An Assessment of the Environmental Impact of Management Options for Waste Wood
Task A Report

Report to Defra

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Date | April 2011
Executive summary

This report is part of a study supported by Defra into the management of waste wood in the UK. This report reviews information available on waste wood arisings and management. It is based on a literature survey and site visits and discussions with key players in the area.

The report provides the latest quantitative estimates for production of waste wood and for its management. It also discusses the range of estimates available and the reasons for wide ranges where possible.

The main findings of the report are:
- Waste wood encompasses a wide range of quality and composition/contamination. Its management is dependent on the quality of the wood and the specification required by the user. For the purposes of this report we have differentiated waste wood on the basis of contaminants present, as indicated in the Table below. Based on grades suggested by WRAP, TRADA and WRA.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A – Clean wood</td>
<td>Relatively homogenous (hardwood/softwood), primary processed woods. Predominately untreated wood but may contain small particles of paint, surface coatings, nails and metal fixings prior to processing. Example sources: Primarily packaging waste, scrap pallets, and processed off-cuts from the manufacture of untreated products.</td>
</tr>
<tr>
<td>B – Mixed grade</td>
<td>May contain up to 60% grade A material, plus building and demolition materials and domestic furniture made from solid wood. Some contaminants present, such as nails and metal fixings, some paints, plastics, glass, grit, coatings, binders and glues. Example sources: Construction and demolition waste, some industrial off cuts, some civic amenity waste (e.g. used furniture, separated DIY waste)</td>
</tr>
<tr>
<td>C – Low grade</td>
<td>Contains contaminants as per grade B plus coated and treated timber (not including the treatments described in grade D waste). Mainly suitable only for WID-compliant combustion or landfill. Example sources: mixed grade A and B plus coated and treated timber from Commercial &amp; Industrial waste streams via Waste Transfer Stations, and separated waste wood from Municipal Collections, Recycling Centres, and Civic Amenity Recycling sites.</td>
</tr>
<tr>
<td>D - Hazardous</td>
<td>Industrial wood waste – contaminants such as Copper, Chrome, Arsenic (CCA) preservatives and halogenated hydrocarbons, such as those present in creosote. Example sources: Specialist grade D waste, such as railway sleepers and utility pokes, which may be used in landscaping. Other sources include fencing panels and demolition waste from the 1950s-2006, which is only suitable for WID-compliant combustion or specialist landfill.</td>
</tr>
</tbody>
</table>

- There is a well-established and effective waste wood aggregation and reprocessing sector which manages Grade A and B waste wood, but there are less effective routes to divert and recycle Grade C and D waste wood.
- Although there are relatively good statistics for Grade A and B waste wood, both arisings and management routes, available from WRAP and the WRA, there are considerable uncertainties in the quantities of waste wood produced and in the quantities going to disposal for Grades C and D. This is particularly true for waste wood in MSW, where estimates tend to be on a
much wide range. We have used data from the most recent sources, but the uncertainty in the data will hamper development of diversion routes for this waste wood from landfill.

- There is increasing interest in energy recovery from Grade C waste wood, but this is linked to the need to demonstrate the energy content that can be attributable to biomass as required by the Renewables Obligation.

- The reuse and recycling of waste wood and its use as a fuel is driven by various policy initiatives such as waste policy, recycling targets, the landfill tax and renewable energy policy. These are areas where Government policy has changed considerably over the past decade or so, which makes it difficult for the producers and re-processors of waste to keep pace with changes. Interviewees told us that long term consistency and clear policy were important for investment in segregation, recycling and recovery infrastructure. In particular the WRA is keen to have a protocol that provides a clear definition of the various grades of waste wood that is in line with the requirements of their users.

- Data on Grade D waste wood is difficult to access and it is not clear what happens to some of this waste wood at the end of its life.

- Segregation of Grade B and Grade C waste wood can sometimes be difficult, particularly for waste wood derived from mixed sources including MSW. This means that these loads can be rejected by re-processors and may go to landfill. Re-processors do separate some loads of mixed waste but separating contaminated fractions is costly and difficult.
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Appendix 1 A3 Version of Overall Routes Map
1 Introduction

The UK’s resource of waste wood arisings comes from a number of sectors, including timber production, furniture and chip board manufacture, other industrial and commercial waste, construction and demolition sites and as part of the municipal waste stream.¹

There are a variety of routes through which this wood waste is managed. Over the past decade its importance as a feedstock for the panel board industry and as a fuel for bioenergy plants has grown; and a significant amount is now being used for animal bedding. There are other reuse and recycling options, such as the use of wood chip in horticulture, production of liquid biofuels, production of charcoal and recycling of furniture. This rise in recycling, reuse and recovery has been charted by WRAP in a variety of reports available from its web site; and by the Wood Recyclers Association, who publish annual statistics on the use of waste wood.

What is left (the ‘residue’) goes to incineration or landfill, i.e. waste wood which may be too contaminated for re-use or recycling or that which is mixed with other waste and difficult to separate. Some of the wood in residual MSW may be recovered within refuse derived fuel (RDF) or solid recovered fuel (SRF) if the residual MSW is treated in certain types of mechanical biological treatment plants (MBT). Alternatively it may simply be landfilled because no easy route to recycling is available.

In this Task report we review the data that is available on UK waste wood arisings and what this data tells us about the composition of waste wood, its management and what factors are important in its management. It seeks to address the following questions:

- What are the major sources of waste wood? What is the type of wood waste that comes from these sources?
- How much waste wood is there in the UK? What are the issues with current statistics? What are the current sources of data and what are the limitations of these sources?
- How is waste wood managed? What are the key stages in management? What are the properties of waste wood that dictate what happens to it and how it might be reused/recycled? What protocols are available for producers and re-processors for the management of waste wood?
- Is there any information on the factors that determine that waste wood ends up in landfill or incineration? Has any work been reported that attempts to decrease the disposal of waste wood to landfill?

¹ This can include arboricultural waste arisings and garden prunings that otherwise might be burnt on bonfires or left to rot in situ.
2 Waste Wood Nomenclature

Waste wood originates from a number of different sources and may contain a varying amount of contaminants or have been treated for market in a variety of different ways. The level of contamination and the type of treatment influence the options for re-use or disposal of the wood and the options for its management. Thus it is useful to use a system of terminology that reflects these different grades or uses of waste wood. In this section we examine how waste wood is currently classified; how the different classification systems have arisen and why they are used; and propose a nomenclature for this report to allow us to differentiate between the different grades and their potential management options for the purposes of the report.

In both the literature and in waste wood management the definition and classification of waste wood can be and may not be consistently applied. As a result reported data may be difficult to compare and interpret. The official European Waste Classification (EWC) codes\(^2\) are presented below. These are used for waste transfer notes and should provide a useful way of checking what is going to landfill, energy recovery or other treatment.\(^3\)

Some researchers surveying waste wood have found it difficult to use EWC codes for various reasons and use Substance Orientated Classification (SOC) codes instead. The recent work on the waste arisings from the industrial and commercial sectors in Wales is an example of this (Environment Agency 2009). SOC codes are presented in Table 2. This difference should not make it difficult to compare results, as the EWC codes should be comparable to the SOC codes.

The situation is complicated, however, because aggregators, re-processors and users of waste wood issue their own specifications and, for their purposes, a simpler protocol for waste wood categorisation would be more useful. This could, ultimately, be related to EWC or SOC codes, but at the moment terms are used loosely and defined by what can or cannot be used for a particular purpose rather than related to the codes used for waste management.

There are a number of proposed protocols for waste wood categorisation, often led by the Trade Associations with the intention of providing clear specifications for aggregators and reprocessors and the organisations that supply them (i.e. the waste wood producers). Examples of these are presented in Box 1. To our knowledge nobody has correlated the EWC categories in Table 1 with the proposed protocol definitions in Box 1 below, although it is a logical step.

<table>
<thead>
<tr>
<th>EWC code</th>
<th>EWC description</th>
<th>Wood wastes included (additional EWC codes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>02 01 03</td>
<td>Plant tissue waste</td>
<td>Other waste natural wood residues (includes wood and wood cuttings)</td>
</tr>
<tr>
<td>02 01 07</td>
<td>Waste from forestry exploitation</td>
<td>Forestry residues (includes trees, wood cuttings, forestry waste)</td>
</tr>
<tr>
<td>03 01</td>
<td>Waste from wood processing and the production of panels and furniture</td>
<td>03 01 01 Waste bark and cork 03 01 02 Sawdust 03 01 04 Shavings, cuttings, spoiled timber/particle board/ veneer containing dangerous substances (includes chipboard and treated timber)</td>
</tr>
</tbody>
</table>

\(^2\) See Commission Decision 2000/532/EC and Regulation 1013/2006/EC. This classification is designed to allow comparison of statistics on waste. Reference to the EWC code is required on all Duty of Care Transfer notes and the codes are used to specify what kind of wastes facilities can take. For guidance see: EA (2006).

\(^3\) However, AEA BRE (2007) note that “The Environment Agency has found it is difficult to filter out all occurrences of “double counting”. This is mainly because a treatment process can change the EWC code of the waste (i.e. the output has a different EWC code from the input EWC code. EWC Chapter 19 (wastes from waste treatment facilities) is particularly important in this regard. This creates problems for examining breakdown by EWC…... In addition, there are also issues with certain waste streams. For example, a car is classified as a hazardous waste item even though only a small part of it is actually a hazardous waste. Thus, a depollution ATF (Authorised Treatment Facility) will effectively reduce the tonnage of hazardous waste from input to output.”
<table>
<thead>
<tr>
<th>Code</th>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>03 03</td>
<td>Wastes from pulp, paper and cardboard production and processing</td>
<td>03 03 01 Waste bark and wood</td>
</tr>
<tr>
<td>15 01</td>
<td>Packaging</td>
<td>15 01 03 Wooden packaging 15 01 10* Packaging (wood) containing residues of or contaminated by dangerous substances</td>
</tr>
<tr>
<td>17 02</td>
<td>C&amp;D waste (wood, glass and plastic)</td>
<td>17 02 01 Wood 17 02 04* Glass, plastic and wood containing or contaminated with dangerous substances (e.g. railway sleepers)</td>
</tr>
<tr>
<td>19</td>
<td>Wastes from waste management facilities</td>
<td></td>
</tr>
<tr>
<td>19 01</td>
<td>Incineration and pyrolysis wastes</td>
<td>19 01 17* Pyrolysis [of wood] wastes containing dangerous substances 19 01 17 Pyrolysis [of wood] waste not containing dangerous substances</td>
</tr>
<tr>
<td>19 02</td>
<td>Wastes from physico/chemical treatments</td>
<td>19 02 09* Solid combustible wastes [containing wood] containing dangerous substances 19 02 10 Combustible waste[containing wood] but not liquid or containing dangerous substances</td>
</tr>
<tr>
<td>19 12</td>
<td>Mechanical treatment of waste</td>
<td>19 12 06* Wood containing dangerous substances 19 12 07 Wood not containing dangerous substances 19 12 10 Combustible waste [refuse derived fuel containing wood]</td>
</tr>
<tr>
<td>20 01</td>
<td>Separately collected MSW</td>
<td>20 01 37* Wood containing dangerous substances (civic amenity waste, treated timber) 20 01 38 Wood not containing dangerous substances (e.g. pencils, untreated timber, wood cuttings)</td>
</tr>
<tr>
<td>20 02</td>
<td>Garden and park wastes</td>
<td>20 02 01 Compostable waste[containing wood]</td>
</tr>
<tr>
<td>20 03</td>
<td>Other Municipal waste</td>
<td>20 02 01 Mixed municipal waste[residual household waste containing wood] 20 03 07 Bulky waste including wooden chairs.</td>
</tr>
</tbody>
</table>

