Department
for Environment
Food & Rural Affairs

Sustainable food procurement

Main report

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We work closely with our 33 agencies and arm's length bodies on our ambition to make our air purer, our water cleaner, our land greener and our food more sustainable. Our mission is to restore and enhance the environment for the next generation, and to leave the environment in a better state than we found it.

This project was commissioned by Defra and delivered by WRAP, in collaboration with City, University of London.

WRAP is not-for-profit, working with governments, businesses and citizens to create a world in which we use resources sustainably. Our experts generate the evidence-based solutions we need to protect the environment, build stronger economies and support more sustainable societies. Our impact spans the entire life-cycle of the food we eat, the clothes we wear and the products we buy, from production to consumption and beyond.

The **Centre for Food Policy, City, University of London** is an interdisciplinary centre dedicated to improving food policy worldwide. We explore how the food system really works in practice. We exist to shape a food system that improves the health of people, society, the environment and the economy. What we eat, why we eat it and at what cost are questions of growing importance.

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Abstract

This report is part of the 'Sustainable Food Procurement' (SFP) project. This project aimed to examine the evidence for positive sustainability outcomes – defined broadly as reductions in carbon emissions and other improved environmental outcomes, economic benefits and health benefits – driven by changes to public-sector food services. The project involved a literature review of published evidence relating to sustainable food procurement, focusing on outcomes arising from implementation of public food service reform, wider food-system synergies and lessons learnt from around the world. Building upon the literature review, initial exploratory modelling was undertaken to understand the scale of possible impact which could be achieved by more widespread sustainable food procurement in England. In doing so, it presents original analysis of the scale of public food services, an important update to understanding the size of the opportunity which may have been previously under-recognised.

The rapid evidence assessment identifies the *potential* for food procurement schemes to deliver transformational impacts across both their institutions and the wider food system across multiple sustainability outcomes. In order to achieve this potential, new procurement policies must be successfully implemented and change what food is available and consumed in the institution. How to do this was well evidenced and synthesised into specific recommendations. Evidence of wider food system transformation across the three pillars of sustainability was more limited. Some encouraging positive evidence was identified regarding all three factors with opportunities for synergies, particularly in procurement from smaller producers and serving a menu which has a high share of fruits and vegetables, which has opportunities to provide healthy food with a lower GHG footprint whilst supporting local businesses. However, more work is needed to robustly measure, evaluate and understand how and in which situations and for which outcomes sustainable food procurement schemes can leverage transformational change.

This document is the **main report** and includes the research in considerable detail. It includes Appendices (section 7.0 onwards) detailing the methodology of the project. A shorter **summary report** is available which covers the key findings, including synthesis of findings for policymakers.

1.0 Objectives and scope of work

This research project aims to understand the role of public food procurement in improving sustainability outcomes. Sustainability, here, is understood to encompass the 'three-pillar' conception of environmental, economic and social sustainability.[1] The focus of the project is on *outcomes*, and therefore is interested not just in the idea and logic applied to sustainable food procurement but the evidence of impacts recorded by real-life schemes.[2] In particular, focus is given to where the impacts of SFP schemes have been measured robustly and quantified.

1.1 Research questions

Despite the broad sustainability concept, greenhouse gas emission reduction across public sector food procurement was given a particular focus, reflected in the primary and secondary research questions:

Primary question (RQ1): *What evidence is there about the effectiveness of public sector procurement of food and catering services in reducing greenhouse gas emissions?*

Secondary question (RQ2): *To what extent can public sector food and catering services deliver improved food system and health outcomes, increase sustainability, reduce inequality, support local economic growth and wider socio-economic outcomes in light of Brexit and recovery from COVID-19?*

These research questions therefore cast a broad net, with a focus on the extent to which SFP has been shown to drive change. As the research progressed, the focus on *outcomes* was expanded to include lessons on uptake and implementation, due to the wealth of evidence being identified regarding these areas in the literature identified.

1.2 Approach to project

The project involved many different stages which overlapped and fed into one another. A graphic summarising the flow of work and its stages is presented in Figure 1. In short, the conceptual model (1.3), influenced by the research questions (1.1) and policy background (2.0), fed into the Rapid Evidence Assessment (REA) (3.0), which was the main piece of work. This evidence from this was used to identify sustainability outcomes (3.3 to 3.6), situate these into wider food system synergies and trade-offs (3.7) and identify learnings regarding implementation and uptake of sustainable food procurement (3.8).

A second stream of work was scaling the possible impact of sustainable food procurement in England (4.0). This included original analysis on the size and scale of public sector

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[1] https://link.springer.com/article/10.1007/s11625-018-0627-5

[2] Throughout the report, the terms *outcomes* and *impacts* are used interchangeably to refer to the changes – whether positive or negative – which result from an intervention or programme.

procurement (4.1), which was combined with findings from the REA to explore the possible greenhouse gas impact of public food services (4.2) and possible economic impacts of more localised procurement (4.3). All of this fed into the conclusions, evidence gaps and limitations (5.0).

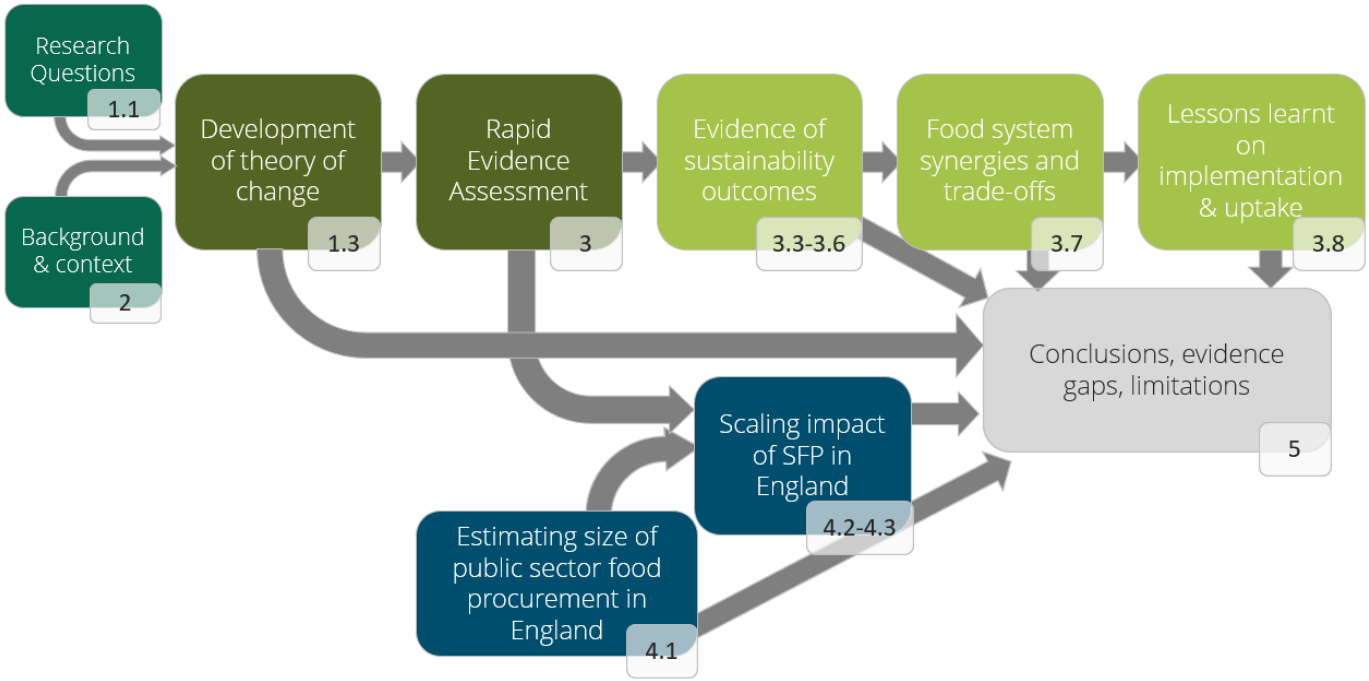

Figure 1: Summary of project stages and their relation. Designed by authors.

1.3 Theories/conceptual models

This section outlines existing definitions of 'sustainable food' (1.3.1) before presenting the theory of change as to how and why institutional procurement can lead to sustainability outcomes (1.3.2), which acts as a framework for understanding what SFP is and how it can have deliver sustainability outcomes across the food system.

1.3.1 Definitions of 'sustainable food'

In 2022, the Food Standards Agency (FSA) commissioned the Centre for Food Policy at City, University of London and collaborative partners to carry out a Rapid Evidence Assessment (REA) on UK citizen, industry and academic perceptions and definitions of food sustainability. The results of this REA highlight that defining 'sustainable' food is a complex issue.[3] It suggests that:

Currently **sustainability** is usually depicted in academic literature as an interaction between three pillars; economy, environment, and society, with human health sometimes being included as a separate pillar or subsumed within 'society', and as something that is in the interest of "future generations". Since the emergence of the UN Sustainable

[3] Reynolds, C., Moore, S., Denton, P., Jones, R., Collins, C.A., Droulers, C., Oakden, L., Hegarty, R., Snell, J., Chalmers, H. and Sieff, A., 2022. A rapid evidence assessment of UK citizen and industry understandings of sustainability-Why our understanding of sustainable food is important when making food choices. https://doi.org/10.46756/sci.fsa.ihr753

Development Goals in 2015, there is a trend in the literature towards increasing focus on how to measure sustainability, and identification of indicators and metrics to assist monitoring, measuring and reporting on sustainability initiatives and interventions.

While the literature recognises food as a leading driver of climate change, papers tend to define **sustainable food** in terms of production and there is a lack of discussion around sustainable consumption habits. 'Planetary boundary' theory and the existence of natural environment limits have emerged as key concepts in the context of sustainable food production. Most papers avoid specifying exact foods that can be considered sustainable, but sustainable food is seen as that which has positive impacts on human and planetary health.

The concept of **sustainable diets** in the literature considers the interplay between food, health, culture and environment. The FAO definition of sustainable diets is drawn upon in many papers, and encompasses human and planetary indicators such as biodiversity/ecosystems, dietary health, access, and safety to guarantee future food and nutrition security while optimising resources.[4] The definition of sustainable diets is evolving to include cultural, ethical and economic indicators, and to recognise that regional cultural and dietary variances may present limitations to a global framework of sustainable diets.

Sustainable food systems are also a key concept in the academic literature, described as complex interacting and interconnected systems generating global food production and supply and being a major contributor to GDP in both high and low-income countries. Sustainable food systems are recognised as having an integral role to delivery of the UN SDGs. Sustainable food systems have the potential to deliver global nutrition demand, ecosystem stability and economic security, while mitigating health issues.

Sustainability metrics and indicators are identified in the literature as key to evaluating social, economic, environmental, and political sustainability. Most indicators in the literature relate to the environment pillar of sustainability, while social indicators are less frequently referenced. Holistic indicators are required to assess sustainability from more than one viewpoint. A limitation of many metrics is their assumed universal applicability, whereas some scholars recognise that metrics needs to be flexible and adjusted to varying socio-economic and regional circumstances.

The contested definition of 'sustainable food' is discussed further in light of the REA evidence in section 3.2.

1.3.2 Theory of change

The research team developed a *theory of change* to articulate 'how' and 'why' reformed institutional food procurement can contribute to improving sustainability outcomes. These were designed before initiating the REA and regularly revised throughout the project in response to the evidence, feedback from the Defra steering group and external review.

The outputs of this process are two graphics which illustrate what is meant by 'sustainable food procurement' and its impacts.

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[4] https://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/522860/

Conceptual model: theory of change

Public food procurement should be considered as embedded in a wider food system. Producers grow food for both public and private markets. Ingredient availability, skills of catering staff and preferences of consumers in public institutions are all intimately connected to the wider food system. These factors shape and are shaped by the decisions of consumers, both those who consume food within a public institution and those who do not.

Public food procurement should also be considered as embedded within the institution itself. In most cases, the serving of food is secondary to the main purpose of a public institution, whether that is education (as in schools), healthcare (in hospitals and care homes), administrative and technical functions (in the civil service) and so on. The concerns of those institutions, including notably budgetary, will impact and be impacted by choices in public food service. These two levels have overlap and are not rigidly defined: those who work, attend and eat food in public institutions are also consumers in their private lives through purchases made in hospitality and retail settings.

Rather than simply being constrained by these systems in which it is embedded, the public food service can influence the institution, consumers of the food service and the wider food system. Influencing these other levels is the objective of 'sustainable food procurement' (SFP) interventions. Figure 2 displays this relationship graphically.

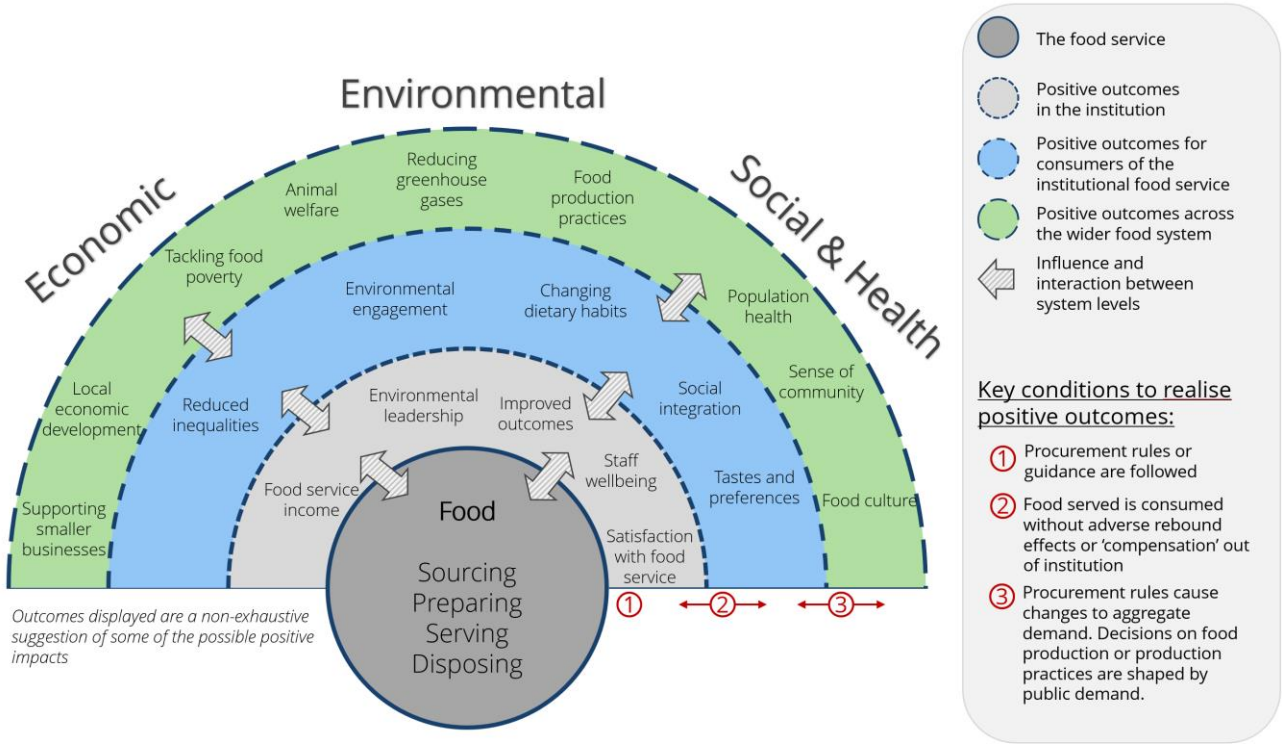

Figure 2: Conceptual model. Designed by authors. Inspired partly by South Lanarkshire Good Food Strategy 2020-2025. [5]

[5] https://www.southlanarkshire.gov.uk/info/200172/plans_and_policies/1793/food_strategy

The central activity which is targeted by SFP interventions is the sourcing, preparing, serving and disposing of food. What food is procured, how it is prepared, served and disposed of are all factors possibly shaped by the food and/or procurement policy of the institution (or local authority, municipality, national government or other responsible body). The food service can then influence the surrounding systems. For example, the food service could positively impact the institution by:

- Improve satisfaction with the food service and consumer numbers, which may in turn impact the income/budget;
- It can improve staff wellbeing (both catering and other staff) and allow the institution to show environmental leadership;
- Improved food service may also contribute to the primary outcomes of the institution, such as improved educational or health outcomes;
- And other There may be other institution-level outcomes; this list is non-exhaustive.

Though positive impacts are the intention of SFP interventions, it should be borne in mind that negative impacts are possible as well: changes could decrease satisfaction with the food service and negatively impact staff wellbeing, for example.

Those food service and institution-level changes could then influence the consumers of food in the institution (students, patients, armed forces, office staff etc.). This could involve things such as:

- Altering the tastes, preferences and dietary habits of those consumers,
- Supporting consumer engagement on environmental or social issues;
- Alleviating food insecurity;
- And other possible consumer-level outcomes; this list is non-exhaustive.

At its widest level, the food system includes the systems of production and consumption which go beyond just what is in the institution. These broad aspects, such as the food culture, influence public procurement as they help shape what food is available and at what price point. How food is grown and how supply chains are structured are similarly aspects of both the wider system which may impact what can be procured. Changes to public procurement could also possibly leverage changes at this level through:

- Changes to food production practices and supporting the existence of expansion of smaller producers and suppliers, contributing to local economic development;
- Improving the health and wellbeing of consumers, which may contribute to altering their tastes and preferences;
- Changes to local economies and consumer tastes could contribute to broader changes in food culture, which may be reflected in private consumption;
- There may be other system-level outcomes; this list is non-exhaustive.

These outcomes could be across any of the three pillars of sustainability, or indeed all three at once where there are synergies, such as changing dietary habits to be both healthier and less environmentally impactful.

The theory of systemic change through sustainable food procurement is therefore to positively impact these systems in which public sector food service is embedded. Just as food service may be initially constrained by the wider systems, successful SFP

interventions could contribute to positive feedback loops: supporting small, local producers may strengthen their market position, making it easier to buy sufficient volumes of food from them in future. Similarly, altering tastes and preferences towards healthier, less-processed foods could feed back into greater demand for public food service to serve healthier foods. In this way, SFP interventions could theoretically be a lever to support positive food system changes.

Due to the complexity of food service embedded in the wider food system and institutional culture, successfully realising the proposed changes is not guaranteed. Three critical dependencies are highlighted in red in Figure 2, which are necessary conditions of public procurement successfully influencing the wider food system:

1. Firstly, the introduction of new rules or guidance on procurement must be translated into meaningful differences on the public plate. This is particularly relevant if procurement policies are set at a level removed from the institution (e.g. a local authority or municipality) and if the institution is constrained by other factors such as workforce or budgetary pressures. It is also related to challenges of availability of supply in the supply chain. In short, the key requirement is realistic procurement policies which can be implemented.
2. Secondly, for public sector food to contribute to positive societal impacts, particularly around environmental outcomes, the public food service must lead to aggregate changes in demand for particular goods. In other words, rather than simply redirecting the same amount of supply from existing niche markets (such as for organic or agroecological produce) to different buyers, the demand of public food must increase the supply of that niche market. This could be either supporting small/niche producers enough that they are able to expand (thereby taking up a larger share of the overall food market) *or* encourage other producers to improve the way they are producing to meet the environmental/social quality the public food service requires. In this sense, it is about encouraging an additional share of UK food production coming from suppliers meeting social or environmental objectives.
3. Thirdly, as with societal impacts, the extent of individual impacts will depend on how consumption of public food and consumption outside of the institution interact with one another. Here, the wider food environment is likely to be important. To realise health benefits, for example, healthy food served in public settings must firstly be consumed rather than wasted, or must not result in consumers seeking alternatives out of the public setting, thereby decreasing the food service customers. The healthy food consumption must secondly not lead to adverse rebound effects out of the institution, such as consumers ‘compensating’ by choosing unhealthier food than they would have done otherwise (e.g. because it has been ‘earned’ by having a healthier lunch in a public institution). Policy coherence between procurement policy and wider food system policies may be necessary to mitigate adverse rebound effects.

This conceptual model overall points towards a complex interaction between food service, institutions and the wider food system. Sustainable food procurement has the *possibility* to act as a lever for positive change in institutions and the wider food system, but realising this is not guaranteed and depends on key supportive conditions. Those conditions may

be influenced by the economic, social and policy systems beyond the scope of procurement policy alone.

Framework for classification of 'sustainable procurement' measures

Another important precondition for understanding 'sustainable food procurement' is what constitutes 'sustainability'. There is a lack of consensus on what 'sustainability' means when it comes to food (see 1.3.1). This manifests in a variety of approaches, often with significant overlap: concepts such as *seasonal* food, *fresh* food, *local* food and food from specific production practices or certifications such as organic, LEAF marque or Fairtrade which signal that a set of agreed standards have been met are often mentioned (this is discussed in light of evidence identified in section 3.2). Such approaches can be considered to focus on *ingredients* sourced.

However, *what ingredients are purchased* is only one question which can be influenced by procurement policy, and public food service as a whole. As is displayed in Figure 3, alongside ingredients, procurement policies can determine various elements regarding equipment, infrastructure and other non-food considerations. These could include, for example, requirements or standards of infrastructure relating to transport, how and where food is prepared (such as if it is offsite, 'cook-chill' production or on-site, 'from scratch' cooking) and the energy efficiency of appliances used. Procurement policies can similarly influence the human actors within the food service, throughinfluencing staff through training and guidance on efficient behaviours to reduce energy and food waste, menu design and cooking skills etc.. Similarly, decisions which influence consumers: how food is communicated about, how it is served, the canteen environment, and with what adjacent activities (educational campaigns, experiential learning, taste tests etc.) is food served.

All of these areas interact and depend on one another: serving *fresh and local* food for example, may necessitate that food is prepared *on-site and from scratch*. Doing so may require *menu redesign* and *support for staff* in preparing such foods. This may go alongside an *educational campaign* for consumers about the food's provenance. As a result, these four distinct intervention areas are highly interlinked. This is discussed in relation to the REA evidence in 3.2.

