

# Alternatives to single-use plastics: Executive Summary

RSM UK Consulting LLP (RSM) in conjunction with Dr Samuel Short (University of Cambridge) and the University of Birmingham Library Services, were commissioned by the Food Standards Agency (FSA) to carry out a rapid evidence assessment of the alternatives to single-use plastics in food packaging and production. This research aims to establish a baseline understanding of the risks and opportunities associated with the use of alternatives to single-use plastics in the food system, identify the main alternatives to single-use plastics, and understand potential future developments in the area.

## Methodology

To undertake this rapid evidence assessment, we searched for relevant academic within two databases (SCOPUS and Web of Science) as well as grey literature from relevant national and international governmental and non-governmental organisations. The results were screened for relevance to the research and overall quality, and gaps in evidence were supplemented with additional articles using a further targeted search. Additionally, two co-production workshops with our expert panel including our academic advisor, representatives from FSA and experts from academic, industry and policy backgrounds were undertaken. Conclusions, evidence gaps and areas for future consideration were triangulated across research themes.

## Findings

Findings from the review were extracted and mapped against each research question. Gaps in evidence were identified, with a lack of available literature for on the trajectory of alternatives development and use, and any potential need to adapt UK food regulation. Evidence related to the role of the FSA was primarily derived from workshops and consultations with the expert panel. Table 1 provides a summary of key findings against each research question.

**Table 1: Summary of findings**

Research question	Key findings
1. What are the single-use plastic alternatives emerging in food production and packaging, and what risks and opportunities do the alternatives pose?	Two broad groups of alternatives were established: material/product alternatives (traditional materials, natural fibres, biopolymers synthesised from biomass, biopolymers synthesised from bioderived monomers, biopolymers produced by microorganisms), and system/process alternatives (reducing, reusing and recycling food packaging and, active and intelligent packaging).

Research question	Key findings
<p>2. To what extent are the alternatives already in use</p>	<p>Market information on the current extent of alternative usage is both limited and inconsistent. There is a lack of evidence to enable a comprehensive assessment of the extent of use for each alternative. To demonstrate the extent of adoption, five case studies have been developed:</p> <ul style="list-style-type: none"> <li>• The London Marathon (seaweed)</li> <li>• The University of Cambridge Library Services (traditional alternatives, biopolymers and Polylactic acid (PLA))</li> <li>• Wagamama UK (recycled materials, cardboard and Crystalline Polyethylene Terephthalate)</li> <li>• McDonald's Europe (traditional alternatives, fibre, edible packaging)</li> <li>• Loop/ Tesco Trial (reusable packaging made from traditional alternatives for example glass and aluminium).</li> </ul> <p>Alternatives brought a number of benefits in each case. However, companies typically encountered a number of trade-offs when introducing alternatives. For example, the majority of McDonald's products are consumed off-site meaning they are dependent on consumers and adequate infrastructure for their recyclable packaging to be of maximum benefit.</p>
<p>3. What trajectory are the alternatives likely to take over the next ten years, in terms of innovation, adoption, spread, and becoming established in the industry, and what are the associated enablers and barriers, including regulatory approaches and policy initiatives?</p>	<p>Global production capacity of bioplastics is anticipated to increase from 2.1 million tonnes in 2019 to 6.3 million tonnes by 2027. This will largely be driven by growth in production of PLA and Polyhydroxyalkanoates (PHAs). Current and upcoming legislation in the UK and Europe will encourage a continued focus on the 3R's (reduce, reuse, recycle) and the circular economy.</p> <p>Enablers to support the growth of alternatives include increased consumer awareness of environmental issues and, existing regulation and legislation. Barriers include established industry regimes, consumer practices, perceptions and awareness, high production cost of bio-plastics, and a lack of available waste management guidance.</p>

Research question	Key findings
<p>4. Are there any changes required to UK food regulation in the context of the alternatives, and if so, what are the potential changes at the legislative, governance, training and enforcement levels?</p>	<p>The application of existing legislation to novel materials which serve as an alternative to single-use plastics is unclear. Clarity is needed with regards to the following factors for new materials: appropriate treatment and disposal of packaging, labelling standards and guidance on how to demonstrate safety of new materials.</p>

Overall, fossil-based plastics are a very cheap, versatile material compared with the alternatives currently being developed and tested. Conventional plastics will probably remain the preferred industry choice for certain applications for the foreseeable future while the alternatives are optimised and scaled into commercial products for application in real world industries. As such, there is a need for caution in driving the transition to more sustainable solutions.

The evidence reviewed in this study suggests that there is unlikely to be one single solution to the single-use plastics problem, and that all alternatives have significant limitations which must be considered. The solution will be a range of materials and systems depending on food type and context. For example, zero packaging may be the most sustainable solution for dry goods, edible films for fresh produce, and biopolymers such as PLA to replace single-use plastics in the take-away industry.