

Final report

Working with compostable products and packaging in closed venue events



This report describes the procurement, use and management of compostable packaging and non-packaging products in closed events and uses the experiences gained from the 2012 London 2012 Olympic Games and Paralympic Games

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inspired
by 2012

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**Material change for
a better environment**

Front cover photography: Orange bin for food and compostable packaging and non-packaging wastes, outside McDonald's restaurant at the Olympic Park, London.

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Executive summary

This report aims to help the hospitality industry and organisers of UK and international events to understand how to deliver, measure and report more effectively on the management of biodegradable wastes that arise from events, with a focus on compostable packaging and non-packaging products e.g. cutlery.

The London 2012 Olympic Games and Paralympic Games (the Games) were planned and managed according to a target to re-use, recycle or compost 70 % of the operational waste created within the Games venues throughout the 77-day Games period and send none of that waste directly to landfill. In support of this, compostable packaging and non-packaging products associated with the preparation and consumption of food were sourced and used at the Games venues. Hot drinks were also served in compostable packaging from most of the catering and concession areas at the venues.

The London Organising Committee of the Olympic Games and Paralympic Games (LOCOG) instructed suppliers and licensees to minimise the use of primary, secondary and tertiary packaging and source those made from materials that can be re-used, recycled, or recovered by commonly available methods in the UK. They were required to maximise the use of recycled content in products and packaging, using compostable packaging and non-packaging products only where it was not possible to re-use or recycle such items easily.

During event planning LOCOG identified that the controlled use of compostable packaging and non-packaging products would help to maximise the amount of quality compost made from biodegradable wastes arising at the Games venues.

This guidance document is for use by event organisers and waste managers. It gives information on how to successfully recycle biowaste from events and covers the entire lifecycle of the Games. It includes a number of key steps, from the use of certification bodies and messaging on compostable packaging, to how the Games biowaste is composted and issues that should be considered for future events.

The European market for biodegradable plastics is between 140,000 and 217,000 tonnes per year and is expected to follow a similar trend in growth of the global market. Differentiating compostable products from non-compostable products is made easier with knowledge of the materials used in their construction, the requirements for certifying products as compostable and the key industry bodies that provide information and product certification services.

The experience of using compostable packaging and non-packaging products during the Games included the procurement and checking of all items to be used, a total of 150. The criteria that all compostable packaging and non-packaging products had to meet facilitated the procurement of products that performed in the 'use' stage of their lifecycle and adequately biodegraded under composting conditions after they became waste.

In total 1,590 tonnes of bagged compostable biowaste from the London and South East of England Games venues was composted. This was done by one of SITA UK's composting sub-contractors at an in-vessel and outdoor composting facility in Kent operated by Countrystyle Group. This tonnage represented 59.8% of the total waste collected via the compostable waste stream from these venues, while 40.2 % was sent to Energy from Waste (E-f-W), due largely to contamination.

A total of 2,568 tonnes of waste was collected via the compostables bins from all Games venues UK wide, of which 1,706 tonnes (66.4 %) was accepted for composting by the seven



composting facilities that treated biodegradable wastes from the Games. Despite the challenges, these figures represent an unprecedented achievement given that a compostables waste stream has never been attempted on such a scale for an event in the UK.

A number of important lessons were learnt by those involved with delivering the Games. Those lessons have been described and summarised in an associated, short guide titled ['Working with Compostable Products: Key Lessons and Guidelines for Future Events'](#). The guide also includes more detailed recommendations for procuring compostable packaging and non-packaging products for events in future and making arrangements at the event and with the composter(s) who will treat the event's biodegradable waste stream (food waste and used compostable packaging and non-packaging products).

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LOCOG, Countrystyle Group, Novamont, DIN CERTCO and Vinçotte are also thanked for supplying many of the images used in this report and agreeing to such use.

1.0 Introduction

This report and its associated short guide, "[Key Lessons and Guidelines for Future Events](#)", forms part of the wider legacy following the delivery of the London 2012 Olympic Games and Paralympic Games. The documents are for use in the events and hospitality industry to enable organisers of other UK and international events to understand how to deliver, measure and report more effectively on the management of biodegradable wastes that arise from events, particularly compostable packaging (e.g. hot drinks cups and lids) and non-packaging items (e.g. cutlery and plates). This report and its associated short guide are also designed to support the waste management industry by highlighting the practices put in place by the waste contractor and through highlighting associated key lessons.

Before the Games, a target was set that the parties involved must aim to re-use, recycle or compost at least 70%, by weight, of the operational waste created within the Games venues throughout the 77-day Games period and send none of that waste directly to landfill. The setting of such a target was driven by increased commitment in the UK to improve resource efficiency, to use renewable resources where practicable and cost-effective, to prevent waste where possible and to manage wastes that do arise using the highest feasible option in the waste hierarchy (as appropriate to each type of waste).

Waste composition analysis and modelling techniques were used to make estimates for the total material flow arising from Games time activities. The modelling of potential waste which may be generated was vital to planning LOCOG's waste reduction and minimisation interventions; it helped with the identification of priority materials and areas to focus efforts and their alignment with existing waste management infrastructure. For instance, approximately 40 per cent of operational waste was estimated to be food or food-contaminated packaging.

The procurement and use of compostable packaging and non-packaging products at the Games incurred considerable management time and extra financial resource but this commitment helped LOCOG to meet its waste re-use, recycling and composting target and played a part in changing the behaviour of the public, employees, contractors and Games Makers who visited, worked and provided voluntary support at the Games venues.

LOCOG worked hard to embed sustainability into the management of all the Games-related projects and venues, information and knowledge, procurement and contracts. More specifically, the aims were:

- **climate change** - to deliver a low carbon Games and showcase how we are adapting to a world increasingly affected by climate change;
- **waste** - to deliver a zero-waste Games, through exemplary resource management practices and by promoting long-term behavioural change;
- **biodiversity** - to conserve biodiversity, create new urban green spaces and bring people closer to nature through sport and culture;
- **inclusion** - to host the most inclusive Games to date by promoting access, celebrating diversity and facilitating the physical, economic and social regeneration of the Lower Lea Valley and surrounding communities; and
- **healthy living** - to inspire people across the UK to take up sport and develop more active, healthy and sustainable lifestyles.

Focussing on one of those sustainability themes - better management of resources derived from wastes in future - WRAP has identified that the Hospitality & Food Service sector is in a strong position to make a considerable contribution to reducing food and associated packaging waste and to drive the management of the wastes it does generate further up the

waste hierarchy. If at least a quarter of this sector were to contribute in these ways those organisations and businesses could collectively save up to £76 million by the end of 2015 through waste reduction and recycling. To encourage change, WRAP has worked closely with interested and relevant organisations and individuals to draw up a Hospitality and Food Service Agreement (HFSA)¹ that includes the following targets:

- **Prevention target:** Reduce food and associated packaging waste arising by 5 % by the end of 2015. This will be against a 2012 baseline and be measured by 'carbon dioxide equivalents' (CO₂e) emissions.
- **Waste management target:** Increase the overall rate of food and packaging waste being recycled, sent to anaerobic digestion (AD) or composted to at least 70 % by the end of 2015.

WRAP will deliver the agreement across the UK through its national programmes, including Zero Waste Scotland. It will work in partnership with organisations and businesses who sign up to the FSHA help them meet the targets through online tools, workshops, working groups and expert advice.

The Games have provided a leading example about how biodegradable wastes from a multi-venue, complex event can be managed more sustainably. Much of what has been learnt from this experience could be applied to smaller events in future, including one-off as well as annual or biennial events.

An important legacy of the Games has been to show that the procurement and use of compostable packaging and non-packaging products at an event and subsequent composting of the event's biodegradable wastes can help to drive up the percentage of the event's total wastes that are recycled and composted. This lesson can be applied in the Hospitality & Food Service sector, towards achieving the HFSA targets and making better use of renewable resources derived from biodegradable wastes.

¹ See <http://www.wrap.org.uk/content/hospitality-and-food-service-wraps-work-0> for more information.

2.0 Introduction to sourcing compostables and managing them after use at events

This section of the report covers key terms relevant to compostable packaging and non-packaging products. It also directs readers to lists of manufacturers and suppliers of compostable packaging and non-packaging products and, after highlighting the relevance of the waste hierarchy and End-of-Waste criteria to the management of biodegradable wastes from events, it provides guidance on the selection of processes for biologically treating biodegradable wastes from events.

2.1 Compostable packaging and non-packaging products

This report focusses specifically on packaging and non-packaging products which are designed to be composted at industrial/commercial scale after being used for the supply, preparation and consumption of food and drinks at events. Such products must be certified compliant with at least one standard for compostability, such as EN 13432 (see section 3.1 for reference to others).

Products made from biodegradable materials, such as cornstarch and plant-fibre, are available in a variety of forms, some of which are used as packaging such as trays and flexible plastic-like wrap for fruits and vegetables. Other forms such as cutlery are not packaging but can be compostable, hence this report's inclusion of the term 'non-packaging products'.

In this report and in the context of assessing whether a packaging or non-packaging item is compostable, 'product' always means the final product that is intended to be used at the end of the chain. The base or raw-materials, intermediate constructions and additives that many final products consist of are collectively termed as 'constituents' in this report. Readily separable parts of a final product are termed 'components', a good example of which is a compostable cup with a detachable compostable lid. This report's glossary for terms and definitions (section 8) includes key terms relevant to compostable packaging and non-packaging products.

Unfortunately, standards and certification schemes for compostable packaging and non-packaging products do not always use the same terms and there can be differences between definitions of the same term. In addition, there is confusion in relevant industries and markets about the meanings of many terms. Some materials and products are marketed under the wrong terms, in some cases without being able to provide evidence to substantiate the 'green' claim(s) made. This report attempts to explain some of the key terms and uses the most appropriate definitions available (see glossary and particularly sections 2.2.1 and 3.2).

Appendix 1 provides a flow diagram for event organisers, which highlights key considerations when planning what wastes an event will generate and how those wastes will be collected and managed. Types of information and documents, processes to follow and topics about which decisions will need to be made are identified.

Section 9 of this report (named 'Useful contacts') provides names and contact details of organisations that can help event organisers and hosts, manufacturers and suppliers of compostable products, and composters to collaborate so that the event's biodegradable wastes can be successfully composted.

2.2 Key terms, trends and experience

2.2.1 Key terms

The term '**bioplastics**' encompasses a whole family of materials which are either biobased, biodegradable, or both. The renewable and/or non-renewable sources of the key ingredients in a material should not be confused with its functionality, e.g. whether it is compostable.

'**Biobased**' means that the material or product is (partly) derived from biomass (organic matter that is available on a renewable or recurring basis, e.g. plants). Biomass used for making naturally derived bio-based polymers comes from sources such as corn, sugarcane and maize crops. Synthetically derived bio-based polymers are those derived from renewable resources but which require a chemical transformation for conversion to a polymer.

The term '**biodegradable**' means that a material (e.g. a constituent/substance, finished product or waste) is capable of being broken down into simpler compounds by the action of naturally occurring micro-organisms (e.g. bacteria, fungi, and/or algae) in the environment in which the biodegradation is occurring. The process of biodegradation is influenced by the environmental conditions (e.g. temperature, moisture, available nutrients and pH) that the material and microbes are exposed to.

A compostable material is one that undergoes biological degradation during composting to yield carbon dioxide, water, inorganic compounds and biomass at a rate consistent with other known compostable materials, and leaves no visually distinguishable or toxic residues (see section 3.1 for reference to the relevant standards).

In the case of packaging and non-packaging finished products, base materials and intermediates, they may be biobased and/or biodegradable, depending on what they are made of.

Oxo-degradable [also known as oxy-degradable or oxo-(bio)degradable] materials are primarily oil-based and comprise polyethylene with additive that facilitates rapid oxidation when the additive (in the material/product) is exposed to heat and/or ultraviolet light. Oxidation breaks parts of the molecular chains within the polymer.

2.2.2 Trends and experience

Most industrial polymers and plastics are produced from non-renewable, oil or gas-based resources. Due to recent concerns about fossil resource depletion, efforts have been made to replace conventional oil and gas-based plastics with others based on hydrocarbons derived from renewable sources such as biomass.

In the UK's waste management industry there has been substantial resistance to the use of oxo-degradable plastics due to the length of time such plastics tend to take to completely degrade, the extent to which very small polymeric particles may remain in the environment and, particularly, the contamination that the pro-oxidant additive brings into dry recycle streams such as the plastic called polyethylene terephthalate (PET). To date, oxo-degradable plastics have not complied with compostability standards² and so are not suitable for feeding into composting systems.

² According to the standards, oxo-degradable plastics are eligible to be tested and assessed for compostability. Failure to comply with any compostable standard's compostability criteria has been the stumbling block.

2.2.3 European market for biodegradable plastics

The amount of biodegradable plastics available for making compostable packaging and non-packaging products is growing and there are also a variety of paper and board materials being used as base materials in these kinds of products. Growth in the supply of suitable base materials and on-going innovation in the design and manufacture of compostables are two important factors that should make it easier to source finished products appropriate for use at events.

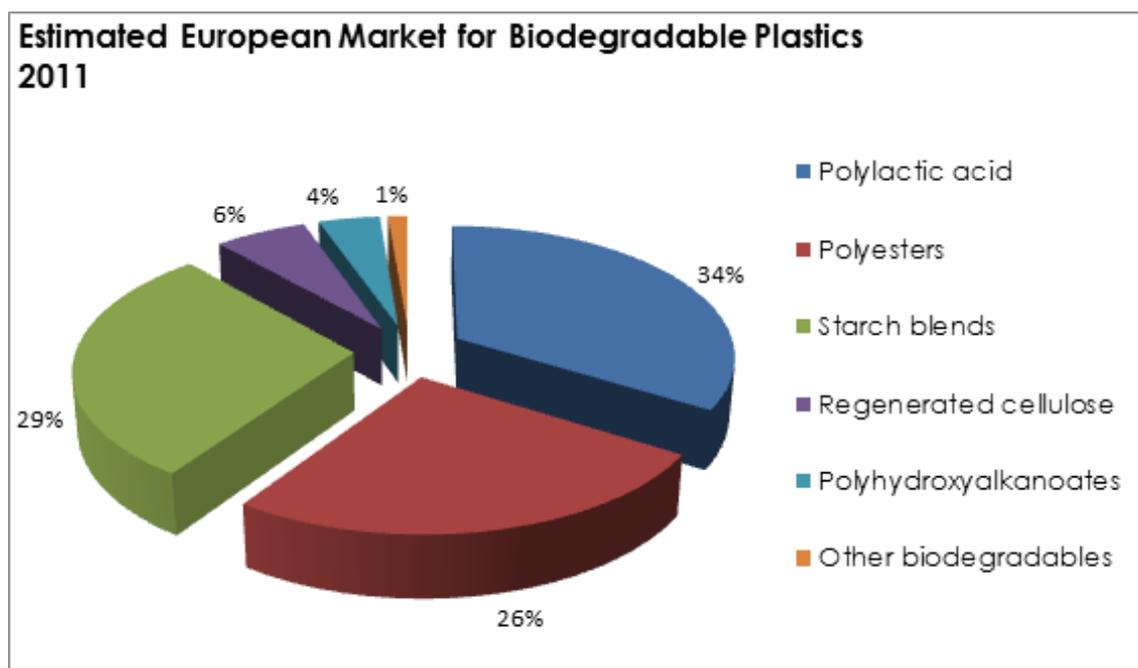
Global production capacity for biodegradable plastics was estimated at 486,000 tonnes per year in 2011 and is expected to increase by around 60% by 2016, driven by growth in production of polylactic acid (PLA) and polyhydroxyalkanoates (PHA)³. NNFCC estimates that the European market for biodegradable plastics is between 140,000 and 217,000 tonnes per year. This includes biodegradable plastics used across a range of applications; food and non-food packaging, food service, agricultural and horticultural applications, and biodegradable bags, but excludes fibre applications such as clothing and upholstery.