Note: Codes donated with asterisk (*) are considered hazardous.
Table 2: Substance Orientated Classification (SOC) Codes

<table>
<thead>
<tr>
<th>SOC Group</th>
<th>SOC Sub-Group Name</th>
<th>EWC-Stat code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical wastes</td>
<td>Spent solvents</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td>Acid, alkaline or saline wastes</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td>Used oils</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td>Spent chemical catalysts</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>Chemical preparation wastes</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Chemical deposits and residues</td>
<td>3.1</td>
</tr>
<tr>
<td></td>
<td>Industrial effluent sludges</td>
<td>3.2</td>
</tr>
<tr>
<td>Health care</td>
<td>Health care and biological wastes</td>
<td>5</td>
</tr>
<tr>
<td>Metallic wastes</td>
<td>Metallic wastes</td>
<td>6</td>
</tr>
<tr>
<td>Non-metallic wastes</td>
<td>Glass wastes</td>
<td>7.1</td>
</tr>
<tr>
<td></td>
<td>Paper and cardboard wastes</td>
<td>7.2</td>
</tr>
<tr>
<td></td>
<td>Rubber wastes</td>
<td>7.3</td>
</tr>
<tr>
<td></td>
<td>Plastic wastes</td>
<td>7.4</td>
</tr>
<tr>
<td></td>
<td>Wood wastes</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td>Textile wastes</td>
<td>7.6</td>
</tr>
<tr>
<td></td>
<td>Waste containing PCB</td>
<td>7.7</td>
</tr>
<tr>
<td>Discarded equipment</td>
<td>Discarded vehicles</td>
<td>8.1</td>
</tr>
<tr>
<td></td>
<td>Batteries and accumulators wastes</td>
<td>8.41</td>
</tr>
<tr>
<td></td>
<td>WEEE and other discarded equipment</td>
<td>8.2, 8.43</td>
</tr>
<tr>
<td>Animal &amp; vegetable wastes</td>
<td>Animal waste of food preparation</td>
<td>9.11</td>
</tr>
<tr>
<td></td>
<td>and products</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Animal faeces, urine and manure</td>
<td>9.3</td>
</tr>
<tr>
<td></td>
<td>Animal &amp; vegetal wastes</td>
<td>9 excl. 9.11 &amp; 9.3</td>
</tr>
<tr>
<td>Mixed (ordinary) wastes</td>
<td>Household and similar wastes</td>
<td>10.1</td>
</tr>
<tr>
<td></td>
<td>Mixed and undifferentiated materials</td>
<td>10.2</td>
</tr>
<tr>
<td></td>
<td>Sorting residues</td>
<td>10.3</td>
</tr>
<tr>
<td>Common sludges</td>
<td>Common sludges (excluding dredging spoils)</td>
<td>11 excl. 11.3</td>
</tr>
<tr>
<td></td>
<td>Dredging spoils</td>
<td>11.3</td>
</tr>
<tr>
<td></td>
<td>Combustion wastes</td>
<td>12.4</td>
</tr>
<tr>
<td></td>
<td>Contaminated soils and polluted</td>
<td>12.6</td>
</tr>
<tr>
<td></td>
<td>dredging spoils</td>
<td></td>
</tr>
<tr>
<td>Mineral wastes</td>
<td>Solidified, stabilised or vitrified</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>wastes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other mineral wastes</td>
<td>12.5</td>
</tr>
<tr>
<td></td>
<td>Construction and demolition</td>
<td>12.1</td>
</tr>
<tr>
<td></td>
<td>wastes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Asbestos wastes</td>
<td>12.2</td>
</tr>
<tr>
<td></td>
<td>Waste of naturally occurring</td>
<td>12.3</td>
</tr>
<tr>
<td></td>
<td>minerals</td>
<td></td>
</tr>
<tr>
<td>Non-wastes</td>
<td>Virgin timber</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blast furnace slag</td>
<td></td>
</tr>
</tbody>
</table>
Box 1 Protocols for wood waste classification

**Trada classification of wood waste (2008)**

**Clean wood**: the most desirable wood from a recycling perspective with an absolute minimum of physical or chemical contamination. This is typically provided by pallets and many processing off-cuts.

**Wood waste associated with other materials**: waste wood combined, or mixed with other materials and products such as coatings, paints, laminates and fixings. Wood may be subject to further contamination once in the waste stream, by materials such as stones, dust and plastic. Depending upon the level and types of contamination, the wood recycling industry has the capacity to clean wood, which allows for a greater range of recycling options.

**Wood-based panel material**: an increasing amount of panel board material such as chipboard, plywood, MDF and OSB is entering the waste stream. Whilst products such as chipboard may contain a high proportion of recycled wood, the chipboard is not itself readily recyclable. The main reason for this is that, during manufacture, the wood particles are coated with resin. This limits the capacity of the fibres to absorb more resin and prevents bonding in a recycled board.

**Preservative treated wood**: if wood has been treated with creosote or CCA (copper chrome arsenic) it is classified as hazardous waste, and this makes recycling difficult and affects disposal options. It is predicted that the volume of CCA treated wood entering the UK waste stream will grow and reach its peak in the middle of this century since treated wood will remain in service for many applications for 60 years or more.

**Wood Recyclers Association (2009)**
See Defra (2010) for the full proposals

**Grade A**: "Clean" recycled wood - material produced from pallets and secondary manufacture etc and suitable for producing animal bedding and mulches.

**Grade B**: Industrial feedstock grade - including grade A material plus construction and demolition waste, this is suitable for making panel board.

**Grade C**: Fuel grade - this is made from all of the above material plus that from municipal collections and civic amenity sites and can be used for biomass fuel.

**Grade D**: Hazardous waste - This includes all grades of wood including treated material such as fencing and track work and requires disposal at special facilities.

**WRAP (2007)**
Notes that various descriptions are used to describe waste wood, including:

- origin, for example from civic amenity sites;
- type of wood material, for example plywood;
- how it was used, for example furniture; and
- potential to become contaminated.

The report recommends that the Environment Agency produce guidance on when regulatory controls apply that reflects:

- the low risk of harm posed by using clean waste wood provided that quality controls, as proposed in this report, are in place to minimise any potential risk posed by contaminating materials;
- treated wood waste should remain as waste; and
- wood offcuts produced as a result of processing virgin wood (for example from sawmill operations or timber product manufacturing) that are free from contaminants and it is clear how they are going to be used, should not be seen as waste and therefore should not be regulated.

It also recommended that where treated waste wood is mixed with clean waste wood this will be treated as waste.
These different classification codes and protocols have all been used at one time or other in surveys aimed at understanding how waste wood is currently managed, what current arisings are, how much waste wood goes to landfill and how much could be diverted from landfill further up the waste hierarchy. The type of classification used results from the intention of the survey: some surveys are intended to uncover the best recycling and reuse routes for specific waste wood arisings; others are intended to understand what the make up of mixed waste is and where it goes. We have discussed these issues here because they result in problems in assessing waste arisings and in differentiating waste wood from different sources within the literature. The different codes and protocols lead to some difficulty when comparing results; the way the results are presented can lead to double counting; and they can make it difficult to establish what is happening to some types of wood waste.

For this work we have used four broad terms to refer to different grades of waste wood, which are generally in line with the terms used by the aggregation and re-processing industry. These reflect the use that the wood can be put to, but are not as accurate as the waste classification codes. We have used these terms because the purpose of the work is to examine management routes. We also anticipate that these terms, as defined below, will be meaningful to people working in sectors producing waste wood and in the recycling, re-use and recovery of waste wood. Definitions for grades A to D are provided in Table 2. The definitions are drawn from a number of sources, but are mainly from current definitions given by WRAP, TRADA and the Wood Recyclers Association (WRA).

Table 2. Definitions of waste wood, to enable separation of the sources of waste wood into common grades. Based on grades suggested by WRAP, TRADA and WRA.

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<tr>
<td>B – Mixed grade</td>
<td>May contain up to 60% grade A material, plus building and demolition materials and domestic furniture made from solid wood. Some contaminants present, such as nails and metal fixings, some paints, plastics, glass, grit, coatings, binders and glues. Example sources: Construction and demolition waste, some industrial off cuts, some civic amenity waste (e.g. used furniture, separated DIY waste)</td>
</tr>
<tr>
<td>C – Low grade</td>
<td>Contains contaminants as per grade B plus coated and treated timber (not including the treatments described in grade D waste). Mainly suitable only for WID-compliant combustion or landfill. Example sources: mixed grade A and B plus coated and treated timber from Commercial &amp; Industrial waste streams via Waste Transfer Stations, and separated waste wood from Municipal Collections, Recycling Centres, and Civic Amenity Recycling sites.</td>
</tr>
<tr>
<td>D - Hazardous</td>
<td>Industrial wood waste – contaminants such as Copper, Chrome, Arsenic (CCA) preservatives and halogenated hydrocarbons, such as those present in creosote. Example sources: Specialist grade D waste, such as railway sleepers and utility pokes, which may be used in landscaping. Other sources include fencing panels and demolition waste from the 1950s-2006, which is only suitable for WID-compliant combustion or specialist landfill.</td>
</tr>
</tbody>
</table>

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Task A Report
In this report we are not concerned with virgin forestry residues. We have, however, included the management of virgin wood processing residues because these have a number of potentially important waste management pathways that are relevant to what is being discussed here. However, the report is primarily concerned with post-consumer or treated wood wastes.

In addition to the different terminology used to refer to wood wastes there is also a problem with the actual term “wood waste” and what it encompasses. To overcome this terms such as pre- and post-consumer wood are often used to differentiate between clean wood residues from forestry and wood processing and treated or preserved wood waste from manufacture and consumer use. Some reports on waste wood include pre-consumer residues in their statistics on waste and others are only concerned with post-consumer or treated wood wastes. This is an important issue to the wood production and processing sectors, as pre-treated wood (i.e. wood that may have been mechanically processed but not treated with coatings, preservatives or glues) is regarded as a residue rather than a waste for the purposes of combustion under the Waste Incineration Directive and for waste licensing legislation, both of which have important economic implications. It also has important implications to the collection of wood waste statistics, in that residues from forestry and the wood processing industries are included in the Forestry Commission statistics, but some of these are also included in EWC codes. Generally in the literature there is confusion over the inclusion of residues. In addition many people involved in bioenergy (specifically the use of wood for energy) generalise about wood wastes, when they really mean wood residues. Thus in the bioenergy sector there is general confusion over what constitutes a waste and a residue and careless use of the terminology.
3 Sources of waste wood

The main sources of wood waste are:

- the production of timber products;
- furniture manufacture (including kitchen, office furniture and shop fitting);
- packaging;
- construction using wood;
- demolition of buildings and other wood based products (e.g. telegraph poles, railway sleepers); and
- mixed waste from the domestic, commercial and industrial sectors at the end of the life of the product.

