CIRCULAR ECONOMY OPPORTUNITIES IN THE FURNITURE SECTOR

EEB
European Environmental Bureau

This report was produced for the European Environment Bureau (EEB) by Eunomia Research & Consulting Ltd

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EUROPE'S LARGEST NETWORK OF ENVIRONMENTAL CITIZENS ORGANISATIONS

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Executive Summary

Around a quarter of the world's furniture is manufactured within the European Union – representing a €84 billion market that equates to an EU28 consumption of ~10.5 million tonnes of furniture per annum while employing approximately 1 million European workers and consisting of, predominantly, SMEs[1].

The European furniture industry faces a variety of economic and regulatory challenges – including manufacturing growth in emerging markets, improved logistics (reducing export costs from India, China etc.), declined tariffs on foreign trade, increased demand for low-cost items within the EU, increased raw material, labour and energy costs within the EU[2] and consumer demand for sustainable products.

10 million tonnes of furniture are discarded by businesses and consumers in EU Member States each year, the majority of which is destined for either landfill or incineration. This report was commissioned by the European Environmental Bureau (EEB) to contribute towards the debate around the benefits of expanded policy options to support the transition towards circularity across the European furniture sector.

Circular economy interventions have the potential to help counter these trends, with repair, refurbishment and remanufacture allowing value recovery, economic growth and job creation within the European furniture industry, while saving on resources and the environment. Yet realising these economic, environmental and social benefits will require the adoption of appropriate demand and supply chain levers, to support a significant step change across the industry.

Whilst recycling rates in the EU have improved through the introduction of policy mechanisms such as the Landfill Directive and its diversion objectives, there is minimal activity in higher-value circular resource flows, with remanufacturing accounting for less than 2% of the EU manufacturing turnover[3]. In terms of furniture in particular, whilst reuse of furniture is common, this tends to be on a small scale and with local social goals in mind rather than larger scale environmental and economic ones.
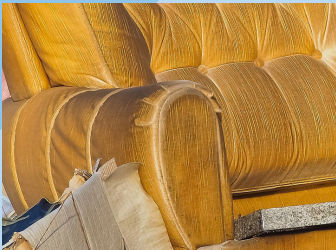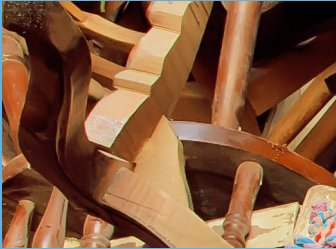
Barriers to a circular furniture sector are wide ranging and have been identified through the course of this research, informed through stakeholder consultation and literature review, and include:

- **Lower quality materials and poor design** – the move away from solid wood and metal furniture to cheaper materials, which restricts the potential for a successful second life. Weak product design and specification drivers – in relation to recycled content, reuse of components, product durability, and design for disassembly/reassembly, repair, reuse, remanufacture and recycling, the drivers for improvement are weak or absent.

- **REACH Regulation (on Registration, Evaluation, Authorisation and Restriction of Chemicals) –** legacy hazardous substances pose challenges and additional costs for recyclers, together with a lack of information on chemicals contained in products and on ways how to deal with them appropriately.

- **Poor consumer information and availability of spares** – consumers are rarely given guidance on how to maintain and repair furniture, in order to prolong and extend the product lifespan. A lack of availability of spare parts encourages the purchase of new furniture over circular consumer patterns.

- **Limited collection and reverse logistics infrastructure –** currently there are weak drivers and underinvestment in the collection and logistics for furniture take-back. Producer responsibility mechanisms are not widely used in the furniture sector.

- **High cost of repair and refurbishment** – in many parts of the EU, transport and labour costs are high, making any significant repair and refurbishment costly, particularly where re-upholstery is required. In general, economies of scale and economic incentives are needed to make repair and refurbishment viable.

- **Weak demand for second-hand furniture** - the price differential between new furniture against the cost of second-life furniture, is not significant enough to drive more sustainable purchasing behaviour. This is coupled with poor awareness of the availability and benefits of sustainable furniture options, for both domestic and commercial purposes.

- **Poor demand for recycled materials -** end markets for recycled materials, post deconstruction, are underdeveloped, and in some cases, already saturated, with these associated market failures restricting further investment in recovery.

- **Weak over-arching policy drivers** – typically furniture is not managed in accordance with the waste hierarchy, with reuse failing to be prioritised over recycling, incineration and landfill. Underinvestment in reuse, repair and remanufacturing infrastructure limits the potential for furniture being managed in accordance with the principles of the waste hierarchy or the circular economy.

This report presents a range of scenarios including policy measures which offer potential options addressing barriers and advancing circularity across the European furniture sector. It describes potential packages - some which have the potential to work more quickly than others and with varying degrees of certainty. In consideration of the suggested policy and intervention measures referenced here, it is acknowledged that the European furniture sector is not homogeneous, with differing consumer patterns and waste infrastructure types and capacities demonstrated across Member States.

It is further acknowledged that adoption and implementation of some of the policy measures presented poses greater challenges for those Member States where waste recovery, recycling and waste treatment technology is underdeveloped. In recognition of these facts, it is our view that this should not limit the level of ambition, in the setting of policy instruments which offers the potential to deliver significant economic, environment and social contributions for the EU furniture sector and wider economy.

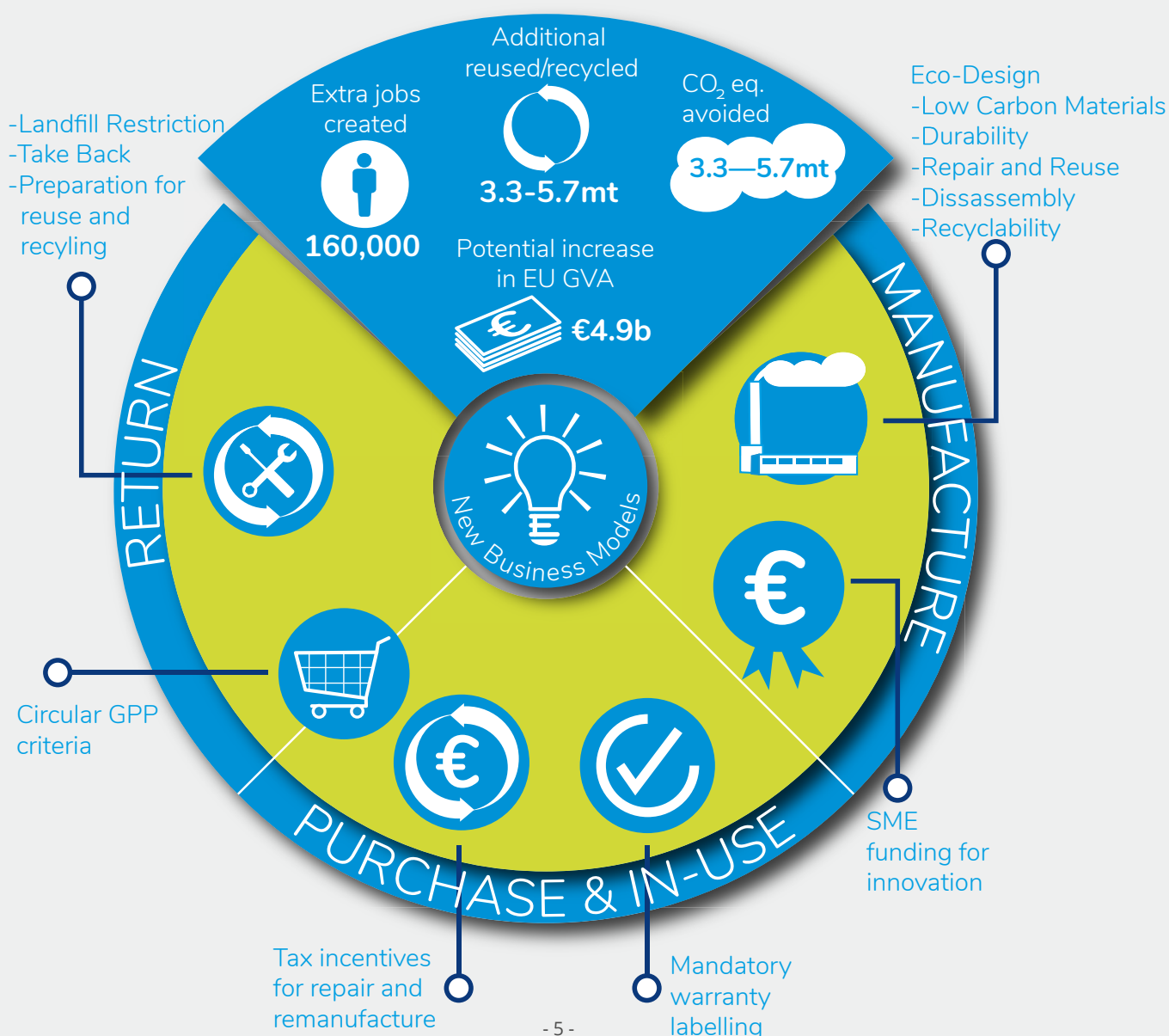A move towards circular economy models

within the European furniture sector would benefit from a variety of complimentary policy instruments to deal with market failures on the supply side (i.e. ensuring return of items and creating durable, refurbished and remanufactured items) and the demand side (creating demand for these products).

We would note that as a first key option (compatible with several policy packages described in this report), it would be desirable to develop an agreed common set of core criteria that could work across different instruments such as Extended Producer Responsibility (EPR),

Green Public Procurement (GPP), eco-design requirements or labelling schemes. Criteria would cover a variety of CE criteria across durability, the use of recycled material content and reused components (i.e. remanufacture), hazardous substance content, and design to facilitate repair, remanufacture and recycling.

These core criteria could be used to define a 'Green Furniture Mark' (GFM) - a new A to G rating instrument similar to the EU energy label, with the intention of providing consumers and procurement professionals with clearer information on the environmental and circularity features of furniture products. This rating could be determined by a points style system (similar to the BREEAM approach[4] for buildings) using a self-assessment approach but with third party oversight.

Opportunities for a Circular European Furniture Sector

Extra jobs created
160,000

Additional reused/recycled
3.3-5.7mt

CO_2 eq. avoided
3.3—5.7mt

Potential increase in EU GVA
€4.9b

-Landfill Restriction
-Take Back
-Preparation for reuse and recyling

Eco-Design
-Low Carbon Materials
-Durability
-Repair and Reuse
-Dissassembly
-Recyclability

RETURN

MANUFACTURE

PURCHASE & IN-USE

New Business Models

Circular GPP criteria

SME funding for innovation

Tax incentives for repair and remanufacture

Mandatory warranty labelling

Package 1 - Fully Mandatory

Supply Side

- Mandatory Extended Producer Responsibility (EPR) for take back, with preparing for reuse and recycling targets, and with a modulated fee (that takes account of the different treatment costs and environmental impacts of different products and materials) or an Individual Producer Responsibility (IPR) approach, to encourage better design for repair and recycling[5].

- Mandatory eco-design measures on durability, repair and recyclability or a mandatory warranty period of five years to drive durability and reparability. This could be associated with a GFM label approach to reinforce and extend good practice.

Demand Side

Mandatory Green Public Procurement (GPP) to drive demand for reuse and remanufactured items (other aspects taken care of by mandatory eco-design).

Package 2 - Part Mandatory

Supply Side

- Mandatory EPR for take back, with preparing for reuse and recycling targets, and with a modulated fee based upon the 'Green Furniture Mark' (GFM) criteria, or an IPR approach, to encourage better design for repair and recycling[6].

- EU-wide GFM approach, with an A to G rating for furniture, with mandatory labelling but no mandatory eco-design standard.

Demand Side

Mandatory GPP for the public sector, with common criteria to the GFM or a set GFM level required (e.g. B rating).

Package 3 - Full Voluntary

Supply Side

- EU-wide voluntary agreement (Self-Regulatory Initiative) on take back, preparing for reuse and recycling as an alternative to mandatory EPR.

- Voluntary use of the GFM (industry led voluntary initiative), but driven by GPP.

Demand Side

- Voluntary GPP as now, but with reference to a minimum standard under GFM (e.g. B rated).

- Promotion of the GFM label for which the highest rating class A corresponds to what is also required by the more comprehensive EU Ecolabel scheme.

Package 4 - Incentives Only

Supply Side

- EU-wide SME support initiative for CE innovation in the sector, combined with tax incentives, grants and/or low interest loans for CE furniture companies.

- Deposit-refund incentive for consumers to return furniture for reuse and recycling, i.e. a refundable levy on new furniture, or a modulated 'bulky waste' collection charge – free where the item is reusable.

Demand Side

- Mandatory labelling of warranty period; to clearly display the 'free' manufacturers/retailer warranty in a large format next to the product.

- Tax incentives for refurbished/remanufactured items; e.g. lower rates of VAT.

Package 5 - Information Only

Supply Side

- Mandatory EU harmonised information system from the OEMs to drive repair and remanufacture.

- Voluntary use of the GFM, but driven by GPP.

Demand Side

- Mandatory labelling of warranty period; to clearly display the 'free' manufacturers/retailer warranty in a large format next to the product.

- Voluntary GPP as now, but with reference to a minimum standard under GFM (e.g. B rated).

- Promotion of the GFM label for which the highest rating class A corresponds to what is also required by the more comprehensive EU Ecolabel scheme.

Package 6 - Waste Management Only

- EU wide landfill ban on furniture disposal.

- Clearer regulation/guidance from the EU around end of waste and use of recycled materials.

The deployment of such a GFM scheme could be either voluntary, with take up by manufacturers but in part driven by GPP (e.g. a minimum requirement of an A or B rating for example) or mandatory, requiring all furniture to be assessed and labelled under the GFM scheme. This could be an alternative to mandatory eco-design requirements or as a compliment; the eco-design requirements setting the minimum legal standard (i.e. a G rating) and the GFM rating showing levels of performance above that legal minimum (up to A which could align with Eco-label requirements).

Estimates of the potential impact of each of the above policy packages have been modelled through the application of available data and use of key assumptions referenced within this report, with a summary of the key headlines presented in Table A, with respect to impact on additional tonnage reuse and recycling, net carbon reduction and job creation.

With respect to estimated tonnage and climate change impacts, results for each package are presented on an annual basis net of impacts occurring in the baseline. The table shows that climate change benefits are the most significant for Policy Package 1 – the Full Mandatory package.

Analysis of the economic impacts of increasing circularity in the furniture sector is similarly sparse. Eunomia has previously considered this in the UK context in a report published for SUEZ in 2017.[9] The analysis undertaken within the report considered increases that may arise in the Gross Value Added (GVA) resulting from increases in the recycling and reuse of furniture. The GVA is - in economics - a measure of the value of goods and services produced in a given area, industry or sector of an economy.

The analysis estimated that the potential increase in GVA from improved circularity in the furniture sector was in the order of £500 million for the UK under the most ambitious scenario, by 2030. Based on extrapolation of EU28 Member State population against UK population alone, this provides an estimate in the order of £3.8 billion[10] in increased GVA from improved circularity under the most ambitious scenario.

We hope that this report and its findings contribute towards closing the knowledge gap and that it will result in deployment of circular activities across the European furniture sector.

Table A: Policy Packages - Estimated Potential Impacts

	Policy Package	Additional tonnes reused	Additional tonnes recycled	Estimated net carbon impacts for scenario, tonnes CO2 eq.	Additional job creation
1	Full Mandatory	2,097,962	3,670,289	-5,713,542	157,347
2	Part Mandatory	1,546,538	3,149,566	-4,933,647	115,990
3a	Full Voluntary - self-regulatory[7]	1,069,288	2,392,433	-2,896,593	80,197
3b	Full Voluntary - industry-led[8]	717,278	1,470,269	-2,172,445	53,796
4	Incentives only	440,452	1,053,690	-1,810,371	33,034
5	Information only	227,187	687,853	-1,448,296	17,039
6	Waste management only	168,225	3,185,947	-3,343,633	12,617

Contents

Introduction

This report was commissioned by the European Environmental Bureau (EEB) to contribute towards the debate in Europe around the challenges and opportunities for transitioning towards a circular furniture sector. The intended audience for the study findings includes policy makers and key actors across the furniture value chain. The aims of the project include:

- Exploration of policy options considered as needed to support the transition towards circularity across the European furniture sector; and

- Assessment of the potential impact of policy instruments explored through this study - in terms of increased stimulus across the furniture value chain. This includes a presentation of estimated economic, environmental and social outcomes associated with different scenarios for moving the sector towards a circular economy.