The materials with greatest market share are PLA, starch blends, and polyesters (see figure 1). NNFCC estimates that the European market for biodegradable plastics will increase more slowly than other bioplastics markets, and will more closely mirror GDP.

It should be noted that these market estimates are derived from production capacity estimates, which in turn are based on production of resins/base materials rather than final products. This approach has been taken in order to avoid double counting. The figures quoted are not an estimate of certified, finished products available on the market.

In addition to biodegradable plastics, other biodegradable materials not included in these figures may be used in food packaging and food service applications, for example paper and board.

Figure 1 Estimated European market for biodegradable plastics



³ Source: European Bioplastics/Institute for Bioplastics and Biocomposites, 2012.

2.2.4 Lists of manufacturers and distributors of compostables

Manufacturers of constituents, components and finished products can choose to have their items assessed by as many certification bodies as they wish, although most choose one. The main, independent assessors in the European Union are the German certification body DIN CERTCO and the Belgian certification body AIB-VINÇOTTE International s.a./n.v. (Vincotte). Such items can be manufactured and supplied for use anywhere in the globe, so certification bodies do not operate under nor set geographic constraints.

Links to DIN CERTCO and Vincotte lists of registered (approved) base materials, intermediates, additives and certified compostable 'final products' are shown below. These include information about the type of item assessed (base material, intermediate, additive, or finished product), its maximum thickness and dimensions, and the manufacturer or supplier.

compostable products packaging and non-packaging products suitable for use at events and for being commercially composted afterwards are those that bear Vincotte's 'OK compost' certification mark and/or European Bioplastics's 'Seedling' certification mark (European Bioplastics allows DIN CERTCO and Vincotte to licence the use of its Seedling logo as a certification mark).

DIN CERTCO's website

DIN CERTCO's website

(http://www.dincertco.de/en/products_made_of_compostable_materials.html) uses the term 'registration number', regardless of whether the website user is searching for a certified final product or a registered base material, intermediate or additive. Similarly, this certification body's certificates use the term 'registration number' on the certificates it issues, regardless of whether the assessed item is a certified finished product or a registered base material, intermediate or additive.

A product's certificate can be searched for via its registration number at:

http://www.dincertco.de/en/search_for_certificates_via_registration_no_.html

Other ways to search DIN CERTCO's database are described at:

http://www.dincertco.de/en/how_to_search_in_our_database_.html

Particularly helpful information, written in English, about compostable products is available by visiting:

http://www.beuth.de/beuth/owa/DCOWeb.DCOProd?p_branche_id=61605778&p_oberbran=*61555874&p_sprache=en&p_proc_name=PROD then clicking on the link to 'Products made of compostable materials'.

Figure 2 European Bioplastics' 'Seedling logo' certification mark



compostable

The link to Din Certco's website above is also useful because it provides links to the following types of constituent available for forming into a compostable finished product:

- 'compostable material' (base materials), which have registration numbers that begin with '7W';
- 'compostable intermediates', which have registration numbers that begin with '7H';
- 'compostable additives', which have registration numbers that begin with '7Z'; and
- 'additive according to DIN EN 13432', which have registration numbers that begin with '8Z' and are specifically authorised to use DIN CERTCO's 'DIN-Geprüft' certification mark.

Figure 3 DIN CERTCO's 'DIN-Geprüft' certification mark for registered additives



Vinçotte's website

Vinçotte's webpage about compostable constituents and final products provides information in a different way from that on Din Certco's relevant webpages. The downloadable lists available <http://www.okcompost.be/en/certified-products> are organised into sections according to the standard that the item conforms to and which certification mark(s) the final product is authorised to bear.

Vinçotte's 'OK compost' downloadable list is structured into sections, beginning with 'Raw Material', then moving onto 'Components and Constituents' and lastly 'Finished Products'. Each item has a code beginning with 'S' and unlike DIN CERTCO's approach, an 'S' letter always begins the code regardless of whether the item is a compostable constituent, component or final product. This is because Vinçotte's 'S' code is specific to the manufacturer who is licenced to supply the compostable constituent(s) or final product(s). Similarly, each sub-licenced supplier of compostable final product(s) is allocated a unique 'S' code. A certified final product's 'OK compost' mark must include the licensee's 'S' code so that it is easy to identify the company responsible for supplying the product.

Each item in the 'OK compost' document complies with at least one standard relevant to compostability, such as EN 13432 in the case of compostable packaging and EN 14995 in the case of compostable plastic. An item that is a final product is authorised to bear Vinçotte's 'OK compost' certification mark.

Figure 4 Vinçotte's 'OK compost' certification mark



Vinçotte's 'Seedling logo' downloadable list is structured into sections, beginning with 'Raw Material' then moving onto 'Components and Constituents', and lastly 'Finished Products'. Similar to DIN CERTCO's approach to registration numbers, each item assessed by Vinçotte has a unique code beginning with '7W' if it is a registered raw material, '7H' if it is a registered constituent or component, '7Z' if it is a registered additive and '7P' if it is a certified final product.

Each item in the 'Seedling logo' document complies with at least one standard relevant to compostability, such as EN 13432 in the case of compostable packaging and EN 14995 in the case of compostable plastic. An item that is a final product is authorised to bear European Bioplastics' 'Seedling logo' certification mark (see above in DIN CERTCO section).

Due to DIN CERTCO and Vinçotte both operating certification schemes that licence the use of the 'Seedling logo', these certification bodies have agreed the following to avoid confusion about an item's identity and which certification body has assessed it:

- Vinçotte ensures that each item it assesses has a unique code by allocating '7W', '7H', '7Z' and '7P' letters that are followed by a number between 2000 and 3999; and
- DIN CERTCO does not allocate '7W', '7H', '7Z' and '7P' codes that include any number between 2000 and 3999.

Organics Recycling Group's website

The Organics Recycling Group works in formalised, certification service partnerships with DIN CERTCO and Vinçotte. The scope of these partnership services includes:

- DIN CERTCO's assessment of the compostability of constituents (base materials, intermediates, additives), components, and final products⁴; and
- Vinçotte's assessment of the compostability of assessment of the compostability of constituents (base materials, intermediates, additives), components, and final products⁵.

ORG's partnership services with these two certification bodies are often used by clients who wish to register constituents and components available for use in the UK and certify compostable final products also for use in the UK. The partnership services do not apply any geographic restrictions.

ORG provides a downloadable list of compostable finished products that are available in the UK, which have been certified by DIN CERTCO and/or Vinçotte. This list is not exhaustive and inclusion of each certified final product is the manufacturer's/distributor's choice. It is downloadable from <http://www.organics-recycling.org.uk/page.php?article=2479>.

⁴ An introduction to and information about DIN CERTCO's certification scheme for products made of compostable materials is available at http://www.dincertco.de/en/products_made_of_compostable_materials.html

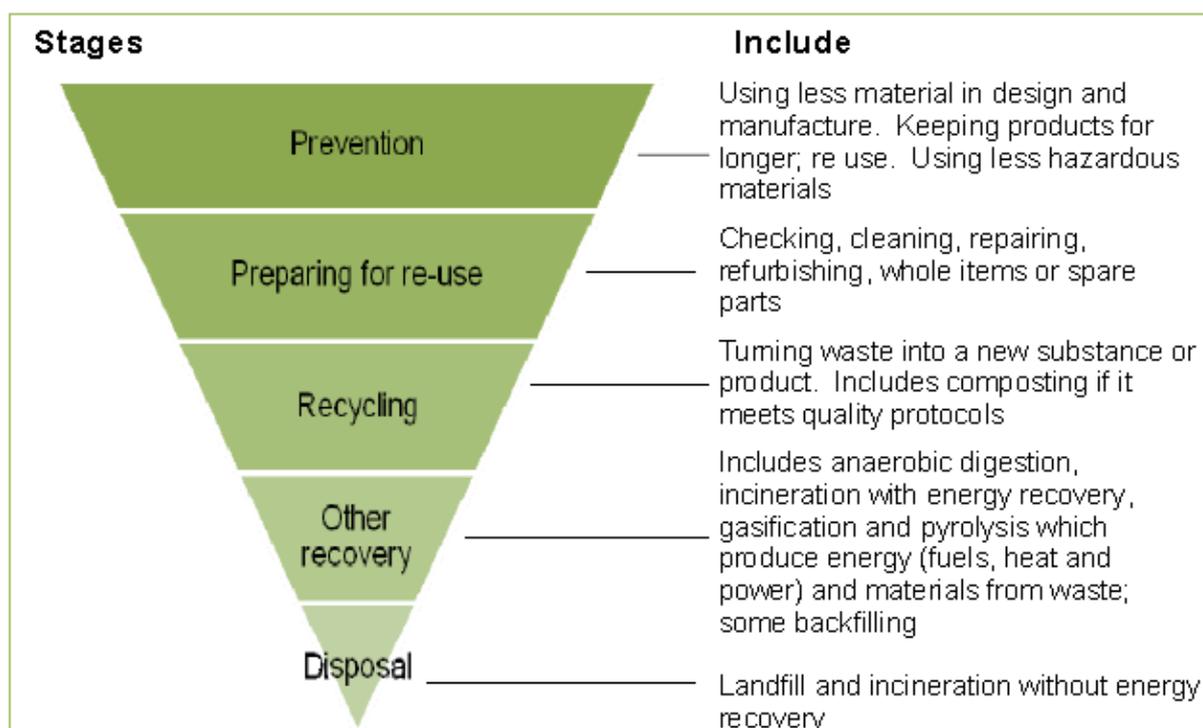
⁵ An introduction to Vincotte's certification services, including those relevant to compostability, is available at <http://www.okcompost.be/en/vincotte-amp-en-13432/>

2.2.5 The waste hierarchy

The revised EU Waste Framework Directive (2008/98/EC⁶) sets the basic concepts and definitions related to waste management, such as definitions of waste, recycling, recovery⁷. It explains when waste ceases to be waste and becomes a secondary raw material (so called end-of-waste criteria), and how to distinguish between waste and by-products.

With the aim of improving the sustainable management of wastes, Article 4 of the revised EU Waste Framework Directive ranks waste prevention and four waste management options in a hierarchy, according to the available evidence on their impact on the environment (see Figure 5). This directive requires that waste legislation and policies of the EU Member States apply the waste hierarchy.

Figure 5 The English Government's waste hierarchy diagram



Source: Department for Environment, Food and Rural Affairs, June 2011.

Businesses and public bodies (including local authorities on behalf of householders) that handle⁸ waste⁹ are legally obliged 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 the business or public body's waste is transferred to another person or organisation. Such obligation also applies to events, whether they are organised and run by the private or public sector.

⁶ See <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0098:EN:NOT> for the revised Waste Framework Directive.

⁷ 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. Defra has provided definitions of waste hierarchy stages at <http://www.defra.gov.uk/environment/waste/legislation/waste-hierarchy/>

⁸ The handling of waste includes importing, producing, carrying, keeping, treating or disposing of waste; dealers or brokers who have control of waste, and anyone responsible for the transfer of waste.

⁹ To check 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> See also guidance available from the devolved administrations for each of the other countries of the UK.

Wastes from the London 2012 Olympic Games and Paralympic Games hierarchy were prevented and managed in accordance with the waste hierarchy, with some justified departure from it with regard to the food and compostable packaging and non-packaging wastes stream.

Key point: Organisers of events must try to prevent wastes and manage those that do arise using the highest legally allowed and practicable option in the waste hierarchy. Managing any specific waste stream according to a lower option in the hierarchy must be justified.

Guidance on applying the waste hierarchy typically includes information on what the waste hierarchy means in practice, how it should be applied to a range of common materials and products, and what public bodies and businesses need to do to apply the waste hierarchy¹⁰.

In most circumstances, the composting of biodegradable waste is classified as 'other recovery' unless the composting process produces compost that complies with 'end-of-waste criteria' and the compost is used according to good practice in a market specified in those criteria, in which case the biodegradable waste fed into that process is classified as 'recycled' (see section 2.2.6 of this report for an outline of the 'end-of-waste criteria' relevant to composting and anaerobic digestion). Similar provision is made in the case of anaerobic digestion, and the details of the corresponding 'end-of-waste criteria' are different from those for composting.

For most materials, the waste hierarchy ranking applies as shown in figure 5. However, for some types of material evidence suggests that waste management options which are not in keeping with the waste hierarchy order are better for the environment. Departure from the waste hierarchy is allowed where this gives better environmental benefits, as justified by 'life cycle thinking' on the overall impacts of the generation and management of the specific waste stream considered.

With regard to biodegradable waste types likely to arise at events, the following acknowledged departures from the waste hierarchy should be considered:

- 'for paper and card, energy recovery is environmentally better than composting' (Welsh Government's guidance);
- 'for food, current research shows that anaerobic digestion is environmentally better than composting and other recovery options' (Defra's guidance); and
- 'for garden waste and for mixtures of food waste, dry anaerobic digestion followed by composting is environmentally better than composting alone' followed by note that 'Anaerobic digestion on its own is unable to break down the woody material found in garden waste, however dry anaerobic digestion facilities usually include a post-digestion composting stage to achieve this breakdown' (Defra's guidance).

¹⁰ Defra's summary guidance on applying the waste hierarchy in England is available at

<http://www.defra.gov.uk/publications/2011/06/15/pb13530-waste-hierarchy-guidance/>

The Welsh Government's guidance on applying the waste hierarchy is available at

http://wales.gov.uk/topics/environmentcountryside/epq/waste_recycling/publication/hierarchyguide/?lang=en

Scottish Government intends to issue guidance in 2012 on the waste hierarchy – see

http://www.sepa.org.uk/waste/moving_towards_zero_waste/waste_hierarchy.aspx

Northern Ireland's Department of the Environment is consulting on its draft revised waste management strategy, 'Delivering Resource Efficiency' – see http://www.doeni.gov.uk/index/protect_the_environment/waste.htm

The practicalities of recovering or recycling biodegradable wastes from events need to be considered, such as waste transport distance to treatment facilities that have sufficient capacity to accept the waste, suitability of the waste stream for the treatment process, distances the outputs from the treatment processes will be transported, and environmental benefits and impacts due to the use of process outputs and management of process 'waste' by-products.

Key point: The composting and anaerobic digestion of controlled biodegradable wastes is normally classified as 'other recovery' unless the specific facility that produces compost or digestate from that waste complies with the corresponding End-of-Waste criteria.

2.2.6 End-of-Waste criteria for composting and anaerobic digestion

In England, Wales and Northern Ireland the Compost Quality Protocol (CQP)¹¹ sets the accepted 'end of waste' (E-o-W) criteria for controlled biodegradable wastes which are composted. These criteria include compliance with PAS 100¹². Scotland has established a similar policy¹³, to the effect that certification of conformity with PAS 100 and use of certified compost such that it is not disposed of, is accepted as having met E-o-W criteria for composted controlled biodegradable wastes.

E-o-W criteria for digestates made from anaerobically digesting controlled biodegradable wastes are similar as for composts, although there are differences in terms of several allowed types of source-segregated biodegradable wastes, some of the tests carried out and the associated minimum quality criteria.

An event's biowaste can be recovered by anaerobic digestion or by aerobic composting, provided that the digestate or compost output is not subsequently disposed of, e.g. used as cell fill in landfill. Anaerobic digestion or aerobic composting can recycle an event's biowaste if the corresponding E-o-W criteria are met.

If it's important that the event's biodegradable waste tonnage delivered for composting can be counted as recycled, the event organiser should choose a composting process which;

- in England is CQP and PAS 100 certified;
- in Wales is CQP and PAS 100 certified;
- in Northern Ireland is CQP and PAS 100 certified; or
- in Scotland is PAS 100 certified.

Visit <http://www.organics-recycling.org.uk/page.php?article=1797> to see the Organic Recycling Group's list of composting processes that produce one or more grades of compost certified compliant with the relevant country's E-o-W criteria.