Figure 1 shows the sources of wood waste in commercial and industrial (C&I) waste in the UK. Data gathered by Defra, WRAP and other sources to date indicate that wood waste can essentially be classified as those fractions that are clean enough to be used in re-use, recycling or recovery operations and those fractions that are either too contaminated or are intimately mixed with contaminated waste streams. The former are currently successfully re-used, the main issue being the cost of the option, the specification required and gate fees or prices offered for the residues.

However, for the contaminated waste streams there are far fewer options, and these are dependent on the degree of contamination and the cost of separating mixed wastes from contaminated wastes. Currently these options may not be available or may be costly, such that insufficient incentives can be offered to the producers to make source separation attractive. As a result contaminated wood waste is more likely to go to landfill or mass burn incineration.

Figure 1: Sources of wood waste in commercial and industrial waste in the UK (source: WRAP 2005).

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5 Railway sleepers are not included in Figure 1 because WRAP (2004) found this to be a small resource that does not usually enter the wood waste market.
3.1 Waste wood statistics

There is no routine collection of waste wood statistics for the UK that focuses on all waste wood production and this is complicated by the fact that much wood waste does not go to final disposal, but directly to reuse, recycling or recovery. In addition there are 80,000 sites in England and Wales that handle waste but are exempt from the need for an Environmental Permit and so currently do not have to provide data on their operation (AWE/BRE 2007). Although not all of these sites handle wood waste it is likely that some of them do. Consequently EWC codes do not capture all of this resource and it is difficult to monitor what happens to the wood waste created in industrial processes without talking directly to industry.

Even if a concerted effort were made to obtain a full picture of the management of wood waste arisings through detailed survey of household, industry, commerce and construction and demolition and all waste treatment and disposal facilities the results would be contradictory and would include double counting. In addition the sectors where much of the waste wood originates are fluid, in that they change with time and depending on the general economy.

As a result of all of the above, most of the information we have on waste wood arisings is derived from extrapolation of surveys of producers and from estimates based on the composition of typical waste streams from the various sectors. The surveys are costly and therefore not done annually. The problem mentioned above on the changing nature of the sectors that produce wood waste also has the important consequence that statistics can be out of date soon after they are collected. In addition statistics may be collected for industrial and commercial waste, but often it has been collected in terms of SOC codes, not specifically wood waste, and assumptions have to be made using the classification used (e.g. wood waste may be present as part of non metallic waste or mixed waste). In other words any statistics we have are best guesses, approximations of what might be being produced or snapshots in time of what are.

Nevertheless, these are the best statistics we have and a number of useful studies have been done over the past decade, such as those listed in Box 2.

Box 2 Sources of data for waste wood arisings

- WRAP surveys, conducted in 2005 and 2009. (Note that a lot of the background statistics used in the 2005 report came from 1998-2003 data). These reports focus on post-consumer wood (not forestry or sawmill residues or arboricultural wastes). In addition WRAP have maintained close contact with the waste wood industry and produced a number of useful, related reports.

- The Environment Agency surveyed waste in 2002-3 and published a survey on the composition of waste in the Industrial & Commercial sectors in Wales (Environment Agency 2009). Defra has more recently published the results of a similar survey of commercial and industrial waste (Defra 2010c). All of this work included the analysis of the potential to recycle waste. Although wood waste is not specifically included in their categorisations, there are some intriguing results that indicate what is happening to waste categories that may contain wood waste. For example, comparison of waste production and management for the 2010 and 2003 reports indicate that recycling and reuse have increased significantly, while landfilling has decreased.

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6 The report also points to other data gaps and says "the EA permitting returns system records data at the point of management; this does not provide information on waste at the point of production. As waste produced needs to be managed at some point, arisings can be estimated from the aggregation of amounts through the management routes. However... there are gaps in the data for amounts recycled and exported, and there are also gaps in the data for amounts either treated or used for energy recovery (smaller treatment facilities are covered by waste management licences, but larger treatment facilities are covered by PPC). One solution suggested is to require data from all sites, even exempt sites and to map EWC data to the sector in which the waste is produced. The situation is further compounded, however, because there are many breaches of Duty of Care. The amount of waste dealt with at exempt sites is thought to be in the region of 17 Mt, and a significant proportion of this is demolition/storage/excavation waste."
Defra has also funded work on waste wood arisings (Defra 2008, Defra 2009). Defra (2009) examines municipal waste arisings. Defra (2008) examines the use of waste wood as a biomass fuel and bases its analysis on the WRAP wood waste arising estimates. This report is primarily focused on issues with diversion of such waste from landfill. The report investigates the main alternatives to landfill, the costs of these alternatives and the policy incentives in place to encourage diversion. It concludes that energy recovery is the most likely route for diverting additional wood waste from landfill and analyses the barriers to this use. The Forestry commission release statistics on wood fuel use, although much of this refers to virgin and not waste wood. They include saw mill and primary processing residues in these statistics.

Various local authorities and devolved administrations have surveyed industrial commercial and waste arisings in their area in order to plan waste management facilities. Some of these surveys have included wood waste or examined the SOC categories (e.g. North West Regional Advisory Board 2007).

There have been surveys of the construction and demolition industries to examine the potential for better management of waste wood arisings.

The most recent survey of wood waste arisings was undertaken for WRAP (2009), the results of which are presented in Table 3, together with a breakdown of the composition of wood waste (Figure 2). This report also provided a comparison of results in other previous reports (Figure 3). The way in which this data was collected and the information included in the report is summarised in Box 3.

There are major differences in the estimate of waste wood between this report and the previous WRAP report in this area (WRAP 2005). These differences relate to the types of wood waste considered and the availability of the waste wood. The 2009 report considers only post-consumer wood and focuses on wood waste available to an external market. Wood waste used in house or potential wood waste in mixed streams is not included in the estimates. Thus, only the wood waste collected at civic amenity sites is considered for municipal waste, although a further fraction of wood waste may be recoverable from this source if segregation and collection were in place.

This data, while comprehensive for the purpose of the report, misses data on waste wood arisings that could be managed differently because if misses waste wood managed in house. So, for example, wood residues left in situ in arboricultural management might be available to a recycling or reuse market if there were a clear market pull. Waste wood in mixed streams might be segregated if the right economic drivers were in place. From the view of optimal environmental management it is important to include such waste wood fractions in order to assess the optimal management pathway.

### Table 3: WRAP analysis of wood waste in the UK by wood waste stream (thousand tonnes).

<table>
<thead>
<tr>
<th>Source: WRAP 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Packaging</strong></td>
</tr>
<tr>
<td>1,169.9</td>
</tr>
</tbody>
</table>

### Figure 2: Estimate of wood waste composition ('000t) (WRAP 2009)

*(Solid wood = 72% of total wood waste. Treated solid wood includes preservative treated wood, painted, lacquered and similar wood. Solid wood from packaging is considered as clean wood – it forms over 70% of clean solid wood with the remaining coming from other activities).*

<table>
<thead>
<tr>
<th>Wood waste type</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Solid wood</td>
<td>1,426.6</td>
</tr>
<tr>
<td>Treated solid wood</td>
<td>1,903.4</td>
</tr>
<tr>
<td>Particleboard</td>
<td>568.3</td>
</tr>
<tr>
<td>MDF</td>
<td>261.9</td>
</tr>
<tr>
<td>Plywood</td>
<td>303.8</td>
</tr>
<tr>
<td>OSB</td>
<td>117.2</td>
</tr>
</tbody>
</table>
Figure 3: Range of estimates in most comprehensive studies published on wood waste UK (million tonnes) Source: WRAP 2009, taken from CONFOR (2010).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal</td>
<td>0.6</td>
<td>1.1</td>
<td>1.1</td>
<td>0.8</td>
<td>2.5</td>
</tr>
<tr>
<td>Commercial and Industrial</td>
<td>1.6</td>
<td>3.5</td>
<td>4.5</td>
<td>3.3</td>
<td>1.8</td>
</tr>
<tr>
<td>Construction, Demolition and remodelling</td>
<td>2.3</td>
<td>2.9</td>
<td>5</td>
<td>3.3</td>
<td>0.9</td>
</tr>
<tr>
<td>Total</td>
<td>4.5</td>
<td>7.5</td>
<td>10.6</td>
<td>7.4</td>
<td>5.2</td>
</tr>
</tbody>
</table>

WRAP (2009) also considers the impact of the current recession on waste wood arisings (which it estimates to have decreased waste wood availability by 14%). Statistics on paper, pulp and panel production all bear this out, showing decreasing production of these products in the UK from 2004 to 2008 (Forestry Commission 2008). At the same time, the capacity for wood waste use by the renewable power sector is increasing and it is estimated that it will increase by 1.5 times its 2009 capacity by 2011. Together these trends will place considerable pressure on the more accessible clean sources of waste wood, resulting in increased prices for this type of waste wood, but will do little to address the issue of what to do with contaminated waste wood. This is the most difficult fraction of waste wood to quantify because it is frequently mixed with other waste fractions; and it is the fraction that is most likely to end up in landfill.

Figures from the Defra funded study of Municipal Solid Waste (MSW) (Defra 2009) provided higher estimates for wood waste in MSW than WRAP (2009). This is because the WRAP study was examining accessible resource, not total. The Defra study estimated that there was around 1,056,748t wood waste in MSW in England in 2006/7. This report pulled together data from compositional surveys undertaken at local level in England between 2004-2008, and combined this data with information from WasteDataFlow and compositional analysis. It indicates that the wood waste arisings per household are low (>10Kg/household in 2006/7), but that wood is much higher at household waste recycling centres (HWRC) (15% of the total, or 30-45Kg/household in 2006/7). Figures for wood waste arisings from MSW in England were: 157,092t/y from kerbside collection and 797,561 from HWRC.

Other sources of information on waste arisings and management were overviewed by AEA and BRE (2007). Table 4 summarises this and other sources of data.

Table 4: Summary of additional sources of information on wood waste arisings in the UK

<table>
<thead>
<tr>
<th>Source</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEA and BRE (2007)</td>
<td>This report uses EWC and SOC figures as well as various Environment Agency databases to estimate what happens to various waste fractions.  This included wood, but it was not easy to report waste wood to landfill separately. Non-metallic wastes to landfill in 2006 were 309,000t. This category can include wood wastes. The report also provides figures for some recycling routes: 713,768t packaging wood waste recycled in 2006; 396,354t of wood waste recycled from the RATs input;130,631t of wood waste recycled from the RATs output data sets; and 0.85Mt wood packaging recycled in chipboard production in 2006. It also quotes the WRA figures for recycling in 2006.</td>
</tr>
<tr>
<td>BFM (2005)</td>
<td>Estimates that combustion accounts for 223,500t waste wood used by the furniture.</td>
</tr>
</tbody>
</table>
sector each year. 75% of the sector’s wood waste consists of board based off-cuts and sawdust, which are less appealing to off-site recyclers than solid timber wastes. Report estimates that the total waste produced in the furniture manufacturing sector was 525,199 in 2001. At this time the BFM report indicated that the sector was burning a mix of wood based fuel, but that this was dominated by board material (which was burnt at 92% of sites). Although only 32% of sites were able to give information on quantities of wood burn, these sites indicated that almost 70% of the wood waste being burnt was panel based. This equates to 77825t of solid timber and 177,650 t of board material in 2001.

