

PackFlow Covid-19 Phase I: Wood

A review of the quantity of wood packaging placed on the market (POM) and recycled in 2019

Peter Mitchell

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PackFlow Covid-19: Project Remit

This project seeks to estimate the impacts of Covid-19 and the subsequent lockdown measures (in isolation) on the compliance landscape for UK packaging recycling in 2020 and projecting forward to 2022.

This is achieved by:

1. Updating estimates for UK packaging POM (placed on the market) and recycling by material and by industry sector in 2019 to provide a baseline for future scenarios.
2. Using relevant data sources and industry insights to estimate and provide a narrative, by packaging material type, regarding the impacts of Covid-19 and the subsequent lockdown in 2020-2022 on:
 - The total amount of material that is likely to be placed on the market (POM) by sector
 - The impact of the change in POM on the UK recycling rate by material, and by sector
 - The changes to the level of obligated tonnage by material
 - Including an indicative assessment of the potential impact of the recession on the proportion of POM that is recorded within the obligated tonnage each year.

Scenarios, assumptions and data sources are agreed with the Steering Group made up of key industry stakeholders representing individual materials and sectors.

Where requested by stakeholders, further scenarios have been developed to expand on aspects of recycling that may only in-part be attributed to the Covid-19 situation but were not included in the initial project brief.

Valpak, the project funders and the stakeholders acknowledge that there are a myriad of factors that can affect the packaging waste system inside and outside of the current Covid-19 situation. This project seeks to isolate the impacts of the change of consumption patterns, recycling and direct impact on businesses of the Covid-19 situation. All stakeholders acknowledge that the continued evolution of the wider recycling system will also impact on the overall UK compliance position.

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J729 Wood Version 1

Executive Summary

Introduction

The PackFlow Covid-19 reports <https://www.valpak.co.uk/more/material-flow-reports> cover all packaging materials and have been produced to provide industry, Governments, and other stakeholders with evidence to better understand the potential implications of lockdown and the ensuing recession on packaging materials flows, packaging materials collection & recycling, and to assess potential compliance risks versus the packaging targets.

The PackFlow Covid-19 project has two phases:

Phase I

- Updates the baseline year to 2019 for estimates of packaging materials POM, collections, recycling and end markets (from 2017 in the previous flow reports¹).

Phase II

- Collates data and market intel on the impacts of the Covid-19 lockdown (materials flow, collections, recycling and end markets)
- Develops scenarios for packaging materials flow and recycling for 2020 to 2022
- Assesses potential compliance risks versus recycling targets for packaging materials.

To support Defra and Governments in their packaging policy work and assist other industry stakeholders, this Phase I report focuses on generating robust estimates of UK wood packaging placed on the market (POM)² that are as accurate as is reasonably possible. The report also considers the quantities of wood packaging recycling, both in the UK and abroad, and provides insights into the end markets and products that are manufactured by packaging wood recyclers in the UK.

Data robustness assessments have been conducted and error margins are calculated and provided wherever possible throughout report.

¹ The previous packaging materials flow reports can found at <https://www.valpak.co.uk/more/material-flow-reports> .

² Wood packaging placed on the market means all household and non-household wood packaging used around products sold and transported within the UK.

Wood Packaging POM

This report estimates wood packaging POM in 2019 to be 1,358k tonnes (+/- 10%). This estimate represents a 5% increase³ from the previous⁴ wood POM figure of 1,291k tonnes (2017).

The wood packaging POM estimate is established from a bottom-up approach (Figure 1) as the weight of wood packaging produced in the UK plus the weight of net imported wood packaging into the UK (i.e. the weight of imported wood packaging less the weight of wood packaging exported).

Figure 1 UK Wood Packaging POM, 2019 (k tonnes)

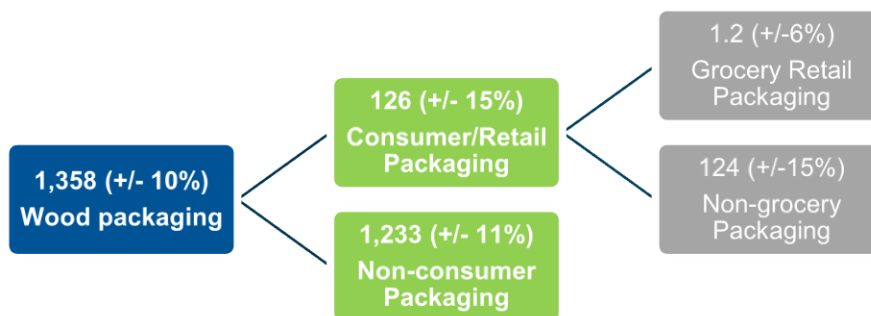
UK production of wood packaging	872
<i>plus</i> Wood packaging imported ⁵	769
<i>less</i> Wood packaging exported ⁶	283
= Wood Packaging POM	1,358

A total of 872k tonnes (64% of wood packaging POM) of new wood packaging is estimated to have been produced in the UK in 2019, of which 746k tonnes is estimated to be new wood used in new/refurbished wooden pallets and 127k tonnes is wood used in UK production of non-pallet wood packaging.

Total imports of wood packaging are estimated to be 769k tonnes in 2019, of which 651k tonnes is import of wood packaging declared by obligated producers who are registered, and 118k tonnes is estimated to be wood packaging imported by unregistered producers.

Total exports of wood packaging are estimated to be 283k tonnes in 2019, of which 248k tonnes is wood packaging exports declared by obligated producers who are registered, and 35k tonnes is estimated to be wood packaging exported by unregistered producers.

Figure 2 Wood Packaging POM by Sector, 2019, k tonnes⁶



³ The error margin indicates that the two wood packaging POM figures are not substantially different.

⁴ <https://www.valpak.co.uk/more/material-flow-reports/woodflow-2025>

⁵ It is assumed that these figures exclude fastenings etc.

⁶ Figures may not sum due to rounding.

Consumer wood packaging POM is estimated at around 126k tonnes (+/- 10%) in 2019

The vast majority 124k tonnes (+/-15%) is estimated to be wood packaging in the consumer non-grocery sector.

Consumer grocery wood packaging is estimated to be ~1,200 tonnes (+/- 6%)

Wooden packaging POM in the non-consumer sector is 1,233k tonnes (+/- 11%) in 2019.

The vast majority (90%) of wood packaging POM is in the non-consumer sector.

Wood packaging POM handled by obligated producers in 2019 is estimated to be 1,201k tonnes (or 88% of total POM).

A slight decrease on the estimated 90% of wood packaging POM obligated in 2017.

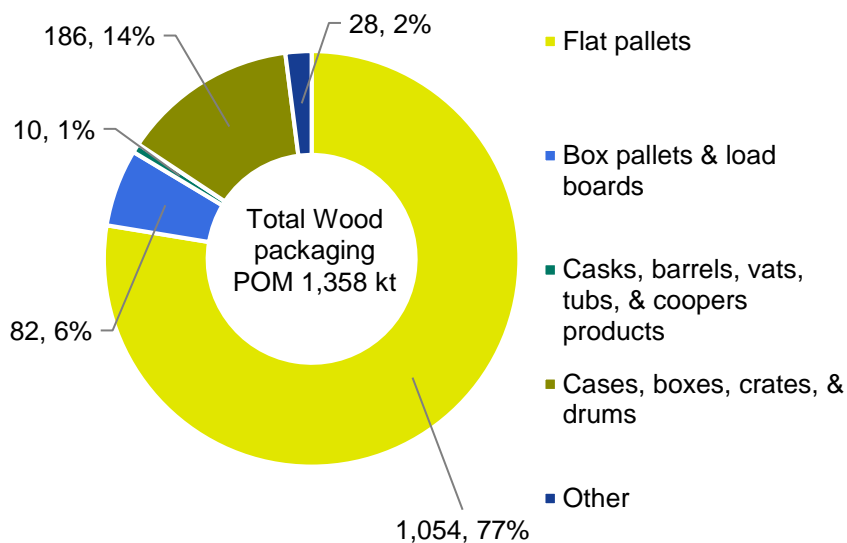
The proportion of wood packaging POM that is handled by unregistered producers is estimated to be 12% (or ~157k tonnes) in 2019.

A slight increase on the estimated 10% of wood packaging POM that was unregistered in 2017.

By format, including imports, flat wooden pallets are estimated to account for 77% of wood packaging POM in 2019.

Cases, boxes, crates and drums are the next largest product format for wood packaging, representing 14% of wood POM, wooden casks, barrels, vats, tubs & coopers products represent around 1% of total wood POM.

Figure 3 UK Wood Packaging POM by format, 2019 (k tonnes, %)



The majority (85%) of wood packaging POM in the non-consumer sector is estimated to be flat wooden pallets.

The vast majority (99%) of consumer wooden packaging is in the non-grocery retail sector, with wooden boxes (63%) being the biggest packaging format category.

While the quantity of wooden packaging in consumer grocery retail is small, there has been some shift into wood packaging (compared to 2017) for products such as fruits, ready meals, cheeses and alcoholic drinks.

Wood Packaging Collection and Recycling

Wood waste arising (wood packaging and non-packaging wood) in the UK is estimated to be 4.52m tonnes in 2019⁷.

The WRA estimate⁸ that ~1m tonnes of wood waste (wood packaging and non-packaging wood) is collected each year by local authorities at HWRC/CA sites.

Waste Data Flow figures for 2018/19 indicate that local authorities collected 874k tonnes of wood waste (wood packaging and non-packaging wood).

The vast majority (99%) of wood waste collected by local authorities is via HWRC/CA sites and is non-packaging wood. Less than 10k tonnes of wood waste collected by local authorities is wood packaging and virtually none of this is collected via bring sites or kerbside.

Accredited waste wood packaging recycling is estimated to be 612k tonnes in 2019.

The accredited recycling rate for wood packaging is ~45% in 2019. (Comparing against the wood packaging POM figure of 1,358k tonnes in 2019 estimated in this report).

In 2019, wood-based panel board manufacturers recycled of 361k tonnes of waste wood packaging. Wood recyclers manufacturing animal bedding, equine surfaces etc used 250k tonnes of wooden packaging in 2019, the WRA believe that all of this tonnage was recorded as accredited wood packaging recycling.

The total quantity of wood packaging waste recycled in the UK is uncertain because a plausible figure for unaccredited wood packaging recycling is not available.

However, all major UK wood recyclers are accredited, and the WRA believe that the tonnage of wood packaging that is recycled (by accredited wood recyclers) but is unaccredited is very small.

If the estimated ~1 million tonnes of wood packaging waste arising⁹ per year is broadly accurate, then the fate of substantial tonnages (~300k tonnes) of wood packaging waste is potentially not accounted for. The WRA believe that very little of this will go to landfill and that the figure for informal/unreported usage of wooden packaging will reduce significantly as there are formal markets for all types of waste wood.

⁷ <https://www.tolvik.com/wp-content/uploads/2020/04/Tolvik-UK-Biomass-Statistics-2019-FINAL.pdf>

⁸ Based on a WRA estimate of ~23% of annual wood waste being collected via HWRC/CA sites.

⁹ Note that estimates of wood packaging waste arisings will likely be very different from wood packaging POM estimates. Essentially, this is because of the durability of wood packaging, it has a long life on the market and is extensively re-used and repaired. Therefore, there are long (and unknown) lags between wood packaging being POM and arising in the waste stream.

Wood Packaging End Markets

A total of ~4 million tonnes of waste wood was recovered/recycled in 2019.

Waste wood recovery by UK energy facilities (large and small scale biomass) was ~2.5 million tonnes. Around 1.5 million tonnes of waste wood was recycled into wood-based panel board, animal bedding and equine surfacing.

The quantity of wood packaging waste recovered or recycled is estimated to be 824k tonnes in 2019, of which 614k tonnes (or 75%) of this being recycling of wood packaging.

In 2019, wood-based panel board manufacturers recycled 361k tonnes of waste wood packaging.

Wood recyclers manufacturing animal bedding, equine surfaces etc used 250k tonnes of wooden packaging in 2019, and the WRA believe that all of this tonnage was recorded as accredited recycling.

A full market estimate of the quantity of wood packaging being re-used is unknown.

The EU Waste Framework Directive sets out five steps for dealing with waste ranked according to environmental impact - the 'waste hierarchy'. Within this hierarchy, businesses involved in the generation or handling of waste should consider prevention and preparation for re-use before recycling, recovery and disposal. Operators should be mindful that some packaging, and particularly wooden pallets are often suitable for reuse.

The Steering Group commented that the fate of substantial quantities of wooden pallets is unknown, these are wooden pallets that are not of the size typically used by the various pallet pools but are pallets that could be directly re-used.

In terms of recovery of wood packaging, 120k tonnes of wood packaging waste is estimated to have gone to large scale biomass (Biomass - Chapter IV) in 2019, with small scale biomass using 90k tonnes of wooden packaging waste.

Recommendations for Further Work

There are uncertainties around estimates of the fates of wood packaging and the level of unaccredited wood packaging recycling.

The estimate of ~1 million tonnes¹⁰ a year of wood packaging waste arising¹¹ implies (assuming other estimates of the fate of wood waste are robust), that the fate of a substantial tonnage (~300k tonnes a year) of wooden packaging is not accounted for by recovery, re-use, recycling, disposal or export.

Further research is recommended to provide an updated comprehensive assessment of wood packaging waste arising, re-use, recycling and informal/formal recovery routes for wood packaging.

¹⁰ Accurate and up to date estimates of the quantity of waste wooden packaging arising are not available, studies now around 10 years old indicate around 1 million tonnes of wooden packaging waste arising per year.

¹¹ Note that estimates of wood packaging waste arisings will likely be very different from POM estimates. Essentially, this is because of the durability of wood packaging, it has a long life on the market and is extensively re-used and repaired. Therefore, there are long (and unknown) lags between wood packaging being POM and arising in the waste stream.