Where compostable packaging or non-packaging products are to be fed into a PAS & CQP composting process that makes quality compost, the Compost Quality Protocol's criteria require that such inputs have been independently certified compostable.

¹¹ Downloadable from <http://www.environment-agency.gov.uk/business/sectors/142481.aspx>

¹² Downloadable from <http://www.wrap.org.uk/content/bsi-pas-100-compost-specification>

¹³ Downloadable from http://www.sepa.org.uk/waste/waste_regulation/composting.aspx, the Scottish Environment Agency's 'Compost Position September 2004'

If it is important that the events biodegradable waste tonnage delivered for anaerobic digestion can be counted as 'recycled', the event organiser should choose a composting process which;

- in England is AD QP¹⁴ and PAS 110¹⁵ certified;
- in Wales is AD QP and PAS 110 certified;
- in Northern Ireland is AD QP and PAS 110 certified; or
- in Scotland is PAS 110 certified.

Visit <http://www.biofertiliser.org.uk/members> to see the Biofertiliser Certification Scheme's list of AD processes that produce one or more digestate outputs certified compliant with the relevant country's E-o-W criteria.

Where digestible packaging or non-packaging products are to be fed into a PAS & AD QP digestion process that makes quality digestate, please check the requirements of the PAS and AD QP as the criteria that must be met were under review at the time of writing this report.

2.2.7 Selecting the biological treatment process for an event

In practice, one or more commercial scale facilities may be needed for receiving and treating the event's biowaste, which will generate peak tonnages over a relatively short timescale. Facilities being considered need to:

- have sufficient capacity over the period that the event's biowastes would be delivered;
- be close enough to the event that transportation of this high-bulk-density waste stream remains cost-effective;
- have waste codes in their permit/licence to operate that are appropriate for the biowaste types intended to be sent from the event to the composting facility;
- have approval to treat an appropriate type(s) of animal by-products, issued by the competent authority that assesses compliance with ABP regulations (see section 5.1.3); and
- have a sufficiently robust treatment process to handle compostable packaging and non-packaging wastes* (if included in the event's biowaste stream) or have an effective packaging removal step as part of pre-treatment**.

* Most composting facilities are potentially suitable although outdoor windrow systems may need special measures to prevent windblown dispersal of packaging residues whilst windrows are being turned on the composting pad.

** Most AD facilities currently operating in the UK would remove compostable packaging/non-packaging waste rather than try to feed it into the anaerobic digestion system. Stretchable items with elastic properties tend to get caught in machinery and should not be pumped through digestion systems. Maintenance downtime will be higher if these types of items are fed into the digestion system. Biodegradable wastes intended to be fed in need a physical form that readily shreds into pieces small enough to successfully pump through the system.

¹⁴ Downloadable from <http://www.environment-agency.gov.uk/business/sectors/142481.aspx>

¹⁵ Downloadable from <http://www.wrap.org.uk/content/bsi-pas-110-specification-digestate>

In addition to checking the ABP approval, event organisers should consider the events proximity to a suitable composting facility when making arrangements to recycle or recover the events biodegradable wastes. Composting facility capacity to accept extra waste and the existence of appropriate waste codes in the permit or licence to operate must also be checked.

Currently, there is a much larger network of E-o-W composting facilities in the UK than there are E-o-W AD facilities and also more composting facilities with approval to treat appropriate types of animal by-product (see section 5.1.3) than counterpart AD facilities. Turning to packaging, there's a diversity of final packaging products that are certified compostable but there appear to be none certified 'digestible' in accordance with EN 13432's (little known about) anaerobic digestion criteria.

CASE STUDY

LOCOG chose in-vessel composting for recycling the Games venues' biowaste stream for several reasons. They sought to minimise transport distance of this high-bulk-density, low value per tonne resource. Due to their target to reuse, recycle and compost at least 70 % of the Games venues' wastes and their commitment to driving the management of their waste up the waste hierarchy, they considered venue-proximate composting and AD facilities that were approved to treat category 3 animal by-products (or catering waste including meat/fish) and that complied with E-o-W criteria.

Although AD was initially preferable given that this option - for food waste - is preferred above composting in the waste hierarchy, no E-o-W AD facilities were close enough to the high tonnage London and SE England Games venues. There was also concern that the compostable packaging and non-packaging in with the food waste would be unsuitable to feed into AD systems and that although some facilities may be able to largely remove it this could significantly reduce the tonnage of Games biowaste that could be claimed as 'recycled'.

In contrast, suitable in-vessel, animal by-products approved, E-o-W compliant composting facilities were found that were within cost-effective transport distances of the key Games venues.

3.0 Standards for compostables, claiming conformance and the role of certification

This section of the report identifies standards for compostable finished products, which are also applicable to constituents in finished products (base materials, intermediates and additives) and to components of finished products. This part of the report also highlights Defra's Green Claims Guidance and finishes with recommendations for assessing acceptability of uncertified products for use at events in future.

3.1 Standards for compostable finished products, base materials, intermediates and additives

A material or item tested for compostability may be a finished product, a component of or a constituent in a finished product. Tests applicable to constituents depend on the nature of the constituent.

The standards relevant to assessing whether packaging/non-packaging final products, base materials and intermediates are compostable are:

- EN 13432 - requirements for packaging recoverable through composting and biodegradation (includes test scheme and evaluation criteria);
- EN 14995 - plastics: evaluation of compostability (includes test scheme and specifications);
- ISO 17088 - specifications for compostable plastics;
- ISO 18606 - packaging and the environment — Organic recycling; and
- ASTM D6400 - standard specification for labelling of plastics designed to be aerobically composted in municipal or industrial facilities.

N.B.: Certification of compliance with one or more standards for compostability does not ensure compliance with regulatory requirements¹⁶ applicable to food contact materials.

3.2 Types of constituent in finished products and meaning of component

3.2.1 Base material/raw material

The main material used in an intermediate or finished product, such as paperboard made from cellulose fibres from plants.

3.2.2 Additive

Additives (also known as constituents) are substances added to the material(s) used to make a final product in order that it has certain properties. They can also be added to base materials and intermediates. Examples of additives are coatings, adhesives, antiblocking agents, pigments /colourants (to give the product, intermediate or base material a colour) and inks.

¹⁶ Framework Regulation EC 1935/2004 – 'general requirements for all food contact materials' and any EU legislation on specific materials (as applicable to the material) and any national legislation covering groups of materials and articles for which EU legislation is not yet in place. See http://ec.europa.eu/food/food/chemicalsafety/foodcontact/eu_legisl_en.htm for more information.

3.2.3 Intermediate

An intermediate is an item that is in a state between base material and final product, such as a laminate consisting of several layers of material and, often, one or more additives. A final product does not have to contain an intermediate; in simple constructions the final product can comprise a base material and an additive.

3.2.4 Component

A component is part of a finished product that can be separated from another part of the product by hand or by using simple physical means.

3.3 Types of test and compostability criteria

In the case of the EN 13432 standard, its criteria and tests relevant to compostability are as summarised in this section.

3.3.1 Biodegradation

A sample of the product is laboratory tested under simulated, high temperature composting conditions (58 °C +/- 2 °C) to find out the extent to which microbes biodegrade the sample into water, carbon dioxide and biomass.

The amount of carbon dioxide released by the microbes as they break down the sample is compared with the amount of carbon dioxide released by microbes breaking down a cellulose control substance. The test is allowed to run for a maximum of 180 days (approx. 6 months).

Biodegradation criterion: by the end of 6 months the sample must biodegrade by 90% in total or generate at least 90% as much carbon dioxide as the cellulose control substance.

3.3.2 Disintegration

At the same time as the biodegradation test, a sample of the product is laboratory tested to find out how quickly it disintegrates into smaller pieces. The sample is mixed with fresh, shredded biowaste and composted in a pilot-scale container maintained under conditions in which naturally occurring microbes decompose the biowaste and sample. At the end of the test the decomposed biowaste and any sample residue is termed 'sample compost'.

Disintegration criterion: By the end of 12 weeks, not more than 10 % of the original dry weight of test material is allowed to be pieces > 2 mm in any dimension.

Notes

The EN 13432 standard acknowledges that disintegration testing can be done in a commercial scale composting process.

3.3.3 Ecotoxicity

The 'sample compost' from the disintegration test is filled into 3 trays with addition of seeds and a cover layer of inert material, then watered and given time for the seeds to germinate and grow. A second species of plant seed is sown into 3 further trays of the 'sample compost'. 'Blank compost' from a parallel disintegration test (run separately when the sample was undergoing disintegration testing) is filled into 3 trays and set up in the same

way as for the 'sample compost'. The same plant species as the seeds sown in the 'sample compost' are separately sown in each set of 3 trays containing 'blank compost'.

Ecotoxicity criterion: the germination rate and biomass of plants grown in the 'sample' compost must be more than 90 % of the germination rate and biomass of plants grown in the 'blank compost' control.

3.3.4 Chemical analysis

Volatile solids criterion: the sample must contain a minimum of 50 % volatile solids 'which exclude largely inert materials'.

Heavy metals criteria: Also known as 'Potentially Toxic Elements', the concentration of each element in the sample is not allowed to exceed its corresponding upper limit shown in table 1.

Table 1 Maximum element content allowed in base material, intermediate or final product

Element	Upper limit (mg/kg dry matter)	Element	Upper limit (mg/kg dry matter)
Zinc (Zn)	150	Chromium (Cr)	50
Copper (Cu)	50	Molybdenum (Mo)	1
Nickel (Ni)	25	Selenium (Se)	0.75
Cadmium (Cd)	0.5	Arsenic (As)	5
Lead (Pb)	50	Fluoride (F)	100
Mercury Hg)	0.5		

3.4 Laboratory approval

Certification bodies require that samples of base materials, intermediates, additives or final products that they assess for compostability are tested in one of the laboratories they have approved for carrying out the tests. Such laboratories are familiar with the compostability tests and have been assessed and deemed competent to perform those tests.

DIN CERTCO's list of 'recognised' (approved) laboratories can be downloaded from http://www.dincertco.de/web/media_get.php?mediaid=38812&fileid=92767&sprachid=2 This list includes laboratories that carry out tests required by other standards relevant to this certification body's other certification schemes. Laboratories with 'testing scope' appropriate to compostability can be found by typing in the standard's number in the document search box (e.g. '13432').

Vinçotte's 'List of Approved Laboratories' is available towards the bottom of its webpage <http://www.okcompost.be/en/download-documentation/> In terms of commercial scale compostability, choose a laboratory whose testing scope is 'OK compost'.

3.5 The role of registered base materials, intermediates and additives

A final product made of a registered base material or intermediate is not automatically a certified product. By definition, base materials and intermediates are not final products; other constituents may be added when making the final product, such as ink and glue. Consequently, the final product and information about its constituents need to be assessed by the certification body before conformance is claimed and the appropriate certification mark is allowed to be used.

A potential advantage from using registered constituents is that it may enable fewer types of test to be carried out on the finished product. This depends on whether the product complies with any of the certification body's rules about which type of test can be omitted due to the registered constituent(s) having already passed the appropriate test(s), and is conditional upon the finished product not being substantially different from its registered constituent(s). This is a generic summary and it is important for final product manufacturers to refer to the certification body's scheme rules or contact the certification body for product-specific assessment of which tests are necessary.

3.6 Self-assessment and self-claim of conformity to a standard

Self-assessment

Manufacturers can arrange the laboratory testing of their samples of constituent, component or final product. They can evaluate whether the test results and laboratory's comments on the test results show that the tested sample complies with the standard's criteria for compostability. Indeed, many manufacturers of final products and base material constituents in final products used at the Games had undertaken their own assessment but had not applied for or obtained certification.

Although proof of compliance is the minimum necessary in order to make a claim, independent assessment of evidence and certification of compliance from a certification body (third party) is commonly required (see 2.10) by packaging customers and in the composting industry.

Green claims

Claim of compostable or 'compostability' is an example of an environmental or green claim. An environmental or green claim is the communication of the environmental attributes of a product, service or organisation. Environmental claims are important for enabling consumers to make informed choices and drive business to improve the environmental performance of their products or organisation. However, the true value of environmental claims and marketing rests on the assurance that claims are both credible to consumers, and reflect a genuine benefit to the environment.

Defra's webpage about 'Green claims and labels'¹⁷ provides a useful introduction to this topic and links to a number of other relevant webpages such as the 'Green claims guidance'¹⁸ page and downloadable documents. It's Green Claims Guidance (2011) provides advice to business for clear, accurate, relevant and substantiated environmental claims and labels on products, services or in marketing and advertising.

The following principles are the foundation for best practice on making an environmental claim:

- ensure claims are presented in a truthful and accurate way that would not mislead consumers;
- be clear on the scope or boundaries to which the claim applies;
- use plain language and information that is specific and unambiguous;
- ensure the amount and type of supporting information is clear, helpful and appropriate; and
- ensure any labels, symbols or pictures are clear and relevant.

¹⁷ See <http://www.defra.gov.uk/environment/economy/products-consumers/green-claims-labels/>

¹⁸ See <http://www.defra.gov.uk/publications/2011/06/03/pb13453-green-claims-guidance/>

False or misleading claims

Due to possible error in self-assessment, error or insufficient clarity in self-conformity claims, and the misleading and false claims that have been made about a number of products on the market (where the manufacturer or supplier has not been able to provide evidence of the product's compostability), there is increasing reliance on independent assessment of product conformity with standards for compostable packaging and non-packaging products. Such independent (third party) assessment is carried out by certification bodies (see sections 2.2.4 and 3.7).

3.7 Certification of conformity to a standard for compostability

Assessment of conformity to a standard can be carried out by an independent certification body, after receiving an application from the manufacturer or supplier of a compostable finished product. Product testing must be carried by a laboratory independent from the product manufacturer or supplier. If the certification body's assessment concludes that the product conforms to the standard, a certificate is issued and the product becomes licenced to bear the relevant certification mark (see section 2.2.4 for common examples).

Due to competition amongst certification bodies, and the fact that they usually develop their own certification marks, there is not a single universally used compostable mark.

3.8 Potential impacts when a product is modified

Any change made to a product has the potential to invalidate its certificate of compostability. Any change made must be notified to the certification body so that it can check whether the product remains certified or certification must be suspended whilst testing is carried out on the new product and/or constituent(s). Specific tests that may be triggered depend on the nature of the change made to the product. For example, changes in terms of ink colour and percentage of ink used may not trigger heavy metals testing of the product if the percentage of ink remains below a very low threshold level and the new ink colour used is a registered ink.

Certification bodies' scheme rules may vary, so it is important to check the rules of the specific scheme that is assessing the final product.

3.9 Product certificates – Checking the validity of claims

When a certified final product is being sourced it is important to check that the manufacturer or supplier has a valid certificate. Example certificates are shown in Appendix 3, highlighting where to find key information to check. When a copy of the final product's certificate has been provided, the following checks should be made:

That the product is:

- a Din Certco 'seedling' certified final product by looking for a code that begins with '7P' with a following number that is not between 2000 and 3999;
- a Vinçotte 'seedling' certified final product by looking for a code that begins with '7P' with a following number that is between 2000, 3999 or any number between those numbers;
- a Vinçotte 'OK compost' certified final product by looking for 'Finished Product' as the description for 'Product Group' on the certificate;

The product:

- matches its description (e.g. colour and form);

- is within the dimension ranges stated (length, width, height, and diameter if applicable);
- does not exceed the certified maximum thickness, or grammage in the case of paper and card;
- the product is supplied, or to be supplied, by the specific company named on the certificate; and
- the certificate's expiry date is not exceeded.

In addition, the certificate's details can be cross referenced with the online list of certified products available from the certification body's website.

A supplier who is not also the final product manufacturer must have a valid sub-licence (agreed with the certification body) and certificate (issued by the certification body) in order to supply the certified final product, regardless of whether the customer is in the supply chain or an end user.