This study has been led by Eunomia Research & Consulting Ltd, with contributions from Thomas Matthews. Eunomia is a UK based consultancy with expertise in policy making at an EU/international level, circular economy, and resource efficiency. Key recommendations and policy shortlisting has been informed through stakeholder interviews and discussions with the EEB.

Methodology

The approach taken in the production of this report is based on:

- Analysis of established datasets - including Eurostat and PRODCOM, to baseline the current performance of the European furniture sector - including production, consumption and waste generation.

- In-depth literature review – including analysis of market research data and case studies of good practice highlighting examples of policy instrument implementation and circular economy business model intervention in the furniture industry; and

- Stakeholder interviews – the project has benefitted from contributions from European furniture trade body representatives, furniture designers, retailers, and manufacturers, NGOs and end of first life operators (repair, reuse, remanufacture). Interviews have served to identify barriers and constraints inhibiting circular economy across the sector, and to test a number of potential policy measures.

This study has made use of the best available data within the confines of the research. The report has sought to make reasonable assessments of the potential impacts of increased application of circularity across the furniture sector, in terms of waste avoidance, carbon reduction and job creation across the value chain. A lack of available and robust data has meant that we have needed to make conservative estimates, based on the literature review and assumptions linked to available reference points. The quantitative analysis therefore needs to be treated with caution as it is only intended to indicate the broad potential scale of opportunity, rather than precise forecasts.

STATUS OF THE EU FURNITURE SECTOR

Status of the EU Furniture Sector

This section provides an overview of the European furniture sector, with respect to production, consumption, waste generation and treatment, together with discussion around some of the key challenges and opportunities impacting on the sector.

European Furniture Production and Consumption

EU Member States manufacturing 28% of furniture sold worldwide[11] – representing a €84 billion market, employing approximately 1 million European workers and consisting of, predominantly, SMEs. Various data sources[12] have been used to estimate production and consumption (by value and weight) at a European level and for different furniture types[13]. Due to some data suppression at this level of granularity, the study looked in detail at €72 billion of furniture production per annum.

Of this, Italy (€17.5 billion), Germany (€14.5 billion), UK (€8.8 billion) and Poland (€7.1 billion) are the most significant furniture producers by value. Similarly the most significant exporters were Germany (€9.5 billion), Italy (€9.2 billion) and Poland (€8.7 billion), whilst the largest importers were Germany (€11.8 billion), UK (€6.6 billion) and France (€6.0 billion).

European Member States are major consumers of furniture[15], estimated at €68 billion per year, with the EU28 being a net exporter. The largest consumers by value being Germany (€16.8 billion), UK (€14.2 billion), Italy (€10.2 billion),

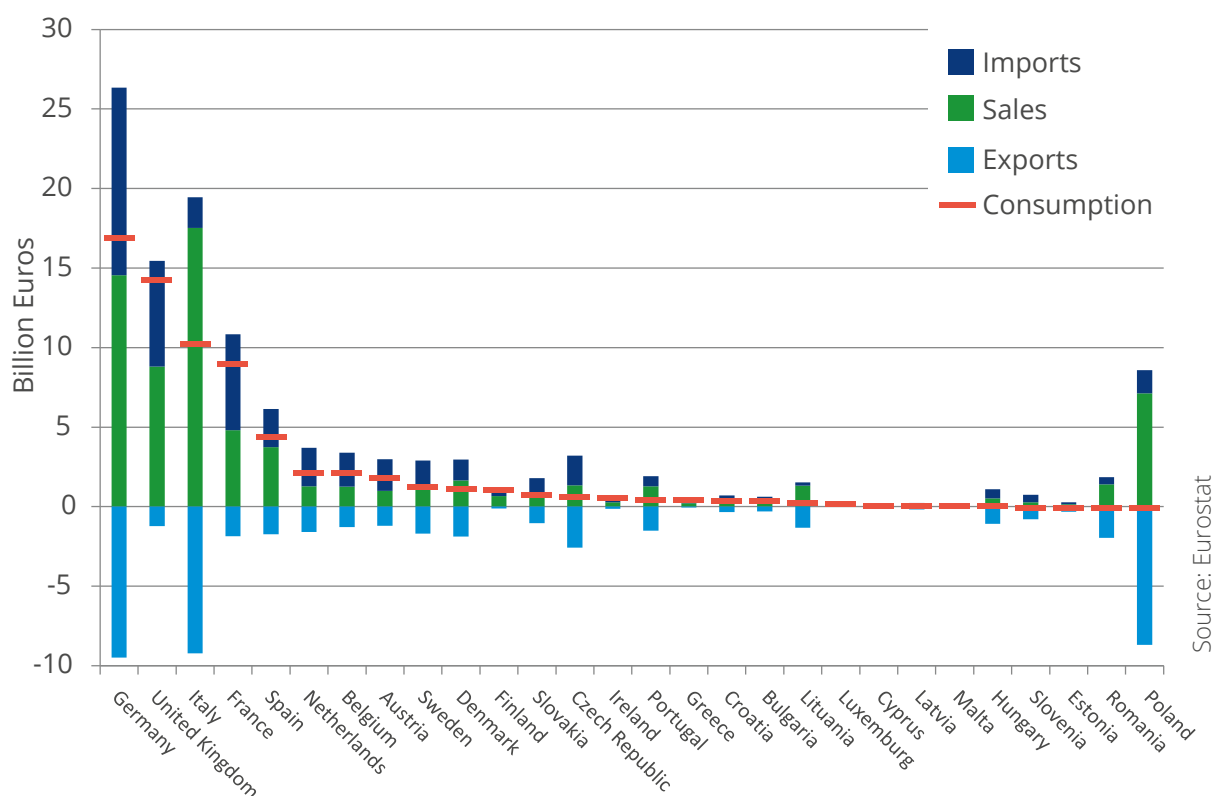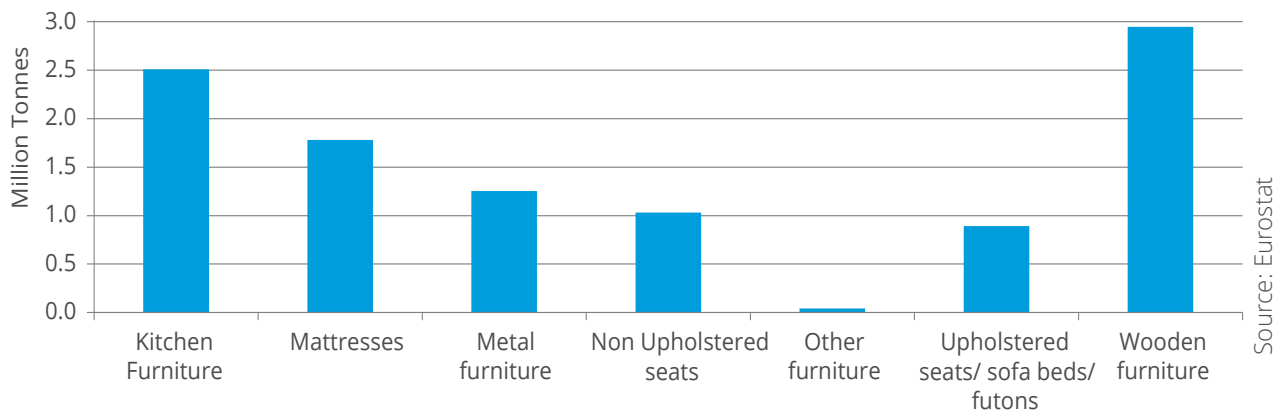**Figure 1: Furniture Production, Import and Export Values by Member State [14]**

Source: Eurostat

Figure 2: EU28 Furniture Consumption by Category

Source: Eurostat

France (€9.0 billion) and Spain (€4.4 billion). This equates to a EU28 consumption of ~10.5 million tonnes of furniture per annum. Figure 2 summarises that in tonnage terms, a significant proportion of consumption includes wooden furniture, kitchen units and mattresses.

DG Enterprise and Industry[16] estimated that the domestic sector accounts for 82% of furniture consumption, with the remaining 18% associated with B2B (business to business) consumption. Based on a total EU28 consumption of €68 billion, and consumption of ~10.5 million tonnes of furniture per annum this would be equivalent to:

- €55.8 billion and 8.6 million tonnes of domestic furniture consumption p.a. and

- €12.2 billion and 1.9 million tonnes of business furniture consumption p.a.

European Furniture Waste Generation and Treatment

Furniture waste generation has been analysed using a variety of sources[17]. According to European Federation of Furniture Manufacturers (UEA) statistics[18], furniture waste in the EU accounts for more than 4% of the total municipal solid waste (MSW) stream. Comparably, other data sources at Member State level estimate furniture waste from domestic sources accounting for between 2%[19] and 5%[20] of MSW. Based on these datasets it is estimated that household furniture represents between 2% and 5% of MSW in the EU28.

Assuming waste generation reflects a similar pattern to consumption, waste arising from commercial sources has been assumed to contribute 18%[21] of total furniture waste generation across the sector. Assuming an average composition of 3.75% furniture in MSW, the total annual EU28 furniture waste[22] equates to 10.78 million tonnes[23], reflecting a yearly substitution of new versus discarded furniture.

There is limited information on end of life treatment of furniture. Evidence suggests that on reaching its end of life, most furniture is destined for landfill. According to European Federation of Furniture Manufacturers (UEA) statistics, 80% to 90% of the EU furniture waste in MSW is incinerated or sent to landfill, with ~10% recycled[24].

Reuse activity in the sector is also low. Where reuse does occur, it is mostly through commercial second-hand shops, social enterprise companies or charities. Some furniture items are also exchanged via free and paid exchange platforms, such as eBay and Freecycle, though the number of items traded in this way is difficult to quantify. In the UK, data from the Furniture Reuse Network (FRN) indicates that its members delivered 120,000 tonnes of reuse[24], representing approximately 6% of total furniture arising as waste[26]. With respect to remanufacturing, the size of the European sector is estimated to be €300 million turnover, employing 3,400 European workers (less than 0.1% of the total furniture industry)[27].

Figure 3: Furniture Waste by EU Member State

Source: Eurostat
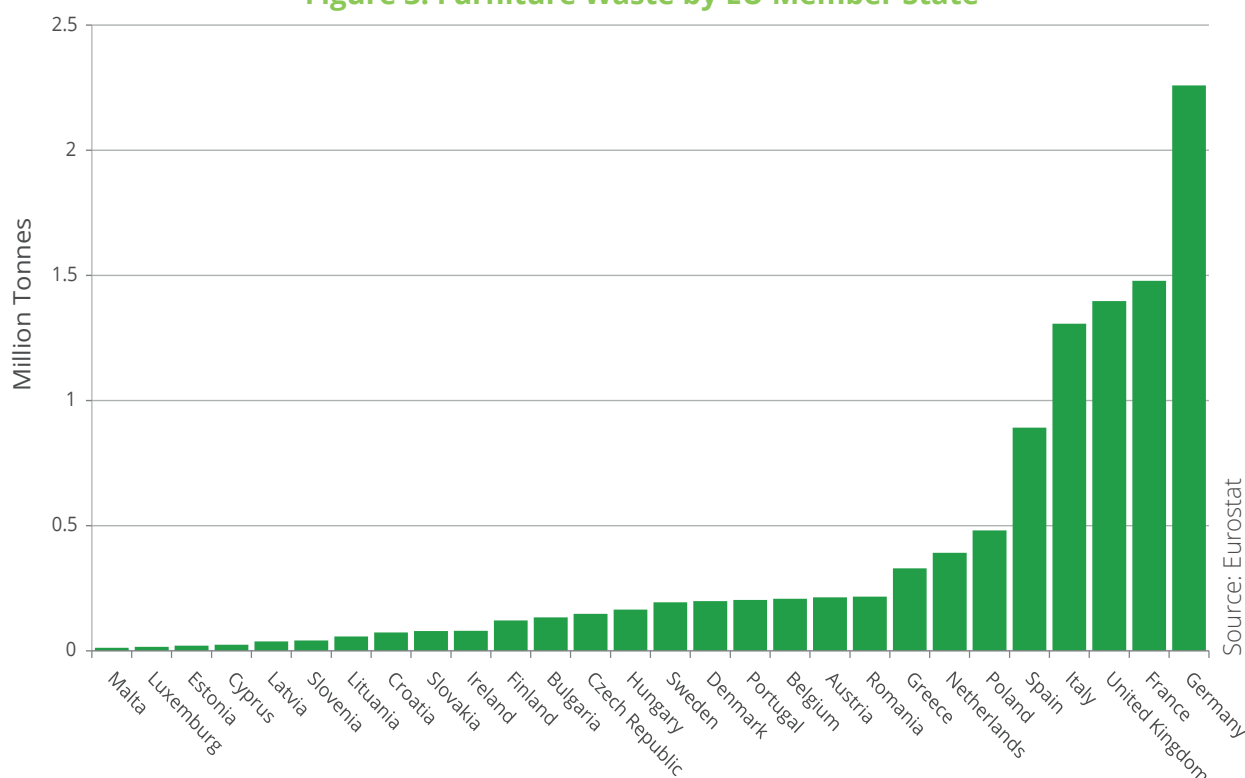
Challenges and Opportunities

The European furniture industry faces a variety of economic, regulatory and environmental challenges – including manufacturing growth in emerging markets, improved logistics (reducing export costs from India, China etc.), declined tariffs on foreign trade, increased demand for low-cost items within the EU, and increased raw material, labour and energy costs within the EU[28].

While the EU furniture industry has so far managed to remain reasonably competitive worldwide, it has increasingly faced problems in signalling the quality and sustainability of its products in its own domestic market. Whilst EU furniture products still represent a considerable share of the high-end furniture market worldwide, growing pressure on the lower-end segments of the market from cheaper products from other areas of the world has the potential to erode market share significantly. In some regards there is no longer a level-playing field, with competitors from low-cost countries having certain key advantages, for example in regard to labour laws and environmental standards[29].

Circular economy interventions have the potential to help counter these trends, with repair, refurbishment and remanufacture allowing value recovery, economic growth and job creation within the European furniture industry. Whilst recycling rates in the EU have improved through the introduction of policy mechanisms such as the Landfill Directive, there is minimal activity in higher-value circular resource flows, with remanufacturing accounting for less than 2% of the EU manufacturing turnover[30]. In terms of furniture in particular, whilst reuse of furniture is common, this tends to be on a small scale and with local social goals in mind rather than larger scale environmental and economic ones.

Realising these economic, environmental and social benefits will therefore require the adoption of appropriate demand and supply chain levers, to support a significant step change across the industry.

BARRIERS AND POTENTIAL POLICY APPROACHES

Barriers and How to Overcome Them

Challenges Towards More Circularity

This section provides some examples of the specific barriers that hinder the transition towards a more circular economy in the furniture sector. Discussion here presents key findings of the analysis, informed through stakeholder consultation and literature review. The key barriers to a circular furniture sector have been identified as:

- **Lower quality materials and poor design –** the move away from solid wood and metal furniture to cheaper plastic, chipboard and medium-density fibreboard (MDF), particularly in flat-pack furniture, restricts the potential for a successful second life since products are often insufficiently robust to be moved easily. In addition, products are often not designed for disassembly and reassembly, or reconfiguration.

- **Weak product design and specification drivers –** in relation to recycled content, reuse of components, product durability, and design for disassembly/reassembly, repair, reuse, remanufacture and recycling, the drivers for improvement are weak or absent. One of the most significant challenges to product life extension for original equipment manufacturers (OEMs) and retailers includes the potential for reduced sales of new products[31]. Durability, and facilitating repair and life extension, are not necessarily in the best commercial interests of the OEMs or retailers, unless they operate in a market niche that trades on high quality/longevity or lease, for example. In addition, short product warranties do not incentivise manufacturers to design for longevity. Even fire proofing labels can be attached in ways that result in

them being removed by consumers, making the subsequent reuse difficult, if not impossible[32]. In the public sector where there is great potential to procure and lease better products, Green Public Procurement (GPP) criteria is not mandatory.