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Appendices

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Glossary

bn - Billion

CA – Civic amenity

C&I – Commercial and Industrial

CPI – Confederation of Paper Industries

C&D – Construction and demolition

EA – Environment Agency

EfW – Energy from Waste

EPIC – Environmental Product Information Centre

GDP – Gross Domestic Product

HWRC – Household waste recycling centre

k – Thousand

kt – Thousand tonnes

LA – Local authority

NPWD – National Packaging Waste Database

POM – Placed on the market

Primary Packaging – Any packaging that the customer will take home, remove and throw away e.g. aluminium can, plastic bottle

PRN – Packaging Recovery Note

PERN – Packaging Export Recovery Note

RDF – Refuse Derived Fuel

Secondary Packaging – Inner packaging used to transport or display goods to/in store, usually cardboard boxes or shelf-ready packaging

Transit/Tertiary Packaging – Any transit packaging e.g. pallets, shrink wrap, staples or strapping

WDF – Waste Data Flow

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- The Wood Recyclers Association (WRA)
- The Wood Panel Industries Federation (WPIF)
- The Advisory Committee on Packaging (ACP)
- The Timber Packaging and Pallet Confederation (TIMCON)
- The Environment Agency (EA)
- The Department for Environment, Food & Rural Affairs (DEFRA)
- The Scottish Government
- Zero Waste Scotland (ZWS)
- The Department of Agriculture, Environment and Rural Affairs (DAERA)

1. Introduction

1.1. Background

The PackFlow Covid-19 reports <https://www.valpak.co.uk/more/material-flow-reports> cover all packaging materials and have been produced to provide industry, Governments, and other stakeholders with evidence to better understand the potential implications of lockdown and the ensuing recession on packaging materials flows, packaging materials collection & recycling, and to assess potential compliance risks versus the packaging targets.

The PackFlow Covid-19 project has two phases:

Phase I

- Updates the baseline year to 2019 for estimates of packaging materials POM collections, recycling and end markets (from 2017 in the previous flow reports¹²).

Phase II

- Collates data and market intel on impact of the Covid-19 lockdown (materials flow, collections, recycling and end markets)
- Develops scenarios for packaging materials flow, collections and recycling from 2020 to 2022
- Assesses potential compliance risks versus targets.

To support Defra and Governments and other industry stakeholders in their packaging policy work and assist other industry stakeholders, this Phase I report focuses on generating robust estimates of UK wood packaging placed on the market (POM)¹³ that are as accurate as is reasonably possible. The report also considers the quantities of wood packaging recycling, both in the UK and abroad, and provides insights into the end markets and products that are manufactured by packaging wood recyclers in the UK.

1.2 Phase I Objectives

The PackFlow Covid-19 project for wood packaging has the following key objectives for Phase I:

- Provide an updated (and cross-checked) baseline estimate of wood packaging placed on the UK market in 2019, by sector, format and source:
 - Format (e.g. pallets, barrels, casks etc)
 - Sector (e.g. consumer, non-consumer)
 - Source (handled by obligated producers who are registered, non-obligated wood packaging)
- Estimate the quantities of wood packaging collected through HWRC/CA sites, kerbside and other collection routes, and by sector;
- Estimate the quantities of wood packaging recovered and recycled, sent for incineration with energy recovery, and sent to landfill for both UK and overseas end market destinations; and
- Provide estimates of the quantities of wood packaging that is recycled (i.e. is recorded as accredited recycling) and wood packaging that is recycled but does not generate a PRN/PERN (i.e. is unrecorded or unaccredited).

1.3 Methodology

Alternative methodologies and data sources exist to calculate packaging recycling rates. One approach that is common practice and deemed an appropriate method, and indeed is accepted by the EU, is to establish packaging recycling rates based on the quantity of packaging materials recycled relative to packaging materials POM.

¹² The previous packaging materials flow reports can found at <https://www.valpak.co.uk/more/material-flow-reports>.

¹³ Wood packaging placed on the market means all household and non-household wood packaging used around products sold and transported within the UK.

An alternative is to calculate packaging recycling rates as the ratio of the quantity of packaging materials recycled and the quantity of packaging waste arising.

In the context of plastic packaging recycling, basing the recycling rate calculation on plastic packaging POM rather than plastic packaging waste arising has recently been called into question by Eunomia (2018)¹⁴. It is noted here that estimates of plastic packaging waste arising established through composition analyses applied to waste data collated from multiple sources, tend to produce higher estimates of the quantity of material 'on the market' compared to POM approaches.

The Eunomia report claims that the NPWD's registered producer data (tonnages of packaging materials reported by producers who have registered their obligation under the packaging regulations) is likely to be subject to systematic underestimation, as companies have a vested interest in under-reporting their POM tonnages. It suggests that this might have resulted in an underreporting of plastic packaging POM and, as a consequence, an overestimate of the plastic packaging recycling rate.

The Eunomia report proposes an alternative calculation based on plastic packaging waste arising. While the approach is valid, it (like any methodology) has a number of significant limitations, relating to the accuracy of data for:

- The composition of household waste;
- The quantity of waste arisings from local authorities; and
- The quantity and composition of waste arisings in commercial and industrial streams.

Regarding plastic packaging, the justification of the use of POM data over alternatives is provided in full in section 1.3.1 of PlasticFlow 2025¹⁵.

In the context of estimating recycling rates for wood packaging, estimates based on waste arising will likely be very different from POM estimates. Essentially, this is because of the durability of wood packaging, it has a long life on the market and is extensively re-used and repaired. Therefore, there are long (and unknown) lags between wood packaging being POM and arising in the waste stream. Further, there are no comprehensive sources for waste wood statistics for the UK that include up-to-date and accurate data on waste wood and packaging wood waste arising. Waste Data Flow is of limited use for estimating wood packaging waste arising because the vast majority of wood packaging is non-consumer and there are only very small quantities of wood packaging waste collected by local authorities (for example at HWRC/CA sites).

1.3.1 POM

Wood packaging POM is estimated using a bottom-up approach that references a variety of data sources for wood packaging products placed on the market combined with data and estimates provided by industry. The results of this method are cross-checked against wood packaging POM tonnages reported to NPWD by producers obligated under the packaging regulations (and who are registered), and data provided by the project's industry Steering Group.

The baseline year is 2019, where 2019 data are not available the most recent available data are used.

1.3.2 POM (Bottom-up Approach)

The bottom-up approach to estimating POM references several data sources for wood packaging products placed on the market combined with data and estimates provided by via the industry Steering Group. The key data sources are:

- TIMCON: UK pallet production and pallet refurb/repair
- PRODCOM: UK manufacturers' sales of non-pallet wooden packaging products
- NPWD: Imported and exported wood packaging¹⁶

¹⁴ Eunomia: Plastic Packaging – Shedding Light on the UK Data, <http://www.eunomia.co.uk/reports-tools/plastic-packaging-shedding-light-on-the-uk-data/>

¹⁵ <https://www.valpak.co.uk/more/material-flow-reports/plastic-flow-2025>

¹⁶ The figures declared by obligated producers are scaled up to account for non-obligated flows.

Further details of the methodology to quantify wood packaging POM in 2019 and the results are provided in Section 2 of this report.

1.3.3 POM Cross-check (Net Pack Fill)

This cross-check collates data on the quantity of wood packaging data reported into NPWD by obligated producers who are registered. The net pack fill estimate is thought to capture the vast majority of obligated tonnage but it does not include wood packaging handled by unregistered producers ('de-minimis' businesses below the thresholds for obligation which are an annual turnover (in the previous year) of £2 million and handling 50 tonnes of packaging or more per year, and businesses with an obligation but are not registered with the relevant agency 'free-riders') and packaging for internal company use which is non-obligated packaging under the packaging regulations.

To estimate the amount of packaging placed on the UK market that is reported by obligated producers in NPWD, the net pack fill calculation set out below is applied. Details are reported in section 3 of this report.

Net Pack Fill	=	Packing/ Filling Table 1 - pack/filling	+	Imports Table 3A - imported for selling	+	Imports Table 3B - packaging removed from around imports	-	Exports Table 2A + Table 2B – pack/filling
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1.3.4 Recycling

NPWD is used as the source for accredited (recorded) recycling of wood packaging. The quantity of wooden packaging reported as accredited recycling is that which is eligible to raise a PRN/PERN but can differ from the actual issuance of PRN/PERN evidence for wood packaging recycling.

Industry representatives are consulted via a Steering Group, and alternative data sources are provided on the recycling of wood packaging that might not, for whatever reason, be reported (by accredited recyclers) on to NPWD. The output of these discussions, together with an estimate of wood packaging waste arising are used to assess total wood packaging recycling (i.e. accredited/recorded and non-accredited/unrecorded wood packaging recycling).

1.3.5 Data Robustness

There are levels of uncertainty around the data used to establish the various elements that are combined to estimate total wood packaging POM. Therefore, total POM estimates and the splits for consumer and non-consumer are reported with error margins to provide an indicative range of uncertainty. The data robustness scores for each element of data are presented in Appendix II, these are converted to a percentage and related to appropriate margins of error¹⁷ as shown in Figure 5. The respective margins of error are provided alongside estimates throughout the report.

¹⁷ These are assumed to be indicative estimates of the degree of uncertainty and are not the outputs of a statistical calculation.

Figure 4 Relating Data Robustness Scores to Appropriate Margins of Error

Robustness Score			Error Margin	
96%	to	100%	+/-	3%
91%	to	95%	+/-	6%
86%	to	90%	+/-	9%
81%	to	85%	+/-	12%
76%	to	80%	+/-	15%
71%	to	75%	+/-	18%
66%	to	70%	+/-	21%

To calculate an indicative margin of error for the total POM, the margins of error for the sub-elements that make up the total are converted to tonnages and then expressed as an overall percentage using a Root of Sum of Squares calculation (to approximate the overall error of a summation of subcategories with different error margins).

2. Wood Packaging POM

2.1 Introduction

This section of the report provides an overview of wood packaging flows onto the UK market. It provides details of the data sources used and presents an estimate of the quantity of wood packaging POM in 2019.

2.2 Placed on the Market

Wood packaging typically enters the UK market in the following formats, which are adopted for the purposes of this report:

- **Flat pallets** – extensively used as transit packaging by all industries requiring transport of large quantities of goods and bulky items. Pallets are typically made to standard sizes and managed operationally through large leased pallet pools. Pallets are designed for multiple trips, and are durable, reusable and repairable (often being repaired several times during their lifetime). However, flat pallets may also be single use pallets when required in specialist circumstances. It is only the quantity of new wood used in pallet manufacture and new wood added by repair/refurb activities that is included in the estimate of POM tonnage (leased pallets are obligated on their first trip only).
- **Box pallets and load boards** – box pallets offer further protection to products on flat pallets and are often used in manufacturing industries to bulk transport components and parts. Load boards are planks of wood used to cushion heavy goods during transit.
- **Casks, barrels, vats, tubs & coopers' products** – used typically in the beverage industry to brew, store and transport drinks up to the bottling stage. Wooden coopers' products are used in the transportation of wiring.
- **Other** – all other forms of wood packaging such as wood shaving fillers, wood wool and specialist items not covered above.

An estimate of the total weight of UK wood packaging POM in 2019 is established as the weight of wood packaging produced in the UK plus the weight of net imported wood packaging into the UK (i.e. the weight of imported wood packaging less the weight of wood packaging exported).

To estimate the weight of wood packaging produced in the UK 2019 industry data are used where possible to provide a more complete coverage of the wood packaging supply chain (for example compared to net pack fill which only covers the tonnage of wood packaging reported by registered obligated producers). Figure 4 provides an overview of the methodology used and the key data sources.

Figure 5 Key Data Sources for Wood Packaging POM, 2019

		UK Production		Imports	Exports
UK production, import/export* and de-minimis wood packaging	=	TIMCOM UK production of new/refurbished pallets	+	NPWD Table 3a imported for the purpose of pack/fill and selling + Table 3b packaging removed from imports	NPWD Table 2a direct exports pack/fill + Table 2b exports by 3 rd party pack/fill
		PRODCOM UK non-pallet packaging production		-	De-minimis imports (estimate)
UK wood packaging POM	=	UK wood packaging production	+	UK imported wood packaging	- UK exported wood packaging

2.3 Wood Packaging Production

This section reports estimates of wood packaging produced in the UK. Wood packaging production statistics are available by product category according to industry 1624 Manufacture of Wooden Containers in the Standard Industrial Classification of Economic Activities (SIC).

The two key data sources used in this report are:

- the Timber Packaging and Pallet Confederation & Forestry Commission (TIMCON), and
- the Office for National Statistics (ONS), UK Manufacturers' Sales by Product (PRODCOM).

A fundamental characteristic of wood is that it is hygroscopic meaning that wood will gain or lose moisture based on the conditions of its surrounding environment. When a tree is first felled, it is considered to be in the green state, and contains a very large amount of moisture. Wood packaging products are made from both green and kiln dried materials and over the lifetime of wood packaging its moisture content can reduce from 50% to 10% or less. The moisture content of wooden pallets (produced in the UK or imported) will typically decrease over the lifetime of the pallet and consequently its weight will vary at different points along the supply chain. In the estimates reported below a standard¹⁸ density of 507kg per cubic metre (m³) is applied to wood volumes.

2.3.1 TIMCON Market Data

In this report TIMCON market data for 2019 is used to estimate the weight of wood in UK new pallet production and the weight of wood used in pallet refurbishment and repair activities.

TIMCON figures for the volume (m³) of new wood used in new pallet production is multiplied by the standard density of wood used in wood packaging (507kg per m³). The weight of new wood used in pallet repair/refurb is calculated using TIMCON figures for the volume (m³) of new wood used in pallet repair/refurb multiplied by the standard density of 507kg per m³.

