INDICATORS AND METHODS FOR MEASURING TRANSITION TO CLIMATE NEUTRAL CIRCULARITY

Task 5: Case-study group 3

Report for: DG RTD, Directorate B – Healthy Planet, Unit B1: Circular Economy & Biobased Systems

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1. INTRODUCTION

The transition to a circular economy (CE) needs to occur on multiple levels, from households and individual consumers to national and cross-border ecosystems. Measuring and monitoring the development of this transition is an ambitious task and is ideally supported by indicators relevant to all steps in that process.

This case-study is one of 19 developed for a research project into "*Indicators and methods for measuring transition to climate neutral circularity, its benefits, challenges and trade-offs*". It provides a detailed summary of the development and testing programme conducted for Group 3 of the 'Households' sub-policy area during Task 5 of the project. The main purpose of this case-study is:

1. Provide an overview of the testing and monitoring method adopted for each indicator.
2. Outline the key results and performance of each indicator.
3. Highlight any challenges or lessons learnt from the identification, planning, delivery and analysis of the relevant methodology for each indicator.

The aim of Task 5 is to take the learnings of all other Tasks thus far and develop and test the new indicators identified in Tasks 3 and 4 as having potential to enable a deeper understanding of the 3 facets of circularity for the five key approaches. This case-study is a direct output of Task 5.

This case-study focuses on the following 2 indicators outlined in Table 1**Error! Reference source not found.**.

Table 1. Overview of case-study Group 3

URN		Indicator name	Methodology	Level of implementation				
				European Union (EU)	National	City / Region	Companies	Household
H6	**1**	Reuse of consumer goods via reuse centres (kg/person).	Stakeholder engagement with reuse centres		x			x
H8	**2**	Comparison of the estimated technical lifetime of furniture products by manufacturers and the actual use time by households.	Environmental Product Declarations (EPDs) and citizens survey	x				x

2. INDICATOR 1: 'REUSE OF CONSUMER GOODS VIA REUSE CENTRES

This indicator aims to measure the annual level of reuse of consumer goods via reuse centres, measured in kg per person. A reuse centre is an entity that looks to extend the lifespan of goods by offering consumers the opportunity to donate and acquire pre-used goods (including many of which that have been upcycled). The process prevents these items from becoming waste and prolongs the duration of their use[1]. Consumer goods in this context is any good that is purchased by consumers for consumption and is not used in the manufacture of other goods[2]

The benefits of monitoring this indicator include:

- Helps to gain a better understanding of national differences associated with the use of reuse centres.
- Allows for future changes in behaviour and consumption patterns to be observed and analysed.
- Focuses on supporting activity higher up the waste hierarchy* (e.g. **reuse** of goods, **reducing** waste generation).

*The waste hierarchy is a ranking system used for different waste management options, giving priority to prevention, then reuse, followed by recycling, then recovery, finishing with disposal[3]

2.1 KEY METHODOLOGY

2.1.1 Testing method

The primary methodologies utilised to measure and test this indicator were desk-based research and consultation with key stakeholders. This indicator was tested across the following high priority products, as outlined in the Circular Economy Action Plan (CEAP)[4]:

- Electronics & information and communication technology (ICT).
- Batteries & Vehicles.
- Textiles.
- Furniture.

This indicator was tested across two Member States, the Netherlands and Belgium, with the system boundary being the weight of all goods within the pre-determined product categories that were reused on an annual period via reuse centres. The indicator is specifically looking at the weight of reused goods, rather than the weight of all goods that go through the centres. The Netherlands and Belgium were selected due to the availability of contacts within these nations, as well as the relatively large networks that these contacts spanned.

2.1.2 Data collection method

This indicator required tonnage data from reuse centres operating within EU Member States. A number of reuse organisation were contacted, primarily members of 'RREUSE'[5], an international network of social enterprises active in the CE, notably in the field of reuse. It was originally anticipated that all the data could be provided by RREUSE, but as the data belonging to individual reuse organisations was deemed confidential, RREUSE were unable to provide this. However, individual reuse centres within the RREUSE network were

[1] European Commission, Velenje – Transforming Waste to Worth. (Official website of the European Union, n.d.) https://environment.ec.europa.eu/topics/urban-environment/european-green-capital-award/inspiration/velenje-transforming-waste-worth_en. Accessed April 2024.

[2] Investopedia, Industrial vs. Consumer Goods. (Investopedia, 2021). https://www.investopedia.com/ask/answers/050415/how-are-industrial-goods-different-consumer-goods.asp. Accessed April 2024.

[3] DEFRA, Guidance on applying the waste hierarchy. (DEFRA, 2011). https://assets.publishing.service.gov.uk/media/5a795abde5274a2acd18c223/pb13530-waste-hierarchy-guidance.pdf. Accessed April 2024.

[4] European Commission, Circular Economy Action Plan. (Official website of the European Union, 2023). https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en. Accessed April 2024.

[5] RREUSE, rreuse. (RREUSE, n.d.). https://rreuse.org/. Accessed March 2024.

able to provide the data. Therefore, a number of organisations recommended by RREUSE were contacted via email to request this data.

Whilst numerous reuse centres/networks were contacted, ultimately data was only able to be attained from 'Kringloop Nederland'[6], a reuse network covering around 250 branches (reuse centres) throughout the Netherlands and 'Herwin'[7], the umbrella for reuse centres in the Flemish region of Belgium (Flanders), comprising of around 100 branches.

The following organisations were also contacted but with little to no success:

- Envie (France)8.
- RESSOURCES (Brussels & Wallonia, Belgium)9.
- Re-Use Austria (Austria)10.
- Kringwinkel Antwerpen (Antwerp, Belgium)11.

2.1.3 Calculations

The following formula was used to calculate the reuse of consumer goods via reuse centres (kg/per person):

$$The\ reuse\ of\ consumer\ goods\ via\ reuse\ centres = Weight\ of\ goods\ reused\ (kg)\ each\ year \div Population\ of\ region/state$$

As the data supplied by Kringloop Nederland consisted of the overall weight of collected items, it was necessary to calculate the weight of the goods that were specifically reused. To do this, the overall reuse rate (as supplied by the reuse centres) was applied to the overall collection weight:

$$Estimated\ weight\ of\ reused\ goods = Weight\ of\ goods\ collected\ (kg) \times Reuse\ rate$$

2.1.4 Timeline

The project timeline is shown in Table 2.

Table 2. Gantt chart for H6

WC	18-Dec	25-Dec	01-Jan	08-Jan	15-Jan	22-Jan	29-Jan	05-Feb	12-Feb	19-Feb	26-Feb	04-Mar	11-Mar	18-Mar	25-Mar
Task 1 - Define consumer goods and reuse centres															
Task 2 - Identify and contact key stakeholders and develop questions															
Task 3 - Disseminate survey / conduct interviews															
Task 4 - Explore backup datasets (if necessary)															
Task 5 - Create Excel model for calculations															
Task 6 - Analyse responses & conduct calculations															
Task 7 - Analysis of themes															
Task 8 - Case study write up															
Review period															
Key deliverables				Online survey									Initial draft case study		Draft case study

Legend

Task progress | Christmas holiday | Review period | Key deliverable

[6] Kringloop Nederland, Industry association Kringloop Nederland stands for a circular economy, inclusive society and a professional recycling industry. (Kringloop nederland, n.d.). https://www.kringloopnederland.nl/. Accessed March 2024.

[7] Hrewin, The collective of social circular entrepreneurs. (Herwin, n.d.). https://herwin.be/. Accessed March 2024.

[8] Envie, What we do. (Envie, n.d.). https://www.envie.org/. Accessed March 2024.

[9] Ressources, Ressources. (Ressources, n.d.). https://www.envie.org/. Accessed March 2024.

[10] Re-Use Austria, Home. (Re-use Austria, n.d.). https://www.envie.org/. Accessed March 2024.

[11] Kringwinkel Antwerpen, Home. (Kringwinkel, Antwerpen, n.d.). https://www.kringwinkel.be/antwerpen. Accessed March 2024.

2.1.5 Data gaps and mitigation

Table 3 summarises the data gaps encountered during the testing of this indicator, as well as the strategy implemented to mitigate the impacts, and the level of confidence in the resulting data.

Table 3. Overview of identified data gaps, limitations and mitigation efforts

	Description of data gap	Mitigation efforts	Level of confidence
1	Lack of reuse data covering all of Belgium, with only data from the Flanders region being available.	As the unit of measurement used for this indicator is kg/person, the calculation shown in **Calculations** used population data only from the Flanders region, rather than Belgium as a whole. This means an assumption was made that the level of reuse via reuse centres in Flanders was the same across other Belgian regions. Due to Flanders intentions of becoming a circular leader in EU[12], this is likely representative of a 'best case scenario' for Belgium.	Medium
2	Reuse data only being available from reuse centres covered in the Herwin and Kringloop Nederland networks.	The reuse networks that have been included in this study cover the vast majority of reuse centres in the Netherlands and Flanders. Any outstanding data is not likely to have a significant impact on the results of the analysis.	High

2.1.6 Quality review of analysis

To ensure robust and high-quality analysis of the data, the following QA procedure was conducted:

- Prior to work beginning, the Project Director reviewed the proposed research methodology and ensure that the data collection plan was fit for purpose. Only once the research team had addressed any comments from the review process did they proceed to the data collection phase.
- The Quality Assurance Manager held the responsibility for the quality of the final case study and supporting data documents. This quality assurance process was undertaken in conjunction with the Project Manager, who offered assistance in appraising the quality of the document as well as suggestions for improvement.