CRWP (2007)  
This study surveyed construction, refurbishment and demolition waste and what happens to it. The report indicates that much of this waste is recycled to panel board manufacture, either directly from the site or from waste transfer stations. According the BRE’s SmartWaste Plan database, 80% of demolition waste is recycled in this way. However, more wood waste arises than is required by the panel board industry and so there is more than can be recycled. In addition there are major problems with treated timber, very little of which can be recycled or reused and there are issues with recovery of energy because much of this wood is subject to the Waste Incineration Directive for the purposes of combustion. No quantities reported, except that timber is 7.3% of waste arisings.

CRWP (2009)  
The report identified items for reclamation, such as hard wood main entrance doors and timber interior doors (including cupboard doors). No quantitative data is provided, except that timber is ~7% of demolition waste arisings.  
Note: the Big REc survey (2007) does provide data on reclamation and salvage from demolition. The results of this work indicate that around 24700t/y timber was salvaged in 2006, down from 377,000 t in 1998. The difference is because much more of this wood is now being used by the particle board industry. In addition 286,000t of beams were salvaged in 2006. The survey found a big increase in the amount of demolition wood chipped for compost or for MDF panel board. None of this wood was burnt on site.

AEA (2010)  
Survey of bio-energy installations generating heat in UK, an industrial wood survey, historical data sets, information from the Wood Panel Industries Federation and from the Biomass Capital Grants scheme. Report estimates wood usage was 502,970t in 2009. This was dominated by the use of 365,469t for combustion in the Wood Panel Industry. This figure was lower than for 2008, reflecting economic conditions. Note: The data for the Wood Panel Industry may well not be included in the WRAP (2009) figures and may explain some of the difference between the results for the WRAP (2005) and (2009) studies.

Commercial and industrial Waste Survey. 
Commercial waste contains 1Mt of wood waste 
Industrial waste contains 1.9 Mt wood waste. 
This was made up as follows:
- Wood and wood products sector – 1.15 million tonnes (78.4% of arisings in this sector); 
- Retail – 0.49 million tonnes (3.9% of arisings); 
- Furniture and other manufacturing – 0.19 million tonnes (28.7% of arisings); and 
- Transport, storage and communications – 0.14 million tonnes (6.3% of arisings).

WRAP (2007)  
Estimates that there are 10Mt of wood waste arisings in the UK of which: 1.25Mt went to panel board manufacture in 2006, 230,000t went to animal bedding in 2006 and 100,000t to bioenergy. The report also provided forward estimates to these sectors of 2.16Mt, 250,000t and 1.46Mt respectively for 2016. It estimated that around 9Mt of wood waste goes to landfill each year and that as much as 70% of this is only suitable for burning in Waste Incineration Directive plants.

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7 Board-based products used in furniture manufacture are: chipboard, melamine faced chipboard and medium density fibreboard (MDF)
Wood recycled through civic amenity (CA) sites: **461,589t** from July 2008-June 2009

**TRADA and Enviros (2005)**

Reviews use of treated waste wood. Report includes review of estimates of wood waste arisings:

- 7.4Mt of wood waste generated annually in the UK, 1.2 Mt of which comes from construction.
- 2.1 Mt of wood waste from demolition
- Civic amenity sites generate 0.8Mt waste wood, largely furniture waste and mainly painted, stained or varnished. Most of this is thought to go to landfill.
- Around 53,000t/y furniture diverted from landfill to reuse through the Furniture Reuse network.

**Waste Online (2002 data)**

Estimated that 420,000 t waste wood produced by households each year
Packaging produce 670,000t/y
C&D 750000t/y

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**Box 3. Note on WRAP 2009 report**

This report provides a comprehensive update of wood waste availability in the UK. It has been used in our report to provide the latest data, so it is important to understand the methodology used:

The report started from the baseline of the WRAP 2005 report – in that report it was clear that construction and demolition are an important waste stream, so this is where effort was concentrated in the 2009 work. The report also examines only post-consumer wood, and does not include wood waste from primary timber processing. There is some controversy over whether or not primary timber processing wood should be included, but as it does not come under WID for the purposes of combustion and it is not classed as waste wood, it is logical for WRAP to exclude it.

The study took a top down and bottom up approach. Top down figures included consumption and import figures for the UK, end use, demolition statistics and comparison with other countries. This gave an ‘input flow’ of 12.5 million t in 2007. Bottom up figures were obtained by interviewing key players including reprocessors, recyclers, waste management companies, construction companies, sawmills, wood processors and packaging and pellet manufacturers. As well as interviews, turnover was used as an indicator for the production of waste.

Interviews were conducted with a large proportion of UK re-processors and recyclers, panel board manufacturers, sawmills and bioenergy producers. However, mainly due to the number of companies involved, a much lower percentage of secondary processors, construction and demolition contractors, joinery and furniture manufacturers and pellet producers were interviewed. One of the key findings is that many construction companies did not know how much waste they were producing, particularly as sub-contractors are often used.

In addition the amount of segregation is of construction waste is highly variable. It was generally estimated by construction companies that construction waste arisings are 10-15% of the wood the construction industry use. The report then extrapolates from the figure to estimate the amount of solid wood and panelling, and it was assumed that 100% of support applications such as hoarding became waste, giving an estimated 19% waste rate overall. On the other hand much of the wood arisings in the Demolition sector is treated and there is more difficulty recycling this wood. WRAP used an estimate of wood generated per demolished building of 3.6t to calculate total arisings of 100,000t.

A similar picture emerges for furniture producers and joinery companies: there was a general lack of clarity on quantities of waste produced and WRAP estimated that around 15% of wood consumed end up as waste.

The study also found that many furniture producers burn waste on site, so much of their waste does not appear in the waste stream. Overall WRAP found that the companies try to reduce waste first, then recycle it or reuse it by burning it, aiming to decrease the amount going to landfill. As a result
this study found much less waste from manufacturing industry using wood than the 2005 study – only around 14% of the input wood.

The estimates for wood waste from MSW concentrated on WasteDataFlow[^6] for civic amenity sites. Packaging wood waste figures were taken from the Environment Agency’s National Packaging Waste Database. The figure quoted in Table 1 additionally includes wood waste generated in the manufacture of wood packaging.

Some wood waste was not included: e.g. single use wood packaging; wood from domestic residences or the development of domestic residences by small companies (which is likely to be burnt in the garden or landfilled); arboricultural wood (likely to be chipped for mulch or left to rot in situ); wood waste from gardening (although the oversize fraction from composting is included). It is probable that this does not represent a significant amount of wood waste that could be available to reuse, recycling or recovery.

[^6]: WasteDataFlow is operated by Enviros in behalf of Defra. This is a web based system for MSW data reporting by UK local authorities. Cumulative statistics are published by Defra. Although this data could include separate wood recycling figures, published data only records the total amount of recycling or recycling of fractions that do not include waste wood.
4 Waste wood management

Waste wood can be managed through a number of different pathways and the options available will depend on the producer of the waste, how easy it is to sort, re-use, recycle or recover the waste, the cost of disposal and local facilities.

4.1 Options on the Open Market

The main options open to producers of waste wood for management of this wood are: re-use on site; recycling on or off site; energy recovery; or disposal. The majority of waste wood going to disposal will go to landfill or energy from waste plants.

Table 5 shows the main routes available on the open market for each sector. From this it can be seen that there are a number of re-use, recycling and recovery options, but that un-segregated waste stands a good chance of ending up in landfill unless facilities are available to sort the waste. Figure 4 shows the main management routes for the relatively clean wood waste grades examined in WRAP (2009). This diagram does not show any disposal options. Compared to figures presented in WRAP (2005) (see Figure 5) the two studies show that the percentage going to panel board manufacture has decreased from 67.5%; but the percentage going to animal bedding and horticulture has increased; and the percentage going to energy has also increased.⁹

WRAP (2009) estimates that demand for waste wood is likely to outstrip supply in the next few years. Figure 6 presents figures provided by TRADA, which predict increases in recycling and energy recovery over the next 10 years. However, this report was produced before a number of bioenergy plants were announced.

One option not mentioned in Table 5, but which could be important for waste wood is the production of a solid recovered fuel (SRF) or refuse derived fuel (RDF) after mechanical biological treatment (MBT) of mixed waste streams (particularly municipal solid waste). Both SRF and RDF may include waste wood. In addition their management through incineration in purpose built plants may also open up new options for energy recovery from treated wood waste that comes under the Waste incineration Directive for the purposes of combustion. Currently there are a lot of MBT plants in planning and the production of residual fuels from these plants will be significant; in addition the potential for the production of solid recovered fuels from commercial and industrial waste is significant. Combustion plants are built are being built in the UK to recover energy from these plants (e.g. the plant at Ineos Chlor where a 750,000t/y SRF plant is planned to supply heat and power to the Runcorn site). The impact of these plants on the potential to recover energy from grade C waste wood could be substantial.

Table 5: Current wood waste management routes (From WRAP 2009). This table shows routes available on open market

<table>
<thead>
<tr>
<th>Sector</th>
<th>Management of waste</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Small companies: dispose to skips or directly to civic amenity sites</td>
<td>Waste management contractors segregate waste</td>
</tr>
<tr>
<td></td>
<td>Large companies: some segregation on site or disposal to skips.</td>
<td>If no segregation on site waste management companies will do this at their site</td>
</tr>
<tr>
<td>Demolition</td>
<td>Sort for shipping on site. Disposal is then to landfill (contaminated streams) or segregation by waste management contractor.</td>
<td>WRAP estimate that 80-90% of demolition waste is recycled through aggregates.</td>
</tr>
<tr>
<td>Industrial -</td>
<td>Significant fraction burnt on site for heat.</td>
<td>Estimated 100% of wood waste</td>
</tr>
</tbody>
</table>

⁹ WRAP (2009) points out “Wood panels are primarily sold to the construction and furniture sectors. Both have been heavily hit by the recession and most UK wood panel manufacturers’ annual reports and commentary suggests 2008 was a very difficult year. As a consequence of falling output levels, wood panel manufacturers’ demand for wood waste inputs is likely to have fallen in 2008 and continued to decline in 2009.”
<table>
<thead>
<tr>
<th><strong>Furniture</strong></th>
<th>Larger companies also sell to compost or animal bedding market.</th>
<th>could be burnt on site in small companies (WRAP 2009). WRAP also report that most large furniture manufacturers are aiming for 100% reuse or recycle (0% landfill).</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Industrial - joinery</strong></td>
<td>Significant proportion of waste is burnt for heat. Remainder is used for animal or equestrian bedding.</td>
<td></td>
</tr>
<tr>
<td><strong>MSW</strong></td>
<td>Waste wood generally mixed with other waste. The reject stream from MBT plants and composting plants may contain some waste wood, which becomes part of an RDF and Solid recovered fuel. This fraction of waste will probably be burnt, but there could be a trend towards burning treated waste wood with it, to try to increase the % bioenergy content to meet the requirements in the RO.</td>
<td>Could be sorted for combustion.</td>
</tr>
<tr>
<td><strong>Packaging</strong></td>
<td>Most of this waste goes to panel board manufacture.</td>
<td></td>
</tr>
<tr>
<td><strong>Arboricultural waste</strong></td>
<td>On site composting. On site chipping. Some of this waste goes to civic amenity sites</td>
<td>A fraction of this waste may be land filled. However, it is common for contractors to chip on site and sell residue for horticultural purposes.</td>
</tr>
<tr>
<td><strong>Traditional industries</strong></td>
<td>Traditional industries using wood, e.g charcoal manufacture. The yield of charcoal is about 0.17% but is a high value product. Might be made from waste wood.</td>
<td>4. Future uses – production of biofuel</td>
</tr>
</tbody>
</table>

**Figure 4: Waste wood management routes (WRAP 2009)**

![Waste management routes](image-url)
Figure 5: Waste management routes other than disposal used for waste wood in the UK Source: WRAP 2005.