- **REACH Regulation (on Registration, Evaluation, Authorisation and Restriction of Chemicals) –** obligations to deal with legacy hazardous substances introduces challenges and additional costs for recyclers, with producers often failing to disclose hazardous substances contained in materials or products. Information on how to remove hazardous parts/components safely is often not disclosed.

- **Poor consumer information and availability of spares –** assembly information for flat pack furniture can be challenging for some consumers, and they are rarely given guidance on how to maintain and repair furniture, in order to prolong and extend the product lifespan. The importance of not cutting off the fire label is generally not mentioned. Availability of spares is also important, e.g. to replace a broken hinge or damaged cupboard door for example, however a lack of availability of spare parts encourages the purchase of new furniture over circular consumption patterns.

- **Limited collection and reverse logistics infrastructure –** currently there are weak drivers and underinvestment in the collection and logistics for furniture take-back, with increased investment required to cover the cost of transport, labour and wider infrastructure associated with the collection and storage of furniture. Producer responsibility mechanisms are not

widely used in the furniture sector. Certain waste streams, including mattresses, pose particular issues for municipalities, with no incentives to collect these items separately, and high reprocessing costs: neither landfill operators, nor providers of treatment facilities are especially keen to receive whole mattresses.

- **High cost of repair and refurbishment – in** many part of the EU, transport and labour costs are high, making any significant repair and refurbishment costly, particularly where re-upholstery is required. Often, small social enterprises are given just one or two matching items and it is not economically viable to constantly make upholstery patterns unless the item itself is of particularly high value. Volunteer labour helps improve the economics, but in general, economies of scale are needed to make repair and refurbishment viable.

- **Weak demand for second-hand furniture -** the price differential between new furniture against the cost of second-life furniture, is not significant enough to drive more sustainable purchasing behaviour. This is coupled with poor awareness of the availability and benefits of sustainable furniture options, for both domestic and commercial purposes, a consumer desire for new products, and, to a degree, a stigma attached to second-life furniture - which is often associated with disadvantaged groups in society.

- **Poor demand for recycled materials -** end markets for recycled materials, post deconstruction, are underdeveloped, and in some cases, already saturated, with these associated market failures restricting further investment in recovery.

- **Weak over-arching policy drivers – typically** furniture is not managed in accordance with the waste hierarchy, with reuse failing to be prioritised over recycling, incineration and landfill. Underinvestment in reuse, repair and remanufacturing infrastructure limits the potential for furniture being managed in accordance with the principles of the waste hierarchy or the circular economy.

These barriers are discussed in more detail in the subsequent sections, presenting key challenges and opportunities for addressing key areas of market failure across the furniture value chain, through lessons already learned, and the successful adoption of policy instruments elsewhere.

Potential Policy Instruments and Good Practice

In light of the barriers presented above, potential instruments which offer opportunities for dealing with market failures on the supply side and the demand side are presented below, with case studies used to illustrate the case, where possible. Later on in the report some of the advantages and disadvantages of these approaches are identified.

Overall Waste Strategy Targets

Proposals contained within the EC CE Package include a more ambitious 65% target for recycling and preparation for reuse of household and similar waste by 2030, however this reflects a combined target, rather than imposing a separate target for (preparation for) reuse. Where regulation has failed to adopt separate reuse, or preparation for reuse targets, Member State tends to focus on increasing the amount of recycling required to reach the combined target, rather than focussing on how to improve (preparation for) reuse rates.

Proposals contained within the EC CE Package include a more ambitious 65% target for recycling and preparation for reuse of household and similar waste by 2030, however this reflects a combined target, rather than imposing a separate target for preparation for reuse. Where regulation has failed to adopt separate preparation for reuse targets, Member States tend to focus on increasing the amount of recycling required to reach the combined target, rather than focussing on how to improve preparation for reuse rates.

Preparation for reuse targets already exist in certain countries at a national/regional level, in Spain (WEEE), Flanders (household), and France (furniture). The adoption of separate preparation for reuse targets in these countries has signalled intent to increase the volume of products made available for reuse to the social sector. A key requirement under the French EPR law includes fostering preparation for reuse, with a target for increasing the total volume of reused goods being placed back on the market by 50% by 2017. This approach sees the efforts of the operator of the B2C EPR scheme, Eco-Mobilier, working in partnership with a range of social economy actors, to increase the transfer of used and discarded furniture deemed to be in satisfactory working order and sanitary condition to be prepared for reuse.

Case Study – Preparation for Reuse Targets, Spain

Spain is the first European country to set a mandatory, national reuse target. The Spanish Waste Plan 2016-22 sets a 50% target for waste to be recycled or prepared for re-use. Within this target, 2% of all furniture, textiles, electricals, and other suitable goods, must be redirected from recycling or landfill and 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.

Producer Responsibility and Take-back

Europe already has the producer pays principle enshrined in various pieces of legislation[33], and yet producer responsibility regulation at the EU level does not yet encompass furniture. Extended Producer Responsibility (EPR) for furniture offers the potential for financing the cost of separate collection, sorting, treatment and recycling of furniture, whilst also offering the possibility of driving waste prevention and reuse, and driving producers towards sustainable sourcing of materials and removing

hazardous chemicals in the production process.

Proposed amendments to the Waste Framework Directive set out include general requirements for EPR schemes – in particular, financial contributions paid by producers to EPR schemes to be modulated based on the costs necessary to treat their products at end-of-life[34].

Notable EPR schemes exist in France, Flanders and Sweden, with France being the only Member State to have implemented EPR to drive the collection, recycling and reuse of furniture arising from the domestic and commercial waste stream. Flanders is currently exploring the implementation of EPR for mattresses arising from the domestic stream, with a view to implementation in 2018.

The French EPR model has also introduced economic instruments used to drive eco-design and other circular economy aspects in the furniture manufacturing process.

Case Study - EPR for Furniture in France

In France, end-of-life furniture is managed in line with EPR regulation. Separate schemes are in place for domestic and commercial furniture, managed and operated by Eco-Mobilier and Valdelia, respectively. The main objectives of the French EPR include:

- Decreasing waste furniture sent to landfill;
- Achieving a 45% recycling/reuse target; and
- Driving eco-design principles within the furniture manufacturing sector.

€80M was collected via levies in 2013 to finance the domestic scheme, paid by furniture producers, retailers and importers, to cover the cost of collection, logistics, infrastructure and R&D into new markets for recovered materials. In 2015, the domestic EPR scheme collected 0.85M tonnes of domestic furniture, achieving a 55% recycling and 86% recovery rate.

Under the French EPR scheme, 2016 saw creation of Eco Modulation Criteria for new furniture placed on the market. A lower levy is charged to manufacturers, where they met environmental product criteria. This is essentially a simple criteria, in order for

the process to be 'controllable'/not over burdensome to administer. This covers products which are:

- Manufactured 95% of metal, no padding, (easy to recycle)

- Manufactured from 95% made of wood, sourced from sustainable forests (easy to recycle)

- Products designed for babies / children which can be adapted to the growth of their user – e.g. furniture for children (cots which convert to beds/chairs, designed for growth)

Eco-modulation criteria had to be designed so that minimum 3% furniture could be eco-modulated by 2017. If companies comply with criteria, they pay a lower levy – a fee reduction of about 20% in order to incentivise design for recycling.

Conversely, and in the absence of mandatory producer responsibility, self-regulation (or voluntary industry agreements) offers an alternative approach to financing infrastructure for increased take-back, reuse and recycling. The Commission considers well-designed non-regulatory approaches as alternative policy solutions, where they are likely to deliver policy objectives more rapidly, or in a more cost-effective manner. This, however, is most likely to be achieved where the voluntary approach is backed by there being a credible alternative regulatory mechanism being actively discussed.

Clearly, the success factors of such voluntary led initiatives are largely dependent on the uptake, and market share, of participating signatories and supporters, as well as the nature of the commitments under the agreement. Furthermore, voluntary commitments can be challenging to implement across sectors such as the furniture sector which are large in scale, fragmented and heavily represented by SMEs. At EU level, self-regulation measures under the EU Ecodesign Directive require for instance a market coverage of its signatories which covers at least 80% of units placed on the Union market, and/or put into service, of the type of products covered by the measure.[35]

At a Member State level, voluntary agreements, such as those led by the Waste and Resources Action Programme (WRAP), have demonstrated the potential to deliver change through industry led programmes, although with very variable levels of uptake (in terms of substantive action), generally well below 80% of the market level noted above. In these cases, there has been no credible regulatory alternative in play, making it an entirely voluntary commitment. Some similar UK agreements have been shown to be demonstrably weak in the level of commitment on the part of signatories, not least the Dairy Roadmap, where a commitment from the dairy industry to use 30% recycled HDPE in plastic milk bottles was effectively cast aside when primary material prices feel in 2015.

Case Study – Voluntary Agreements to deliver Producer Responsibility, WRAP (UK)

WRAP delivers change through voluntary agreements with industry, and which seek to increase collection and manage of waste in accordance with the waste hierarchy. Examples of current/recent voluntary agreements include:

- Courtauld Commitment – aimed at improving resource efficiency and reducing waste in the UK grocery sector. Supporting signatories represent 95% of the 2016 UK food retail market.

- Sustainable Clothing Action Plan (SCAP) 2020 – aimed at improving the collection, re-use and recycling of clothing and textiles, SCAP currently has over 80 signatories and supporters representing more than 65% of UK retail sales by volume.

- Hospitality and Food Services Agreement (HAFSA) – aimed at reducing food and associated packaging waste across the hospitality and food services sector, over 230 leading signatories and supporters signed up to support these aims, covering approximately 25% of the UK sector.

Mechanisms to Support Infrastructure Development

Countries typically lack the infrastructure capacity needed to take account of the burden of additional collection and treatment of products following the introduction of producer responsibility, as seen in the wake of the challenges experienced by Member States, following introduction of EPR for WEEE. Instruments which seek to deliver producer responsibility (whether mandatory or voluntary) cannot be implemented in the absence of parallel economic activities to expand investment in infrastructure for reuse, recycling, and recovery of post-consumer/business furniture.

The experience following introduction of EPR for furniture in France provides recognition of the operational and capacity challenges in identifying recycling markets for the volumes of materials recovered and processed. An expansion of furniture collection from domestic and commercial sources in France has resulted in a saturation of recycling markets for materials such as particleboard, textiles and foam. As part of efforts to counter these market constraints, a proportion of the levies collected from EPR (approximately 1% of the levy budget) is reinvested into R&D and capital investment, with a current focus on R&D to develop markets for recovered wood fibres, production of bio-ethanol from furniture waste, and recycling of PU foam.

In the absence of financial support reinvested through mandatory producer responsibility schemes, examples of funding mechanisms to drive increased capacity in the reuse, repair and remanufacturing sectors include capital funded programmes, such as those which exist in Scotland.

Case Study – Circular Economy Investment Fund, Scotland

The Scottish Government has ambitions to deliver a circular economy for Scotland. The Government has set out its commitment to move towards a more circular economy within its national waste strategy, 'Making Things Last' (with similar commitments enshrined within Scotland's national economic strategy). Scotland's Zero Waste Plan has been developed, and is delivered in partnership through Zero Waste Scotland, enterprise agencies and the environmental regulator, SEPA, as well as other actors such as local authorities. Delivery is supported by over £70M of investment, including a Circular Economy Capital Investment Fund to drive capacity within the reuse, repair and remanufacturing sector across Scotland.

Equally, the ability of the social sector to professionalise and respond to the challenge of scaling up activity represents both a significant challenge and opportunity for the sector. The experience of the Flemish region of Belgium has demonstrated success in the use of financial instruments to address shortfalls in both physical and professional capacity for reuse, following the introduction of regulation requiring increased collection of bulky waste.

Case Study – Financial Infrastructure Expansion in the Social Economy, Flanders

Over the past 20 years, The Flemish Region of Belgium has introduced a series of financial instruments to support the expansion of furniture reuse infrastructure in the social sector. The introduction of the Solid Waste Management Plan 1991-1995 saw mandatory door-to-door collection for bulky waste. The Household Waste Implementation Plan 1997-2001 saw the introduction of re-use centres in Flanders for the first time, with the second instalment of the Plan requiring reuse centres to increase performance to a reuse performance of 5kg per inhabitant by 2007.

Requirements for increased collection activities have been matched by the Flemish Government with financial support to enlarge the social sector, to assist in the scaling up and professionalization of operations. This has included financial support for start-ups and investment match/bonuses, with grants of up to €25,000 to subsidise the activities of reuse centres.

Eco-design

Eco-design initiatives, mandatory and voluntary, can help significantly in terms of life extension, both directly, and by enabling repair and remanufacture. Proposals contained within the EU CE Package address mainly energy-related products within the scope of the existing legal framework directive. But the Circular Economy Action Plan also includes a commitment to examine options and actions for a more coherent policy framework of the different strands of work of EU product policy in their contribution to the circular economy, though this is not eco-design per se and this does not necessarily address furniture.

As noted earlier, life extension might not always be in the interests of OEMs and retailers as the opportunities arising from longer life products generally benefit other sectors, for example, in repair and remanufacturing. In consideration of this fact, it is perhaps not unsurprising that for furniture retailers and OEMs, eco-design appears to be far from central to their thinking.

In the absence of mandatory eco-design requirements, examples of pioneering companies are present in the marketplace, including IKEA, which, under commitments to expand its range of sustainable products, is due to launch a range of modular furniture.

Case Study – Modular Furniture, IKEA

IKEA has recently announced proposals to launch a modular furniture range in 2018, as part of its continued commitment to product life extension. This will see the introduction of furniture products with the intention of enabling customers to customise and build up/add to or extend the function of individual products. This encompasses standardised design to enable customers to upgrade or convert furniture items into alternative uses – including conversion of sofas to a bed, replacement of arm rests, or the addition of side tables

Other examples include Gispen, one of the largest office furnishers in the Netherlands. Through participation under the Dutch Green Deal pilots, the organisation has diversified its business model to expand its eco-design product range, with circular economy principles now at the heart of the business strategy.

Case Study – Eco-design, leasing and take-back business models – Gispen[36], The Netherlands

As a designer and producer of office furniture, Gispen's business model is built upon circular economy principles, with an ethos around well-designed durable products, long service life and optimum use. Post installation, Gispen also offers reverse logistics for furniture, and furniture updating and reconfiguring services, as office furniture requirements for office spaces evolve.

Whilst principally focused around design and manufacturer, Gispen's business model has shifted towards delivering facility management services to its customer base. The approach to design and supply of circular furniture products follows guiding principles, including sustainable material selection, disassembly potential, maintenance and upgradability, and recyclability.

Gispen provides a variety of financing models to its customers which includes pay-per-use. Under this business model, Gispen retains ownership of the product, with contracts structured depending on the deployment, and use, of the furniture. The amount customers pay is reflected in the number of workstations required, functional and aesthetic need, and the period of use / intensity of usage.

Harmonisation of Chemical and Waste Policy and Standards

Traceability and restrictions on the use of chemicals of concern as required by REACH (EC 1907/2006) is an important regulation to ensure the protection of human health and the environment. When a substance has

been banned or it is restricted under REACH, this means that any relevant new product containing this substance can no longer be placed on the market - though this may not be true for all imported products, which often creates an un-level playing field for European actors.

The problem here is that since most furniture items have a significant life span, what may be an acceptable chemical when the product is made may not be when the item is in need of remanufacture or recycling, for example ten years' hence. It should be noted that REACH does not prevent direct reuse per se as it does not apply to second hand products, but of course reuse organisations may be hesitant to resell goods containing hazardous substances. It can also present a cost increase for preparing for reuse organisations and recyclers, particularly as a result of the lack of information (e.g. via a detailed product Bill of Materials) on which part/material contains which hazardous substances or not and how this can be dealt with without unduly restricting circularity.