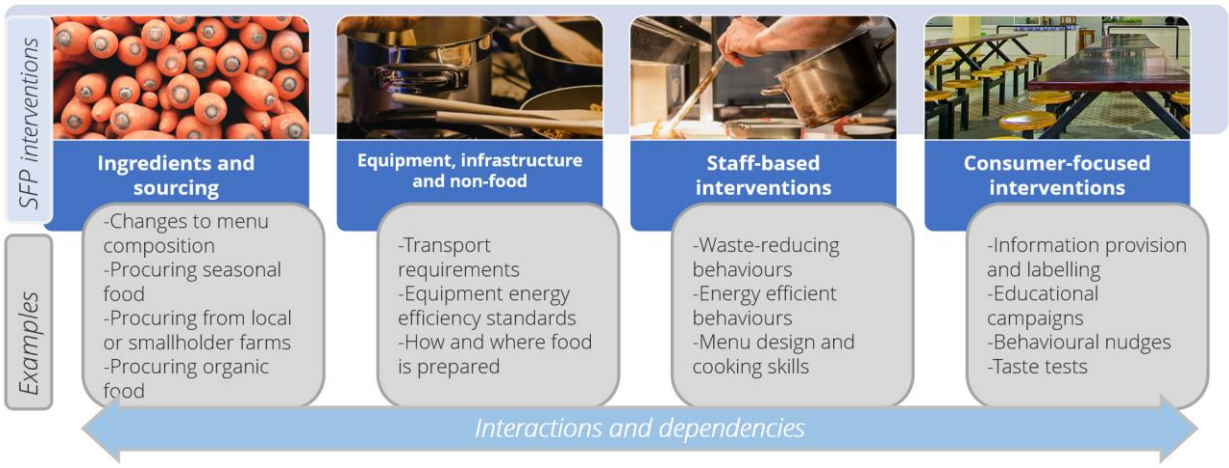

Figure 3: Framework for classification of sustainable food procurement measures. Designed by authors. Photo credits: [1, 2, 3, Unsplash] and [4, CC BY-NC-SA 2.0]

2.0 Background and context

2.1 National background and context

2.1.1 Public sector procurement of food

In 2014 Defra published 'A Plan for Public Procurement', a report dedicated to improving the public procurement process across the UK. [6]The goals of the Plan were to simplify public procurement procedures by providing transparency for businesses to obtain access to government contracts, including small and medium enterprises (SMEs), and ensuring the use of high-quality food and ingredients in the public sector.

To achieve these goals, the Plan detailed new standards and guidelines for food procurement public bodies, with a focus upon economic competitiveness, nutrition, and the production process. The report included a toolkit for public body food procurers to utilise, including a revised Government Buying Standard (GBS) and a 'balanced scorecard' for public procurement. The GBS provides minimum mandatory standards when buying goods and services for government departments, which are encouraged for the wider public sector.[7] The 'Balanced scorecard' helps those buying food and catering services evaluate criteria including sustainability, health and social-economic value.[8]

Other public sector settings have specific standards which offer guidance for procuring food and catering services, such as in schools[9] and healthcare.[10]

More recent political discussions have centred around the public procurement of food due to the UK's departure from the European Union (EU). The 2019 Conservative Party manifesto stated that "when we leave the EU, we will be able to encourage the public sector to 'Buy British' to support our farmers and reduce environmental costs".[11]

Public procurement in the UK is currently governed by a domestic and international regulations. For example, The WTO Government Procurement Agreement, which the UK joined in its own right on 1 January 2021, requires the UK to ensure that products, services and suppliers of any other country or party to the Agreement, be given treatment 'no less favourable' than the UK gives to domestic products, services and suppliers.[12]

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[6] Defra (2014) A Plan for Public Procurement

[7] https://www.gov.uk/government/collections/sustainable-procurement-the-government-buying-standards-gbs

[8] https://www.gov.uk/government/publications/a-plan-for-public-procurement-food-and-catering-the-balanced-scorecard

[9] https://www.gov.uk/government/publications/school-food-standards-resources-for-schools

[10] https://www.england.nhs.uk/long-read/national-standards-for-healthcare-food-and-drink/

[11] The Conservative and Unionist Party Manifesto 2019, Get Brexit done: Unleash Britain's Potential, p.42

[12] Article IV, see: https://www.wto.org/english/tratop_e/gproc_e/gpa_1994_e.htm

2.1.2 National Food Strategy independent review and the Government Food Strategy

In 2019, the UK Government commissioned Henry Dimbleby to conduct an independent review of the food system, which was published in two parts. Part One focused on providing support to the country's most disadvantaged children and highlighted the need to take advantage of the opportunity to transform the UK's trading operations and utilise the UK's sovereignty, protect high environmental and animal welfare standards and ensure prospective deals are subjected to independent scrutiny.[13]

Part Two of the National Food Strategy was published in July 2021 and laid out a comprehensive plan for transforming the food system. The report stated that change is required at all levels, with the need for structural, cultural, local, and individual transformations. It also set out a systems approach that recognises the complexity of the food system and the need to understand and address trade-offs. The four strategic objectives in the report were:

- Escape the junk food cycle and protect the NHS;
- Reduce diet-related inequality;
- Make the best use of our land;
- Create a long-term shift in our food culture

Alongside some school-specific recommendations is 'Recommendation 13. Strengthen Government procurement rules to ensure that taxpayer money is spent on healthy and sustainable food', with recommendations including reforms to the Government Buying Standards for Food (GBSF), prioritising quality before cost, rolling out of dynamic procurement for food and offering accreditation such as the existing Food for Life certification.

In the same year as the National Food Strategy part two, the House of Commons Environment, Food and Rural Affairs (EFRA) select committee conducted an inquiry into public sector food procurement.[14] It similarly recommended changes including: updating the GBSF; supporting domestic producers and SMEs; making standards mandatory across the entire public sector;and making improvements to monitoring compliance of public bodies.

In June 2022 the Government published the Food Strategy which set out a plan to transform the food system to ensure it is fit for the future. It takes on the majority of Henry Dimbleby's recommendations and builds on the work that is already underway in relation to the Agriculture Act (2020), Agricultural Transition Plan, Fisheries Act (2020), Environment Act (2021), and Levelling-Up White Paper.

The strategy committed to leading by example with public procurement, outlining a vision that public sector food and catering should be an exemplar for wider society, delivering positive health, animal welfare, environmental and socio-economic impacts. As a first step

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[13] The National Food Strategy: Part One

[14] https://publications.parliament.uk/pa/cm5801/cmselect/cmenvfru/469/46902.htm

in delivering this vision a consultation was launched in June 2022 on public sector food and catering policy. The consultation, running for 12 weeks, set out proposals for:

1. New guidance principles on fair and transparent procurement
2. Changes to the Government Buying Standards for food and catering services
3. New data reporting requirements

2.1.3 Local and municipal procurement

NAs well as national rules, local and municipal governments can play a significant role in the procurement of food. The GBS for food are voluntary for non-central government departments, so local governments can choose whether to apply them or not. This offers flexibility for local governments who in some cases define their own objectives and strategies either within or beyond the GBS.[15] The exact scope of the rules will depend on those specific localities and services they provide, such as whether schools are local-authority run or academies.

Local and municipal procurement is also prominent in other countries, where city-specific food and procurement policies may exist. Many of the examples cited in the evidence assessment (section 3.0) are case studies from specific cities or authorities in Europe, for example.

2.1.4 Existing voluntary standards

Food for Life

Further efforts devoted to building a better food system include the work of the Soil Association and its Food for Life programme. The Food for Life programme promotes healthy and sustainable eating and the importance of understanding how food is sourced, grown and cooked. Engaging with schools, nurseries, hospitals and care homes, the programme helps to develop knowledge and skills across the community to initiate long-term change.[16] Food for Life can be 'commissioned' by local authorities to support settings within specific areas to improve their food procurement.[17] The Food for Life Served Here certification is awarded to catering institutions and helps them monitor how food is sourced, cooked, and promoted. More than 2 million meals are served every day which are Food for Life quality, including around half of English primary schools, over 50 NHS hospitals and over 50 universities.[18]

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[15] Some examples of local procurement strategies include Durham Country Council (https://www.durham.gov.uk/media/37607/Sustainable-Buying-Standard-Food/pdf/SustainableBuyingStandard-Food.pdf?m=637836276715530000) and Bristol City Council (https://www.bristol.gov.uk/files/documents/860-good-food-and-catering-procurement-policy-framework-2018/file)

[16] Food for Life, Welcome to Food for Life

[17] https://www.foodforlife.org.uk/commissioners

[18] UK Parliament. (2021). Written Evidence submitted by The Soil Association. UK Parliament. Available at: https://committees.parliament.uk/writtenevidence/9028/pdf/

Other standards and assurance schemes for produce

Various other standards and schemes exist which assure food products, including their quality, provenance or supply chain factors. Compliance with such schemes assures consumers and businesses about the standards and practices of the food they buy. These include, but are not limited to, international standards including Fairtrade, Marine Stewardship Council and the European Union organic logo as well as certification and assurance schemes and initiatives including LEAF Marque, Red Tractor and RSPCA Assured. Procurement standards can align with these product standards by requiring purchases of specific products only from certified production.

Though these are voluntary, many businesses and public sector organisations require suppliers to comply with assurance schemes. Many of such standards are not exclusive to catering but will be well-known certifications applied to consumer products.

2.1.5 Aims of Defra

Government is adopting an ambitious and transformational approach to public sector food and catering. Defra's vision is that public sector food and catering is an exemplar to wider society in delivering positive health, animal welfare, environmental and socio-economic impacts. Defra wishes to understand how public sector procurement of food and catering services could deliver on this vision . This includes understanding how public food and catering procurement can improve sustainability outcomes, how the public sector could be encouraged to source healthy, sustainable, and locally produced food and be a lever to mitigate climate change.

2.1.6 Consultation

In June 2022, Defra launched a consultation on public sector food and catering policy, including the Government Buying Standards for Food and Catering Services. The consultation is seeking views on ways to promote local, sustainable, healthier food in the public sector, open public sector procurement to a wider range of businesses and increase the transparency of food supply chains. Defra will use this research, together with the consultation and other stakeholder forums to inform future public sector food procurement initiatives.

2.2 International background and context

2.2.1 The United Nations

Within the objectives of the Sustainable Development Goals (SDGs), the United Nations (UN) advocates for action on sustainable public procurement and public sector food procurement for the realisation of the right to food, alleviation of hunger and empowerment of rural communities. Often this is in the context of low- and middle-income countries. Some notable contributions include:

2.2.1.1 SDG Target 12.7

This target aims to 'Promote public procurement practices that are sustainable, in accordance with national policies and priorities'. This target is measured by an indicator of number of countries implementing 'Sustainable Public Procurement policies and plans', for

which the first data collection exercise was undertaken in 2020-21.[19] Within this first data report, food, catering and vending machines was one of the most common product categories for green public procurement criteria, with 58% of responding governments indicating having criteria for at least one type of product or service in the category.[20]

2.2.1.2 Public Procurement and the Right to Food

In 2014, Olivier De Schutter, then United Nations Special Rapporteur on the Right to Food, published *The Power of Procurement: Public Purchasing in the Service of Realizing the Right to Food.* De Schutter identifies five key principles that are essential for public procurement policies and approaches. Such policies should:

- Source from small-scale food producers and actively empower them to access tenders;
- Guarantee living wages and fair remunerative prices along the food supply chain;
- Set specific diet requirements for adequate food diets;
- Source locally and demand from their suppliers that they produce food according to sustainable methods;
- Increase participation and accountability in the food system.

It is also recommended that to maximise the effectiveness of public procurement schemes and programmes, it is essential that policymakers fully integrate these under the right to food national strategies and framework rules and collaborate with other food security policies.[21]

2.2.1.3 Public food procurement for sustainable food systems and healthy diets

In 2021, the Food and Agriculture Organization of the United Nations (FAO) published *Public food procurement for sustainable food systems and healthy diets,* to at build the knowledge base around on Sustainable Public Food Procurement and also encourage a transformation within the food system.

The report aimed to enhance understanding, dissemination, and the use of public food procurement as a development tool, particularly in relation to school meals programmes. It presented evidence on how public food procurement can help to deliver a range of benefits for multiple beneficiaries. Stated favourable outcomes from public food procurement included providing a market for local and smallholder farmers, promoting the conservation and sustainable use of agrobiodiversity, and improving the nutritional health and well-being of children and communities.[22]

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[19] https://www.unep.org/explore-topics/resource-efficiency/what-we-do/sustainable-public-procurement/sdg-127-target-and

[20] UNEP 2022: '2020/2021 Data collection for SDG Indicator 12.7.1'. Accessible here: https://wedocs.unep.org/bitstream/handle/20.500.11822/37967/SDG.pdf

[21] De Schutter, (2014). The Power of Procurement: Public Purchasing in the Service of Realizing the Right to Food.

[22] FAO, (2021). Public food procurement for sustainable food systems and healthy diets - Volume 1

2.2.2 The European Union

The European Commission has also identified Food and Catering Services as a key group of goods, services and works (referred collectively as products) with the potential to achieve significant environmental improvements in the public sector. This is primarily due to the product group accounting for a high proportion of public purchasing and the large development potential for environmental performance.

In a 2008 publication, the Commission defined Green Public Procurement (GPP) as "…a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured" [23].

Public authorities can reduce the environmental impact from their actions by selecting products to purchase that hold a lower environmental impact. However, GPP is voluntary, therefore Member States and public authorities can control the degree to which it is implemented.

Criteria for EU GPP were developed to support public authorities to ensure the products they require are procured and implemented in a manner that reduced their environmental impacts. The EU GPP criteria published in 2019[24], has sought to find a balance between environmental relevance, cost considerations, market availability and ease of verification.

EU GPP criteria must be verifiable and should be composed for different stages of the procurement process. The criteria options include 'Selection Criteria', 'Technical Specifications', 'Award Criteria' and 'Contract Performance Clauses'. Some examples of core criteria include:

- Organic food products;
- Marine and aquaculture food products;
- Animal welfare;
- Fair and ethical trade products;
- Environmentally responsible vegetable fats;
- Food and beverage waste prevention.[25]

[23] European Commission, (2008). COM (2008) 400 – Communication Public procurement for a better environment

[24]European Commission, Food procurement, Catering Services and Vending machines product group.

[25] Others can be viewed in: European Commission (2019), EU GPP criteria for food procurement, catering services and vending machines – Final Technical Report.

3.0 Rapid evidence assessment

A literature review in the form of a Rapid Evidence Assessment (REA) was carried out, with a specific focus on analysing the nature and extent of evidence relating to the *outcomes* of sustainable food procurement and related schemes (SFP-related schemes). A brief overview of the methodology is presented in section 3.1, with a much more detailed account including limitations as an appendix to this report (7.0). This is followed by a section with an overview of the how SFP-related interventions are conceptualised in the literature (3.2). The primary outcomes of interest related to greenhouse gas emissions reductions (3.3), other environmental impacts (3.4), changes to consumer health (3.5) and societal economic impacts (3.6). Themes identified in the REA are then connected to wider food system effects (3.7). As the research progressed, evidence suggested that achieving the professed outcomes of SFP-related schemes was highly dependent on their successful implementation. Lessons learnt about implementation were identified in the literature; these are discussed in section 3.8. Evidence gaps related to the REA and the wider project are discussed in 5.0.

Throughout sections 3.0, 4.0 and 5.0 a mixture of in-text references and footnotes are used. In-text references are papers identified through the literature review searches, for which a bibliography is provided in section 6.0. Footnotes present other relevant, contextual information and links for further reading. Further information and reading on specific examples which are regularly cited can be found in the 'key case studies' appendix (7.0).

3.1 Methodology

The project aims to understand the role of procurement in improving sustainability *outcomes*, with a definition of sustainability which encompasses environmental, economic and social outcomes in line with the research questions (see 1.1). The central part of this process was the undertaking of a rapid evidence assessment (REA) to understand the extent and nature of evidence relating to these research questions. The REA followed Defra's REA guidance.[26] A brief graphical representation of the method is presented in Figure 4 with. Full details of scope and evidence overview is? outlined in an appendix (section 7.0).

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26 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/560521/Production_of_quick_scoping_reviews_and_rapid_evidence_assessments.pdf

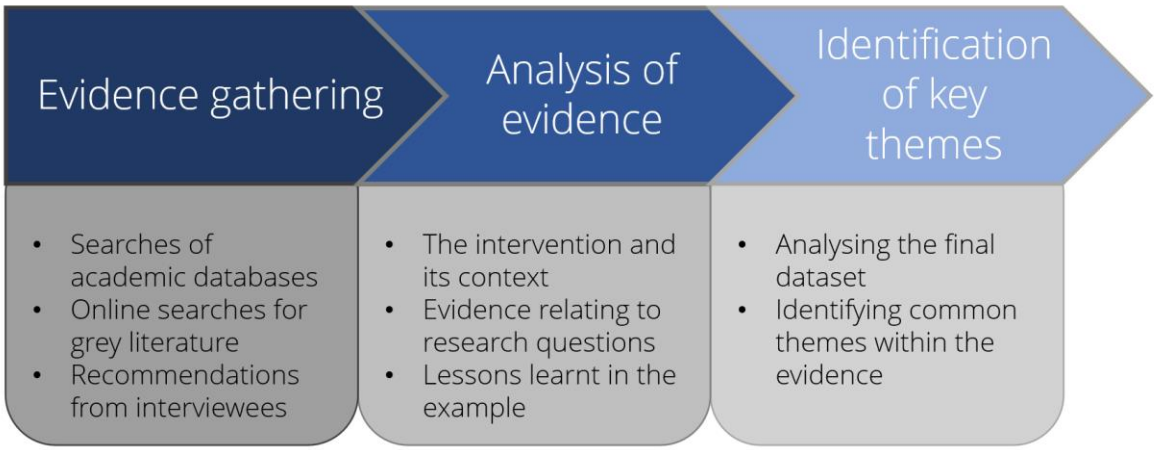

Figure 4: Graphical summary of methodology. Designed by authors.

Searches of academic databases returned nearly 1,000 unique results. Over 1,500 unique web results were additionally considered for grey literature. After screening for relevance, a total of **206 papers** were included in the final dataset. 126 came from academic literature and 80 from grey literature publications.

Each paper included was coded for information including the country or countries covered in case studies, the intervention and evidence relating to outcomes, as well as critical appraisal where evidence was likely to contain biases. Detail on the scope of the evidence and critical appraisal are covered in the methodological appendix (7.0).

3.2 How SFP-related schemes or interventions are conceptualised in the literature

Considering the framework for classifying sustainable food procurement interventions (see Figure 3), we can broadly think of SFP as targeting one, or multiple, of four key areas:

- The *food and ingredients* which are purchased, the production methods and inputs to produce this food and composition of meals then served;
- The *equipment and infrastructure* used to transport, prepare and serve this food;
- The *staff* who are tasked with the sourcing and preparing food (their actions and decisions);
- The *consumers* who purchase and eat the food (their actions and decisions).

Most of the evidence collated was found to relate to the *food and ingredients.* This is to be expected: food is the cornerstone of a meal service. It is consistent with the framework offered by Swensson et al. (1,2) of public food procurement, that it is used to determine three things: (a) 'what food will be purchased?' (e.g. local, diverse, nutritious, healthy) (b) 'from whom?' (e.g. local producers, family farms, SMEs, women) (c) 'from which type of production?' (e.g. organic, more sustainable).

Beyond this, however, there is substantial variation in what is considered 'sustainable' food. The most common criteria referenced were: **local** food, **organic** food,

fresh/seasonal food, **healthy** food and **low-carbon/plant-based**[27] food. Other elements with significant overlap but less commonly mentioned included factors such as certification schemes, whether organic or otherwise (such as certified seafood, Fairtrade teas, coffees and chocolate and so on), higher animal welfare, being from smallholder or family farms, explicitly biodiverse or underutilised ingredients.

These criteria are, to a large extent, overlapping and complementary to one another, and were mostly presented together, such as expressed objectives to purchase local, seasonal and organic food. 'Healthy food' was the only criterion regularly identified without reference to other criteria. This is likely to be due to two main factors: (a) papers documenting nutrition standards which are less directly concerned with environmental or social sustainability, and (b) that 'healthy' food may be considered an implicit by-product of procuring otherwise 'sustainable' (e.g. organic, seasonal, low-carbon) foods, so 'healthy food' may not be a stated objective but is could be an expected outcome.

This suggests that **generally speaking, there is a shared, broad notion of what constitutes 'sustainable' food: fresh, seasonal, locally-procured, organically-grown, with 'less but better' meat and healthy, vegetable-rich recipes**, though definitions of these concepts may vary from place to place.[28] However, the identified criteria do not always go hand-in-hand: 'local' food is not necessarily low-carbon for example[29]; likewise, a meal can have a lower carbon footprint without being healthy[30]; organic food can be distributed through conventional, large supply chains and so on. In some ways, the schemes are united by defining themselves *against* a perceived status quo of 'conventional' or 'industrial' food. In this sense, the terminology used by the Strength2Food project (3) of "alternative" public sector food procurement models is a useful concept, with the way in which a scheme is 'alternative' varying by location. For this project, looking at broadly-defined 'sustainable food procurement' (SFP), the terms SFP or '**SFP-related scheme**' are used as an umbrella term to refer to public procurement schemes which are in some way 'alternative' or 'values-based', targeting broad sustainability and health outcomes.

Implementing holistic SFP-related schemes

As identified in the conceptual models (1.3.2), SFP-related schemes are not just about ingredients and their production. Procurement-related interventions can similarly address *how food is distributed, prepared and served* (see Figure 3). Approximately one-fifth of papers explicitly contained interventions which in some way or form addressed each of

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[27] This category is used as a catch-all term for a variety of approaches specifically designed to reduce carbon emissions: this includes increasing the amount of vegetarian food cooked and sold, limiting the amount of meat which is purchased, blending proteins and any other approach which focused on the carbon footprint of food.

[28] For a summary of contested 'less but better' meat definitions, for example, see: https://www.nature.com/articles/s43016-022-00536-5

[29] https://ourworldindata.org/food-choice-vs-eating-local

[30] A recent study of supermarket food products showed a relatively low footprint for chips, condiments and fizzy drinks, for example: https://www.pnas.org/doi/full/10.1073/pnas.2120584119

these key intervention areas. By addressing multiple areas, an SFP-related scheme could be considered more holistic (Figure 5).