It is important that during the period of supply and anticipated period of use the expiry date on the final product's certificate is not exceeded. The checks listed above must be carried out, with a particular check that the name of the prospective supplier is the same as the company named on the certificate.

The sub-licence and certificate the certification body has issued to the supplier should have the same expiry date, and this date will be the same as the expiry date of the certificate issued to the manufacturer of that same product. If the manufacturer does not renew the certificate or if for some reason the certification body suspends or withdraws the manufacturer's certificate, the sub-licensed supplier's certificate also becomes suspended or withdrawn. Consequently, the manufacturer and sub-licensed supplier would no longer be allowed to supply that final product with claim that it is compostable.

3.10 Assessing acceptability of uncertified products for use at an event

Section 4.2 describes the process used for assessing the compostability of uncertified products put forward for use at the Games. That process was time-consuming, required specialist technical input and involved the regulator and Organics Recycling Group in agreeing a commercial scale composting trial to assess the disintegration and biodegradation of final products for which laboratory-based disintegration and/or biodegradation testing had not been done.

It is likely that for events in future, due to the cost of specialist, independent technical input and that the regulator may not agree to multiple composting trials for multiple events at a variety of locations, the packaging and non-packaging associated with the preparation and consumption of food and drinks at the event would have to be those final products which are certified compostable.

Key lesson: The packaging and non-packaging associated with the preparation and consumption of food and drinks at the event should only be those final products which are certified compostable.

4.0 The Games Experience

This section of the guidance explains the quality management system (QMS) used for the Games and provides best practice guidance on procuring compostable packaging and non-packaging products, including assessment of the products put forward by prospective manufacturers and suppliers.

4.1 Controlling the types of waste at the Games

LOCOG committed to staging a 'Zero Waste' Games¹⁹, at which it encouraged the use of materials with re-used and recycled content and the use of minimally packaged products that could be re-used or recycled.

Suppliers and licensees (e.g. food retail concessions) were required to minimise waste, achieve high recycling and send no waste directly to landfill. LOCOG's packaging guidance²⁰ required that where practicable, all products and packaging should be reusable, recyclable or recoverable. Suppliers and licensees were also obliged, if requested by LOCOG, to prepare appropriate Management Plans outlining how they would support LOCOG's commitment.

Suppliers and licensees were instructed to minimise the use of primary, secondary and tertiary packaging and source those made from materials that can be re-used, recycled, or recovered by commonly available methods in the UK. They were required to maximise the use of recycled content in products and packaging, and regain information about this in case requested by LOCOG.

Compostable products and packaging were only be used where it was not possible to re-use or recycle such items easily, prior written approval had to be obtained and appropriate documentation in respect to their supply had to be retained. Oxo-degradable products and packaging (including film wrapping) were not permitted to be supplied, unless otherwise agreed with LOCOG.

Controlling packaging and products associated with the preparation and consumption of food and drinks at the Games venues enabled the recycling of food and associated compostable packaging and non-packaging wastes. Visitors were allowed to bring their own food and drinks to the venues but by controlling the food and drinks packaging and associated products (e.g. compostable cutlery was provided in eating areas except the fine dining area where metal cutlery was used), overall the compostable waste collected contained a manageably low level of physical contaminants.

Unless otherwise agreed with LOCOG, suppliers and licensees were required to use LOCOG's Waste and Resource Management Services Contractor (SITA UK) at their expense for the removal and management of any waste generated at LOCOG venues in connection with their supplied products and services (at agreed rates for this service). Where required by LOCOG, suppliers or licensees were also obliged to take back, at their expense, any excess or non-compliant packaging relating to the products and services provided for subsequent re-use or recycling.

¹⁹ See LOCOG London 2012 Zero Waste Games Vision at <http://www.london2012.com/about-us/publications/publication=london-2012-zero-waste-games-vision/>

²⁰ See LOCOG Packaging Guidelines, version 2 at <http://www.london2012.com/documents/LOCOG-publications/LOCOG-packaging-guidelines.pdf>

4.2 Procuring compostable packaging and non-packaging products for use at the Games

4.2.1 Introduction to technical assessment of products selected by LOCOG

Once the decision to use compostable products for specified catering and packaging products had been made a QMS was adopted. This system was used for checking that the products put forward by manufacturers and suppliers as compostable were fit for purpose.

In the case of the Games, products deemed fit for purpose were those independently certified compostable (confirmed to meet the compostability criteria in EN 13432) or were fast-track assessed by an independent specialist for compliance with EN 13432's compostability criteria, and in some cases trial composted in an industrial scale composting process.

Figure 7 Compostable cutlery provided at the Games venues (foreground centre and right)



It should be noted that a WRAP technical specialist in compostable products and packaging was used prior to and during the Games and that this guidance assumes that such support is unlikely to be available for any future events that seek to use compostable packaging and non-packaging products. Other organisations may be able to provide suitable, independent technical expertise (see section 9 of this report for names and contact details of organisations that should be able to help or direct event organisers to suitable specialists).

N.B.: Due to the complexity of assessing non-certified materials, events in future should use packaging and related non-packaging products that are independently certified compostable.

4.2.2 Developing a product list

As a starting point a specification of the likely catering and packaging products needed to sell the food produced on site should be developed in conjunction with all on-site caterers. This specification will enable the core products to be sourced while giving an idea of their number and range.

LOCOG provided Packaging Guidance²¹ for suppliers that included packaging design, materials selection (including the role of compostable packaging) and a materials matrix which indicated the appropriate recycling status of each combination of packaging component and materials type. In addition, prior to Games time, a list of key products was

²¹ LOCOG Packaging Guidelines, Version 2, see <http://www.london2012.com/documents/LOCOG-publications/LOCOG-packaging-guidelines.pdf>

developed by LOCOG who had liaised heavily with the on-site caterers, in turn all product dimensions and types thought to be needed during the Games were listed. Many of the key products are itemised in Appendix 2. Once in place, two packaging organisations were contracted to procure and deliver those and other secondary products to the Games.

Key lesson: Develop and communicate a packaging specification for suppliers and licensees.

The two product suppliers responsible for sourcing all the primary and secondary compostable packaging and non-packaging products listed had to ensure that all products were compostable as per the criteria set in EN 13432. Havi Global Solutions²² delivered all of the compostable food and drinks packaging and non-packaging products that McDonald's sought to use (see figure 8 for examples), while London Bio Packaging²³ delivered the remaining compostable food and drinks packaging and non-packaging products used by other caterers at the Games venues.

Figure 8 Examples of compostable food and drink packaging and cutlery procured for use by McDonald's at the Games venues



In total, 150 compostable products were used in the Games and out of these, 52 were already certified to EN 13432 by one or both of the certification bodies Din Certco and Vinçotte. Havi supplied 44 products while London Bio Packaging covered the remaining 106 products. On a few occasions (< 10 products) other caterers used additional suppliers but these were kept to a minimum and were still subject to the same criteria as those that London Bio's and Havi's products had to meet.

Figure 8 shows examples of how compostable products were labelled in keeping with the iconography used in the On-Pack Recycling Label Scheme²⁴, with text stating 'Compostable Packaging' and the 'swoosh' image coloured orange to match the orange colour and same, larger text and imagery on the bins for compostables. Light-orange compostable bags/liners were also used. Together, these measures aimed to ensure that the public and workforce at

²² Havi Global Solutions: a multinational company that develops, sources, markets, and sets up strategic supply chain and packaging services solutions, serving clients in more than 22 nations. See <http://www.havigs.com/> for more information.

²³ London Bio Packaging Ltd: a leading supplier of compostable and recyclable packaging to the UK's food and catering industry. See <http://www.londonbiopackaging.com/> for more information.

²⁴ See <http://www.oprl.org.uk/> for more information.

the Games would know which bin to put their compostable packaging and non-packaging wastes into. The aim was that users would find it simple to decide which single bin their waste food and food-related packaging, cutlery and paper napkins should be put into (see figures 10, 11 and 12 for images of the bins available at Front of House).

4.2.3 Products submitted for assessment

Sources of compostable products used in the Games were varied, in part due to the number of different compostable materials available on the market and the number of manufacturers producing such products. Four types of final product were submitted for approval by WRAP’s technical specialist:

- those independently certified compliant with EN 13432;
- those constructed of a single EN 13432 registered material;
- those constructed of multiple materials, only some of which were registered as compliant with EN 13432; and
- those constructed of materials that has not been registered as compliant with EN 13432 materials but which the manufacturer/supplier expected would be fit for purpose.

Due to variations between the final products that were put forward, it was important from the outset to set up a simple spread sheet which enabled both the basic characteristics of each product to be presented while providing a useful tool to sign off products once confirmed fit for purpose. An example of the spread sheet used for the Games can be seen in Figure 9. From the information provided during this first stage the technical specialist was able to request the next set of information.

Figure 9 Basic spread sheet for starting a product evaluation process

ID	Product	Base Material	Other Comment (e.g. colour requirement)	Proposed Material	Recyclable/Compostable	Certified EN 13432 Product
1	Cup Hot_341ml (12oz)	Coated card	Manufacturer to label	PLA coated card	Compostable	Yes
39	Sandwich single fill	Coated card/Biopolymer	Caterer to label	Card/biopolymer film	Compostable	No

Description of Figure 9:

The ‘ID’ number or sku code²⁵ allows the product to be referenced and should be used by all parties involved with delivering and using the product. The ‘Product’ column allows for a basic description to be provided, including any difference in size between similar product types e.g. cups. The ‘Base Material’ column is used for recording the main material used in the product’s construction while helping form the next set of information requests. It also works in collaboration with the “Proposed Material” column for recording more specific information about what type of base material is used. The “Recyclable/Compostable” column is for recording whether the product is compostable or if at present only recyclable

²⁵ A sku code is a code allocated to a stock keeping unit.

(through a MRF). The final box is for recording whether the product is currently EN 13432 certified.

4.2.4 Technical assessment of products selected by LOCOG

For those products which prospective suppliers indicated as certified 'EN 13432 products' the information requested was simply a copy of the certificate confirming that the product met the requirements of EN 13432. Checks on the certificate were made to make sure that it was in date and was for a complete product, not just a material used in the product's construction (please refer to section 3.9 for more information). This information can be cross referenced with the relevant certification body's online list of certified products (see section 2.2.4 for links to each certification body's relevant webpage). Once confirmed, the product was signed off as it had proven to be compostable.

If the supplier indicated that it is not an EN 13432 certified product, more information was needed on its composition. To collect this compositional information a form was issued to the supplier asking for the following details on **each material** used in the product's construction:

- the type e.g. card, biopolymer film;
- the manufacturer of that material;
- the percentage by mass (% w/w) of that material in the final product;
- the material's thickness; and
- whether it is a material registered by one of the certification bodies as suitable for use in EN 13432 products.

In addition, information about each additive in the final product was also requested:

- type e.g. adhesive, coating, ink etc;
- designation of the additive e.g. varnish, water soluble ink, type of adhesive etc;
- percentage of the additive used in the final product; and
- the additive's safety data sheet number.

This information was requested for every non-certified product which was to be used in the Games. Reviewing the information in the form helped develop a picture of the product's composition and the questions which would need to be asked around the materials biodegradability etc. all of which was evidenced to confirm that the complete product was compostable. At this point it was often easy to determine those products which were not suitable due to the materials and additives being used not being inherently biodegradable.

A number of the non-certified products used in the Games were constructed of one material which was registered as compostable. For these products the thickness of the material was first checked to confirm it was not greater than that certified and that no other additives or materials were added which would alter its breakdown when being composted. If the answer to both these questions was 'yes' the product was approved because although not formally certified the registered material had not been changed apart from being in a different form, e.g. change of form from a flat sheet to a constructed burger box.

For those products not constructed of registered materials or only some registered materials a host of additional documentation was requested and assessed to determine whether additional testing or further information was needed. Once all possible information had been collated and assessed an evidence based decision was made on whether to approve the product for use in the Games.

For the products which had evidence to support that it was safe to be composted, i.e. from a chemical, ecotoxicity and biodegradability standpoint, a physical trial was carried out at one of the sites to be used for composting the Games biowaste. The approach used mirrored that of the disintegration tests carried out by laboratories on samples that undergo assessment for certification. Net bags with 2 mm diameter holes were filled with product samples and a proportion of the biodegradable wastes being received at the site. The bags were subsequently added to the composting process and were removed and assessed after both the initial in-vessel stage and subsequent, outdoor stabilisation stage - a total of 8 weeks - to gauge whether any of the product samples could be seen in the recovered net bag. If less than 10 % w/w of the product remained in its net bag it was approved on the basis that it had substantially disintegrated/biodegraded and met EN 13432's corresponding criteria.

The amount of documentation needed to complete the evaluation of each product was extensive as too was the time period needed for obtaining and evaluating the product and its supporting documents.

Key lesson: From the time of receiving the packaging and non-packaging product list, and due to the complexities associated with the process as described in the sister report, at least 8 weeks should be allocated to evaluate and sign-off a product, excluding any

Both registered inks and certified labels were utilised to mark all the products used in the Games; their suitability was confirmed during the approval period, with the amount of ink being a key consideration for the technical specialist to check.

Most ink manufacturers should have information pertaining to the heavy metal levels of their inks although this can often be difficult to obtain without a confidentiality agreement. For future events sourcing registered inks is a priority as the chemical and heavy metal limits for compostable products are stringent. A chemical analysis can be performed on the inks if information about their heavy metals concentrations is not available.

4.2.5 Product examples

The following examples highlight where products had issues with their composition and what mitigation steps were adopted:

1. Condiment sticks used to package individual servings of sugar, pepper, salt etc. were manufactured with a paper base material deemed suitable for composting. When information on any additives used on the product was requested the supplier indicated that a very thin polyethylene coating was used. As polyethylene is non-biodegradable it rendered the whole product unsuitable for the Games and it was rejected. Due to this and the short period of time remaining before the start of the Games a recyclable alternative was sourced, but this led to confusion amongst the public who used the Front of House areas due to the condiment sticks not being compostable.
2. Tortilla wrap at 400 µm thick with an adhesive additive saw a card base material which had biodegradability and disintegration testing results to prove it suitable. Unfortunately when reviewing the laboratory test data it indicated that the base material reached the 90 % biodegradation level after 10 months, but to be approved for use in the Games this level had to be reached in a maximum of 6 months, as required in EN 13432. Consequently the thickness of the base material was reduced so that it would comply with EN 13432's biodegradation criteria. A sample of the thinner tortilla wrap (base material with adhesive) was also trialled at the composting site and was not visible in the net bag by the end of the 8 week composting process.

4.3 Waste capture and containment at the Games venues

Waste collection at the Games venues was organised into three primary streams; green coloured bins for assorted dry recyclables (paper, card, metal (cans), high density and low density plastics), orange coloured bins for food waste, compostable packaging and associated non-packaging products (e.g. compostable cutlery and plates), and black bins for general, non-recyclable/compostable wastes and 'if in doubt' items (see figure 10).

Figure 10 Covered-top bins for dry recyclables (green), general wastes (black) and compostable wastes (orange)



Colour covered-top bins for these types of waste were provided in Front of House (FoH) and Back of House (BoH) areas, but the FoH bins had see-through bodies. In addition, the same style of bin with purple colouring was provided in some FoH areas for collection of used, water-proof, plastic ponchos (see figure 11).

Figure 11 Covered-top bins for dry recyclables (green), water-proof ponchos (purple), general wastes (black) and compostable wastes (orange)



Open loop bins for recyclables, compostables and general waste were also provided at FoH eating areas (see figure 12).

Figure 12 Open loop bins for dry recyclables (green), general wastes (black) and compostable wastes (orange)



BoH compounds for temporarily storing wastes from the FoH and BoH bins housed 120 litre, 240 litre or up to 1100 litre covered-top, bulk-up, wheeled bins (see figure 13). These compounds were managed by the venue cleaners, who were also responsible for workforce eating areas where seating was provided and the FoH 'general circulation' areas. Caterers

were responsible for moving wastes from their directly managed areas (kitchens), FoH eating areas and their vicinities, concession and workforce areas.