Estimates of the weight of wood used in pallet manufacture and pallet refurbishment/repair are shown in Figure 6 and Figure 7.

¹⁸ Environment Agency Agreed positions and technical interpretations – producer responsibility for packaging (14_08_26_Agreed_Positions_v8_5.pdf)

Figure 6 Wood in Production of New Pallets

	Units	2017	2018	2019
Number of new pallets manufactured	Items	41,400,000	44,900,000	47,288,680
Volume of new wood used	m ³	1,084,747	1,230,260	1,295,710
Volume of new wood per item	m ³	0.0262	0.0274	0.0274
Weight of wood in new pallets	Tonnes	575,318	623,742	656,925

Figure 7 Wood in Pallet Refurbishment and Repair

	Units	2017	2018	2019
Number of pallets repaired	Items	44,400,000	46,000,000	48,608,200
Volume of new wood used	m ³	138,993	165,600	175,600
Volume of new wood per item	m ³	0.0031	0.0036	0.0036
Weight of wood in pallet refurb/repair	Tonnes	81,809	83,959	88,720

2.3.2 PRODCOM Sales

The ONS PRODCOM dataset includes UK manufacturers' sales figures for wooden packaging products. Sales of 'non-pallet' wooden packaging products in are divided into key sections as summarised in Figure 8.

The quantity data for PRODCOM category 16241135 (box pallets and load boards) is reported as the number of items sold. This figure is converted to weight data for box pallets and load boards produced in the UK as described in Figure 8. The total weight of UK sales of wood packaging in 2019 for products other than flat pallets is then the summation of the tonnages reported in PRODCOM for these categories.

Figure 8 Conversion of PRODCOM Wood Production Data to Kg

PRODCOM	Product description	Unit	Conversion to Kg
16241135	Box pallets and load boards of wood EXCLUDING: - flat pallets	Number of items	Volume (cubic metres) of new wood per box pallet x 2 x number of items x 507
16241200	Casks, barrels, vats, tubs, and coopers' products and parts thereof of wood INCLUDING: - staves	kg	
16241320	Cases, boxes, crates, drums and similar packings of wood EXCLUDING: - cable drums	Kg	
16241350	Cable-drums of wood	Kg	

2.4 Summary of Wood Packaging Production

A summary of the estimates of the total weight of new wood used in UK production of wood packaging products in 2019 is reported in Figure 9. The total quantity of new wood used in UK production of pallets and non-pallet wooden packaging is estimated to be 872k tonnes in 2019 (up by 26k tonnes or 3% compared to 2017).

The total quantity of new wood used in the production and repair/refurb of pallets in the UK is estimated from TIMCON market data to be 746k tonnes in 2019 (up from 657k tonnes or 13% in 2017). The total quantity of new wood used in the production of non-pallet wooden packaging products in the UK is estimated from PRODCOM data at 127k tonnes in 2019 (down by ~60k tonnes or 33% compared to 2017 figures reported by PRODCOM).

Figure 9 New Wood Used in UK Wood Packaging Production, 2019 (k tonnes)

New wood used in wood packaging production by product	2019
UK production of new pallets	657
UK refurb/repair of new pallets	89
TOTAL new wood used in pallet production & pallet refurb/repair	746
Box pallets and load boards of wood EXCLUDING: - flat pallets	59
Casks, barrels, vats, tubs, and coopers' products and parts thereof of wood INCLUDING: - staves	7
Cases, boxes, crates, drums and similar packings of wood EXCLUDING: - cable drums	61
Cable-drums of wood	3
Total non-pallet packaging (incl. fastenings)	130
Total wood in non-pallet packaging (excl. fastenings¹⁹)	127
TOTAL wood packaging production	872

2.5 Wood Packaging Imports

This section provides estimates of the quantity of wood packaging imported into the UK by registered producers and the quantity of wood packaging imported into the UK by unregistered producers in 2019.

Producers handling wooden packaging who are obligated under the packaging regulations (and who are registered) report data on the tonnages of imported wood packaging into NPWD (note that figures for the import of wood packaging are not covered by either the TIMCON or PRODCOM datasets). The quantities reported by producers in compliance year 2020 are actual 2019 sales and include empty and filled wood packaging and wooden packaging that is transit packaging.

The quantity of wood packaging imported by unregistered producers is estimated using an estimate of the ratio of the imports by small businesses to total imports established in the methodology for the Wood Flow 2025 report²⁰.

¹⁹ Industry data used in Wood Flow 2025 indicated that fastenings (non-wood items) represented no more than 2.3% of the weight of a finished pallet. No data was available for fastenings within non-pallet wooden packaging. Therefore, it is assumed in this report that the proportional weight of fastenings in pallets and non-pallets packaging is unchanged from this figure.

²⁰ <https://www.valpak.co.uk/more/material-flow-reports/woodflow-2025>

It is estimated that 15.4% of total imported wood packaging is imported by unregistered producers²¹, and this ratio is used to scale up the estimate of wood packaging imported by registered producers to a total figure for the import of wood packaging.

Figure 10 shows that a total of 651k tonnes of wood packaging was imported into the UK by registered producers and 118k tonnes of wood packaging was imported into the UK by unregistered producers.

The total quantity of wood packaging imported into the UK by registered and unregistered producers in 2019 is estimated to be 769k tonnes.

Figure 10 Wood Packaging Imported into the UK, 2019 (k tonnes)

Wood packaging imported by registered and unregistered producers ²²	2019
Registered producers	
Table 3a Packing/filling (imported empty packaging for pack/fill that remains in the UK)	22
Table 3a Selling (packed goods imported for onward selling in the UK)	246
Table 3b Packaging removed from direct imports	383
Wood packaging imported by registered producers	651
Wood packaging imported by unregistered producers	118
TOTAL wood packaging imported by registered and unregistered producers	769

2.6 Wood Packaging Exports

This section provides estimates of the quantity of wood packaging exported by registered producers and the quantity of wood packaging exported by unregistered producers in 2019.

Producers with an obligation for wooden packaging under the packaging regulations (and who are registered) report their data on the tonnages of exported wood packaging into NPWD (note that figures for export of wood packaging are not covered by either the TIMCON or the PRODCOM datasets). The quantities reported by producers in compliance year 2020 are actual 2019 sales and include empty and filled wood packaging and wooden packaging that is transit packaging.

The quantity of wood packaging exported from the UK by unregistered producers is estimated using the export ratio for small businesses (to total exports) established in the methodology for the Wood Flow 2020 report²³. It is estimated that 12.5% of total exports of wood packaging was exported by unregistered producers²⁴, and this ratio is used to scale up the estimate of wood packaging exported by registered producers to a total figure for export of wood packaging.

Figure 11 shows that a total of 248k tonnes of wood packaging was exported from the UK by registered producers in 2019, and a total of 35k tonnes of wood packaging was exported from the UK by unregistered producers in 2019.

²¹ The dataset underlying this particular part of the analysis is for 2014. While this is an out of date figure it was discussed with the steering group and deemed a reasonable approximation. The project team believe it unlikely that this figure would have changed substantially, and that attempting to update the % of unregistered producer would entail a lot of work without really adding precision. It is acknowledged that this is an area of uncertainty for the wood POM estimate.

²² It is assumed that these figures exclude fastenings etc

²³ <https://www.valpak.co.uk/more/material-flow-reports/woodflow-2025>

²⁴ The dataset underlying this particular part of the analysis is for 2014. While this is an out of date figure it was discussed with the steering group and deemed a reasonable approximation. The project team believe it unlikely that this figure would have changed substantially, and that attempting to update the % of unregistered producer would entail a lot of work without really adding precision. It is acknowledged that this is an area of uncertainty for the wood POM estimate.

The total quantity of wood packaging exported from the UK by registered and unregistered producers in 2019 is estimated to be 283k tonnes.

Figure 11 Wood Packaging Exported from the UK, 2019 (k tonnes)

Wood packaging exported by registered and unregistered producers ²⁵	2019
Registered producers	
Table 2a Packing/filling (direct exports)	236
Table 2b Packing/filling (third party exports)	11
Total wood packaging exported by registered producers	248
Wood packaging exported by unregistered producers	35
TOTAL wood packaging exported by registered and unregistered producers	283

2.7 Summary of Wood Packaging POM

This section reports a summary of this project's final estimates of wood packaging POM in 2019. Detailed figures for the key components of wood packaging POM (k tonnes) are presented in Figure 12 where the arrows indicate the direction of change and the tonnage difference (k tonnes) compared to 2017.

Wood packaging POM is estimated to be 1,358k tonnes (+/- 10%) in 2019, an increase of around 67k tonnes²⁶ or 5% from the previous wood packaging POM estimate of 1,291k tonnes in 2017.

The wood packaging POM estimate is established from a bottom-up approach as the weight of wood packaging produced in the UK plus the weight of net imported wood packaging into the UK (i.e. the weight of imported wood packaging less the weight of wood packaging exported).

A total of 872k tonnes (64% of wood packaging POM) of new wood packaging is estimated to have been produced in the UK in 2019, of which 746k tonnes is estimated to be new wood used in new/refurbished wooden pallets and 127k tonnes is wood used in UK production of non-pallet wood packaging.

Total imports of wood packaging are estimated to be 769k tonnes in 2019, of which 651k tonnes is import of wood packaging declared by obligated producers who are registered, and 118k tonnes is estimated to be wood packaging imported by unregistered producers.

Total exports of wood packaging are estimated to be 283k tonnes in 2019, of which 248k tonnes is wood packaging exports declared by obligated producers who are registered, and 35k tonnes is estimated to be wood packaging exported by unregistered producers.

²⁵ It is assumed that these figures exclude fastenings etc

²⁶ The error margin indicates that the two wood packaging POM figures are not substantially different.

Figure 12 Total UK Wood Packaging POM, 2019, and changes versus 2017 (k tonnes)



2.8 Consumer Wood Packaging

Wood packaging POM in the consumer sector is broken down into consumer grocery POM and consumer non-grocery POM. The addition of these two sub-sectors equates to the total wood packaging POM in the consumer sector.

Total retail or consumer wood packaging POM in 2019 is therefore estimated at 1.2k tonnes + 124k tonnes = 126k²⁷ tonnes (+/-15%). Details of the calculations for consumer grocery POM and consumer non-grocery POM are as follows.

2.8.1 Grocery Retail

The quantity of wood packaging POM by grocery retailers is estimated from aggregated NPWD data provided by the Environment Agency (EA). The grocery market dataset provided by the EA is the 2019 sales quantities of wood packaging reported in the table 1 selling activity *minus* exports. The aggregated 2019 sales for the 11 UK supermarkets in the dataset represents 84% of UK grocery retail sales.

Scaling up the aggregated NPWD figures for supermarkets to 100% of UK grocery market sales provides an estimate of consumer grocery wood packaging POM for 2019 of 1,207 tonnes (+/- 6%).

2.8.2 Non-grocery Retail

Scaling up the grocery retail sales figure to represent total UK retail sales, including non-grocery retail, uses the Office of National Statistics (ONS) retail sales figures. The ONS retail sales figures show grocery retail sales accounted for 43% of total UK retail sales in 2019.

²⁷ sum of unrounded consumer grocery and non-grocery figures.

However, simply scaling up using these market shares is not considered robust, since it is likely that wood packaging usage in the grocery and non-grocery sectors is very different. The difference in usage of wood packaging in the grocery sector and the non-grocery retail sectors is analysed using the wood packaging data reported by Valpak's members.

The analysis involves the following key stages:

- Identification of grocery and non-grocery retail members;
- Gathering of company reported data and information; and
- Calculation of wood packaging tonnage per billion-pound turnover for grocery and non-grocery retailers, for which available data covers around 1.5% of obligated wood packaging.

The method assumes the wood packaging profile of those retailers within the available sample is representative of those not in the sample and that size of turnover is a suitable scaling factor for packaging usage.

- Total consumer grocery wood packaging flow in 2019 is 1,207 tonnes (see section 2.3.1);
- The proportion of grocery retail sales to total retail sales in the UK is ~43% in 2019²⁸;
- Total non-consumer retail wood packaging flow, assuming a like-for-like packaging composition is 2,841 tonnes in 2019,
- Wood packaging usage is estimated to be 4 tonnes /£bn turnover in grocery retail and 333 tonnes /£bn turnover in non-grocery retail (this is because non-grocery retail covers sectors such as DIY stores and garden centres),
- Non-grocery wood packaging tonnes/£bn turnover is circa 76 times that of grocery wood packaging tonnes/£bn turnover, and
- Multiply the difference between the like-for-like total retail (2,841 tonnes) and grocery retail (1,207 tonnes) by 76 which equates to ~124k tonnes of consumer non-grocery wood packaging

The estimate of consumer non-grocery wood packaging POM is ~124k tonnes (+/-15%).

2.9 Non-Consumer Wood Packaging

The quantity of non-consumer wood packaging POM is estimated as the total POM estimate (1,358k tonnes) *minus* the estimate of consumer wood packaging POM (~126k tonnes).

This provides an estimate of 1,233k tonnes (+/- 11%) of non-consumer wood packaging POM in the UK in 2019. Based on this estimate non-consumer wood packaging accounts for ~90% of total wood packaging POM in the UK.

2.10 Wood POM by Format

2.10.1 Total POM formats

Figure 13 shows estimates of total wood packaging POM in 2019 by type of format. The estimates for 2019 are derived from a combination of sources: TIMCON market data for pallets, PRODCOM for non-pallet packaging, and Valpak's EPIC database for grocery retail primary packaging supplied to consumers in the UK.

Wood packaging in the form of pallets accounts for the largest proportion (77%) of total wood packaging POM in 2019.

