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# Guidance on Applying the Waste Hierarchy

January 2012



This guidance is produced under regulation 15(1) of the Waste (England and Wales) Regulations 2011 and any person subject to the regulation 12 duty must have regard to it.

The Waste (England and Wales) Regulations 2011 came into force on 29 March 2011. The regulation 12 duty came into force on 29 September 2011.

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This document/publication is also available on our website at [[www.wales.government.uk/waste](http://www.wales.government.uk/waste)].

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## What is this document and who should read it?

This guidance is for any establishment or undertaking which imports, produces, collects, transports, recovers or disposes of waste or which as a dealer or broker has control of waste.

It sets out:

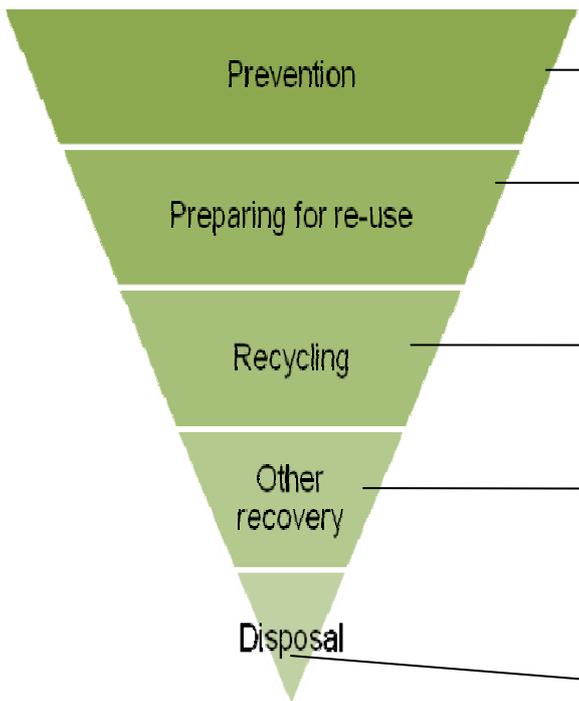
- what the waste hierarchy is (Section 1);
- how it works for a range of common materials and products (Section 2);
- what establishments or undertakings need to do to comply with Regulation 12 (Section 3);
- key questions and ideas for dealing with waste in line with the hierarchy (Section 4).

Though the principles of the waste hierarchy within this document apply to all wastes, the specific application of the hierarchy to **hazardous waste** will be set out in separate guidance to underpin Towards Zero Waste (the overarching waste strategy document for Wales) and the Sector Plans. This guidance is being developed by Defra in close liaison with the Welsh Government, the hazardous waste sector and the Environment Agency.

## Section 1 –The Waste Hierarchy

### 1.1 The “waste hierarchy” ranks waste prevention and management options according to what is best for the environment.

It gives top priority to preventing waste in the first place. When waste is created, it gives priority to preparing it for re-use, then recycling, then other recovery (e.g. of energy), and last of all disposal (e.g. landfill).

Stages	Includes
 <p>The diagram is a green inverted funnel divided into five horizontal sections. From top to bottom, the sections are labeled: Prevention, Preparing for re-use, Recycling, Other recovery, and Disposal. Lines connect each label to its corresponding section in the funnel.</p>	Using less material in design and manufacture. Keeping products for longer; re-use (e.g. donations to charity). Using less hazardous materials.
Preparing for re-use	Checking, cleaning, repairing, refurbishing, whole items or spare parts that have been discarded as waste for them to be re-used.
Recycling	Turning waste into a new material, substance or product. Includes anaerobic digestion if the digestate is a product meeting quality protocols for use as a soil conditioner or fertiliser. Includes composting if it meets quality protocols for use as a soil conditioner or fertiliser.
Other recovery	Includes anaerobic digestion where the digestate does not meet quality protocols; landspreading and some backfilling. Can include: incineration with energy recovery, gasification and pyrolysis which produce energy (fuels, heat and power) and materials from waste.
Disposal	Landfill and incineration without energy recovery

① The waste hierarchy is set out at Article 4 of the revised Waste Framework (Directive 2008/98/EC). The definitions of each of prevention, preparation for re-use, recycling, recovery and disposal can be found in Article 3 of the Directive. Non-exhaustive lists of disposal and recovery operations can be found in Annexes I and II of the Directive, respectively. The Directive is transposed in Wales by the Waste (England and Wales) Regulations 2011.