Figure 13 Wheeled, bulk-up bins for dry recyclable, general and compostable wastes (left to right)



4.4 Games waste management contractor

SITA UK was given responsibility for the collection, recycling and recovery (e.g. E-f-W) of the contract-managed wastes from all of the Games venues.

The vast majority of the total waste tonnage arising from the Games venues arose from those venues in London and south east England. SITA UK transported the dry recyclable and general wastes from those venues, separately, to their Materials Recycling Facility in Barking. Sorted, compacted and baled dry recyclables were sold and supplied by SITA UK to merchants in the dry recycling industry.

4.5 Composting contractors and their management of biowastes from the Games

4.5.1 Overview

Compostable wastes from the London and South East England venues went to SITA UK's waste transfer station in Barking, where it underwent bag-level sorting to remove bags of dry recyclables and general waste bags that had been put into the wrong bins/containers at the venue's BoH compounds. SITA then transported this removed waste to an Energy-from-Waste facility. The bags containing predominantly compostable wastes were bulked up and transported to Countrystyle Group's in-vessel and outdoor composting facility near Sittingbourne in Kent (see sections 4.6.2 to 4.6.8 for more details).

Compostable waste from the Games venues in Dorset were supplied to Eco-Sustainable Solutions's in-vessel composting facility near Parley in Dorset. SITA UK also transported (or arranged contract haulage of) compostable wastes from other Games venues in Coventry and Newcastle to their own in-vessel composting facilities, respectively 'Waterswallows' near Buxton and 'Ellington' in Northumberland. Compostable waste from the Games venue in Glasgow was transported to Scottish Water Horizons's Deerdykes composting facility in North Lanarkshire, the Cardiff Games venue's compostable waste went to Cowbridge Compost Ltd for treatment at their Cowbridge facility in South Glamorgan, and the Manchester Games

venues' compostable waste went to Viridor Waste Management Ltd's nearby 'Trafford Park' in-vessel composting facility.

In summary, seven composting facilities treated food and compostable packaging and non-packaging biodegradable wastes from the Games venue(s) each was near, or reasonably close to. Composting processes that treated biowastes from the Games venues operated in similar ways, although the detail of their operation varied a little between sites and companies involved.

4.6 Composting biodegradable waste from the London and SE England Games venues

Described in this section is the management of the biodegradable waste collected from the Olympic Park and other Games venues in London and the south east of England, which generated the vast majority of total waste arisings from all the Games venues.

4.6.1 Checks at SITA's transfer station

Biodegradable waste collected from the London and SE England Games venues' bulk-up bins for 'compostables' was transported to SITA's waste transfer station in Barking. Unloaded bags were not opened but were visually checked for physical contaminants that could be seen through the light orange coloured compostable bags; any such bags that seemed to contain a high proportion of physical contaminants were removed to a rejects pile (see figure 14). Deliveries also tended to contain some blue bags used by caterers; such bags and their contents were removed to a rejects pile, without being opened because the blue bags were not compostable.

Figure 14 Pile of rejects after bag-level sorting of compostable wastes from the London and SE England Games venues (SITA UK's waste transfer station in Barking)



For each load delivered to the transfer station, after checking and removal of the non-compostable bags and their contents and the compostable bags that seemed to contain a high proportion of physical contaminants, the remaining pile of compostable bags and their contents (see figure 15 for an example) was loaded into a vehicle and transported to Countrystyle Group's in-vessel and outdoor composting process near Sittingbourne in Kent.

Figure 15 Pile of bag-level sorted compostable wastes from the London and SE England Games venues (SITA UK's waste transfer station in Barking)



SITA UK's transfer station at Barking has planning permission to operate 24 hours a day, 7 days a week, 365 days per year until 14th July 2015. The authorised operating hours, the labour and the bag-level sorting of biowaste from the London and SE England Games venues proved important for achieving suitable quality biowaste for supply to Countrystyle's composting facility.

It should be noted that biowaste arising from future events may not necessarily need to go to a transfer station before supply on to the composting facility. The use of a transfer station will be influenced by the bulking-up gain it can provide, vehicle types available for waste transportation, distance to the composting facility that will receive the event's biowaste, and the bag-level sort gain that could be achieved (if there is sufficient time and space and authorisation to do this) at the transfer station rather than relying on the composting facility to do all of the biowaste quality control.

4.6.2 Overview of the composting facility

Countrystyle's composting facility near Sittingbourne in Kent accepts approx. 1000 to 1500 tonnes of biowaste per week during busy periods and processes circa 40,000 input tonnes per annum, in accordance with its Environmental Permit.

The Animal Health and Veterinary Laboratories Agency has approved this process for treating category 3 animal by-products according to European Union Animal By-Products Regulations. This category of animal by-products includes catering wastes that include meat, which is the type of animal by-product that arose at the Games venues.

Treatment in-vessels is followed by outdoor composting in static aerated piles and after a minimum total composting period of 7 weeks and 3 days, the composted material undergoes particle size screening to produce a 0 – 40 mm grade of compost, principally for use in agriculture, and a woody 'oversize' fraction that undergoes further management at the facility.

4.6.3 Inspection after delivery to the composting facility

Each tipped load delivered to site underwent visual inspection in terms of bag colour and types and estimated level of physical contaminants present (see figure 16). Some bags which looked as though they may contain a significant proportion of physical contaminants or glass were manually split open in order to determine their contents. Bags were split where they had been tipped; a bag splitting machine was not used as there was not sufficient time or space.

Figure 16 Composting site inspection of biodegradable waste from the London and SE England Games venues



The most common physical contaminants seemed to be the recyclable (but not compostable) plastic bottles in which water and fizzy drinks were sold at the Games venues (see figure 17), the associated bottle tops and non-compostable bag liners from the catering areas (see figure 18).

Figure 17 Common types of physical contaminant in biodegradable waste from the London and SE England Games venues



Incidence of glass seemed low, but it was visually identified in a number of loads and wherever noticed, picked out of an accepted waste delivery before the biodegradable fractions were fed into the shredder (see figure 18). One delivery included four 5 litre plastic containers full of bleach, which were removed in Countrystyle's waste reception hall and later safely disposed of.

Figure 18 Common types of physical contaminant in biodegradable waste from the London and SE England Games venues



Periods when the quality of biowaste delivered seemed poorest were soon after the Athlete's Village opened, the start of the Olympic Games and at the end of that main Games period. The later Paralympic Games seemed to result in better quality of biowaste, which is not surprising considering the experience that had gone beforehand and improvements made at the Games venues during the transition period between the Olympic and Paralympic Games.

4.6.4 Decision to accept or reject each load delivered

Decision to accept or reject each tipped load was made by the composting site manager, after having visually inspected and scored it using the criteria shown in table 2. The bag-level sorting at SITA's waste transfer station in Barking tried to achieve a limit 2%, on a weight per weight basis, as agreed with Countrystyle.

If rejected, the waste was loaded from the reception building floor back into the vehicle that had delivered it, and then transported to an energy-from-waste facility. Each rejected load was recorded and the composter estimated that such loads seemed to include approximately 10% w/w contamination. If accepted, as much of the physical contaminant was removed as practicable, given the limited time and space for doing so.

Assessing whether each tipped load contained more or less than the contractually agreed 2% w/w physical contaminants limit was done by subjective, visual assessment because it was not time- and cost-effective to quantify physical contaminants (removing them then measuring their volume or weight).

Table 2 Criteria for acceptance or rejection of delivered loads

Hazardous content	Acceptance criteria (critical limit) and load inspection score	Control activity and associated record
Physical contaminants (e.g. plastic bags, non-compostable packaging and plastics, metals, concrete and consolidated mineral fragments (e.g. rocks and stones), etc.	Score 1 = VERY GOOD = load delivered is very clean.	Accept delivery.
	Score 2 = GOOD = load delivered has negligible physical contaminant content.	Accept delivery.
	Score 3 = MEDIUM = physical contaminant content is quite high, but still below 2 % w/w plastics/packaging items unsuitable for composting, evaluated by subjective assessment.	Accept delivery and remove as much of physical contaminants as practicable.
	Score 4 = POOR = physical contaminant content is above 2 % w/w plastics/packaging items unsuitable for composting, evaluated by subjective assessment.	Reload waste and send to energy-from-waste facility.

Source: Countrystyle Group. Excerpt covers criteria relevant to physical contaminants.

After a short period of receiving and then rejecting what seemed to be more contaminated biowaste which arose near to and at the end of the Olympic Games, the composter agreed to work to a higher physical contaminants limit of 5% w/w and control input quality by spending more time removing physical contaminants from the biodegradable waste that would be arising from the London and SE England Games venues during the Paralympic Games. LOCOG and SITA agreed to pay extra to cover the composter's higher labour and physical contaminants disposal costs.

4.6.5 Shredding and composting batch formation

After exiting the reception building, the accepted biodegradable waste was shredded into less than 12 mm particles together with other food waste and garden waste accepted from other sources (principally collected from households on behalf of local authorities). Loading waste from both the Olympic Park and local authority sources into the shredder mixed those wastes together as well as reducing their particle sizes.

4.6.6 Controlling the proportion of Games waste when forming composting batches

The proportion of biowaste from the Games included in any particular composting batch needed to be low enough to achieve adequate porosity (at least 20 % v/v) for aeration of the composting mixture and a suitable carbon to nitrogen ratio (25:1 to 30:1). The density and C:N of the Games biowaste seemed to vary a little over the Games period according to influences on consumption of food and drinks at the venues, which in turn seemed to influence the proportion of fibre-based compostable packaging to food waste. This biowaste stream was generally more dense and had a lower C:N than for food and garden waste from local authority kerbside collection sources.

When trial composting some of the packaging items before the start of the Games, Countrystyle's policy was that the composting site manager would determine the input percentage of Games biowaste to local authority garden and food biowaste needed to produce compost that met the requirements of PAS 100 and the CQP. This policy was followed for the accepted biowaste from the Games and in practice, between 60 and 80 tonnes of that waste was evenly incorporated into any single 350 tonne batch during batch formation (a 17 to 23% w/w incorporation rate).

4.6.7 Screening of composted material

After 3 days to 2 weeks composting in-vessel then at least 7 weeks composting in outdoor bays, a trommel screen with rotary drum with 40 mm apertures is used to create a 0 – 40 mm particle size grade of compost, principally for use in agriculture. This compost falls from the screening machinery into an open-sided bay for temporary storage of this grade.

Woody particles too large to pass through any of the screen apertures are transferred up a conveyor, under a magnet for removing metal (except brass, copper and stainless steel), and on into a star-screen which removes further compost and small woody particles from the very coarse woody particles (oversize).

Before the very coarse woody particles fall into a containment bay underneath the screen, an air-classifier unit blows air across the surface of the oversize particles which draws the physical contaminants that become airborne down a pipe which deposits those pieces in an enclosed bay. This is particularly effective for the removal of light, low density plastics and some of the higher density physical contaminants with large enough surface area to weight ratio, e.g. plastic bottle tops. Physical contaminants are transferred from the enclosed bay into a rejects skip which, when full, is sent to an appropriate facility for energy recovery or disposal.

4.6.8 Management of the oversize material

The oversize material is litter-picked to remove the majority of plastic and textile contaminants that the air-classifier system fails to transfer to the enclosed bay for storing physical contaminants before transfer to the rejects transport container. Residual cardboard/paper type packaging may be left in the oversize provided it looks plain.

After litter picking, the woody oversize particles may be added to newly formed composting batches loaded into the tunnels used for the initial phase of composting treatment.

Comments on physical contaminants and residues of compostable packaging and non-packaging wastes (e.g. plates and cutlery) from the Games are made in sections 4.9 and 5.4.

4.7 Quantity of waste collected via Games venue 'compostables' bins and its subsequent management

London and south-east of England Games venues

A total of approximately 2,660 tonnes of waste was collected via the 'compostables' bins at the Games venues in London and the south-east of England over the 77-day Games period (Athletes' village opening, Olympic Games, transition and Paralympic Games periods). After delivery to SITA UK's waste transfer station in Barking and 'bag level' sorting, a total of 840 tonnes of waste (mostly highly physically contaminated biodegradable waste) was sent to a nearby energy-from-waste (E-f-W) facility.

A total of approximately 1,820 tonnes of bagged compostable biowaste was sent from the transfer station to Countrystyle's in-vessel and outdoor composting facility near Sittingbourne in Kent.

Over the Games period, Countrystyle accepted a total of 1,590 tonnes of biowaste for composting. Ten deliveries, comprising a total of 230 tonnes, were rejected due to human perception that the level of physical contaminants exceeded what would need to be removed

in order to accept the load but could not be due to time-constraints and other factors. Each rejected load was sent to be recovered at an energy-from-waste facility.

In summary, on a percentage by weight basis, approximately 31.5 % of the total waste collected via the compostables bins at the London and SE England Games venues was diverted to E-f-W via the transfer station at Barking and a further 8.6 % of that total amount was sent to E-f-W after rejection by Countrystyle. In total, 40.2 % of the London and SE England Games venues compostable waste collected ended up being recovered using E-f-W treatment and 59.8 % was accepted for composting by Countrystyle (not accounting for rejects tonnage arising from removing physical contaminants from accepted loads at the composting facility).

All Games venues

A total of 2,568 tonnes of waste was collected via the 'compostables' bins from all Games venues UK wide, of which 1,706 tonnes (66.4 %) was accepted for composting by the seven composting facilities that treated biodegradable wastes from the Games. Despite the challenges, these figures represent an unprecedented achievement given that a compostables waste stream has never been attempted on such a scale for an event in the UK.

4.8 Quantity of compostable packaging and non-packaging products and physical contaminants from accepted Games waste

Inputs

Countrystyle weighed and recorded each delivery of biowaste from the Games and whether it was accepted for composting or rejected. The quantity of compostable packaging and non-packaging within the tonnage accepted was not quantified.

Physical contaminants and compostable residues after composting

Using figures provided by Countrystyle and from sampling and characterising small proportions of graded compost and oversize material from a composted batch that contained Games biowaste, Organics Recycling Group estimated that oversize material particles > 40 mm (off trommel screen, pre-star-screen) contained;

- 10.72 % w/w (moist sample) physical contaminants from sources other than the Games;
- 0.67 % w/w (moist sample) Games non-compostable physical contaminants; and
- 0.68 % w/w (moist sample) Games compostable packaging and non-packaging residue.

The amount of oversize material sampled from the batch was 5 cubic metres, from which a total of 5.44 kg of sub-samples were taken, selected randomly from the sampled material that was spread out on the composting pad surface.

N.B.:

- The above figures are derived from a small sample so may or may not be representative of the compost produced from the Games waste; and
- The Games non-compostable physical contaminants percentage is likely to be underestimated because of uncertainty of the source when sorting light plastics and LDPE other than water and fizzy drinks plastic bottles and their tops. Local authority sources of food and garden waste also include some light plastics, LDPE, card/paper, metal and physical contaminants. A conservative approach was taken when allocating

non-compostable physical contaminants as having come from the Games venues; if in doubt the contaminant was classed as 'non-Games'.

4.9 Quality and quantity of compost derived from accepted Games waste

Visually, the quality of 0 – 40 mm compost produced from biowastes that included food and compostable packaging and non-packaging biowastes from the Games remained high and Countrystyle's customers continued to receive and use the compost.

Physical contaminants that can be seen in figure 19 are a plastic bottle top, low density plastics (non-compostable) and paper/card (perhaps residue of a compostable cup from the Games).