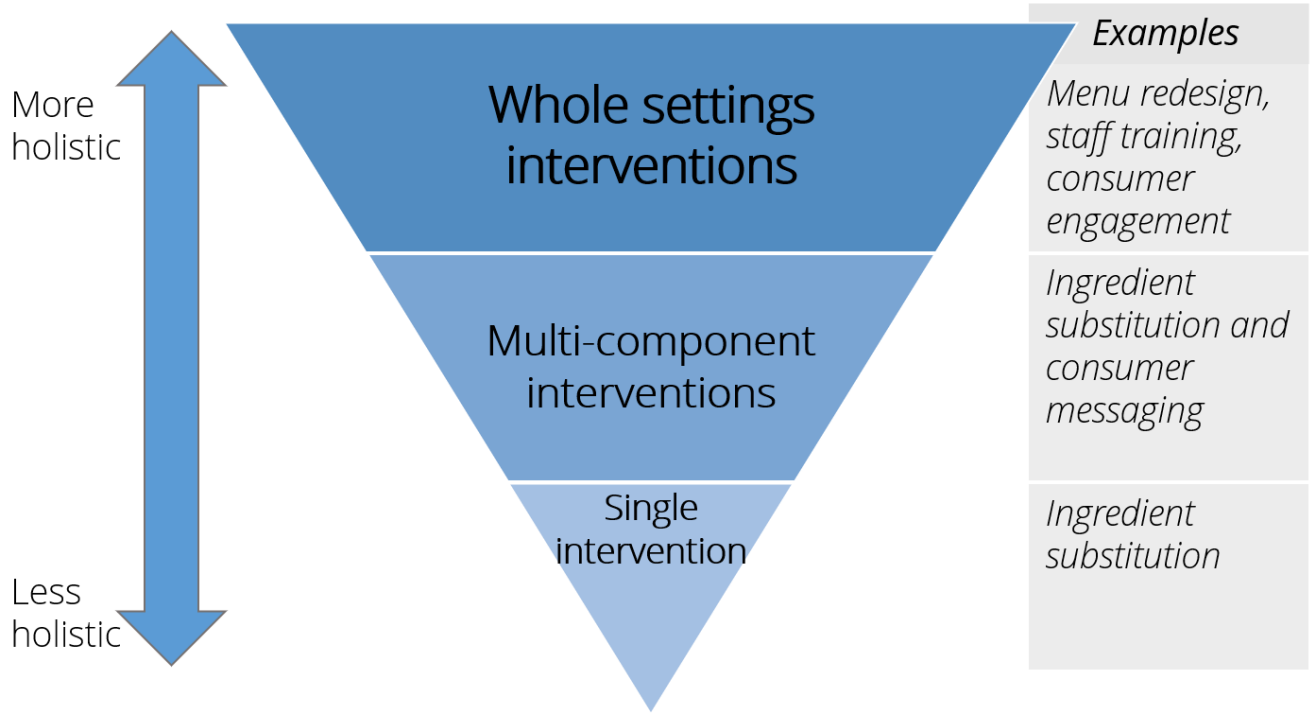

Figure 5: Schema of SFP intervention scope

Less holistic interventions look exclusively at a *single intervention* area, such as substituting ingredients for those which met a set criterion, such as organic certification or lower salt content, but otherwise keeping the meal service as similar as possible. *Multi-component interventions* would tackle multiple areas at once: introducing local ingredients alongside a messaging campaign for customers about food provenance, for example. A *whole-setting intervention* (to borrow the terminology used by Food for Life) is more holistic, recognising the complex interactions between the food which is procured, the way it is prepared and the choices of staff and customers. Such an intervention may leverage the change in procurement strategy to enact wider shifts in culture and values. More holistic interventions may better address the potential barriers identified in the literature (this is discussed in section 3.8).

3.3 Key themes: greenhouse gases

The primary research question of the REA (see 1.1) was determining the extent and nature of evidence relating to the reduction of GHGs from public-sector food procurement. It should be noted that the topic of GHGs and food *outside* of the context of public procurement is widely discussed and many of the principles raised or conclusions drawn from that literature is relevant when considering SFP-related schemes. However, the scope of this research was to look directly at evidence *from* SFP-related schemes on GHG outcomes. These themes should be considered in the context of what is known about food systems' climate impact more broadly, particularly that most food system emissions come from primary production and associated land use rather than supply chains and

distribution.[31] The results are summarised in Table 1 and discussed in more detail in subsequent sections.

Table 1: Summary table - greenhouse gases

Thematic area	Key messages
Audits of public-sector food procurement GHG footprints	Most audits of meal footprints found were in schools. Across various countries and settings, they generally point to between **1-2 kgCO_2e** per meal, although adult meals and their footprints may be larger.
	Food production is consistently the largest driver of carbon footprint, broadly averaging to **70%** of the total impact.
	Where energy use emissions were quantified, they were highly variable, and will be largely context-dependent. In some circumstances, energy-inefficient cooking could be an emission hotspot.
	Where food waste is more substantial, reducing it presents a clear opportunity for emissions reduction. Where less efficient waste management practices – such as landfills – are used for food waste, disposal-related emissions can be significant, so diverting waste to better management can be an opportunity.
Quantification of interventions in public-sector food procurement	Modelling of food-service interventions suggest that **changing *menu composition*** and ***production practices*** offer the two largest opportunities for emissions reduction. These include using less meat and purchasing organic or otherwise sustainably-produced food.
	A substantial number of claimed emissions reductions from past interventions have poorly evidenced methodologies, often in case-study-type publications.
Transport and the role of 'local' food	Generally, **transport** represents a small share of food service emissions (around 10%). As a result, switching to local food procurement often has a **small impact** in terms of food service GHGs.
	Local suppliers do not necessarily guarantee lower transport emissions. The efficiency of the supply chain is crucial in realising transport benefits. Many deliveries by smaller suppliers may in fact increase the distance travelled. **Logistics is key**.
	Generalisations about the environmental benefits of 'local' food, therefore, are unhelpful.

[31] See, for example: https://www.nature.com/articles/s43016-021-00225-9 or https://essd.copernicus.org/articles/14/1795/2022/

	However, local food is a key objective for many stakeholders. Focusing only on GHGs may overlook other, **more holistic sustainability benefits of short supply chains** due to the possible correlation of local food and seasonal, healthy, less meat-intensive menus.
Common use of generalised statements	Publications around SFP often rely on generalised statements about the carbon benefits of their schemes. In some cases, such as with local food, this may overlook nuances.

3.3.1 Audits of public-sector food procurement GHG footprints

One of the most common references to GHGs in the literature was in the form of *audits* or quantifications of the 'carbon footprint' associated with a public meal service. Such publications do not necessarily look at the possible carbon *savings* of specific interventions, such as procuring food from a particular mode of production. In some cases the papers use the results of a carbon audit for the purposes of modelling and evaluating possible interventions, or the difference in footprint between specific types of meals (see 3.3.2). In other cases however, the audits are used to form a baseline for future policy, or simply to understand the impact associated with public meal service. The findings of these papers offer some valuable insights around the approximate carbon footprint of school meals, where it is most regularly measured, and from this an insight into which stage of the food supply chain is most relevant.

Most Western school meal services footprints are approximately 1–2 kgCO_2e/meal

The evidence base identified includes carbon footprint analysis of school meals in England (4,5); Italy (6–10); Ames, Spain (11); the USA (12) and across multiple European countries (13–15). Meals or food service in other municipal settings have similarly been analysed including public catering in Helsinki, Finland (6,8,16); public healthcare in England (17) and a university in England (18). Comparable audit-style publications would likely be identified by more expansive or targeted searches and could be complemented by information from non-public-sector food service settings.

Making direct comparisons between the estimates presented in the identified literature can be difficult. Variations between food service footprints can be driven by a number of factors including the composition of meal served; the nature of the food service; the size of the meal; the amount which is wasted as well as country- and time-specific factors such as the method of waste management or energy intensity of electricity or transport fuel. Such factors, notably the size of the meal, are often not presented alongside results. Furthermore, different analyses can have different boundaries: the measurement of the carbon footprint up to the point of meal service ('cradle-to-plate') could be quite different to a 'cradle-to-grave' analysis which includes waste treatment if that waste treatment is a less carbon-efficient method, such as landfilling, and food emission factors may or may not include upstream effects such as land use change.

As a result of these variations, the differences identified in the literature should not be over-emphasised, as they may be driven by methodology, scope or context which is not always clear from the detail provided in publications. Despite this, a broad trend can be identified across the evidence where the carbon footprint of a school meal service has been calculated: roughly **1–2 kgCO_2e/meal** was regularly reported in the literature identified. One literature review suggested that school canteen meals could vary between 0.134–13.2 kgCO_2e per meal (15), but the evidence identified here suggests that the normal range is more constrained.

To contextualise these figures: WRAP estimates the consumption-based emissions of the UK food system to be approximately 158 mtCO_2e[32] in 2019 which, using UK population figures comes to an average of approximately 6.5 kgCO_2e per person per day. Bearing in mind that most of the estimates of 1–2 kgCO_2e come from school meals, and **adult meals may be larger and therefore have a larger footprint**, this is broadly commensurate with around one fifth to one-third of daily food-related emissions coming from each meal eaten in public food service. However, based on the food production boundary presented in the EAT-Lancet commission on sustainable diets[33], if divided equally amongst the global population the 'planetary boundary' points to around 1.8 kgCO_2e per person per day.[34] In this case, a single meal from the current school meal services in industrialised countries accounts for almost an entire day's food-related 'budget' of GHGs. This suggests that substantial reductions in GHGs are possible and necessary.

Production is consistently the largest driver of carbon footprint

Despite possible differences in scope and limited comparability between the estimates identified, where the meal service footprint is broken down into the share by supply chain stage some broadly consistent trends can be identified. Primary production in all cases where it was measured accounted for the majority of the meal or ingredient footprint, broadly **averaging to around 70% of emissions**, but rising as high as 95% of GHG footprint in some cases (7). This is broadly consistent with other global estimates which suggest that approximately 72% of global food-related emissions come from land-use change and primary production, although this is a bit lower (c. 57%) in industrialised countries.[35] Recent estimates of UK consumption-based emissions by WRAP also point to around 66% of emissions coming from primary production and imports.[36]

By contrast, the share of food service emissions attributed to transport was in most cases much lower. In some cases, such as Helsinki, it was suggested that logistics played a very small part – as low as 1% of the total footprint (16) – but **values of around 10%** and up to 20% were more common. This is, again, consistent with estimates that in the wider food

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[32] https://wrap.org.uk/resources/report/uk-food-system-ghg-emissions

[33] https://eatforum.org/eat-lancet-commission/eat-lancet-commission-summary-report/ Table 5

[34] See also: https://www.mdpi.com/2071-1050/12/4/1407/htm

[35] See Figure 3.: http://www.nature.com/articles/s43016-021-00225-9

[36] https://wrap.org.uk/resources/report/uk-food-system-ghg-emissions Note that the report breaks this further down into specific supply chain parts, but this can be calculated from the 2019 figures in Table A2.

system of industrialised countries, transport may account for approximately 10% of emissions.[37] One analysis of five different European countries found that downstream transport (i.e. from supplier to school) “generally contributed only a modest proportion of total emissions” (13). The case of transport is discussed in more depth in section 3.3.3.

Other sources of emissions such as direct energy use in kitchens were identified in a small number of papers with highly variable results: anywhere from 8% (11) to 41% (16) of the food service. Again, possibly differing scopes and different context – such as whether food is prepared from scratch or using pre-prepared or highly processed products – limit attempts at generalisation. In circumstances with inefficient cooking methods and carbon intensive energy generation, this could be a substantial hotspot, but more research is required to understand in which settings.

Some publications specifically quantify the GHGs associated with food waste. Wasted food has two ‘footprints’: there are the *disposal* emissions of waste, which are emissions associated with treating or disposing wasted food (quantified in (13,14,19)) and there are the *embodied* emissions of waste, i.e. all of the production, transport and processing emissions associated with food which is not then eaten (discussed in, for example, (9,20))..

Disposal emissions can be highly variable between locations, dependent on the technologies used to treat waste. This is well illustrated by a cross-country analysis in Europe (13): where low-carbon methods such as anaerobic digestion, compost or using surplus as animal feed is practised, disposal accounted a small part of emissions, whereas where landfills were more common, the waste disposal could account for as much as one-third of supply chain emissions. In Greece, for example, waste disposal emissions were suggested to be as high as 0.48–0.66 kgCO_2e/meal (13,14) due to widespread use of landfills. Entire meals could be served with a smaller carbon footprint than these disposal emissions alone (see 4.2.3).

Embodied emissions will vary based on the emissions associated with the meal service. It is notable that some of the highest carbon footprints identified (e.g. Greece, (13) and USA, (12)) also reported very high rates of waste. Regardless of the carbon intensity of a meal or recipe, the growing, transporting and cooking of food which isn’t consumed represents emissions which served no nutritional or other purpose and could therefore have been avoided. Whilst the rate of food waste will vary between institutions and meals, reducing waste as much as possible is a clear avenue for reducing the footprint of public meal services.

3.3.2 Quantifications of interventions in public-sector food procurement

Alongside the detailed audits of the carbon footprint of public-sector meal services (3.3.1), many of the publications identified presented a quantified reduction in carbon emissions associated with some intervention in the food service.

[37] See Figure 3.: http://www.nature.com/articles/s43016-021-00225-9

Modelling possible interventions

Often, audits (see 3.3.1) formed the baseline and insight for subsequent modelling of interventions or changes. These include analyses of specific interventions in specific circumstances, such as:

- Changing the menu composition of snack meals served in Denmark to the 'better' half of existing recipes, which could lead to a 40% reduction in GHGs (21);
- Switching five common fruits and vegetables used in Turin, Italy's school meal service to integrated or organic production, which could lead to a footprint reduction of 26% for those products (7);
- Removing unnecessary vending machines and encouraging energy efficiency improvements in the tender process of an Italian university reducing energy-related emissions of vending machines by 22.9% (22);
- Not producing or purchasing any food which is subsequently wasted in a US school meal service, which was estimated as leading to a possible 47% reduction in emissions (12).[38]

Studies identified in the context of British public procurement included an analysis of primary school meals which **suggested that healthier meals** (defined by salt, saturated fat and sugar levels) have, on average, a **carbon footprint about one-third less than unhealthy meal**s (5). Despite lower averages, a substantial range was observed for both meal types and so results may not be generalisable to all meals. A detailed analysis of carbon footprints associated with English school meals is presented in (4) which suggests an average carbon footprint of 1.06 $kgCO_2e$/meal.[39]

Two particularly in-depth studies on the relationship between SFP-related schemes and carbon footprints are to be found in Italy (19) and Spain (11), both in relation to school meal services. These studies, as well as being detailed audits of the hotspots of emissions in school meal services (see 3.3.1), are useful in that they compare multiple possible interventions in a single model. This allows for greater comparability than looking at multiple different calculations in different locations, possibly with different scopes and methodologies.

Some of the headline results are summarised in Table 2. Note that the interventions described between the two papers may be similar in direction but have different scopes or specific nuances. The purpose for their comparison is to be broadly illustrative of possible reductions, and the relative impact between them. What these pieces of evidence suggest

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[38] Note that this particular estimate was made in the context of very high waste rates, in which as much as 54% of what was purchased was wasted at some stage in the meal preparation and service. It also estimates a theoretical alternative in which absolutely nothing is wasted. Whilst meal services can become very efficient, perfect efficiency is not really feasible and so this should be treated as an theoretical maximum-case reduction.

[39] Despite using the same data source, there is a notable difference in average meal footprint estimated by (5) and (4) The reasons for this discrepancy are explored in (4) and, based on this, the preferred values used in section **Error! Reference source not found.** are those from (4). This is detailed further in the methodological appendix (section 10.0).

is that for school meals, the biggest possible scopes for emissions reduction come in changing *production practices* and *menu composition*, i.e. two aspects which relate to production, rather than distribution or processing which represent much smaller (though not negligible) opportunities.

Table 2: Estimated GHG reduction by SFP intervention in school meals.

Intervention*	% GHG reduction in (19)	% GHG reduction in (11)
Organic production	6-11%	15%
Changing menu composition	20%-32%	7-11%
Procuring locally	<1%	2-5%
Renewable energy	4.8-6%	2%
Food waste recycling	3%	n.a.

Note that interventions have been grouped, but the specific scope of the intervention differs between studies. They are presented together just for broad, illustrative purposes.

For *production practices*, adopting 50% or 100% organic procurement in Italy was estimated to reduce the meal footprint by 6 to 11% respectively (19), and 65% organic procurement calculated as reducing the GHG footprint in Galicia, Spain by as much as 15% (11). The feasibility of achieving these benefits may also be influenced by local climate, so results are not necessarily directly translatable to the UK.

Where *menu composition* has been modelled, switching to a pescatarian or vegetarian menu has been suggested to reduce meal emissions by 20% to 32% respectively in Italy (19), with the publication from Spain indicating that switching 50% of beef to inshore (local) fish could reduce emissions by 7%, or swapping 30% of meat and fish for legumes reducing emissions by as much as 11% (11).

There are possible synergies between these strategies, combining organic or seasonal production and lower-carbon menus: a fully organic pescatarian menu was modelled in Italy as leading to a 29% reduction, a fully-organic vegetarian menu reducing emissions by as much as 42% (19). These results are presented in Table 3. These suggest that menu composition change is, by itself, a more significant action than method-of-production change alone, but both are complementary.

Table 3: Matrix of GHG reductions by menu and production type. Adapted from (19).

	Standard menu	Pescatarian menu	Vegetarian menu
Conventional	0%	-20%	-32%
50% organic	-6%	-24%	-37%
100% organic	-11%	-29%	-42%

By contrast, reduced transport distances through local procurement and improved logistics were indicated as reducing emissions by approximately 1% in Italy (19) and 2% in Spain, with a 5% reduction possibly coming from the use of local, inshore fish (11). Use of renewable electricity within the school similarly was estimated at around 5% in Italy and

2% in Spain, although in the latter a 50% green tariff was modelled, so a fully renewable service would likely be around a 4% reduction (11).

The importance of *production methods* and *menu composition* is further supported by a study across five European countries which quantified the carbon footprint of meals between *local* (LOC) and *low-cost* or conventional (LOW) meal services.[40] The emissions per meal from this analysis are presented in Figure 6: whilst local meal services did have smaller footprints than conventional meal services in all cases, the variation between countries was in most cases more significant due to variance in national cuisines (both composition and size of dish) and infrastructure, such as methods of waste treatment. Notably, however, the authors point out that the **carbon footprints "depended more on the composition of meals rather than where foods came from",** with locally-procured meals typically containing less animal products and more fruits and vegetables than 'conventional' meal services (13). In other words, **where local procurement schemes were lower carbon, it was not *because* they were local but rather because local procurement was associated with different, lower-carbon menus**. This is an important result suggesting that synergies between multiple SFP-related agendas can be achieved.

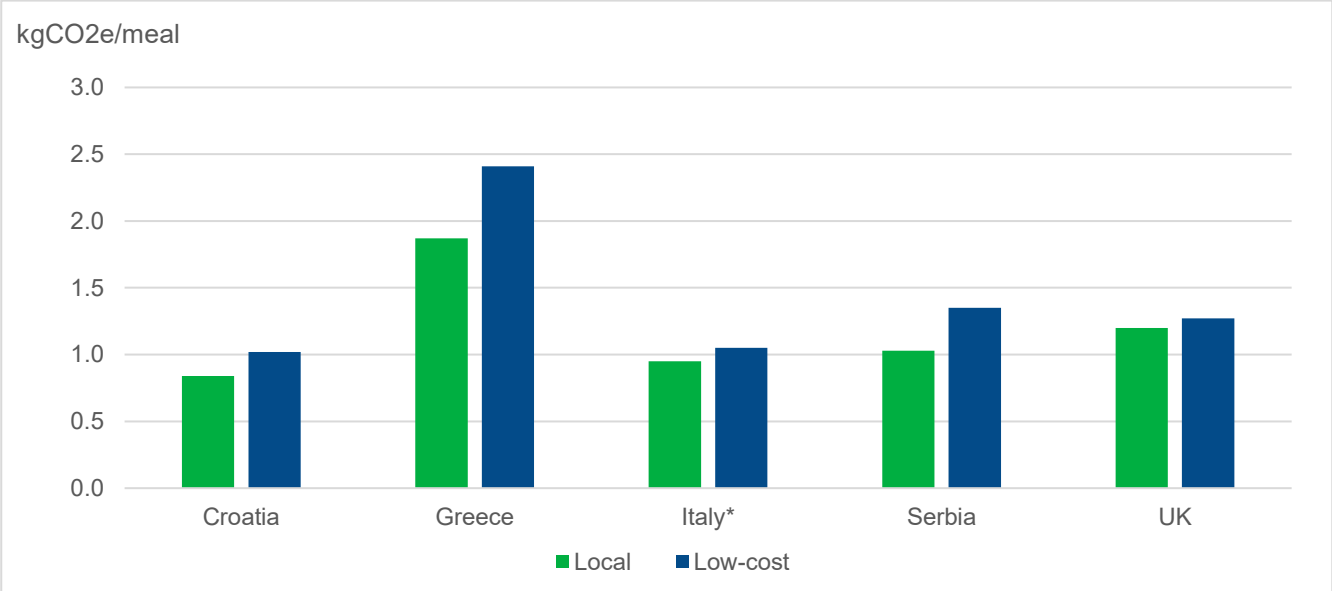

Figure 6: Emissions per meal in five European cases. Adapted from Figure 5 in (13).
Note that in Italy, both 'local' and 'low-cost' cases involve procurement of organic food.
The particularly large values in Greece were mainly driven by high wastage rates, disposal of waste in landfill and high proportion of meal being fresh meat.

Overall, the evidence points towards a clear conclusion which is in line with the meal service hotspots identified in section 3.3.1: **production and menu composition are the most significant opportunities for reducing the GHG footprint of public food services**. This is consistent with evidence relating to food systems more generally.[41]

[40] With the exception of Italy in the analysis, which in both LOW and LOC cases is procuring organic food.

[41] See, for example: https://ourworldindata.org/environmental-impacts-of-food

Despite this, ‘local’ food and transport distances continues to play a key role in the narratives around public food, something which is discussed in 3.3.3.

Quantifying the impact of past interventions

Alongside papers which modelled proposed interventions based on an audit of GHG data, example cases were regularly identified which made claims about the GHG savings of past activities. These include, for example:

- Estimates from Vienna, Austria on the savings from the ÖkoKauf (EcoBuy) programme: as a whole, the programme (which contains procurement of non-food items) has been cited as saving 100,000 tCO_2e/year (23,24), with organic food procurement saving approximately 20,000 tCO_2e annually (25,26). Other estimates suggest as much as 21,600 tCO_2e has been saved through the procurement of seasonal fruits and vegetables, with organic food purchases saving some 11,700 tCO_2e/year (27);
- Reduced transport emissions through local procurement in East Ayrshire was estimated to save 37.7 tCO_2e in a single ‘typical’ school, a figure widely cited across grey literature papers (6,8,23,24,26,28);
- A 20% reduction in food service emissions in Los Angeles, USA driven by a 32% reduction in industrially-produced meat served (29);

These examples are illustrative, with other publications identified making similar claims (30–37). Presenting the carbon reductions associated with past procurement-related activities is an important way of advertising the impact of these activities, helping to make the case for other municipalities or bodies to emulate this success.

