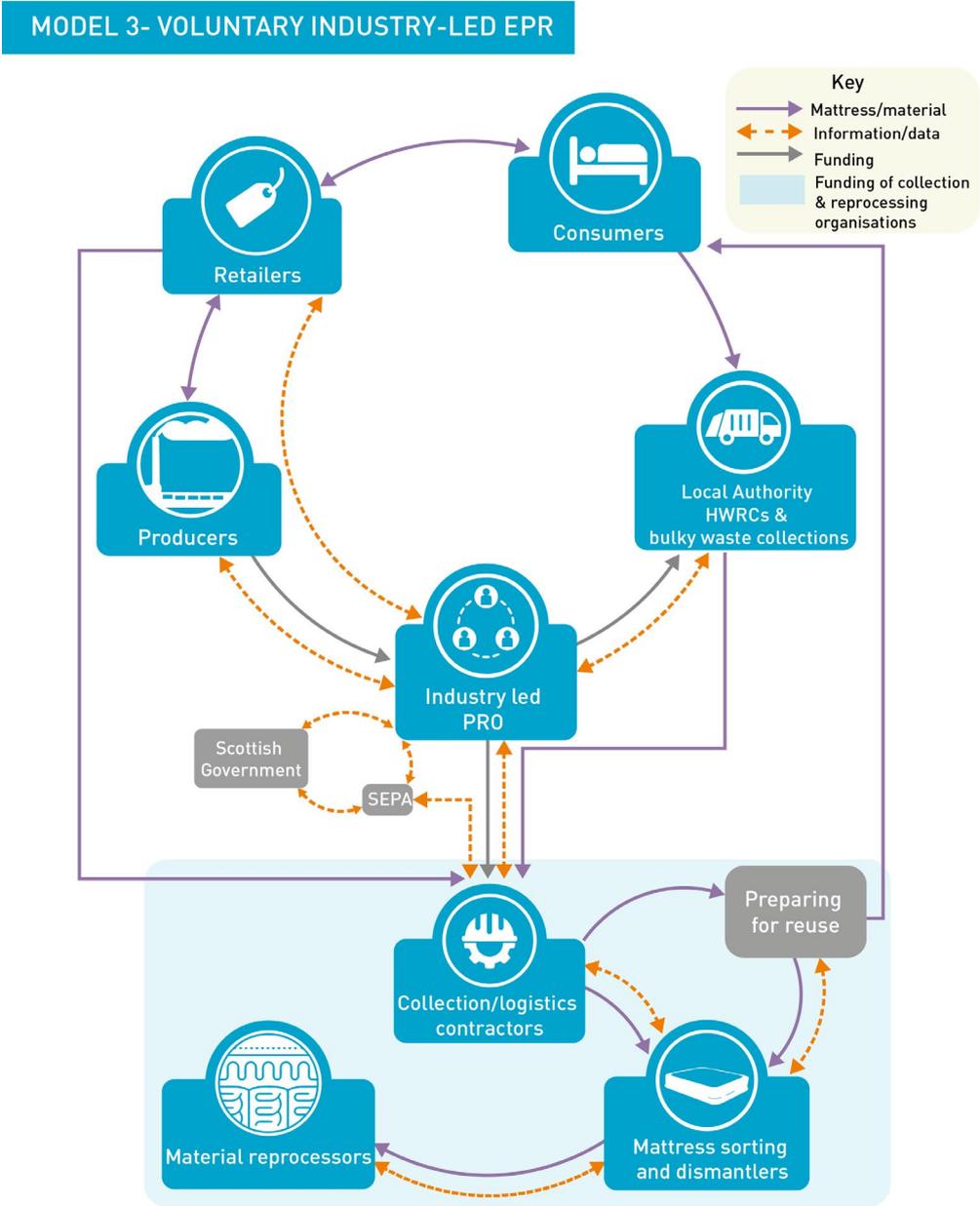
FEATURES AND BENEFITS

- Government-led rather than industry-led EPR – No PRO.
- Producers, local authorities and recyclers involved in scheme design and determining levy.
- Online multi-seller platforms required to take responsibility for paying the levy for their sellers – and collecting it from them.
- Mandatory free-take back by retailers – with Deposit Refund as a backup should collection rates be too low.
- Separate collection, recycling and preparing for reuse targets – progressively increasing and set out in 5 year plans.
- Funded by a product levy:
 - Modulated – to help incentivise eco-design;
 - Visible – clarity for consumers; helps highlight free riding; but greater complexity showing modulation.
- Commercial collection and recycling contracted through public sector competitive tendering.
- A suitable organisation to lead on preparing for reuse.
- SEPA authorisation/auditing of processing sites..

Model 2 is a mandatory EPR scheme, government-led rather than industry-led, including:

- Government-led rather than industry-led EPR – no PRO;
- Producers, local authorities and recyclers involved in scheme design and determining levy;
- Online multi-seller platforms required to take responsibility for paying the levy for their sellers – and collecting it from them;
- Mandatory free take-back by retailers (supported through the levy) – with deposit refund as a backup should collection rates be too low;
- Separate collection, recycling and preparing for re-use targets – progressively increasing and set out in five-year plan
- Funded by a product levy to cover the costs of collection and treatment (only desirable UK-wide to minimise cross-border purchases resulting in avoidance of the levy) and flytipping
 - Modulated – to help incentivise eco-design
 - Visible – clarity for consumers; helps highlights free-riding; but greater complexity showing modulation
- Commercial collection and recycling contracted through public sector competitive tendering;
- A suitable organisation to lead on preparing for re-use;
- SEPA authorisation/ auditing of processing sites.

5.3 Model 3: Voluntary industry-led EPR



FEATURES AND BENEFITS

- Industry-led single PRO – industry-friendly, regulation light.
- Co-ordination and support from ZWS – approval of PRO 5 year plan (including targets) but no ability to enforce.