2.2 KEY ANALYSIS RESULTS

2.2.1 Analysis

Table 4 shows the weight of goods reused in Flanders in the years 2020, 2021 and 2022. The data shows that all priority products experienced a yearly decrease in the weight of goods reused from 2020 to 2022, except Batteries & Vehicles, which saw a small increase from 2020 to 2021, before a relatively significant decrease in 2022. All priority products other than Batteries & Vehicles saw their peak weights in 2020, whilst Batteries & Vehicles peaked in 2021.

[12] Circular Flanders, How circular is the Flemish economy? (Circular Economy Monitor Flanders, n.d. https://cemonitor.be/en/how-circular-is-the-flemish-economy-v2024/. Accessed 17th April 2024.

Table 4. Weight of goods reused across priority products in Flanders (2020 – 2022)

Priority product	Weight of goods reused 2020 (kg)	Weight of goods reused 2021 (kg)	Weight of goods reused 2022 (kg)
Electronics & ICT	2,225,970	2,188,190	1,856,300
Batteries & Vehicles	462,260	464,670	372,710
Textiles	4,445,140	4,194,610	3,299,090
Furniture	15,178,610	14,509,300	11,491,780

Table 5 shows the weight of goods reused in the Netherlands in the years 2020, 2021, and 2022. All priority products saw a decrease in the weight of goods reused from 2020 to 2021, with all areas then seeing an increase from 2021 to 2022. The Electronics & ICT and Batteries & Vehicles priority products saw their peak in 2022, whilst Textiles and Furniture peaked in 2020.

Table 5. Weight of goods reused across priority products in the Netherlands (2020 – 2022).

Priority product	Weight of goods reused 2020 (kg)	Weight of goods reused 2021 (kg)	Weight of goods reused 2022 (kg)
Electronics & ICT	15,059,720	12,778,400	17,973,069
Batteries & Vehicles	1,234,742	781,008	1,656,813
Textiles	30,469,501	26,805,290	29,998,778
Furniture	45,428,017	25,952,366	36,114,725

Table 6 displays the average weight of goods reused per person in Flanders from 2020 – 2022. The table shows that this figure decreased from 2020 – 2022 across all priority products. Furniture saw the highest average weight of reused goods per person each year.

Table 6. Average weight of goods reused per person in Flanders (2020 – 2022).

Priority product	Weight of goods reused per person 2020 (kg/person)	Weight of goods reused per person 2021 (kg/person)	Weight of goods reused per person 2022 (kg/person)
Electronics & ICT	0.336	0.329	0.277
Batteries & Vehicles	0.070	0.070	0.056
Textiles	0.671	0.630	0.492
Furniture	2.290	2.181	1.715

Table 7 displays the average weight of goods reused per person in the Netherlands from 2020 – 2022. The weight of Electronics & ICT and Batteries & Vehicles goods reused per person increased from 2020 – 2022, despite falling between 2020 – 2021. The weight of Textiles and Furniture goods reused per person peaked in 2020, decreasing in 2021, before increasing again in 2022, though not to the same level as was seen in 2020.

Table 7. Average weight of goods reused per person in the Netherlands (2020 – 2022).

Priority product	Weight of goods reused per person 2020 (kg/person)	Weight of goods reused per person 2021 (kg/person)	Weight of goods reused per person 2022 (kg/person)
Electronics & ICT	0.424	0.351	0.490
Batteries & Vehicles	0.035	0.021	0.045
Textiles	0.858	0.736	0.819
Furniture	1.279	0.713	0.986

Whilst Furniture was the product that had the highest weight of goods reused per person, it is likely that this is due to the large weight of individual items, rather than this product being reused more frequently.

The Covid-19 pandemic and resulting lockdowns across Europe may have impacted the data displayed above. It is suggested that the high levels of reuse in 2020 may have been a result of lockdowns, with households potentially making more donations to reuse centres as a result of time being spent clearing homes of unused goods. With more donations means more goods available and likely better choice for consumers, potentially increasing reuse. Further, uncertainty and financial worries during the pandemic may have also led households to consider attaining second-hand goods where they previously may have opted for new products.

The data presented in this section highlights the significant differences in reuse between Flanders and the Netherlands, with the Netherlands experiencing generally higher levels of reuse. This difference may be a result of the presence of a wider reuse network infrastructure and more supportive policies in the Netherlands compared to that in Flanders.

It is estimated that Kringloop Nederland covers around 7%[13] of reuse centres in the Netherlands, whilst Herwin is estimated to cover around 5%[14]. Whilst these figures may seem low, it is likely that the market shar that these organisations cover is much higher than this, due to the large number of small scale reuse centres likely to be in operation.

To view the raw data and subsequent analysis of this data, please refer to Appendix 4.2.

2.2.2 Limitations

The following limitations were identified through this testing programme:

- The data received from Kringloop Nederland was provided in terms of total weight of goods collected, along an average reuse rate covering all priority products (49% in 2020, 48% in 2021 & 2022). As individual reuse rates were not available, an assumption had to be made that this rate applied to all priority products equally, despite the actual rate likely fluctuating between priority products. This may have led to inaccuracies in estimating the actual reuse volumes.
- Similarly, assumptions had to be made with the data provided by Herwin. As this network only covers the Flanders region of Belgium, it had to be assumed that the reuse of consumer goods was at the same level per capita across Belgium as a whole. Due to Flanders intentions of becoming a circular leader in EU, the results are likely a representative of a 'best case scenario' for Belgium.
- Further, the data used in the testing of this indicator only came from reuse centres within the Kringloop Nederland and Herwin networks. Whilst these organisations do account for the vast majority of reuse centres across the Netherlands and Flanders, it is likely that there are some reuse centres that have not been recorded, impacting the accuracy of the analysis performed in Section 2.2.1.
- A key limitation that was discovered during the testing phase of this indicator was the confidentiality of data from reuse organisations. This prevented access to necessary data across regions and product

[13] Statista, Number of second-hand stores in the Netherlands from 2007 to 2022. (Statista, 2023). https://www.statista.com/statistics/1142520/netherlands-second-hand-stores-number/#:~:text=Over%20one%20thousand%20second%2Dhand,than%20five%20thousand%20in%202009.. Accessed April 2024.

[14] IBIS World, Second-Hand Goods Stores in Belgium. (IBIS World, 2023). https://www.ibisworld.com/belgium/industry-statistics/second-hand-goods-stores/14704/. Accessed April 2024.

categories, which led to data gaps and potentially impacted and distorted results as only partial data sets were available.

- As there is no standardised reporting format across different reuse centres and Member States, there is likely to be a degree of variability in the standard of this reporting. For instance, different organisations may have different methods for weighing and categorising goods, impacting the uniformity and reliability of the data that has been collected.

2.2.3 Performance

During Task 4 of this study, the original indicator, named “Reuse of consumer goods via De Kringwinkel” was given a score of 10 in the RACER evaluation process. This score was awarded as the indicator was deemed relevant to achieving circularity, but comparability between different member states was assumed to be difficult due to differences in the network of reuse centres across Member States.

Following Task 5, the indicator was awarded a score of 9 due to achieving a lower score on the ‘Ease’ criterion. This reduction in the ‘Ease’ score was due to the difficulties experienced in retrieving data from reuse centres, many of whom did not currently feel motivated to share this data. Further, of those reuse networks that did share data, they did not both cover the full Member State of which they operated meaning assumptions had to be applied to make the data usable for this indicator.

Table 8 provides an overview of the RACER evaluation for this indicator, before and after the completion of the testing programme.

Table 8. RACER evaluation

Stage of project	RACER criterion					Score
	Relevance	Acceptability	Credibility	Ease	Robustness	
Task 4 (original RACER assessment)	3	2	2	2	1	10
After Task 5 (following testing)	3	2	2	1	1	9

To ensure consistency in applying RACER, the assessment matrix shown in Appendix 4.3 was applied to support the decision making process.

2.3 CHALLENGES AND LESSONS LEARNED

2.3.1 Challenges

The main challenge faced when testing this indicator was the lack of responses from contacted stakeholders. Of the stakeholders that did reply, common reasons for not being able to share this data included that their organisation had confidentiality concerns, they did not have the capacity to share the data, or they were unwilling to without financial compensation. However, it is believed that this data is being collected be reuse organisations. Measures were taken to try to mitigate the impact of this challenge, including issuing follow-up emails to stakeholders and expanding the number of organisations that were contacted.

Further, those organisations that did share data (Herwin and Kringloop Nederland) were unable to provide the exact data that was originally required (e.g. Herwin only covering Flanders, Kringloop Nederland supplying collection data and overall reuse rate). Therefore, the data had to be manipulated and assumptions made to make it usable within the context of this study.