### 1.2 The revised Waste Framework Directive allows departure from the waste hierarchy where this gives better environmental benefits, as justified by “life cycle thinking”

In some circumstances for some wastes there is justification to deviate from the waste hierarchy on environmental grounds. In doing so it is important that a life cycle assessment approach is taken that compares the environmental impacts of managing the wastes according to different options in the waste hierarchy. In some cases this can lead to the hierarchy being over turned, and/or to parts of the hierarchy being broken down further in terms of priority.

① Article 4(2) of the revised Waste Framework Directive states that: “When applying the waste hierarchy referred to in paragraph 1, Member States shall take measures to encourage the options that deliver the best overall environmental outcome. This may require specific waste streams departing from the hierarchy where this is justified by life-cycle thinking on the overall impacts of the generation and management of such waste”.

Regulation 12 of the Waste (England and Wales) Regulations 2011 states that an establishment or undertaking may depart from the waste hierarchy to achieve the best overall environmental outcome where this is justified by life-cycle thinking on the overall impacts of the generation and management of the waste.

## Section 2 – What this means for common materials and products

**2.1** The **table on page 7** illustrates how the hierarchy applies for a range of common materials and products. It includes departures from the hierarchy where, in the opinion of the Welsh Government, this is justified on the basis of life cycle thinking. The list is not exhaustive, and could be expanded in future years. The evidence base used by the Welsh Government to form its opinion on the departures is provided in Section 5.

**If your establishment or undertaking imports, produces, collects, transports, recovers or disposes of (or which as a dealer or broker has control of) waste materials or products not listed in the table on page 7, you still need to apply the waste hierarchy to these wastes.** Specific information is available for a wider range of waste products and materials. For instance:

- if you are involved in the construction sector tailored information is available at [www.wrap.org.uk/construction](http://www.wrap.org.uk/construction). and <http://www.cewales.org.uk/waste/> ;
- if you deal with paint, you can find ideas on how to re-use your surplus at <http://www.communityrepaint.org.uk/> .

The ranking of the various waste management options on page 7 is based on **current scientific research** on how the options impact on the environment in terms of ecological footprinting, climate change, air quality, water quality and resource depletion<sup>1</sup>. The main sources of evidence on which these hierarchies are based are listed in section 5. Over time, new technologies may emerge, and the comparative efficiency of waste management options may change. Likewise, new research is published all the time.

To take account of such changes, this guidance and the evidence informing it will be periodically reviewed.

**2.2** **For most materials, the waste hierarchy ranking applies as described in Section 1.1.** But for the materials below, the evidence suggests that waste management options which are not in keeping with the waste hierarchy order are better for the environment:

- for paper and card, energy recovery is environmentally better than composting<sup>2</sup>;
- for *lower grade wood*, energy recovery options are more suitable than recycling. To determine the grade of wood you handle, please see the

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<sup>1</sup> With a few exceptions (e.g. aggregates), emissions from transport of recyclable materials (including collection from the kerbside) are a very small fraction of the total impacts, and they are dwarfed by the benefits of recycling.

<sup>2</sup> Welsh Assembly Government - Ecological Footprint impact of the Welsh Waste Strategy (Arup, 2009).

Wood Recyclers Association grading structure for UK derived, non-virgin wood<sup>3</sup>;

- for glass, low benefit open loop recycling, for example the manufacture of aggregate, is environmentally worse than landfill<sup>2</sup>;
- for plastics, landfill and energy recovery with combined heat and power (CHP) are considered to be better environmental options than some open loop recycling options (for example, plastic wood manufacture) and energy recovery without CHP for some cases. This is because the available evidence demonstrates that the use of plastic waste for open loop recycling and for energy recovery without CHP both give rise to significant increases to the ecological footprint of managing plastic wastes in this manner compared to closed-loop recycling (which brings a significant decrease). The use of plastic for energy recovery without CHP is also found to have a higher carbon cost than its disposal to landfill. However, where energy is recovered from the use of plastic wastes at high efficiency, this can result in a net negative production of greenhouse gases when compared to the use of fossil fuels in standard generation facilities. It is recognised that further work may be needed to clarify the waste hierarchy in respect of management options for plastic wastes.<sup>2,4</sup>

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<sup>3</sup> Defra: Applying the Waste Hierarchy: evidence summary; June 2011.

