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Compostable Food Packaging

Overview

- Compostable packaging could potentially reduce both food waste in landfill and waste from plastic food packaging.
- Current issues include lack of a collection / disposal infrastructure, enforcement of standards, and complications with recycling.
- This brief describes policy options to enable greater use of compostable packaging.

What is compostable packaging?

Compostable packaging can be made from materials such as paper/card, plants (palm leaf, sugar cane and cassava) and certain bioplastics (Box 1). In contrast to biodegradable materials that are not legally defined, compostable materials are regulated by industrial standards (Box 1). All certified compostable packaging is designed to break down inside an industrial composting facility (Box 1) when collected with food waste. Some are also suitable for composting at home. They are not generally designed to break down in natural environments, such as the ocean.[9,10,11] Interest in compostable packaging in general, and compostable bioplastics in particular,[12] is growing rapidly due to concerns about plastic packaging waste.

Advantages of compostable packaging

A key advantage of compostable packaging is that it allows for the processing of packaging contaminated with food residue that is unsuitable for recycling. Such waste currently goes to incineration or landfill. Food waste in landfill gives off methane,[13] a greenhouse gas (GHG) that has a short-term global warming effect 30 times that of carbon dioxide (CO_2).[14] Diverting food waste from landfill reduces these GHG emissions and composting it produces CO_2, water and biomass that can improve soils. Applications of compostable packaging include:

- **Takeaway food containers.** Companies such as Vegware and Biopac offer compostable catering ranges with sandwich boxes, food cartons, salad boxes and coffee cups.[15,16] Materials include paperboard, plant materials and the compostable bioplastic polylactic acid (PLA), which is also used for cutlery (Box 1).
- **Coffee pods.** These are suited to compostable packaging since they are typically contaminated with coffee residue. Several companies now manufacture Nespresso-compatible compostable coffee pods using materials such as sugar beet and sugar cane.[17,18,19]

Box 1: Key Terms related to compostable packaging:

- **Industrially compostable** materials undergo at least 90% biodegradation within 6 months in an industrial facility in the presence of oxygen, microorganisms and high temperatures (50–60°C).[1,2] These materials are regulated in the EU.[3]
- **Home compostable** materials undergo 90% degradation after 12 months at ambient temperature, in the presence of microorganisms and oxygen, in a domestic composting unit.[1]
- **Anaerobic digestion** is the breakdown of organic material by microorganisms without oxygen at 37 – 44°C. This produces biogas (captured for heat, fuel and electricity) and a biofertilizer.[4]
- **Biodegradable materials** are generally accepted to mean those broken down by microorganisms into water, CO_2 and biomass.[1] However, the term has no specific definition or timeframe; 'biodegradable' products can take years to fully decompose.[5]
- **Bio-based plastics** are made wholly or partly from feedstocks derived from natural products, such as sugarcane, corn, cassava and algae.[6]
- **Bioplastics** are plastics that are either bio-based, biodegradable or both.[6] Certain bio-based plastics do not biodegrade; conversely some oil-derived plastics are fully compostable. Plastics that are both bio-based and biodegradable include polylactic acid (PLA), a clear plastic made from fermented plant starch. It is used for takeaway containers, cups and barrier linings.
- **Oxo-degradable plastics** contain an additive to accelerate fragmentation in heat or ultraviolet light. They are not considered to be biodegradable and can generate harmful microplastics.[1,7] The EU Single-use Plastics Directive will ban these from 2021.[8]

- **Flexible packaging.** NatureFlex is a thin film made from wood pulp. It is used in food contact materials such as sandwich boxes, fruit labels, and wrap for meat and cheese.[20] Parkside Flexibles also make flexible packaging from paper, cellulose and a bioplastic for packaging dry goods such as snack bars.[21]

Limitations of compostable packaging

Issues with using compostable packaging within the current UK waste reprocessing infrastructure include:

Box 2: Case studies for compostable food packaging

Event catering: the 201718 Volvo Ocean Race, Cardiff Stopover[22]
The 2017–2018 Volvo Ocean Race's Cardiff stopover took place over 14 days, with 180,000 attendees. During the event, 3.18 tonnes of used Vegware and food waste were collected and used to produce a nutrient-rich compost within 12 weeks. Key elements included:

- Low contamination, since only compostable packaging was used.
- Colour-coded bins situated in pods, with clear signage.
- Training of the event staff and food service retailers.
- Access to an appropriate facility: Rose Hill Recycling in-vessel composting in Gloucestershire, which accepts Vegware.