2.3.2 Lessons learned

Lessons learnt were recorded throughout the process of creating and testing this indicator, which should be applied to inform future assessments of indicators. They were as follows:

- During the stakeholder engagement process, it was found that there are no standard practices supporting the measurement of reused goods by reuse centres. The product categories that the goods were divided

into were decided by individual reuse organisations, as was the stage of the process where the goods were weighed (i.e. collected weight or reused weight). Therefore, the implementation of a standard measurement and reporting process would help to align different reuse organisations, simplify the data collection process and support harmonisation.

- It was also learnt that a large proportion of reuse organisations work on a regional scale rather than on a national basis. This should be considered in future data collection rounds, where multiple organisations within the same Member State may have to be engaged with, increasing the complexity of this process.

2.4 CONCLUSIONS AND RECOMMENDATIONS

It is recommended that this indicator is considered for further development, with significant work required to facilitate its progress.

The main findings discovered during the testing of this indicator were that the weight of goods reused per person via reuse centres in Flanders decreased across all priority products between 2020 – 2022, with these figures also decreasing within 'Textiles' and 'Furniture' products in the Netherlands.

Reuse is an essential facet of the CE, ranking high in the waste hierarchy. Proposals such as the EU Strategy for Sustainable and Circular Textiles[15] already set out actions aimed at increasing the level of reuse within the textiles industry, however further steps must be taken to incentivise reuse across all priority products within the EU.

One recommendation to assist in the measurement of this indicator is to implement mandatory volume reporting for reuse centres across Europe. This should guide reuse centres on what data to collect, the frequency of the data collection, and the priority products that should be used for categorisation purposes. It is important that this reporting process is made simple and achievable so as to not discourage the work being undertaken within these reuse centres. A standardised approach to reporting should be developed and adopted across Member States to ensure consistency and comparability of data. To support this, it is recommended that the EC develop and disseminate a set of guidelines detailing how goods should be categorised and weighed across all Member States.

The implementation of mandatory reporting will ensure that the data has good availability, directness, and robustness, whilst uniform reporting practices will ensure the objectivity of the data. In order to make the implementation of mandatory volume reporting as smooth as possible, it is recommended that the legislation is integrated into existing EU directives, such as the Ecodesign for Sustainable Products Regulation (ESPR)[16].

This reporting process should also explore potential synergies with reporting obligations for existing and upcoming Extended Producer Responsibility (EPR) schemes. It is important that these schemes ensure they set up the correct framework to support reuse activities, a feature that many have failed to do so far[17].

It is also recommended that research is undertaken to calculate the average weight of items reused within each priority product. Whilst an indicator measuring the number of items reused within each priority product would offer an insightful indicator, this feasibility of attaining this data is unrealistic. Therefore, it is recommended that average weights are calculated so that estimations can be made on the number of goods reused within each priority product. This would allow for a better picture of the level of reuse within different priority products, so those priority products with traditionally higher weights (e.g. furniture) can be compared with those with usually lower weights (e.g. textiles).

In order to support the implementation of this indicator, it is recommended that a new target is established with regards to the reuse of consumer goods via reuse centres. The target should be implemented within the ESPR, in line with its aim of setting reusability requirements for products. Whilst the ESPR is currently focussed on the design and production phases, there is scope for it to be expanded to include post-consumer phases. These targets could also be included within exiting waste management directives such as the Waste

[15] European Commission, EU strategy for sustainable and circular textiles. (Official website of the European Union, n.d.). <https://environment.ec.europa.eu/strategy/textiles-strategy_en>. Accessed March 2024.

[16] European Commission, Ecodesign for Sustainable Products Regulation. (Official website of the European Union, 2023). https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/sustainable-products/ecodesign-sustainable-products-regulation_en. Accessed April 2024.

[17] Policy Connect, Unpacking the Circular Economy: Unlocking Reuse at Scale. (Policy Connect, 2023). https://www.policyconnect.org.uk/research/unpacking-circular-economy-unlocking-reuse-scale. Accessed April 2024.

Framework Directive[18] or the Waste from Electrical and Electronic Equipment (WEEE) Directive[19]. The targets may be set in relation to the amount of goods reused annually (measured in kg per person), or targets for individual product categories may instead be developed.

In testing this indicator, it was found that a large proportion of reuse organisations operate on a regional scale, rather than a national one. Therefore, in order to ease future testing, it is recommended that this indicator is measured on a regional/city scale as opposed to the national scale that was originally proposed. As well as simplifying the data collection process, it will also help the indicator achieve more granular results by highlighting regional differences within the same Member State. That being said, the original naming of the indicator remains valid and fit for purpose.

Whilst there is not any direct crossover with this indicator and those within the new EU monitoring framework for CE, quantifying the reuse of consumer goods via reuse centres at a national level would indirectly support improvements across the following macro level indicators:

- **Material footprint:** i.e. a quantification of the demand for material extractions triggered by consumption and investment by households, governments and businesses across the EU. Encouraging the reuse of consumer goods would support the reduction of material footprints as goods are being reused by consumers, minimising the number of new goods that are needed on the market to meet demand.
- **Total waste generation per capita:** i.e. the total waste generated in a country (including major mineral wastes), divided by the average population of the country. Encouraging the reuse of consumer goods will reduce the number of new goods placed on the market, thereby reducing waste generation when these goods reach end of life.
- **Generation of municipal waste per capita:** i.e. the waste collected by or on behalf of municipal authorities and disposed of through the waste management system. Encouraging the reuse of consumer goods will reduce the number of new goods placed on the market, thereby reducing municipal waste generation when these goods reach end of life.
- **Consumption footprint:** i.e. the environmental impacts of EU and Member States consumption by combining data on consumption intensity and environmental impacts of representative products, with the indicator covering mobility as an area of consumption. Encouraging the reuse of consumer goods will reduce consumption footprint as fewer new goods will be purchased.

[18] European Commission, Waste Framework Directive. (Official website of the European Union, n.d.). https://environment.ec.europa.eu/topics/waste-and-recycling/waste-framework-directive_en. Accessed April 2024.

[19] European Commission, Waste from Electrical and Electronic Equipment (WEEE). (Official website of the European Union, n.d.). https://environment.ec.europa.eu/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en. Accessed April 2024.

Table 9. Summary of recommendations for H6

Type of recommendation	Recommendation	Timeline	Key stakeholders or partners	RACER Criteria addressed
Legislation	Implement mandatory reporting for reuse centres.	Medium (1.5 – 5 years)	• **Responsible:** European Commission (EC). • **Accountable:** National governments. • **Consulted:** National governments, reuse organisations. • **Informed:** Reuse organisations.	• **Ease:** The data collection process would be eased should this recommendation be implemented. • **Robustness:** Would increase the consistency and accuracy of the reported data.
R&D	Research the average weight of items within each priority product area.	Short (0.5 – 1.5 years)	• **Responsible:** EC. • **Accountable:** EC, National Governments. • **Consulted:** Reuse organisations. • **Informed:** Reuse organisations.	• **Robustness:** Data would be more robust with estimations more accurate should a standardised approach be introduced.
Guidance	A standardised approach to reporting should be implemented across Member States to ensure consistency and comparability. This should be supported by the creation of guidelines detailing how goods should be categorised and weighed.	Medium (1.5 – 5 years)	• **Responsible:** EC. • **Accountable:** EC, National Governments. • **Consulted:** Reuse organisations. • **Informed:** Reuse organisations.	• **Robustness:** Would increase the consistency and accuracy of the reported data.

3. INDICATOR 2: COMPARISON OF THE ESTIMATED TECHNICAL LIFETIME OF FURNITURE PRODUCTS BY MANUFACTURERS AND THE ACTUAL USE TIME BY HOUSEHOLDS

This indicator will measure the difference between the estimated technical lifetime of a furniture product at its point of manufacture versus its actual use time by the household. The 'estimated technical lifetime' of a furniture product is assumed as the time the furniture maintains its function, which is determined at the point of manufacture through considering both its technical design and aesthetic longevity. The 'average use time' is the actual length of time the household uses the product, from the point of purchase all the way through to its subsequent disposal or resale/donation.

Prolonging the lifespan of products is a key aspect of the CE. Maximising product lifespans will decrease the need for replacements, which will result in significant environmental savings. Value Retention Processes (VRPs) can be employed to support this, such as reuse, repair, remanufacture and refurbishment (The International Resource Panel, 2018).

There are many benefits for the EC to monitoring this indicator, including:

- Supportive of maximising resource utilisation and minimising waste generation.
- Quantifies the success of product life extension interventions.
- Encourages furniture manufacturers to increase the durability of their products.
- Encourages furniture manufacturers to provide instructions on proper care, maintenance and repair.

3.1 KEY METHODOLOGY

3.1.1 Testing method

Furniture was selected as the key focus for this indicator due to being identified as a key value chain for urgent action within the CEAP[20]. The ESPR will also set ecodesign requirements for furniture products across the EU, so this indicator would support the tracking of product-level performance improvements as a result of the new requirements.