- Industry required to set non-binding separate collection, recycling, and preparing for reuse targets – progressively increasing year on year.
- Voluntary for producers to belong to the PRO.
- Funding through membership, on a market share basis .
- Commercial collection and recycling contracted under public sector style competitive tendering.
- Obligation from Gov't for a suitable organisation to lead on preparing for reuse.
- SEPA authorisation/auditing of processing sites.
- Threat of legislation and binding targets etc. as in Model 1 if insufficient progress against plan.

Model 3 is a voluntary, industry-led EPR scheme organised and funded by mattress producers and retailers with targets (a cross between the California Model and the CRUK (Carpet Recycling UK) model), including:

- Industry-led single PRO – industry-friendly, regulation-light;
- Coordination and support from Zero Waste Scotland – approval of PRO five-year plan (including targets) – but no ability to enforce;
- Industry required to set non-binding separate collection, recycling and preparing for re-use targets – progressively increasing year on year;
- Voluntary for producers to belong to the PRO;
- Funding through membership, on a market share basis;
- Commercial collection and recycling contracted under public sector style competitive tendering;
- Obligation from government for a suitable organisation to lead on preparing for re-use;
- SEPA authorisation/ auditing of processing sites;
- Threat of legislation and binding targets, etc, as in Model 1, if insufficient progress is made against plan.

6 Complementary instruments

The literature review and consultations undertaken for Eunomia's recent work for the EU on a Product Policy Framework, indicates that EPR should be at the core of circular economy policy. Its effectiveness can be increased by implementing an integrated approach, whereby a variety of complimentary policy instruments are applied to deal with market failures on the supply side and the demand side.

Essentially, this means policy instruments can ensure that the lowest quality items cannot be placed on the market and encourage, incentivise, or indeed, mandate the creation/recreation of more durable, refurbished and remanufactured items, and higher quality recycled materials.