<sup>4</sup> 'Plastic waste as a fuel – CO2 neutral or not?', Errikson and Finnveden, RSC Journal, 28<sup>th</sup> July 2009 (DOI: 10.1039/b908135f).

Paper and Card	Food	Garden Waste	Textiles	Wood	Glass	Metals	Plastics±	WEEE	Tyres	Residual 'black bag'
Prevention	Prevention	Prevention	Prevention	Prevention	Prevention	Prevention	Prevention	Prevention	Prevention	Prevention
Preparation for re-use	Preparation for reuse		Preparation for re-use	Preparation for re-use	Preparation for re-use	Preparation for re-use	Preparation for re-use	Preparation for re-use	Re-treading	EfW at maximum process efficiency (heat only) with IBA recovery/recycling
Closed Loop Recycling	Anaerobic Digestion with digestate applied to land	Anaerobic Digestion (dry) <sup>2</sup>	Recycling	Recycling; energy recovery ♦ (preferable to recycling for lower grade materials)	Recycling in a remelt process	Recycling	Closed loop and some open loop recycling	Recycling (esp. suitable for metals and high quality plastic)	Recovery: use in road surfaces	Mass Burn EfW at >60% efficiency and gasification or pyrolysis at >50% efficiency with IBA recovery/recycling
Open Loop Recycling (eg. To other fibre products)	Composting of segregated food waste with compost applied to land	Composting; other energy recovery technologies			Open loop recycling (eg. Glass fibre insulation)	Recycling/ Recovery as a by-product of EfW or processing of industrial effluents etc	High efficiency open loop recycling (eg. mixed polymer blends for polymer substitution)	Energy recovery ♦ (esp. suitable for non-hazardous mixed plastic)	Energy recovery in cement kilns	Mass Burn EfW gasification or pyrolysis at >30% and <50% efficiency with recycling of ash
Energy recovery ♦ (esp. suitable for short fibres or contaminated materials)	Other recovery (including landspreading EfW and household disposal to sewer)		Energy recovery ♦				Energy recovery with CHP for non-recyclable plastics		Energy recovery through pyrolysis	MBT/MHT with RDF to high efficiency EfW
Composting					Disposal		Landfill		Other recovery (eg drainage fill & sea defences)	Energy Recovery ♦ (Electricity Only) with recycling of IBA
Disposal and Landspreading	Disposal	Disposal	Disposal	Disposal	Low Benefit open loop recycling (eg. Secondary aggregate)	Disposal	Some open loop recycling (eg. Plastic wood)	Disposal	Gasification/ incineration with EfW	MBT with AD/IVC and CLO to landfill*/ MBT with RDF to EfW plants operating in electricity-only mode.
							Energy recovery without CHP		Microwave treatment	Disposal

± The hierarchy may be different for some forms of bio-based plastics.

◆ 'Energy recovery' covers a range of technologies, some of which will be more environmentally beneficial than others. Future versions will differentiate between technologies as more scientific evidence becomes available.

EfW = energy from waste; CHP = combined heat and power; IBA = incinerator bottom ash; MBT = mechanical biological treatment; MHT = mechanical heat treatment; = compost like output (usually produced by MBT/MHT plants); RDF = waste derived fuel (usually produced by MBT plants) Section 3  
– Your legal obligations.

### 3.1 What does my business or organisation have to do to comply with Regulation 12 of the Waste (England and Wales) Regulations 2011?

(a). Does your establishment or undertaking **produce or handle waste**? This includes importing, producing, collecting, transporting recovering or disposing of waste; and dealers or brokers who have control of waste.

As a source of further information on whether something is waste see the 'draft' Definition of Waste 2010 guidance at:

<http://webarchive.nationalarchives.gov.uk/20100505154859/http://www.defra.gov.uk/corporate/consult/waste-definition/index.htm>.