Consequently the continued presence of non-disclosed legacy chemicals will continue to inhibit the preparing for reuse and recycling of end-of-life furniture for many years to come unless action is taken. The Commission is already seeking to focus efforts around examining the relationship between chemical, product and waste policy, due to acknowledgment that the current situation challenges delivery of targets set within the EC Circular Economy Package.

A 'clean furniture economy' will require significant efforts which focus on ensuring the continued removal of hazardous substances from products and materials, and not only those that are currently restricted. Ideally there needs to be a 'forward look' going beyond compliance with current REACH restrictions. Ideally this would involve the use of only genuinely 'green chemistry' principles in new products although in practice this may mean avoidance of REACH Candidate List Substances or all substances with hazardous properties of very high concern (CMR, PBT, EDC, neurotoxicants, immunotoxicants, etc.); for

example the Substitute It Now List[37].

There may be a need for (time-bound) exemptions on the recycling of certain materials that contain restricted substances in some cases where there is a genuine lack of alternatives and a clear technical need. In addition it is important for products to come with a full disclosure on what hazardous substances are contained in specific materials or products, through the introduction of an EU harmonised information system and/ or other type of declaration, so as to allow proper management of these products and materials in terms of reuse or as waste. This is important, for example, since brominated flame retardants that go into incineration (e.g. resulting from the inclusion of energy from waste in recovery targets) can result in brominated dioxins which are not currently restricted under the Industrial Emissions Directive.

Sector Innovation Support

The role of R&D and innovation funding represents an important catalyst to stimulate furniture manufacturers to transition from linear production towards closed loop models – including dematerialisation/sustainable material selection, design durability, modularity, reuse/ repair, reassembly and recycling. Yet the capacity of furniture manufacturers to deliver a step change and adapt their business models through innovation continues to be limited by access to financial and technical resources. With a predominance of SMEs in the furniture sector, a lack of access to finance, expertise and infrastructure will continue to constrain the furniture industry from moving towards take-back, repair, leasing and other service-based models.

The EC launched the Green Action Plan for SMEs, together with the European Resource Efficiency Excellence Centre (EASME), to address at least some of the shortfall in access to expertise and funding more broadly experienced by SME businesses. At a Member State level, sector specific programmes, such as the Sustech[38] project in Belgium for wood, textiles and furniture manufacturers, has been lauded as a model for accelerating the

transition towards resource efficiency within the sector. Other examples include the Scottish Government/ERDF-funded Circular Economy Programmes and Investment Fund operated by Zero Waste Scotland, which provides expertise and capital support to SMEs across key sectors, to advance new business model development.

Case Study – Innovation Support for the Furniture Manufacturing Sector – Sustech, Belgium

The Sustech project was realised through the ambition of partners Fedustria, Centexbel and **WOOD.BE** to support the acceleration from linear to closed loop models within the textiles, wood and furniture manufacturing sectors in Belgium.

The focus included supporting participating businesses move forward with a variety of challenges, with a focus on the product design and end-of-life phases. Businesses support challenges launched by the project and included:

- Development – including dematerialisation, sustainable material selection, design for recycling, re-assembly, modularity; and

- End-of-life – including recycling and product life extension.

Ecolabels

The EU Furniture Ecolabel scheme also encourages the production of durable products that are fit for purpose, easy to repair and easy to dismantle into separate material streams at the end-of-life to maximise recycling potential.

A new set of EU Ecolabel criteria has been published by the European Commission under Commission Decision (EU) 2016/1332. The previous scope of the product group (which only permitted wooden furniture ≥90% by weight wood or wood-based materials) has been amended to reflect inclusion of other materials, without maximum or minimum limits. The expanded scope of Ecolabel criteria increases the number of potential products covered, and hence offers the greater potential for influencing the furniture market,

although the second-hand, refurbished or remanufactured furniture products are not included within the new scope[39],

Importantly, the uptake of ecolabels is intrinsically linked to the awareness and demand from the public and purchasing organisations, most notably the public sector, which is, at best, patchy across Europe. The EU Ecolabel for wooden furniture still only has three companies as license holders, although with 232 products in total (193 with one Spanish company). Blue Angel in Germany is one of the most well-used labels for furniture but still only has 24 companies and 72 products represented. Nobilia has a 29% market share for kitchens in Germany but only has 10 certified products.

Whilst the expansion of Ecolabel criteria for furniture is warranted, uptake will continue to be hampered in the absence of further recognition of the ecolabels on the part of buyers, and in particular, through an expanded application of Green Public Procurement (GPP) criteria (discussed below). Further uptake of the Ecolabel scheme is also impeded by the perception of bureaucracy in the application procedure, and the perception of high costs of implementation[40].

Green Public Procurement Criteria

GPP offers significant potential to drive demand for products with better environmental performance and CE potential. EU studies indicate that the public sector spend on office furniture represents 15% of the market.[41] Government procurement (excluding wider public sector) in the UK represents approximately 10% of the office furniture market.[42] The updated EU GPP criteria for furniture has recently been published[43], a process carried out in alignment with the revision of the EU Ecolabel criteria for the same product group.

The voluntary uptake of GPP limits its potential to impact on the sector, with a need for more binding objectives to ensure a more widespread adoption across the public sector. Overall, the

level of EU GPP uptake in the EU28 appears far lower than the 50% target set by the European Commission in 2008, with research indicating a level of EU GPP uptake for furniture below 20%; significantly behind other GPP product criteria use across Member States.[44]

Whilst improved criteria focusing higher up the waste hierarchy are clearly needed, the voluntary uptake of GPP criteria ensures a continued lack of demand from the public sector for furniture which meet these criteria, thereby continuing to limit its effectiveness in incentivising the furniture market. Some Member States have been more proactive than others in pushing the agenda forward in this regard, such as Italy.

Case Study – Mandatory Requirements for GPP, Italy

In December 2015, the Italian Government introduced provisions which require mandatory GPP requirements for all Italian public entities to include within public procurement actions. This requirement is mandated for tenders, including procurement which is both above and below financial thresholds. Minimum environmental criteria are contained within the Italian GPP National Action Plan (2008), which cover 16 product and service areas of most relevance to Italian public procurement.

Green Product Marks

There is a strong rationale for exploring the possible merits of developing a European-wide 'Green Furniture Mark', to support both the supply and demand of furniture with circularity performance characteristics in the European market. Green product mark schemes, such as the EU Energy Consumption Labelling Scheme and Energy Star in the US for electrical and electronic equipment, BREEAM and LEED for buildings, have demonstrated value in enabling consumers to select products based on environmental performance, whilst at the same time, encouraging suppliers to invest in more environmentally responsible product design.

Whilst green product marks can be mandatory or voluntary in their deployment, business-led standards remain less trusted by consumers even when they are recognized as high-quality standards by stakeholders, with the more effective schemes benefiting from independent oversight, to improve consumer confidence and assurances around environmental product assertions.

This is intended to complement rather than replace the pass-fail EU Eco-label. The intention here is that the GFM would have an A to G rating to provide consumers and procurement professionals with clearer information on the environmental and circularity performance and features of furniture products. This would be determined by a points style system (similar to the BREEAM approach for buildings) using a self-assessment approach but with third party oversight. It should be noted that the GFM could also be used to complement both minimum eco-design standards and EPR, just as the EU Energy Label complements Eco-design and EPR for the EEE sector.

It would be desirable for the GFM to use an agreed common set of core criteria that work across other existing EU instruments (GPP and Eco-label). Criteria would cover a variety of CE criteria across durability, the use of recycled material content, and reused components (i.e. remanufacture), hazardous substance removal, and to facilitate repair, remanufacture and recycling.

The deployment of such a GFM could be either voluntary, with take up by manufacturers being driven by GPP (e.g. a minimum requirement of a B rating for example) or mandatory, requiring all furniture to be assessed and labelled under the GFM scheme as an alternative or in complementarity to mandatory eco-design requirements. In any case some consistency should be promoted, e.g. by which the lowest rating (G) of the GFM would reflect the mandatory minimum for example and highest rating (A) of the GFM corresponds to what is also required by the more comprehensive EU Ecolabel scheme.

Financial Instruments to Support Supply and Demand

A lack of demand for circular furniture products and services will continue to restrict the growth of the sector across Europe. The overall economics of the situation often mean that new budget products can be bought almost as cheaply as refurbished ones, and with a longer warranty. There are strong arguments to suggest that reducing some relevant taxes can encourage key actors to consider more sustainable product procurement options, such as repaired or remanufactured furniture.

Under current VAT rules, low VAT rates for sustainable products are restricted under the common system set within the VAT Directive (2006/112/EC), which includes general rules on individual Member States' freedom to set VAT on goods and services. Furthermore application of reduced rates for specific type of sustainable products would require clear and unambiguous distinctions between 'sustainable' and 'non-sustainable' products (e.g. on the basis of green labelling criteria) and in competitive markets, incomplete pass through of VAT reductions may ultimately occur.[45]

The EC Taxation and Customs Union recently launched an open public consultation on the reform of VAT rates, with a reform proposal scheduled for release in the autumn of 20172 and it is currently unclear whether such reform proposals will include incentives for sustainable products. In consideration of this potential, subsidies and tax incentives for 'circular' or environmental products will only work where they are sufficient to close the price gap with equivalent 'budget' products.

Case Study – Tax Breaks for Repair, Sweden

The Swedish Government is seeking to introduce tax breaks on the repair of household items, including furniture, to stimulate the development of a new home repair industry. The Government recently submitted proposals to parliament to cut the VAT rate on repairs to household products from 25% to 12%. Proposals are intended to lower the cost of repair, and in doing so, to drive consumers to consider the repair of household items before instantly replacing items with new.

Incentives for consumers to return furniture for reuse and recycling is another important consideration around supply. This could, for example, be a levy charged on new furniture that is refunded on the item's return for reuse and recycling (as opposed to EPR where the levy is non-refundable and goes to support reuse and recycling). This is a form of deposit-refund scheme, and whilst such schemes have not been established in Europe, incentivising customers to return unwanted furniture, such as the model adopted by IKEA through the use of a voucher system, has demonstrated some success.

Case Study – Voucher Scheme for Unwanted Furniture, IKEA France

IKEA introduced a "Second Life for Furniture" programme for its customers. Initially introduced in France and Belgium, the scheme allows customers to return unwanted IKEA furniture into a store in exchange for a voucher, which can be redeemed against a purchase of new furniture products in-store. In Sweden, IKEA are piloting this business model further, by offering allowing customers to also return non-IKEA plastic furniture in exchange for a voucher.

An alternative return incentive for consumers could be a modulated 'bulky waste' collection charge, i.e. free where the item is reusable and collected by an accredited reuse organisation and otherwise charged at a significant cost to discourage 'regular' waste disposal.

Information Provision and Consumer Rights

Initiatives which provide consumers and repair and reuse organisation with information to maximise the likelihood that products are repaired and reused, which are currently being developed in other sectors (e.g. electrical appliances) - such as provision and dissemination of service manuals, as well as

support for service and repair through helplines and internet platforms - is significantly under developed in the furniture sector.

A lack of information from manufacturers on the durability, disassembly, reassembly, reconfiguration, reparability and reuse of furniture products, coupled with the availability and affordability of spare parts and short product warranties, inhibits repair and reuse activity, both for consumers while they own the product and for organisations that are preparing for reuse.

What is often missing for the consumer/procurer is anything that indicates the life expectancy and reparability of the product at the point of purchase, brand reputation and length of warranty often being the only guide. Minimum product lifetime guarantees, longer warranty periods and minimum availability time for spare parts could all help.

It is possible to point to regulatory instruments deployed in other sectors, which have sought to address such issues, including the Right to Repair Law in the USA, which includes a requirement for automobile manufacturers to make parts available on fair and reasonable terms. This is also a key aspect of Eco-label requirements for electrical and electronic products, while the WEEE Directive mandates the provision of information to assist recycling at end of life.

Case Study – Right to Repair Law the Automotive Sector, Massachusetts

Fair Repair legislation is based on the Massachusetts Automotive Right to Repair Law passed in August of 2012 and the subsequent national agreements reached between Automotive (2014) and Truck (2015) manufacturers and their aftermarket counterparts. Under this regulation and related voluntary agreements, manufacturers are required to provide independent retailers with equivalent product diagnostics, tools, service documentation and firmware on fair and equal terms to that provided to their authorised dealers.

In the absence of regulatory instruments, the furniture retailer IKEA has launched a variety of pilots in stores across Europe, to evaluate the benefits of running repair workshops to enable its customers to extend the lifespan of furniture items.

Case Study – Product Life Extension, IKEA

IKEA's 2016 Sustainability Strategy 2016 sets out a range of sustainability priorities, which includes a commitment to achieve a fourfold increase in sustainable sales by 2020, compared with 2013. This includes a commitment to transition towards products as services – whereby products are designed to be easy to care for, repair, adapt, disassemble, and recycle.

Initiatives include a variety of pilots currently being trialled across 'circular stores' including:

- Repair workshops in-store – to enable customers to learn how to repair or recycle furniture products; and
- Rental and share schemes – recently launching a furniture leasing scheme for Finnish companies, based on a monthly subscription.

Other initiatives being explored by IKEA include the use of 3-D printing of spare parts, to allow quick and efficient dispatch of furniture spares to its customers.

Research has identified the potential role of the Consumer Sales Directive[47] (CSD) as a mechanism to require businesses to consider longer product lifespans[48].

In the UK, the Consumer Rights Act has been introduced as a mechanism to enable customers to both return products which are unfit for purpose, but also, to drive retailers to make a repair, or replace a faulty product.

Case Study – Guarantees and returns, The Netherlands[49]

In the Netherlands, every consumer purchase is covered by a mandatory legal guarantee. The duration of this guarantee is based on the expected lifespan of the product. If the product is defective, it is the responsibility of the seller to replace, repair or provide a refund for the defective product.

Under the guarantee, a hierarchy of remedies firstly includes a requirement to repair or replacement, according to the consumer's wishes, within a reasonable time frame and free of charge. Secondly, a refund or reduction of the purchase price if repair or replacement is impossible, but only under certain conditions. There is no deadline for implementing a solution. If the fault occurs within the first six months, the seller must prove that the item was not defective ("reversal of burden of proof"). However, a remaining weakness in the system, is that this too brief a period, before the buyer becomes the actor responsible for proving the problem was due to a default in the product.

Whilst in relative infancy, the application of product passports (or product information systems) offers the potential for increasing reparability and reuse of a range of products, by providing better information on how components and materials that a product contains, can be disassembled, repaired and recycled at the end of life. While furniture is not especially complex, as noted earlier, it is important to understand the hazardous substances present in products as a minimum.

The application of material passports have been adopted in other sectors, including the shipping and aerospace industry, as a tool for assessing reusability and/or recyclability of a product. The potential benefits of material passport application in the furniture sector was recently highlighted in research findings[50] from one of the Resource Efficient Business Model (REBus) pilot projects, which identified their relevance in supporting value retention of raw materials across the value chain.

Pros and Cons of Potential Policy Instruments

This section presents a range of scenarios including policy measures which present potential options for advancing circularity across the European furniture sector. In consideration of the suggested policy and intervention measures referenced here, it is acknowledged that the European furniture sector is not homogeneous, with differing consumer patterns and waste infrastructure types and capacities demonstrated across Member States.

It is further acknowledged that adoption and implementation of some of the policy measures presented represents greater challenges for those Member States where waste recovery, recycling and waste treatment technology is under developed. In recognition of these facts, it is our view that this should not limit the level of ambition, in the setting of policy instruments which offers the potential to deliver significant economic, environment and social contributions for the EU furniture sector and wider related economies.

Extended Producer Responsibility

Table 1 below discusses the pros and cons of different policy approaches to producer responsibility, including:

- Mandatory EPR regulation for furniture – along the model formally adopted under French EPR law. This would ensure that used furniture (including mattresses) is dealt with responsibly, with targets for preparing for reuse and recycling by category and by weight.

- Voluntary agreement – essentially a self-regulatory initiative on take-back and preparing for reuse as an alternative to mandatory EPR, with additional eco-design drivers.