However, a key limitation of the evidence identified of this nature was its methodological transparency: in most cases the baseline scenario and assumptions are not clearly identified in the cited sources, making it difficult to evaluate the claims made, or even to contextualise them. An emissions reduction expressed as tonnes of CO_2e is useful for communicating and making equivalences to other recognisable units (such as plane journeys or home energy use), but if not contextualised by the emissions associated with the food service as a whole, it is hard to state whether the cited reduction is a meaningful one or not. Similarly, looking at the emissions reductions associated with one activity rather than the emissions of the meal service as a whole may be misleading: for example, stating that local procurement has saved emissions based on transport distance required (i.e. the distance between producer and consumer) may ignore changes in emissions associated with the local production methods, or that procuring from multiple smaller suppliers may actually have *increased* the distance travelled by reducing efficiency (see 3.3.3).

A literature review regarding SFP-related schemes found that few studies look at the *impacts* of SFP-related schemes and “those that do lack transparency in reporting their methodologies and data”, instead often being case studies or examples of isolated best practice cases (3). The findings of this review reinforce this claim, in particular in regard to case-study style publications. It is quite likely that in many of the cases cited, the numbers quoted in case study documents *are* in fact formed through robust analysis with a well-defined baseline. It may be that such analysis is unpublished, being conducted internally

within a municipality or organisation, or that the original source material and methodology documentation has not been cited but could be found with additional dedicated searches.

Driving aggregate changes in food consumption and production

The changes presented in the cases above are all done through modelling based on the carbon emission factor of different foods. This is an accepted, standard approach to evaluating upstream impacts of food purchases. Public procurement is, however, embedded in a wider food system, and the logic of change presented in the conceptual model (1.3.2) relies on SFP schemes changing food demand or production practices on aggregate. Should a lower-carbon diet in an institution lead to 'rebound' effects in which consumers 'compensate' by eating more carbon intensive foods outside of the setting, its effect may be negated (likewise for healthy and unhealthy foods). For these reduced carbon emissions to be realised, the interventions need to be reflected in *aggregate demand* for different food types and farm-level decision making about what to grow and how to grow it. **This broader picture of GHG emissions has not, to our knowledge, been analysed**. It would be difficult to analyse; this is not a criticism of studies which have quantified using a standard approach. However, *more information on how demand for particular ingredients in public settings and the wider food system interact would be beneficial.* The upstream effects of food procurement on on-farm decision-making, and positive signs that public procurement *does* lead to upstream changes, is discussed further in (3.4.2).

3.3.3 Transport and the role of 'local' food

Procuring locally has a small impact on emissions, if any

As has been alluded to already, a tension was identified in the literature around the issue of transport and the procurement of local food. Procuring local food was consistently identified as a key intervention within the literature (see 3.2). However, the evidence presented in sections 3.3.1 and 3.3.2 suggests that transport represents a relatively small share of food service emissions (often very roughly around 10%), and that local food procurement interventions are expected to generate much smaller savings than menu composition changes, with local procurement possibly saving just 1% of meal service emissions (see Table 2).

Some of the publications identified make explicit the relatively small role of transport, suggesting that they "have less of an impact on reducing GHG emissions than other aspects" (7), with transport to institutions contributing "only a modest proportion" of emissions (13). Despite this, reductions in transport emissions were regularly touted as a benefit of SFP-related schemes: the oft-quoted 37.7 tCO_2e transport savings for a typical school in East Ayrshire from food chain localisation, for example (6,23,24,26,28,38), or "a 70 per cent reduction in transportation needs" observed in a Food for Life case study (39). Beyond these quantifications, generalised statements stressing the role of short supply chains in reducing the carbon footprint of meal services have been widely identified in the literature, particularly grey literature case studies (40–47). As an illustrative example, one stakeholder was quoted that "it reduces the greenhouse gas footprint when transport costs are minimized" (46). The use of generalised statements is discussed further in 3.3.4.

One theme emerging from the literature is that realising a reduction in transport demand and associated emissions is not as simple as buying from local producers. **The efficiency of the supply chain is a crucial mediating factor**. One study evaluating the carbon footprint of short and long food supply chains across multiple countries – not exclusive to public procurement, but more generally – in fact found that longer supply chains have both a lower amount of 'food miles' travelled and a lower carbon footprint per kg of product (48 Table 9), driven by the efficiency of bulk delivery by large trucks. This is summarised in one literature review: "the organisation and distribution within the [short food supply chains] is thus critical for the environmental impact in terms of CO_2 emissions" (3). There is a risk that unorganised local supply chains – many small deliveries by many small suppliers – may in fact *increase* the transport-related emissions as the number of deliveries go up. The inefficiency of some local suppliers is highlighted in an example of a pilot analysis in Durham, England where an analysis calculated that if the local meat and groceries were to be combined in existing delivery rounds, the transportation emissions from the meat transportation could drop from 99 $kgCO_2e$ to just 8 $kgCO_2e$ per school year (49). Strategies to improve logistics of small suppliers and reduce transport emissions were identified in Växjö, Sweden (6) where central delivery consolidation was estimated to cut local transport emissions by 95% or 175 tCO_2e, or through the 'Dynamic Purchasing System' in South West England, leading to an estimated 59% reduction in local delivery emissions of some 6.01 tCO_2e (50).

To illustrate this point, a very simple hypothetical scenario comparing three suppliers to an institution with and without consolidation is presented in Figure 7. If suppliers each independently transport their produce (scenario 1), there would be nearly 50% more miles travelled than if their orders were consolidated for some of the journey (scenario 2):

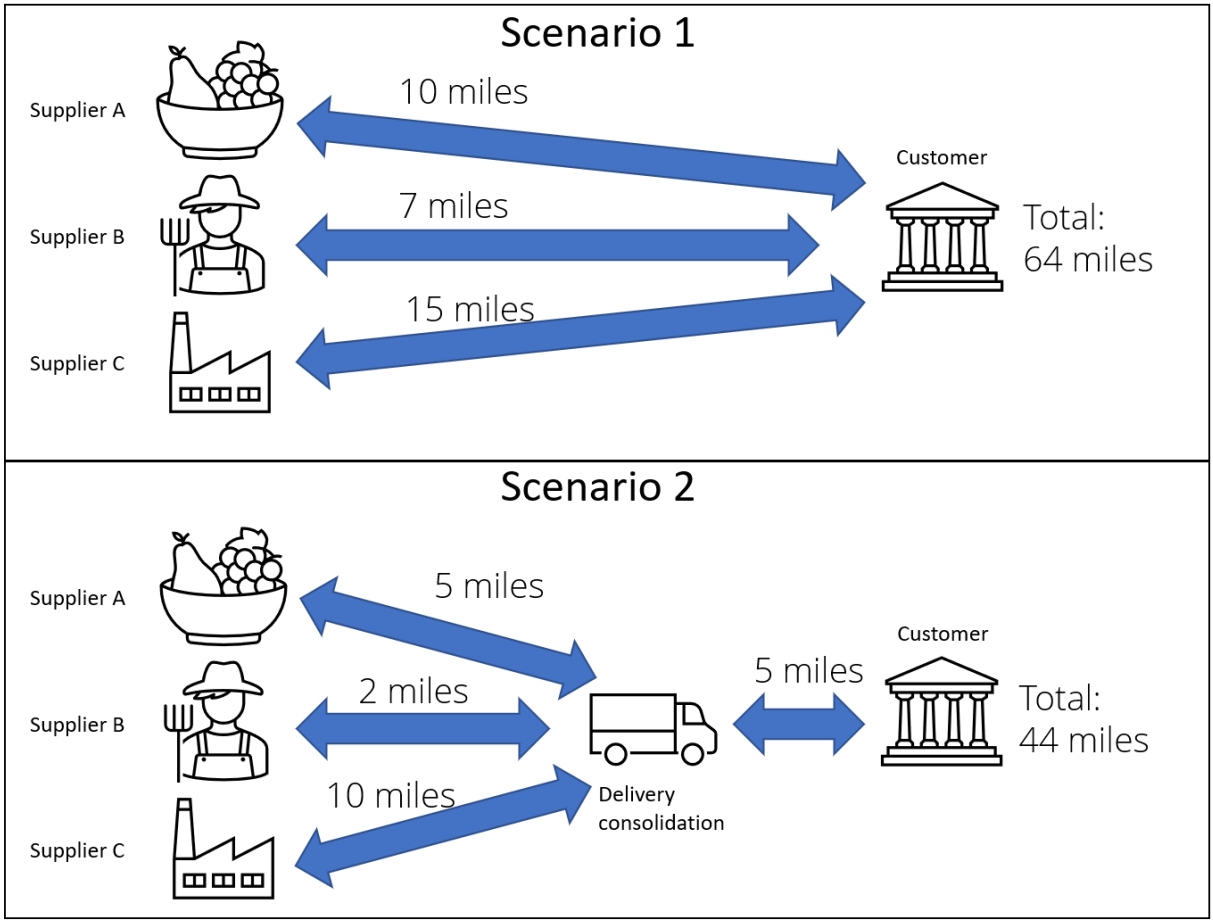

Figure 7: Hypothetical example of transport distance savings through efficient distribution. Distance is for a single journey, so multiplied by two for a return. Designed by authors.

What this evidence points towards is that simple generalisations about the role of 'local' food are unhelpful: local supply chains both entail a relatively small contribution to reducing the carbon footprint of public procurement and actually realising any transport benefits is highly contingent upon the structure and organisation of delivery logistics.

But local procurement may be part of holistic changes to procurement which achieve wider sustainability gains

The above evidence is illustrative of the tension whereby the distance travelled by food is of much more modest contribution to its GHG impact, but the sustainability of local food is a key point for its advocates. This points primarily to the fact that what *sustainability* means is ill-defined (see 1.3.1). GHGs are only one part of environmental sustainability, and environmental sustainability is only one part of a more holistic understanding of sustainability. The social and economic components of short supply chains – especially where 'short' refers not just to distance travelled but number of intermediaries – may be as, if not more, important 'sustainability' aspects for proponents (these are discussed more in section 3.6). **These non-GHG related concerns should be strongly considered even when discussing the more modest impact of food localisation**. Food localisation, therefore, may not be just about the distance travelled by the food products but also the other aspects which may correlate with locality: the number of intermediaries, the production methods, and the menu composition.

The correlation of local food with other aspects of sustainability is important when considering its impacts more holistically. This is clearly demonstrated by a cross-country study (13), which is discussed and presented in section 3.3.2. It found that across five European countries including the UK, on a footprint-per-meal basis local food service *did* have a lower footprint than conventional/low-cost food service, but that the driver for this difference was *not* the distance travelled. Rather, the observed local food examples typically had different menus to the observed typical conventional meal services, menus with lower animal product content and more fruits and vegetables (13). In this case, the decision to procure locally has acted as a vehicle for other changes around the sustainability of the meal. There is a difference between the theoretical, modelled approach which takes SFP-related interventions as discrete, separate entities and the reality in which intervention mechanisms are interconnected, often requiring a more holistic approach (see 3.2).

As a result, the discussion of modest transport GHG benefits in section 3.3.3 should not be used as a way to dismiss local procurement as an objective. For its advocates, local food is clearly about much more than just the distance travelled: it is a window into a more holistic, values-based approach to food procurement which may also involve procuring seasonal, lower-carbon or healthier fruit-and-vegetable-based menus which sustain local economies through supporting supplier diversity, connecting producers and consumers and supporting local food cultures. More discussion of socioeconomic impacts can be found in section 3.6. It is important therefore that when discussing the environmental impacts of local food, a reductive approach which looks only at the impact of the transport emissions is avoided, instead recognising how it may contribute to more holistic food service changes.

3.3.4 Common use of general statements

As a contrast to the quantifications and detailed analyses presented in sections 3.3.1 and 3.3.2, another key trend identified in the literature was a reliance on the use of highly generalised statements, or falling back on ‘common knowledge’ about food sustainability. Such claims are not necessarily wrong, but they do suffer from a lack of supporting evidence which may weaken their usefulness as examples of environmental impact.

Such general statements include that SFP-related schemes have “been recognized as having great potential to positively influence water and land use, climate change, conservation and the sustainable use of biodiversity” (2), that they “contribute to environmental benefits such as tackling greenhouse gas emissions” (51) and so on (52,53).

Generalised claims are made regarding specific SFP-related interventions, such as caterers buying organic food and “reducing their carbon footprint” (54); local procurement reducing ‘food miles’ and therefore emissions (see 3.3.3, or (42–44,46,55)); or dietary change, such as reducing meat consumption in the food service being an action which “greatly reduces carbon footprint” (56–59) or the role of broadly-defined (if defined at all) ‘sustainable food’ reducing carbon emissions (60–62).

The appeals to ‘common knowledge’ represents a weakness in the evidence base. This is not because the proposed mechanisms for GHG reductions are not necessarily accurate:

dietary change clearly can be a big driver of reduced GHGs, for example (see 3.3.2). However, such claims may gloss over nuances, such as the modest role of transport-related emissions (see 3.3.3), or the contested role of organic in reducing GHGs at larger scales.[42] More nuance and better referencing of evidence to back up such claims should be encouraged.

3.4 Key themes: environment

Alongside the core focus on greenhouse gases (see 3.3), the evidence identified was analysed for information relating to other environmental outcomes such as the land use, water use and biodiversity impacts associated with food production for public-sector food service. These are summarised in Table 4, and discussed in more detail in subsequent sections.

Table 4: Summary table - environment

Thematic area	Key messages
Quantified environmental impacts	Alongside audits of meal carbon footprints, it was common to quantify other environmental impacts such as land use and water footprint. This was often done in a *prescriptive* manner: modelling scenarios to inform decision making.
	As with carbon footprints, there was a parallel group of *descriptive* publications which quantified the impact of a decision or intervention already taken. In most cases these were grey literature papers with **unclear methodologies** for the calculations undertaken.
	The large variety of metrics available make **standard quantification** more **difficult**.
Upstream environmental management changes	A very small number of studies stress-test the conceptual model of SFP interventions and robustly measure changes in environmental decision-making on farms due to procurement policies. In those that do, however, there is an important **suggestion that farm management decisions** can be **altered by sustainable food procurement policies.** More evidence which investigates the logical assumption of the SFP conceptual model would be beneficial.
Common use of general statements	Often, claims about environmental benefit of SFP schemes relied on 'common knowledge' and generalised statements, rather than specific evidence for the claims.

[42] See, for example: https://www.nature.com/articles/s41467-019-12622-7

	This was particularly the case for organic, local and seasonal food procurement. It was also particularly common in grey literature such as promotional case studies or best practice reports, which may be considered to have a different purpose to evaluative evidence.
	Nothing suggests that the general statements are incorrect. However, more robust evidence which accounts for nuances would be of benefit.
	Very little evidence was identified about the **outcomes of other product certifications** such as Fairtrade, or about buying **seasonal food in public settings**. Procuring certified or seasonal products was always presented alongside other procurement interventions. Those certification schemes in many cases conduct their own impact analyses, but these wider impacts are not easily connected to public-settings purchases.

3.4.1 Quantified environmental impacts

In a small number of papers, the impact of an institutional meal service on other environmental indicators was quantified. In most cases, this was combined with analysis of the carbon footprint of a meal service (see 3.3.1). These were primarily life-cycle assessment (LCA)-based studies which used other, non-global warming potential (GWP) measures to estimate impacts such as on biodiversity. Similar to identified GHG-related modelling (3.3.2), these can be split into two groups: those which *prescribe* action which could be taken and those which *describe* action which has been taken.

Prescriptive quantification

Evidence which quantifies environmental impacts for prescriptive purposes include audits of school meals and their associated food waste in England (4), Italy (9) and the USA (12) which used LCA measures such as water footprint, photochemical ozone creation potential and acidification potential, as well as an analysis of Italian school meals in terms of land use and cumulative energy demand (63). Such audit-based approaches have similarly been used for specific tableware scenarios, i.e. comparing the use of plastic or compostable tableware in a canteen food service (64), to evaluate the water footprint of an English university meal service (18) or the recipes for snack meals distributed to older people in Denmark (21). These analyses could be thought of as *prescriptive*: they quantify the impact of the status quo and use these evaluations to model scenarios or otherwise prescribe possibly beneficial interventions. Often, the prescribed actions show congruence with those recommended to reduce GHGs (see 3.3).

Analysis of English school meals finds that there are some similarities with the carbon footprint, in that meat items remain disproportionate in their water footprint share: they amount to 10% of the weight of items procured but 38% of the water footprint (4). Similarly for a university meal-service audit: meat products amounted to 30% of procurement by weight but 76% of the water footprint (18). In both cases fruits and vegetables have a very low water footprint, leading to the suggestion that a more fruit-and-vegetable-heavy meal

service would entail a smaller water impact, a similar finding to meal carbon footprints (see 3.3). It should be noted that despite broad congruence there are some notable differences, with ingredients like chocolate not being identified as a carbon hotspot but are considered a water-use hotspot, so menu changes with different objectives may lead to different outcomes (4).

Similar findings were identified in an analysis of snack-meals served to older people in Denmark. The study compared the 20 most popular snack-meal recipes, evaluating 16 different environmental impact categories including GWP, nature occupation (a proxy for biodiversity) and a monetised overall environmental impact, which summed all of the environmental criteria. They find that, whilst GWP is the single most important impact category, it contributes less than half of the total environmental impact, with biodiversity loss also contributing about one quarter of the total environmental impact. The 'best' half of snacks had a monetised environmental impact about 40% less than the 'worst' half, but specific ranking of recipes depends on the functional unit and impact category chosen. The authors emphasise that the functional unit of analysis is important: whilst impact per unit of mass (e.g. impact/kg of product) is often used, when meals have specific requirements such as providing energy or protein, these are more useful functional units and impact the ranking of recipes. Despite these nuances, this analysis points to simple changes to reduce environmental impact: prioritising the lower-impact recipes which still meet taste and health criteria (21).

In these pieces of evidence, quantification of environmental impact, however defined, is therefore used as a tool to assist decision-making. These authors use quantification and modelling to propose actions which *could* be taken in the context of institutional meals.

Descriptive quantification

A second group of publications were found to *describe* an impact which had already happened. Whereas the *prescriptive* evidence publications were largely peer-reviewed modelling exercises, this *descriptive* evidence was found primarily in grey literature case studies.

The identified claims often centre around water use: reduced meat consumption in Rome, Italy's schools having saved 5,783 m^3 (33) of water, and reduced meat and organic procurement in Vienna, Austria having saved as much as 233,000 m^3 (27), for example, or case studies of reduced water consumption in specific kitchens (43,65). In Copenhagen, Denmark, a case study paper claims that the switch to organic milk had saved "approximately 370,822,400 litres of groundwater from being contaminated with pesticides each year" (29).

In these cases, the publications use the quantification of environmental impact such as water use for a specific purpose: to advocate for the success of their actions. It is likely that the analysis done used similar methods and principles to those prescriptive quantifications described above, but due to the nature of grey literature case studies often providing very little method, or even references, to back up the claims made, it is difficult to say for sure. Based on the information available, therefore, these publications were noted as having a substantial risk of bias. This is not a comment on the possible quality of any

analysis done to inform these figures, and is more a reflection of the substantially different purposes of academic publications and advocacy case studies.

3.4.2 Upstream environmental management changes

Reflecting upon the conceptual model presented in section 1.3.2, one of the core proposed outcomes of SFP-related schemes is impacts upstream. These include economic impacts for producers and suppliers (see 3.6), but also upstream impacts on the environment. These impacts are primarily associated with the production of food: the amount of land and water required, the use of pesticides, the impact on biodiversity and so on. In short, it is proposed that public procurement can contribute to shifting food demand which determines *what* is produced and sold and from *which type of production,* to borrow terminology from Swensson et al. (1,2).

These outcomes are in part dependent on the assumption that public food procurement can change the *aggregate* food consumption habits and demand, and thereby *directly influence* the decision-making of farmers and suppliers. There is a clear logic to this assumption, that all else remaining the same, shifting public procurement demand creates *additional* demand for a specific product or type of products (such as organic vegetables or certified chocolate), in turn leading the market to react. However, interactions between food consumption and demand in public institutions, private consumption and demands, food prices and other market trends mean that the real situation is likely to be more complex than the simple logical statement. As a result, evidence which has explored this relationship between SFP-related schemes and on-farm environmental decision making are particularly noteworthy.

Detailed analysis was found in a small number of cases. Studies undertaken in Brazil, in the context of the school and public sector procurement programmes (PNAE/PAA) included interviews and surveys with farmers to understand how farm practices had changed over time and farm-level surveys of agrobiodiversity, comparing farms supplying public contracts and neighbouring farms which did not. The authors found that farms involved in the PNAE had higher agrobiodiversity than control farms when measured by total species richness on farms and horticultural plot richness, particularly in larger farms. The sizes of horticultural plots were on average triple the size amongst PNAE farms when compared to control farms (66). Farms participating in the scheme had higher organic particulate matter and soil phosphorus than control groups, higher on-farm agrobiodiversity and marketed a greater range of crops: PAA farms on average marketing 14, compared to 3.8 in the control group (67).

The interviews and workshops with farmers confirmed these as active farm management changes over time, and that participation in the schemes “played a direct role in farmers’ decisions to shift their household’s primary economic focus from low agrobiodiversity, input-intensive farming systems to more diversified, low external input systems” (66). What this evidence points towards, therefore, is that schemes such as the PNAE/PAA can be observed in on-farm environmental indicators. Rather than simply diverting food purchases to existing agroecological farms, the schemes are *incentivising more farms to adopt agroecological practices.*

Such findings are consistent with claims made in other publications relating to the PNAE/PAA supporting farm diversification (68), with similar results being reportedly found in Ethiopia (2). The qualitative judgement of experts in public food procurement programmes in lower- and middle-income countries indicate that improved crop diversity is the primary environmental benefit of such schemes (47).

Some limited evidence was also identified in high-income countries. Some anecdotal case studies have pointed towards public procurement tenders increasing the biodiversity of foods procured, such as Copenhagen's tender including 86 apple varieties (51), and qualitative assessment by participants in SFP-related schemes have perceived a direct impact on upstream practices, with claims that "certification motivated [suppliers and farmers] to adopt more sustainable practices, or source more local food, in order to win university contracts" (69).

However, the most robust piece of evidence of SFP-related scheme incentives leading to aggregate, farm-level management changes comes from Sweden. One study of Swedish time-series data from 2003-2016 analysed changes to agricultural land in each municipality based on the share of local organic food procured in both that municipality and across Sweden, whilst controlling for various measures such as the presence of subsidies, demographic variables and private organic consumption. Regression analysis using this data pointed towards public organic food purchasing being associated with a significant positive impact on organic farmland: a 1% increase in the weighted average of other counties' procurement was associated with an increase in the share of organic land in a county from 0.4-0.6% (70). This effect was not found at the local level, i.e. it was aggregate organic purchases across Swedish municipalities which impacted organic farmland changes, rather than purchases in that same county, although this may reflect specificities of the procurement policies as they were implemented by municipalities, including whether they are explicitly targeting local organic food or just organic, and how locality is defined.