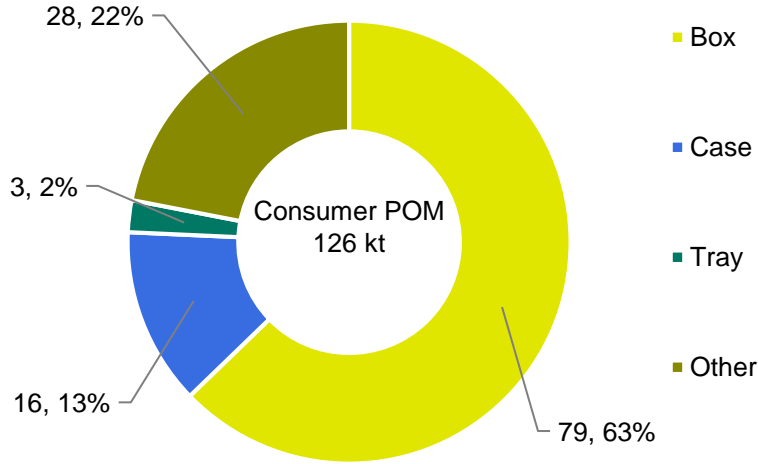
Cases, boxes, crates and drums are the next largest product format for wood packaging and represent 14% of total wood packaging POM in 2019.

Wooden casks, barrels, vats, tubs & coopers products represent around 1% of total wood packaging POM in 2019.

²⁸ <https://www.ons.gov.uk/businessindustryandtrade/retailindustry/datasets/poundsdatatotalretailsales> In 2017 this was 43%, and although there is a less than 1% change (from 43.2% in 2017 to 42.5% in 2019), this indicates some reduction in non-grocery sales.

The majority (>90%) of wood packaging POM is non-consumer, of this 85% is estimated to be flat wooden pallets. For the consumer sector the vast majority (99%) of wood packaging is in the non-grocery retail sector.

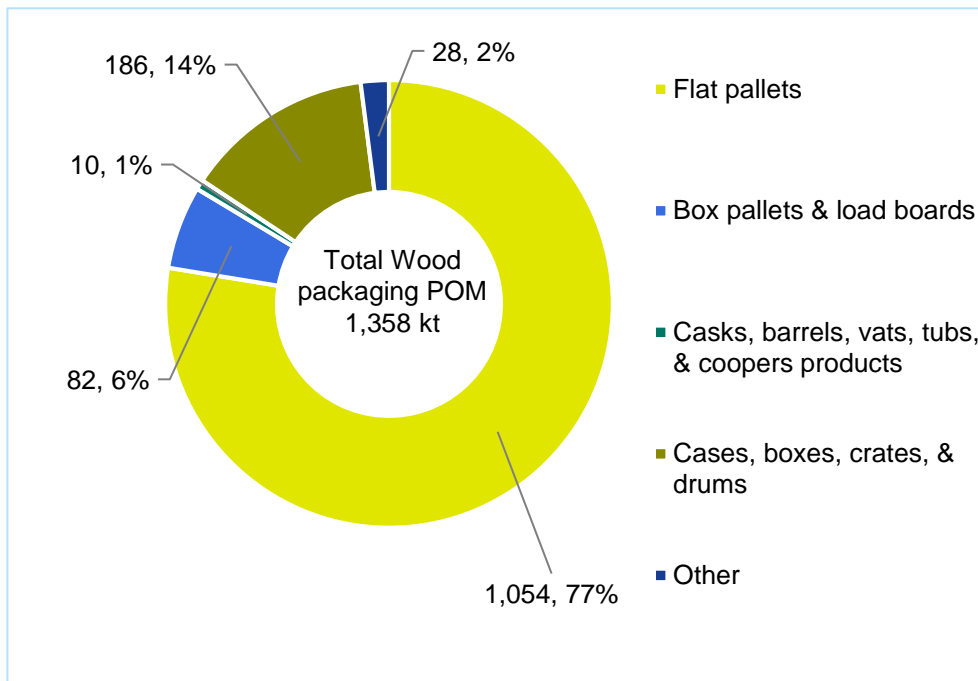
Figure 13 UK Wood Packaging POM by format, 2019 (k tonnes, %)



2.10.2 Consumer formats

A breakdown of wood packaging POM in the consumer sector by format is estimated from analysis of the wood packaging composition data from the supermarkets within Valpak’s EPIC database as a proxy for grocery packaging, and a sample of non-grocery retailers used as a proxy for non-grocery packaging within Valpak’s EPIC database. The results of this analysis are shown in Figure 14.

Figure 14 UK Consumer wood packaging POM by format, 2019 (k tonnes, %)



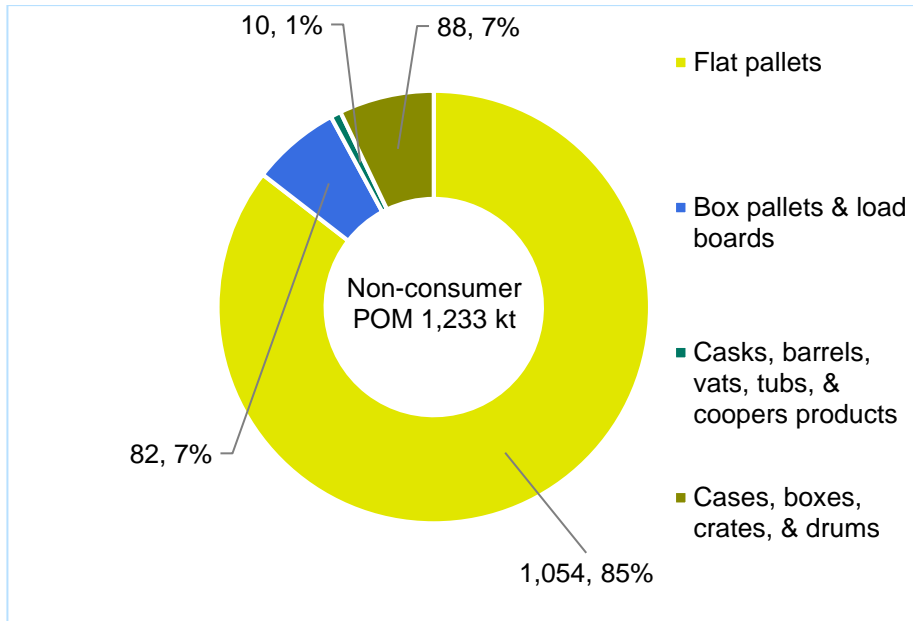
The vast majority (99%) of consumer wooden packaging is in the non-grocery retail sector, with wooden boxes (63%) being the biggest packaging format category. While the quantity of wooden packaging in consumer grocery retail is small, there has been some shift into wood packaging (compared to 2017) for products such as fruits, ready meals, cheeses and alcoholic drinks.

2.10.3 Non-consumer formats

To break down the non-consumer packaging by format, the data was initially separated into pallets and non-pallets wood packaging. The PRODCOM data then allowed for a further breakdown of non-pallet packaging products. Figure 15 shows the breakdown of non-consumer wood packaging POM in 2019.

The vast majority (>90%) of wood packaging POM is non-consumer, of this 85% is estimated to be flat wooden pallets.

Figure 15 UK Non-consumer wood packaging POM by format, 2019 (k tonnes, %)



3. POM Cross-check (Net Pack Fill)

This section of the report presents estimates of the total weight of wood packaging POM in 2019 that is handled by producers obligated (and registered) under the packaging regulations.

The tonnages for obligated wood packaging are those reported into NPWD by businesses with an obligation under the packaging regulations who are obligated (and registered) i.e. businesses with a turnover of more than £2 million (in the previous year) and who handle more than 50 tonnes of packaging per year.

Net Pack Fill	=	Packing/Filling Table 1 - pack/filling	+	Imports Table 3A - imported for selling	+	Imports Table 3B - packaging removed from around imports	-	Exports Table 2A + Table 2B – pack/filling
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The net pack fill calculation (outlined above) for wood packaging takes the weight of packaging reported at the packing/filling stage of the supply chain as opposed to the selling stage of the supply chain. It is believed by stakeholders that because of the likely size of businesses who are packer/fillers there are fewer unobligated packer/filler businesses in comparison to unobligated sellers. Also, other activities such as raw material manufacturing will include process losses which means that not all material manufactured will be converted or pack/filled, so it is expected that declared tonnage will reduce as it moves further down the supply chain.

Using the net pack fill calculation as the best proxy for obligated wooden packaging, the total tonnage of obligated wood packaging POM in 2019 is 1,201k tonnes, as shown in Figure 16.

Figure 16 Obligated Wood Packaging POM, 2019 (Net pack fill, k tonnes)

Table 1: Pack/fill (UK packing/filling)	820
Imports:	
Table 3a: Selling (imported for selling)	246
Table 3b: Packaging removed from imports	383
TOTAL UK pack/fill + imported	1,449
Table 2a: Packer/filling (direct exports)	236
Table 2b: Packer/filling (third party exports)	11
TOTAL exported	248
Net Pack/Fill	1,201

It is important to note that the net pack fill estimate is open to the possibility of a degree of error because it relies on the accuracy of the data that is submitted by registered producers to NPWD. The NPWD data is widely recognised as being the best available as there is a legal obligation for companies to submit data that is as accurate as is reasonably possible, which is then audited by the regulating body. This data is used by policy makers and their agencies.

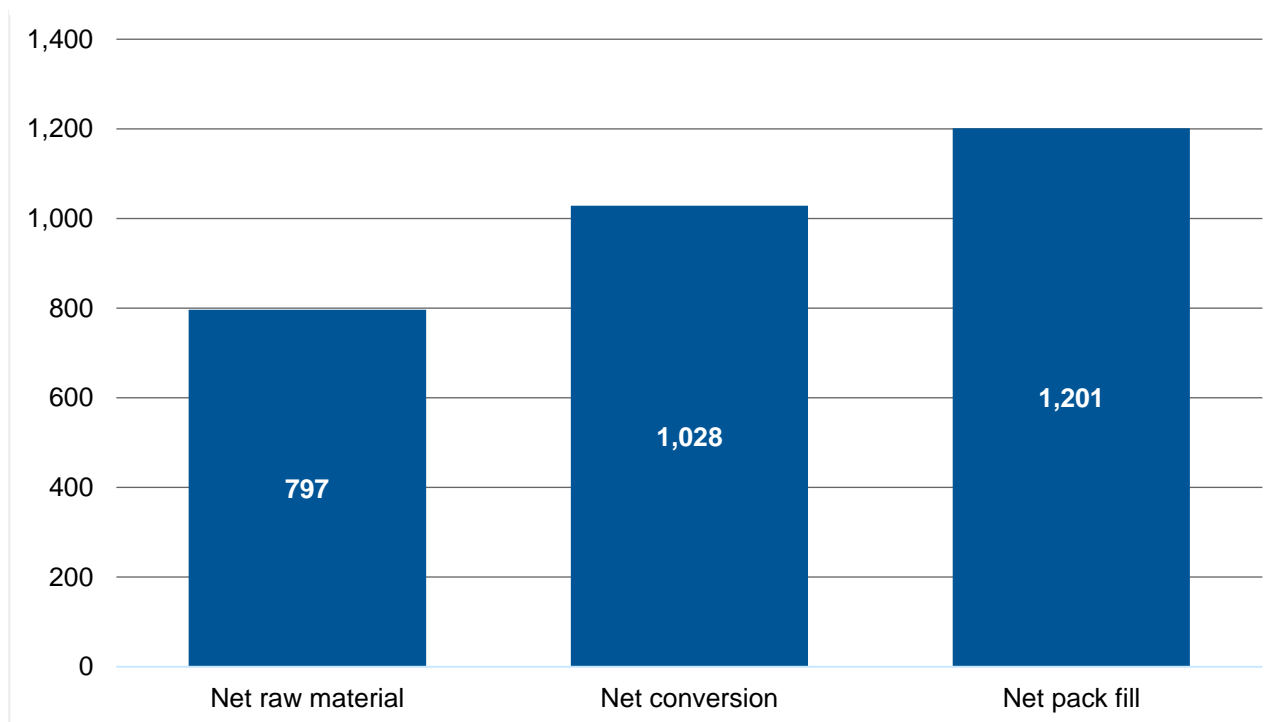
The net pack fill calculation does not account for the tonnage of wood packaging handled by unregistered producers which are:

- De-minimis producers – businesses handling fewer than 50 tonnes of packaging or with a turnover (in the previous year) below £2 million;
- Free-riders – businesses that are obligated but are not registered; and
- Illegal importers.

There is no available dataset to accurately quantify the quantity of wood packaging handled by unregistered producers. Here, unregistered wood packaging POM is calculated as the wood packaging POM estimate of 1,358k tonnes less the net pack fill figure of 1,201k tonnes which provides an estimate of the unregistered tonnage for wood packaging at 157k tonnes (or 12% of wood packaging POM). This compares to a figure of 123k tonnes (or 10% of wood POM) for the unregistered tonnage for wood packaging POM in the previous wood flow report.

As a sense check of the obligated tonnage established by the net pack fill calculation, net UK tonnages declared by registered producers in other activities along the supply chain are calculated. Net UK tonnages are established for raw material manufacturing and conversion, in addition to pack/filling. The aim was to identify the obligated tonnage at other stages of the supply chain to see how they differ. The results are shown in Figure 17.