Table 1: Producer Responsibility

Pros	Cons
Mandatory EPR regulation	
If well-designed, an EPR scheme can ensure that high levels of circularity occur. As in France, a reduced/ modulated fee can be charged for furniture that is designed for repair and recycling and meets certain criteria. Where charges are significant this could also be used to help drive improved design for CE. Mandatory EPR can therefore stand alone to a degree, although mandatory eco-design requirements would strengthen the overall package. A harmonised EPR scheme at EU level would provide consistency and reduce the burden on brands operating across multiple Member States.	Such schemes are generally collective and the costs spread across all producers according to market share. Unless the producer fees are modulated according to environmental criteria (for example, the product longevity), then positive actions on eco-design by some will not be recognised in the fees they pay, so there will be limited / no incentive to improve design until such time as the overall targets (for preparation for reuse, and for recycling) demand it. Where EPR is introduced at national level and in the absence of a harmonised scheme at EU level, this risks the development of a patchwork of inconsistent schemes, introducing challenges for brands to comply with the different requirements across the EU.
Voluntary agreement	
An industry-led voluntary agreement across EU industry could potentially be reached more quickly than mandatory regulation. This would involve take-back and preparing for reuse targets. In addition there could be minimum eco-design standards or a Green Furniture Mark (GFM) labelling scheme (see below).	This is likely to be weaker than mandatory EPR, and is unlikely to cover the whole market. It would not be realistic to get all furniture OEMs to sign up to the agreement, although retailer sign-up and supply chain pressure would help. Effectiveness is more likely to be assured through the credible prospect of a mandatory instrument.

Eco-design Requirements

Table 2 includes an assessment of the various policy instruments considered available to drive eco-design across the EU furniture sector. These include:

- **Mandatory eco-design** – including horizontal requirements around materials use (sustainability, chemicals), durability, reparability (including availability of spares) and recyclability.

- **The 'Green Furniture Mark' (GFM) labelling approach** - to meet a variety of CE criteria, potentially modelled on an A to G scale similar to that used by the EU Energy Consumption Labelling Scheme, but with a points-based system similar to BREEAM. Such a scheme would be self-declared, but with third party oversight, and could be mandatory or voluntary, the latter allowing OEMs to sign-up some products and gradually drive the market (with additional demand drivers via GPP).

- **Mandatory EU-wide requirement on flame retardant label location and form of attachment** – to ensure labels are not visible (e.g. hanging down) whilst the furniture is in use and to avoid removal by consumers.

- **Restrictions on the use of all Candidate List SVHCs** (or, to go further, Sin List chemicals[51] within new products, with consideration of transitional exemptions for specific applications which are time bound, and clear marking of materials (using a harmonised product information system approach or otherwise). This will avoid endless legacy issues and provide improved clarity to re-use and recycling organisations.

- **Mandatory warranty periods –** included a suggested minimum 5 year warranty (including spares and repairs).

Table 2: Eco-design requirements

Pros	Cons
Mandatory eco-design	
Would provide a clear minimum requirement and could help to drive all CE aspects, e.g. to facilitate quick repair and refurbishment (quicker generally translates into lower cost). Spares availability and cost requirements could also be included. Durability requirements are also desirable to avoid the need for repair and allow many lives for a product. The avoidance of hazardous materials could also be included. Would also ensure a level playing field with regards to global competition, by setting the rules to access the EU market.	May not guarantee any particular level of CE activity (as EPR would). Would require consistent implementation which is likely to be challenging for a sector highly represented by SMEs. Durability requirements will require additional standards and add cost in terms of testing (which would need to be done at the component level to become less onerous). Some manufacturers already do extensive testing, however.
Mandatory EU-wide requirement on flame retardant label location	
Simple to enact and would solve a major issue in relation to reuse of upholstered furniture. Could be part of any mandatory eco-design initiative.	Small change to production techniques required at OEMs.
Setting new standards/rules for fire safety that would allow the use of alternative to flame retardants	
Would not necessitate an immediate and strict phase out of materials, and hence, may be more acceptable to industry. Combined with the obligation of labelling flame retardants (see above), may act as a market driver towards cleaner furniture.	New rules and standards would result in changes to production methods.

Green Furniture Mark	
An A to G style label, that denotes the level of environmental/CE performance, without setting any minimum pass-fail standard should have higher uptake and complement the best in class Type 1 Ecolabels in Europe (EU Flower, Blue Angel, Nordic Swan), having core criteria streamlined through GPP, and a self-assessment approach for producers. It would be simple for consumers to understand (given similarity with the Energy Label) and could be mandatory or voluntary; potentially part of a wider voluntary agreement as a means for the better OEMs to set the pace for others.	The GFM would need third party assessment to be a reliable and credible guide. A voluntary version may only affect a relatively small percentage of a cost-conscious market. If consumer or GPP demand is not there, other OEMs and retailers will not sign up. It would also require a promotional campaign to help drive demand.
Avoidance of SVHCs in new products and transitional exemptions for certain legacy materials containing chemicals restricted under REACH	
By phasing out the use of Candidate List SVHCs under REACH (or indeed Sin List chemicals[52] in new furniture, as well as those substances currently restricted, this would allow quicker elimination of future remanufacturing and recycling constraints. If necessary it could be helpful to allow transitional time-bound exemptions on the recycling of certain materials (such as foams and textiles) that contain restricted substances, depending on the possibility to identify safe reprocessing and use applications as secondary raw material.	There may be a need for new product exemptions in some instances where there is a genuine lack of alternatives and a clear technical need. Transitional exemptions for recycled materials allow harmful chemicals to remain in circulation longer and require special handling by those preparing for reuse and in recycling. Incinerating brominated flame retardants also generates brominated dioxins.

Setting new standards/rules for fire safety that would allow the use of alternative to flame retardants	
Would not necessitate an immediate and strict phase out of materials, and hence, may be more acceptable to industry. Combined with the obligation of labelling flame retardants (see above), may act as a market driver towards cleaner furniture.	New rules and standards would result in those OEMs seeking use alternative flame retardants, needing to make small changes to production methods.
Extending the mandatory warranty period	
Requiring a longer mandatory manufacturer's or retailer's warranty period for furniture, as against the two year minimum implied under EU consumer law, would effectively eliminate very poor quality furniture (otherwise, it would create too many returns for retailers) and be to the general advantage of manufacturers of more durable furniture, hence reducing waste. May also support the market for second hand and refurbished items (higher costs for bottom of the market items).	Would increase the purchase price of furniture at the bottom end of the market (even though life-cycle costs may decline).

Procurement-Related Initiatives

The role of procurement undoubtedly represents a significant opportunity to create 'demand pull' across the sector. Table 3 assesses the potential implication of a review of instruments, including, extended GPP requirements - with a stronger emphasis on the CE, supported by a GFM performance scale and CE criteria, with requirements to purchase GFM furniture above a certain class, consideration of lease options in the context of whole life costing) and mandatory application of Core Criteria for the public sector (as in Italy).

Table 3: Procurement-related initiatives

Pros	Cons
Extended GPP requirements	
GPP requirements are already in existence and their use reasonably widespread. Making the core criteria more strongly focused on CE (as Zero Waste Scotland has done through new guidance), and mandatory across the EU public sector (as in Italy), would offer a strong driver. To make it simpler for procurers, and link to consumer information, the GFM approach could be used; e.g. a requirement for a B level product or higher. Supply chain requirements could also be part of this, for example requiring plastic furniture manufacturers to take part in the Clean Sweep initiative to prevent pellet losses and marine micro-plastics.	This will mainly drive public sector procurement and will not guarantee a given level of CE activity (as mandatory EPR would). That said in some ways GPP may be able to go further than EPR, for example including such aspects as leasing and buying refurbished / remanufactured items in criteria for example; and ensuring through waste contracts that social enterprises get to cherry pick for reuse at household waste recycling centres (HWRCSs). Such measures would help to drive significant activity.

Information for Procurers, Repairers and Recyclers

Table 4 provides some discussion around a range of potential instruments which offer the potential to increase demand for sustainable furniture, through enhanced provision of information to both consumers and procurers of furniture, including:

- **Further promotion of existing instruments** – namely the EU Eco-label, GPP and 'Green Awards' for furniture.

- **Mandatory labelling / Consumer information** – taking inspiration from Environmental Product Declarations (EPD), which could be extended to also describe certain CE characteristics, including durability and disassembly.

However, the mere replication/extension of Product Environmental Footprint (PEF) related information or EPD system to the furniture sector would not provide an effective communication instrument. The Green Furniture Mark (GFM) approach could provide a good basis to start communicating about key performance characteristics for CE of furniture on an A to G basis adopting a similar approach like under the EU Energy Labels scheme or such as the BREEAM certification scheme.

- **Mandatory labelling of warranty period** - to clearly display the 'free' manufacturers/retailer warranty in a large format next to the product.

- **Mandatory EU harmonised information system** - Rather than providing life cycle impact information (as with a PEF), a digital type of product information system could provide information on the products bill of materials (BOM), including chemicals, and can cover other aspects such as information on how to repair. This could be related to the EPD, which also generally includes a material breakdown.

Table 4: Information for Procurers, Repairers and Recyclers

Pros	Cons
Mandatory EU wide harmonised Product Information System	
BOM information, which travels with the product through its life, is of practical use in preparing for reuse and recycling. This is particularly helpful in regard to the chemicals and polymers used. A digital type of product information system can also describe practical CE characteristics, e.g. to assist repair.	Whilst useful in allowing the recycling sector to identify and handle hazardous materials appropriately, less useful for the re-use sector, as they will have a good understanding of most materials and components used already and the repair techniques. Risks associated with the process becoming too burdensome for OEMs, with information relating to chemical exposure potentially being difficult to obtain.
Mandatory labelling and consumer information	
A PEF/EPD like analysis would provide life cycle impact information combined potentially with CE information (including material composition as already found in EPDs). Gives consumers and procurers better information (about environmental impacts and CE aspects) without dictating the quality of products able to be sold (as mandatory eco-design would). Could drive all key CE features.	A PEF/ LCA study is a complex and expensive undertaking for a single product, let alone many thousands of products on the EU market, especially where models change regularly. It is also likely to be a weak demand driver of CE for furniture as a) PEF/ LCA information can be complex for consumers and procurers to understand, b) they may not be so diligent, or environmentally driven, price being the predominant factor c) unlike the labelling of electrical appliances, the labelling would not necessarily relate to a feature that reduces costs to the consumer (so the consumer is less likely to be influenced by this).
Mandatory labelling of warranty period	
This would be a softer touch than a mandatory warranty period, giving a market advantage to the suppliers that can offer a longer warranty period.	Mainly drives durability and to a lesser extent reparability.
Further promotion of existing instruments	
There are existing labelling initiatives which could be more heavily promoted to both consumers and public sector buyers. Already well-known in some countries but poorly used in others. An EU-wide Green Furniture Awards scheme could be used to provide further momentum. Flanders has a 'Factory of the future award' to promote CE manufacturing for example.	The existing EU Ecolabel criteria for Furniture might be ambitious and comprehensive but market uptake is limited. CE criteria need to be simple for procurers, especially the core GPP criteria as opposed to the comprehensive criteria. Uptake of GPP is relatively poor outside of organisations where there is a mandate. Further promotion is not guaranteed to change the situation significantly.

Incentives for Consumers, Repairers and Recyclers

Instruments offering the potential to encourage consumers to return for reuse and recycling and to support repairers and recyclers are presented and discussed in Table 5, and include:

- Incentives for consumers to return furniture for reuse and recycling, e.g. a deposit-refund scheme or a modulated 'bulky waste' collection charge.
- Tax incentives, grants and low interest loans for CE furniture companies e.g. lower business rates and corporation tax.
- Lower rates of VAT applied to furniture repair.
- An EU/national furniture CE innovation support programme for SMEs. Business awareness raising and innovation support, including R&D; e.g. on End-of-Life (EoL) options for PUR foam.

Table 5: Incentives for consumers, repairers and recyclers

Pros	Cons
Lower rates of VAT for activities associated with refurbishment and remanufacture	
This increase the competitiveness of stakeholders in the repair, refurbishment and remanufacturing sector, without requiring any complex analysis or labelling issues.	There are currently restrictions on what can be done in this regard, although the potential for lower VAT rates on sustainable products is currently being considered under VAT reforms. Subsidies and tax incentives for 'circular' or environmental beneficial activities (e.g. repair) will only work where they are sufficient to close the price gap with equivalent new 'budget' products.
Refundable levy	
If a substantial amount and the scheme is clear to consumers, it could provide a good incentive for them to return furniture to authorised reuse and recycling organisations. From the retailer perspective, there could be a surplus generated if all furniture is not returned.	Likely to be unpopular with retailers and OEMs as the initial outlay for furniture will increase. Introduces an additional administrative burden for retailers. Given the delay between purchase and disposal, the value of the refund could be eroded by inflation, reducing the incentive for returns.
Modulated bulky waste charges	
Similar to the above, this would incentivise consumers to return furniture to authorised reuse and recycling organisations, but avoids the involvement of the retailer and therefore would be simpler to administer. In regions which operate pay-as-you-throw systems, this modulation already exists for bulky waste where it is not charged for when taken to a collection centre for reuse.	Potentially a weaker incentive unless the 'regular' bulky waste charges are significant.
Tax incentives, grants and low interest loans for business	
This will help start-ups to become established, and to grow, by lowering their operating cost base and/or allowing capital investments. This is the approach that Zero Waste Scotland is taking through their CE programme and Innovation Fund (CEIF).	Potentially a state aid / competitiveness issue. Can artificially keep companies afloat in the short term without correcting the fundamental market failures. Supply side interventions of this kind are also likely to require demand side initiatives in combination.

EU/national furniture innovation support programme for SMEs	
Innovation support can help to raise awareness of, and develop, new technologies and techniques, to open up new market opportunities. CE grants can help organisations to invest more into new CE related operations or scale up existing operations.	Requires funding, partners and larger scale demonstration pilots to test proof of concept. Needs to be able to overcome market barriers.

Waste Management Measures

Measures which are considered necessary to increase end of life options for furniture are discussed in Table 6 and include:

- Clearer regulation/guidance around end of waste and use of recycled materials; and

- A landfill ban on furniture disposal.

Table 6: Waste management measures

Pros	Cons
Clearer regulation/ guidance on EoW and quality standards for recycled materials	
Giving greater clarity over when a material ceases to be waste would open up end of life options for furniture materials. Consistent interpretation and application of EU End of Waste criteria is required across the EU. May be important where materials are returned as 'waste' to civic amenity sites and container parks, and where the waste status affects what can be done at the site. Uniform and consistent adoption of quality standards for recycled materials and enhanced specifications that would increase their uptake in new products.	Many MS may already have consistent interpretation and application in this regard. Much depends on how rigidly Member States interpret some aspects of waste law. The effectiveness of the measure is only as significant as the underlying problem. A lack of consistent development and interpretation of quality standards for recycled materials across Member States results in variability in material grades offered by reprocessors/recyclers.
Landfill ban on furniture disposal	
A relatively simple measure for large furniture items only, since smaller items that may be contained within mixed waste are difficult to identify. This would push activity up the hierarchy.	A landfill ban alone could simply result in more incineration of the banned items. A more positive approach is to concentrate on measures that stimulate recycling and preparing for reuse, which would need to accompany a ban on landfill in order to avoid a simple switch into incineration.