These findings are influential in that they show that the *share* of agricultural land managed in a certain way (in this case, organic) can increase when incentivised by public procurement policies, even when controlling for private demand. This suggests that the demand created by institutional procurement is additional (i.e. it does not simply divert existing 'sustainable' produce) and leads to desired changes in land management.

Evidence such as these cites from Sweden and Brazil are crucial for examining the theory of change of SFP and how it may enable systemic effects (see 1.3.2). More evidence like this, with clearly defined indicators and robust analysis of the observed impact of procurement schemes would be beneficial.

3.4.3 Common use of general statements

In direct contrast to the analyses which directly evaluate and test the observed outcomes of SFP-related schemes on the environment (see 3.4.2), most of the evidence identified relies on generalised statements or using 'common knowledge' definitions of sustainable food as evidence for the environmental benefits of SFP-related schemes. Depending on the intervention, these infer or imply the benefits of food certification, locality or method of production. As with the use of common statements around greenhouse gases (see 3.3.4),

such publications were overwhelmingly grey literature case studies or overview papers. The *purpose* of the paper – such as policy advocacy – is likely to be a key determinant of its content.

This was often the case for case studies of organic, local or seasonal food. The presence of procurement targets of organic seasonal foods is at times treated as an outcome in itself (24), and such objectives are justified by the benefits of organic food in the abstract, such as reduced pesticide consumption, improved on-farm biodiversity, soil fertility, increased animal welfare or protection of groundwater (8). Grey literature case studies, particularly those produced as part of the EU's 'Green Procurement Good Practice' documentation[43], tend to rely on formulaic, general descriptions of the benefits of organic agriculture, at times referring to supporting evidence (e.g. (41)), whilst at other times not (71) .

A few examples will illustrate this point: in (32) it is stated that "by requiring organic food, the hazardous impacts from pesticides and stress on agricultural land are reduced", caterers who purchase organic food are "backing higher levels of biodiversity" in (54), and one overview paper contains a 'why organic?' box which claims that it "protects soil fertility; it avoids the overexploitation of natural resources and preserves biodiversity; it encourages animal welfare; it supports short supply chains […] it adds value to diverse local products" (42). Such generalised statements are commonplace (see, for example (32,40–42,54,56,61,71–79)). Not all of these outcomes are necessary aspects of organic production, though they may often be correlated. Organic food can be sold in long-distance supply chains and animal welfare may not necessarily be improved, for example. By not backing up the claims, the publications rely on common perceptions.

It should be stressed that the evidence cited are largely short, promotional pieces such as case studies, collections of best practice or impact reports. They are not specifically about evaluation but *are* about making a case for action. In such cases, they may be expected to not refer to in-depth analyses. This is also not intending to suggest their claims are wrong (as stated in section 3.3.2, changing production practices such as through organic agriculture has been modelled as one of the most impactful benefits, although on the other hand the overall environmental impact of organic production may be debated[44]): many of the professed benefits may be realised in those cases.[45]

Interestingly, very **little literature was identified relating to the proposed outcomes of using other specific certifications, such as the LEAF Marque, Rainforest Alliance or Fairtrade certifications,** although they were in some cases described as part of the procurement policy ((34,50,61), for example). Two main possible explanation are considered: firstly, though certification more broadly (including organic certification) was identified in around 35 papers, in no cases was it the sole object of an intervention. In other words, certification went hand-in-hand with local, seasonal or organic food in

[43] https://ec.europa.eu/environment/gpp/case_group_en.htm

[44] See, for example: https://www.nature.com/articles/s41467-019-12622-7

[45] See, for example: https://www.tandfonline.com/doi/abs/10.1080/19320248.2011.627301 or https://www.mdpi.com/2071-1050/12/12/4859

procurement policies. Impacts, where described, were therefore for the whole intervention, or focused on one of those other correlating aspects. A second possible explanation for this would be that, whereas 'organic' or 'seasonal' farming refers to a general principle (and in some cases, a certification), with specific certifications, **authors and institutions may perceive the certifying body responsible in demonstrating its impact**. **In many cases, those bodies do present impact reports illustrating this point**.[46] For procuring bodies, this may be sufficient and there is not necessarily a need to link the procurement of, for example, tea purchased in British hospitals to smallholder tea farmers. This is an understandable evidence gap, though the points made in section (3.4.2) about examining systemic impacts through aggregate changes would also be relevant to such certifications.

There was a similar experience with **fresh or seasonal** food: though often cited as a target intervention (in around 54 papers), it was an intervention which was always considered alongside other themes such as organic food, certified products or lower-carbon menus. As a result, direct evaluation of the impact of seasonality in the context of public procurement was not identified, though there may be relevant publications in the wider food-related literature.[47]

Overall, the evidence base is limited where it relies on logical assumptions rather than critically evaluating them. Often the assumption is made that organic food, local food or seasonal food are inherently 'good' or 'sustainable' without defining what is meant by that 'sustainability', or in some cases without making reference to further evidence which would back up the claim (even if evidence does, in fact, support the claim, such as in 3.3.2).[48] Such publications are likely to only convince those already sympathetic to the views expressed. Crucially, there is nothing which suggests that the logical assumptions are incorrect: these alternative schemes in many cases may lead to improved environmental, health or economic outcomes, and these perceived benefits may be sufficient to justify action. However, it is also possible that the relationship and structure of the supply chain is more nuanced and has other dependencies which mean the desired benefits are not realised, nuances which are glossed over by appeals to 'common knowledge' around the benefits of particular food types, sourcing strategies or production methods.

3.5 Key themes: health and social effects

The publications identified were further analysed for any insight they offered into downstream consumer health associated with public food procurement schemes. The findings are summarised in Table 5 and described in further detail in subsequent sections.

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[46] For Fairtrade, for example, see: https://www.fairtrade.org.uk/wp-content/uploads/legacy/Branching-out-in-Malawi.PDF for LEAF Marque, see https://leaf.eco/about-leaf/our-impacts and for Rainforest alliance, see: https://www.rainforest-alliance.org/resource-item/impacts-report-2019-impact-study/

[47] See, for example: https://doi.org/10.1017/S0029665113003753, https://doi.org/10.1016/j.jclepro.2013.12.077 or previously Defra-commissioned work

[48] How organic food, for example, fits into broader 'sustainable consumption' is an actively discussed issue. See, for example: https://www.frontiersin.org/articles/10.3389/fnut.2015.00019/full or https://doi.org/10.1017/S0029665114001438

Table 5: Summary table – health

Thematic area	Key messages
Fruit and Vegetable consumption	There is sufficient evidence to suggest that **SFP-related schemes can contribute** to **improved fruit and vegetable availability and consumption.** It is unclear how much of this is driven by the availability of healthy food and how much is driven by other canteen interventions, such as promotions or messaging. Multi-component interventions have a stronger impact and clear benefit.
	However, very **little evidence** was identified which examined the relationship **between fruit and vegetable consumption** and intermediate **health indicators** (such as BMI) or final **health outcomes** (such as reduced instances of non-communicable diseases). This may reflect the time period of intervention analysis, or the presence of **rebound effects** outside the public setting.
Meal uptake	As with fruit and vegetable uptake, there is evidence that SFP-related schemes can **improve uptake of public-sector meals**, particularly in school contexts.
	Health benefits are largely dependent on healthy food being consumed, rather than just procured, served and wasted. **Whole-settings approaches** which consider preparation, serving and communication are beneficial in this regard.
	Regular **audits** of food service are required to ensure that nutritional **guidelines are being met**, and that healthier food is being **consumed rather than wasted**.
Healthy food preferences, values, rebound effects	Some evidence of **improved food knowledge and attitudes** amongst school students, with anecdotal claims of improved quality being well received in multiple settings.
	Where changed attitudes and preferences are identified, it is unclear whether this is driven by the food/ingredients procured, or other adjacent activities such as nutritional education and messaging.
	Food served in public settings can **complement or contradict wider food-system dynamics**. Improvements to private consumption are more likely to be observed where they are complementary. Where contradictory, the impact of public procurement may be limited by access to unhealthy ‘competitive foods’.
	Some evidence of consumers rejecting ‘healthy’ changes to food procurement across multiple settings. This risk, or the perception of the risk, may constrain caterers looking to reform their food procurement.

Other reported health and social effects	Some limited, evidence was found which mentioned **improvements** in other metrics such as **pupil attainment, patient rehabilitation and care home resident mood**. The relationship between procurement rules and such broader social outcomes should be further explored.

3.5.1 Fruit and vegetable consumption

One of the most documented areas of health outcomes in SFP-related schemes is that of uptake of fruits and vegetables (F+V). F+V uptake, or uptake of 'healthy meals' (which is inferred to be meals which are nutritionally balanced, with many F+V included, and is discussed in 3.5.2) is often used as a proxy for nutritional outcome. It should be noted that these studies overwhelmingly come from school and educational settings, so not all findings are necessarily applicable in other settings where adults or older people are concerned.

Procurement schemes and canteen interventions and the relationship with F+V uptake

The Food for Life (FFL) scheme has evidence in primary schools of positive impacts on the consumption of fruits and vegetables across a number of different metrics. These come predominantly from independent evaluation studies based on cross-sectional nutritional questionnaires and dietary surveys comparing students in participating institutions and those not participating in FFL (80,81), the results of which are cited in other FFL publications (52,82). Some notable figures are included in Table 6, suggesting that in FFL schools, the number of fruit and vegetable portions consumed each day both in school and at home increased, with greater shares of students reporting fruit and vegetable consumption than non-FFL schools. In addition to these figures, one study found that, when controlling for Free School Meal (FSM) status, gender and local authority, students in FFL were more than twice as likely to eat five or more F+V portions per day, and 60% more likely to eat above the national average of 2.55 portions (81). Notably, however, the results in (80) were more conclusive for primary schools than secondary schools, with secondary trends observed being positive but not statistically significant.

Table 6: Key F+V uptake outcomes in FFL schools

Reference	Metric	Non-FFL	FFL
(80)	*Children self-reporting eating 4 or more F+V/day*	37%	48.9%
	Y5 children self-reporting eating 5 or more F+V/day	16.3%	20.9%
(81)	*Avg. portions F+V consumed*	1.54	2.03
	Avg. F+V portions consumed at school	0.89	1.24
	Avg. F+V portions consumed at home	0.65	0.79

	Students reporting consuming no F+V in the previous day	33.9%	23.4%

Another SFP-related scheme for which there has been significant research interest in F+V consumption is the US Farm-to-School (FTS) scheme. Where experimental studies have been carried out, mixed results have been identified: one analysis of plate waste in Florida schools advertising local produce observed more F+V consumption after FTS implementation, and a significant increase in consumption of vegetables even when controlling for school-level fixed effects (83). An experiment of F+V plate waste in Wisconsin found that those exposed to FTS programmes in younger years were less likely to waste food in later years, but that locally-sourced items were wasted more often than conventionally-sourced items, with substantial variation based on how vegetables were prepared (84).

Other studies of FTS and related schemes offer further insight. Stakeholders participating in the scheme in the upper Midwest suggested that one of the main benefits of the food was that "the students like it" and eat more F+V when sourced locally (85). Systematic review papers of FTS and FTS-related activities present a nuanced view: one referenced evidence that selection of F+V servings increased up to 25-82% after an FTS programme was implemented, but also pointed out that measurements are often limited to food *selection* (rather than consumption) at a *trial* rather than "assessing its overall impact on children's actual consumption of fruits and vegetables" (86). Another review found that the relationship between FTS and related activities and F+V consumption or preference is inconclusive, but that FTS-related activities with positive F+V consumption often had other intervention components such as incentives or school-chef partnerships (87).

Outside of the specific FFL and FTS schemes, various pieces of evidence suggest that SFP-related schemes, especially when combined with educational components, can impact F+V consumption. These include findings from the UK and US that nutrient standards alone "were insufficient to make a meaningful impact on students' health", but with canteen interventions "we've begun to see some success in kids eating more meals and actually consuming more fruits and vegetables" (88,89). A review paper of evidence related to healthy food procurement policies found that the procurement strategies can promote heathy eating behaviour, but that findings were stronger where procurement interventions were paired with strategies like education or price reductions (90); the importance of multicomponent interventions like these are further highlighted in other review and discussion papers (3,91).

This evidence points towards a relatively clear trend: increased F+V availability through procurement schemes, whether 'sustainable' (such as local or organic) or 'health-based' (such as nutritional standards) *can* increase F+V selection and consumption, but are not necessarily guaranteed to do so. Evidence points towards a much stronger relationship between *multicomponent* schemes which combine procurement standards and food preparation improvements or promotional, educational and other canteen-based activities.

This raises a key point which relates back to the question of 'what an SFP-related intervention is' (see 1.3.2). The question of what food is *consumed* is intimately connected not only to what food is *procured* but also how it is *prepared*, *served* and *communicated about.* Often, schemes such as FFL combine procurement, menu and educational

changes, and experiments relating to FTS combine messaging campaigns (83), other promotional activities or incentives (90), or have findings highly dependent on food preparation (84). Systematic reviews of canteen interventions and nutritional policies are particularly useful in informing what specific strategies work (see for example (91) or (90); this is also discussed further in section 3.5.2). Treating procurement policies as part of a wider suite of changes may be more effective in promoting healthy habits.

F+V uptake and improved health outcomes

A secondary point raised in literature on F+V consumption was the disconnect between what is often measured – such as F+V selection, or F+V consumption – and the final desired health-related outcomes, such as reduced instance of non-communicable diseases associated with intermediate outcomes including reduced BMI and obesity rate (52,87). Review and discussion papers show that overall, evidence is lacking on the impact of canteen interventions on biophysical measures, with focus on short-term measures rather than long term effect (91). In those which do assess biophysical markers "find little link between healthy eating programmes and obesity reduction" (3), and similarly "no evidence that [FTS-related] activities significantly influence BMI, blood lipids and/or blood pressure" (87). These papers refer specifically to school/institutional food purchasing, so other studies into the relationship between F+V consumption and obesity or blood pressure more generally may show more direct relationships.

There are two main factors which may in part explain this disconnect. Firstly, the timing of intervention periods and analysis (3). Improved health is a long-term effect and requires long-term habits, but interventions to improve F+V consumption may occur over short time periods, and will not yet have translated to long-term consumption changes. Funding for such interventions may similarly operate at a shorter term. Whilst changes in health is the desired outcome, in the short term "improvements such as changes in diet" may be considered appropriate measures of the activities conducted (52).

Secondly, and this relates to the conceptual model elaborated in 1.3.2, the relationship between an institutional food service and its downstream health effects is not necessarily direct. It relies food consumption in the institutional setting leading to changes in preferences and consumption that last outside of that setting, so that when interventions end, the behaviours last. It also relies on the assumption that 'healthy' food served in institutions does not lead to consumers experiencing a rebound effect, in which the 'good act' of eating healthy food in an institution leads them to compensate by eating an unhealthier meal than they would otherwise have done outside the food service. Whilst some studies do look at private consumption (see evidence of increased F+V consumption at home, Table 6), many evaluate only the habits in the intervention context. More studies which look at long-term, observed outcomes such as behavioural habits and health outcomes in the long-term amongst those exposed to SFP-related schemes would be beneficial.

3.5.2 Meal uptake

Closely related to measurements of the F+V consumption (see 3.5.1) were analyses which evaluated the uptake of meals in general. This is relevant to health outcomes where meals served in institutional settings are considered to be healthier to the baseline or alternative,

such as meals purchased in other retail or food service settings. Analyses of meal uptake is useful for monitoring implementation, identifying both if food outlets serve in accordance with guidelines and if this food is being consumed. They also improve understanding of the methods and opportunities available to improve meal uptake, and therefore increase the perceived health or environmental outcome. This is particularly relevant in situations where institutional meal service is optional, such as in many schools, or workplaces.

Increased meal uptake in the context of procurement policies or standards

As with F+V consumption, evidence from the FFL scheme points towards increased uptake. Where school meals are not mandatory, 'uptake' refers to the share of students consuming school lunches, rather than an alternative (such as a packed lunch), which may be considered a reflection of the perceived quality, nutrition and value of the meal service amongst students and parents. Findings include school meal uptake in pilot FFL primary schools rising from 45.4% to 49.2% and in secondary schools from 50.3% to 56%, with a higher uptake increase (+6.1%) observed in 'silver' or 'gold' FFL schools, i.e. those which have gone further in reforming their meal service (80). Cross-sectional observational data showed a 6.2% difference in school meal uptake between FFL schools (56.1%) and control schools (49.9%) (81). Though FSM rates were not statistically different between the school groupings, it does not appear to be controlled for, something which should be done in future analysis. Stakeholders involved in schemes also have anecdotally reported "substantial improvements in the public perception of the quality of school meals" with "consistent increases in school meal numbers" (39,45,82,92).

Such increases in uptake have similarly been described by stakeholders in various other school contexts including local food campaigns in Richmond, England (57), East Ayrshire, Scotland (28) and California, USA (72) and for nutritional standards in North Carolina, USA (93). However, this is not always reported as the case: challenges related to consumer preferences are discussed further in section 3.5.3. If the meals served are healthier or more nutritious than those which would have otherwise been consumed, this increased uptake could be beneficial. However, this connection is implicit rather than directly evaluated.

Audits of meals served

More robust quantifications of meal uptake often rely on data provided by audits of food service and consumption. Some such audits are carried out in the absence of specific procurement policies, or otherwise are used to evaluate compliance with existing nutritional policies and requirements. Some examples include school lunch audits carried out in Turkey (94), France (95) and the UK (5). The data from such audits is an important precursor not only to establishing a baseline and measuring health impacts, but also measuring elements such as the carbon footprint of a meal service (see 3.3).

Outside of schools, hospitals were found to be another common location for audits: a systematic review found food waste to be the most common metric used, not from an environmental perspective, but as a surrogate for nutritional intake (96). Examples of nutritional audits in hospitals include in Canada (97), Scotland (98) and England (99). Notably, in the audits identified, nutritional intake was often found to fall below energy and protein amounts set in standards, which may suggest that compliance with policies and

standards needs active monitoring and cannot be assumed. Such audits are important for monitoring compliance with standards and to ensure that healthy food availability actually translates into a suggested health benefit, rather than nutritious food being wasted.

Meal uptake in the context of canteen and kitchen interventions

Alongside evidence specific to procurement-based standards and schemes, evidence was identified which related specifically to choices made in preparing and serving food. These include educational, promotional or nudge-based strategies. Referring back to the conceptual model of SFP-related interventions (see 1.3.2), a holistic approach to 'sustainable procurement' recognises multiple possible intervention areas, of which *what* food is procured is only one: *how* that food is prepared, served and communicated about is another crucial factor for ensuring healthy food is actually consumed and contributing to consumer health. As the search approach (see methodological appendix, section 7.0) focused on studies explicitly relating in some way to procurement, the evidence presented here is unlikely to be exhaustive of the possible canteen-based nudges or interventions and their impacts, though they illustrate the point well.

Most notable amongst the literature identified was a systematic review of peer-reviewed school-based interventions documented in the US, many in the context of Farm-to-School activities. The overall conclusion was that practices consistently associated with improved meal consumption included offering menu choices; adapting recipes to improve palatability or cultural appropriateness; pre-slicing fruits; rewarding students who try F+V; sufficiently long lunch periods; recess before lunch and limiting access to competitive foods (100). Studies such as these are particularly helpful for understanding how decisions made in the canteen – even as simple as slicing fruits, whether locally or ecologically grown or not – can influence consumption amongst students. These are similar to findings presented in 3.5.1 that multicomponent SFP-related interventions have more impact on F+V consumption.

Other evidence around behavioural nudges and consumption show mixed effects. These include, for example, increased fruit, vitamin C and fibre but stable vegetable consumption in schools (101), or a meal-placement experiment in a late-night university canteen which saw unhealthy food choices staying constant whilst vegetable selection increased, suggesting that the nudge led to increased total consumption (102). How specific nudges are designed in specific settings is likely to impact their effectiveness. As previously stated, specific searches around canteen interventions *not* in the context of sustainable procurement would likely return much more evidence and reviews of evidence which would elaborate this point. Nonetheless, the overall message presented here and in section 3.5.1 is clear that holistic approaches to SFP-related schemes which look not just at *what* is procured but *how* it is prepared and served and more likely to achieve desired downstream outcomes, such as health improvements. This is summarised graphically in Figure 8: how food is *prepared* and *served* forms the bridge between what is *procured* and *consumed.* Specific actions by institutions can help here. However, the gap between food consumption in public settings and health impacts downstream has insufficient evidence at present.

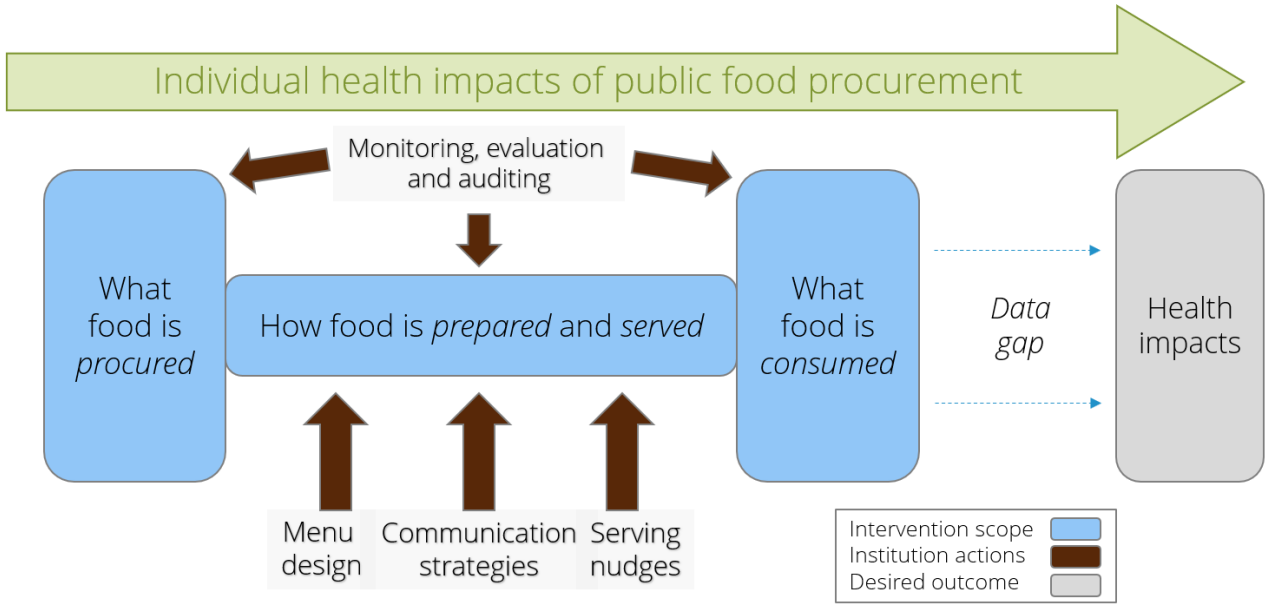

Figure 8: Graphical representation of interventions and data gaps to realise health benefits of meal uptake or F+V consumption in public settings. Created by authors.