Figure 17 Net pack/fill, net raw material and net conversion, 2019 (k tonnes)

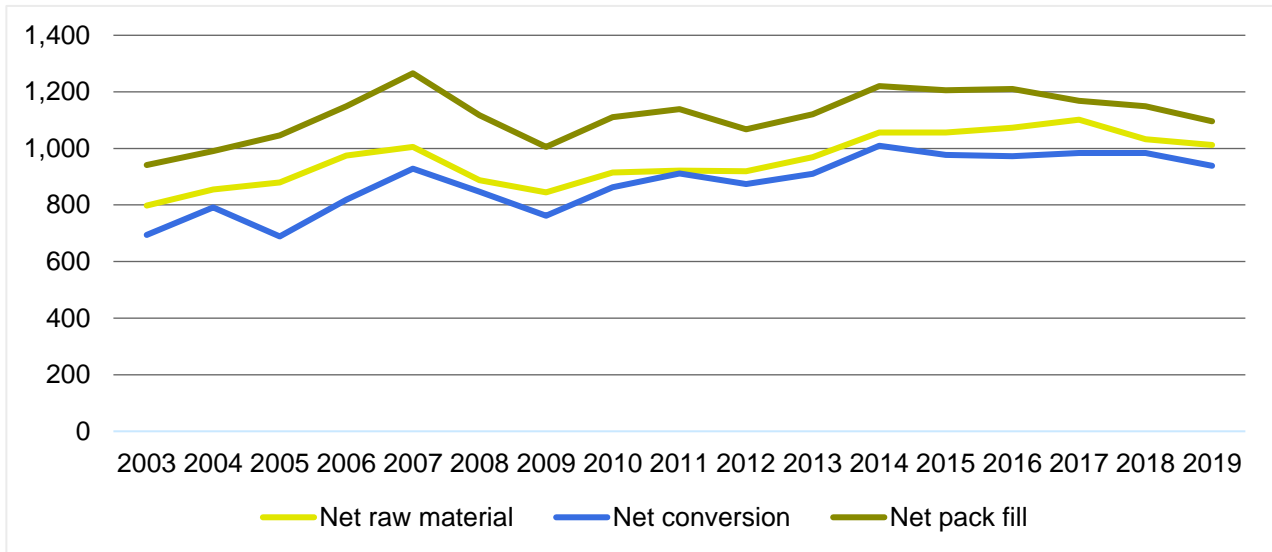


For wood packaging the tonnages of net raw material production and net conversion are below net pack fill. The comparison across supply chain activities for wood packaging shows a different pattern to that of other packaging materials (where manufacturing and conversion tonnages are comparable or higher than the net pack fill tonnage).

A possible reason for this in the case of wood packaging could be the nature of the wood production industry. For example, producers at the manufacturing stage may not be aware of the extent to which their wooden products are eventually made into packaging products further along the supply chain. Also, due to the high quantity of re-use pallets in circulation there could potentially be producers entering these tonnages incorrectly into their annual packaging returns for NPWD (multi-trip pallets should only be declared when entering the UK market for their first trip).

Other potential contributory factors could be that there are differing levels of de-minimis and/or free-riders at each stage of the supply chain. Note this pattern for wood packaging is not peculiar to 2019 and can be seen in data from 2003 onwards as shown in Figure 18.

Figure 18 Producer data net pack/fill, net raw material and net conversion, 2003 to 2019 (k tonnes)



4. Collection & Recycling of Wood Waste

This section of the report examines the quantities of wood and wooden packaging waste arising, collected, and recycled/reprocessed within the UK or exported in 2019.

4.1 Wood Waste Arising

As noted above estimates of the quantity of wood waste arising are likely be very different from POM estimates, particularly for wooden packaging. Essentially, this is because of the durability of wood packaging, it has a long life on the market and is extensively re-used and repaired. Therefore, there are long (and unknown) lags between wood packaging being POM and arising in the waste stream.

Wood waste arising (wood packaging and non-packaging wood) in the UK is estimated to be 4.52m tonnes in 2019²⁹. Accurate and up to date estimates of the quantity of waste wooden packaging arising are not available, studies now around 10 years old³⁰ indicate around 1 million tonnes of wooden packaging waste arising per year.

4.2 Collection of Wood Waste

Estimates of the collection of wood packaging waste sourced from local authorities (LAs) and from commercial and industrial (C&I) businesses are provided in this section of the report.

These estimates are based on assumptions made in previous Wood Flow projects, namely;

- The quantity of wood waste collected is assumed to be equivalent to the quantity of waste wood recycled
- Household data on LA recycling collections taken from Waste Data Flow (WDF)³¹ is used as a proxy for household recycling.
- The quantity of wood packaging waste accepted by accredited reprocessors / exporters for generation of PRN/PERNs (as reported on NPWD) equates to accredited recycling of wood packaging waste. These figures do not account for any unaccredited³² recycling of wood packaging waste.

Where wood waste is collected by LAs and/or by private collectors on behalf of LAs, it is generally collected from:

- Kerbside
- Bring sites
- Household waste recycling centres (HWRCs) or civic amenity (CA) sites.

Collection tonnage data is reported into WDF by LAs as; wood for composting; wood, chipboard and MDF; and composite wood materials. Collections of wood in the C&I sector are usually carried out by private waste management companies or wood recyclers.

4.2.1 Local Authority Collection

LA household collections of wood packaging waste in the UK can be represented as follows:

²⁹ <https://www.tolvik.com/wp-content/uploads/2020/04/Tolvik-UK-Biomass-Statistics-2019-FINAL.pdf>

³⁰ These are referenced in the wood flow 2025 report <https://www.valpak.co.uk/more/material-flow-reports/woodflow-2025> and indicate a range from 998k tonnes per year to 1,170 tonnes per year for wood packaging waste arising.

³¹ It should be noted that WDF is based on the collection of data from all LAs in the UK and as such due to the number of those reporting data that there is the risk of inconsistencies in the way LAs interpret the questionnaire and / or report data. WDF is used as it is considered the best available dataset for LA collected wood.

³² Wooden packaging that is recycled or exported for recycling by a company that is not accredited/registered with the Environment Agencies to raise PRN/PERNs on wood packaging reprocessed or exported.

$$\text{Total UK Wood Packaging Collected by Local Authorities} = \text{Kerbside Collection}^{27} + \text{Bring Site Collection} + \text{HWRC/CA Site Collection}$$

The WRA estimate³³ that ~1m tonnes of wood waste (wood packaging and non-packaging wood) is collected each year by local authorities at HWRC/CA sites.

WDF also includes figures for collection of waste wood with the figures for the financial year 2018/19³⁴ reported below. Collection tonnage data for wood waste reported into WDF refers to all wood waste and does not separately identify waste wood that is packaging wood. It is estimated that only around 1% of wood waste collected by local authorities is wooden packaging³⁵.

A summary of the UK local authority wood waste and wood packaging waste collection is shown in Figure 19.

Figure 19 Local Authority Wood Waste Collection, 2018/19 (k tonnes)

LA collected waste wood	Kerbside	Bring	HWRC/CA	TOTAL
Waste wood (non-packaging)	2	7	857	866
Waste wood (packaging)	0	0	9	9
Total waste wood	2	7	865	874

Figure 19 shows a total of 874k tonnes of wood waste (wood packaging and non-packaging wood) is collected by local authorities in 2018/19. Of this, it is estimated that just 9k tonnes is waste wood packaging. The majority (99%) of wood waste collected by LAs is collected at HWRC/CA sites. Some may be collected at kerbside, although this is likely to be part of bulky waste collections, and unlikely to be wooden packaging waste.

4.2.2 C&I Collection

C&I collection of wood packaging waste is estimated as follows:

$$\text{Total UK wood packaging recycled} - \text{Local authority collected wood packaging waste} = \text{Commercial \& Industrial collected wood packaging waste}$$

The total quantity of wood packaging recycled is the tonnage of accredited wood packaging recycling from NPWD. Local authority collected tonnages of wood packaging are based on WDF. C&I collected tonnages of wood packaging waste are estimated as the difference between the total quantity recycled and local authority collected wood packaging waste.

C&I wood packaging waste collected is estimated at 603k tonnes in 2018/19 as shown in Figure 20.

³³ Based on a WRA estimate of ~23% of annual wood waste being collected via HWRC/CA sites

³⁴ At the time of writing 2018/19 data was the most recent full set of WDF data available.

³⁵ Adopting the same assumption for the share of wood packaging in total wood collected as that in the Wood Flow 2020 report. This is supported by waste compositional analysis of mixed waste collected by LAs published by Defra in 2009²⁹, which concluded that 4% of all LA collected waste (at kerbside, HWRCs and bring sites) is estimated to be wood, of which only 1.48% is untreated wood and is therefore likely to include an element of packaging wood waste.

Figure 20 C&I wood packaging waste collected, 2018/19 (k tonnes)

Collected wood waste packaging	Quantity
Total collected	612
LA collected	9
C&I Collected	603

It is important to highlight that the quantity of wood packaging collected for recycling is not equal to the quantity that is ultimately recycled. The WDF collection figures will not equal the amount recycled, as many local authorities do not robustly account for material rejected by the materials recycling facilities (MRFs) during the sorting process. Therefore, for simplicity, by assuming that the total collected for recycling equals the total actually recycled, this calculation distorts the representation of contamination and non-target material, accounting for them all upfront (in this case, by default, within the C&I collections estimate).

This means that C&I collections as reported here are implicitly underestimated by the combined, unknown level of contamination and non-target material.

It is also important to note that the NPWD recycling data only covers wood packaging waste recycled by accredited reprocessors/exporters. It does not include tonnages recycled without a packaging recovery note/ packaging exported recovery note (PRN/PERN) being generated or packaging wood recycled by unaccredited wood recyclers.

4.3 Recycling of Wood Packaging

This section of the report examines the quantity of wood packaging recycling in the UK and that which is exported. In contrast to collection it specifically focusses on wood packaging that is successfully recycled (i.e. where wood packaging waste is used by businesses to manufacture products derived from waste packaging wood).

To estimate the total quantity of wood packaging recycling that is taking place, recycling activities are split into two categories:

- Accredited recycling, meaning recycling of wood packaging waste recycling reported by accredited wood recyclers and accepted as being eligible for issuing PRN/PERNs
- Unaccredited recycling, meaning recycling of wood packaging waste that is not recorded by accredited or unaccredited wood recyclers.

4.3.1 Accredited wood packaging recycling

Accredited recycling and recovery is that undertaken by a reprocessor/exporter whose activities are eligible for registration as an accredited reprocessor/exporter and to issue PRN/PERNs. Only the activities of wood recyclers who are registered as accredited are considered here.

Eligible markets for the recycling/recovery of waste wood packaging include:

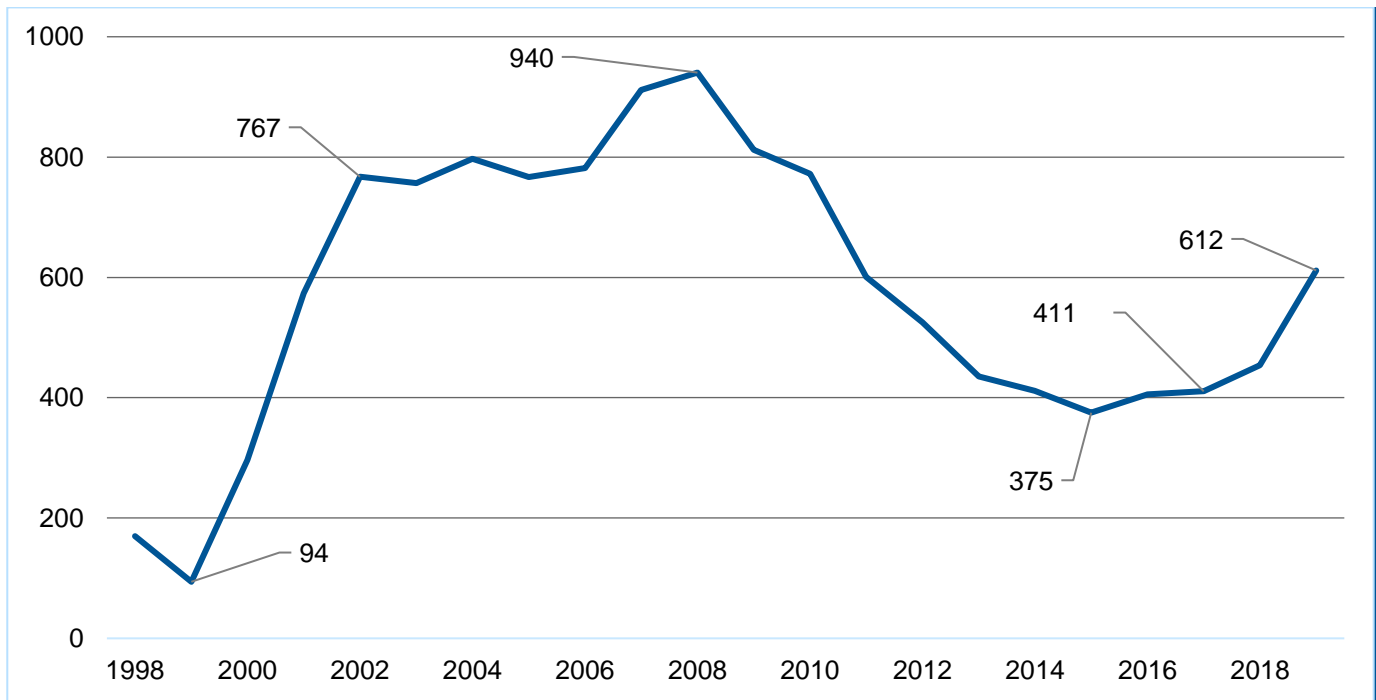
- Manufacture of wood-based panel board, for example, chipboard or orientated strand board (OSB);
- Decorative woodchip;
- Utility chip (including that used in riding arenas etc., and as a biomass fuel); and
- Animal bedding.
- There may be an element of wood packaging waste in mixed waste which is combusted in energy recovery facilities. This material is eligible for recovery PRNs under the following circumstances:
 - Energy recovery from packaging waste burnt in a municipal waste incinerator where the energy efficiency meets the requirement of the R1 specification (i.e. with an energy efficiency of 0.6 or above)

applies to installations permitted before 1 January 2009; for installations permitted after 31 December 2008 the energy efficiency is 0.65 or above).