POLICY PACKAGES AND IMPACT ANALYSIS

Policy Packages and Impact Analysis

Combining Policy Instruments into Packages

A move to the circular economy model, through a Circular Economy Roadmap in Furniture (CERIF), would benefit from a variety of complimentary policy instruments to deal with market failures on the supply side (i.e. ensuring return of items and creating durable, refurbished and remanufactured items) and the demand side (creating demand for these products). Having considered the pros and cons of different tools/approaches, this section presents potential packages of those that could work effectively together to provide varying degrees of circularity, some more quickly than others and with varying degrees of certainty, including:

- Package 1: Fully Mandatory

- Package 2: Part Mandatory

- Package 3: Full Voluntary

- Package 4: Incentives Only

- Package 5: Information Only

- Package 6: Waste Management Only

These packages are analysed in terms of their potential environmental and social impacts. We would suggest that the following horizontal measures need to be added to each package to prevent fundamental barriers to reuse/ recycling:

- Mandatory regulation on fire label location and attachment (to avoid it being visible; and

- Restrictions on all Candidate List SVHCs under REACH (or, to go further, Sin List chemicals[37] and consideration of transitional exemptions for specific applications - which are time bound, and come with clear information regarding the substances of concern. This will avoid endless legacy issues, allow recycling for some applications and under certain circumstances, and provide improved clarity to re-use organisations reselling products.

In addition, it is worth noting that at present there is a patchwork of Circular Economy related criteria across various policy instruments (particularly when all national schemes as well as EU-wide schemes are taken into account) which can make participation complex and difficult for producers. Even with regard to GPP, a 2011 DG Environment study identified that the target for 50% of all public tendering procedures endorsing common GPP criteria by 2010 was not reached[53].

Therefore, it would be desirable to have an agreed common set of core criteria, and a related 'Green Furniture Mark' (GFM) as discussed earlier, with the intention of providing consumers and procurers with a simple means of assessing product circularity, using the well-established A to G rating approach; from entry level basic eco-design requirements (G) through to a circular 'excellence' benchmark (A). The GMF would be deployed alongside (rather than substituting) existing EU instruments, such as the EU Ecolabel and GPP Criteria.

Table 7: Policy Package Scenarios

Package 1 - Fully Mandatory

Supply Side

- Mandatory Extended Producer Responsibility (EPR) for take back, with preparing for reuse and recycling targets, and with a modulated fee (that takes account of the different treatment costs and environmental impacts of different products and materials) or an Individual Producer Responsibility (IPR) approach, to encourage better design for repair and recycling[54].
- Mandatory eco-design measures on durability, repair and recyclability or a mandatory warranty period of five years to drive durability and reparability. This could be associated with a GFM approach to reinforce and extend impact.

Demand Side

Mandatory Green Public Procurement (GPP) to drive demand for reuse and remanufactured items (other aspects taken care of by mandatory eco-design).

Package 2 - Part Mandatory

Supply Side

- Mandatory EPR for take back, with preparing for reuse and recycling targets, and with a modulated fee based upon the 'Green Furniture Mark' (GFM) criteria, or an IPR approach, to encourage better design for repair and recycling[55].
- EU-wide GFM approach, with an A to G rating for furniture, with mandatory labelling but no mandatory eco-design standard.

Demand Side

Mandatory GPP for the public sector, with common criteria to the GFM or a set GFM level required (e.g. B rating).

Package 3 - Full Voluntary

Supply Side

- EU-wide voluntary agreement (Self-Regulatory Initiative) on take back, preparing for reuse and recycling as an alternative to mandatory EPR.
- Voluntary use of the GFM (industry led voluntary initiative), but driven by GPP.

Demand Side

- Voluntary GPP as now, but with reference to a minimum standard under GFM (e.g. B rated).
- Promotion of the GFM label for which the highest rating class A corresponds to what is also required by the more comprehensive EU Ecolabel scheme.

Package 4 - Incentives Only

Supply Side

- EU-wide SME support initiative for CE innovation in the sector, combined with tax incentives, grants and/or low interest loans for CE furniture companies.
- Deposit-refund incentive for consumers to return furniture for reuse and recycling, i.e. a refundable levy on new furniture, or a modulated 'bulky waste' collection charge – free where the item is reusable.

Demand Side

- Mandatory labelling of warranty period; to clearly display the 'free' manufacturers/retailer warranty in a large format next to the product.
- Tax incentives for refurbished/remanufactured items; e.g. lower rates of VAT.

Package 5 - Information Only

Supply Side

- Mandatory Product Information Systems from the OEMs to drive repair and remanufacture.
- Voluntary use of the GFM, but driven by GPP.

Demand Side

- Mandatory labelling of warranty period; to clearly display the 'free' manufacturers/retailer warranty in a large format next to the product.
- Voluntary GPP as now, but with reference to a minimum standard under GFM (e.g. B rated).
- Promotion of the GFM label for which the highest rating class A corresponds to what is also required by the more comprehensive EU Ecolabel scheme.

Package 6 - Waste Management Only

- EU wide landfill ban on furniture disposal.
- Clearer regulation/guidance from the EU around end of waste and use of recycled materials.

Policy Package Impact Analysis

Climate Change Benefits of Recycling Furniture

There is relatively little information available in the literature on recycling furniture products. However, the net carbon benefits of recycling will be related to benefits of recycling the constituent materials. There will be additional carbon impacts associated with loss rates from material that could not be recovered for recycling and additional energy expenditure from disassembly; it is also not clear to what extent transport is taken into account within the materials recycling figures, and whether this is likely to be more significant for recycled furniture. These additional impacts will tend to reduce the overall benefits that might be attained through recycling the constituent materials.

Table 8 shows the carbon benefits of recycling the key constituent materials of furniture. This shows that the benefits vary considerably between the different materials, with the benefit from recycling textiles and aluminium much greater than that of recycling wood or chipboard.[56] In the case of textiles, it is important to note that the recycling benefit shown in the table is calculated based on a certain proportion of the collected textiles being reused. Impacts associated with textiles recycling alone are much less than that shown in the table. For wood (and kitchen furniture), the WRAP data on recycling (Table 8) does not account for carbon sequestration, and

hence, the data presented here will inevitably underestimate the benefits of recycling wood. Accurate forecasting of the benefit of wood recycling is limited further by the absence of an agreed methodology for accounting for the recycling benefit of wood recycling, and agreement with respect to how long carbon would be sequestered for within recycled wood. Indicative data on the composition of furniture is provided in the Appendix.

The data in Table 8 and the composition data can be used to obtain an estimate of the maximum benefit available from recycling furniture items in Table 9, which is calculated assuming all of the recyclable materials are recycled. As it was indicated above, actual benefits from recycling will be less than the figures indicated in Table 8 as well as this is the case for the resulting figures in Table 9 below.

Table 9: Maximum Benefit Available - 100% Recycling of Discarded Furniture

Furniture Item	Maximum recycling benefit, tonne CO2 eq. per tonne of material
Kitchen Furniture	-0.07
Mattresses	-2.64
Metal furniture	-3.20
Non Upholstered seats	-1.70
Other furniture	-0.59
Upholstered seats/ sofa beds/ futons	-1.42
Wooden furniture	>>-0.01[58]

Table 8: Carbon Benefits of Recycling Materials contained in Furniture[57]

Material	Textiles	Aluminium	Steel	Wood	Plastic	PUA foam	Chipboard
Tonnes CO_2 eq. per tonne material	-5.9	-8.7	-1.8	-0.01	-1.2	-1.21[1]	-0.01[2]
Source[3]	[A]	[A]	[A]	[B]	[A]		

Notes
1. Estimated (based on plastic)
2. Estimated (based on wood)
3. Sources – [A] Scottish Carbon Metric; [B] WRAP

Climate Change Benefits from Reusing Furniture

The environmental benefits associated with the reuse are not necessarily higher than the recycling benefits, even where the latter can be properly calculated. Much depends on whether the reused article results in the avoided purchase of a new manufactured article. Where this is the case, the benefits of reusing that article are likely to be more substantial than those of recycling. This is because the impacts associated with producing the constituent materials contained in furniture are typically higher than the impacts associated with recycling the constituent components. However, where reused articles are purchased by lower income households who would otherwise not have purchased anything, the benefit associated with avoided production does not occur. Transport impacts may also be higher for the reuse scenario, and there may also be additional energy associated with the preparation for reuse, although the latter typically results in only a relatively small impact.

Data on the climate change impacts of manufacturing the key constituents of furniture is shown in Table 10. The table indicates that the climate change impact of manufacturing textiles is far higher than that of the other materials. Significant impacts include the use of large amounts of pesticides and fertilisers in the production of cotton, and energy use in acrylic and polyester production as well as in the finishing of fabrics.[59] Impacts are also relatively high for aluminium, but somewhat lower for plastics and steel.

WRAP considered the carbon benefits of reuse for commonly reused articles in the UK. For wood, this does not consider the potential benefits of sequestering the carbon contained within the wood, which have been considered by other researchers in this area. According to the methodology developed by the International Reference Life Cycle Data System (ILCD)[60] on behalf of the European Commission, the carbon sequestered in wood for 10 years would give an additional carbon benefit of 132 kg CO2 eq. per tonne, whilst carbon sequestered in wood for 100 years would give a carbon benefit of 1,320 kg CO2 eq. per tonne of wood.[61]

To take this into account, we have adapted the dataset originally developed by WRAP, but assuming a sequestration factor for 10 years.[62] Data on the climate change benefits of reusing key furniture items is presented in Table 11. It is important to note that some furniture items are less likely to be reused due to concerns regarding hygiene – this is the case for mattresses, for example; such items have been excluded from the table (and were not included in the original datasets developed by WRAP).

It should be noted that there is much less certainty in respect of data on the climate change benefits of reusing furniture than is the case for the recycling data. The data

Table 10: Carbon Impacts of Producing Materials contained in Furniture

Material	Textiles	Aluminium	Steel	Wood	Plastic	PUA foam	Chipboard
Tonnes CO_2 eq. per tonne material	22.0	10.0	2.5	0.1	3.0	3.0	0.7

Table 11: Indicative Benefits of Reusing Key Furniture Items[55]

Furniture item	Estimated benefits of reuse, tonne CO_2 eq. per tonne of product	Source
Non upholstered seats	-2.60	WRAP
Upholstered seats	-1.05	WRAP
Wooden furniture	-0.04	Eunomia

provided in the table above considers the anticipated benefits in respect of third sector organisations undertaking reuse. This type of reuse operation may result in lower levels of furniture production being displaced than other routes, as such items are more likely to be sold to low income households who might otherwise not be able to afford to purchase such items. In contrast, the benefits arising from other reuse routes – such as B2B reuse of refurbished furniture items for example – may be higher than those seen here. Furthermore, the environmental benefits from reusing or recycling furniture are not mutually exclusive. Furniture reuse would only delay the time when the recycling benefits would eventually realise but they may offer additional environmental benefits when offsetting the need to produce new furniture.

Impacts of Material Substitution

As was confirmed in Table 10, the climate change impacts of manufacturing the various constituent components of furniture vary considerably. As such, it should be expected that impacts of producing some items can be reduced in some cases through material substitution. It is necessary to consider these items on a case by case basis, as materials are typically not substituted on a like-for-like basis as far as tonnage is concerned. This is shown in Table 12 through consideration of the climate change impacts of outdoor furniture[64] items manufactured using different materials.

Climate change impacts are highest where the furniture is manufactured using aluminium, and lowest where wood is used – despite the latter using considerably more material on a weight-basis.

Table 12: Climate Change Impacts for Outdoor Furniture Items[65]

Material	Weight of material used, kg	Climate change impacts, kg CO_2 eq. per furniture set
Plastic	30	102
Aluminium	10	307
Pine	70	49

Climate Change Benefits from the Policy Packages

Approach to the Modelling

This section provides high level estimates of the potential climate change benefits to Europe as a whole arising from the policy packages set out previously. Estimates are calculated against the baseline of furniture consumption previously described[66]. Results are also considered for five European countries: France, UK, Germany, Spain and Italy.

Assumptions relating to the end-of-life stage for each package are set out in the Appendix. A certain amount of reuse and recycling is assumed to occur in the baseline, and net impacts are therefore calculated based on the additional recycling and reuse that is expected to occur in each scenario. Assumptions relating to the baseline scenario are also indicated in the same table.

As it was indicated previously, some items are less likely to be reused, and might therefore be more likely to be recycled when the policy packages take effect. Different assumptions were therefore used to model the effect of the scenarios on the different furniture categories. Assumptions applied to the different furniture categories are set out in the Appendix.

For items which were not included within the WRAP dataset on the benefits of reuse (previously presented in Table 11), the following approach was taken:

- Impacts for reusing kitchen furniture were estimated based on the recycling impacts;

- Impacts for reusing metal furniture were estimated based on the impacts of reusing non upholstered seats;

- Impacts for reusing mattresses were estimated based on the impacts of reusing sofas. It has to be noted however

that reusing mattresses is not an option considered broadly, due to hygiene concerns as explained. We only consider a 5% reuse of mattresses in the most ambitious scenario.

The impacts of sending furniture items to landfill or energy from waste (EfW) were modelled using data obtained from the background environmental impact models incorporated into Eunomia's European Waste Model. For landfill impacts, this includes consideration of the impact of the non-emitted biogenic carbon being effectively sequestered in the landfill.[67]

In practice, the benefits from incinerating wood is likely overstated here – namely, it would reach this level only if all the biogenic CO_2 emissions can be ignored, since all wood comes from sustainably managed sources. In practice, this is highly unlikely to be the case for all wood

used in waste furniture across all of Europe. Whilst data on what proportions of wood is classified/considered "unsustainable" is lacking, unsustainable wood destined for EfW results in a negative CO2 impact, rather than providing a benefit.

Results

Table 13 presents estimated climate change impacts across the whole of Europe for the policy packages previously defined. Results for each package are presented on an annual basis net of impacts occurring in the baseline. The table shows that climate change benefits are the most significant for Policy Package 1 – the Full Mandatory package.

As was indicated previously, the benefits for reuse are highly uncertain. The benefits considered in the model may be considered to relatively conservative estimates of potential

Table 13: Net Climate Change Impacts of Policy Packages and Additional Furniture Reused and Recycled – All Europe

	Policy Package	Estimated net carbon impacts for scenario, tonnes CO_2 eq.	Additional tonnes	
			Reused	Recycled
1	Full Mandatory	-5,713,542	2,097,962	3,670,289
2	Part Mandatory	-4,933,647	1,546,538	3,149,566
3a	Full Voluntary - self-regulatory[68]	-2,896,593	1,069,288	2,392,433
3b	Full Voluntary - industry-led[69]	-2,172,445	717,278	1,470,269
4	Incentives only	-1,810,371	440,452	1,053,690
5	Information only	-1,448,296	227,187	687,853
6	Waste management only	-3,343,633	168,225	3,185,947

Table 14: Net Climate Change Impacts of Policy Packages – Specific Countries

	Policy Package	Estimated net carbon impacts for scenario, tonnes CO_2 eq.				
		France	UK	Germany	Spain	Italy
1	Full Mandatory	-738,547	-863,101	-723,314	-492,333	-470,043
2	Part Mandatory	-636,646	-748,188	-630,957	-428,986	-405,860
3a	Full Voluntary - self-regulatory[71]	-375,266	-436,289	-368,029	-248,421	-239,115
3b	Full Voluntary - industry-led[72]	-281,450	-327,217	-276,022	-186,316	-179,336
4	Incentives only	-234,541	-272,680	-230,018	-155,263	-149,447
5	Information only	-187,633	-218,144	-184,014	-124,211	-119,557
6	Waste management only	-423,771	-495,099	-452,155	-260,439	-316,722

benefit of reuse, given that the referenced data source is based on third sector reuse. Since arguably, third sector reuse is likely to result in lower levels of furniture production being displaced (for example, when compared with B2B services), benefits of reuse are likely to be higher than estimates presented, with further research needed to provide more certainty[70].

Table 13 also presents estimated additional furniture tonnage reused and recycled across the whole of Europe for the policy packages previously defined. Results for each package are presented with respect to impact occurring against the baseline. The table shows that benefits are the most significant for Policy Package 1 – the Full Mandatory package.

The climate change impacts of the policy packages for some key European countries are presented in Table 14. The results are influenced both by the total amount of tonnage and by differences in the proportions of furniture in the various categories; thus total benefits are lower for Germany than in the UK despite Germany having a larger tonnage of furniture waste because much of the additional tonnage is in lower impact materials such as wooden furniture.