3.5.3 Health food preferences, values and rebound effects

The evidence presented in sections 3.5.1 and 3.5.2 relate primarily to measures of consumption and possible health effects *in the institutional setting.* However, for proponents of SFP-related schemes, the public kitchen can play a role in shaping people's preferences and consumption more widely, shaping their tastes and introducing them to new meals or ingredients. How public procurement interacts with wider food-system dynamics is therefore important to consider.

Positive reported changes in food preferences

As discussed in section 3.5.1, evidence relating to observed intermediate health *outcomes* such as changed obesity rates or BMI from school procurement changes are not widely identified, although this may be a limitation of study timescales rather than interventions (3,52,87). However, other measures and approaches in the literature may provide insight into possible changes in food preferences or values.

As is common across the literature more generally, school-based studies predominate, likely due to the formation of eating habits at a young age. Other insights from school-based studies include a systematic review of the US FTS scheme and FTS-related activities, such as food education, consistently showing a positive relationship with food and nutrition-related knowledge, nutrition self-efficacy and willingness to try F+V amongst children. From the evidence identified, the authors point out that integrated nutritional curricula were the main driver of the positive impacts, with other activities such as experiential learning through farm visits having fewer high-quality studies which evaluate their impact on student behaviours (87).

Similarly, evidence from the FFL scheme included a cross-sectional school study where, even after controlling for FSM status, gender and local authority, pupils in FFL schools were about 40% more likely to self-report that they ‘like’ or ‘really like’ school meals and report higher F+V consumption both at school and at home (81), with other positive trends in FFL-participating schools including confidence and enjoyment of cooking and food-growing activities, improved attitudes towards certified food (such as organic or Fairtrade) which, in some cases resulted in changes at home and influencing parents’ diets (80). Further qualitative judgement of participants suggested that FFL had been a vehicle to open conversations between parents and children about food choices in and out of school (52).

Other evidence identified include the perceptions of scheme administrators that there is a high level of acceptance in schools, with some US FTS participants claiming a main motivation for continuing the scheme is that “the students like it” (85), others that the improved student acceptability of seasonal produce “outweighed the cost difference of the product” (103). Other anecdotal reports of “better quality patient food being served” in hospitals involved in the FFL scheme (104) further support this, with perceived improvements in quality and taste acting as a justification for further expansion of schemes (105). Where meal uptake is recognised as being a function of desire (rather than, say, incentives to consume certain foods), this could be inferred to have more of an impact on preferences, and possibly habits.

Whilst such varied, often self-reported and qualitative measures are difficult to compare, they do point towards an impression that schemes such as FTS and FFL can positively impact attitudes and preferences, which may lead to effects outside of the institutional setting. It is unclear, however, if this is driven by the procurement strategy itself or other adjacent activities such as messaging or nutritional education. Some evidence points towards messaging and information provision alone being sufficient: a canteen experiment compared messaging approaches for vegetables and found that those receiving a ‘local food’ message had improved vegetable-related attitudes and preferences, whereas those with a ‘nutritional’ message or no message at all did not (106). In this case, even if messaging and information provision is sufficient to promote consumer change, this still relies on the actual procurement of ‘local’ food to realise those positive impacts.

It is also important to note that public food-serving institutions are not the only arena in which food preferences and values can be shaped. What is carried out in schools, hospitals and canteens can be complementary or contradictory to the wider food-system dynamics. This is also not a passive process: as in Denmark, organic procurement in institutions was paired with a big focus on consumer awareness of and developing public support for organic food more generally, including accreditation for private kitchens, and this may be a factor for its reported success (29,107).

Public procurement can be embedded in wider municipal policy, and evidence from Mouans-Sartoux, France, suggests this has helped to engage citizens around food with the development of other activities including community gardens and local groups. This includes survey evidence that citizens consume organic food and purchase direct from producers at a significantly higher rate than the French average (44), though it’s unclear if consumer preferences were driven by municipal policy, or if that policy reflects existing

preferences. In any case, the suggestion from the evidence is that locating SFP-related schemes in complementary food system changes may be beneficial in realising changes in values and preferences around healthy or sustainable food.

Possible rebounds or rejections of 'sustainable' food

The translation of institutional food service into food habits and values is in part dependent on consumers not rejecting the changes made, nor experiencing 'rebound' effects whereby their private consumption alters and 'compensates' for the changes in behaviour in institutional settings.

Some limited evidence suggests that public food procurement may *not* positively impact food outside of the institution. This includes a dietary analysis inside and outside of schools in FFL commission areas finding no difference in the consumption of sweet or savoury snacks in or out of schools, although there was a slight significant difference with more high-fat food *inside* FFL schools (with no significant differences outside of schools), and significantly higher consumption of high-energy drinks outside of school in non-FFL areas (81). Analysis of food service revenues in schools participating in the US FTS programme found a negative relationship between local food expenditure and overall profits even when federal funding for local food purchases are included, which the authors suggest may indicate that competitive foods – food and drink sold outside of the main meal service, whether on-site (such as vending machines or alternative cafes) or off-site (such as neighbouring businesses or packed lunches) – are widely preferred (108). The role of competitive foods has been highlighted elsewhere by stakeholders as a barrier to implementing healthy food standards (93), and a systematic review of evidence from the US found access to competitive foods to be inversely associated with consumption of school meals (100). These do not point to consumers (in this evidence, school students) rejecting food *per se* but does indicate that what food is available outside the institutional food service is an important consideration both for increasing uptake and realising health outcomes.

There is some evidence internationally that nutritional standards can provoke a backlash, or reduced public meal consumption: a healthy food policy in Hungarian schools failed in part because the meals were considered unappealing: "catering reform will only be successful if pupils like and choose to eat these meals, but this aspect has been neglected" (109); similar challenges related to student palates have been documented in the case of Croatia (110), the USA (111,112) and Wales (113). In contrast to the cases of complementary food-system dynamics, stakeholders in the US highlighted that nutritional standards were hindered by proposed healthy diets in school cafeterias not reflecting the preferences and choices available in wider society, increasing the perception of cafeteria food being less desirable (88). This perceived risk of consumers rejecting food service changes were identified across settings: healthcare facilities have similarly reported dissatisfaction and consumer pushback to food changes including 'less but better' meat (114,115) with one example in Australia described by canteen staff as leading to reduced popularity of the food and in some cases abuse of canteen staff (116). Kitchen staff may therefore feel constrained: even with a self-professed interest in healthy or sustainable food, concern for the financial viability of the food service if ingredients cost more or are less popular may be a higher priority (112,115–117).

Whilst most of the evidence concerns nutritional standards and 'healthy' food, some evidence was found of consumers possibly rejecting 'sustainable' food (and its definitions) due to cultural or political disagreements. Cultural hesitations against reducing meat content were reported in a Stockholm hospital, for example (61) and a UK university focus group reported scepticism about food information and labelling related to sustainability (118). Disagreements over what constitutes sustainability was more forcefully described by one Finnish interviewee who considered reduced-meat menus as "brainwashing children" (119). These concerns speak directly to the lack of a unified concept of 'sustainable' food, as has been identified earlier (see 1.3.1), and are reflecting of ongoing controversies and debates within food-system sustainability, such as over the role of ruminant livestock.[49] Clearer consensus on these issues and clear messaging around that will help.

3.5.4 Other reported health and social effects

As well as direct health outcomes, what we eat can have an impact on other important social outcomes which are relevant to specific public institutions.

Effects for consumers

In schools, for example, there is some evidence that SFP-related schemes and healthy food can support other educational outcomes such as attainment and behaviour. One analysis of FFL schools found that they improved their attainment score on average, including some higher ratings in external evaluations, with approximately one-third of senior leaders linking improved test results to FFL activities, which include food and nutrition education (80). Other qualitative evidence from those involved in the FFL scheme have suggested it may have contributed to improved pupil attainment and behaviour, especially for those from deprived backgrounds (92), allowing the scheme to possibly help 'close the gap' for disadvantaged children (82). For stakeholders interviewed, these 'big picture' outcomes "had distinct implications for schools as institutions" (52). Outside of the FFL evaluations, other discussion papers have cited previously published evidence that "improving the nutritional quality and dining environments of school food […] may also result in improved academic performance, engagement and classroom concentration" (Cited in 62). Such judgements are certainly encouraging, and would merit further evaluation of the possible links between SFP-related schemes in schools and attainment or behavioural outcomes.[50] Longitudinal data comparing schools over time, for example, would be beneficial.

Similarly for healthcare, there are some encouraging indications that healthy and sustainable food could contribute to improved recovery times. Stakeholder interviews in a hospital in Basel, Switzerland suggested "there is no doubt that high quality and appetising food supports a patient's fast recovery", and at the Royal Brompton, UK an interviewee

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[49] See, for example: https://tabledebates.org/building-blocks/methane-and-sustainability-ruminant-livestock for discussion on the topic.

[50] Public Health England published some reviews in 2013 related to breakfast consumption and school food and attainment, which similarly found little conclusive evidence, other than the importance of consuming breakfast on short term cognition and memory. https://www.gov.uk/government/collections/school-food

“believes that patients recover faster thanks to the hospital’s sustainable food programme” (61). In the same publication about hospital food, it is claimed that an evaluation at a hospital in Asti, Italy, showed a decreased recovery period for 5,000 hospital patients “thanks to the high-quality, fresh, and local food served”, though this claim is not elaborated upon nor is the evaluation cited in the publication, so this is hard to verify (61). Further evaluation examining the possible connection between patient outcomes and sustainable or healthy food services should be pursued.

Other than patient recovery time, other health and social benefits have been indicated in qualitative studies, such as that care home residents in FFL pilots are “eating more and enjoying meals”, including possible co-benefits such as a reduced need for constipation treatment (81), improved social connections and wellbeing benefits including relief from boredom, anxiety, depression and loneliness (120–122), partially from the adjacent intergenerational food-related activities conducted as part of the scheme. These are encouraging signs that SFP-related schemes can have positive outcomes for care home residents.

Effects for suppliers

Some of the social effects of procurement schemes may be experienced upstream. Social inclusion of farmers was ranked as the third-most important social-economic element of public procurement schemes (after improvements to food security and living conditions) by Latin American experts in institutional food procurement (47). Farmer inclusion is cited as a driving force for the likes of the Brazilian PNAE programme (123), which ethnographic evidence suggested has helped to create more interaction between farm and school communities, reducing stigmas associated with farmers (124). Greater integration of farming and non-farming communities was similarly identified in a local food pilot in Denmark, with the development of social capital amongst farmers expected as an important scheme outcome (125). Further outcomes, including economic outcomes for suppliers, are discussed in section 3.6.

Additionally, procurement contracts may stipulate the use of specific social clauses, or labour integration for people who are long-term unemployed. These are referenced in some case studies identified (e.g. (60) or (34)), but these do not evaluate the impacts of these schemes. Another case study, of a scheme in Corfu, Greece, working with people with mental illness made reference to an impact evaluation of that organisation’s activities (of which approximately half are public contracts, but it is unclear how many are food-related) which point towards a reduction in relapse (-35%), increased communication indicators (+25%) and reduced need for mental health services (34). These are very limited pieces of evidence and more would be beneficial, but they suggest that how contracts are designed, and *from whom* they purchase can contribute to positive social inclusion outcomes.

3.6 Key themes: economy and other social effects

Evidence relating to upstream economic impacts, such as on producers, suppliers and the workforce of procuring bodies was also considered. The key messages from this section are summarised in Table 7 before being discussed in the rest of this section.

Table 7: Summary table - economy and social aspects

Thematic area	Key messages
Quantifications: Social Return on Investment (SROI)	Monetised social returns have been explored in SROI analyses, primarily in the UK and in relation to the Food for Life scheme. Different analyses have different scopes, so are not necessarily directly comparable, but broadly point towards **£3 - £6 return** in **social benefits for each £1 invested.**
	Environmental benefits are **poorly quantified** due to scope and data limitations**,** and **may therefore be understated**. More research is needed to bring together **monetised environmental impacts of food production and food procurement.**
	SROI analyses are often limited in not robustly assessing displacement effects, i.e. the impact of the procurement scheme which has been replaced. Whilst studies do make adjustments to account for this, a fuller exploration or comparison of two cases would be beneficial.
Quantifications: Local Economic Multiplier	Measures of local economic activity suggest that SFP-related schemes return approximately **£0.80 - £1.50 in extra local economic activity** for each £1 invested.
	However, the impact is often calculated in isolation. Where SFP schemes and 'conventional' low-cost procurement has been compared, they have had broadly comparable in economic impact. One possible reason is that 'local people' – i.e. staff wages – is as important as 'local food' for generating local economic activity.
Impacts on upstream suppliers	In emerging economies, there is the suggestion that smallholder farmers benefit economically from procurement schemes.
	Evidence of increased employment, financial security and opportunities to invest for small suppliers. The impact on previous suppliers who have been displaced is unclear.
	Potential **indirect benefits** such as increased visibility of suppliers in the community and increased sales through other channels, such as farm shops or butchers.
	For some suppliers, the economic impact of procurement contracts has been modest and played a small role in their security or income. Where this was the case, many suppliers still expressed satisfaction with the procurement schemes' ethos and co-benefits.

Staff wellbeing outcomes	Procurement schemes have anecdotally been associated with improved staff satisfaction, accomplishment and working relationships across settings and countries.
	Survey measurements of wellbeing suggest minor, if any, improvements. None have suggested a decrease, however.
	Specific elements of programme design are likely to have a bigger impact on staff wellbeing than the procurement policy itself. Multi-component or **whole-settings approaches** can support these outcomes.
Changes to food service costs	**Increased market costs** associated with procuring 'sustainable' food have been highlighted across numerous countries, settings and interventions.
	Caterers in many cases express a concern that increased ingredient cost will be accompanied with reduced sales.
	Although there are many examples in which cost increases have been documented, **there are also numerous in which food service cost has been stable or even decreased**. More holistic approaches may manage costs better.
	Further evaluation and comparison of specific outcomes such as food service running costs, revenues and profits in different institutions would be beneficial.

3.6.1 Quantified economic outcomes: Social Return on Investment (SROI)

One of the strongest approaches to quantifying the economic impacts of SFP-related schemes is the use of 'Social Return on Investment' (SROI) analyses. This approach attempts to capture a range of social outcomes associated with an activity than would normally be captured in a cost-benefit analysis, including outcomes which do not have a financial value.[51] This uses a net-present value accounting principle and expresses results as a ratio of return based per unit of investment (e.g. £1). This approach is useful for quantifying diffuse benefits which are 'hidden' due to not necessarily having a financial value, but do have an impact on economy and wellbeing: factors such as financial security, wellbeing or health.

[51] See here for more information: https://www.nefconsulting.com/training-capacity-building/resources-and-tools/sroi/

Identified results

The SROI analyses identified in this review all came from the UK, conducted within the remit of the FFL programme and therefore referring to the benefits of local food procurement, mainly from small suppliers and in some cases organic (6,8,23,24,26,28,38,39,52,81). The range of SROI values identified are presented in Figure 9: broadly, they point towards between £3–£6 of social return for each £1 invested, a figure consistent with other review findings (3).

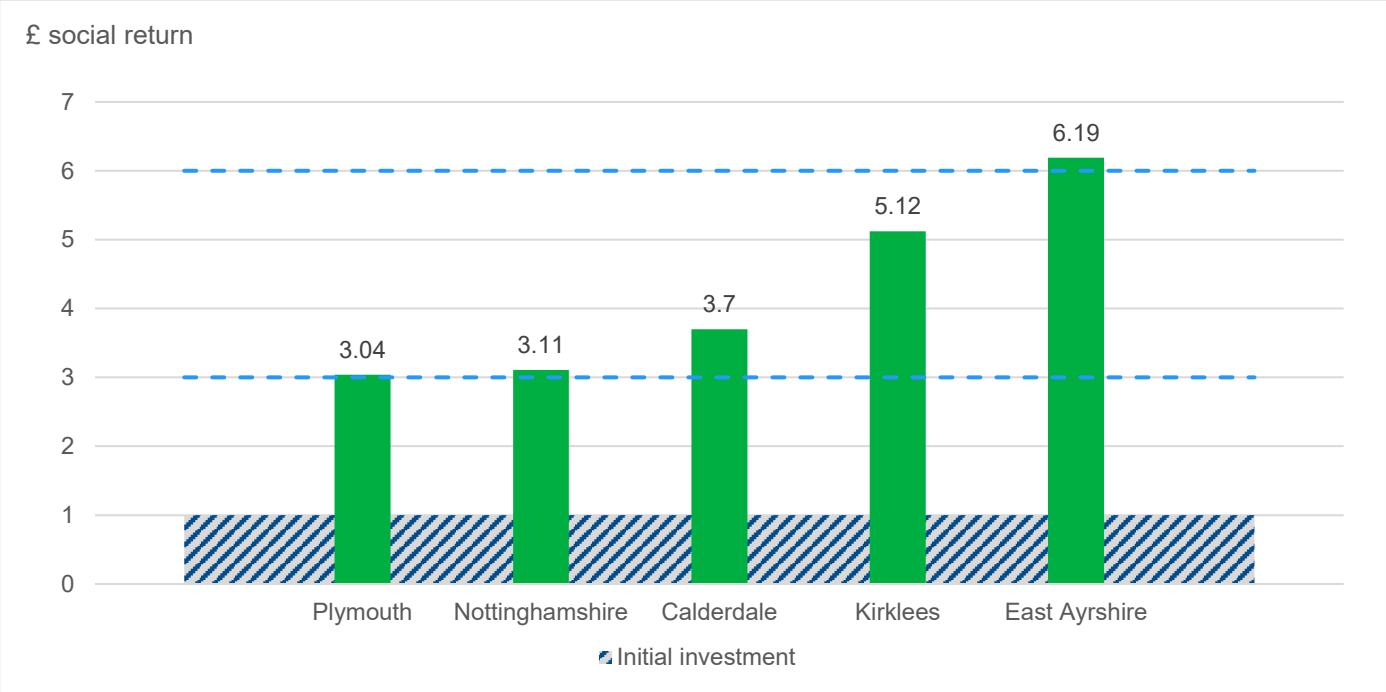

Figure 9: SROI values identified

The Nottinghamshire-Plymouth analysis suggested that 50-69% of the benefit was experienced by local businesses, 15-21% by employees, 10-14% by the government, with the remainder in benefits to local society and the environment (39). Across Kirklees and Calderdale, approximately 29-32% of the benefit went to local businesses, 12-15% to schools and their staff, 12-15% to the local authority in health benefits, 11-14% to employees of food businesses, and the remainder across other stakeholders, including the environmental benefit (52). The breakdown of East Ayrshire returns is not included here.[52]

The variation observed between these estimates will reflect both real differences in the contexts, schemes and impacts in particular places but also differences in methodology and scope. The specifics of SFP-related contracts, the institutions in scope of an

[52] **A note on the East Ayrshire value**: the original paper, published in 2008, pre-dated our search boundaries so was not included in the main REA. However, the analysis has been much referred to (though often poorly cited) in the literature identified, particularly grey literature. Where identified, the value has been referred to as £6 return. However, the original analysis suggested £6.19. The reason for this consistent rounding down is unclear. For consistency with the evidence identified in the REA, we mainly refer to the £6 value. Discussions of how this value is broken down by area/stakeholder are not included for the East Ayrshire study, though the original can be consulted if more information is desired. Some of the differences in scope are elaborated in methodological appendix section 11.1).

intervention and the local context will differ from one example case to another. At the same time, any valuation exercise is subject to uncertainty and subjective (or sometimes practical) determination of what is and is not included. This means that the results are not always directly comparable: as an example, the Plymouth and Nottinghamshire results are based on the returns, primarily economic for suppliers and schools, and are based on the returns for each £1 spent on local ingredients (39). By contrast the Kirklees and Calderdale estimates (52) are of FFL commissions, which cover schools and some other healthcare settings and also includes benefits derived by local society such as parents and carers and local charities or voluntary groups which are not included in the Plymouth and Nottinghamshire analysis (39). More stakeholders included in the analysis means more stakeholders to divide the returns between, which makes comparing returns by stakeholder group more difficult. The Kirklees-Calderdale estimate is also based on the investment in scheme administration rather than amount spent locally, as the ingredient expenditure was claimed to have stayed constant (52). Such methodological differences may make comparison difficult, but may also explain some of the differences observed: as more outcomes are factored into the valuation, this is likely to only increase the total returns. The decision of what to include or not include therefore has a meaningful impact on the results.

Limitations

As well as results being highly dependent on the scope and context of studies, these results have further limitations. Environmental benefits were constrained to reductions in food waste (treatment) and transport emissions, without considering possible upstream benefits such as reduced use of fertiliser, improved on-farm biodiversity or reduced greenhouse gas emissions from food production. This narrow scope was explained by the authors as being due to the 'local' geographic scope and data challenges. It is likely, therefore, that the monetised environmental benefits are substantially understated.

Improving the monetised environmental impact would be a challenge: valuation of ecosystem services and the costs or values associated with food production by 'true cost accounting' (TCA) methodology is an entire field of study in itself.[53] Nonetheless, finding a way to bring together ecosystem service valuation or TCA approaches with SROI approaches at a larger scale – as is suggested in one FFL study (126) for a national-scale SROI analysis – would be a significant step forward, filling this data gap and improving understanding on the monetised environmental impacts of SFP-related schemes, both production and procurement.

Another important limitation of the SROI analyses which constitutes a possible bias in their results is the lack of comparison case. Only the social returns of the 'alternative' procurement scheme are considered, not the social returns of an existing 'conventional' procurement scheme. This is an important limitation because, as is discussed and shown in relation to LM3 analysis in section 3.6.2, 'conventional' schemes may already be

[53] See https://www.parliament.uk/globalassets/documents/post/postpn_378-Ecosystem-Service-Valuation.pdf for ecosystem service valuations and https://www.nature.com/articles/s43016-020-00193-6 for food system True Cost Accounting

generating significant local economic benefits, particularly through expenditure on staff. What proponents of SFP-related schemes need to show is that the benefits of these schemes meaningfully *exceed* those of the existing food services they intend to replace. The literature review conducted as part of the Strength2Food project suggested that local benefit is often calculated "without taking account of displacement effects" (3) but this statement is an exaggeration: *deadweight* (costs and benefits that would have been realised anyway) and *displacement* (costs and benefits to stakeholders outside of study scope) effects are considered in the studies identified, and are subject to sensitivity testing. In the Kirklees-Calderdale study, for example, sensitivity testing included increasing deadweight and displacement to 50%. These scenarios reduced the SROI by 38% and 31% respectively. Even this adjustment sees a substantial SROI between £2.3 and £3.2 for each £1 invested (52). What is a limitation, however, is that these displacement and deadweight calculations are often based on assumptions: a more illuminating approach, though certainly more arduous and resource-intensive, would be to conduct a full SROI analysis in the context of a 'conventional' and 'alternative' procurement scheme, ideally in the same location (i.e. before and after a change in procurement contract). Such an endeavour would provide a much more robust estimate of the *additional* social benefit associated with changing from 'conventional' to 'sustainable' procurement.