Figure 6: Present and predicted use for wood waste in UK Source TRADA 2008 *(Biomass means bioenergy).*

Letsrecycle (Jan 2010) provided figures showing that 78.5% of wood packaging was recycled through accredited recyclers and exporters in 2008; and that 18% of wood waste from packaging went to bioenergy.

Information on the management of waste wood in the construction and demolition industry is summarised in Box 4.

**Box 4. Experience of waste wood management in the construction and demolition industry**

CRWP, working with the construction and demolition industry, has produced a series of reports discussing how strategic waste management plans can decrease waste production on site and has also surveyed sites to identify what happens to waste and what issues contractors face (see CRWP 2007, 2008, 2009, 2010 and Comley 2009).
These reports indicate that contractors find that recycling markets are available but are not reliable on a month by month basis (CRWP 2009); they also identified that contractors often feel that it is not worth recycling small amounts of wood (Comley 2009). Furthermore CRWP (2008) expressed concerns that demolition contractors are likely to encounter more materials in the future that cannot be readily recycled (including treated timber with adhesives). However, CRWP (2010) estimates that around 65% of timber waste from construction is diverted to landfill. This report also noted that Environmental Permitting allows some demolition waste to be treated on site. This means that a contractor can burn clean wood on site provided an environmental permit is granted and not more than 10t is burnt in 24 hours. CRWP (2009) identified that some ‘dirty wood’ is being sent to Germany. This report provided estimates for management of waste wood as follows:

- Disposal off site 19%
- Recycled off site 75%
- Energy recovery 3%

Finding out how much wood waste ends up in landfill is difficult. The only current way is to use the total wood waste arisings in WRAPs 2005 or 2009 studies and assume everything that is not recycled will go to disposal (either landfill or energy from waste). SEEDA\textsuperscript{10} have looked at figures for the Greater South East. They quote figures for 2005 of 950000t of wood waste, three quarters of which end up in landfill. Included in this was 55,000t of segregated waste that was sent to landfills due to lack of proper processing facilities.

### 4.1.1 Information from the recycling sector

In addition to the information above the recycling sector provide figures on the waste management routes for waste wood. Table 6 summarises the latest data from the Wood Recycling Association (WRA). The Furniture Reuse network estimate furniture reuse to be about 90,000t/y. It is not clear how much of this is wood waste, but the figure is not included in WRAP (2009).

**Table 6 Summary of wood waste uses (from WRA (2011)).**

*Note: WRAP (2009) estimated that 2.4Mt/y of wood is recovered in England. CONFOR (2010) estimate that use of recovered wood is 2Mt/y.*

<table>
<thead>
<tr>
<th>Use</th>
<th>Quantity (t/y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel Board</td>
<td>1,065,000</td>
</tr>
<tr>
<td>Animal bedding</td>
<td>360,000</td>
</tr>
<tr>
<td>Equine surfaces</td>
<td>75,000</td>
</tr>
<tr>
<td>Mulches, soil conditioners and composing</td>
<td>9,000</td>
</tr>
<tr>
<td>Pathways and coverings</td>
<td>18,000</td>
</tr>
<tr>
<td>Biomass energy</td>
<td>485,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,111,000</strong></td>
</tr>
</tbody>
</table>

### 4.2 In house options

In addition to disposal of wood waste on the open market there are a number of in house management options. This wood waste is often not counted in statistics, but may be a significant source of arisings

\textsuperscript{10} See: [http://www.seeda.co.uk/_documentbank/Item8_PTZWBoardReport.pdf](http://www.seeda.co.uk/_documentbank/Item8_PTZWBoardReport.pdf)
and may not be managed in the most environmentally friendly manner, so it is important to include it in our assessment:

- Across much of the wood processing industry waste wood is used for heat (and/or power). According to the annual RESTATs survey wood usage is 502,970t in 2009. This is dominated by the use of 365,469t in 2009 for combustion in the Wood Panel Industry. This figure was lower than for 2008, reflecting economic conditions.

- Another in-house use is recycling of oversize rejects from green waste composting. Some of this is made into mulch, but most is re-composted. The oversize fraction accounts for about 10% -20% of the input. Currently composting of waste amounts to some 4 mtpa, so there is a potential 0.4m t or more of waste wood is re-composted. This consumes energy and composting capacity and it might be better to use it as a fuel.

- Arboricultural wood waste is also often managed on site, although there are no readily available statistics for on-site management. On site management includes chipping for mulch or simply leaving the residue to rot on site. There has been no analysis of what is the best environmental route for the management of such waste. Likewise garden wood waste may be left to rot on site, chipped on site or burnt. There is no analysis of the impact of uncontrolled burning of relatively wet wood waste in back gardens, or of the quantities involved.

4.3 Traditional industries

There are traditional industries that use wood that may also use wood waste, e.g. charcoal manufacture. Although the yield of charcoal is about 0.17%, it is a high value product, there is no evidence that this is a significant route for the management of waste wood.

4.4 Future options

There are other options under consideration at present, notably the idea that lignocellulose could be used for biofuel production. Although technologies to do this are not yet commercial, there is a lot of work ongoing worldwide (particularly in the USA). Should this become possible, it is likely that the first feedstocks considered for processing will be wood wastes.

4.5 Landfill of waste wood.

Figures for the landfilling of wood waste are generally derived from estimates based on composition of MSW, C&I and C&D waste and the amount of these waste arisings going to landfill.

WRAP (2007) provides figures that indicate “around nine million tonnes of wood waste goes to landfill each year”. The report also says: “a lot of waste wood is of such low quality that it cannot currently be recycled”; “the majority of treated waste wood is currently landfilled” and “as much as 70 per cent of waste wood is only suitable for burning in Waste Incineration Directive (WID) compliant boilers or disposal to landfill.” However, the subsequent report from WRAP (2009) estimated much that lower quantities of waste wood go to landfill (the default level going to landfill or other disposal is 2.5 Mt).

Using the estimates identified about 1.1 Mt of wood waste in the municipal waste stream goes to landfill, plus a further 0.6 Mt of furniture waste which could include a significant proportion of wood waste. In addition it is thought that 0.5Mt of arboricultural waste goes to landfill (AEA 2011). This provides an estimate in the region of 2.2 Mt of waste wood to landfill.

Wasteflowdate indicates that some 461,000t of wood waste is recycled from civic amenity sites, but there is no indication on how much wood waste is brought to civic amenity sites.

CRWP (2007) provides data on C&D waste that shows that 1.4Mt are ‘disposed off site’ (and not included in the amount that is recycled off site). This may be going to landfill. For other waste streams there is data on waste wood arisings but no indication of how the waste wood is disposed of. Waste recyclers tell us that they reject a small proportion of waste wood supplied on the basis that the
wood is contaminated and not suitable for recycling. It is not clear where this wood goes subsequently, but it might go to landfill.

SEEDA data indicates that some 712,500t of wood waste was landfilled in their region in 2005. SEEDA represents around 13% of the UK population. If we assume that waste wood production is proportional to population then one estimate for the amount of waste wood going to landfill is 5.5Mt.

These figures show the large range of estimates for landfilled wood waste in the UK. It is not clear how much wood waste goes to landfill or the quality of this waste wood. However, personal communication from waste wood aggregators and recyclers indicate that much of the cleaner waste wood grades are currently diverted from landfill to recycling or energy recovery. This means that much of the wood waste continuing to go to landfill will probably be the treated waste wood grades for which there is little demand, plus rejects from the recycling industry and arboricultural residues for which there is also no ready market.

This lack of understanding of the tonnage of wood waste in landfill, its quality and origin adds considerable uncertainty to our ability to plan the management of waste wood. Although most of the wood going to landfill will be of mixed grade and contaminated there are two sources that could be examined more closely:

- Arboricultural waste wood: with the right infrastructure and logistics it may be possible to recycle this waste stream or to use it in energy recovery
- Rejected loads from re-processing: It should be possible to recover energy from these loads. However, this option would require considerable investment in WID compliant plants and, if the plant is to be eligible under the Renewables Obligation for Renewable Obligation certificates (ROCs) there will also be a need to prove its biomass content. Further processing (e.g. to remove ferrous and non-ferrous metals and chipping) will also be required.

### 4.6 Summary

The data above have been summarised in Table 7.

**Table 7 Summary of waste wood arisings and management routes.**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Estimate(s)</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MSW</strong></td>
<td>- 1.056Mt/y (Defra 2009); - 1.065Mt/y + 0.6Mt/y furniture waste (WRAP 2005) - 0.62Mt/y (WRAP 2009)</td>
<td>• Around 90,000t/y furniture recycled through Furniture Reuse network. • Wastedataflow indicates that wood recycled through CA sites was 461,589 in 2008. • The remainder is landfilled or incinerated</td>
</tr>
</tbody>
</table>

Some timber re-use on site. CRWP (2008) says that demolition contractors are likely to encounter more materials in the future that cannot be recycled readily (e.g. treated timber with adhesives).

CWRP (2010) estimates that around 65% of timber waste from construction is diverted from landfill. However, where the tonnage arising is low contractor often feels it is not worth recycling (Comley 2009). Environmental permitting allows demolition arising to be treated on site, which means that a contractor can burn clean wood on site provided a permit is granted and no more than 10t is burnt in 24 hours. Treated timber can be difficult to manage appropriately as very little can be re-used or recycled CRWP (2009). Generally contractors commented that recycling markets are not reliable.
month on month. This report also identified that some of this ‘dirty’ wood is being sent to Germany. WRAP (2005) disposal in tonnes:
- Recycled: 47,476
- Spread on registered sites 25,088
- Used for back fill: 11,531
- Landfill engineering or restoration: 9409
- Disposal at landfill: 7598

CRWP (2009) estimate:
- Disposed off site: 19%
- Recycled off site: 75%
- Energy recovery: 3%

<table>
<thead>
<tr>
<th>Category</th>
<th>Annual Generation (Mt/y)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C&amp;I (Construction and Industry)</td>
<td>4.48 (WRAP 2005)</td>
<td>(Resource dominated by furniture and other industrial wood production waste, followed by construction and other industry waste) WRAP (2009) estimated: 0.46Mt/y industrial wood waste. Large proportion of furniture and industry waste wood used for heat on site. From AEA (2010) RESTATs survey the figure for wood usage for heat in UK was 502,970t in 2009. This was dominated by the use of 365,469t in 2009 for combustion in the Wood Panel Industry. Other uses include recycling to panel board, animal bedding and mulching. Remainder will be landfilled or incinerated but it is likely that this is a small fraction of total arisings.</td>
</tr>
<tr>
<td>Packaging</td>
<td>1.7Mt/y (WRAP 2005)</td>
<td>According to Defra statistics 76.9% (940,460t) was recycled in 2009. Most of this was re-processed in the UK, although a small amount went abroad.</td>
</tr>
<tr>
<td>Joinery Industry</td>
<td>125000-200000 t/y (BWWF, CPA and BRE (2009)).</td>
<td>BWWF, CPA and BRE estimate that 22% of joinery waste if burnt for heat on site; and 16% is sold as fuel. For machine waste 6% used for heat on site; 4% used for particle board manufacture; 56% used for animal bedding; 12% sold for fuel; and 23% for other use (mainly composting).</td>
</tr>
<tr>
<td>Arboricultural Arisings</td>
<td>Confor (2010) 120,000t/y 2.3Mt/y (Kilpatrick et al 2008)</td>
<td>ADAS estimate from land used for urban, recreational and transport purposes. Forest Research estimate that around 0.5Mt of this arboricultural resource goes to landfill, the rest being managed in situ or chipped for mulch.</td>
</tr>
</tbody>
</table>

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5 Policy

A number of UK Government policies impact on the recovery of waste wood from waste. These include:

- Waste management policy (including the current drive to a zero waste economy and the Waste Strategy Review)
- Packaging regulations
- Renewable energy policy: the Renewables Obligation, the Renewable Heat Incentive and the Renewable Transport Fuels Obligation.