Recovery PRNs can be issued for 19% of the waste unless the operator of the incinerator proposes an alternative sampling method in the accreditation application to demonstrate the packaging content of these waste streams.

The total quantity of accredited wood packaging waste recycled (reprocessed in the UK or exported by accredited exporters) from 1998 to 2019 is shown in Figure 21.

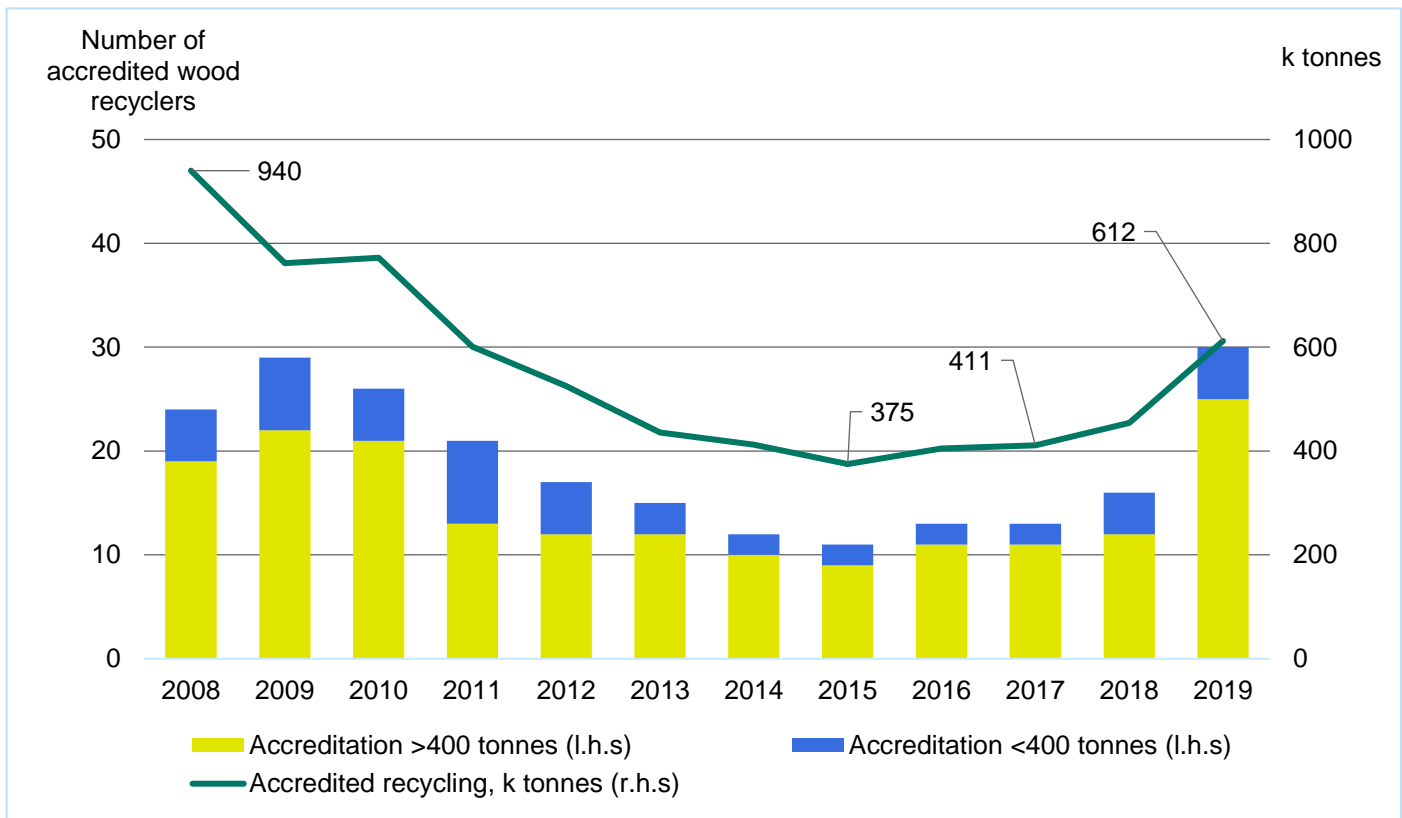
Figure 21 Accredited Wood Packaging Recycling, 1998 to 2019 (k tonnes)



Since 1998 the quantity of accredited wood packaging recycling has followed two distinct trends: an increase from 2000 up to 2008 when it peaked at 940k tonnes; followed by a decline that continued to a low point in 2015. Since 2015 accredited wood packaging recycling has increased, in 2019 it increased by 154k tonnes to 612k tonnes compared to 454k tonnes in 2018.

It is believed the decrease from 2009 is due to an increase in wood packaging being used in end markets such as biomass energy (which is classified as a recovery activity rather than a recycling activity). In addition, the number of wood reprocessors who were accredited with agencies for wood packaging declined, notably between 2010 and 2015, and for sites with large accreditations (>400 tonnes per year) for wood packaging see Figure 22.

Figure 22 Wood Recycler Accreditation and Accredited Wood Packaging Recycling, 2008 to 2019



4.3.2 End Markets

This section presents analysis to determine the quantity of packaging wood waste recovered and used in different end markets in 2019.

The project Steering Group commented that it seems likely there are substantial quantities of waste wood packaging that is being recycled/recovered but it is taking place without any recycling or recovery evidence being issued and as such is considered unaccredited (or unrecorded) recycling.

There is no fully inclusive and comprehensive source of waste wood statistics for the UK that includes up-to-date and accurate data on waste wood arisings and markets. There is uncertainty around the amounts of wood and wooden packaging going to re-use, recycling or recovery but it is believed that the quantity of wood wastes going to landfill disposal is small.

Here, the available data sources are reviewed, and the information drawn from them is updated using information on current markets for wood waste from the Wood Recyclers Association (WRA) and the Wood Panel Industries Federation (WPIF).

The major end markets for waste wood (including packaging) are:

- Wood-based panel board manufacture;
- Biomass energy generation;
- Other recycling (animal bedding, equine surfaces and mulches etc.)

To understand how wood waste packaging may be used in different markets, it is first necessary to understand the quality requirements of each market. Wood waste comes from a variety of sources that dictate the level of contamination in the waste wood. The source and level of contamination is used by wood recyclers to grade the quality of the wood waste, providing an indication of the need for processing and potential end markets available. This

classification has been standardised by the WRA and is used in the Publicly Available Standard 111³⁶. The grades and typical end market uses of waste wood are summarised in Appendix I.

Figure 23 UK Waste Wood End Markets, 2019

	UK Waste Wood Market Estimates
Sector	k tonnes
Wood-based panel board	984
Animal bedding, equine surfaces and other recycling	320
Biomass - Chapter IV	2,390
Reuse ³⁷	n/a
Export	190
Small Scale Biomass	100
Total	3,984

Figure 23 reports the estimated quantities of waste wood going to various UK wood waste markets in 2019 according to the WRA. It should be emphasised that these figures are for all types of waste wood, not just wooden packaging waste.

A total of ~4 million tonnes of waste wood was recovered/recycled in 2019. Waste wood recovery by UK energy facilities (large and small scale biomass) was ~2.5 million tonnes. Around 1.5 million tonnes of waste wood was recycled into wood-based panel board, animal bedding and equine surfacing.

The main recycling end markets for packaging wood waste are predominantly in applications that require grade A wood, i.e. production of animal bedding, equine surfaces etc, and grade B applications such as wood-based panel board manufacture. These grades consist predominantly of wooden packaging waste but may also contain waste wood from other sources, such as wood waste from manufacturing of wood products and joinery offcuts.

The wood-based panel board industry used 984k tonnes of waste wood in 2019, 320k tonnes of waste wood was used by UK manufacturers of animal bedding, mulches and equines surfaces, and 190k tonnes of waste wood was exported.

Having identified the total quantity of wood waste utilised by each market, the next stage in the analysis is to estimate tonnages of wooden packaging waste used by each end market. Estimates of waste wood packaging are summarised in Figure 24. This includes information on the quantities of wood recycling reported by members of the WRA and estimates made by the WRA of the quantities of wood waste managed by non-members to provide a full market figure (where available).

³⁶ <https://www.wrap.org.uk/content/bsi-pas-111-processing-wood-waste>

³⁷ The WRA's membership reported ~25k tonnes of waste wood going to reuse in 2019 but the full market estimate is uncertain and this figure should not be interpreted as such.

Figure 24 UK Waste Wood Packaging End Markets, 2019

	Wood packaging share of total wood waste	UK Wood Packaging Market Estimates
Sector	%	k tonnes
Wood-based panel board	37%	361
Animal bedding, equine surfaces and other recycling	78%	250
Biomass - Chapter IV	5%	120
Reuse	n/a	n/a
Export		3
Small Scale Biomass	90%	90
Total		824

The quantity of wood packaging waste recovered or recycled is estimated to be 824k tonnes in 2019, of which 614k tonnes (or 75%) is attributed to the recycling of wood packaging.

In 2019, wood-based panel board manufacturers recycled of 361k tonnes of waste wood packaging. Note that while all UK wood-based panel board producers are accredited the quantity of wooden packaging going into wood-based panel board mills is not necessarily the same as that reported as accredited recycling.

The WRA estimate that ~80% of the wood waste used in the manufacture of animal bedding, equine surfaces and mulches is waste wood packaging. Wood recyclers manufacturing animal bedding, equine surfaces etc used 250k tonnes of wooden packaging in 2019, and the WRA believe that all of this tonnage was recorded as accredited recycling.

A full market estimate of the quantity of wood packaging being re-used is unknown. The Steering Group commented that the fate of substantial quantities of wooden pallets is unknown, these are wooden pallets that are not of the size typically used by the various pallet pools, but are wood pallets that could be directly re-used.

The 3k tonnes of wood packaging exported is based on the 2019 NPWD figure for PERNs but it is acknowledged here that the actual figure for wood packaging exported is unknown.

In terms of recovery of wood packaging 120k tonnes of wood packaging waste is estimated to have gone to large scale biomass (Biomass - Chapter IV) in 2019, with small scale biomass using 90k tonnes of wooden packaging waste. Small scale biomass feedstock has to be clean, untreated grade A material, which will predominantly be wooden packaging but may also contain pre-consumer waste wood such as joinery offcuts. For Chapter IV biomass, the feedstock is varied according to the specific requirements of the operator but all operators will be able to use treated/non-hazardous waste wood (grades B and C) as well as clean, untreated (grade A) and virgin wood. However, both economically and environmentally, it makes more sense for biomass operators to use more of the treated/non-hazardous material as feedstock (i.e. wood grades B and C rather than grade A).

4.3.2.1 Summary of End Markets

A total of ~4 million tonnes of waste wood was recovered/recycled in 2019. Waste wood recovery by UK energy facilities (large and small scale biomass) was ~2.5 million tonnes. Around 1.5 million tonnes of waste wood was recycled into wood-based panel board, animal bedding and equine surfacing.

The quantity of wood packaging waste recovered or recycled is estimated to be 824k tonnes in 2019, of which 614k tonnes (or 75%) of this being recycling of wood packaging.

In 2019, wood-based panel board manufacturers recycled of 361k tonnes of waste wood packaging.

Wood recyclers manufacturing animal bedding, equine surfaces etc used 250k tonnes of wooden packaging in 2019, and the WRA believe that all of this tonnage was recorded as accredited recycling.

In terms of recovery of wood packaging 120k tonnes of wood packaging waste is estimated to have gone to large scale biomass (Biomass - Chapter IV) in 2019, with small scale biomass using 90k tonnes of wooden packaging waste.

A full market estimate of the quantity of wood packaging being re-used is unknown.

The EU Waste Framework Directive sets out five steps for dealing with waste ranked according to environmental impact - the 'waste hierarchy'. Within this hierarchy, businesses involved in the generation or handling of waste should consider prevention and preparation for re-use before recycling, recovery and disposal. Operators should be mindful that some packaging, and particularly wooden pallets are often suitable for reuse

The steering group commented that the fate of substantial quantities of wooden pallets that are placed on the market is unknown, these are wooden pallets that are not of the size typically used by the various pallet pools, but are pallets that could directly be re-used.

4.3.3 Unaccredited Wood Packaging Recycling

The total quantity of wood packaging waste recycled in 2019 is estimated to be 614k tonnes. Subtracting the accredited recycling figure of 612k tonnes gives a total figure for unaccredited wood packaging recycling of just 2k tonnes which appears implausibly low.

In 2017, total wood packaging recycling was estimated at 546k tonnes, subtracting accredited wood packaging recycling of 411k tonnes (in 2017) gives an unaccredited figure of 135k tonnes for 2017 (10% of 2017 POM). In 2019 accredited recycling was 612k tonnes versus 614k tonnes estimate of total wood packaging. The increase in accredited wood packaging recycling appears to be related to the increase in the business target recycling rate for wood packaging (to 48% from 33%), which pushed up wood PRN prices, and led to an increase in wood recyclers becoming accredited, and an increase in accredited wood packaging recycling in 2019.

If the estimated 1 million tonnes of wood packaging waste arising per year is broadly accurate, then the fate of substantial tonnages (~300k tonnes³⁸) of wood packaging waste is potentially not accounted for.

The total quantity of wood packaging waste recycled in the UK is unknown because a plausible figure for unaccredited wood packaging recycling is not available. However, all major UK wood recyclers are accredited, and the WRA believe that the tonnage of wood packaging that is recycled (by accredited wood recyclers) but is unaccredited is very small.

4.4 Summary of Collection and Recycling of Wood Waste

This section summarises the key findings for the collection and recycling of wood waste and wooden packaging waste.

Wood waste arising (wood packaging and non-packaging wood) in the UK is estimated to be 4.52m tonnes in 2019³⁹.