These limitations are in no way intended to detract from the valuable conclusions which SROI analyses provide. By contrast, it is because they are such useful exercises that additional, more ambitious analyses would be invaluable. The process of gathering stakeholder insight is beneficial and turning it into quantified monetary benefit provides a usable input for further analysis and policy insight (as was done in section 4.3). Building upon this work to address the limitations and truly measure how SFP-related schemes change social outcomes could strengthen the argument for such schemes.

3.6.2 Quantified economic outcomes: Local economic multiplier (LM3)

An approach similar to but distinct from the SROI analysis (see 3.6.1) is the estimation of 'local economic multiplier' using LM3 (Local Multiplier 3) methodology. This method was developed by the New Economics Foundation and is a way of measuring local economic impact through measuring how income circulates within a local economy across three 'rounds' of spending.[54] Unlike the SROI this does not attribute a monetary value to non-monetary benefits, rather it is a measure of how money itself remains in or 'leaks out' of defined geographic areas. The values are expressed as a numerical value of economic activity generated by an initial £1 (or other unit of currency). If, for example, the LM3 value was £2.25, this would mean that for every £1 invested, an *additional* £1.25 (£2.25 - £1 initial investment) of economic activity is generated in the local area.

The LM3 methodology has been identified across a number of SFP-related schemes in the literature. The values of identified analyses are presented in Figure 10, grouped to specific

[54] See more here: https://www.nefconsulting.com/what-we-do/evaluation-impact-assessment/local-multiplier-3/

interventions: the FFL scheme, local procurement and organic procurement (and one local and organic procurement scheme in Italy (13)). This points to a range of between £1.8 to £2.5 in local economic benefit to alternative procurement schemes (i.e. 80p to £1.50 extra local economic activity), with substantial variation within rather than between interventions. Given the small number of quantifications, different contexts, overlapping interventions (the FFL scheme containing both local and organic procurement, for example) and possibly different applications of the methodology, it is difficult to draw any strong conclusions suggesting that one particular SFP-related scheme is more economically advantageous than the other.

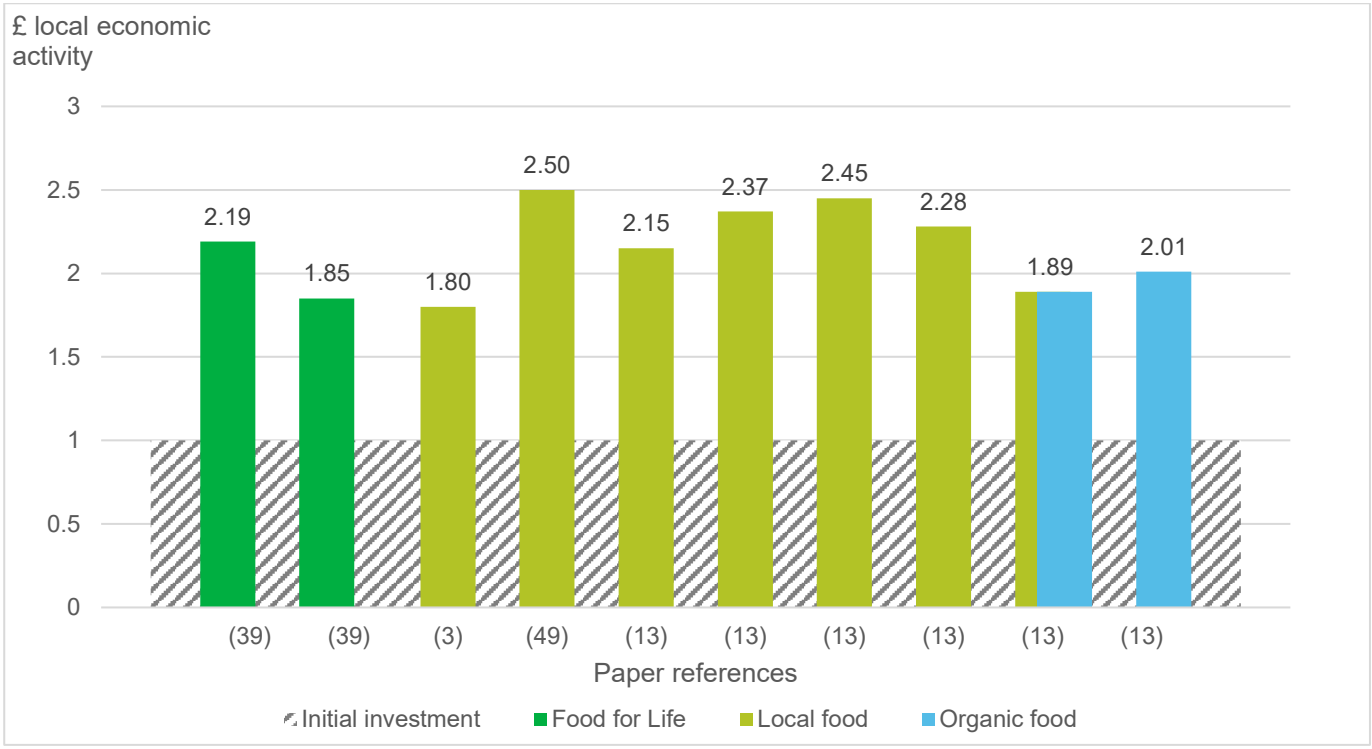

Figure 10: Local Economic Multiplier of SFP-related schemes

In fact, one substantial limitation of inferences drawn from this evidence is that it only tells half of the story: it represents the economic benefit of an alternative procurement scheme only. This relates to the criticism levelled in the Strength2Food literature review, that economic studies should be interpreted with caution: they often focus on benefits to local suppliers “without taking account of displacement effects” and with small sample sizes (3). In reality, an SFP-related scheme must replace or alter an existing scheme. For economic benefits to be realised, they must exceed or improve upon the benefits of the scheme being replaced. The evidence identified suggests this is not so clear-cut.

As part of the Strength2Food project, LM3 analyses were undertaken in five different countries, comparing a ‘local’ and ‘low-cost’ or ‘conventional’ school food service model (13). These are presented in Figure 11. Note that in Figure 10, only the ‘local’ schemes for these countries are presented, other than for Italy where both are presented.

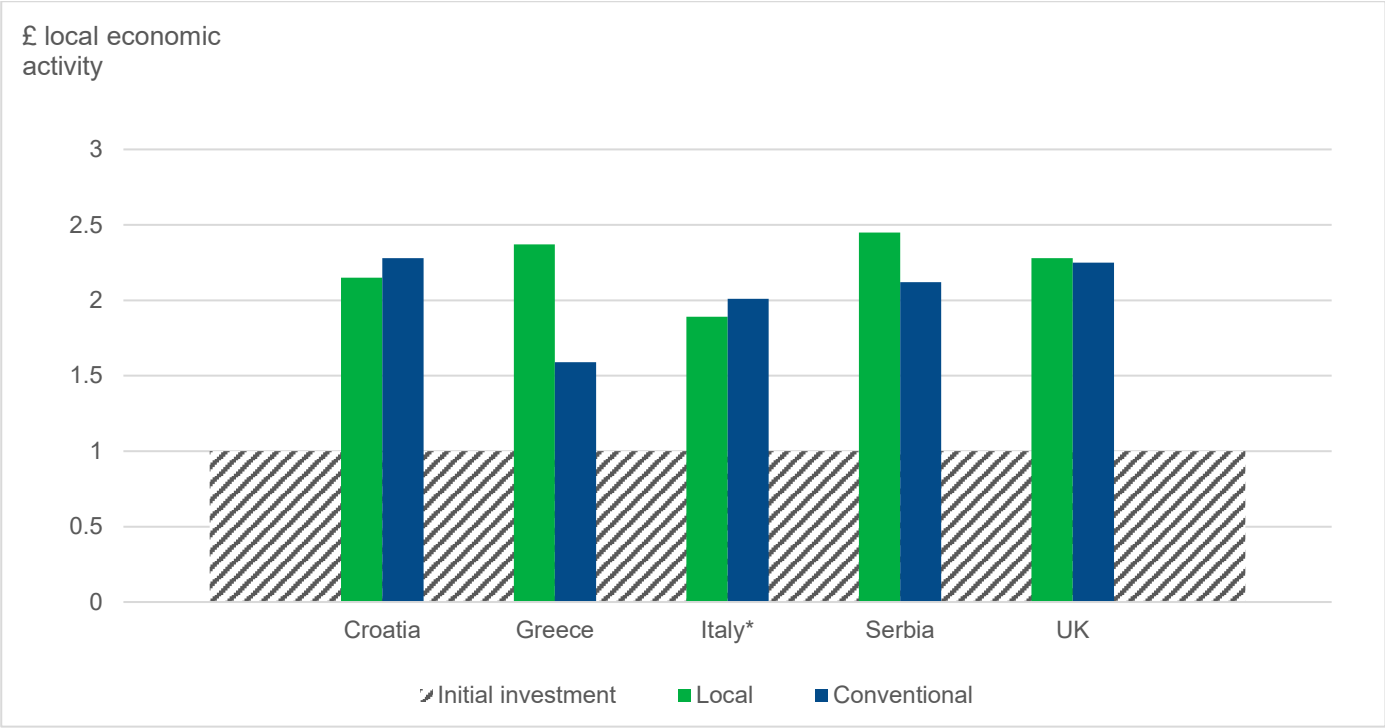

Figure 11: Local economic multiplier comparison in five countries. Adapted from (13). In Italy, both the 'local' and the 'conventional' were also procuring organic food.

What is particularly notable from these findings is that the difference between local and conventional food procurement is very small, with in some cases the conventional food service having a *greater* local economic impact than the specifically local meal service. Some reasons for this potentially unexpected finding suggested in the Strength2Food analysis (13,14) include: for Italy, a failure to adhere to the local procurement objectives in the local example, meaning there was little functional difference to the two models, and in Croatia different relative shares of staff expenditure, with local staff spending being a key determinant of local economic activity. Even in other situations, the conventional food service results are largely comparable with the results for alternative meal services presented in Figure 10. Although SFP-related schemes often put most importance on the ingredients being procured (see 3.2), these cross-country comparisons suggest that "paying staff a meaningful wage offers big returns locally, even when ingredients suppliers are lower cost and further away" (13,14). Whilst the SFP literature stresses the role of 'local food' (see 3.3.3), these results suggest that from the perspective of local economic activity, 'local people' may be an equally important factor. This also suggests that, regardless of whether particular 'local' procurement activities are prioritised or not, there is a local economic benefit to having a school food procurement system in the first place.

These findings also illustrate a key consideration from a methodological standpoint: apart from in situations where no public food procurement is currently occurring, SFP-related schemes are introduced to replace or augment existing contracts. Accurately measuring their benefits – whether economic or otherwise – requires adequately understanding the impact of what they are replacing. Statements which profess benefits without factoring in this displacement are at risk of overstating the scheme impacts.

3.6.3 Impacts on upstream suppliers

Returning to the conceptual model of SFP (see 1.3.2), one of the key suggested beneficial outcomes is improvement in economic conditions upstream for those firms and workers directly or indirectly associated with public sector procurement and its supply chain. This can be through economic development, supporting small businesses or smallholder farmers, supporting worker conditions through purchasing food produced under specific certification schemes and so on. As with environmental impacts (see 3.4), these assume net improvement in upstream conditions or financial security of those in the public-sector procurement supply chain is driven by the public procurement scheme.

Impact on smallholder farmers

Within SFP-related schemes undertaken in the context of emerging economies, there is some evidence of improvement in the conditions of smallholder farmers. Often, publications make generalised statements about "offering [smallholders] a more secure place in the food market and allowing them to better plan production" (51) through schemes which "reduce the risk of investments by farmers to increase and diversify their agriculture production, which may contribute to increasing their incomes and access to formal markets" (2) (see also (124,127)). Experts in the field support such claims, highlighting income increase as the most important economic benefit of public food procurement, followed by price support and market inclusion for smallholders (47). Where this has been directly measured, qualitative studies have taken place in the context of the Brazilian PNAE which suggest that participants in SFP-related schemes perceive it as having a positive impact on access to stable markets (68,128), improved income (129,130), as well as their autonomy from commodity markets (67). Surveys of Brazilian farmers involved in the PNAE suggest that the scheme "played a direct role in farmers' decisions to shift their households' primary economic focus from low agrobiodiversity, input-intensive farming systems to more diversified, low external input systems" (66). One review paper suggests that there is broadly sufficient evidence of increased farmer income, but notes that studies often struggle to assign attribution to specific interventions rather than country-contextual factors (131).

However, robust, controlled and quantified evidence which examines material changes in producer income, food security or economic stability was not widely identified. As another discussion paper picked up, evidence on SFP-related schemes largely consists "of case studies using qualitative methods" with "limited availability of empirical investigations demonstrating links between practices and improved performance" (132), a conclusion which is reinforced by the evidence identified here. Whilst there is a clear theoretical basis and clearly many participants and those with experience of the schemes do perceive benefits, this is not well verified with robust analysis, particularly of a quantitative nature. However, there is little evidence to suggest the theory and reported experience is in any way incorrect. The data gap may reflect difficulties in measurement in circumstances such as low-income, remote rural areas, and is something researchers and practitioners should continue looking to improve upon.

Impact on suppliers

In industrialised country settings which are likely to be more relevant to the British experience, some primarily qualitative evidence supports the idea that upstream suppliers benefit from SFP-related schemes.

Increased employment is mentioned with some regularity, but often in very general terms: the use of regional suppliers "potentially increases employment in the area" (50), with case studies highlighting employment growth in areas with an SFP-related policy (such as in Los Angeles County, USA (29)) or within a specific contractor (for example in Ottignies-Louvain-la-Neuve, Belgium (60), Brighton, England (133) or Lens, France (76)). Interviewees in Food for Life SROI analyses pointed to employment increases in some cases quantified, including the ability "to invest in their infrastructure and [employ] more staff" (39,52). Such employment changes appear to be largely treated in isolation, often qualitatively stated in a case study format. Whilst small suppliers tend to be more labour intensive, so it is likely that there will be a net increase in employment if changing from 'conventional' to smaller suppliers, as was raised in the context of LM3 analysis (see 3.6.2) there is a risk related to the additionality of outcomes described: if one supplier replaces another, whilst the new supplier may increase its employment, the old one could equally reduce it in response to losing the public sector contract. Only analysis which looks at the net change in jobs would be able to observe the *added* benefit of using smaller suppliers, and this was not identified in our review.

Various pieces of evidence suggest that public contracts gave suppliers increased financial security and the ability to expand or change their business direction. The SROI studies undertaken as part of the FFL evaluation point to suppliers getting a large share, if not most of the monetised social benefits through improved security (39,81). This is based on stakeholder interviews in which the "outcome that was highlighted most was the increase in the security of their income and business", where the "security of income conferred by the school meals contract [was] a key benefit" (39). Even where suppliers reported school or public sector contracts as a smaller part of their business, they "were able to identify some tangible impacts on their business" including a "reputational benefit" to being involved, enhancing their standing locally and conferring a competitive advantage (52). However, this evidence is largely anecdotal, and one discussion paper highlighted the "limited availability of empirical investigations demonstrating links between practices and improved performance" (132). As with employment, the impact on the financial security of the supplier losing the contract is not clearly examined.

There is also some suggestion from the evidence that the appeal of public contracts can lead to suppliers changing their business: anecdotal evidence of suppliers seeking certification to pursue University procurement contracts in Canada (69), suppliers in Rome, Italy improving their performance to meet school contract requirements (33), suggestions that in Ghent, Belgium the demand for organic food "may inspire farmers to make the switch" (51) and participants in the FFL describing the contract security allowing them to invest and develop their business (134). This suggests that either the economic appeal of public contracts or the normative appeal of 'sustainable' food can influence how suppliers position themselves.

Part of the reported impact is not just how suppliers position themselves in regards to a procuring body, but also a wider community and supply chain. Some suppliers pointed to indirect benefits from SFP-related scheme involvement including improving credibility with other prospective procuring bodies (135), or increased demand through other channels such as butcher or farm shops due to increased visibility from the public contract (134): one local school procurement model in Greece, for example, reported that “parents came to browse the butchery and shop after children talked about the farm” (14). Participation in SFP-related schemes can also increase visibility to other actors in the supply chain: greater awareness of other local actors has been highlighted as an outcome of FTS procurement in the US (103) and in the FFL scheme in the UK (39). In one case, some suppliers of large caterers in an FFL scheme were unable to benefit from improved reputation due to being unable to disclose their participation in the scheme, but this was one isolated report and was “less of an issue for small and highly local suppliers” (52).

Contrasting these suggestions of meaningful economic benefits to suppliers were reports in some cases that institutional food contracts can have quite a modest impact, or represent only a small amount of a supplier’s income. This was the case in a ‘Fish to School’ pilot in the US, where a seafood processor indicated that school districts were not a large revenue source (136). As part of local economic multiplier analyses (see 3.6.2) in five European countries (13,49) it was similarly indicated that the school service contract was a small part of the business for suppliers and did not necessarily contribute to the winning of new business. It is possible the extent of economic importance will vary substantially on the size, nature and profile of the supplier. Interestingly, however, even where the public food contract represented a small part of their business, participants expressed satisfaction with the schemes: the local organic farm in (49) was reportedly driven by a communitarian, rather than economic, ethos to serve the school, suppliers in (13) reported the scheme to be “a steady and complementary area of business” and fish suppliers in (136) reported that working with schools helped create goodwill, which benefited their marketing. This would suggest that ‘values-based’ procurement is not just about the ‘values’ of the procuring body, but can reflect the ‘values’ of the supplier.

Overall, this evidence points towards a number of potential benefits for small suppliers both material and non-material. The evidence of material benefit is mixed and is likely to depend on context, such as the size and nature of the supplier and the specific contract. There is a substantial difference in the financial situation of a small farm supplying an institution directly and a large national supplier which offers certified goods, for example. Equally, a contract to supply a single school is not a comparable opportunity to supplying an entire municipality’s public procurement. SFP-related schemes reflect a broad activity with substantial variation between how it is implemented in different places, making generalisations difficult. Even where material benefits are limited, there is a suggestion that non-material benefits such as improvements in image and reputation could be substantial.

The evidence identified is limited in two key ways: firstly, the evidence is overwhelmingly anecdotal or qualitative. Whilst qualitative insights from stakeholders have clear benefits and should be gathered where possible, their conclusions could be better supported by quantitative insights into changes in employment, firm size or sales which have been

impacted by procurement schemes. Secondly, by pursuing often qualitative, case-study type evidence, there is a risk that *additional* economic benefits have been attributed to situations where they are not additional. Improvements in employment or improved financial security for one supplier may mean decreased employment and increased precarity in another which has lost the contract. Evaluating this more holistically and looking at the *net* changes associated with procurement decisions would greatly strengthen the evidence base.

3.6.4 Staff wellbeing outcomes

As well as material outcomes for suppliers (see 3.6.3), SFP-related schemes could have an impact on the non-material wellbeing of workers involved. In particular, this has been examined for caterers and canteen staff involved in the scheme, with mixed results.

Various anecdotal reports and qualitative judgements suggest that there could be positive impacts on staff wellbeing. Interviews with FFL participants suggested that teachers had "overall improved job satisfaction" due to creative opportunities provided by the scheme (52) and that suppliers involved had wellbeing benefits "as a result of knowing that they were a respected business and were contributing to a thriving local economy" (39). For canteen staff, FFL interviewees' "most commonly raised [outcome] concerned the quality of working relationships, peer networking and the overall working environment", highlighting "a sense of accomplishment" (52), which in some cases was augmented by the recognition that certification provides (122). There are similar claims made in Denmark that organic procurement is better for workers' health (71), and that the Organic Cuisine scheme gives cooks "greater pride in their work" (8), and interviews with participants in 'local' and 'conventional' procurement models across five European countries suggest stronger relations between supply chain members and higher community engagement in local models (13).

Where staff wellbeing has been measured or quantified using surveys, however, the results have been more mixed. One review of literature relating to alternative procurement models highlights results that self-reported satisfaction ratings not increasing in the context of an alternative procurement programme, though other indirect sources of job satisfaction such as involvement in decision making or extent of networking were reported (3). In another study cited in the same review, an indirect measure of staff absences found them to be slightly (1.8%) lower in the 'alternative' procurement model (3). In a survey of staff before and after the introduction of FFL, a slight increase was identified in satisfaction with facilities and satisfaction with training and number of qualifications, but the overall job satisfaction remained very similar (80). In Denmark, staff physical and psychological wellbeing before and one year after organic conversion training pointed to no significant psychological difference, with one significant increase in bodily fatigue. However, self-reported job satisfaction, motivation to work and perceived food quality had gone up (107). These findings have been misrepresented as "a 54 percent increase in job satisfaction" (56) when in fact what is reported is that 54% of respondents indicated some positive change in their motivation to work (50% indicated the same for job satisfaction) (107).

These mixed results suggest that it is possible for staff to have meaningful wellbeing improvements, but that this is not necessarily a given outcome of an SFP-related scheme.

Notably, however, there was no evidence identified which suggested that SFP-related schemes *decrease* staff wellbeing. It is likely that specificities of the kitchen, programme, context and design considerations influence wellbeing outcomes. Moving production offsite, for example has been suggested to have "a negative impact on both pay and levels of job satisfaction" (6), and this may be true regardless of what ingredients are procured. A comparison of 'conventional' and 'local' procurement models in five European countries found no notable difference in the profile of employees between 'local' and 'conventional' services; other influential factors like staff training or development opportunities varied more significantly by country or size of firm than by the procurement model (13). These suggest that wellbeing may be strongly influenced by the specific design of a scheme or model, rather than the food procured.

Evidence from the literature, for example, points towards specific design considerations influencing scheme success such as the role of leadership in the institution (see 3.8.3), lower information barriers (3.8.6), participatory decision making (3.8.8) and canteen staff training (3.8.9). It is likely that these factors – particularly staff training and accomplishment, work culture and involvement in decision making – have strong interactions with staff wellbeing and job satisfaction. Improved staff wellbeing therefore *can* be an outcome of SFP-related schemes, but should not be assumed as an outcome. Other important factors related to how food service is designed and how staff are treated will have a crucial role.