5.1 Waste Management policy

UK waste management regulations cover the definition, regulation, transport and handling of waste. The most recent regulations transpose the Revise EU Waste Framework Directive into UK law. These deal with issues such as what constitutes a waste, definitions of recycling, re-use and recovery, targets for recycling and licensing /permits for the handling and treatment of waste. Further details on issues relevant to waste wood are provided in Box 5.

Over the past decade waste management and policy in the UK has changed radically, driven by a need to decrease the environmental impact of landfill, in particular by decreasing the amount of waste going to landfill (particularly biodegradable waste). The UK has landfill diversion targets, set at EU level. To achieve these targets in England the Government has put in place a landfill tax, restrictions on the amounts of biodegradable municipal waste (BMW) landfilled, and recycling targets. These are examined below. In Scotland a zero waste to landfill policy has been proposed. Wood is included as a biodegradable waste, although it has been shown that it does not degrade as rapidly in landfill as other biodegradable wastes (Padgett 2009). As such it is included in the drives to divert waste from landfill, and initiatives have been established to encourage more effective use of wood, its reuse and recycling. These are examined below in section 5.1.2. on recycling targets.

Box 5 Relevant Waste Regulations

The key regulations that are important to waste management policy in England are:

- Directive 2008/98/EC on waste (‘The Revised Waste Framework Directive’). This co-ordinates waste management in EU Member States in order to limit the generation of waste and optimise waste treatment and disposal. The UK was required to transpose this into UK law by December 2010. Issues covered that are relevant to this work include:
  - the definition of waste, recovery and disposal.
  - Revised re-use and recycling targets (for household and similar waste to 50% by 2020)
  - Clarification of when a by-product becomes a product in its own right.
  - Criteria to determine when a waste ceases to be a waste and becomes a product.
  - Clarification that the waste hierarchy should be applied as a matter of principle, but that deviation will be permitted if it allows a better environmental outcome. This approach allows the whole life-cycle of products and materials (not only the waste phase) to be considered, which is intended to focus on reducing the environmental impacts of waste generation and waste management, and strengthen the economic value of waste.

12 The recent inclusion of C&I wastes within the definition of BMW will mean additional measures will need to be introduced to reduce the amount of BMW from C&I sources landfilled.
13 See: http://www.scotland.gov.uk/Publications/2011/02/09135833/11
Clarification of when the incineration of waste is sufficiently energy efficient to be classed as recovery. (The criterion is that energy from waste plants operate at a minimum efficiency of 65% to be classified as recovery.)

The Directive also includes the principles of self sufficiency and proximity but although it allows Member States to limit incoming shipments of waste destined to incinerators classed as recovery, it does not ban this practice.

- Related to this the EC also published a communication clarifying the concepts of a product, production residue and by-products. This also provides guidelines on what is a waste and what is not.
- The UK Government has passed Waste (England and Wales) Regulations 2011 (SI No 988 2011) in response to the revised Waste Framework Directive. These took account of the responses to consultation about its conditions including responses on banning of certain substances from landfill and on the Waste Hierarchy.

The framework for implementing changes in waste management in the UK includes development of waste strategies. The current waste strategy was published in 2007 (the Waste Strategy for England (2007)). This included a focus on specific materials, including wood; and proposed actions to focus on the development of energy markets for waste wood by addressing informational and practical barriers to expansion of this use. However, it also made it clear that energy should only be recovered from residual waste that cannot be viably recycled or where there are clear carbon benefits from recovery of energy.

The Government is currently undertaking a review of waste policies (Defra (2010b) aimed at looking at all aspects of waste policy and delivery in England. It will publish a revision of the 2007 Waste Strategy later this year. The main aim of this review is “to ensure we are taking the right steps towards creating a zero waste economy”. This revision has been driven by issues such as the need to improve recycling and landfill diversion in the business sector as well as for municipal waste. As part of this review the Government is considering:

- How, informed by whole life-cycle thinking, it can incentivise the delivery of the waste hierarchy (prevention > preparing for re-use > recycling > recovery > disposal), in particular in the light of the current fiscal constraints, so that we:
  - do more on waste prevention and reuse – stopping waste at its source;
  - continue to increase recycling rates, when it’s the best option, through incentivising and making it easier for both households and businesses to take action;
  - maximise the cost effective generation of renewable energy from residual waste.

This review is very relevant to wood waste and provides a number of opportunities to put measures in place to encourage reduction, recycling and recovery of energy from wood wastes.

### 5.1.1 The landfill tax

As part of the move to decrease the impact of waste disposal in landfill the UK Government has targets to divert biodegradable waste from landfill sites. Targets for the diversion of biodegradable waste from landfill are set out in the Landfill Directive. For the UK the targets are: reduction in the amount of waste sent to landfill based on the amount of this material landfilled in 1995 to 75% by 2010, to 50% by 2013 and to 35% by 2020.
The Government’s main mechanism to achieve this is the Landfill tax, which has to be paid on waste going to landfill. Currently the level set is £56/t for biodegradable waste. This tax will increase to £80/t in 2014 and will not fall below this rate to 2020. The aim of this task is to encourage waste producers to produce less waste, recycle more and send less to landfill.

5.1.2 The Landfill allowance trading scheme (LATS)

The Government has also introduced a landfill allowance trading scheme (LATS), aimed at helping waste disposal authorities reduce the amount of biodegradable municipal waste (BMW) going to landfill (Defra 2005). This scheme allocates allowances to each waste disposal authority in England at a level that will allow the country to meet its contribution to the UK targets under the Landfill Directive. Each year each authority is allowed to landfill BMW up to the allowance held. Authorities that do not need their full allowance may bank them for the following year or alternatively they may trade them with authorities that have overshot their allowance (i.e. these authorities are allowed to ‘borrow’ up to 5% of their allowances from the following year through trade). In years where the UK is expected to meet a target banking and trading/borrowing is not allowed, in order to ensure the target is met. This means that Waste Disposal Authorities have to put in place mechanisms to ensure they meet their BMW targets.

The BMW targets are set by the EU Landfill Directive and apply to biodegradable waste both under municipal control and under C&I sources. In England and Wales, LATS allowances only apply to biodegradable waste under municipal control. This means that C&I biodegradable waste would need some other accounting and targets to make the overall reduction in biodegradable waste (municipal + C&I) achieve the Directive targets.

5.1.3 Recycling targets

Recycling targets and indicators for England are set out in the Waste Strategy, 2007:


From this it can be seen that the emphasis was on household waste and that targets for commercial and industrial waste streams were not included in the 2007 strategy.

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20 For more information see: http://customs.hmrc.gov.uk/channelsPortalWebApp/channelsPortalWebApp.portal?_nfpb=true&_pageLabel=pageExcise_ShowContent&propertyType=document&id=HMCE_CL_000509#P5_327

21 Update: following consultation the Government has decided to end the Landfill Allowance Trading Scheme.
Initiatives for recycling outside the municipal sector

WRAP and the National Industrial Symbiosis Programme (NISP) run support programmes to encourage waste reduction by businesses. WRAP (http://www.wrap.org.uk/) has supported work on recycling of waste wood, including studies on how much is produced, what happens to this wood waste and what the issues are with recycling more waste wood. In addition it has supported work to develop a methodology to identify contaminated waste wood, and has supported initiatives to define a protocol for waste wood, to define the various grades of waste wood in a way that is easily understood by producers and re-processors alike. The NISP (www.nisp.org.uk) connects businesses together to allow mutually profitable links between companies from all industrial sectors so that under used resources and materials from one company can be recovered, reprocessed and re-used by others. It provides links between member business, case studies, training and workshops.

In 2008 the Government announced a Strategy for Sustainable Construction in 2008 (BERR 2008). This included a target of 50% reduction in construction, demolition and excavation waste sent to landfill by 2012 compared to 2008, excluding aggregates used for backfilling quarries, site restoration or land spreading. Legislation was also introduced making Site Waste Management Plans (SWMP) mandatory for construction projects in England worth over £300,000. Actions to ensure these targets are achieved included various sector plans to provide a framework for actions and guidance, particularly for small businesses; guidance on the incorporation of waste minimisation principles in building design; work to improve the understanding of life cycle assessment; better waste data and evidence; and improvements in opportunities to take back or exchange unwanted or waste materials. Support for these targets has been provided through the Construction Resources and Waste Platform (CRWP, http://www.crwplatform.co.uk/conwaste/) and WRAP. This work has enabled some companies to decrease their waste production, increase re-use on site and increase recycling. However, a review of achievements in this programme in 2009/10 concluded that small construction companies find it difficult to comply with SWMP provisions compared to larger companies; and that work is needed for SMEs to raise their awareness of their responsibilities and to encourage them to view waste as a resource (House of Commons (2010) and this is supported by evidence from CRWP (2010).

5.2 Packaging regulations

EU Directive 2004/12/EC set packaging recycling and recovery targets for Member States to achieve by December 2008. For wood in packaging this target was 15%, but Defra statistics showed that the UK achieved 78.5%. After 2008 Member States had to continue to meet these targets, but Governments could set higher targets if they wished. As a result the Government set new mandatory business targets for 2006-12 aimed at increasing the recovery of packaging waste. For wood this target was 22% for 2010 – 2012. Statistics show that 1055,607t of wood packaging was produced, 811,143 of which was recycled in 2009. Further extension of these targets was proposed in 2010 and the draft amendment to the 2007 Packaging waste regulations show that the targets for wood will increase from 22% in 2010 to 74% in 2020.22

Box 6 The Packaging regulations


The following is an extract from Defra (2010a):
This system makes producers (businesses that handle more than 50t/y packaging and have an annual turnover of >£2M) responsible for meeting their share of the targets listed above, based on their role in the supply chain and the amount of material handled in the preceding year.

5.3 Renewable Energy legislation

The EU Renewable Energy Directive (EU 2009) sets a “mandatory target of a 20% share of energy from renewable sources in overall Community energy consumption by 2020 and a mandatory 10% minimum target to be achieved by all Member States for the share of biofuels in transport petrol and diesel consumption by 2020, to be introduced in a cost-effective way.” This sets mandatory national targets for the overall share of energy from renewable sources in gross final consumption of energy and for the share of energy from renewable sources in transport. The UK target is 15%.