**To note:** Defra and the Welsh Government will publish a revised version of the Definition of Waste Guidance soon.

**If yes, you need to take all such measures as are reasonable in the circumstances to apply the waste hierarchy to prevent waste, and to apply the hierarchy as a priority order when you transfer your waste to another person.**

This duty will apply equally to those who operate under waste exemptions from, as well as those permitted under, the Environmental Permitting Regime.

**From 29 September 2011, you will need to add a declaration on your Duty of Care Waste Transfer Notes and Hazardous Waste Consignment Notes confirming that you have complied with this duty.** Here is some text you can use:

*'I confirm that I have fulfilled my duty to apply the waste hierarchy as required by regulation 12 of the Waste (England and Wales) Regulations 2011.'*

① your duties are set out at in Regulations 12, 15 and 35 of the Waste (England and Wales) Regulations 2011.

In addition, if you produce, import, carry, keep, treat or dispose of waste, or as a broker control such waste, you have a legal **duty of care** to take all reasonable steps to keep your waste safe. If you give your waste to someone else, you must be sure they are authorised to take it and can deal with it or dispose of it safely:

<http://www.environment-agency.gov.uk/business/topics/waste/40047.aspx>.

(b). Are you operating a site that requires a permit under the Environmental Permitting Regulations (England and Wales) Regulations 2010?

In addition to the duties described at (a) above, a condition in **new or revised permits** will place a duty on the permit holder to apply the hierarchy. For example you could minimise process loss through improvements to the way your business operates and/or considering recycling options for any waste produced at the site.

If you are an existing permit holder, this new condition will apply when your permit comes up for review. For more details, see:

[Environmental Permitting Guidance @ http://www.environment-agency.gov.uk/business/topics/waste/128153.aspx](http://www.environment-agency.gov.uk/business/topics/waste/128153.aspx)

### 3.2 What does this mean in practice?

You can save money by applying good environmental practice, as follows:

- plan how you will apply the waste hierarchy;
- monitor your performance regularly;
- know what waste you are producing, and make efforts to produce less; and
- keep segregated the waste materials you do produce to help you or others recover value from them.

Other factors will influence the decisions you make about waste generation and management, such as which options are technically feasible, which are economically viable, and which best protect natural resources or human health<sup>5</sup>.

These other factors are better considered on a case-by-case basis, according to the circumstances of your business or organisation. Whether and how they are relevant will depend for example on the geographical location, type and size of your business/organisation.

If you are making decisions on waste management which do not comply with the waste hierarchy because of these other factors, ***you must be able to justify them.*** It is good practice to keep a record of your decisions.