During this research project, this indicator was tested across the following furniture items, which were selected due to their common use within households[21]:

- Mattresses.
- Upholstered furniture (e.g. upholstered sofas, armchairs, recliners, headboards, etc.).
- Divan bases (i.e. the wooden base/structure for mattress).
- Mostly metal furniture (e.g. metal chairs, tables, bedframes, filing cabinets, etc.).
- Mostly hard plastic furniture (e.g. children's chairs, outdoor chairs and tables, etc.).
- Wood-based panel, indoor freestanding furniture (i.e. items which are not fixed to a wall or floor, such as tables, desks and wardrobes).
- Solid wood, freestanding indoor furniture (e.g. solid wood tables, chests, etc.).
- Outdoor treated wood furniture (e.g. outdoor furniture, fencing, sheds, decking, etc.).

To measure this indicator, web scraping of Environmental Product Declarations (EPDs) was carried out for the selected furniture items and a citizen's survey was developed. Further information is provided on both methodologies in the following sub-headings.

[20]European Commission, Circular Economy Action Plan. (Official website of the European Union, 2023). https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en. Accessed April 2024.

[21] Note, these categories have been developed through experts opinion and stakeholder consultation in the UK.

The indicator aimed to be tested at an EU level. However, in order to meet efficiencies when disseminating the citizens survey, one key data input was collected across France only (rather than the entire EU). France was selected due to having an existing Extended Producer Responsibility (EPR) scheme for furniture, and therefore it was assumed that citizens/households would be more aware of sustainability credentials for these products. Please view Section 3.2.2 for further information on this.

3.1.2 Data collection method

This indicator required two separate data inputs across the above furniture items. The following sub-headings provide further details on the data collection method for each key data input.

3.1.2.1 Data input 1: Estimated technical lifetime

This data input refers to the estimated technical lifetime of furniture items at their point of manufacture, to be provided by furniture manufacturers. The estimated technical lifetime was calculated across each of the key furniture items listed in Section 3.1.1 as follows:

- Estimated technical lifetime for 'Mattresses'.
- Estimated technical lifetime for 'Upholstered furniture'.
- Estimated technical lifetime for 'Divan bases'.
- Estimated technical lifetime for 'Mostly metal furniture'.
- Estimated technical lifetime for 'Mostly hard plastic furniture'.
- Estimated technical lifetime for 'Wood-based panel, indoor freestanding furniture'.
- Estimated technical lifetime for 'Solid wood, freestanding indoor furniture'.
- Estimated technical lifetime for 'Outdoor treated wood furniture'.

To identify the estimated technical lifetime of the selected furniture items, web-scraping of publicly available furniture EPDs was conducted. In order to identify the relevant EPDs, the following two EPD online databases were used:

- The International EPD system[22].
- EPD-Norway[23].

Key search terms were applied into the databases to identify furniture EPDs, such as 'seats', 'tables', 'chairs', 'armchairs', etc. It was found that applying the direct furniture categories above into the databases was too complex, and did not generate as many results as more simple search terms. A database was developed using MS Excel, and the following information recorded:

- Name of product.
- Company name.
- Furniture type (see categories above).
- Referenced service life.
- Link to EPD.

Due to using more simple search terms, in order to correctly categorise each identified furniture item, a judgement was made by the Researcher. This included reviewing the description and composition of the furniture item.

Within the Product Category Rules (PCR) for 'Furniture, Except Seats and Mattresses', it is recommended that historical and statistic data of the effective lifetime of furniture products is used (EPD International, 2019). However, in the absence of statistical data, it is recommended that a default scenario of 15 years is assumed, which is also in line with the PCR on seats (The International EPD system, 2022) and the updated PCR on furniture (EPD-Norway, 2022).

[22] The International EPD System, Search the EPD Library (The International EPD System, publication date unknown). https://www.environdec.com/library. Accessed 6th March 2024.

[23] EPD – Norway, Furniture. (epd – norway, publication date unknown). https://www.epd-norge.no/epder/mobel/. Accessed 6th March 2024.

3.1.2.2 Data input 2: Average use time

This data input refers to the average use time of furniture items, from their point of purchase to their disposal or resale/donation. This data was provided by households across each of the key furniture items listed in Section 3.1.1 as follows:

- Average use time for 'Mattresses'.
- Average use time for 'Upholstered furniture'.
- Average use time for 'Wood-based panel, indoor freestanding furniture'.
- Average use time for 'Divan bases'.
- Average use time for 'Mostly metal furniture'.
- Average use time for 'Mostly hard plastic furniture'.
- Average use time for 'Wood-based panel, indoor freestanding furniture'.
- Average use time for 'Solid wood, freestanding indoor furniture'.
- Average use time for 'Outdoor treated wood furniture'.

To calculate the average use time of the selected furniture items, Ricardo developed a citizen's survey. The data informing this analysis, and the conclusions drawn from it, were gathered in a nationally representative survey of citizens in 1,019, conducted by YouGov Plc for the sole purpose of this project. The total sample size was 1,019 adults, and the survey was undertaken between 28th February - 1st March 2024. The survey was carried out online. The figures were by YouGov in accordance with the national demographic breakdown and are therefore representative of all French adults (aged 18+).

To maximise efficiencies across all indicators using a citizen's survey, one nationally representative survey was sent out across France, which covered the indicators shown in Table 10.

Table 10. Indicators includes within the 'Household goods' citizen survey.

URN	Indicator name
H5	Items of clothing repaired by households per year
H7	Household spending on maintenance and repair, across priority product and material stream
H8[24]	Comparison of life of household furniture as estimated by manufacturers and the actual duration these items are used by households
H10	Unused household goods, across priority products and material streams

3.1.2.3 Supporting qualitative data inputs

Alongside the above key data inputs needed for this indicator, the following qualitative data relating to furniture disposal by households was collected:

- The main reason households dispose or resell/donate their furniture.
- The most common disposal method for furniture by households.

Please refer to Appendix 4.4 to view the survey script. Please note, the survey was translated and disseminated in French by YouGov.

[24] Please note, this indicator is presented within the Group 3 case study document for 'Households'.

3.1.3 Calculations

For data input 1, no calculations were needed due to using the default scenario of 15 years outlined in the relevant PCR.

For data input 2, the survey data was manipulated from the following survey question: "*On average, how long does your household tend to keep each of the following furniture types, from the moment of purchase to their disposal/resale/donation?".* As the survey respondents were provided with numerical ranges to select, the mid points of each bracket was identified. All responses for 'Don't know' and 'NA' were removed from the calculations. The weighted average was then calculated across each key furniture item in order to determine the average use time by households.

Once data input 1 and 2 were ready, the indicator was tested across two different two approaches. The first approach involved calculating the ratio of the two data inputs as follows:

$$\frac{\textbf{Data input 1: Estimated technical lifetime of furniture products}}{\textbf{Data input 2: Average use time by household of furniture products}}$$

The second approach involved calculating the difference between the two data inputs as follows:

$$\textbf{Estimated technical lifetime of furniture products} - \textbf{Average use time by households}$$

Please view Appendix 4.5 for the full calculations and analysis.

3.1.4 Timeline

Table 11 below presents the timeline for the testing of this indicator.

Table 11. Gantt chart for H8.

WC	18-Dec	25-Dec	01-Jan	08-Jan	15-Jan	22-Jan	29-Jan	05-Feb	12-Feb	19-Feb	26-Feb	04-Mar	11-Mar	18-Mar	25-Mar
Task 1 - Develop list of furniture products															
Task 2 - Develop online survey															
Task 3 - Disseminate online survey															
Task 4 - Build simple Excel model															
Task 5 - Web-scraping for EPDs															
Task 6 (optional) - Interviews															
Task 7 - Analyse survey results & conduct calculations															
Task 8 - Conduct analysis of themes/trends															
Task 9 - Write up case study															
Review period															
Key deliverables				Online survey									Initial draft case study		Draft case study

Legend

Task progress | Christmas holiday | Review period | Key deliverable

3.1.5 Data gaps and mitigation

The identified data gaps and mitigation strategies are included in Table 12.

Table 12. Overview of identified data gaps, limitations and mitigation efforts

	Description of data gap	Mitigation efforts	Level of confidence
1	Unable to locate specific use times of furniture items from publicly available EPDs. The majority of EPDs reviewed referred to the default service life of 15 years.	• Key Europeans trade associations were contacted to identify industry benchmarks for the average use time of furniture. Due to time constraints, we were not able to identify any use times through this route. • It was therefore decided to use the default service life of 15 years as a proxy across each furniture type for this testing programme.	Medium

3.1.6 Quality review of analysis

To ensure robust and high-quality analysis of the data, the following QA procedure were conducted:

- Prior to work beginning, the Project Director reviewed the proposed research methodology and ensure that the data collection plan was fit for purpose. Only once the research team had addressed any comments from the review process did they proceed to the data collection phase.
- In relation to the survey development and dissemination, Project Manager reviewed the line of questioning for this indicator to ensure that it was clear, followable and able to generate reliable and robust results. In addition to this, respondents were also required to answer each question before being able to move on to ensure data validation of the survey.
- Once the survey has closed and the results had been analysed, the Quality Assurance Manager conducted a thorough internal quality assurance process on the MS Excel data set which pulled together the data from the survey and subsequent calculations. Any incoming data and assumptions were clearly logged, presenting survey data, user inputs, calculations, assumptions and results.