To achieve these targets the Government has put various incentives and obligations in place, most importantly:

- The Renewables Obligation – requires electricity suppliers to provide a proportion of their supply from renewable sources. Eligible sources are defined by the various Renewable Obligation Orders and include biomass in stand alone plants, co-firing and energy from waste under certain conditions. Wood, including waste wood is defined as a biomass (providing there is evidence that its energy composition is >90% derived from biomass). On the other hand the situation for mixed waste is not so clear cut. In general it is necessary to prove the biogenic composition of this waste. Ofgem will allow a percentage of mixed waste to be claimed for ROCs, providing the evidence is clear. In other cases Ofgem allows a deemed value for the biogenic content of mixed waste, which is set at 50% at present and will decrease as recycling increases.
- The Renewable Transport fuel Obligation
- A proposed Renewable Heat Incentive, to be introduced in July 2011.

These incentives are examined below.

5.3.1 The Renewables Obligation (RO)


The RO was introduced in April 2002 and is the main mechanism for Government support for the generation of electricity from renewable resources within the market place and it is one of the main mechanisms to assist the UK meet its targets under the Kyoto protocol. The Order places a legal requirement on electricity suppliers to source an annually increasing proportion of electricity from certain eligible renewable energy sources. If they are unable to do this they can pay a buy out fee. The proportion of electricity to come from RO eligible renewable sources was set at 3% in 2003, increasing to 10.4% in 2010 and 15.4% in 2015/16. To demonstrate that they have met their share of the RO, suppliers must obtain certificates, known as Renewable Obligation Certificates (ROCs), for renewable power supplied. Suppliers can meet their obligation by:

- acquiring ROCs
- paying a buy-out price (which was set at of £30/megawatt hour in 2002-3 and is adjusted annually by the retail price index, RPI), or
- a combination of ROCs and paying a buy-out price.

When a supplier chooses to pay the buy-out price, the money they pay is put into a buy-out fund. At the end of the “obligation period” the buy-out fund is redistributed or recycled to ROC holders relative to the number of ROCs they hold.

The RO has been amended a number of times since its introduction. The most significant amendment was the introduction of banding for different types of renewable power. Eligibility and band levels are provided on the DECC web site. Dedicated biomass plants receive 1.5ROCs per MWh generated and CHP and advanced biomass plants (i.e. gasification or pyrolysis plants) receive 2ROCs per MWh generated.

The definition of biomass for the purposes of the RO is important. Generators must be able to demonstrate at the power station that the fuel they use is more than 90% biomass (by energy content). If they cannot do this the fuel is not eligible as a biomass fuel. This is important for waste
streams and for fuels derived from mixed waste as some waste wood may be. It is also important for waste derived fuels such as solid recovered fuel. Currently waste burnt in energy from waste stations is deemed to have a biomass content of 50% for the purposes of the RO (which will decrease to 35% in time); however if the generator can prove that the biomass content is higher (to Ofgem’s satisfaction) he can claim for that biomass content. In addition recent changes mean that it is now possible to burn biomass with waste and to claim ROCs on the part of the power generated that can be attributed to the biomass. Importantly, simple and cost-effective methodologies for demonstrating the biomass content of mixed waste streams such as those constituting solid recovered fuels (SRF) do not exist, although the Government is supporting work to develop such methodologies.

Further changes will be introduced this year, including mandatory reporting of sustainability against green house gas criteria:

- Solid biomass and biogas electricity will need to have a carbon intensity of 285.12 kgCO$_2$/MWh or lower (equivalent to a minimum 60% greenhouse gas (GHG) emission saving for electricity generation using solid biomass) to be eligible for ROCs from April 2013
- Sustainability reporting will also be required on the mass/volume, type of biomass, its format, whether energy crop or production residue, whether an environmental certification has been met, and if so which one, and country of origin;
- Mandatory reporting against the sustainability criteria will be introduced from April 2011 for all generators above 50kW;
- From April 2013, generators of 1MW and above will need to meet the sustainability criteria in order to be eligible for support;
- Waste and biomass wholly derived from waste will not need to meet the sustainability criteria and will not need to report on sustainability;
- Generators below 1MW will not need to comply with the sustainability criteria, but will need to factually report against these.

These requirements are important for waste wood, because generators using waste wood will not need to meet the sustainability criteria or produce a report on sustainability. This may provide a further incentive for biomass power developers to consider waste wood as a fuel.

### 5.3.2 Renewable Heat Incentive (RHI)


The Government intends to introduce an RHI from July 2011. Its objective is to significantly increase the level of renewable heat in England, Scotland and Wales. The RHI will be introduced in two phases and the first phase will include support for tariffs for non-domestic heat (i.e. heat from the commercial and industrial sector, the public sector, not for profit organisations and communities).

For waste wood the most important conditions for the RHI concern those included for biomass eligibility:

- Essentially biomass heat boilers will be eligible. In addition energy from waste will be eligible, but only the biomass component of the waste will be rewarded (unless it can be demonstrated that the waste is more than 90% biomass). Combined heat and power schemes operating on biomass will also be eligible for the heat component,
- Only solid recovered fuel derived (SRF) from MSW and SRF that is >90% biomass content will be eligible, although the Government is proposing to examine the case for SRF from other waste streams.
- Participants who burn MSW will receive the biomass tariff, adjusted pro-rata for the solid biomass content of their waste. Unless participants prove a higher percentage of biomass content, the pro-rata content will be deemed at 50 per cent. The Government is considering evidence for a separate tariff for MSW.

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23 Eligible waste feedstock for combustion, gasification and pyrolysis will be limited to solid biomass from municipal solid waste (MSW), including solid recovered fuel (SRF) from MSW. In addition, other wastes where at least 90% of their energy content is comprised of solid biomass will receive support. Examples of such wastes include waste wood and residues from the paper manufacturing industry.
• Biomass generators of 1MWth and above will be required to report to Ofgem on the sustainability of their biomass feedstock annually. Where participants use the biomass element of eligible wastes as a feedstock, these feedstock will also be exempt from the reporting requirement.
• Only accredited plant will be eligible for payments. Ofgem will be responsible for accreditation.
• The tariff for biomass is 1.9-4.7p/kWh (thermal) depending on the size and amount of biomass heat generated.

There are two incentives in the RHI to encourage the use of waste wood. The first is the tariff itself; and the second incentive specifically for the use of waste wood is that wastes and residues will not be subject to the sustainability reporting requirements.

A significant amount of wood waste is already used in wood processing plants (i.e. furniture manufacturers, joinery firms, panel board manufacturers and paper and pulp mills) (AEA, 2010). It is not certain how much additional wood waste will be used to generate heat as a result of the RHI, but it could be a significant incentive for premises where wood heat boilers are not installed, where wood residues are plentiful and where there is a significant heat load. This could influence the availability of grades A and B waste wood. There is also a potential to use treated waste wood. For example, Plevin and Sons currently have a planning application in for a CHP plant to generate 1.6MWe and 12 MWth operating on treated waste wood.24

5.3.3 Renewable transport Fuel Obligation (RTFO)

The RTFO requires suppliers of fossil fuels to ensure that a specified percentage of the road fuels they supply in the UK comprises renewable fuels. The target for 2011/1 is 3.5% by volume.25 Currently this supply is predominantly biodiesel and bioethanol, produced using first generation or conventional processing technologies. Waste wood is not a suitable feedstock for such first generation fuels. However, the development of first generation biofuels is controversial because many of the fuels use food crops for feedstock (e.g. wheat or maize for bioethanol, oil crops such as rape seed oil for biodiesel). This has resulted in controversy over the role of such biofuels in rising food crop prices and in land use and land use change due to greater demand for crops. As a result there is a lot of ongoing research to develop biofuel production processes based on residues from crops or wastes, through chemical or biochemical processing of lignocellulose, also known as second or advanced generation biofuels. There are examples of proposed second generation processes that use wood residues using biomass to liquid processing (Choren 2011, UPM 2011) or gasification to biomethane. Although these technologies are not yet commercial, demonstration plants are being funded in Europe (EC 2011). It is unlikely that such technologies will be commercial before 2020, but in the following decade this technology may become more important.

5.3.4 Electricity Market Reform consultation


The Government is in the first stages of a consultation to develop market reform in the electricity market, one objective of which is decarbonisation of electricity supply as part of a package to achieve a reduction in UK GHG emissions of 80% by 2050. If accepted this reform will replace the RO with an alternative system based on feed in tariffs from 2017 and provide a mechanism to support the carbon prices.

It is not clear yet what difference these proposals will make to the use of waste wood for energy in the UK. The outcome will depend on the tariff set and the conditions around the application of the tariff and the mechanism for carbon price support. However, the consultation documents indicate that the Government expects all models of feed in tariffs considered to attract new investors in low carbon generation. In addition, in other countries where feed in tariffs exist the incentives for the use of

25 For further information see: http://www.renewablefuelsagency.gov.uk/abouttherfo
biomass such as waste wood are sufficiently attractive to encourage the generation of power from waste wood.

### 5.3.5 Production of solid recovered fuel

Trends in waste management mean that increasingly municipal waste (and some commercial waste) is being processed using mechanical or biological processing prior to resource recovery. Such processes enable greater recycling of materials in mixed waste; but they also leave a residue which is typically higher in calorific value than mixed waste and is known either as 'solid recovered fuel' (SRF) or 'refuse derived fuel' (RDF). Its relevance here is that the composition of SRF can be manipulated to increase its biomass component. Municipal waste does not contain a large amount of wood waste. Estimates indicate that somewhere between 3% and 5% of municipal waste is wood (Resource Futures 2009), if wood in garden waste is not included. According to marketing material for SRF from its MBT plant at Frogs Land, Shanks indicate that its SRF is 5% wood, the remaining components being paper, textiles and plastic. Other work on the composition of SRF bears this out (IEA 2004), but. In general, therefore, SRF from municipal waste is not a significant source of waste wood; but it can have a high biomass component (some SRF can also contain other organic material, such as dried food and garden wastes, so the composition can be diverse). Consequently some developers are proposing to mix SRF from various municipal and commercial sources with waste wood to achieve biomass energy content that achieves the eligibility requirements for the RO. For example, Scottish and Southern currently has a planning application in for a plant at its Ferrybridge site which would be operated on a mix of SRF, waste wood and clean wood. We believe that to achieve a biomass fuel using SRF derived from MBT would require considerable dilution of the total fuel. Other potential users include cement kilns and pulp and paper mills (e.g. proposals for a 50 MW, 500,000t/y plant at Kemsley (RPS 2009)), but some of these users require high calorific value fuel, which means that they will only use SRF with high plastics content.
6 Evidence from site visits

As part of this work a number of site visits were conducted at waste wood re-processing sites, civic amenity sites, a wood panelling production site and a construction site. In addition we contacted representatives of CRWP to discuss their experience of working with the construction and demolition sector.

Some waste wood is also recycled at local level through furniture and other specialist recyclers (generally small companies or not for profit organisations) who sell products directly within their local communities. These organisations deal with furniture reuse, secondary use of treated wood such as railway sleepers, mulches and compost. We did not talk to representatives of these reuse operators.

6.1 Sources of waste wood

Waste wood is re-processed at a number of different types of sites and aggregated in a variety of ways. It can be re-processed as part of general recycling activities, for example at a MRF site or as part of recycling activity at civic amenity sites and sold on directly from these sites. In addition there are a number of aggregators and re-processors operating specialist waste wood processing. The latter tend to take wood waste from producers who mainly operate in wood processing, packaging or the construction and demolition sectors.