Figure 19 Countrystyle's 0 – 40 mm compost grade made from biowastes from the London and SE England Games venues



Based on figures supplied by Countrystyle, limited composition analysis (of oversize material and compost), and some rule of thumb assumptions about mass loss during composting (partial conversion of biomass to gasses and liquids), Organics Recycling Group has estimated that approximately 950 tonnes of 0 – 40 mm compost was made from the 1,590 tonnes of biowaste that Countrystyle accepted from the Games London and SE England venues.

5.0 Arranging the composting of compostable packaging and non-packaging products

This section of the guidance outlines regulatory requirements that should be checked when an event organiser is looking for composting processes. Physical contaminants from the Games biowaste stream and the efficacy of the composting process that treated this waste is discussed, followed by brief coverage of additional treatment options that may need to be considered for treating event compostable packaging in future. The last part of this section suggests issues to be discussed and details that may need to be agreed with the composter when planning how the event's biowaste stream will be managed.

5.1 Regulatory requirements

5.1.1 Summary of regulatory requirements

In order to treat food and compostable packaging and non-packaging wastes from events, the composting process receiving these kinds of controlled biodegradable waste must:

- be authorised by the regulator to treat controlled biodegradable wastes;
- have the appropriate waste codes and descriptions in the authorisation; and
- be approved by the competent authority to treat animal by-products ('Category 3 Animal By-Products' or 'catering waste').

5.1.2 Authorisation to operate a composting process

Sites and facilities compost controlled biodegradable wastes must have an authorisation to operate. The type of authorisation depends on the country in which the composting operation is located, the types biodegradable wastes it treats, size of operation (capacity), control of emissions, the characteristics of the treatment site and technology used, and other factors.

Small scale processes that treat very limited quantities and types of controlled biodegradable wastes may be eligible for an exemption from permitting or waste management licencing. In England and Wales, composting processes that are not eligible to operate according to a registered exemption from permitting must have an 'Environmental Permit', which may be a Pollution Prevention and Control Permit, a Bespoke Environmental Permit or a Standard Rules Environmental Permit. Scotland and Ireland name their authorisations differently, as shown in table 3.

The composting facility's permit/licence or registered exemption from permitting/licencing stipulates the types of waste that the facility is allowed to accept and treat. For any waste type that the composter considers accepting, he/she must check that the type of source the waste comes from, the description of the waste and the corresponding waste code is included in the authorisation to operate. The composting facility operator should discuss what is feasible with the local regulatory office in the circumstance that the authorisation seems to omit appropriate waste code(s) and description(s).

Table 3 Types of authorisation, relevant regulator and competent authority

	Treating controlled biodegradable wastes		Enforcing Animal By-Products Regulations
	Authorisation for treating controlled biodegradable wastes	Regulator	Competent authority
England	Environmental Permit or registered exemption from permitting	Environment Agency	Animal Health and Veterinary Laboratories Agency (AHVLA)
Wales			
Scotland	Pollution Prevention Control Permit, Waste Management Licence or registered exemption from permitting/licencing	Scottish Environment Protection Agency	
Northern Ireland		Northern Ireland Environment Agency	Department of Agriculture and Rural Development

5.1.3 Approval to treat animal by-products

An important objective of the Animal By-Products Regulations is to ensure that all meat and other products of animal origin which are treated by anaerobic digestion or composting must meet the treatment standards required, to ensure sufficient destruction of pathogens so that the digestate or compost may be safely applied to land.

Under Regulation (EC) 1069/2009 animal by-products can fall into one of three categories that reflect the level of risk to public and animal health. Category 3 materials are considered low risk. Category 3 materials includes parts of animals that have been passed fit for human consumption in a slaughterhouse but which are not intended for consumption. Category 3 also includes products of animal origin, or foodstuffs containing products of animal origin which are no longer intended for human consumption for commercial reasons or due to manufacturing or packaging defects or other defects that do not pose a risk to public or animal health. Catering waste that arises from a source that is not a means of transport operating internationally is a type of Category 3 animal by-product.

Composting facilities that treat category 3 animal by-products and/or rendered category 2 animal by-products must be assessed and approved by the authority responsible for enforcing Animal By-Products regulations²⁶ (the competent authority). In most circumstances, composting facilities that treat catering wastes must be assessed and approved by the competent authority²⁷.

²⁶ (EC) No. 1069/2009 as implemented by Regulation (EC) No. 142/2011. National animal by-products regulations can be applied if the only types of animal by-product being composted are catering waste and some specific, named low risk animal by-products such as manure and paunch content.

²⁷ In very restricted circumstances AHVLA (authority responsible for enforcing Animal By-Products regulations in England, Wales and Scotland) allows small scale processes to be exempt from approval, if the only type of ABP the process treats is catering waste. See <http://www.animalhealth.defra.gov.uk/managing-disease/animalbyproducts/compost-biogas-manure/home-small-site-composters-ad-plants.htm> for more information. The T23 exemption that can be registered for small scale composting of restricted waste types in England or Wales includes conditions relevant to the treatment of animal by-products – see <http://www.environment-agency.gov.uk/business/topics/permitting/116273.aspx> for more information.

The competent authorities who assess composting processes that treat animal by-products regularly update lists of composting sites approved for treating animal by-products. These lists can be found at;

- <http://animalhealth.defra.gov.uk/managing-disease/animalbyproducts/premises.htm> for facilities in England, Wales and Scotland; and
- <http://www.dardni.gov.uk/index/animal-health/animal-by-products/animal-by-products-approved-premises.htm> for facilities in Northern Ireland.

5.2 Classification of biodegradable wastes arising at events

Biodegradable wastes that arise at events are controlled wastes. In addition to being subject to waste regulatory controls, the food and compostable packaging and non-packaging wastes arising at the event will, in most cases, be classified as catering waste that includes meat/fish. Catering waste is one of a number of specific types of waste derived from animals that is termed 'Category 3 Animal By-Product'.

If the event's food wastes include meat, fish, foods with ingredients that have been derived from animals, foods cooked in animal fats and/or non-animal-derived foods which may have been cooked in the same (vegetable or seed-derived) oil as animal-derived foods, such wastes are likely to be classified as catering waste that includes meat/fish.

Compostable products used for consuming (e.g. cutlery, paper napkins) or packaging types of food derived from animals and drinks that contain substances derived from animals (e.g. milk and cream) become animal by-product waste when they have been discarded, due to having been in contact with animal by-products.

Packaging that has been in contact, for any duration, with foods or drinks that consist of animal-derived material or include ingredients derived from animals is classified an animal by-product waste. For example, a carton board tray used for serving fish and chips and containing them during consumption will absorb cooking oil in which the fish was cooked.

5.3 Choosing a composting facility with an appropriate animal by-products approval

If intended to be composted, compostable packaging that has been in contact with food or drinks that consist of animal-derived material or include ingredients derived from animals must go to a composting facility that is approved to treat;

- category 3 animal by-products;
- category 3 animal by-products and rendered category 2 animal by-products; or
- catering wastes that include meat/fish.

The same options apply when planning to compost food (and perhaps drink) wastes that arise at events, which in most cases would be classified as catering wastes that include meat/fish.

N.B.: It is unlikely that many, if any, events would entirely exclude meat/fish so the composting facilities chosen must have one of the types of animal by-product approval named above.

Key point: If an event organiser is in any doubt about the type of ABP approval required for the composting of an event's biodegradable wastes, the local Animal Health vet (or the Department of Agriculture and Rural Development if in Northern Ireland) should be contacted for advice.

In addition to this, event organisers should consider the event’s proximity to a suitable composting facility when making arrangements to recycle or recover the event’s biodegradable wastes. Composting facility capacity to accept extra waste and the existence of appropriate waste codes in the permit or licence to operate must also be checked.

5.4 Physical contaminants from events and problems they can cause

High density plastics

The most numerous physical contaminants in biowaste seemed to be high density plastics in the form of water, fizzy drinks and larger bottles (some of which were recyclable PET, none of which were designed to biodegrade under composting conditions). Those bottles tended to pass through the composting site’s shredder without being shredded into pieces, though a notable proportion of the many squashed ones found in the oversize material showed that the bottle neck and plastic top had been shredded off. Plastic bottle tops were numerous and due to their smaller size could sometimes be found in the 0 – 40 mm compost as well as the woody oversize material that arose at end of process screening. These types of physical contaminant were manageable (see figure 20).

Figure 20 High density plastic bottles from the composted woody oversize pile (left) and bottle tops under the trommel screen (right)



Low density plastics

A variety of low density, flexible plastics (see figure 20, left picture) were also separated from the woody oversize material using the air-classifier unit configured with specialised screen.

Figure 21 Low density, flexible plastics separated from woody oversize by star-screen (left) and physical contaminants in star-screened woody oversize material (right)



The woody oversize material is litter-picked before any fraction of it is combined with shredded biowaste from new deliveries during composting batch formation (see figure 21).

Figure 22 Partially litter-picked, star-screened oversize woody material



Residual cardboard/paper and cutlery

There appeared to be much less residue of compostable plates, cups, 'cardboard' food servings trays and cutlery than the amount of these waste types in Games biowaste loads delivered for composting. The majority of these waste materials will have spent considerable time in the high-temperature, moist core zone of the composting batch they were fed into.

It is assumed that the small proportion of incompletely biodegraded compostable plate, cup, 'cardboard' food serving trays and cutlery items (see figure 23) had spent longer than normal at the surface or in the near-surface layer of the composting batches in their 7-week

outdoor phase of composting. Consequently, such items did not biodegrade to the same extent as the same kinds of items that had undergone typical exposure time in composting batch core zones.

Figure 23 Residual compostable plates (left, excluding blue paper with Union Jack flags) found in woody oversized material and compostable cutlery (right, excluding black coloured knife) in star-screened oversized woody material



Residual cardboard/paper type packaging is left in the oversized material provided it looks plain and the small proportion of compostable plates, cups, 'cardboard' food serving trays, and cutlery (from the Games) found in the oversized has been allowed to stay in that fraction so it can become fully biodegraded by the end of its second treatment in the composting system.

Glass

Glass in particular is a problematic physical contaminant because small pieces tend not to get separated from the compost particles during screening. Composting facilities rely on specifications with waste suppliers, inspection of deliveries, manual removal of any glass seen (with appropriate health and safety wear and procedures) and rejection of any load in which contamination by glass is unacceptably high. Glass is not tolerated in the markets for E-o-W compost.

It should be noted that in the case of biowaste from the Games, where glass was seen in a load delivered such items were removed in the reception hall (pre-shredding) or the load was rejected.

5.5 Efficacy of composting the compostable packaging and non-packaging products

The composting process used for recycling biodegradable waste from the Games successfully biodegraded the vast majority of compostable packaging and non-packaging final products in that waste stream. The light-orange compostable bags/bin liners were relatively quick to biodegrade and the majority of the compostable paperboard based products (plates, cups, cup lids, food cartons, cutlery and napkins) had biodegraded (to the extent that any residues were soil-like compost particles) by the end of the composting process.

5.6 Need for additional treatment options

In future, the need for additional treatment options will be influenced by the proportion of compostable packaging and non-packaging products in the event's biowaste stream, the proportion incorporated in any one batch at the start of the process, composting process duration and grades of compost made. It is possible that;

- extra moisture may need to be added during composting if the event's biowaste includes a high proportion of fibre-based compostable packaging/non-packaging products;
- composting batches that include some of the event's biowaste may benefit from extra time to biodegrade in an additional maturation phase, especially if the normal composting process is only six weeks duration; and
- some compost grades (e.g. 0 – 40 mm) may need to be double-screened or litter picked to remove sufficient physical contaminants to ensure the compost meets the PAS 100 minimum quality criteria and is fit for purpose.

5.7 Finding suitable composting processes

In addition to checking that a composting facility has an appropriate permit/licence to operate, has appropriate waste codes in its permit/licence, has an appropriate approval for treating animal by-products and, if required, is certified compliant with E-o-W criteria, the event organiser should check that the composting process manager is willing to accept compostable packaging and non-packaging products. Issues to be discussed and details that may need to be agreed are likely to include:

- the period during which deliveries of biowaste that includes compostable packaging and non-packaging products will arrive;
- the number of deliveries per day, quantity of biowaste per delivery and timing of deliveries;
- the maximum quantity of physical contaminants per delivered load of biodegradable waste (consider specifying a maximum number of items which if exceeded trigger rejection of the load and a lower 'pick' number of items which if exceeded trigger charged-for removal of the majority of those items; such 'item number' limits could over-ride any volume- or weight-based physical contaminants limit);
- provision in the input specification that any glass seen in a delivered load must be removed if the load is accepted and before it's biowaste content is fed into the shredder;
- where any rejected load should be sent and which organisation pays the associated costs;
- the maximum quantity or proportion (on a weight or volume basis) of compostable packaging and non-packaging products than can be fed in when forming a composting batch;
- whether there is need for additional quality control measures at the composting facility (e.g. litter picking the surface of composting batches during their outdoor phase of treatment, double-screening all or some of the composting batches in order to make compost that complies with PAS 100 minimum quality criteria and is fit for purpose);
- arrangements for composter to provide feedback about quality of biowaste delivered, during the delivery period; and
- the gate fee per tonne of biowaste delivered.

6.0 References

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7.0 Key regulations and standards

Directive 1999/31/EC on the Landfilling of Waste

European Member States are required to reduce the amount of biodegradable waste going to landfill to 35% of 1995 levels by 2016.

Directive 2008/98/EC on Waste (Waste Framework Directive)

Sets out the Waste Hierarchy, 5 priority steps for dealing with waste: prevention, preparing for re-use, recycling, recovery, and disposal. Under the Waste Hierarchy for organic waste, composting, where it meets quality protocols, is defined as recycling and therefore favoured over recovery or disposal options.

Directive 94/62/EC on Packaging and Packaging Waste

Establishes the essential requirements regarding composition and the reusable and recoverable nature of packaging. Six European standards have been issued to cover prevention of packaging and different forms of recovery, including EN 13432.

EN 13432:2000 Packaging Requirements for Packaging Recoverable through Composting and Biodegradation

The harmonised European standard defining the criteria that packaging materials must meet in order to claim to be compostable. The criteria include biodegradation, disintegration, low levels of heavy metals, and absence of ecotoxicity. Conformance with this standard provides presumption of conformity with Directive 94/62/EC on Packaging and Packaging Waste.

EN 14995:2006 Plastics: Evaluation of Compostability

Harmonised European standard defining the criteria that plastics used in non-packaging applications must meet in order to claim to be compostable. The criteria are similar to those of EN 13432.

ASTM D 6400-04 Standard Specification for Compostable Plastics

Covers plastics and products made from plastics that are designed to be composted under aerobic conditions. Defines the properties of materials required to determine if a product will compost satisfactorily and establishes the requirements for labelling of materials and products as 'compostable in aerobic municipal and industrial composting facilities'.

ISO 17088:2012 Specification for Compostable Plastics

The international standard for compostable plastics specifies the procedures and requirements for identifying and labelling plastics and products made from plastics that are suitable for aerobic composting. Labelling must additionally conform to national or regional regulations such as EN 13432.

PAS 100:2011 Publicly Available Specification for Composted Materials

Compliance with PAS 100 allows composters to demonstrate due diligence in the recovery of biodegradable waste materials, but it does not exempt the compost from regulations, measures and good practices that apply to both waste and non-waste materials.

Compost Quality Protocol 2012

Specifies a set of criteria by which compost derived from controlled biodegradable waste is no longer considered to be waste. Once biowaste derived compost has been produced in compliance with the Compost QP and provided it is destined for use in a market designated in the Compost QP, it is not normally subject to waste regulatory controls.