There is also the need to create demand for these products and materials. through incentivisation and mandating. Encouraging the supply of the right sorts of materials and products onto the market will have a more beneficial outcome, if the appropriate demand side measures can be implemented on a commensurate scale.

We would therefore suggest the following complementary instruments as being desirable in all EPR models:

- Minimum UK wide market access requirements ('essential requirements' – although probably only possible after BREXIT), for example:
 - Performance – fitness for purpose (for example firmness and support) where appropriate;
 - Minimum 'free of charge' warranty periods as a proxy for durability and to place the onus on manufacturers rather than consumers as now¹⁶ - potentially as an amendment to UK consumer law;
 - Hazardous material restrictions (beyond REACH in a precautionary sense);
 - Recycled/ organic content requirements;
 - Reparability and 'ease of recycling' requirements (around dismantling);
 - Mandatory Product Information ('passport') requirements around bill of materials (including all chemicals), repair and recycling instructions (for businesses rather than consumers);
 - Mandatory product labelling (such as a new Green Furniture Mark, but similar in nature to the Energy Label for ErPs) of:
 - The free warranty period (noted above as a minimum requirement) and the 'per-use' price of products over the free warranty period;
 - Eco-credentials, such as recycled content, reparability and 'ease of recycling'¹⁷;
 - Fitness for purpose criteria where possible (such as firmness);
 - This could potentially be integrated with, or equivalent in style to, the Energy Label. Eco-label would remain as a separate 'gold-standard' for those companies that see a market advantage.
- GPP for the public sector, mandating of Life Cycle Costing (LCC) in public procurement and a progressive move towards mandatory use of core GPP criteria for mattresses (this could be done in Scotland alone)
- Continuing support for circular economy (CE) innovation, focusing on the sector, combined with tax breaks, grants and/ or low interest loans for Scottish CE manufacturers and recycling companies and for businesses involved in 'preparing for re-use' and potentially for remanufactured/ prepared for re-use products. This is already done to a degree through the CEIF (Circular Economy Investment Fund) administered by Zero Waste Scotland.

These various elements are described further in Appendix 7.1.

¹⁶ EU consumer law provides consumers with two years from purchase to make a case that goods have become faulty due to their manufacture rather than misuse, in practice very difficult outside the stated guarantee/warranty period. During the first six months, the onus is on the producer to prove it was misuse rather than a production fault. The Commission has proposed to extend this to the full two years.

¹⁷ With a potential link to PEF (Product Environmental Footprint)

7 Appendices

7.1 Complimentary instruments

7.1.1 *Minimum product requirements*

European harmonisation legislation, covering items such as packaging, toys and medical devices, is often accompanied by a list of 'Essential Requirements'. For products to be CE marked (*Conformité Européenne* or European Conformity, see Glossary) and allowed on the European single market, products need to conform with all relevant standards (as developed by the European Committee for Standardisation (CEN)). These requirements define the minimum characteristics of that product, often in terms of safety and environmental issues and mandatory minimum eco-design aspects can be delivered in this way.

More ambitious good practice elements would not be mandatory but rather incentivised through modulated fees, GPP criteria and, potentially in some cases, labels for consumers. The benefit of these mandatory minimum requirements is that they provide certainty over the minimum standards whereas modulated fees and other incentives allow the worst products to remain on the market, albeit potentially at a far higher cost than other products if the modulation fee is so-designed. The two approaches need to be carefully considered together in the design of the particular product policy to provide the desired results.

It is important to note that, with relatively long-life products such as mattresses, the reduction/elimination of hazardous substances use is very urgent if closed-loop recycling is to be increased in the medium term without the risk of perpetuating the use of the legacy chemicals in the recycled materials. In these longer-lasting products this may create a need for restrictions that go beyond the current REACH restrictions.