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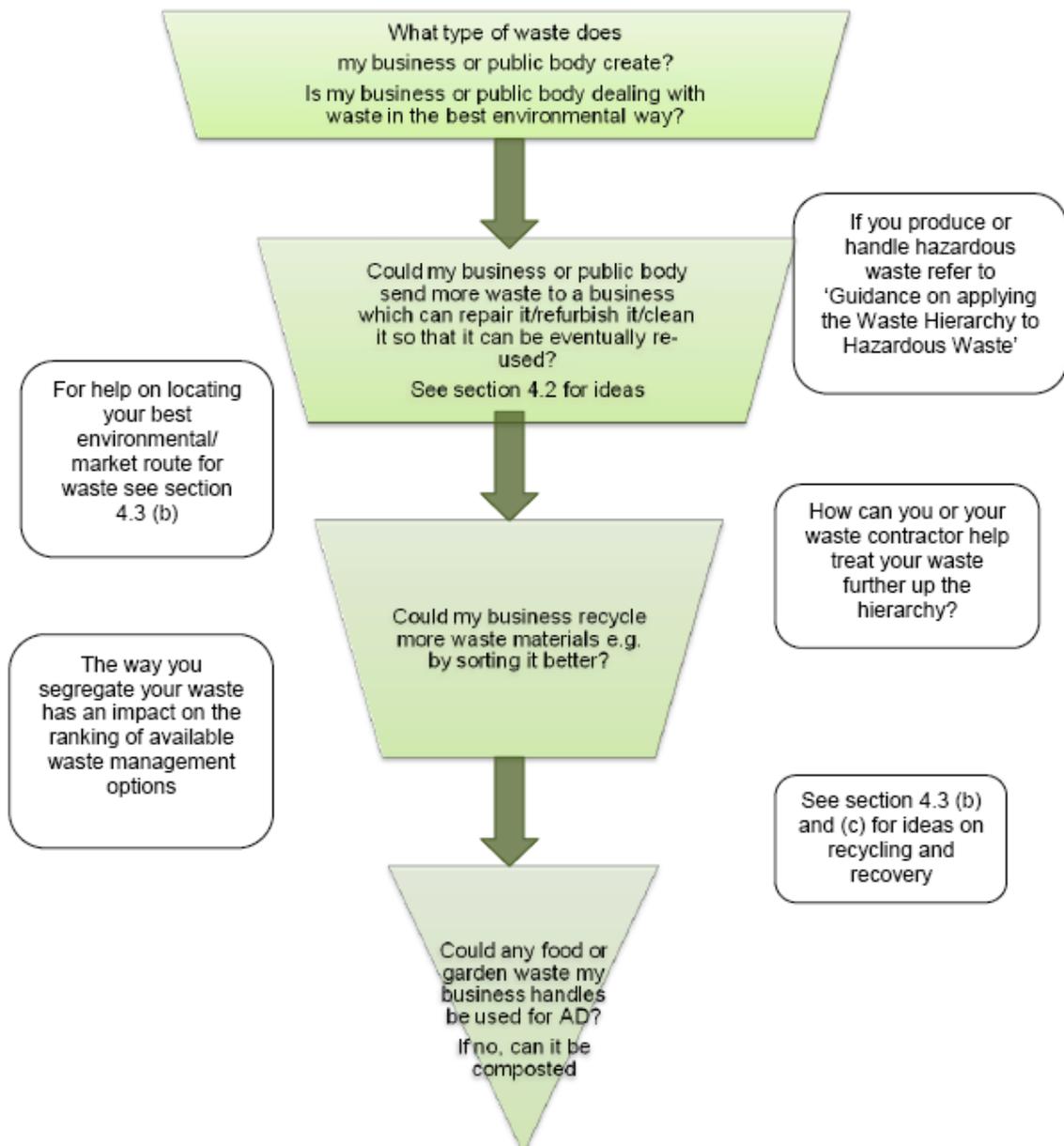
<sup>5</sup> The qualifications to the waste hierarchy are set out in full in Regulation 12 of the Waste (England and Wales) Regulations 2011, <http://www.legislation.gov.uk/ukdsi/2011/9780111506462/contents>.