8.0 Glossary

Aerated static pile composting	Organic waste is mixed together in one large pile instead of rows. To aerate the pile, layers of loosely piled bulking agents (e.g., wood chips, shredded newspaper) are added so that air can pass from the bottom to the top of the pile. The piles also can be placed over a network of pipes that deliver air into or draw air out of the pile.
Aerobic degradation	Degradation of organic matter that takes place in the presence of oxygen, producing carbon dioxide.
Anaerobic degradation	Degradation of organic matter that takes place in the absence of oxygen, producing methane.
Anaerobic digestion (AD)	Process of controlled decomposition of biodegradable materials under managed conditions where free oxygen is absent, at temperatures suitable for naturally occurring mesophilic or thermophilic anaerobic and facultative bacteria species that convert the inputs to biogas and whole digestate.
Anaerobic Digestate Quality Protocol (ADQP)	Published in September 2009, this sets end-of-waste criteria for the production and use of quality outputs from AD of source-segregated biodegradable waste. In England, Wales and Northern Ireland, compliance with the criteria in the ADQP is considered sufficient to ensure that the product may be used without risk to human health or the environment and therefore without the need for waste regulatory control.
Animal by-product	Entire bodies or parts of animals, products of animal origin or other products obtained from animals, which are not intended for human consumption, including oocytes, embryos and semen. Examples are unsold, out of date food at food retail stores, and food that householders throw away.
Animal By-Products Regulations (ABPR) [national regulations]	The Animal By-Products Regulations 2005 (SI 2347/2005) provide for the application of EU Regulation in England. This controls the collection, transport, storage, handling, processing and use or disposal of animal by-products in EU member states, including catering wastes. Similar legislation applies in Scotland and Wales. The England Regulations were amended with effect from 2 May 2009 by the Animal By-Products (Amendment) Regulations 2009 (SI 2011/1774).
Base material [also known as raw material]	Material that is (in the case of polymers) primarily based on organic chain molecules and used, for example, to manufacture intermediates or final products. Materials generally contain further inorganic or low molecular weight organic materials used to influence processing or application properties. Materials can also consist of materials other than plastics, such as cellulose fibres from plants.
Biodegradable	Capable of being broken down into simpler compounds by the action of naturally occurring micro-organisms such as bacteria, fungi, and algae. [Also defined as 'materials which can be completely biodegraded (bio-assimilated) by micro-organisms such as bacteria, fungi and algae.]
Biodegradable plastic	A degradable plastic in which the degradation results from the action of naturally occurring micro-organisms such as bacteria, fungi, and algae.
Biodegradable waste	Waste of animal or plant origin which, for recovery purposes, can be decomposed by micro-organisms, other larger soil-borne organisms or enzymes.

Biodegradation	Chemical degradation brought about by the action of naturally occurring micro-organisms such as bacteria, fungi, and algae.
Catering waste (one type of category 3 animal by-product)	All waste food including used cooking oil originating in restaurants, catering facilities and kitchens, including central kitchens and household kitchens.
Certification (for compost or digestate)	Proof of conformity of a compost or digestate product with the requirements of the named quality protocol and/or standard(s) as well as with the certification body's scheme rules.
Certification (for final products)	Proof of conformity of a final product with the requirements of the named standard(s) as well as with the certification body's scheme rules.
Closed venues	Event sites managed by the event organiser where access is restricted (for example, a ticket or pass is required to gain entry).
Compostable packaging/non-packaging/plastic	A material that undergoes biological degradation during composting to yield carbon dioxide, water, inorganic compounds, and biomass at a rate consistent with the other known compostable materials and leaves no visually distinguishable or toxic residues. Must comply with the requirements of an accepted standard for compostability, i.e. EN 13432, EN 14995, ASTM D6400, ISO 17088 and/or ISO 18606.
Compost Quality Protocol (CQP)	Published in March 2007, with the latest edition published in August 2012, this sets criteria for the production of quality compost from source-segregated biodegradable waste (biowaste). In England, Wales and Northern Ireland, compliance with the criteria in the CQP is considered sufficient to ensure that the product may be used without risk to human health or the environment and therefore without the need for waste regulatory control.
Composting	Process of controlled biological decomposition of biodegradable materials under managed conditions that are predominantly aerobic and that allow the development of thermophilic temperatures as a result of biologically produced heat.
Conformance	In the context of this report, compliance with a standard (meeting the requirements of a standard).
Continuous block	Continuous block composting is an approach used to compost large volumes of material, employing minimal process management: large piles are formed, with new material added at one end and compost harvested at the other. Composting relies largely on passive aeration with turning often achieved through the use of a side turner, or use of a 360 degree excavator which sits on the top of the block and moves the material, which slowly moves the table a windrow's width down the pad at a time, starting from one end. Continuous block composting is commonly used for non-putrescible materials, such as woody green wastes, and may take a number of months to produce a composted product.
Controlled waste	Controlled wastes are household, commercial and industrial wastes as defined in The Controlled Waste Regulations 1992 (as amended).
Degradation	A particular type of gradual decomposition that usually proceeds in well-defined stages to give products with fewer carbon atoms than the original compound. (The term is often applied to decomposition

	resulting from the action of micro-organisms.)
EWC Code [or 'waste code']	European Waste Catalogue Code [allocated to a specific type and description of waste, from a specific type of source]
Final product (intended to be composted)	Item that is disposed of as waste (for composting) after use, is manufactured from polymeric materials or intermediates and frequently also contains additives. Products are not necessarily packaging.
In-vessel composting (IVC)	A term used to describe a wide range of composting systems where the composting feedstock is contained in a purpose-built structure for the sanitisation phase of composting, allowing a higher degree of process control and environmental protection than OAW. Many IVC sites incorporate an element of windrow composting for maturation of the material following the sanitisation phase. At present, IVC is primarily used for feedstocks that fall under the provision of the ABPR.
Mechanical biological treatment (MBT)	A generic term for an integration of several processes treating mixed wastes, such as Materials Recovery Facilities, sorting and composting or anaerobic digestion.
Open air windrow (OAW)	Mechanically turned windrow located outdoors (in the open air), as opposed to under a cover or in a building.
PAS 100	The British Standards Institution's Publicly Available Specification 100, specification for composted material, latest edition published in 2011.
PAS 110	The British Standards Institution's Publicly Available Specification 110, specification for whole digestate, separated liquor and separated fibre derived from the AD of source-segregated biodegradable materials, published in February 2010.
Product (in the context of compostable packaging and non-packaging)	Article that is disposed of as waste (for composting) after use, is manufactured from polymeric materials or intermediates and frequently also contains additives. Products are not necessarily packaging.
Primary packaging	The packaging designed to come into direct contact with the product.
Recovery	Includes recycling, energy from waste recovery [which can include anaerobic digestion], and composting.
Recycling	The reprocessing, in a production process, of waste materials. This occurs at the point at which the materials are put back into productive use (for example, for metals, the steel furnace; for glass, the container factory, etc).
Registration	Proof of conformity of a base material, intermediate or additive with the requirements of the named standard(s) as well as with the certification body's scheme rules.
Reprocessing	A common term used to encompass recovery and recycling.
Re-use	Where products, materials or packaging can be used for a second or subsequent time for the same or similar purpose without requiring any reprocessing.
Secondary (or group) packaging	A group of a convenient, given number of primary packaging units available at a point of sale. It typically has one of two roles; a convenient means to replenish the point of sale (e.g. shelves) or a grouping of primary packaging units into a package for purchase. It

can be removed without affecting the product's properties, and generally defines the unit handled by the retailer.

SKU code	A code allocated to a stock keeping unit.
Source-segregated waste	Waste kept separate from other waste types so as to reduce contamination and facilitate treatment. It is referred to as 'separate collection' in the Waste Framework Directive (2008/98/EC).
Static pile with aeration (aerated static pile)	Form of composting where the materials are turned infrequently and the fresh air is introduced into the pile through a forced aeration system. This may be either through channels in the ground or through a perforated pipe laid within the compost. Aeration may be either positive (pushed through the composting mass) or negative (sucked through the mass).
Thermophilic aerobic digestion (TAD)	Method of treating slurries or liquid suspensions of organic wastes where the materials are pumped into a tank and air is forced through, encouraging the growth of thermophilic bacteria that then digest the waste. The process is typically shorter than composting or AD.
Tertiary (or transport) packaging	A shipping unit of packaging designed to ensure damage-free handling and transport of a number of sales or grouped packages. Examples are an outer case, a pallet or a crate. The term "transport packaging" does not include road, rail, ship or air-freight containers.
Total dry solids	The amount of solids obtained by taking a known amount of test sample then drying it at 105 °C until it reaches a constant weight.
Volatile solids	The amount of solids obtained by subtracting the residue of the test sample, after oven drying at about 550 °C, from the total dry solids content of the same test sample. The volatile solids content is an indication of the amount of organic matter in the sample, before testing.

9.0 Useful contacts

9.1 DIN CERTCO

DIN CERTCO operates a certification scheme for compostable products made of biodegradable materials and licenses the use of the 'seedling' mark developed by European Bioplastics. (Named here is its scheme relevant to this report; it operates other certification schemes.)

DIN CERTCO Gesellschaft für Konformitätsbewertung mbH, Alboinstraße 56, D-12103 Berlin, Germany.

Tel.: +49 (0)30 7562-1131, Fax: +49 (0)30 7562-1141, Email: info@dincertco.de

Webpage about products made of compostable materials is at

http://www.dincertco.de/en/products_made_of_compostable_materials.html

Webpage introducing DIN CERTCO's certification scheme for products made of compostable materials is at

http://www.dincertco.de/en/products_made_of_compostable_materials.html

Specialist contact: Lukas Willhauck, +49 307562-1134, lukas.willhauck@dincertco.de

9.2 Vinçotte

Vinçotte operates a certification scheme for compostable products made of biodegradable materials and licenses the use of its 'OK compost' certification mark and the 'seedling' mark developed by European Bioplastics. (Named here is its scheme relevant to this report; it operates other certification schemes.)

Vinçotte - Certest Products, Everest - Leuvensesteenweg 248 H, B - 1800 Vilvoorde, Belgium.

Tel: + 0032 2 674 59 30, + 0032 2 674 57 48, or + 0032 2 674 58 51

Fax: + 0032 2 674 57 85, Email: okcompost@vincotte.be

Webpage introducing certification services relevant to compostability is at

<http://www.okcompost.be/en/vincotte-amp-en-13432/>

9.3 Organics Recycling Group (part of the Renewable Energy Association)

Organics Recycling Group operates certification services for compostable packaging and plastics, operating in partnership with DIN CERTCO and Vinçotte. (Named here are its services relevant to this report; it operates other certification schemes.)

Organics Recycling Group, Renewable Energy Association, 2nd Floor, 25 Eccleston Place, London, SW1W 9NF, United Kingdom.

Tel: +44 (0)20 7925 3570, Fax: +44 (0)20 7925 2715, Email: gordon@r-e-a.net

9.4 NNFCC

Established by the UK Government in 2003 as the National Non-Food Crops Centre, NNFCC has grown to become a leading UK consultancy focused on understanding biorenewable markets and technologies. It offers consultancy services and acts as an advisor to UK Government, providing technical, market and policy expertise on the conversion of biomass and waste to bioenergy, biofuels and bio-based products.

NNFCC, Biocentre, York Science Park, Innovation Way, York, YO10 5DG, United Kingdom.
Tel: +44 1904 435182, Fax: +44 1904 435345, Email: enquiries@nnfcc.co.uk

Webpage about bio-based products is at <http://www.nnfcc.co.uk/bio-based-products>

9.5 WRAP

WRAP works in England, Scotland, Wales and Northern Ireland to help businesses, local authorities, communities and individuals reap the benefits of reducing waste, developing sustainable products and using resources in an efficient way.

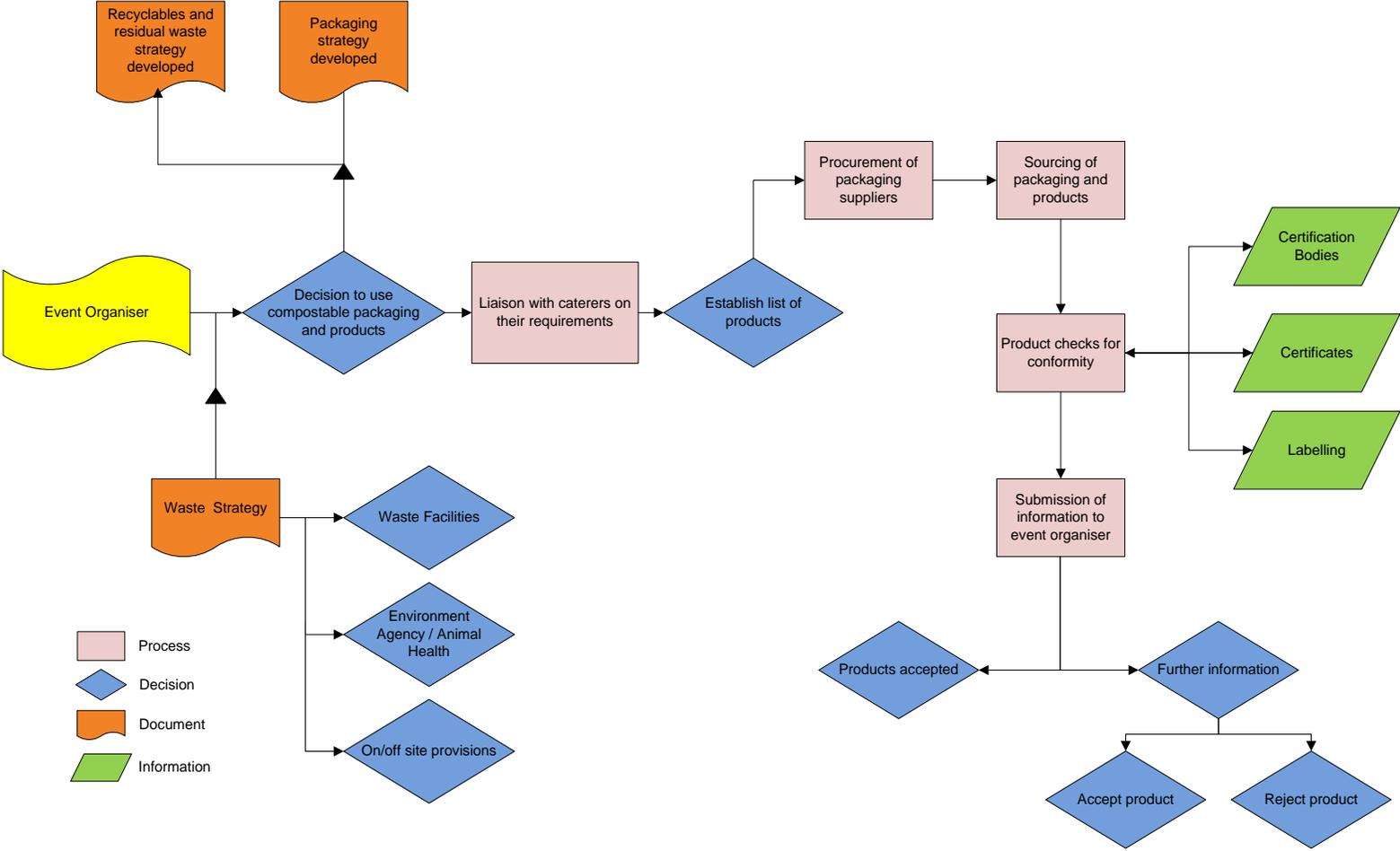
Established as a not-for-profit company in 2000, WRAP is backed by government funding from Defra (Department for the Environment, Food and Rural Affairs), Scottish Government, the Welsh Government, the Northern Ireland Executive, and the European Union.

WRAP's vision is a world without waste, where resources are used sustainably. Its work helps people recycle more and waste less, both at home and at work, and offers economic as well as environmental benefits. WRAP works with a wide range of partners, from major UK businesses, trade bodies and local authorities through to individuals looking for practical advice.

WRAP, The Old Academy, 21 Horse Fair, Banbury, OX16 0AH, England. Tel: 0800 1002040

Webpage about materials at: <http://www.wrap.org.uk/content/material-specifics>

Appendix 1 Planning the procurement of compostable packaging and non-packaging products and their management after use at an event



Appendix 2 Key products list

This appendix provides a list of many of the key compostable packaging and non-packaging products procured for the 2012 Olympic and Paralympic Games. It is provided here to help event organisers get started with sourcing compostable packaging and non-packaging products for an event.