3.2 KEY ANALYSIS RESULTS

3.2.1 Analysis

3.2.1.1 Data input 1: Estimated technical lifetime

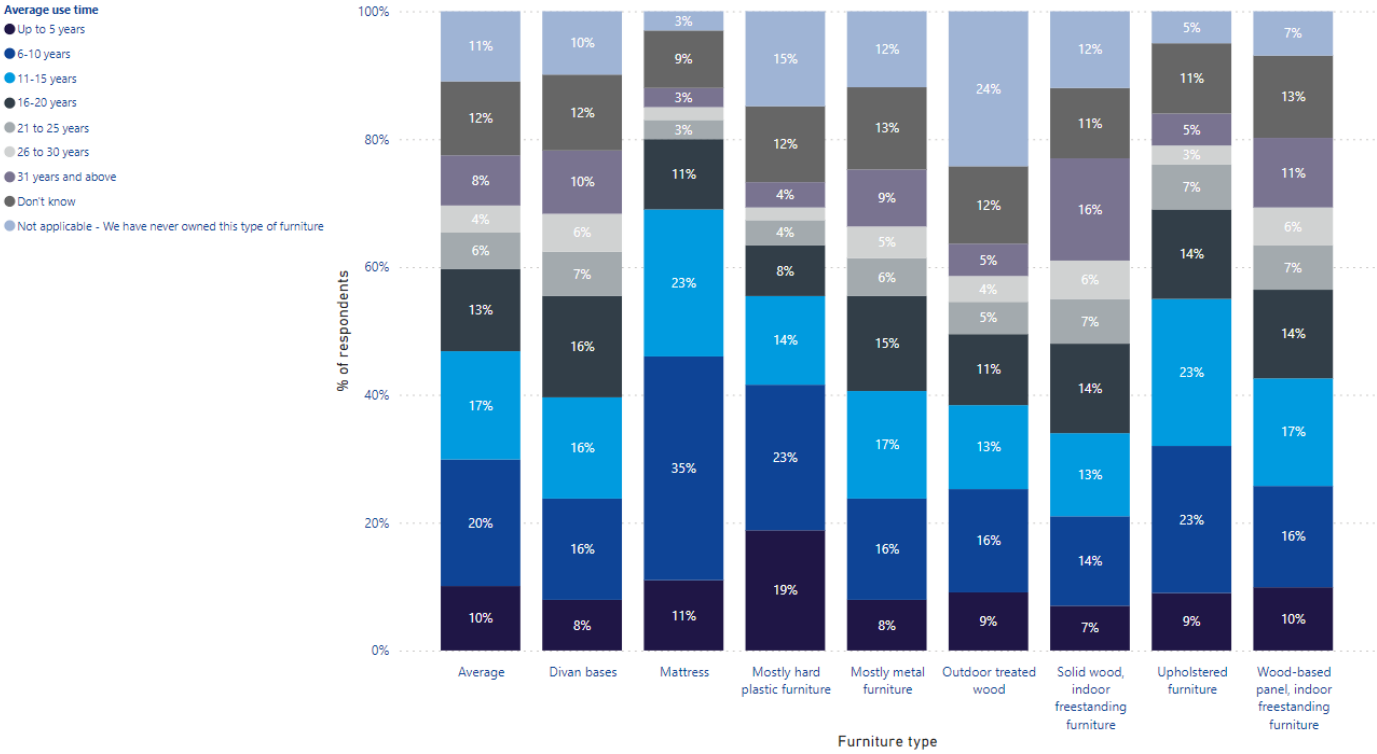
In line with the methodology outlined in Section 2.1.2, a total of 54 EPDs of furniture products manufactured within the EU were identified. Out of the 54 EPDs recorded, 87% of these referred to the default scenario of 15 years. It therefore became clear that most manufacturers do not use historical and statistic data to calculate the estimated technical lifetime of their furniture products (as recommended in the PCR) and alternatively use the default scenario provided. Due to this, it was concluded that this proposed approach would not provide differing estimated technical lifetimes across the in-scope product categories. As a result, the default scenario of 15 years was applied across all furniture items in this testing programme.

Please view Appendix 4.5 for the full analysis.

3.2.1.2 Data input 2: Average use time

Figure 1 presents the estimated consumer use time for furniture, from the moment of their purchase to their subsequent disposal or resale/donation. The results are broken down by the key furniture types. ‘Mattresses’, ‘Upholstered furniture’, ‘Mostly hard plastic furniture’ and ‘Outdoor treated wood’ were mostly commonly used for 6 – 10 years before their disposal or resale/donation. ‘Divan bases’, ‘Mostly metal furniture’, ‘Wood-based panel, indoor freestanding furniture’ were mostly commonly used by French households for 11 – 15 years. ‘Indoor solid wood, freestanding indoor furniture’ had the longest use time by households, with 16% of respondents using these items for 31 years and above. A particularly high proportion of households stated they have never owned ‘Outdoor treated wood furniture’ (24% of respondents).

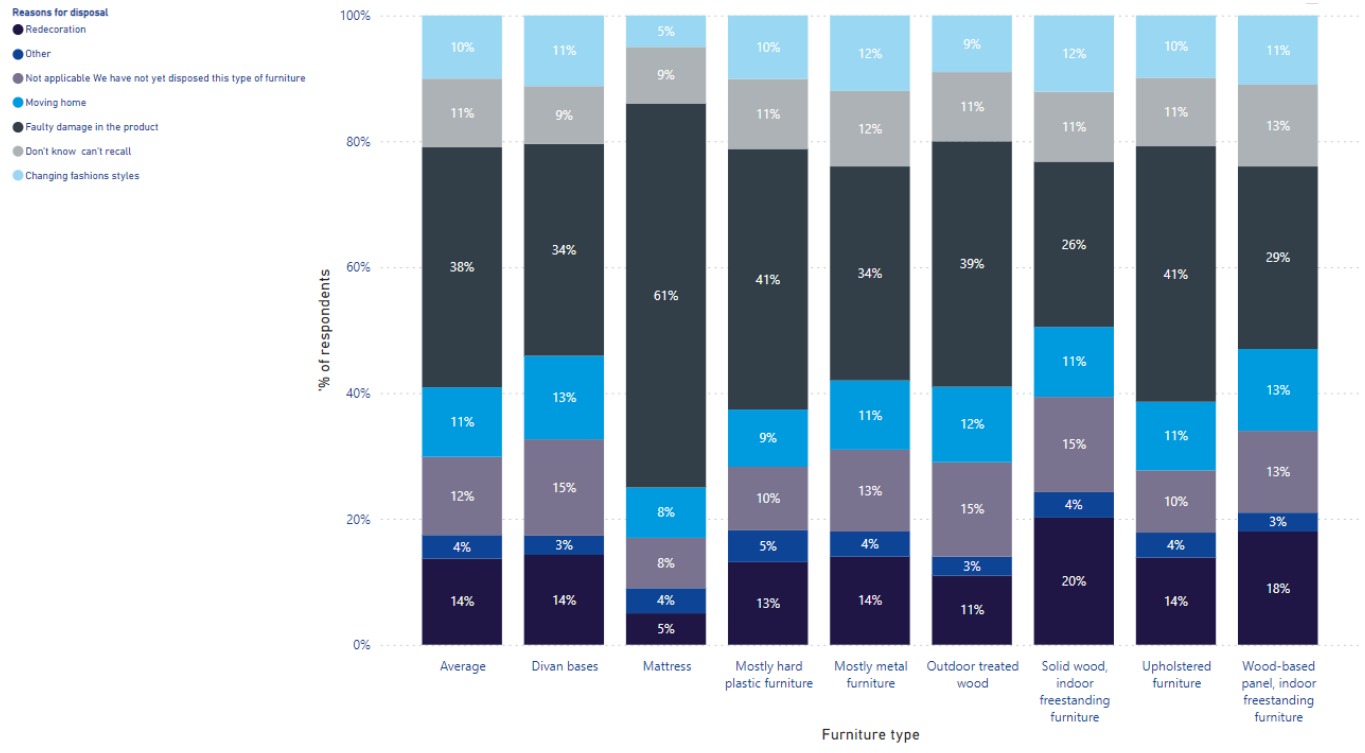
Figure 1. Estimated consumer use time for furniture, broken down by type



3.2.1.3 Qualitative analysis

As Figure 2 below presents, the most common reason that French households disposed of all furniture types studied was due to them being faulty or damaged. In particular for 'Mattresses', 61% of respondents stated that the main reason for their disposal was due to faults or damage. This could indicate a potential gap in repair services or a lack of consumer knowledge on how to repair the items. For 'Solid wood freestanding indoor furniture', 20% of respondents stated that the main reason for their disposal or resell/donation was due to redecoration purposes.