## Section 4 - How do I apply the waste hierarchy?

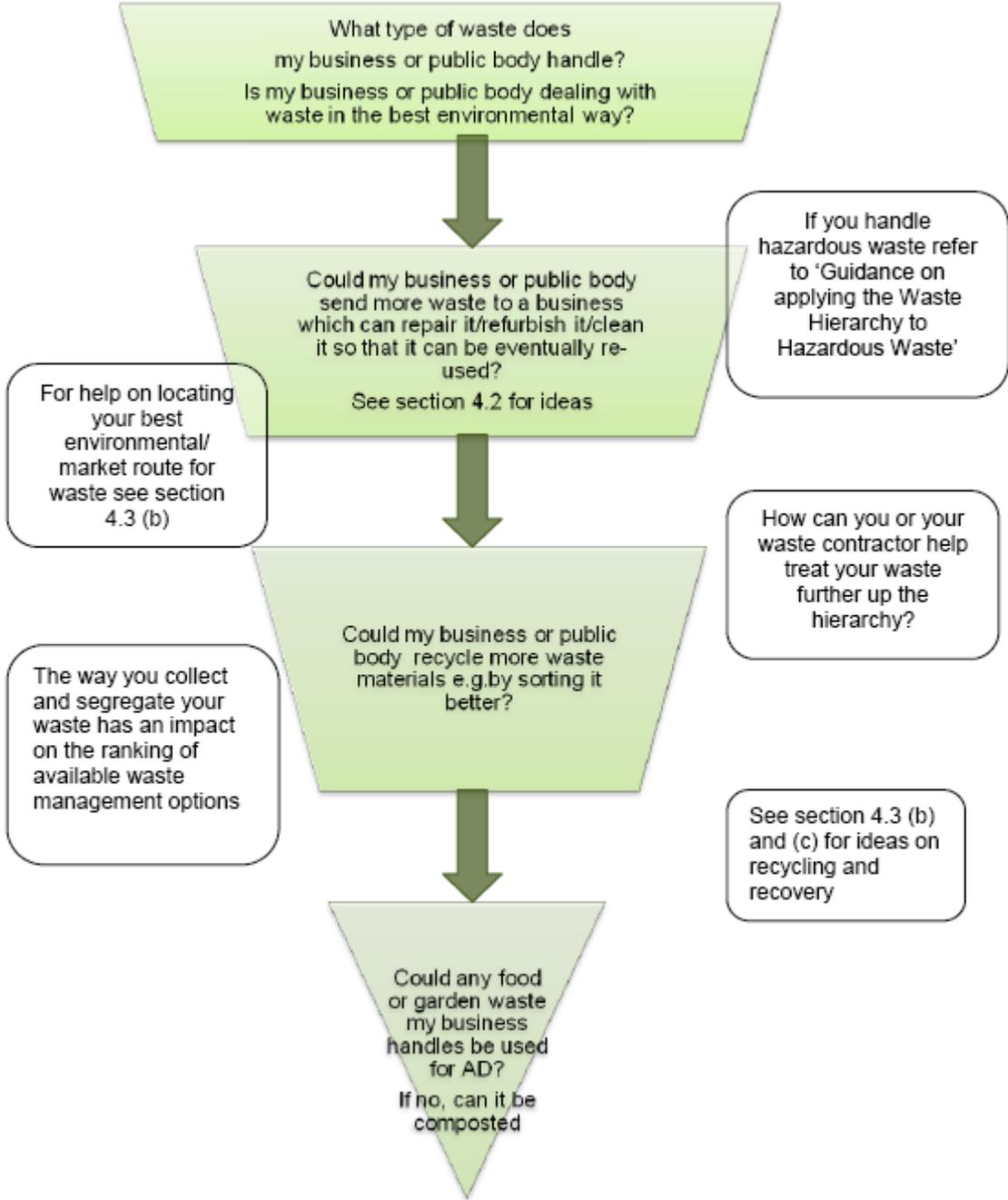
4.1 This section sets out key questions which you need to work through, particularly when you negotiate waste management contracts.

You may find it helpful to work through the following questions to assess whether your establishment or undertaking is applying the hierarchy. If you **produce** waste see Figure 1, if you **handle** waste see Figure 2.

Figure 1: Putting the hierarchy into practice if you produce waste



**Figure 2: Putting the hierarchy into practice if you handle waste**



## 4.2 How can my establishment/undertaking prevent any of this waste? Avoiding waste saves money.

- prevent waste. See <http://wastehierarchy.wrap.org.uk>;
- if your establishment or undertaking designs, manufactures or distributes goods, could you use less input material and/or less hazardous material in design and manufacture? Could your surplus materials be someone else's resource? Are you using the right amount of packaging for shipping? Could you design products to last longer or be repaired more easily? Are your products subject to legal eco-design requirements, and do they *comply*? See <http://wastehierarchy.wrap.org.uk> and <http://www.edcw.org><sup>6</sup>;
- use your procurement process to minimise waste generated from your purchased goods and services;
- sell/donate/swap unwanted items (textiles, furniture, electrical and electronic equipment, toys or leisure equipment etc) for re-use;
- retain and use electrical and electronic equipment, textiles or furniture for longer. Could you refurbish or repair them instead of buying new ones?<sup>7</sup>
- hire or lease rather than purchase electrical and electronic equipment, textiles or furniture. Buy or re-use second-hand and vintage items. See <http://wastehierarchy.wrap.org.uk>;
- maximise the life of tyres through transport and logistics practices. Tyres can be re-used if they are still in good enough condition. For example, tyres which still have enough tread can be re-fitted on vehicles if they have been inspected and marked appropriately;
- re-use items e.g. carrier bags, refill water containers from the tap rather than buy bottled water, and use durable rather than disposable cutlery and containers. Ask your suppliers to use re-useable packaging, and do so yourself with your customers;
- If you are in the construction sector, tailored information is available at [www.wrap.org.uk/construction](http://www.wrap.org.uk/construction) and <http://www.cewales.org.uk/waste/>.