ID	Product	Suggested Material	Other Comment (e.g. colour requirement)	Proposed Material	Recyclable / Compostable	EN 13432 Product
1	Baguette collar natural	Paper / Card	On Item Labelled	Card	Recyclable & Compostable	N
2	Bag baguette natural	Paper / Card	On Item Labelled	Paper	Recyclable & Compostable	N
3	Bag brown plain natural_26 x 39 x 30.5cm	Paper / Card	On Item Labelled	Paper	Recyclable & Compostable	N
4	Bag carrier Medium_21.59cm x 33.02cm x 25.4cm	Paper / Card	On Item Labelled	Paper	Recyclable & Compostable	N
5	(Comp) Bag Glassine_10.16cm x 15.2cm x 35.56cm (4in x 6in x 14in)	Coated paper	On Item Labelled	Paper	Recyclable & Compostable	N
6	bag Glassine_15.2cm x 20.32cm x 25.4 cm	Coated paper	On Item Labelled	Paper	Recyclable & Compostable	N
7	(Comp) Board 12.7cm x 15.2cm	Coated card	No print/label required	Card	Recyclable & Compostable	N
8	(Comp) Board 7.62cm x 27.94 cm	Coated card	No print/label required	Card	Recyclable & Compostable	N
9	Cup Carrier Tray 2 cup	Card	No print/label required	Pulp	Recyclable & Compostable	Y
10	Cup carrier Tray 4 cup	Card	No print/label required	Pulp	Recyclable & Compostable	Y
11	Cup Hot_341ml (12oz)	Coated card	On Item Labelled	PLA coated card	Compostable	Y
12	Cup Hot_455ml (16oz)	Coated card	On Item Labelled	PLA coated card	Compostable	Y
13	Cup Hot_227ml (8oz)	Coated card	On Item Labelled	PLA coated card	Compostable	Y
14	Cup Hot_85ml (3oz)	Coated card	On Item Labelled	PLA coated card	Compostable	Y
15	Cup Hot lid_341ml (12oz)	Biopolymer	On Item Labelled	PLA Biopolymer	Compostable	Y
16	Cup Hot lid_455ml (16oz)	Biopolymer	On Item Labelled	PLA Biopolymer	Compostable	Y
17	Cup Hot lid_227ml (8oz)	Biopolymer	On Item Labelled	PLA Biopolymer	Compostable	Y
18	Cup sleeves	Card	On Item Labelled	Card	Recyclable & Compostable	N
19	Cup soup_341ml (12oz)	Coated card	Caterer to label	PLA coated card	Compostable	Y
20	Cup soup lid_341ml (12oz)	Coated card	Caterer to label	PLA coated card	Compostable	Y
21	White Napkin 2 Ply	Paper	N/A	Paper	Recyclable & Compostable	N
22	Greaseproof Parchment Sheets 280x200mm	Coated paper	Caterer to label	Paper	Recyclable & Compostable	N
23	Plate white_17.78cm (7in)	Coated card	On Item Labelled	Sugar Bagasse	Compostable	Y

Key products list (continued)

ID	Product	Suggested Material	Other Comment (e.g. colour requirement)	Proposed Material	Recyclable / Compostable	EN 13432 Product
24	Plate white_22.86cm (9in)	Coated card	On Item Labelled	Sugar Bagasse	Compostable	Y
25	Bowl White cereal/Dessert_227ml (8oz)	Coated card	N/A	Sugar Bagasse	Compostable	Y
26	Bowl white Pasta_20cm	Coated card	N/A	Sugar	Compostable	Y
27	Pot deli extra squat_227ml (8oz)	Coated card	Caterer to label	PLA coated card	Compostable	Y
28	Pot deli lid_227ml (8oz)	Coated card	Caterer to label	PLA coated card	Compostable	N
29	Sandwich deep fill	Coated Card / Biopolymer	Caterer to label	Card/ PLA film	Compostable	N
30	Sandwich single fill	Coated Card / Biopolymer	Caterer to label	Card/ PLA film	Compostable	N
31	Spoon Plastic	Biopolymer	N/A	Biopolymer	Compostable	Y
32	Knife Plastic	Biopolymer	N/A	Biopolymer	Compostable	Y
33	Fork Plastic	Biopolymer	N/A	Biopolymer	Compostable	Y
34	Knife, Fork, Spoon and Napkin single packs	Biopolymer	On Item Labelled	Biopolymer	Compostable	Y
35	Wooden Stirrer	Biopolymer	N/A	Wood	Compostable	N
36	Tortilla sleeve natural (Compostable)	Card	On Item Labelled	Card	Compostable	N
37	Box Cake Slice	Coated Card / Biopolymer	Caterer to label	card/PLA	Compostable	N
38	Box Hot closable large_228 x 125 x 79 mm	Coated card	Caterer to label	Card	Recyclable & Compostable	N
39	Box hot closable medium_177 x 105 x 70 mm	Coated card	Caterer to label	Card	Recyclable & Compostable	N
40	Pizza Box (12in)	Coated card	On Item Labelled	E flute corrugated board	Recyclable & Compostable	N
41	Pizza Box (9in)	Coated card	On Item Labelled	E flute corrugated board	Recyclable & Compostable	N
42	Noodle Box Small 455ml (16oz)	Coated card	Caterer to label	Card	Recyclable & Compostable	N
43	Noodle Box Large 739ml (26oz)	Coated card	Caterer to label	Card	Recyclable & Compostable	N
44	Box jacket potato white	Coated card	On Item Labelled	Sugar Bagasse	Compostable	Y
45	Box lunch	Coated card	Caterer to label	Sugar Bagasse	Compostable	N
46	Sushi Box Small	Paper / Card / PLA	Caterer to label	Paper / Card / PLA	Compostable	N
47	Sushi Box Medium	Paper / Card / PLA	Caterer to label	Paper / Card / PLA	Compostable	N
48	Sushi Box Large	Paper / Card / PLA	Caterer to label	Paper / Card / PLA	Compostable	N
49	Spoon Plastic	Biopolymer	N/A	Biopolymer	Compostable	Y
50	Knife Plastic	Biopolymer	N/A	Biopolymer	Compostable	Y
51	Fork Plastic	Biopolymer	N/A	Biopolymer	Compostable	Y
52	Knife, Fork, Spoon and Napkin single packs	Biopolymer	N/A	Biopolymer	Compostable	Y

Key products list (continued)

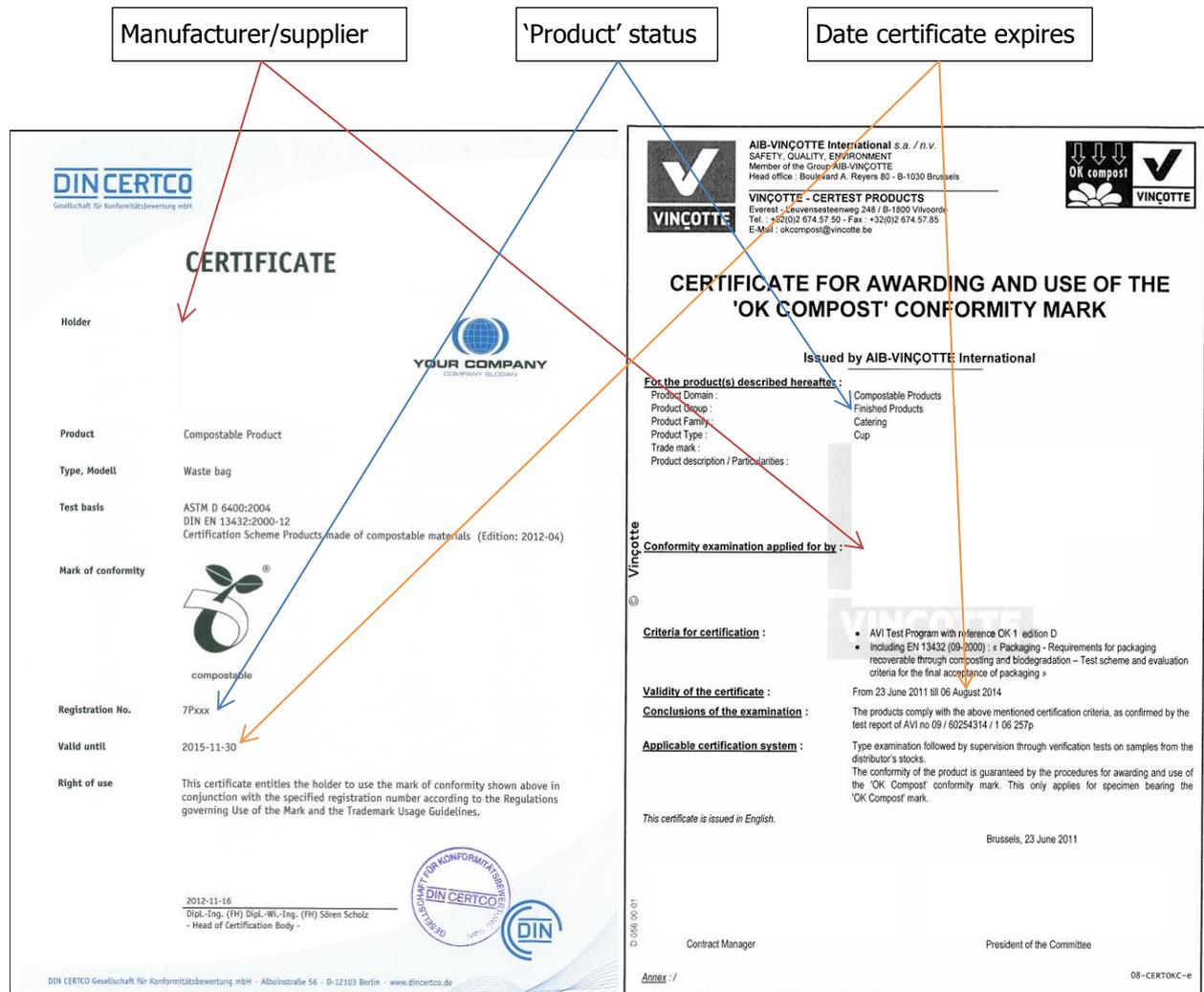
ID	Product	Suggested Material	Other Comment	Proposed Material	Recyclable / Compostable	EN 13432
53	Wooden chip fork	Wood	N/A	Wood	Compostable	N
54	Wooden fork	Wood	N/A	Wood	Compostable	N
55	Wooden knife	Wood	N/A	Wood	Compostable	N
56	Wooden spoon	Wood	N/A	Wood	Compostable	N
57	Wooden chopsticks	Wood	N/A	Wood	Compostable	N
58	100% recycled napkin 1ply - Brown	Paper	N/A	Paper	Recyclable & Compostable	N
59	Card Napkin Dispenser	Card	Caterer to label	Card	Recyclable & Compostable	N
60	Bio-plastic portion pot (1oz)	PLA	Caterer to label	PLA	Compostable	Y
61	Bio-plastic portion pot lid (1oz)	PLA	Caterer to label	PLA	Compostable	Y
62	Bio-plastic portion pot (2oz)	PLA	Caterer to label	PLA	Compostable	Y
63	Bio-plastic portion pot (3oz)	PLA	Caterer to label	PLA	Compostable	Y
64	Bio-plastic portion pot (4oz)	PLA	Caterer to label	PLA	Compostable	Y
65	Bio-plastic portion pot lid (2-4oz)	PLA	Caterer to label	PLA	Compostable	Y
66	Paper souffle cup - White 2oz	Coated Paper	N/A	Coated Paper	Recyclable & Compostable	N
67	5oz pot	PLA	Caterer to label	PLA	Compostable	N
68	5oz-9oz Pot Lid	PLA	N/A	PLA	Compostable	N
69	Bio-plastic & paper baguette bag - Brown	Paper / Biopolymer	On Item Labelled	Paper / Biopolymer	Compostable	N
70	Bagasse rectangular hinged container (1litre)	Sugar Bagasse	Caterer to label	Sugar Bagasse	Compostable	N
71	Bagasse 2 compartment rectangular hinged container	Sugar Bagasse	Caterer to label	Sugar Bagasse	Compostable	N
72	75mm sandwich skillet heat sealable fully lined simulated kraft	Coated Card / PLA	Caterer to label	Coated Card / PLA	Compostable	N
73	65mm sandwich skillet heat sealable fully lined simulated kraft	Coated Card / PLA	Caterer to label	Coated Card / PLA	Compostable	N
74	Small Kraft open tray	Coated Card	Caterer to label	Coated Card	Recyclable & Compostable	N
75	Wrap Box	Coated Card/ Biopolymer	Caterer to label	Coated Card/ Biopolymer	Compostable	N
76	Finger sandwich card	Paper/ Card	Caterer to label	Paper/ Card	Recyclable & Compostable	N
77	Bloomer 'C' card	Paper / Card	On Item Labelled	Paper / Card	Recyclable & Compostable	N
78	Open ended large tray	Coated Card	On Item Labelled	Coated Card	Recyclable & Compostable	N
79	Knife, Fork, and Napkin Single Pack	Biopolymer	On Item Labelled	Biopolymer	Recyclable & Compostable	N
80	Recycled flat paper bag (10" x 10")	Card / Paper	On Item Labelled	Card / Paper	Recyclable & Compostable	N

Key products list (continued)

ID	Product	Suggested Material	Other Comment	Proposed Material	Recyclable / Compostable	EN 13432
81	16oz eco soup	Coated Card	On Item Labelled	Coated Card	Recyclable & Compostable	N
82	32oz eco soup	Coated Card	Caterer to label	Coated Card	Recyclable & Compostable	N
83	Large platter box - Brown	Coated Card	Caterer to label	Coated Card	Recyclable & Compostable	N
84	Standard platter box - Brown	Coated Card	Caterer to label	Coated Card	Recyclable & Compostable	N
85	Quarter insert for large platter	Coated Card	Caterer to label	Coated Card	Recyclable & Compostable	N
86	Plate 10 inch	Sugar Bagasse	On Item Labelled	Sugar Bagasse	Recyclable & Compostable	N
87	8oz Double Wall Hot Cup	Coated Card	On Item Labelled	Coated Card	Recyclable & Compostable	N
88	12oz Double Wall Hot Cup	Coated Card	On Item Labelled	Coated Card	Recyclable & Compostable	N
89	Bio-plastic film sheet - medium (300 x 400 mm)	PLA	On Item Labelled	PLA	Recyclable & Compostable	N
90	590ml Bagasse Tray	Sugar Bagasse	Caterer to label	Sugar Bagasse	Compostable	N
91	887ml Bagasse Tray	Sugar Bagasse	Caterer to label	Sugar Bagasse	Compostable	N
92	350ml Bagasse Tray	Sugar Bagasse	Caterer to label	Sugar Bagasse	Compostable	N
93	Tortilla Wrap 225 x 103ml	Card	On Item Labelled	Coated Card	Recyclable & Compostable	N
94	Muffin wraps - Brown 160 x 160 x 50	Coated Paper	On Item Labelled	Coated Paper	Recyclable & Compostable	N
95	Bamboo Skewer 6"	Wood	On Item Labelled	Wood	Recyclable & Compostable	N
96	Recycled napkin 3 ply - White	Paper	On Item Labelled	Paper	Recyclable & Compostable	N
97	Bagasse Tray White 21oz / 650ml	Sugar Bagasse	On Item Labelled	Sugar Bagasse	Compostable	N
98	Carrier Bag Large - 300 x 260 x 130	Paper/Card	On Item Labelled	Paper/Card	Recyclable & Compostable	N

Appendix 3 Example certificates

This diagram highlights some of the key information that should be cross-checked with details about a final product that a manufacturer or supplier claims is compostable.



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