Job Creation and Economic Impacts

There is relatively little analysis on the job creation potential of reuse in the furniture sector that is likely to result from the introduction of policy packages such as those considered within this study. However, previous work by RREUSE considered that traditional reuse centres would create 70 to 80 jobs per 1,000 tonnes of material collected and reused.[75] On this basis, around 156,000 jobs could be created by implementation of the Full Mandatory policy package through the higher reuse levels alone.

Job creation from the increases in recycling is anticipated to be somewhat more modest, although there is relatively little data in respect of recycling in the furniture sector per se. However, data from the Ellen MacArthur Foundation indicated that recycling might

result in additional job creation of 2 jobs per 1,000 tonnes (using data for textiles and wood processing). This would equate to around 7,300 additional jobs created under the Full Mandatory package across the whole of Europe.

Analysis of the economic impacts of increasing circularity in the furniture sector is similarly sparse. Eunomia has previously considered this in the UK context in a report published for SUEZ in 2017.[76] The analysis undertaken within the report considered increases that may arise in the Gross Value Added (GVA) resulting from increases in the recycling and reuse of furniture. The GVA is - in economics - a measure of the value of goods and services produced in a given area, industry or sector of an economy. The GVA associated with preparing furniture, WEEE, mattresses and textiles for reuse was calculated based on the average time taken to repair products. These times were multiplied by Defra estimates of the GVA per hour worked in different repair sectors.

The GVA associated with recycling different materials was calculated based on the employment intensities of different recycling processes. These figures were multiplied by the UK average salary for 'recovery of sorted materials' to estimate unit GVA impact figures. These figures enabled the GVA associated with increasing recycling rates under the different scenarios to be calculated (after accounting for the impacts of waste prevention).

The analysis estimated that the potential increase in GVA from improved circularity in the furniture sector was in the order of £500 million (€560 million) for the UK under the most ambitious scenario, by 2030. It is difficult to scale these impacts up to provide for European estimates, as key assumptions such as salary data are likely to vary across the different countries. However, based on extrapolation of EU28 Member State population against UK population alone, this provides an estimate in the order of €4.8 billion[77] in increased GVA from improved circularity under the most ambitious scenario. Economic benefit estimates for the sector go beyond forecasts identified in other European furniture sector studies which focused on business as usual rather than the outcomes of policy options to drive improved circularity.

SUMMARY AND CONCLUSIONS

Summary and Conclusions

Estimates of the potential impact of each of the proposed policy packages have been modelled through the application of available data and use of key assumptions referenced within this report and compiled in the Appendix, with a summary of the key headlines presented in Table 15 below, with respect to impact on additional tonnage for recycling and reuse, net carbon reduction and job creation.

While there is no robust data to help predict the precise outcomes, we have used various data reference points (examples that provide an indication of likely impact for example) and relevant carbon factors (by material), labour and cost saving indicators to provide a very approximate indication of the scale of the benefits.

To a large extent the outcomes for each policy package reflect the assumptions made, and while we think these are reasonable, the impact figures must be seen as tentative. More detailed research, than what was possible in this study, is recommended to gain a more accurate and detailed indication of the benefits.

While the EU furniture industry has so far managed to remain reasonably competitive worldwide, it has increasingly faced problems in signalling the quality and sustainability of its products in its own domestic market. Whilst EU furniture products still represent a considerable share of the high-end furniture market globally, growing pressure on the lower-end segments of the market from cheaper products from other areas of the world has the potential to erode market share significantly. In some regards there is no longer a level-playing field, with competitors from low-cost countries having certain key advantages, for example in regard to labour laws and environmental standards[1].

Circular economy interventions have the potential to help counter these trends, with repair, refurbishment and remanufacture allowing value recovery, economic growth and job creation within the European furniture industry.

Table 15: Policy Packages - Estimated Potential Impacts

	Policy Package	Additional tonnes reused	Additional tonnes recycled	Estimated net carbon impacts for scenario, tonnes CO_2 eq.	Additional job creation
1	Full Mandatory	2,097,962	3,670,289	-5,713,542	157,347
2	Part Mandatory	1,546,538	3,149,566	-4,933,647	115,990
3a	Full Voluntary - self-regulatory	1,069,288	2,392,433	-2,896,593	80,197
3b	Full Voluntary - industry-led	717,278	1,470,269	-2,172,445	53,796
4	Incentives only	440,452	1,053,690	-1,810,371	33,034
5	Information only	227,187	687,853	-1,448,296	17,039
6	Waste management only	168,225	3,185,947	-3,343,633	12,617

Whilst recycling rates in the EU have improved through the introduction of policy mechanisms such as the Landfill Directive, there is minimal activity in higher-value circular resource flows, with remanufacturing accounting for less than 2% of the EU manufacturing turnover[79]. In terms of furniture in particular, whilst reuse of furniture is common, this tends to be on a small scale and with local social goals in mind rather than larger scale environmental and economic ones.

Realising these economic, environmental and social benefits will therefore require the adoption of appropriate demand and supply chain levers, to support a significant step change across the industry. **It is clear from the consultations undertaken that there are a wide range of barriers to greater circularity in the EU furniture sector, from technical issues around design and chemicals policy to market issues relating to the low relative cost of new furniture.** Various policy instruments have the potential to help overcoming the main barriers, with a need to address both supply side and demand side issues to provide both the market push and pull required.

The logic suggests that a mandatory but simple EPR system, with gradually increasing targets for 'preparing for reuse' and separate recycling targets, would provide the most certainty in terms of positive outcomes. For a maximum ambition, this would be combined with eco-design regulations including horizontal requirements around materials use (sustainability, chemicals), durability, reparability (including availability of spares) and recyclability. As part of this it would be mandatory for manufacturers, as a minimum, to make public the materials and chemicals used (in a Product Information System or otherwise), to assist 'preparing for reuse' and recycling activities. Those could also act as standards to ensure a level playing field for EU manufacturers in regard to imports.

We would emphasise that restricting the use

of Candidate List SVHC chemicals (or, to go further, the Sin List chemicals[37]; going forward would help to future proof 'preparing for reuse' and recycling, while time bounded and clearly targeted temporary exemptions could be considered on a case-by- case basis for recycling with associated marking, to ensure the traceability on contaminated recycled materials can be ensured.

While less certain in outcome than a mandatory EPR system, an industry-led, EU-wide voluntary agreement (VA) on take-back, preparing for reuse and recycling, again with very clear and progressively tightening targets, could also provide a potential solution. Collective schemes at the EU-wide level would be preferable so as to prevent complications around national variations. This would need to be closely monitored by the Commission and mandatory EPR introduced should progress be too slow.

Another potential instrument that could be an element of several policy packages is a Green Furniture Mark (GFM), with mandatory or voluntary labelling of products around a core set of criteria (common with possible eco-design requirements, GPP and EU Ecolabel), with a points-based performance scale (e.g. A to G as per the Energy Label approach), adopted at an EU-level to help drive uptake of greener products.

A significant discount on EPR fees could be given to furniture that meet a certain level of GFM requirements (e.g. a C rating) so as to drive uptake. The GFM criteria would be reviewed and revised regularly (led by the industry), and with the potential for mandatory eco-design regulation if progress is too slow or lacking in ambition.

Proving durability can be onerous in testing terms and hence an alternative here may be the mandating of longer free warranty periods (e.g. five years) or mandatory labelling of warranty period - to clearly display the 'free' manufacturers/retailer warranty in a large

format next to the product, potentially as part of the GFM labelling.

In addition, it is worth noting that at present there is a patchwork of Circular Economy related criteria across various policy instruments (particularly when all national schemes as well as EU-wide schemes are taken into account) which can make participation complex and difficult for producers. Even with regard to GPP, a 2011 DG Environment study identified that the target for 50% of all public tendering procedures endorsing common GPP criteria by 2010 was not reached[80].

Therefore, **it would be desirable to have an agreed common set of core criteria, and a related 'Green Furniture Mark' (GFM), with the intention of providing consumers and procurers with a simple means of assessing product circularity, using the well-established A to G rating approach; from entry level basic eco-design requirements (G) through to a circular 'excellence' benchmark (A), which could align with the Eco-label standard.** The GMF would be deployed alongside (rather than substituting) existing EU instruments, such as the EU Ecolabel and GPP Criteria.

To drive demand, core CE GPP criteria for furniture would be put in place and made mandatory across all public sector institutions, including the need to purchase GFM furniture above a certain class (e.g. B) and consideration of lease options (in the context of whole life costing).

In terms of incentives and support for the furniture sector, we would suggest an EU-wide SME support initiative for CE innovation in the sector, including grant aid where appropriate. A transitional tax stimulus (reduced rates of business tax) for those in the sector involved in CE approaches (repair, refurbishment and remanufacture), could be used as an additional or alternative measure.

In terms of the consumer, we believe that awareness raising initiatives alone (the GFM approach aside) are likely to be a weak driver and that financial instruments may be helpful to stimulate demand in a cost-conscious market. Reduced VAT on repair activities and GFM A-rated furniture for example could be helpful in this regard.

Consumers could also be incentivised to return furniture for reuse, for example by having a refundable levy (paid on purchase on a new item), or free bulky waste collections, where the item is going to a reuse/preparing for reuse or remanufacturing organisation. Finally, a simpler measure would be a landfill ban on whole (i.e. largely intact) furniture, although this in isolation would not be guaranteed to drive reuse and recycling over energy from waste (EfW) treatment.

These various measures in combination would have variable affect in terms of the volumes and types of furniture diverted for reuse, recycling and EfW.

APPENDIX

Policy Package Analysis Assumptions

Package 1: Fully Mandatory

Supply Side

- Mandatory EPR for take back, with preparing for reuse and recycling targets, and with a modulated fee (that takes account of the different costs and environmental impacts of different products and materials) or an IPR approach, to encourage better design for repair and recycling.

- Mandatory eco-design measures on durability, repair and recyclability or a mandatory warranty period of five years to drive durability and reparability. This could be associated with a GFM label approach to reinforce and extend good practice.

Demand Side

- Mandatory Green Public Procurement (GPP) to drive demand for reuse and remanufactured items (other aspects taken care of by mandatory eco-design).

Assumptions for modelling:

- 100% of market

- 25% reuse, 45% recycling, 15% EfW, 15% landfill

References:

The French EPR law sets targets for 2017[81]:

- A re-use and recycling target of 45%, and 80% for recycling plus recovery for waste household furniture;

- A 75% reuse and recycling rate for workplace furniture, and a 80% recovery rate;

- A separate reuse target in the form of increasing the amount of used furniture put

back on the market by 50% from a baseline situation by 2017.

- Government procurement (excluding wider public sector) in the UK represents approximately 10% of the office furniture market[82]. Other EU studies indicate that the public sector spend on office furniture represents 15% of the market; DG Enterprise and Industry (2014) EU Furniture Market Situation Report[83].

Package 2: Part Mandatory

Supply Side

- Mandatory EPR for take back, with preparing for reuse and recycling targets, and with a modulated fee based upon the 'Green Furniture Mark' (GFM) criteria, or an IPR approach, to encourage better design for repair and recycling.

- EU-wide GFM approach, with an A to G rating for furniture, with mandatory labelling but no mandatory eco-design standard.

Demand Side

- Mandatory GPP for the public sector, with common criteria to the GFM or a certain GFM level required (e.g. B rating).

Assumptions for modelling:

- 100% of market

- 20% Reuse, 40% recycling, 20% EfW, 20% landfill

- Assumes that weaker eco-design drivers make it harder to meet higher levels of reuse and recycling, but that demand is still strong.

Reference:

- Government procurement (excluding wider public sector) in the UK represents approximately 10% of the office furniture market[84].

- Other EU studies indicate that the public sector spend on office furniture represents 15% of the market DG Enterprise and Industry (2014) EU Furniture Market Situation Report[85].

Package 3: Full Voluntary (with extra promotion)

Supply Side

- EU-wide voluntary agreement (Self-Regulatory Initiative) on take back, preparing for reuse and recycling as an alternative to mandatory EPR.

- Voluntary use of the GFM (industry led voluntary initiative), but driven by GPP.

Demand Side

- Voluntary GPP as now, but with reference to a minimum standard under GFM (e.g. B rated).

- Promotion of the GFM label for which the highest rating class A corresponds to what is also required by the more comprehensive EU Ecolabel scheme.

Assumptions for modelling:

- A) 80% of market (formal Self-Regulatory Initiative) – Overall split (including baseline): 16% Reuse, 32% recycling, 26% EfW, 26% landfill

- B) 60% of market (industry-led voluntary initiative) - Overall split (including baseline): 12% Reuse, 24% recycling, 32% EfW, 32% landfill

References

Self-regulatory initiative - conditions for a voluntary agreement which would replace a regulation under the EU Eco-design Directive demands that the industry initiatives must cover 80% of the market share for the respective product category in scope.

- UK Uptake of voluntary agreements co-ordinated by WRAP:

- Courtauld Commitment - includes food & drink businesses representing 95% of the 2016 UK food retail market[86];

- SCAP - WRAP's Sustainable Clothing Action Plan (SCAP) 2020 commitment currently has over 80 signatories and supporters representing more than 65% of UK retail sales by volume[87];

- HAFSA - Over 230 leading signatories and supporters signed up to support these aims, covering approximately 25% of the UK sector (calculated by food and drink sales, including wholesale and distribution)[88].

- It should be noted that the above are signatories, and some do far more than others in terms of their active involvement, hence the 50% figure, representing the top few companies that have a large market share, e.g. IKEA, Nobilia (29% market share in Germany for kitchens), Hermann Miller, etc.

Package 4: Incentives Only

Supply Side

- EU-wide SME support initiative for CE innovation in the sector, combined with tax incentives, grants and/or low interest loans for CE furniture companies.

- Deposit-refund incentive for consumers to return furniture for reuse and recycling, i.e. a refundable levy on new furniture, or a modulated 'bulky waste' collection charge – free where the item is reusable.

Demand Side

- Mandatory labelling of warranty period; to clearly display the 'free' manufacturers/retailer warranty in a large format next to the product.

- Tax incentives for refurbished/remanufactured items; e.g. lower rates of VAT.

Assumptions for modelling:

- 50% of market - Overall split (including baseline):

- 10% Reuse, 20% recycling, 35% EfW, 35% landfill

References

- For a 30p deposit, A.G. Barr is currently recording return rates of 54% for its returnable glass bottle scheme. Germany and Sweden have increased recovery rates to 85%.

- Furniture price elasticity values 1.26 for furniture in general; http://www2.econ.iastate.edu/classes/econ101/vandewetering/chapter5notes.htm

- So for a 10% price decrease, there would be an increase in sales of 12.5% (Sofa = 1.73, Cabinet = 0.97, Table = 0.34)[89]

Package 5: Information Only

Supply Side

- Mandatory Product Information Systems from the OEMs to drive repair and remanufacture.

- Voluntary use of the GFM, but driven by GPP.

Demand Side

- Mandatory labelling of warranty period; to clearly display the 'free' manufacturers/retailer warranty in a large format next to the product.

- Voluntary GPP as now, but with reference to a minimum standard under GFM (e.g. B rated).

- Promotion of the GFM label for which the

highest rating class A corresponds to what is also required by the more comprehensive EU Ecolabel scheme.

Assumptions for modelling:

- 40% of market - Overall split (including baseline):

- 8% Reuse, 16% recycling, 38% EfW, 38% landfill

References

- Studies show that the most trusted labels are those based on government standards, like organic, LEED and Energy Star in the United States, or those backed by NGOs. Business-led standards remain less trusted by consumers even when they are recognized as high-quality standards by stakeholders.

- EU eco-label for wooden furniture only has three companies as license holders, although with 232 products in total (193 with one Spanish company). Blue Angel in Germany is one of the most well-used labels for furniture but still only has 24 companies, 72 products; Nobilia has a 29% market share for kitchens in Germany but only has 10 certified products.

Package 6: Waste Management Only

- EU wide landfill ban on furniture disposal.

- Clearer regulation/guidance from the EU around end of waste and use of recycled materials.

Assumptions for modelling:

- 80% of market (assuming some countries get a derogation) - Overall split (including baseline):

- 7% Reuse, 40% recycling, 43% EfW, 10% landfill (in mixed general waste).