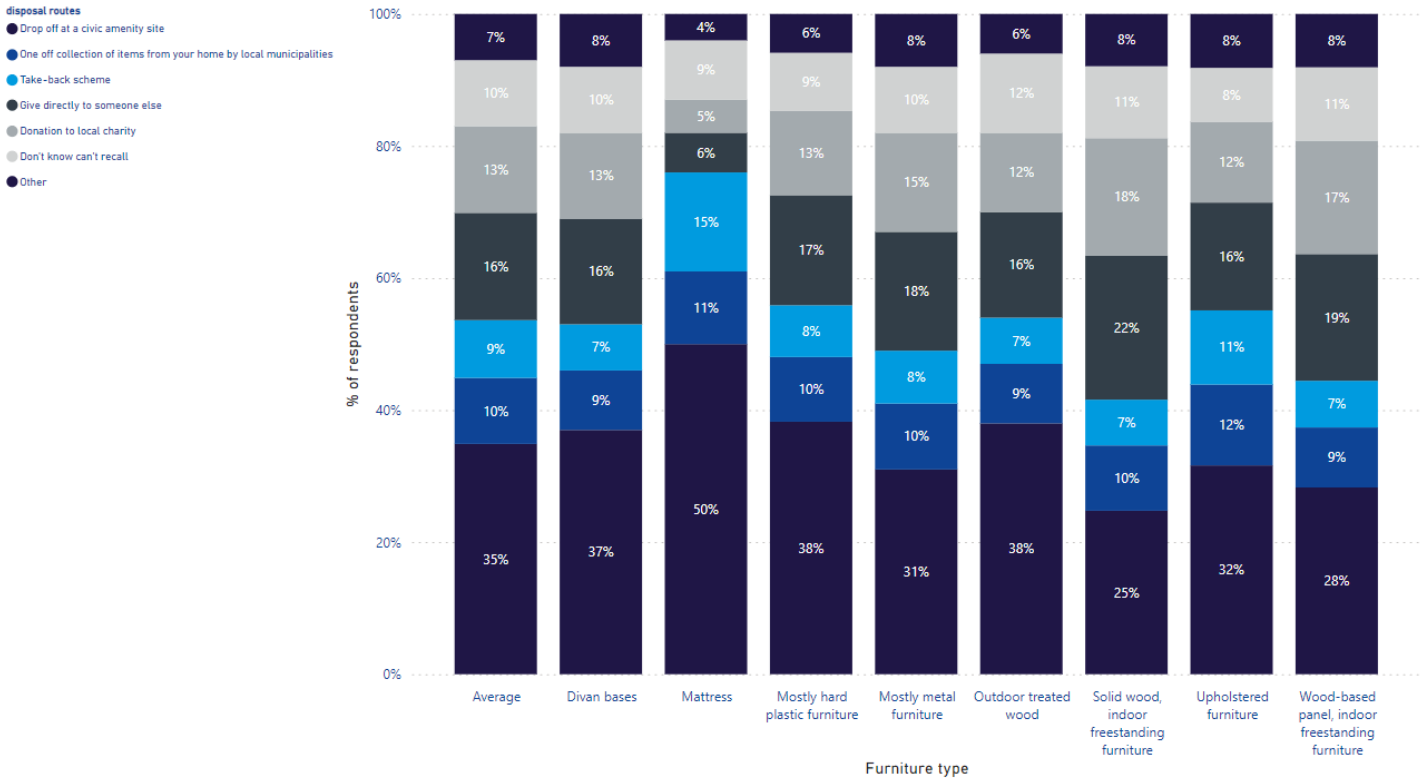
Figure 2. Reasons for disposing of, reselling and donating furniture, broken down by type



As Figure 3 below highlights, on average across all furniture items studied, 'Civic amenity site drop-off' was the most common disposal route for French households, with 35% of respondents selecting this option on average. On average 16% selected 'Give directly to someone else', 13% selected 'Donation to local charity', 10% of respondents selected 'One off collection of items from your home by local municipalities' (i.e. bulky waste collection), 10% selected 'Don't know', 9% selected 'Take-back scheme, and 7% selected 'Other'.

For 'Mattresses', 'Civic amenity site drop-off' was a significantly more common option for their disposal, with 50% of respondents selecting this option. In comparison across all other furniture types, 'Take-back scheme' was the most common disposal route for mattresses (representing 15% of respondents).

Figure 3. Most common disposal routes for furniture, broken down by type



3.2.1.4 Main calculations

In order to report against the defined indicator, the ratio and difference was calculated across the two main data inputs: the estimated technical lifetime and the average use time (as outlined in Section 3.1.3).

As Table 13 below highlights, 'Divan bases, 'Mostly metal furniture', 'Wood-based panel, indoor freestanding furniture' and 'Solid wood, freestanding indoor furniture' on average were used for longer than their estimated technical lifetime. The remaining furniture categories (i.e. 'Mattresses', 'Upholstered furniture', 'Mostly hard plastic furniture' and 'Outdoor treated wood furniture') were used for less time than their estimated technical lifetime. 'Mostly hard plastic furniture' performed the worst, with a difference of 3.85 years between its estimated and actual use time and a ratio of 1.35. 'Mattresses' also performed poorly, with a difference of 3.29 years and a ratio of 1.28. Unsurprisingly, 'Solid wood, freestanding indoor furniture' was the highest performing furniture item, with items on average being used for an estimated 3.36 years more than their estimated technical lifetime. On average across all furniture types included in this testing programme, items are not quite used by households for their full technical lifetime, with a difference of 0.2 years and a ratio of 1.01.

Table 13. Overview of key results

Furniture type	Estimated technical lifetime (years)	Average use time (years)	Difference (years)	Ratio
Mattress	15.00	11.71	3.29	1.28
Upholstered furniture	15.00	13.95	1.05	1.08
Divan bases	15.00	16.63	- 1.63	0.90
Mostly metal furniture	15.00	15.87	- 0.87	0.95
Mostly hard plastic furniture	15.00	11.15	3.85	1.35
Wood-based panel, indoor freestanding furniture	15.00	16.27	- 1.27	0.92
Solid wood, freestanding indoor furniture	15.00	18.36	- 3.36	0.82
Outdoor treated wood furniture	15.00	14.46	0.54	1.04
All	**15.00**	**14.80**	**0.20**	**1.01**

Please view Appendix 4.5 for the full analysis.

3.2.2 Limitations

The following limitations were identified through the testing programme:

- To maximise efficiencies across all of the indicators that required a citizen's survey, this survey developed for this indicator was disseminated at a national level (France). As this indicator was supposed to be explored at an EU level, this is one limitation of this testing programme.
- The testing of this indicator at national level also resulted in the analysis comparing EU level data (for data input 1) against national level data (for data input 2). If this indicator is implemented in the future, data input 1 and 2 must use EU data in order to generate robust and accurate results.
- As previously mentioned in Section 3.1.5, specific technical lifetimes of furniture items from publicly available EPDs were not available. The majority of EPDs reviewed referred to the default service life of 15 years. It was therefore decided to use the default service life of 15 years as a proxy across each furniture type for the nature of this testing programme. This will have reduced the robustness of the final calculations as the technical lifetime of the furniture types were not based on actual statistics. Using a default technical lifespan of 15 years for all furniture types oversimplifies the diversity in furniture design, materials and quality. This approach does not accurately reflect the real-world durability and longevity of various furniture categories.
- Through the web-scraping activities, the identified technical lifespans in EPDs ranges from 7 to 30 years. This variance means that the credibility of a uniform theoretical 15 years is very low.
- Closed-end, qualitative questions were included within the survey, with a pre-determined list of potential answers for respondents to select. Closed-end questions prevent respondents from providing in-depth answers .
- The use of self-reported data for determining the average use time of furniture will have introduced recall bias, and potentially social desirability bias. The respondents may not have accurately remembered when they purchased or disposed of furniture, or they may have reported what they think is socially acceptable (rather than their actual practices).
- This research does not account for the impact of repair and maintenance on extending the technical lifetime of furniture. The role repair and maintenance plays in extending the lifetime of furniture can therefore not be quantified.

3.2.3 Performance

Table 14 below compares the RACER score allocated to the original indicator during Task 4 (named '*Furniture put on the market*') against the final indicator after the Task 5 testing process. During Task 4, the original indicator was allocated a score of 12 out of 15 against the RACER evaluation process. This was due to the data being easy to access (via company's internal reporting processes or Eurostat[25]) and widely accepted by key stakeholders. It also has the potential to be rolled out across other consumer good categories, such as textiles and electronics and ICT.

Following the Task 5 testing, the updated indicator was allocated a score of 9 out of 15, due to performing lower across the 'Acceptability', 'Ease' and 'Credibility' criteria. This was mostly due to the significant change in indicator name and scope during the early stages of Task 5. Focusing on the product lifespan of furniture items, rather than placed on the market data, was determined to be more closely aligned to the project objectives and the EC's priority of selecting ambitious and new indicators. Lower scores were also allocated across these criteria due to not being able to find true technical lifetimes of furniture types through publicly available EPDs and consequently having to use the default scenario of 15 years (as outlined in the relevant PCR). A higher score was awarded for 'Relevance' as a result of the change in indicator name prior to the testing begun. Focusing on product lifespans (rather than placed on the market data) was thought to be more valuable from a CE perspective.