A similar system was also used in the London 2012 Olympic Games.[23]

On-site composting: Dundee and Angus College[24]
Dundee and Angus College has two on-site composters within the Horticulture Department which process compostable Vegware containers and food waste from its canteens. The system saves on food waste collection costs and produces a high-grade compost that is used on the estate grounds. Key factors in this success include:

- Capital investment by Dundee and Angus college and a capital investment grant from Angus Environmental Trust.[25]
- Sufficient outdoor space; a use for the compost within the grounds.
- Estates staff who manage the composter as part of their duties.

Other facilities using compostable packaging with on-site composting include some airports, prisons, hotels and shopping centres.[26]

- Only 51% of local authorities in England currently have separate food waste collections,[27] although they are in place in Scotland, Wales and Northern Ireland.
- Even where food waste collections exist in the UK, the preferred treatment is anaerobic digestion (AD, Box 1). However, bioplastics and compostable packaging are not generally suitable for AD, causing them to be removed and incinerated or landfilled.[28,29,30] A small number of AD plants use combined composting/AD and can accept compostable packaging.[31]
- Difficulty distinguishing compostable packaging from conventional packaging means that it is often removed from composting streams and diverted to landfill or incineration.
- A lack of awareness of how to dispose of compostable packaging means that many consumers put it in recycling or landfill streams. There are also concerns that labelling packaging as compostable or biodegradable could encourage littering.[32]

For the reasons above, compostable packaging may be best suited to closed environments where they are the only materials in use (for example festivals and canteens, Box 2). However, other countries have demonstrated that it can be effective when used in combination with dedicated recovery facilities and consumer education (Box 3). Further issues with using compostable packaging include:

- Certain compostable packaging may present health risks if made from allergenic materials. For example, straws made from wheat may pose a risk to people with coeliac disease.[33]
- Producing compostable packaging from plants could compete with food crops for land if the industry grew significantly, although packaging made from food waste, seaweed or crop/forestry residue would not.[34]

Box 3: Case study: Italy [35]
In the 1997 Italian General Waste Act, collection of organic waste became a strategic objective to achieve national and EU recycling targets. Since then, collection of organic waste in Italy has increased by a factor of 8, reaching 6.1 million tonnes in 2015. Currently the composting sector is Italy's largest recycling industry, involving over 4000 municipalities and 40 million inhabitants.[35] Key factors include:

- **Ample capacity** to compost all collected organic waste, via a distributed network of 261 industrial composters and 47 anaerobic digestion facilities with a total capacity of over 8.5 million tonnes. [35]
- **Low contamination** of organic material (4.8% average),[35] assisted by education campaigns and a ban on plastic single-use bags.
- **Separation of food waste**, with residents being provided with kitchen caddies lined with compostable bags and bins that are emptied as part of door-to-door collections.
- **Enforcement,** with regions such as Milan imposing fines of up to €50 for contaminating food waste collections.
- **Strong market for compost**, helped by campaigns, economic incentives and a national quality-assurance certification scheme. In 2015, organic waste generated 1.8 million tonnes of compost. [35]

Policy options to increase compostables

When part of a national strategy, compostable packaging can support effective waste management, as in Italy (Box 3). In the current UK waste infrastructure, compostable packaging may complicate existing waste streams, however the government has proposed that from 2023, all local authorities in England should offer weekly separate food waste collections for households.[27] Stakeholders, including the Bio-Based and Biodegradable Industries Association,[36] suggest that other ways to promote the use of compostable packaging include:

- A consistent UK-wide logo and on-pack information (for example, 'dispose of with food waste').
- Consumer education on using compostable packaging.
- Prohibition of the term 'biodegradable' and enforcement of European standards for compostable packaging.[3]
- Mandating for specific items (e.g. takeaway containers) to be compostable. For example, in January 2017, supermarkets in France were prohibited from issuing single-use carrier bags unless they were compostable.[37] In regions of the UK with food waste collections, the Co-op offer compostable carrier bags, that customers may use to line food waste bins.[38]
- Requiring residents and catering businesses to sort their food waste and compostable packaging, as in San Francisco where recycling and composting is enforced by checks, warnings and fines.[39]
- Investment in more appropriate facilities, including combined composting/anaerobic digestion plants and collection services. Grant schemes could also encourage on-site composters at appropriate locations (Box 2).
- Proposed reforms to the producer responsibility system for packaging could make compostable packaging materials more economically viable if composting was recognised as a form of recycling (see POSTnote 605).

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