7.1.2 *Mandatory product information*

It is recommended that mandatory product (sometimes called 'product passport' or 'material passport') information has to be provided for PROs (to potentially allow the calculation of modulated fees) and recyclers – including the name and contact details for the manufacturer, year of manufacture, place of manufacture, full disclosure on the product composition, including all chemicals used. This could be attached as a physical label with a QR code, printed or embossed. This may present difficulties because it can become damaged over time and can be forged, leaving room for counterfeiting, which can lead to contamination of the material loop with hazardous substances.

Therefore, a digital information system, such as radio frequency identification (RFID) + Blockchain may be more secure in the sense that it is very difficult to corrupt and provides a stronger guarantee that the product genuinely corresponds to the information logged in the product 'passport'. Digital information can also allow automated information access and allow integration into any other aggregated information set, such as for a building. The European Chemicals Agency (ECHA) at the EU level is currently establishing a database of substances of very high concern (SVHC) in products sold on the EU market, as one step towards better product information, available digitally.

7.1.3 *Green Product Mark (GPM)*

Green product labelling schemes, such as the EU Energy Labelling Scheme, the tyre labelling scheme and BREEAM for buildings¹⁸, have demonstrated value in enabling consumers (both private citizens and businesses) to select products based on environmental performance (e.g. on an A to G scale), whilst at the same time, encouraging suppliers to invest in more environmentally responsible. Such

¹⁸ The BREEAM rating levels are a UK system (similar to LEED in the US) that enable a client or other stakeholder to compare an individual building's performance with other BREEAM rated buildings on a scale from Pass to Outstanding, using a wide range of sustainability criteria.

labels complement rather than replace EU Eco-label (a comprehensive Type I eco-label) and the information is available on all products in a category rather than only those, under Eco-label, which pass the most stringent requirements – generally a very small proportion of those on the market which are only of interest to the ‘greenest’ of consumers.

What we might call Green Product Marks (GPM) and other environmental product declarations (EPD Type II labels) are already used in various product groups, for example the GUT-PRODIS label used for carpet in the EU. UK research¹⁹ has shown that 80% of customers want independent product information and consistently express a willingness to pay more for a more durable product. In Germany, 67% of consumers said in 2010 that they consciously buy products whose manufacture and usage have only a minor environmental impact and 41% of consumers expressed their willingness to accept a certain price premium for environmentally friendly products²⁰. In private and public sector procurement the problem often lies in a lack of available and verifiable information for the professional buyers, meaning labels are one way of providing information in a simplified form (such as the well-understood EU Energy Label).

Ideally the deployment of such a GPM would be mandatory, requiring certain products to be individually assessed and labelled under the scheme, as with the EU Energy Label for EuPs. The GPM would include free warranty information, and cover eco-credentials, such as recycled content, reparability (the subject of ongoing investigation by the Joint Research Centre (JRC) in terms of how this can be assessed and labelled) and ‘ease of recycling’. Some aspects of performance could also be included.