Table 14 provides an overview of the RACER evaluation for this indicator, before and after the completion of the testing programme.

Table 14. RACER evaluation

Stage of project	RACER criterion					Score
	Relevance	Acceptability	Credibility	Ease	Robustness	
Task 4 (original RACER assessment)	2	3	2	3	2	12
After Task 5 (following testing)	3	2	1	2	1	9

To ensure consistency in applying RACER, the assessment matrix shown in Appendix 4.3 was applied to support the decision making process.

3.3 CHALLENGES AND LESSONS LEARNED

3.3.1 Challenges

As stated in the original data collection plan, Ricardo initially attempted to calculate the estimated technical lifetime of furniture items through identifying and reviewing relevant EPDs. There were many challenges identified when testing this approach, which included:

- At the time of the testing, there were not many EPDs available for furniture items online, particularly those relevant for domestic use.
- It was difficult to apply the furniture categorisation, meaning that personal judgement was made in relation to which category an item is best placed within.
- Most products with EPDs are those with higher environmental credentials, meaning the technical lifetimes consolidated were most likely 'best case scenarios' and would result in a bias in our results.
- It is likely that furniture design will fairly continuously evolve, which would possibly impact on the relevance of EPDs and may pose a challenge for maintaining an up-to-date database of technical lifetimes that accurately reflect current market offerings.
- As outlined in the PCR for *'Furniture, except seats and mattresses'* (EPD International, 2019), historical and statistic data of the effective life time of the furniture unit is preferred. However, in absence of statistical

[25] European Union, Welcome to Eurostat. (Eurostat, 2024). https://ec.europa.eu/eurostat. Accessed 09th April 2024.

data, a default scenario of 15 years shall be assumed, in line with the PCR on seats (The International EPD system, 2022). Out of the 54 EPDs recorded, 87% of these referred to the default scenario of 15 years.

Having conducted the analysis of the publicly available EPDs, due to the above challenges, Ricardo decided to use the default scenario of 15 years, as outlined in the PCR on seats (PCR 2009:02), across all tested furniture types.

Alongside the above, the following challenges were identified during this testing programme:

- Due to the team's previous experience of disseminating surveys, it was agreed that gathering data at a citizen level was a significant challenge for this indicator. As a result, during the very early stages of the testing programme, it was decided to use a third party to disseminate the survey. This meant that a response rate of at least 1,000 would be guaranteed.
- The potential cost of data collection via surveys across individual Member States poses a challenge for applying this indicator in the future. As the EC conducts regular EU-wide consumer surveys, it may be appropriate to integrate this topic into these existing surveys or to consider adopting separate surveys related to sustainability and the CE.
- Household economic factors (such as the cost of living and changing household incomes) will be a challenge for this indicator, as they will impact furniture purchase and disposal patterns. These factors could introduce variability into the data that might not be fully accounted for in the analysis.

3.3.2 Lessons learned

Lessons learnt were recorded throughout the process of creating and testing this indicator, which may be applied to inform future assessments of indicators:

- For indicators which are based on data from citizen surveys, a judgement needs to be made at the early stages of testing as to what level of data granularity is required. There is a direct trade-off between the level of granularity asked for and the burden on the respondent to answer the questions. Asking for actual numbers within an open-ended question format is a more burdensome approach and could lead to missing data, however it would result in more granular data. In comparison, using numerical ranges within a closed-ended question format would provide less granular data, but would alternatively be easier/quicker for the respondent to complete, which would likely result in higher response rates.
- For indicators which rely upon survey data from citizens or households, going through a third party supplier is the most effective approach to ensure high response rates. YouGov were able to guarantee a response rate of 1,000, which allowed the team to make robust and evidence-led conclusions from the data. As mentioned above, as the EC conducts regular EU-wide consumer surveys, it may be appropriate to alternatively integrate this topic into these existing surveys or to consider adopting separate surveys related to sustainability and the CE.
- Direct engagement with furniture manufacturers (via interviews or workshops) could have provided additional insights and data sources that are not publicly available. This would have provided an additional level of analysis in our results, and it is recommended this is considered in the future (if implemented).

3.4 CONCLUSIONS AND RECOMMENDATIONS

It is recommended that this indicator is considered for further development, with significant work required to facilitate its progress.

Maximising the life expectancy of products is a key aspect of the CE in order to decrease demand for new replacements and subsequently reduce the extraction and consumption of raw materials. This indicator will help to quantify the gap between furniture product's estimated technical lifetime (at the point of manufacture) versus its actual use time (by households). It would effectively support the identification of particular furniture types that have a poor life expectancy or use time, and therefore required urgent action (such as eco-design or circular design interventions).

The furniture industry has seen a shift in recent years towards the use of lower quality materials. There has been a move away from solid wood and metal furniture, towards cheaper and less durable materials (such as medium-density fibreboard (MDF) and plastic). At the moment the drivers for eco-design improvements are

weak, however change will be coming from the upcoming ESPR[26,27]. Although the specifics of these requirements are yet to developed, they will cover product durability (alongside many other aspects). This indicator would help to monitor the year-on-year improvements in durability across furniture items and monitor the success of the ESPR requirements.

Due to the difficulties accessing real data for data input 1 (the estimated technical lifetimes), the subsequent decision to refer to the default scenario of 15 years across all furniture types during this testing was a significant limitation. Due to this limitation, the data received was less robust and reliable than if the true estimated technical lifetimes for each furniture type explored were identified. To support the implementation of this indicator, it is recommended that guidance is developed for manufacturers to support them to calculate technical lifetimes of furniture products using historical and statistic data. Following this, the EC should consider establishing an online database which consolidates technical lifetimes of various furniture items. For example, the German Federal Ministry of Housing, Urban Development and Building has established a similar database which considers the service life of construction products.[28]

In order to access the required data for data input 2 (average use times), a citizen's survey was essential. Through disseminating this survey via a third party, this data had good availability, robustness and directness. The approach has the potential to be easily replicated on a yearly basis.

At this moment in time, it is not recommended that a target should be set relating to this indicator due to the significant amount of work needed to be carried out before implementation. However, it is recommended that this is reassessed once the data collection process is improved.

The development of clear, EU-wide definitions for the key terms used within this indicator methodology is essential (such as 'technical lifetimes' and 'use time'). This will help to support harmonisation with other key regulations (such as the ESPR) and ensure consistent terminology is adopted by the furniture industry.

A furniture classification system needs to be developed and agreed on by industry and other key stakeholders. During this testing programme, a previously developed list of furniture types was used which was developed through expert opinion and stakeholder consultation in the UK. It was considered that these categories worked well for this testing programme, however there are likely many other classification systems used across the EU. It is therefore recommended that EU policymakers facilitate further engagement with industry to develop and decide upon the key furniture types to take forward. This engagement should also include reaching out to existing Extended Producer Responsibility (EPR) schemes (such as in France) in order to support harmonisation.

During the testing programme for this indicator, it was identified that 'WG10 of CEN TC 207' (The furniture circularity working group) is currently working on various project groups relating to reliability, durability, lifetime and lifespan, as well as on the integration of CE strategies (such as repair, refurbishment and remanufacturing) (Avdan, 2022). EU policy makers should follow the developments made within this group, to ensure alignment with the ESPR and the potential future implementation of this indicator. For example, one of the preliminary requirements of ESPR for furniture and mattresses is the development of minimum lifespans. This number, if defined in the final regulation, may later on be used to inform the estimated technical lifespan needed for this indicator.

In addition, if this indicator is implemented in the future, it is recommended that the EC should develop circular design guidance for the furniture industry to support performance improvements. This guidance should cover a range of circular design strategies, specifically those that support the extension of furniture product lifespans. This may include design for durability, repairability and remanufacture, alongside providing consumers with appropriate instructions to support maintenance and repair activities.

Due to the benefits realised of this indicator during the testing phase, it is recommended that the potential of rolling out this indicator to other priority products is assessed (such as electronics and ICT or textiles).

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[26] The ESPR will set ecodesign requirements for specific product groups to improve their circularity, energy performance (e.g. within both the manufacturing process of the product and its actual use) and other environmental sustainability aspects.

[27] European Commission, Ecodesign for Sustainable Products Regulation. (Official website of the European Commission, 2024) https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/sustainable-products/ecodesign-sustainable-products-regulation_en. 9th April 2024.

[28] Federal Ministry of Housing, Urban Development and Building, Service life of components. (Official website for the Federal Ministry of Housing, Urban Development and Building, 2017). https://www.nachhaltigesbauen.de/austausch/nutzungsdauern-von-bauteilen/. Accessed 10th April 2024.

Following the testing of this indicator, the initial indicator name is still deemed fit for purpose to take forward during any future development activities.