## 4.3 What do I currently do with my waste?

Is there anything that I or my waste contractor(s) can do to make my waste - or more of my waste - suitable for use in a better environmental option than the one(s) I am using now?

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<sup>6</sup> The Eco Design Centre is funded by Welsh Government. It provides information and guidance to business on the principles of eco design, Ecodesign is a strategic design management process that is concerned with minimising the impact of the life cycle of products and services (e.g. energy, materials, distribution, packaging and end-of-life treatment). This involves assessing, prioritising and then designing out problems, or designing new solutions. These solutions can range from specifying renewable materials, reducing the energy during usage to innovating the business model.

<sup>7</sup> 59% of office machinery and computers disposed of by businesses are re-usable without repair. 49% of audio-visual, photographic and computers, calculators etc of by households is re-usable without repair. (Cooper, T. (2004) Inadequate life? Evidence of consumer attitudes to product obsolescence, *Journal of Consumer Policy*, 27, 421-449).

**(a) Could it be prepared for re-use? (e.g. by sorting, cleaning)**

In this document (as in the legislation), when we speak about 're-use', we mean using again a substance, product or material before it becomes waste. 'Preparing for re-use' relates to checking, cleaning or repairing activities which allow a **waste** substance, product or material to be re-used without any other pre-processing. For example industrial machinery, clothes, electronic and electrical equipment and furniture can be repaired or refurbished and then sold on. See <http://wastehierarchy.wrap.org.uk> for more ideas.

It is not always easy to make a distinction between what is waste and what is not. There is no definitive list; it depends on specific circumstances. As a source of further information on whether something is waste see the 'draft' Definition of Waste 2010 guidance at <http://webarchive.nationalarchives.gov.uk/20100505154859/http://www.defra.gov.uk/corporate/consult/waste-definition/index.htm>.

**(b) Could my waste/more of my waste be recycled?**

A wide variety of materials can be recycled; you need to discuss your needs with companies or organisations who can provide this service. The **NetRegs Waste Directory** (<http://www.wastedirectory.org.uk>) offers a search engine that allows businesses to find out where they can recycle different types of waste. Make sure any service you use is legally permitted to take the waste.

The way your waste is segregated and stored on site can have a direct effect on how it can be recycled. It's worth discussing with your contractor how you can get the most value from your waste. See <http://wastehierarchy.wrap.org.uk>.

Food and garden wastes can be treated and recycled back into the soil as a valuable soil conditioner and/or fertiliser. Common treatments are anaerobic digestion and composting.

There are legal requirements on the treatment of food waste, as well as quality standards. Please visit:

- <http://www.defra.gov.uk/food-farm/byproducts/> for information on the legal rules;
- [http://www.wrap.org.uk/composting/production/download\\_pas\\_100.html](http://www.wrap.org.uk/composting/production/download_pas_100.html) for the PAS 100 standard on compost;
- [http://www.organics-recycling.org.uk/index.php?option=com\\_docman&task=cat\\_view&gid=64&Itemid=86](http://www.organics-recycling.org.uk/index.php?option=com_docman&task=cat_view&gid=64&Itemid=86) for the PAS 110 standard on digestate;
- <http://www.environment-agency.gov.uk/business/topics/waste/114395.aspx> for Quality Protocols on compost and digestate.

Organisations who are considering using or investing in anaerobic digestion can find advice at <http://www.walesadcentre.org.uk/>.

### **(c) is there anything else that could be extracted from my waste (energy or product)?**

There are many different energy recovery technologies – including combustion with energy recovery, anaerobic digestion (for biodegradable waste), thermal processes including gasification and pyrolysis, and advanced biorefinery technologies. Some waste contractors will use energy recovery rather than landfill.