From discussions with re-processors and waste processors at site visits the main sources of waste wood used in recycling are:

- Pallets
- Cable drums
- Commercial and industrial (C&I) waste (including packaging waste, wood processing waste, off cuts from furniture and joinery manufacturers etc.) Includes plywood, plain chipboard, melamine, OSB, hard and softwood offcuts.
- Secondary waste wood residues from the panel board industry
- Construction and demolition waste (usually segregated on the construction site),
- Civic amenity sites or privately run recycling facilities where wood can be kept segregated from other waste streams on site. These sites are often the place to which small scale construction firms bring their waste and where the general public may bring DIY wood waste etc,
- Waste collection companies that operate treatment facilities allowing separation of mixed C&I waste streams to separate wood waste.

Many waste wood re-processors also promote sustainable wood re-processing locally offering to collect suitable waste wood or accept deliveries, providing the waste wood is suitable. An example of the sort of specification guide provided is shown in Figure 7.

From our discussions with the WRA and our site visits it is clear that a number of waste wood re-processors are currently experiencing a shortage of waste wood and are examining alternative sources for their operations.

6.1.1 Additional comments on civic amenity sites

Some of the CA sites visited did not have facilities for sorting or recycling wood waste. Instead they used local firms that have facilities for sorting wood waste (e.g. MRF). The option for sorting wood waste from general CA site waste were very dependent on their being a local energy plant that could take low grade waste wood. If this option was not available then there was no market for waste wood. The councils operating the CA sites pay for the waste to be taken away for sorting (including transport costs) and there is no profit from this type of operation.
Figure 7 Product specification used by Egger

<table>
<thead>
<tr>
<th>GRADE A SPECIFICATION - PACKAGING MATERIALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0105 - Production woodworking, sawdust, off cuts</td>
</tr>
<tr>
<td>150103 - Waste wood packaging</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acceptable</th>
<th>Unacceptable (Contamination)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unpainted</td>
<td>MDF / Hardboard</td>
</tr>
<tr>
<td>Softwood pallets</td>
<td>Melamine / Laminated boards</td>
</tr>
<tr>
<td>Timber off cuts</td>
<td>Unfaced chipboard / Cardboard</td>
</tr>
<tr>
<td>Packing crates &amp; boxes</td>
<td>Felt / tar / Rubber / Polythene</td>
</tr>
<tr>
<td>Cable drums</td>
<td>Plasterboard</td>
</tr>
<tr>
<td>Stilages</td>
<td>Soil / Foliage / Twigs / Bricks / Glass</td>
</tr>
<tr>
<td>Bearers</td>
<td>Plastic / Foam / Textiles</td>
</tr>
<tr>
<td>Any form of solid timber packaging</td>
<td>Railway sleepers / Telegraph poles / Treated timber</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GRADE B SPECIFICATION - SOLID MIXED WOOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>030105 - Production woodworking, sawdust, off cuts</td>
</tr>
<tr>
<td>150103 - Waste wood packaging</td>
</tr>
<tr>
<td>170201 - Construction &amp; demolition</td>
</tr>
<tr>
<td>191207 - Crushed wood material from skip companies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acceptable</th>
<th>Unacceptable (Contamination)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All soft &amp; hard wood untreated timber</td>
<td>MDF / Unboard</td>
</tr>
<tr>
<td>Any packaging - pallets / Crates &amp; boxes</td>
<td>Melamine / Laminated boards</td>
</tr>
<tr>
<td>Timber off cuts</td>
<td>Unfaced chipboard / Cardboard</td>
</tr>
<tr>
<td>Solid doors</td>
<td>Felt / tar / Rubber / Polythene</td>
</tr>
<tr>
<td>Roof trusses / Floor boards</td>
<td>Plasterboard</td>
</tr>
<tr>
<td>Window frames / Door frames / Skirting / Architraves etc</td>
<td>Soil / Foliage / Twigs / Bricks / Glass</td>
</tr>
<tr>
<td>Painted wood (not lead based paints)</td>
<td>Plastic / Foam / Textiles</td>
</tr>
<tr>
<td>Railway sleepers / Telegraph poles / Treated timber</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GRADE C SPECIFICATION - LOW GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0030105 - Production woodworking, sawdust, off cuts</td>
</tr>
<tr>
<td>150103 - Waste wood packaging</td>
</tr>
<tr>
<td>170201 - Construction &amp; demolition</td>
</tr>
<tr>
<td>191207 - Crushed wood material from skip companies</td>
</tr>
<tr>
<td>200138 - Municipal / Industrial</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acceptable</th>
<th>Unacceptable (Contamination)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All soft &amp; hard untreated wood</td>
<td>All MDF inc, Laminate Flooring, Hardboard</td>
</tr>
<tr>
<td>All packaging - pallets / Crates / Boxes</td>
<td>Cardboard</td>
</tr>
<tr>
<td>Timber off cuts / Solid doors</td>
<td>Felt / tar / Rubber / Polythene</td>
</tr>
<tr>
<td>Roof trusses / Floor boards</td>
<td>Plasterboard</td>
</tr>
<tr>
<td>Window frames door frames / Painted wood</td>
<td>Soil / Foliage / Twigs / Bricks / Glass</td>
</tr>
<tr>
<td>Melamine / Laminated boards</td>
<td>Plastic / Foam / Textiles</td>
</tr>
<tr>
<td>OSB / Plywood / Unfaced chipboard</td>
<td>Railway sleepers / Telegraph poles / Treated timber</td>
</tr>
</tbody>
</table>

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6.2 Waste wood collection and processing

A number of re-processor and materials recovery facility (MRF) sites were visited where waste wood was aggregated, segregated and processed (usually shredded) prior to being sold on to the panel board, energy or animal bedding sectors.

Waste wood as received at re-processors and MRF sites is rarely suitable for recycling. Although often segregated into specific grades of waste wood, further processing is needed:

- The waste wood has to be sorted to remove contaminants such as plastic bags, string, sacking and other large items.
- The waste wood is then sorted to remove metal components. This metal scrap provides an additional revenue stream for the re-processor, but its removal is important for many subsequent re-uses where metal contaminants can cause important issues (such as sparks at biomass energy plants; or a choking hazard in animal bedding).
- The waste wood is then chipped and dust separated to produce a grade of wood that meets customer specification prior to shipping to the customer.

At a number of sites visited the input streams were kept segregated and processed separately because different streams are more appropriate for different end products.

Some of the civic amenity site operators and private MRF operators indicated that they separate wood waste and export it to Germany as a biomass fuel. This was of the order of a few thousand tonnes a week. Multiplied up across the country this would mean that a substantial amount of waste wood is being exported. However, we could not obtain statistics to corroborate this.

Additionally we were told that previous use of waste wood as a landfill cover has stopped because of the cost of landfill tax.

6.2.1 Use of waste wood for energy on site

Waste wood can be used at the original site of production or at the processing plant to generate electricity and heat for on site use. In the past the cost of compliant with Waste Incineration Directive (WID) emissions control might have made this use uneconomic, but Government incentives mean that it is becoming economic to use poorer quality waste wood in this way. A number of the sites we visited either have planning permission to install plants or intend to apply. The only factor preventing investment at present is the confusion over grandfathering for biomass plants under the RO. For example:

- Egger have a WID compliant 58MWth plant at Hexham and plan to install a similar plant at their Ayrshire site
- Plevin and Sons are applying for planning application in for a CHP plant to generate 1.6MWe and 12 MWth operating on treated waste wood.
- Dalkia are constructing a 50MWe WID compliant biomass power plant at its Pollington processing site.

In addition to talking to waste wood re-processors we also talked to one sawmill operator where co-product was used for wood heat. This processor does not use its own sawdust as it is too valuable to burn; bark is also sold for mulch. This leaves off cuts, edgings and butt reductions that are chipped and used as a fuel on site.

6.2.2 Issues identified in the site visits

A number of issues were identified from the site visits regarding the processing of waste wood:

- Most of the waste wood supplied is suitable for wood processing. A number of the waste wood re-processing firms train suppliers to educate them on what wood can be re-processed and what will be rejected and this has helped to minimise rejected loads. Nevertheless some loads do have to be rejected on the basis of contamination, particularly with panel board such as MDF that cannot be recycled on all sites. This means that rejected, sorted loads may instead go to landfill. This can result in the loss of good quality sorted wood as well as the unsuitable fractions. The current shortage of waste wood is forcing some operators to take
poorly sorted civic amenity waste, but this costs extra to sort on site and is not very popular. The gate fee for civic amenity and demolition waste provides no incentive to source separate so this waste can be very contaminated.

- Although the landfill tax is a good incentive to divert waste from landfill there is no incentive to separate this waste properly. Consequently civic amenity waste contains a lot of plastic and scrap materials. Segregation and sorting represent major costs to re-processors, particularly for civic amenity material.
- Many re-processors are having difficulty in grading loads of wood. Particular mention was made of difficulty in detecting contaminants such as CCA and heavy metals.
- There was a general comment that there are now too many re-processors and not enough waste wood.
- All of the above means that gate fees have collapsed over the past 12-18 months.
- Dust can be a big issue on site for a number of reasons. Generally dust is dealt with by water spraying in windy conditions and by undertaking the dustiest processing inside. Dust is more of an issue with grades of panel board in civic amenity waste. Increasing the quantities of this grade of wood for recycling will increase the dust problem.

General issues identified were:

- Changes in construction practices towards timber frame housing, particularly for social housing means that less wood waste is produced on site and more at the factory, where the producers are more aware of its value.
- There is concern about organic contamination in animal bedding, particularly for cattle, which may stop this market.
- The Environment Agency has allowed some operators to operate on exemptions while permitting is being applied for. Many of the permitted operators were not happy about this. They are concerned about unfair competition; and about whether the operators have appropriate training in handling hazardous waste wood grades.
- For waste wood recycling PRNs are not worth anything at the moment.
- A number of site operators observed that different Government departments and regulators have different aims with regard to waste wood and this means that there is no one overarching aim or objective. Consequently some policies seem to be contradictory.
- The wood processing sector is very keen to have good quality protocols for waste wood, which cover the end to waste definitions.
- The main increasing demand is for fuel for energy plants. However, local authorities like to see their waste recycled, which creates friction in the market. There is no policy encouraging panel board manufacture and so no increase in demand from this sector.
- Waste wood processors suggested that WID compliant bioenergy plant using waste wood would be best sized between 50,000-100,000 t/y. They think that this is small enough for local supply but large enough to be economic.
- Experience in the use of waste wood for energy has indicated that there are problems with waste wood fuel: bridging and blockages from wood chips; dust; and sparks from metals left in wood.
- There is no regulation of fuel for small scale use and so anything can be burnt.
- Waste wood is bulky and there are problems with storing segregated waste wood on small sites. This was an issue for construction and demolition sites and at some civic amenity sites. Civic amenity site operators commented that the market for waste wood is not certain and that waste wood production can vary significantly at some times of the year.

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PRN: this refers to the packaging waste recovery note system under the UK Packaging regulations. This system allows companies to pay for recovery and recycling of an amount of packaging equivalent to their production of such waste. PRNs can be traded on the open market, to be purchased by obligated companies.
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SEEDA Pathway to zero waste [http://www.seeda.co.uk/_documentbank/Item8_PTZWBoardReport.pdf](http://www.seeda.co.uk/_documentbank/Item8_PTZWBoardReport.pdf)