This indicator would indirectly support improvements of the new EU monitoring framework for CE across the following macro level indicators:

- **Material footprint:** i.e. a quantification of the demand for material extractions triggered by consumption and investment by households, governments and businesses across the EU. Maximising the life expectancy of furniture items will reduce the demand for new products and subsequently reduce the extraction and consumption of raw materials.
- **Total waste generation per capita:** i.e. the total waste generated in a country (including major mineral wastes), divided by the average population of the country. This indicator will ensure that the lifespan of furniture products are extended for as long as practically possible, thereby reducing waste generation.
- **Generation of municipal waste per capita:** i.e. the waste collected by or on behalf of municipal authorities and disposed of through the waste management system. This indicator will ensure that the lifespan of furniture products are extended for as long as practically possible, thereby reducing the generation of municipal waste.
- **Consumption footprint:** i.e. the environmental impacts of EU and EU Member States consumption by combining data on consumption intensity and environmental impacts of representative products. Encouraging the life extension of furniture products will reduce the EU and EU Member State consumption footprint, as households/businesses will be purchasing fewer products/goods.

Table 15. Summary of recommendations for H8.

Type of recommendation	Recommendation	Timeline	Key stakeholders or partners	RACER Criteria Addressed
Policy	Development of clear, EU-wide definitions for key terms, such as 'technical lifetimes' and 'use time'.	Short (0.5 – 1.5 years)	• **Responsible:** EC. • **Accountable:** EC and National Governments. • **Consulted:** National trade associations, furniture industry, households. • **Informed:** All stakeholders within the EU furniture industry.	• **Credibility:** Supportive of the development of a more defined methodology. • **Ease:** Would make the indicator easier for stakeholders to understand and interpret. • **Robustness:** Would increase the consistency and accuracy of the reported data.
Research and Development (R&D)	Development and harmonisation of furniture classification system across the EU and individual EU Member States.	Short (0.5 – 1.5 years)	• **Responsible:** EC. • **Accountable:** EC and National Governments. • **Consulted:** National trade associations, Extended Producer Responsibility Schemes, National governments, furniture manufacturers. • **Informed:** All stakeholders within the EU furniture industry.	• **Ease:** The ease of data reporting will be improved, alongside data analysis by the EC. • **Credibility:** Will ensure that the indicator results are easy to interpret by a wide array of audiences. • **Robustness:** Harmonisation of furniture categories will allow the data to be compared at a Member State level and aggregated up to an EU level.
Policy	Follow the developments made by 'WG10 of CEN TC 207' on projects relating to reliability, durability, lifetime and lifespan, as well as on the integration of CE strategies (such as repair, refurbishment and remanufacturing).	Short (0.5 – 1.5 years)	• **Responsible:** EC. • **Accountable:** EC. • **Consulted:** 'WG10 of CEN TC 207'. • **Informed:** Furniture industry.	• **Acceptance:** Key stakeholders will be more motivated to report against this indicator due to alignment with the working group.

Type of recommendation	Recommendation	Timeline	Key stakeholders or partners	RACER Criteria Addressed
Guidance	Development of circular design guidance to support the extension of furniture products lifespans (i.e. design for durability, repairability, remanufacture, etc.).	Medium (1.5 – 5 years)	• **Responsible:** National governments. • **Accountable:** EC. • **Consulted:** Repair organisations/centres, recyclers, manufacturers, citizens. • **Informed:** Furniture manufacturers.	NA – the recommendation will support the indicator through encouraging performance improvements.
Guidance	Development of guidance for manufacturers on how to calculate technical lifetimes using historical and statistic data.	Short (0.5 – 1.5 years)	• **Responsible:** EC. • **Accountable:** EC. • **Consulted:** 'WG10 of CEN TC 207' and key trade associations. • **Informed:** Furniture manufacturers.	• **Credibility:** Supportive of the development of a more defined methodology. • **Robustness:** Would increase the consistency and accuracy of the reported data.
Guidance	Establishment of an online database which consolidates technical lifetimes of various furniture items.	Medium (1.5 – 5 years)	• **Responsible:** National governments. • **Accountable:** EC. • **Consulted:** 'WG10 of CEN TC 207' and key trade associations. • **Informed:** All key stakeholders.	• **Ease:** Increase the ease of calculating technical lifetimes for those manufacturers who do not have historical and statistical data to use. • **Robustness:** Would increase the accuracy of the default scenario for technical lifetimes (if historical and statistical data is not available).
R&D	Assess the suitability of rolling this indicator out to other high priority products (such as electronics and ICT and textiles).	Short (0.5 – 1.5 years)	• **Responsible:** EC. • **Accountable:** EC. • **Consulted:** Households, relevant industries (i.e. electronics and ICT and textiles). • **Informed:** Households and manufacturers in relevant industries (i.e. electronics and ICT and textiles).	• **Relevance:** Rolling the indicator out to other high priority products will increase its alignment with policy objectives. • **Credibility:** Will allow for the results to be compared at a product level in order to identify poor performing product categories that require urgent eco-design action.

4. APPENDIX

4.1 INDICATOR 1 - POPULATION DATA

Table 16 shows that the respective populations for Flanders and the Netherlands both saw year-on-year increases from 2020 – 2022.

Table 16. 2020 – 2022 population data for Flanders and the Netherlands.

Region	2020 population	2021 population	2022 population
Flanders (Belgium)[29]	6,629,143	6,653,062	6,698,876
The Netherlands[30]	17,410,000	17,480,000	17,590,000

4.2 INDICATOR 1 - STAKEHOLDER ENGAGEMENT RESULTS FOR H6

See MS Excel document “DGRTD_H6_Stakeholder Engagement Results_V01.00“ provided alongside this report.

[29] Statista, Population of Belgium from 1992 to 2023, by region. (Statista, 2023). https://www.statista.com/statistics/517196/population-of-belgium-by-region/. Accessed March 2024.

[30] Statistics Netherlands, Population counter. (Statistics Netherlands, 2024). https://www.cbs.nl/en-gb/visualisations/dashboard-population/population-counter. Accessed March 2024.

4.3 ALL INDICATORS - RACER ASSESSMENT MATRIX

Criterion	Description	1 (Poor)	2 (Neutral)	3 (Good)
Relevance	Refers to whether the indicator is closely linked to the objectives to be reached.	Does not support a better understanding of true circularity.	Supports a better understanding of true circularity.	Highly supportive towards gaining a better understanding of true circularity.
		Supports no value-added circular opportunities.	Supports lower value-added opportunities (i.e. metrics related to waste generation, recycling, waste management, etc.)	Supports higher value-added opportunities (i.e. all R-strategies above remanufacturing) and wider systemic change (e.g. indicators that encourage PSS or circular design).
		Not linked to the project objectives and/or European policy objectives (existing or upcoming).	Linked to the project objectives, but not to European policy objectives (existing and/or upcoming).	Fully aligned with project objectives and European policy objectives (existing and/or upcoming).
Acceptance	Refers to whether the indicator is perceived and used by key stakeholders (such as policymakers, civil society, and industry).	Poorly accepted by key stakeholders, e.g. due to the use of confidential data.	Relatively accepted by key stakeholders as the benefits of measuring are clear.	Key stakeholders are motived to report this indicator, due to mandatory legislative requirements (current or upcoming), potential commercial benefit or being in the public interest.
Credibility	Refers to whether the indicator is transparent, trustworthy and easy to interpret.	No defined methodology associated with this indicator and/or interpretation of the indicator is ambiguous.	Methodologies have been proposed or currently existing, but not for this particular indicator (e.g. in a research article).	There is an EU defined methodology.
		Difficult to understand and communicate to stakeholders (e.g. units or measurement of something that stakeholders are not familiar with).	Moderately easy to understand and communicate to stakeholders (e.g. units or measurement of something that stakeholders are aware of but are not confident in practical use).	Easy to understand and communicate to stakeholders (e.g. units or measurement of something that stakeholders already use and are confident in applying).
Ease	Refers to the easiness of measuring and monitoring the indicator.	No defined methodology associated with this indicator and/or interpretation of the indicator is ambiguous.	Methodologies have been proposed or currently existing, but not for this particular indicator (e.g. in a research article).	There is an EU defined methodology.
		Difficult to understand and communicate to stakeholders (e.g. units or measurement of something that stakeholders are not familiar with).	Moderately easy to understand and communicate to stakeholders (e.g. units or measurement of something that stakeholders are aware of but are not confident in practical use).	Easy to understand and communicate to stakeholders (e.g. units or measurement of something that stakeholders already use and are confident in applying).
Robustness	Refers to whether data is biased and comprehensively assesses circularity.	No consistent methodology and dataset are available.	A consistent methodology and dataset available.	A consistent methodology and dataset available.
			A composite/aggregated indicator (based on multiples dimensions).	A one-dimensional indicator.
			A proxy indicator.	

4.4 INDICATOR 2 - SURVEY SCRIPT FOR 'HOUSEHOLD GOODS' SURVEY

See MS Word document "DGRTD _H5_H7_H8_H10_Household Goods Survey Outline_V01.00" provided alongside this report.

4.5 INDICATOR 2 - DATA ANALYSIS FOR H8

See MS Excel document "DGRTD_H8_Data analysis_V01.00 " provided alongside this report.

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