The European Recovered Fuel Organisation's webpages give detail of technologies and quality standards (<http://erfo.info/Quality.6.0.html>).

## **4.4 Other key sources of support**

A simple summary of the benefits for all businesses of sustainable waste management, starting with waste prevention, can be found on the **Business.Wales** website<sup>8</sup>. This includes guidance tailored to individual business sectors.

For local authorities, WRAP's Waste Prevention Toolkit<sup>9</sup> offers interactive guidance on planning, developing, implementing or reviewing waste prevention plans.

The Environment Agency has developed **WRATE**<sup>10</sup>, a piece of life cycle assessment software which allows businesses and public bodies to calculate the environmental impacts of their systems, including waste management impacts. This guidance reflects the key assumptions in WRATE, and we recommend that businesses and public bodies use WRATE to make decisions based on this guidance but more finely tailored to their circumstances.

The Environment Agency is also developing a set of tools (known as **Resource Efficiency Appraisal Development** (READ)) which businesses and organisations will be able to use to benchmark how well they manage resources such as materials, waste and packaging, and the biggest opportunities to improve. These tools are available on the Environment Agency and WRAP websites. <http://www.environment-agency.gov.uk/business/topics/performance/121909.aspx> [www.wrap.org.uk](http://www.wrap.org.uk).

The **“Duty of Care” Code of Practice** is a statutory document which explains how everyone who produces, carries, imports, keeps, treats or disposes of controlled waste, or as brokers or dealers controls such waste can meet the legal duty set out in section 34 of Environmental Act 1990 to manage and transfer that waste correctly to enable its safe recovery or disposal without harming the environment. All waste holders are still required to comply with the statutory duty of care, and in doing so, they should have regard to the Code of Practice.

<sup>8</sup> <http://business.wales.gov.uk/bdotg/action/layer?r.s=m&site=230&topicId=1079068363>.

<sup>9</sup> [www.wrap.org.uk/applications/waste\\_prevention\\_toolkit/restricted.rm](http://www.wrap.org.uk/applications/waste_prevention_toolkit/restricted.rm).

<sup>10</sup> <http://www.environment-agency.gov.uk/research/commercial/102922.aspx>.

## Section 5 - Evidence Sources

5.1 The material hierarchies in this document have been developed using evidence from a number of sources as follows:-

- i) Environmental Life Cycle Assessment of Waste Management Options for Priority Waste Materials' – EA Wales, 2009 (A report for the Welsh Government)  
<http://wales.gov.uk/docs/desh/consultation/090429wasteenvirolifecycleen.pdf>.
- ii) Welsh Assembly Government - Ecological Footprint impact of the Welsh Waste Strategy (Arup, 2009)  
<http://wales.gov.uk/docs/desh/consultation/090429wasteecologicalfootprinten.pdf>
- iii) WRAP – Environmental Benefits of Recycling – 2006, and 2010 update.  
[http://www.wrap.org.uk/downloads/Recycling\\_LCA\\_Report\\_Sept\\_2006 - Final.4cc51d5.2838.pdf](http://www.wrap.org.uk/downloads/Recycling_LCA_Report_Sept_2006_Final.4cc51d5.2838.pdf) and  
[http://www.wrap.org.uk/downloads/Environmental\\_benefits\\_of\\_recycling\\_2010\\_update.06552ad1.8816.pdf](http://www.wrap.org.uk/downloads/Environmental_benefits_of_recycling_2010_update.06552ad1.8816.pdf)
- iv) DEFRA – Applying the Waste Hierarchy – Evidence Summary.  
<http://www.defra.gov.uk/publications/files/pb13529-waste-hierarchy-summary.pdf>.
- v) Carbon Balances and Energy Impacts of the Management of UK Wastes' - Defra R&D Project WRT 237 (December 2006)  
<http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=14644>.
- vi) 'Plastic waste as a fuel – CO2 neutral or not?', Errikson and Finnveden, RSC Journal, 28<sup>th</sup> July 2009 (DOI: 10.1039/b908135f)  
<http://pubs.rsc.org/en/Content/ArticleLanding/2009/EE/b908135f>