The WRA estimate⁴⁰ that ~1m tonnes of wood waste (wood packaging and non-packaging wood) is collected each year by local authorities at HWRC/CA sites.

Waste Data Flow figures for 2018/19 indicate that local authorities collected 874k tonnes of wood waste (wood packaging and non-packaging wood).

The vast majority (99%) of wood waste collected by local authorities is via HWRC/CA sites and is non-packaging wood. Less than 10k tonnes of wood waste collected by local authorities is wood packaging and virtually none of this is collected via bring sites or kerbside.

³⁸ Approximate mid-point of the range of estimates of the differences between wood packaging waste arising and usage in end markets.

³⁹ <https://www.tolvik.com/wp-content/uploads/2020/04/Tolvik-UK-Biomass-Statistics-2019-FINAL.pdf>

⁴⁰ Based on WRA estimate of ~23% of annual wood waste is collected via HWRC/CA sites.

Accredited waste wood packaging recycling is estimated to be 612k tonnes in 2019.

The accredited recycling rate for wood packaging is ~45% in 2019.

(Comparing against the wood packaging POM estimate of 1,358k tonnes in this report).

A total of ~4 million tonnes of waste wood was recovered/recycled in 2019.

A total of ~4 million tonnes of waste wood was recovered/recycled in 2019. Waste wood recovery by UK energy facilities (large and small scale biomass) was ~2.5 million tonnes. Around 1.5 million tonnes of waste wood was recycled into wood-based panel board, animal bedding and equine surfacing.

In 2019, wood-based panel board manufacturers recycled of 361k tonnes of waste wood packaging. Wood recyclers manufacturing animal bedding, equine surfaces etc used 250k tonnes of wooden packaging in 2019, and the WRA believe that all of this tonnage was recorded as accredited recycling.

In terms of recovery of wood packaging, 120k tonnes of wood packaging waste is estimated to have gone to large scale biomass (Biomass - Chapter IV) in 2019, with small scale biomass using 90k tonnes of wooden packaging waste.

A full market estimate of the quantity of wood packaging being re-used is unknown. The Steering Group commented that the fate of substantial quantities of wooden pallets is unknown, these are wooden pallets that are not of the size typically used by the various pallet pools, but are pallets that could be directly re-used.

The total quantity of wood packaging waste recycled in the UK is uncertain because a plausible figure for unaccredited wood packaging recycling is not available.

However, all major UK wood recyclers are accredited, and the WRA believe that the tonnage of wood packaging that is recycled (by accredited wood recyclers) but is unaccredited is very small.

If the estimated 1 million tonnes of wood packaging waste arising per year is broadly accurate, then the fate of substantial tonnages (~300k tonnes) of wood packaging waste is potentially not accounted for. The WRA believe that very little of this goes to landfill and that this figure will reduce significantly as there are formal markets for all types of waste wood.

5. Conclusions and Recommendations for Further Work

This section sets out the key conclusions of the project and details the main areas recommended for further work.

5.1 Conclusions: POM

This report estimates wood packaging POM in 2019 at 1,358k tonnes (+/- 10%). This estimate represents a 5% increase⁴¹ from the previous⁴² wood POM figure of 1,291k tonnes (2017).

The wood POM estimate is established from a bottom-up approach as the weight of wood packaging produced in the UK plus the weight of net imported wood packaging into the UK (i.e. the weight of imported wood packaging less the weight of wood packaging exported).

A total of 872k tonnes (64% of wood packaging POM) of new wood packaging in pallets is estimated to have been produced in the UK in 2019, of which 746k tonnes is estimated to be new wood used in new/refurbished wooden pallets and 127k tonnes is wood used in UK production of non-pallet wood packaging.

Total imports of wood packaging are estimated to be 769k tonnes in 2019, of which 651k tonnes is import of wood packaging declared by obligated producers who are registered, and 118k tonnes is estimated to be wood packaging imported by unregistered producers.

Total exports of wood packaging are estimated to be 283k tonnes in 2019, of which 248k tonnes is wood packaging exports declared by obligated producers who are registered, and 35k tonnes is estimated to be wood packaging exported by unregistered producers.

Consumer wood packaging POM is estimated at around 126k tonnes (+/- 15%) in 2019, the vast majority 124k tonnes (+/-15%) is estimated to be wood packaging in the consumer non-grocery sector.

Consumer grocery wood packaging is estimated to be ~1,200 tonnes (+/- 6%)

Wooden packaging POM in the non-consumer sector is 1,233k tonnes (+/- 11%) in 2019.

The vast majority (90%) of wood packaging POM is in the non-consumer sector.

Wood packaging POM handled by obligated producers in 2019 is estimated to be 1,201k tonnes (or 88% of total POM).

A slight decrease on the estimated 90% of wood packaging POM obligated in 2017.

The proportion of wood packaging POM that is handled by unregistered producers is estimated to be 12% (or ~157k tonnes) in 2019.

A slight increase on the estimated 10% of wood packaging POM that was unregistered in 2017.

By format, including imports, flat wooden pallets are estimated to account for 77% of wood packaging POM in 2019.

Cases, boxes, crates and drums are the next largest product format for wood packaging, representing 14% of wood POM, wooden casks, barrels, vats, tubs & coopers products represent around 1% of total wood POM.

The majority (85%) of wood packaging POM in the non-consumer sector is estimated to be flat wooden pallets.

The vast majority (99%) of consumer wooden packaging is in the non-grocery retail sector, with wooden boxes (63%) being the biggest packaging format category.

⁴¹ The error margin indicates that the two wood packaging POM figures are not substantially different.

⁴² <https://www.valpak.co.uk/more/material-flow-reports/woodflow-2025>

While the quantity of wooden packaging in consumer grocery retail is small, there has been some shift into wood packaging (compared to 2017) for products such as fruits, ready meals, cheeses and alcoholic drinks.

5.2 Conclusions: Collections and Recycling

Wood waste arising (wood packaging and non-packaging wood) in the UK is estimated to be 4.52m tonnes in 2019⁴³.

The WRA estimate⁴⁴ that ~1m tonnes of wood waste (wood packaging and non-packaging wood) is collected each year by local authorities at HWRC/CA sites.

Waste Data Flow figures for 2018/19 indicate that local authorities collected 874k tonnes of wood waste (wood packaging and non-packaging wood).

The vast majority (99%) of wood waste collected by local authorities is via HWRC/CA sites, and is non-packaging wood. Less than 10k tonnes of wood waste collected by local authorities is wood packaging and virtually none of this is collected via bring sites or kerbside.

Accredited waste wood packaging recycling is estimated to be 612k tonnes in 2019.

The accredited recycling rate for wood packaging is ~45% in 2019 (comparing against the wood packaging POM of 1,358k tonnes estimated in this report).

In 2019, wood-based panel board manufacturers recycled of 361k tonnes of waste wood packaging. Wood recyclers manufacturing animal bedding, equine surfaces etc used 250k tonnes of wooden packaging in 2019, and the WRA believe that all of this tonnage was recorded as accredited recycling.

The total quantity of wood packaging waste recycled in the UK is uncertain because a plausible figure for unaccredited wood packaging recycling is not available. However, all major UK wood recyclers are accredited, and the WRA believe that the tonnage of wood packaging that is recycled (by accredited wood recyclers) but is unaccredited is very small.

If the estimated 1 million tonnes of wood packaging waste arising⁴⁵ per year is broadly accurate, then the fate of substantial tonnages (~300k tonnes) of wood packaging waste is potentially not accounted for. The WRA believe that very little of this will go to landfill and that the figure for informal/unreported usage of wooden packaging will reduce significantly as there are formal markets for all types of waste wood.

5.3 Conclusions: End Markets

A total of ~4 million tonnes of waste wood (packaging and non-packaging wood) was recovered/recycled in 2019.

Waste wood recovery by UK energy facilities (large and small scale biomass) was ~2.5 million tonnes. Around 1.5 million tonnes of waste wood was recycled into wood-based panel board, animal bedding and equine surfacing.

The quantity of wood packaging waste recovered or recycled is estimated to be 824k tonnes in 2019, of which 614k tonnes (or 75%) of this being recycling of wood packaging.

In 2019, wood-based panel board manufacturers recycled 361k tonnes of waste wood packaging.

⁴³ <https://www.tolvik.com/wp-content/uploads/2020/04/Tolvik-UK-Biomass-Statistics-2019-FINAL.pdf>

⁴⁴ Based on WRA estimate of ~23% of annual wood waste is collected via HWRC/CA sites

⁴⁵ Note that estimates of wood packaging waste arising will likely be very different from POM estimates. Essentially, this is because of the durability of wood packaging, it has a long life on the market and is extensively re-used and repaired. Therefore, there are long (and unknown) lags between wood packaging being POM and arising in the waste stream.

Wood recyclers manufacturing animal bedding, equine surfaces etc used 250k tonnes of wooden packaging in 2019, and the WRA believe that all of this tonnage was recorded as accredited recycling.

A full market estimate of the quantity of wood packaging being re-used is unknown.

The EU Waste Framework Directive sets out five steps for dealing with waste ranked according to environmental impact - the 'waste hierarchy'. Within this hierarchy, businesses involved in the generation or handling of waste should consider prevention and preparation for re-use before recycling, recovery and disposal. Operators should be mindful that some packaging, and particularly wooden pallets are often suitable for reuse

The steering group commented that the fate of substantial quantities of wooden pallets placed on the market is unknown, these are wooden pallets that are not of the size typically used by the various pallet pools but are pallets that could be directly re-used.

In terms of recovery of wood packaging, 120k tonnes of wood packaging waste is estimated to have gone to large scale biomass (Biomass - Chapter IV) in 2019, with small scale biomass using 90k tonnes of wooden packaging waste.

5.4 Recommendations for Further Work

There are uncertainties around estimates of the fate of wood packaging and the level of unaccredited wood packaging recycling.

If the estimated 1 million tonnes of wood packaging waste arising⁴⁶ per year is broadly accurate, then the fate of substantial tonnages (~300k tonnes) of wood packaging waste is potentially not accounted for. The WRA believe that very little of this will go to landfill and that this figure will reduce significantly as there are formal markets for all types of waste wood.

Further research is recommended to provide an updated comprehensive assessment of wood packaging waste arising, re-use, recycling and informal/formal recovery routes for wood packaging.

⁴⁶ Note that estimates of wood packaging waste arising will likely be very different from POM estimates. Essentially, this is because of the durability of wood packaging, it has a long life on the market and is extensively re-used and repaired. Therefore, there are long (and unknown) lags between wood packaging being POM and arising in the waste stream.

Appendix I

Grades of Wood Waste and Typical End Markets

Figure 25 Description of the various Grades of Waste Wood and Typical End Markets

Grade	Definition	Typical markets
Grade A – Clean untreated wood	Relatively homogenous (hardwood/softwood), primary processed woods. Source: distribution, retailing, packaging and secondary manufacture e.g. joinery and pallet reclamation.	Manufacture of professional and consumer products, such as animal bedding, equine and landscaping surfaces. May also be used as a fuel in domestic and non-IED Chapter IV biomass installations and for the manufacture of pellets and briquettes.
	Materials: solid softwood and hardwood. Packaging waste, scrap pallets, packaging cases and cable drums. Process offcuts from the manufacture of untreated products.	
Grade B- Industrial waste wood	Source: Grade A plus construction and demolition operations, skip operators, transfer stations	Industrial wood processing operations e.g. wood-based panel board manufacture
	Materials: may contain up to 60% Grade A material as above plus building and demolition materials and domestic furniture made from solid wood.	
Grade C – Municipal waste wood	Source: As above plus municipal collections, transfer stations and HWRCs.	IED Chapter IV biomass installations and for wood-based panel board production in controlled volumes
	Materials: all of the above plus fencing products, flat pack furniture made from board products and DIY materials	
Grade D - Hazardous waste wood	Source: All of the above plus agricultural fencing, trackwork and transmission pole contractors	Must be disposed at facilities licensed to accept hazardous waste.
	Materials: Agricultural fencing, transmission poles, railway sleepers, cooling towers.	