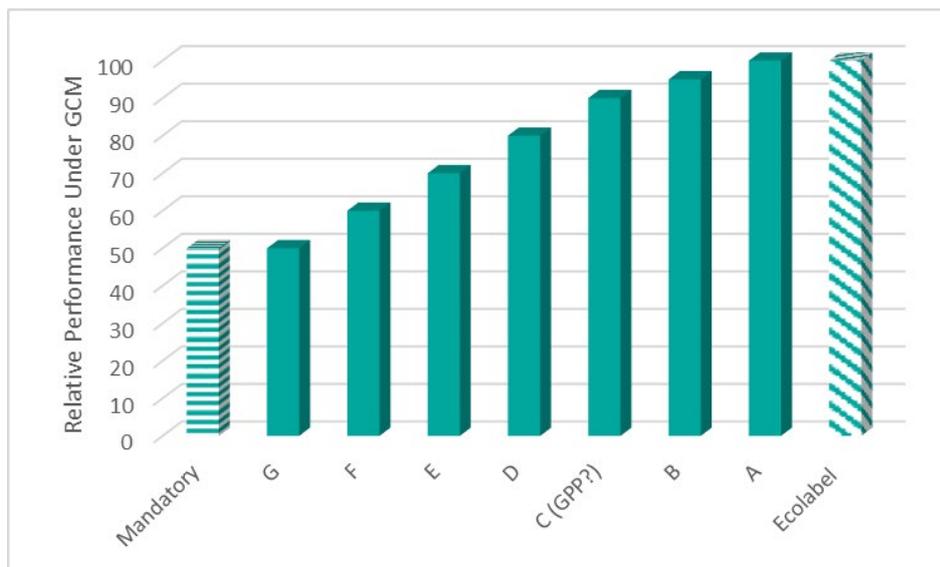
A GPM could be used to complement both minimum eco-design standards and EPR, just as the EU Energy Label complements Eco-design minimum standards and EPR for EEE products in relation to energy now. It is worth noting that the Energy Label is already used to reflect additional performance information, notably in the vacuum cleaner label, which includes information on noise, dust emissions and cleaning performance as well as energy use. Tyres also have additional performance information presented as required under the tyre labelling regulation (noise and wet grip), as well as the energy related criteria, and wear rate could be added to this (as is being explored).

For consistency and ease of understanding, the GPM could have an A to G rating (as per the EU Energy Label) to provide private consumers and procurement professionals with familiar and clearer information on the environmental and circularity performance and features of the product in question. This could be determined by a points-based self-assessment approach, but with oversight and verification by an independent third party. The downside is that providing the required information for each product can be a burden for producers, although this is already done in some product sectors.

It would, of course, be desirable for the GPM to align as far as possible with the core criteria used for the minimum ‘essential’ requirements, modulated fees and GPP. The highest rating, Class A, of the GPM could correspond to what is also required by the more comprehensive EU-wide ecolabel where this existed for a particular product group. The minimum essential requirements level, where mandated, would correspond to the lowest G rating (i.e. compliance): meeting all GPP core criteria (in terms of the points accrued) could correspond to a C or B rating for example. The criteria would be revised periodically so that there is a continuous incentive to innovate.

¹⁹ WRAP, Switched on to Value report and the 2017 update

²⁰ Green Products in Germany 2014; Federal Environment Agency UBA



Source: Eunomia

Figure 12: The relationship between GPM, GPP and Ecolabel

7.1.4 Green public procurement

Every year, over 250 000 public authorities in the EU spend around 14% of EU GDP on the purchase of services, works and supplies²¹. GPP offers significant potential to drive demand for more circular products and CE business models, however GPP is a voluntary tool. At the EU level, GPP criteria are developed (in parallel with Eco-Label negotiations) for certain products in the hope (supported by guidance and outreach) that these influence national, regional and local procurement criteria.

Overall, however, the level of EU GPP uptake in the EU28 appears far lower than the 50% target set by the European Commission for 2010. The last study on uptake in 2012²² showed that only 26% of the contracts signed in the 2009-2010 period by public authorities in the EU included all surveyed EU core GPP criteria, although 55% of these contracts included at least one EU core GPP criterion. There is a great deal of variation across the EU. There were four top performing countries (Belgium, Denmark, Netherlands and Sweden), in which all EU core GPP criteria were applied in 40%-60% of the cases. On the other hand, there were 12 countries where this occurred in less than 20% of recent contracts.

Cost still drives much of public procurement, however there is a great deal of potential to use life-cycle costing (LCC, sometimes called whole-life costing) to promote greener procurement – a theme emerging from a 2011 consultation²³. Sweden uses a range of approaches including:

- Internet-based GPP tool – criteria for 60 product groups;
- LCC (Life Cycle Cost) tools – guidelines and web education;
- Education and support (helpdesk) for public procurement officers and tenderers;
- Monitoring by the Environmental Protection Agency.