Assumptions Used for Scenarios by Furniture Categories

	Reuse	Recycling	EfW	Landfill
BASELINE				
Kitchen Furniture		8%	46%	46%
Mattresses		14%	43%	43%
Metal furniture	8%	8%	42%	42%
Non Upholstered seats	8%	8%	42%	42%
Other furniture			50%	50%
Upholstered seats/ sofa beds/ futon	10%	8%	41%	41%
Wooden furniture	10%	10%	40%	40%
Overall	5%	10%	42%	42%
SCENARIO 1				
Kitchen Furniture	5%	40%	28%	28%
Mattresses	5%	60%	18%	18%
Metal furniture	40%	40%	10%	10%
Non Upholstered seats	40%	40%	10%	10%
Other furniture			50%	50%
Upholstered seats/ sofa beds/ futon	40%	40%	10%	10%
Wooden furniture	40%	45%	8%	8%
Overall	25%	45%	15%	15%
SCENARIO 2				
Kitchen Furniture		35%	33%	33%
Mattresses		55%	23%	23%
Metal furniture	35%	35%	15%	15%
Non Upholstered seats	38%	35%	14%	14%
Other furniture			50%	50%
Upholstered seats/ sofa beds/ futon	38%	35%	14%	14%
Wooden furniture	32%	40%	14%	14%
Overall	20%	40%	20%	20%
SCENARIO 3a				
Kitchen Furniture		30%	35%	35%
Mattresses		45%	28%	28%
Metal furniture	27%	30%	22%	22%
Non Upholstered seats	27%	30%	22%	22%
Other furniture			50%	50%
Upholstered seats/ sofa beds/ futon	25%	30%	23%	23%
Wooden furniture	27%	30%	22%	22%
Overall	16%	32%	26%	26%
SCENARIO 3b				
Kitchen Furniture		22%	39%	39%
Mattresses		32%	34%	34%
Metal furniture	20%	22%	29%	29%
Non Upholstered seats	20%	22%	29%	29%
Other furniture			50%	50%
Upholstered seats/ sofa beds/ futon	20%	22%	29%	29%
Wooden furniture	22%	22%	28%	28%
Overall	12%	24%	32%	32%
SCENARIO 4				
Kitchen Furniture		18%	41%	41%
Mattresses		28%	36%	36%
Metal furniture	15%	18%	34%	34%
Non Upholstered seats	15%	18%	34%	34%
Other furniture			50%	50%
Upholstered seats/ sofa beds/ futon	15%	18%	34%	34%
Wooden furniture	18%	18%	32%	32%
Overall	10%	20%	35%	35%
SCENARIO 5				
Kitchen Furniture		15%	43%	43%
Mattresses		22%	39%	39%
Metal furniture	12%	15%	37%	37%
Non Upholstered seats	12%	15%	37%	37%
Other furniture			50%	50%
Upholstered seats/ sofa beds/ futon	12%	15%	37%	37%
Wooden furniture	14%	15%	36%	36%
Overall	8%	16%	38%	38%
SCENARIO 6				
Kitchen Furniture		35%	53%	12%
Mattresses		55%	37%	8%
Metal furniture	12%	38%	41%	9%
Non Upholstered seats	12%	38%	41%	9%
Other furniture			81%	19%
Upholstered seats/ sofa beds/ futon	12%	38%	41%	9%
Wooden furniture	12%	38%	41%	9%
Overall	7%	40%	43%	10%

Supplementary Tables

Indicative Composition of Furniture Items

Furniture item	Indicative composition (principal materials only)						
	Textiles	Alu	Steel	Wood	Plastic / Latex	PUA foam	Chip board
Kitchen Furniture [1]			2%	40%	2%		54%
Mattresses [2]	29%		20%		13%	35%	
Metal furniture [3]		20%	80%				
Non Upholstered seats [3]			80%		20%		
Other furniture [3]				50%	50%		
Upholstered seats/ sofa beds/ futon [3]	15%		10%	45%		30%	
Wooden furniture [3]				50%			50%

Source:
[1] WRAP 'Reducing the impacts of home products
[2] Europur (2016) Flexible polyurethane foam in mattresses – overview of possible end of life solutions. Volume and mix of end of life material from mattresses
[3] Industry expert

Assumptions Used to Model Baseline and Scenarios (End-of-life Stage)

Scenario Number	Scenario name and description		Net % Overall For Each Waste Option			
			Reuse	Recycling	EfW	Landfill
0	Baseline		5%	10%	43%	43%
1	Full Mandatory		25%	45%	15%	15%
2	Part Mandatory		20%	40%	20%	20%
3	Full Voluntary (extra promotion)	a) self-regulatory	16%	32%	26%	26%
		b) industry led true voluntary	12%	24%	32%	32%
4	Incentives only		10%	20%	35%	35%
5	Information only		8%	16%	38%	38%
6	Waste management only (landfill ban)		7%	40%	43%	10%

References

1   CSIL processing of data from Eurostat, National Statistical Offices, National Furniture manufacturers associations, cited in the EU Furniture Market Situation Report (2014)

2   European Remanufacturing Network (2015) European Remanufacturing Network Market Study

3   European Remanufacturing Council, Supporting Remanufacturing – the Backbone of the Circular Economy http://www. remancouncil.eu/work-programme.php

4   Scoring and Rating BREEAM assessed buildings http://www.breeam.com/ BREEAM2011SchemeDocument/Content/03_ ScoringRating/scoring.htm

5   It should be noted that there are some clear differences between furniture categories; for example EPR for mattresses would be aimed solely at increased recyclability (given hygiene concerns over reuse of mattresses), while EPR for other furniture would also have a preparing for use aspect.

6   It should be noted that there are some clear differences between furniture categories; for example EPR for mattresses would be aimed solely at increased recyclability (given hygiene concerns over reuse of mattresses), while EPR for other furniture would also have a preparing for use aspect.

7   For the purpose of analysis, assumptions here include a formal Self-Regulatory Initiative, which covers 80% of the EU market share.

8   For the purpose of analysis, assumptions here include a voluntary industry-led initiative, which covers 60% of the EU market share.

9   Eunomia (2016) A Resourceful Future – Expanding the UK Economy, report for SUEZ Recycling and Recovery UK

10   Based on UK population being 13% of EU28

11   CSIL processing of data from Eurostat, National Statistical Offices, National Furniture manufacturers associations, cited in the EU Furniture Market Situation Report (2014)

12   PRODCOM - Production, Import and Export data (€) by NACE code; Eurostat - Purchasing power parities (PPPs), price level indices for furniture and furnishing, carpets and other floor coverings by Member State; and Furniture Reuse Network (FRN) – average furniture weight by type for 2009.

13   Appendix A1.0 provides a summary of the calculation method used.

14   European Commission – Eurostat Prodcom statistics

15   Where consumption is a measure of production, plus import, minus export.

16   DG Enterprise and Industry (2014) EU furniture market situation and a possible furniture products initiative

17   Source data used the purpose of analysing furniture waste generation and treatment are there that act as a guide. E.g., they either only reflect activity within a single Member State (or may not be a representative sample), or there are no details on how the estimates were arrived at.

18   UEA, Eco-label Furniture. Extension of the Scope. Final report. August 2004. Note: no details identified on how this estimate was arrived at.

19   WRAP (2012) Estimated that 670,000 tonnes of furniture waste was generated as part of this bulky waste. Eurostat estimated that in 2012 the UK generated 30,143,000 tonnes of MSW, furniture therefore representing 2% of the MSW stream.

20   In 2013 Eco Mobilier estimated that 1.7M tonnes of household furniture waste was produced in France, compared with a total MSW of 33.9 tonnes. Furniture therefore representing 5% of the total.

21   DG Enterprise and Industry (2014) EU furniture market situation and a possible furniture products initiative - estimated that the domestic sector accounts for 82% of furniture consumption, with the remaining 18% associated with B2B consumption

22   Example calculation - EU28 – 243,515,000 MSW tonnage*3.75%*118% = 10,775,538 tonnes)

23   As noted above there is low

confidence in this data and this is reflected by the large tonnage range when considering household furniture waste at 2% and 5% of MSW - 5.75 million tonnes p.a. (at 2% MSW) to 14.4 million tonnes p.a. (at 5% MSW).

24   European Manufacturing Network (2015) Remanufacturing Market Study

25   Both furniture and electricals – assume furniture accounts for approximately 90,000 tonnes collected

26   Based on 1.4m tonnes of furniture waste arising in the UK (domestic and commercial)

27   European Remanufacturing Network (2015) European Remanufacturing Network Market Study

28   European Remanufacturing Network (2015) European Remanufacturing Network Market Study

29   The EU Furniture Market Situation and a possible Furniture Products Initiative (2014) European Commission DG Enterprise and Industry

30   European Remanufacturing Council, Supporting Remanufacturing – the Backbone of the Circular Economy http://www.remancouncil.eu/work-programme.php

31   DG for Internal Policies (2016) A Longer Lifetime for Products: Benefits for Consumers and Companies

32   EC General Product Safety Directive places a general duty on suppliers of consumer products to supply only products which are safe. Transposal of the Directive at a Member State level has seen requirements introduced for retailers to ensure that the permanent label is on the goods when they supply them to the consumers.

33   Including the existing Waste Framework Directive 2008/98/EC Article 8, Extended Producer Responsibility

34   European Parliament (Feb 2017) Briefing on legislation in progress – Circular Economy Package: Four legislative proposals on waste

35   European Commission (2014) The 'Blue Guide' on the implementation of EU product rules http://ec.europa.eu/DocsRoom/documents/4942/

36
 http://www.gispen.nl

37   (http://chemsec.org/business-tool/sin-list/

38   https://www.wood.be/projecten/sustech

39   JRC (2015) Revision of GPP and Ecolabel for Furniture – Technical Report 3.0 Working Document for Written Consultation http://susproc.jrc.ec.europa.eu/furniture/docs/GPP_Furniture_TR_for_consultation_Oct_2015.pdf

40   Drivers, Barriers and Benefits of the EU Ecolabel in European Companies' Perception

41   DG Enterprise and Industry (2014) The EU Furniture Market Situation and a Possible Furniture Products Initiative, November 2014, https://www.ceps.eu/system/files/Final%20report_en.pdf

42   https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/341462/Furniture_GBS_impact_assessment_1407.pdf

43   http://data.consilium.europa.eu/doc/document/ST-11688-2017-INIT/en/pdf

44   DG ENV (2012) Uptake of Green Public Procurement in the EU27. CEPS and College of Europe http://ec.europa.eu/environment/gpp/pdf/CEPS-CoE-GPP%20MAIN%20REPORT.pdf

45   DG ENV (2008) The use of differential VAT rates to promote changes in consumption and innovation http://ec.europa.eu/environment/enveco/taxation/pdf/vat_final.pdf

46   https://ec.europa.eu/taxation_customs/consultations-get-involved/tax-consultations/public-consultation-reform-rates-vat-towards-modernised-vat-rates-policy_en

47   (1999/44/EC)

48   DG for Internal Policies (2016) A Longer Lifetime for Products: Benefits for

Consumers and Companies

49   https://www.europe-consommateurs.eu/fileadmin/user_upload/eu-consommateurs/PDFs/PDF_EN/REPORT-_GUARANTEE/country_fact_sheets/Country_fiche_NL.pdf

50   T. Padding & G.H. Versteeg (2015) Lessons from ProRail Facilities Services Circular Procurement Pilots https://www.pianoo.nl/sites/default/files/documents/documents/pilot-circular-procurement-furniture-prorail-facilities-services-june2015.pdf

51   http://chemsec.org/business-tool/sin-list/)

52   http://chemsec.org/business-tool/sin-list/)

53   EC DG ENV (2012) Uptake of Green Public Procurement in the EU27. Centre for European Policy Studies, and College of Europe http://ec.europa.eu/environment/gpp/pdf/CEPS-CoE-GPP%20MAIN%20REPORT.pdf

54   It should be noted that there are some clear differences between furniture categories; for example EPR for mattresses would be aimed solely at increased recyclability (given hygiene concerns over reuse of mattresses), while EPR for other furniture would also have a preparing for use aspect.

55   It should be noted that there are some clear differences between furniture categories; for example EPR for mattresses would be aimed solely at increased recyclability (given hygiene concerns over reuse of mattresses), while EPR for other furniture would also have a preparing for use aspect.

56   Note that these benefits do not include the potential benefits associated with sequestering the wood.

57   Sources: Zero Waste Scotland (2011) The Scottish Carbon Metric Carbon Factors, March 2011; Zero Waste Scotland (2013); The Scottish Carbon Metric - A National Carbon Indicator for Waste: 2013; WRAP (2011) Benefits of Reuse Case Study - Furniture

58   For wood (and kitchen furniture), the WRAP data on recycling (Table 8) does not account for carbon sequestration, and hence, the data presented here will inevitably underestimate the benefits of recycling wood.

Accurate forecasting of the benefit of wood recycling is limited further by the absence of an agreed methodology for accounting for the recycling benefit of wood recycling, and agreement with respect to how long carbon would be sequestered for within recycled wood.

59   JRC / Bio Intelligence Service (u.d.) Environmental Improvement Potential of Textiles (IMPRO-Textiles), Publication Draft for European Commission

60   JRC (2012) The International Reference Life Cycle Data System (ILCD) Handbook

61   These benefits would apply where wood was reused or recycled, but not where wood was sent for combustion. Some of this benefit would also be applicable for landfilled wood (to the proportion that did not degrade, which is typically considered to be around 50% of the total in most landfill decay models that follow the IPCC methodology.

62   Further sequestration benefits may be applicable if the wood was subsequently recycled or reused beyond this point. These benefits would not be applicable, however, if the wood was sent for combustion.

63   Adapted from the WRAP benefits of reuse methodology. Impacts have been updated to include an estimation of the benefits of carbon sequestration.

64   Whilst only outdoor furniture is referenced here, the benefit of material substitution is considered to represent value in wider categories of furniture, with respect to mitigating climate change impacts during manufacturing.

65   Project Learning Tree (u.d.) Southeastern Forests and Climate Change

66   Figure 2 EU28 Furniture consumption (tonnes) by category

67   Eunomia / CRI (2014) Development of a Modelling Tool on Waste Generation and Management, Report and Appendices for the

Appendix

European Commission DG Environment

68 Assuming 80% EU market coverage

69 Assuming 60% EU market coverage

70 Reused furniture to low income households does not always displace purchases of new furniture.

71 Assuming 80% EU market coverage

72 Assuming 60% EU market coverage

73 Assuming 80% EU market coverage

74 Assuming 60% EU market coverage

75 RREUSE (2015) Briefing on job creation potential in the re-use sector – assumptions based on reuse activities only.

76 Eunomia (2016) A Resourceful Future – Expanding the UK Economy, report for SUEZ Recycling and Recovery UK

77 Based on UK population being 13% of EU28

78 The EU Furniture Market Situation and a possible Furniture Products Initiative (2014) European Commission DG Enterprise and Industry

79 European Remanufacturing Council, Supporting Remanufacturing – the Backbone of the Circular Economy http://www.remancouncil.eu/work-programme.php

80 EC DG ENV (2012) Uptake of Green Public Procurement in the EU27. Centre for European Policy Studies, and College of Europe http://ec.europa.eu/environment/gpp/pdf/CEPS-CoE-GPP%20MAIN%20REPORT.pdf

81 Note from Eco-Mobilier and http://www.rreuse.org/wp-content/uploads/EPR_and_product_reuse.pdf

82 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/341462/Furniture_GBS_impact_assessment_1407.pdf

83 https://www.ceps.eu/system/files/Final%20report_en.pdf

84 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/341462/Furniture_GBS_impact_

assessment_1407.pdf

85 https://www.ceps.eu/system/files/Final%20report_en.pdf

86 http://www.wrap.org.uk/content/courtauld-commitment-2025-influence-touches-95-uk-food-retail-market-share

87 http://www.wrap.org.uk/sustainable-textiles/SCAP/signatories

88 http://www.wrap.org.uk/content/hospitality-and-food-service-agreement-taking-action-waste

89 Prezi https://prezi.com/nqkjikrgtaue/house-furniture/