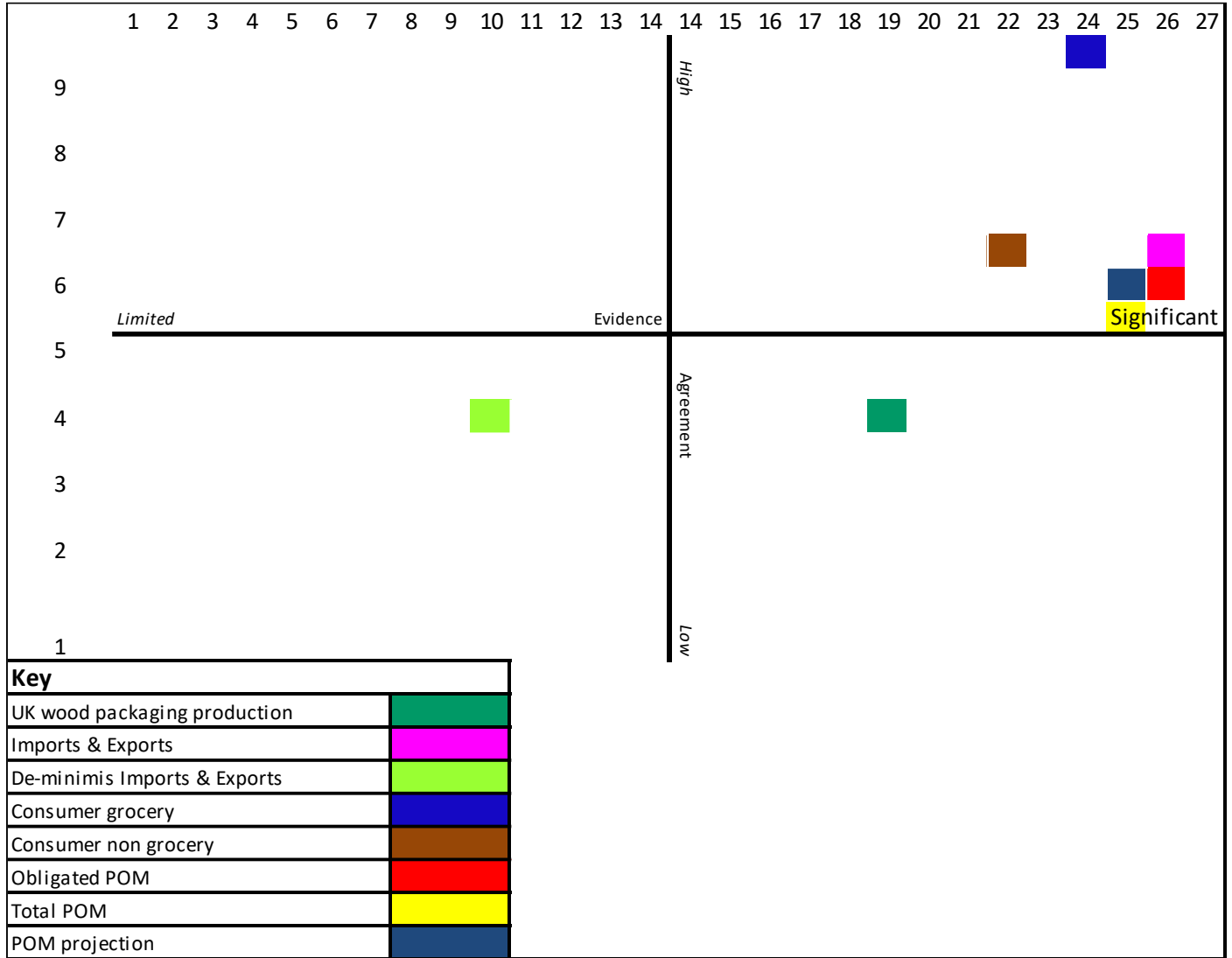
Appendix II

Data Robustness Assessment

A robustness analysis assessment is completed here on the data sources used. This is developed to provide an indicative level of uncertainty for each data source by scoring the data sources on their robustness and the level of agreement amongst stakeholders.

The results of these assessments are summarised in Figure 26 (POM), Figure 27 (Recycling) with an overview summary in Figure 28. The tables thereafter provide a full breakdown of the data robustness and agreement assessments for each dataset in the project.

Figure 26 Data Robustness Assessment Results – POM



To convert scores to a percentage that could be used to relate to an appropriate error margin⁴⁷, the evidence and agreement levels scores were added and the percentage of the total possible score taken.

⁴⁷ These are assumed estimates of error margin and not the outputs of statistical calculation.

Figure 27 Data Robustness Assessment Results – Recycling

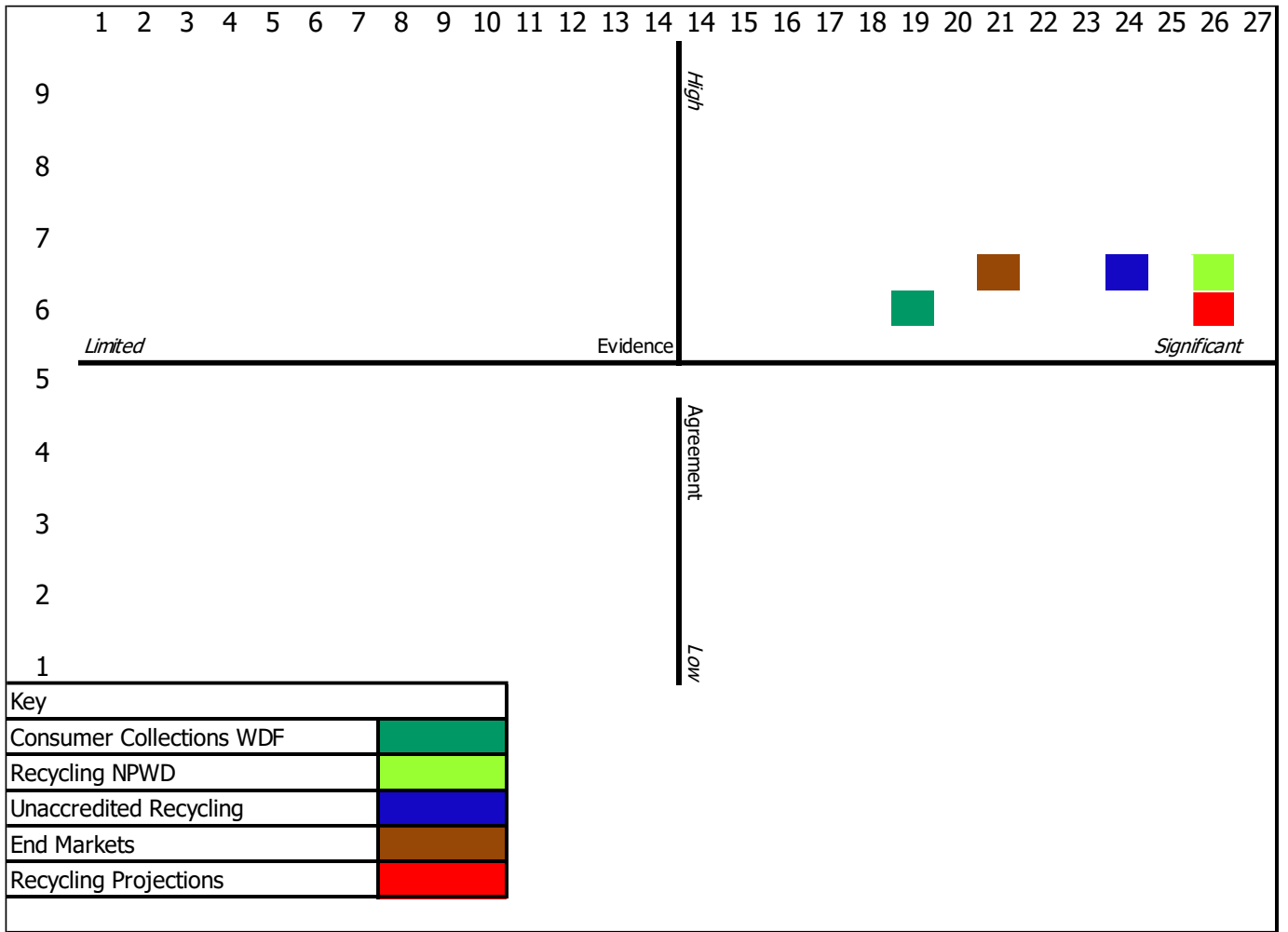


Figure 28 Data Robustness Assessment Results – Summary

Source & data	Robustness scores		Error margin
	Evidence robustness and completeness (max 27)	Degree of agreement around the findings (max 9)	
ONS PRODCOM	26	9	3%
TIMCON Markets data	27	9	3%
HMRC trade data	9	4	36%
EA grocery retail packaging handled	24	9	6%
Valpak EPIC data	22	6	15%
NPWD producer data 2017	26	6	9%
NPWD recycling data 2017	26	6	9%
WDF 2016/17	19	6	21%
WRA, WPIF data	24	6	12%

Figure 29 PRODCOM UK Manufacturers' Sales Data 2019

Data
PRODCOM
Source
ONS
Data Used In:
Wood packaging production (non-pallets)

Evidence (Robustness and completeness):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes	3
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	No	0
Have the findings been independently peer-reviewed?	No	0
Is the methodology/calculation reasonably free from concerns?	No	0
Have the methodology/calculations been independently checked (internally or externally)?	No	0
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	No	0
Total		12

Degree of agreement around the findings:	Scoring (Max 9)	
Does more than one data source confirm the findings (within +/- 5%)?	No	0
Do the key stakeholders/experts actively agree with the findings?	No	0
Has feedback from the key stakeholders been incorporated in the reporting of findings?	No	0
Total		0

Figure 30 TIMCOM Pallet Markets Data 2019

Data
TIMCON Pallet Markets data
Source
TIMCON
Data Used In:
Wood packaging production (pallets inc refurb/repair)

Evidence (Robustness and completeness):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes	3
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes	3
Have the findings been independently peer-reviewed?	Yes	3
Is the methodology/calculation reasonably free from concerns?	Yes	3
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes	3
Total		27

Degree of agreement around the findings:	Scoring (Max 9)	
Does more than one data source confirm the findings (within +/- 5%)?	Yes	3
Do the key stakeholders/experts actively agree with the findings?	Yes	3
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		9

Figure 31 HMRC Trade Data 2019

Data
HMRC trade data
Source
HMRC
Data Used In:
Estimate of de-minimis imports and exports

Evidence (Robustness and completeness)	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	No	0
Has the data been sourced from credible, up-to-date sources?	Yes with some reservations	1
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	No	0
Have the findings been independently peer-reviewed?	More yes than no, but equivocal	1
Is the methodology/calculation reasonably free from concerns?	More yes than no, but equivocal	1
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes with some reservations	1
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	No	0
Total		10

Degree of agreement around the findings	Scoring (Max 9)	
Does more than one data source confirm the findings (within +/- 5%)?	No	0
Do the key stakeholders/experts actively agree with the findings?	Yes with some reservations	2
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes with some reservations	2
Total		4

Figure 32 Environment Agency Grocery Retailer Packaging Handled Data 2019

Data
Environment Agency Grocery Retailer Packaging Handled
Source
Environment Agency
Data Used In:
Consumer grocery POM

Evidence (Robustness and completeness):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes, with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes	3
Have the findings been independently peer-reviewed?	Yes, with some reservations	2
Is the methodology/calculation reasonably free from concerns?	Yes, with some reservations	2
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes	3
Total		24

Degree of agreement around the findings:	Scoring (Max 9)	
Does more than one data source confirm the findings (within +/- 5%)?	Yes	3
Do the key stakeholders/experts actively agree with the findings?	Yes	3
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		9

Figure 33 Valpak EPIC Data 2019

Data
Valpak EPIC Data
Source
Valpak
Data Used In:
Composition of consumer packaging formats

Evidence (Robustness and completeness):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes, with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes	3
Have the findings been independently peer-reviewed?	No	0
Is the methodology/calculation reasonably free from concerns?	Yes	3
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes, with some reservations	2
Total		22

Degree of agreement around the findings:	Scoring (Max 9)	
Does more than one data source confirm the findings (within +/- 5%)?	No	0
Do the key stakeholders/experts actively agree with the findings?	Yes	3
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		6

Figure 34 NPWD Producer Data 2019

Data
NPWD Producer Data 2019
Source
EA NPWD
Data Used In:
Net pack fill, net raw material manufacture, net conversion

Evidence (Robustness and completeness, max 27):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes, with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes	3
Have the findings been independently peer-reviewed?	Yes	3
Is the methodology/calculation reasonably free from concerns?	Yes	3
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes	3
Total		26

Degree of agreement around the findings:	Scoring (Max 9)	
Does more than one data source confirm the findings (within +/- 5%)?	No	0
Do the key stakeholders/experts actively agree with the findings?	Yes	3
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		6

Figure 35 NPWD Accredited Recycling Data 2019

Data
NPWD Accredited Recycling Data 2019
Source
NPWD
Data Used In:
Recycling estimates

Evidence (Robustness and completeness):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes, with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes	3
Have the findings been independently peer-reviewed?	Yes	3
Is the methodology/calculation reasonably free from concerns?	Yes	3
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes	3
Total		26

Degree of agreement around the findings:	Scoring (Max 9)	
Does more than one data source confirm the findings (within +/- 5%)?	No	0
Do the key stakeholders/experts actively agree with the findings?	Yes	3
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		6

Figure 36 Waste Data Flow 2018/19

Data
Waste Data Flow Local Authority Collection Data
Source
WDF 2018/19
Data Used In:
LA collection and consumer collection

Evidence (Robustness and completeness):	Scoring (Max 27)	
Does the data cover the correct time-frame?	No	0
Does the data provide complete coverage?	Yes, with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes, with some reservations	2
Have the findings been independently peer-reviewed?	No	0
Is the methodology/calculation reasonably free from concerns?	Yes, with some reservations	2
Have the methodology/calculations been independently checked (internally or externally)?	Yes, with some reservations	2
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes	3
Total		17

Degree of agreement around the findings:	Scoring (Max 9)	
Does more than one data source confirm the findings (within +/- 5%)?	No	0
Do the key stakeholders/experts actively agree with the findings?	Yes	3
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		6

Figure 37 Total Wood Recycling Data 2019

Data
Total Wood Recycling Data 2019
Source
WRA, WPIF
Data Used In:
Total Wood Recycling

Evidence (Robustness and completeness):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	No	0
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes, with some reservations	2
Have the findings been independently peer-reviewed?	Yes	3
Is the methodology/calculation reasonably free from concerns?	Yes	3
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes, with some reservations	2
Total		22

Degree of agreement around the findings:	Scoring (Max 9)	
Does more than one data source confirm the findings (within +/- 5%)?	No	0
Do the key stakeholders/experts actively agree with the findings?	No	0
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		3

Figure 38 End Markets For Wood Recovery/Recycling 2019

Data
End markets for wood waste
Source
WRA
Data Used In:
Wood waste recovery/recycling

Evidence (Robustness and completeness):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes, with some reservations	2
Does the data provide complete coverage?	No	0
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	More yes than no, but equivocal	1
Have the findings been independently peer-reviewed?	Yes	3
Is the methodology/calculation reasonably free from concerns?	Yes, with some reservations	2
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes, with some reservations	2
Total		19

Degree of agreement around the findings:	Scoring (Max 9)	
Does more than one data source confirm the findings (within +/- 5%)?	No	0
Do the key stakeholders/experts actively agree with the findings?	No	0
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		3