The use of LCC could be made mandatory across public procurement in Scotland as a step towards the mandatory use of GPP criteria. Legislation could also be used to set mandatory targets that increase progressively, for example, at least 25% of procurement spend to use all core criteria and

²¹ https://ec.europa.eu/growth/single-market/public-procurement_en

²² Monitoring the Uptake of GPP in the EU (2012)

²³ State of play and future of GPP in the EU (2011)

LCC by January 2021, 50% by 2025 and 75% by 2030, for example. Responses to consultations in 2011 indicate that there are concerns about introducing mandatory GPP requirements, however there are examples from the EU that demonstrate that GPP can be made mandatory in a manageable and cost-effective way that is inclusive for SME suppliers.

Core GPP criteria are already mandatory in Italy; i.e. procurement initiatives have to require that certain goods (such as ICT, furniture, clothing/uniforms, flooring, tyres) meet GPP core criteria. It is worth noting that Flanders has set a target of 100% SPP (Sustainable Public Procurement; essentially GPP) by 2020, but only for products for which sustainable product criteria are available.

As noted above, GPP requirements could be linked to the proposed GPM directly, offering procurement professionals a simpler means to specify more circular products; e.g. requiring a minimum of a C or B rating for example on a scale of A to G. It is noted, however, that to defend their decisions, procurers need a very reliable, legally sound basis for these criteria. Too simple a system might not hold in court.

An example of a similar approach can be found in the US. In March, the City & County of San Francisco adopted a comprehensive new regulation requiring that all carpet installed in city-funded construction projects be Cradle to Cradle Certified™ Silver (i.e. mid-scale below Gold and Platinum) or better, the aim being to help San Francisco address its priorities for sustainability and material health in its flooring. The resulting regulation also limits flooring purchases to carpet tiles, given that they are easily replaceable, aiding maintenance, reducing costs, and helping to minimise waste.²⁴

Finally, it is important to note in this context that GPP, in a broader sense, can be used to encourage the uptake of CE business models; for example product lease, which effectively involves the need for products that provide durability and/or reparability/upgradability to allow life extension through ongoing reuse.

7.1.5 Tax incentives and subsidies

Lower rates of VAT, or financial subsidies, for products that meet well-defined eco-design requirements (such as EU eco-label or a C or B rating under GPM) could be considered. So far there are few practical examples, the most well-known being the Swedish reduced VAT rate for repair services (a local service, not a product) and the German subsidy for the use of retread truck tyres. The UK offers enhanced capital allowances on energy and water efficient products and in some countries, there are subsidies for eco-friendly products.

Taxes on undesirable products, and to reflect externalities, are another alternative. The UK has recently announced a proposed tax on plastic packaging containing less than 30% post-consumer recycled content for example. Because of the hazards associated with PVC, Denmark had imposed an additional tax for products containing PVC in order to reduce phthalate use as well as to reduce PVC in landfill and incineration operations. However, in November 2017 Denmark announced that it is lifting the tax on PVC containing products because the tax is no longer considered to have any 'significant behavioural effect on health or the environment' and so will end 1 January 2019.

The use of taxes or subsidies may not be necessary, however, where mandatory requirements on eco-design can be put in place or where GPP and modulated EPR fees can sufficiently drive the market.

7.1.6 Business innovation and training support

A wide range of innovation and investment in both product design and manufacture will be required to meet the objectives of a truly circular economy and respond to the eco-design incentives noted above. If the incentives are right, through the policy instruments discussed above, producers should respond in any case. In the interim however, prior to the incentives being fully developed, national innovation

²⁴ <https://www.c2ccertified.org/news/article/new-san-francisco-regulation-requires-cradle-to-cradle-certified-silver-or>

support, including tax breaks, grants and low-interest loan schemes, can play a helpful role in accelerating change.

These already exist to a degree, for example as provided through Innovate UK, Zero Waste Scotland (Circular Economy Investment Fund) and Horizon 2020. This innovation support could be combined with other business tax incentives for circular economy (CE) companies.

More broadly businesses need support on understanding the CE business models that are available, the business case around making the move to these Circular Economy Business Models (CEBM) and in terms of the practical steps required in the transition, including staff training, for example around practical repair and refurbishment skills. This broader aspect of support (excluding skills training per se) is the focus of the Zero Waste Scotland and Scottish Enterprise initiatives on CE support.

7.2 Assessment matrix

Assessment Matrix Excel sheet is included as a supplementary file with this report called “ZWS Assessment Matrix – Mattress EPR Review”.

7.3 Glossary of terms

Blockchain: This is a system for recording movements and transactions through a computer network. It can make use of Radio Frequency Identification (see below).

BoM: A Bill of Materials is a list of the parts or materials required to create a product, as well as instructions for gathering and using the required materials.

B2B: Business-to-business i.e. the exchange of products, services or information between businesses, rather than between businesses and consumers

B2C: Business-to-consumer i.e. the exchange of products, services or information between a business and a consumer

CE: From the original *Conformité Européenn*, this means European Conformity. A CE mark indicates that a product conforms with the health, safety and environmental protection standards for products sold within the European Economic Area (EEA).

CEN: The European Committee for Standardisation is a public standards organisation responsible for the development, maintenance and distribution of coherent sets of standards and specifications, such as those with which product compliance is recognised through the CE mark.

EEE: Electrical and Electronic Equipment.

EPR: Extended Producer Responsibility is a policy approach in which producers take significant responsibility for the collection, treatment or disposal of the products which they put on the market.

ErP: Energy-related Products can be either products that use energy or those that do not use energy but rather have an impact on energy consumption, such as insulation products and water saving devices.

GPP: Green Public Procurement is when a public authority uses their purchasing power to buy environmentally friendly services, goods or works.

ICT: Information and Communication Technology is all of the devices, networking components, applications and systems that work together to allow people and organisations to communicate and access information across digital platforms.

KPI: A Key Performance Indicator is a measurable value used to monitor the success of an organisation in a given area.

LCC: Life Cycle Costing is the process of determining the cost of a product over its whole lifetime, from its initial purchase to disposal.

PRO: A Producer Responsibility Organisation is an organisation set up to fulfil producers' Extended Producer Responsibility obligations. In some cases, producers pay a producer responsibility fee to the Producer Responsibility Organisation, which will then fulfil producers' obligations on their behalf.

R&D: Research and Development is the activity taken by businesses or other organisations to develop new technologies, products or services, or to improve existing technologies, products or services.

REACH: The Registration, Evaluation, Authorisation and Restriction of Chemicals is EU legislation that applies to chemical substances, in order to protect human health and the environment.

RFID: Radio Frequency Identification uses electromagnetic fields to identify and track tag attached to objects.

WFD: Waste Framework Directive

WEEE: Waste Electrical and Electronic Equipment.

7.4 Links to company websites

Auping: <https://www.auping.com/en>

Carpet Recycling UK: <https://carpetrecyclinguk.com/>

Dreams: <https://www.dreams.co.uk/>

Egans: <https://egans.com.au/>

Éco-mobilier: [https://www.Éco-mobilier .fr/](https://www.Éco-mobilier.fr/)

IKEA: <https://www.ikea.com/gb/en/>

Interface ReEntry: https://www.interface.com/EU/en-GB/campaign/reentry/reentry-en_GB

John Lewis: <https://www.johnlewis.com/>

Mattress Recycling Council: <https://mattressrecyclingcouncil.org/>

Matras Recycling Europe: <http://www.matrasrecyclingeurope.com/>

Retour Matras: <https://www.retourmatras.nl/>

Soft Landing: <https://www.softlanding.com.au/>

The Furniture Recycling Group: <http://www.tfrgroup.co.uk/>

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