3.6.5 Changes to food service costs, or perceived costs

One of the most discussed aspects of SFP-related schemes which can be considered both an outcome and a factor which influences the success of scheme implementation was the *cost* of the food service, particularly the cost of ingredients. The issue of prohibitive (market) cost of ingredients is in many ways emblematic of the debate at the heart of SFP-related schemes. Rigid 'value-for-money' ethos or narrow interpretations of 'value' is regularly highlighted as a limitation of conventional public procurement (see, for example (2,6)) as well as the food system more generally.[55] These interpretations of 'value' are suggested to lead to risk-averse procurement culture which inhibits those trying to drive change (62). Without offering judgement on whether such interpretations of value are correct, it has had a lasting impact with publications regularly suggesting that increased costs were incurred when changing procurement system.

Case studies and examples where increased costs were cited as a barrier were many: in hospitals in Austria, Belgium, France and Sweden (61), in Denmark (137), Finland (138), Latvia (139), Germany (140) and elsewhere across Europe (24), in the United States (72,88,111,117,126), the UK (57,81,120,121) and Australia (116). Although these cited examples offer a range of different interventions – from low-sodium procurement and nutritional standards to local, organic procurement – they all report the same concern: that the status quo is cheaper. This concern for procurers is both based on higher ingredient prices (88) but also in some cases about "affordability in its broadest sense: not just the

[55] See, for example, the ongoing work around 'True Cost Accounting' to shift the narrative around market value in the food system: https://sustainablefoodtrust.org/key-issues/true-cost-accounting/

cost of fees and purchases, but the investment an organisation makes in time and effort" (81). Where driven by regulation, the increased cost may be perceived as a burden borne by suppliers (116). Although most of the evidence presented is of qualitative or subjective perceptions of cost increases, the wealth of evidence including some quite extensive stakeholder engagement (in (72,92,141), for example) suggests that cost increases are real and do present a real barrier.

Part of the voiced concern was that increased costs through menu changes may be accompanied by reduced sales, threatening the viability of the meal service: such a concern was expressed in relation to 'healthy' food policies (116,117) and in relation to 'sustainable' food (118). This is not unfounded: one quantitative analysis of US FTS survey data found that local food expenditure had a negative relationship with overall profits, suggesting that students were opting out of the meal service in favour of 'competitive foods' (108).

Where it has been possible to look at these figures as a percentage change from the previous contract, there is a suggestion that organic requirements could lead to increases of about 7-18% per meal (9,76,79,142). It is not always clear whether, in such examples, the 'price per meal' refers to the ingredient procurement or the whole food and catering meal service, though it is assumed to be the latter. This is an important distinction: whilst *ingredients* may be more expensive, in many cases meal service efficiencies have been adopted to offset that, which is discussed further in 3.8.7.

Although stakeholders often perceive an increase in costs, there were many examples in which costs were stable or actually decreased through the implementation of an SFP-related scheme. A non-exhaustive selection of examples both of cost increases and cost stability or decreases is presented in Table 8.

Table 8: Non-exhaustive list of examples of cost changes associated with SFP-related schemes

Cost stability or decrease	Cost increase
• Modelling of low carbon 'snack meals' served in Denmark suggest they have the same average cost as the wider snack-meal menu (21) • An English hospital with 'low-carbon catering' contract expected to save £800,000 over five years (77) • SFP-related requirements in a vending machine contract saved an Italian university €34,410 in energy costs (22) • Switching to a local milk wholesaler saving a single English school £10,000 (143) • A hospital in Spain had "not witnessed any significant change in costs" from purchasing fresh, local, seasonal products (61)	• Modelling of menu changes in Italy suggests that moving from a 50% organic to 100% organic menu would entail a 7% increase in costs (9) • Schools in East Ayrshire, Scotland procuring local food spend 10-15% more than local schools not in the scheme, although the overall accosts still fall below the national average (26) • Local seafood procured in a 'fish to school' scheme in Oregon, USA were between 15% to 500% what school districts would spend without grant funding (136) • Various hospitals including in Belgium, France and England reporting "significant

• Interviewees involved with the FFL programme in Nottinghamshire and Plymouth, England noted that “local produce has not increased the cost of delivering school meal", in some cases actually led to a reduction (39). • Participants in some US FTS schemes suggesting they “actually lower school meal program costs” (103)	additional costs” for local, seasonal or organic procurement programmes (61) • Organic menus procured in Lens, France were priced at €2.75 per meal, an 18% increase on the previous price of €2.33 (76) • Catering services in an English university reporting that their low-carbon menu had increased food costs, but achieved a slight increase in gross profit (31)

There is such a diversity of experiences regarding the cost of SFP-related schemes that it is difficult to suggest a ‘common’ experience; there is no ‘rule of thumb’. Furthermore, the evidence available is overwhelmingly anecdotal, often expressed without a clear baseline, comparator or context. This makes robust comparisons difficult to achieve. In many cases, cost is discussed in general terms, without any quantification (for examples of cost changes in general terms, see for example (25,45,61,88,97,144)). Broadly, our findings are in line with another literature review of alternative procurement schemes which identified mixed evidence relating to costs, with some places experiencing reductions but generally pointing to an increase in costs, whether ingredients, labour, infrastructure etc. (3).

Part of the observed discrepancy will be driven by the scope of analysis: is it looking at change in costs of *ingredients*, cost of *meal service* or in fact meal service *revenue* or *profit*? A meal service can increase spend on ingredients whilst actually decreasing the overall meal service cost, for example, through labour, energy and waste efficiency gains. An increase in ingredient cost may be followed by increased revenue or profit if the service gains consumers, by contrast it may lose revenue if consumers opt for competitive foods. The relationship between ingredient costs, meal service costs and meal service revenue or profit is likely mediated by other specific design choices or management strategies. Strategies to balance the cost of procuring ‘better’ ingredients were repeatedly referenced in the literature, this is discussed in section 3.8.7 and is very important to consider alongside evidence of increased ingredient or meal service costs. Similarly, food service providers are not passive recipients of consumer tastes for specific ingredients but can help to shape them in how meals are prepared, served and communicated about, this is discussed in section 3.5.3.

It could be argued that cost increases – at least, cost increases per ingredient or per kg of food – is less an *outcome* of SFP-related schemes and more of a *feature*. Experts in public food procurement in low-income countries considered cost reduction as the least relevant economic variable: schemes “looking to achieve sustainable development goals are considered expensive, but this increase in budget is very well supported by the other benefits generated” (47). This comes back to the issue of narrow perceptions of value in conventional procurement: possible increases in the cost of food is considered a worthwhile *investment* in the other benefits to environment (see 3.3 and 3.4), health (see 3.5) and local economy (see 3.6). Understanding possible cost increases as a feature

rather than an outcome does not invalidate the clear concerns expressed by stakeholders of increased food service costs and possibly reduced revenues. Rather, it suggests that implementing successful SFP-related schemes – such as ones which see stable or decreased running costs – are more likely to be holistic interventions (3.2) which learn lessons on implementation (see 3.8), in particular how to balance cost increases (see 3.8.7). The financial implications of SFP-related schemes to procuring institutions are as much a function of specific policy design as they are a result of pursuing an SFP-related policy in the first place. Understanding this and evaluating specifics, such as observing the *outcomes* on food service running costs, revenues and profits in different institutions and under different procurement frameworks is an evidence gap which would be beneficial to fill.

3.7 Synergies and trade-offs with wider food system impacts

3.7.1 Identifying wider food system impacts

This REA has identified evidence showing that SFP-related schemes can have positive impacts in terms of reducing greenhouse gases and wider environmental impacts, as well as improving health and economic outcomes.

This section explores some of the wider implications implied by SFP, its potential to lead to wider food system change through enabling additional changes to take place throughout the food system. SFP has previously been identified as a policy action that can "orient food systems towards healthier diets for all"[56]. The logic of SFP influencing wider is wider food systems change is due to SFP-related schemes impacting on food production, supply chains, food environments and consumers (Figure 12 and as detailed in the conceptual model, 1.3.2). Likewise, effective SFP requires connections to producing, processing, distributing, preparing and consuming food, and has a clear links to changing wider food availability, affordability, appeal/acceptability and safety. This means the adoption and use of SFP could influence changes in all these wider parts of the food system. This wider food systems impact in the UK context begun to be explored further by Parsons and Barling.[57]

[56] Hawkes, C., Walton, S., Haddad, L., Fanzo, J. (2020) 42 policies and actions to orient food systems towards healthier diets for all. London: Centre for Food Policy, City, University of London

[57] Parsons, K.; Barling, D. Identifying the Policy Instrument Interactions to Enable the Public Procurement of Sustainable Food. Agriculture 2022, 12, 506. https://doi.org/10.3390/agriculture12040506 and Parsons, K., and Barling, D. (2021) What would a transformational approach to food public procurement look like? A report for the UKRI Transforming the UK Food System Programme. Food Systems and Policy Research Group, University of Hertfordshire

Figure 12: A simplified logic map of SFP leading to wider food system change

Unlike the other sections which look at more prominent themes in detail, including evaluation of the evidence quality, this section presents a high-level overview of the literature where these possible system-wide effects are mentioned. There were 52 pieces of evidence reviewed in the wider REA as discussing wider food system impacts. These wider food system impacts were grouped into themes with 22 positive synergies and 5 negative trade-offs identified (Table 9). Many of these themes are interlinked as detailed in the text below.

Table 9: Number of pieces of evidence identified in the REA related to specific positive and negative food system synergies and trade-offs. Total body of evidence: 52 pieces

Positive food system synergies	Negative food-system trade-offs
Community building, inclusion, and trust (leading to improvements in communities self-defining) (n=12)	External factors impacting on the capacity to deliver quality products and services. The SPF related requirements becoming a barrier. (n=2)
Governance changes and need for policy support. This includes improved governance of different parts of the procurement and wider food system. E.g. public sector catering, farming etc(n=10)	Possible negative or unhealthy relationships with food develop due to changes. (n=2)
"farmers win" (including Improved prices for farmers and Improved living standards for farmers) (n=9)	Increased food waste (and leading to a "disposable" food culture) (n=2)
Increased knowledge of food and about foods on offer (in staff, and citizens) (n=9)	Negative interactions for farmers with other food system actors due to SPF requirements (n=1)
Education programmes and wider food literacy (n=8)	Disempowerment of communities and certain stakeholders (n=1)
Wider changes to consumer behaviour (spill over effects) (n=8)	
Improved overall quality of food (n=7)	
Jobs and Employment as well as skill development (n=6)	
Wider Changes to industry (n=6)	

Positive pleasure and enjoyment of food, satisfaction with service. (positive wellbeing impacts) (n=4)	
Leading to wider actions to promote Healthy and Sustainable food (n=4)	
Time saving and time use (n=4)	
Offering of wider services in the community (n=3)	
Local economic boosts (n=3)	
Food waste reductions (n=2)	
Hygiene and food safety (n=2)	
Food sovereignty and security (n=2)	
Food Citizenship (n=2)	
Food system and community resilience (including stable markets) (n=2)	
Diversified farming systems (agrobiodiversity and agro-ecological practices) (n=1)	
Changes to wider packaging (n=1)	
Empowerment (n=1)	

Positive food system synergies

The most common positive theme was that the introduction and use of SFP has led to wider **community building**, inclusion, and trust, as well as fostering environments for communities to self-create and self-define (n=12, (14,46,52,56,72,80,92,105,111,124,145,146)). This creation of community was seen throughout the food system, and could be communities developed by growers, staff, consumers or venues for SFP. Likewise, the establishment of SFP led to a food system that could support a larger community through additional food growing capacity, more jobs, etc.

Case studies on the introduction of SFP highlight the need for clear governance and wider policy support for success (n=10, (47,72,138,146–152)). In some examples this was emphasised further, with changes to procurement and the introduction of SFP leading to wider **changes to food system governance and standards**.

SFPs were shown to have multiple **benefits for farmers and farming communities**, these include improved prices and stable markets that lead to improved living standards for farmers and communities (n=9, (47,49,66,67,111,124,145,153,154), also discussed in 3.6.3). Within this development of wider **community resilience** (n=2 (66,67) due to SFP, there are examples of SFP leading to a wider range of jobs and employment opportunities as well as **skill development** for existing staff (n=6, (47,80,145,153,155,156), also 3.6.4). Other evidence highlighted economic boosts/**local growth** (n=3 (49,67,154), also 3.6.3), and the improved provision and offering of **wider community services** (n=3, (66,93,134)) due to the introduction or maintenance of SFP programmes. SFP was shown to offer famers the ability to **diversify farming systems** (including incorporating agrobiodiversity concepts and agro-ecological practices) (n=1(66)).

The adoption and use of SFP has been shown to lead to an **improved overall quality of food** in the wider food system (n=7 (2,19,33,81,122,155,156)), as well as **wider changes within industry** (n=6 (56,80,111,119,155,157)). Notable wider changes brought about through SFP include **changes to food packaging** (n=1 (9)), as well as improvements to wider **hygiene and food safety** (n=2 (19,138)), **wider time saving** and time use (n=4 (19,119,158,159)), and **food waste reduction** (n=2 (156,160))

The adoption of SFP has been shown to lead to **increased knowledge of food** and about foods on offer. Evidence of this increase in knowledge is spread across the food system – with examples in farmers, service staff, and citizens (n=9 (60,69,72,80,92,104,122,134,136)). Multiple papers suggested this increased knowledge can then leads to additional food system benefits. These include increased **food sovereignty** and security (n=2 (67,145)), improved participation and engagement in food system decision making, (e.g. **food citizenship** n=2 (80,145)), and wider **community empowerment** (n=1 (145)).

The adoption and introduction of SFP have been shown to be able to be well integrated into education programmes and improve **wider food literacy skills** (n=8 (14,60,69,80,92,110,136,145)), this can in turn lead to SFP being regarded as part of a suite of wider actions that **promote healthy and sustainable food** (n=4, (2,130,152,157)), and wider changes to **consumer behaviour** (via spill over effects from the SFP behaviour change) (n=8 (2,8,44,56,80,92,110,161)). Multiple studies also mention the development of positive associations via engagement with SFP, this includes improved pleasure and enjoyment of food, improved satisfaction with service, and **positive wellbeing impacts** (n=5 (44,80,110,122)). However, as was highlighted in 3.5.3, the extent and nature of spillover into private consumption is not yet well understood.

Negative food system trade-offs

There were multiple negative food system trade-offs highlighted by papers within the REA. These include that the adoption of the SFP can **impact on the capacity of an organisation to deliver quality food and service** (n=2 (150,162)). However in these cases it was not only SFP at fault, with the cause due to accompanying external factors such as changes to standards or markets. This highlights that existing quality and safety standards or the current production and service practices may be barriers to effective transition to SFP.

Likewise, **negative relationships with food** can be developed by producers, staff or citizens due to changes instigate by SFP (n=2 (8,88)). In particular, one study highlighted SFP as causing negative interactions for farmers (n=1 (46)). This same study also highlighted the **disempowerment of communities** and certain stakeholders due to SFP introduction (n=1 (46)). As discussed throughout section 3.7, some of these issues could be mitigated through how schemes are implemented to involve and empower participants.

The use of SFP leads to **increased food waste** in some examples. This is due to changes in practices, products, and menus leading to increased food waste. In particular one study highlighted the growth of a “disposable” food culture related to changes to procurement practices (n=2 (8,88)). In particular this was caused by oversized portions, unhealthy options and disposable crockery and cutlery brought in by contract catering team. These

food waste increases do have solutions including increased stakeholder consultation, and improved food environments and menu design.

Parsons and Barling highlighted additional trade-offs that could result from SFP adoption.[58] These include:

- Increased upfront costs due to changes to SFP. This could be mitigated through changes to menu and recipe design. An example of mitigation given is reducing the quantity of meat or reducing waste to offset increased costs. This is similarly discussed in sections 3.6.5 and 3.8.7.
- Globally produced products possibly being more profitable than fresh/local products; the switch to SFP leading to a change in procurement profitability.
- Tensions between large scale SFP (leading to cost reduction and improved capacity to meet to specific (nutritional) standards) and localised SFP which possibly provide a wider range of diversity, freshness and local produce, and an improved capacity to respond to feedback. This is also discussed in section 3.8.4.
- Standards/requirements for seasonality of ingredients, animal welfare, and types/amount packaging may not be easy to operationalise. This results in tension between the suitability of a uniform SFP or a local place-based approach.

Wider geopolitical events

The recent impacts of Brexit and the COVID-19 pandemic were also considered, though understandably these were barely mentioned in the identified research. In a small number of cases, completion of intended studies was impacted by COVID-19 related lockdowns and disruption (110,154,163).

Otherwise, recent geopolitical events and shocks were considered in some cases as an opportunity: some publications issued a rallying cry for a positive food-system vision "keeping in mind the further uncertainty created by Brexit and the COVID-19 pandemic" (54), or as evidence for the possibility of rapid, deep changes (164). Though too recent to be included in this research, the invasion of Ukraine and impact on global food supplies would likely also present a similar shock. These food system impacts and uncertainties may influence the political viability of SFP schemes and, for their proponents, offer an opportunity. At the time of writing, however, it is far too early to make any firm conclusions as to how these schemes relate to recent geopolitical events.

3.7.2 Policy coherence and wider food system impact

Section 3.7.1 has shown that there are many wider food system synergies and trade-offs that result from the adoption and use of SFP. However, for SFP to be effective – and have

[58] Parsons, K., and Barling, D. (2021) What would a transformational approach to food public procurement look like? A report for the UKRI Transforming the UK Food System Programme. Food Systems and Policy Research Group, University of Hertfordshire

maximum transformational food system impact – it needs to be part of a mix of mutually reinforcing policies that support each other. Indeed, some existing policies may undermine or block the effectiveness of SFP, and prevent wider food system transformation. This complexity of multiple policies interacting in the food system is linked to the term **policy coherence**. The concept of policy coherence is used to highlight and identity mutually reinforcing policies that create synergies towards achieving agreed objectives and to avoid (or minimise) negative outcomes in other policy areas.[59] The role of synergistic policy environments is discussed further in the literature in section 3.8.3.

There are many food system policy areas that have direct and indirect impacts on SFP, so policy actions in these areas also need to consider policy coherence with public procurement. This could include policies regarding nutrition, school/hospital/prison governance, food safety, trading practices, waste management and bio-economy, animal welfare, transport, trade, and taxes etc. This means many UK-level, devolved and local government departments, agencies, and councils all have policy that could impact upon how sustainable procurement operates. Indeed, Parsons identified that food policy within English government involves 16 different departments, policy from each of these could block the effectiveness of SFP.[60]

Parsons and Barling explore policy coherence of SFP in the UK highlighting that although the Department for Environment Food and Rural Affairs (Defra) has "overall policy responsibility" other departments that produce policy that impact on SFP include the Department of Health and Social Care (nutrition standards), the Office for Health Improvement and Disparities (hospital food), the Department for Education (school food), the Ministry of Justice (Prisons), the Ministry of Defence (army procurement), and Food Standards Agency (safety). They also highlight London's Greater London Authority (GLA) due to their current healthy and sustainable food policy for catering provided to "London's police, transport workers, fire brigade and GLA staff".[61]

Though beyond the scope of this document, for the implementation of effective and transformational SFP policy, additional policy coherence analysis needs to be carried out to identity the mutually reinforcing policies that also require change.

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[59] For more on policy coherence, see: OECD. 2016. Better policies for sustainable development 2016: A new framework for policy coherence. OECD. doi:10.1787/9789264256996-en ;
OECD 2021. Making better policies for food systems. OECD. doi:10.1787/ddfba4de-en ;
Parsons, Kelly, and Corinna Hawkes. 2019. Brief 5: Policy coherence in food systems. Rethinking Food Policy: A Fresh Approach to Policy and Practice. London: Center for Food Policy, City, University of London.
Thow, Anne Marie, Stephen Greenberg, Mafaniso Hara, Sharon Friel, Andries duToit, and David Sanders. 2018. "Improving policy coherence for food security and nutrition in South Africa: a qualitative policy analysis." Food Security 10 (4): 1105–1130. doi:10.1007/s12571-018-0813-4.

[60] Parsons Kelly. 2020. Who makes food policy in England? A map of government actors and activities. Rethinking Food Governance Report 1, London: Food Research Collaboration

[61] Parsons, K.; Barling, D. Identifying the Policy Instrument Interactions to Enable the Public Procurement of Sustainable Food. Agriculture 2022, 12, 506. https://doi.org/10.3390/agriculture12040506 and
Parsons, K., and Barling, D. (2021) What would a transformational approach to food public procurement look like? A report for the UKRI Transforming the UK Food System Programme. Food Systems and Policy Research Group, University of Hertfordshire

3.8 Lessons on uptake and implementation

Alongside the analysis of *outcomes* (see 3.3 to 3.6), key themes were identified in the literature about the importance of design and implementation for successful scheme uptake. These lessons learnt are presented in this section, grouped according to key thematic area. The main findings are summarised across Table 10 - Table 12, where the thematic areas are grouped.

Firstly, there are structural constraints which may influence the implementation of SFP-related schemes. These are summarised in Table 10.

Table 10: Summary table of possible structural constraints

Thematic area	Key messages
Local economic and productive characteristics	Localised food procurement may reflect existing regional inequalities.
	The ability to deliver 'local' foods is impacted by the productive and processing capacity of an area to meet procurement requirements.
Kitchen and site infrastructure	There is **no 'one-size-fits-all'** approach to SFP schemes as different settings have different physical infrastructure and management.
	Available kitchen infrastructure impacts the level of processing and preparation which can be achieved in public settings, and the ability of caterers to drive change.
	Other structural limitations to the built environment or day-to-day operations of a setting may restrict the extent of changes in food provision, particularly in healthcare settings.

Secondly, there are specific considerations for policymakers or institutional leaders for how decisions related to food procurement should be made. These are summarised in Table 11.

Table 11: Summary table of leadership and decision-making considerations

Thematic area	Key messages
Political and personal leadership	Policy frameworks and political leadership or objectives **create an enabling environment** for institutions to reform their procurement.
	For policymakers, setting **clear, quantified and time-bound targets** can be an important way of providing this leadership.

	Action on sustainable procurement can be helped or hindered by national and international frameworks and policy. Alignment can facilitate local innovation in procurement practices.
	Within institutions, **personally-motivated 'champions'** are particularly important for successful SFP schemes. However, over-reliance on individual efforts may entail risks that schemes are not fully embedded.
Structures of decision-making	For political bodies, generally **decentralised and local decision-making** can facilitate innovations in local food procurement.
	Procurement from local or small producers seems to benefit from decentralised decision-making, whereas procurement by other criteria such as nutritional standard or certification may benefit from more centralised economies of scale.
	Within institutions, however, fragmentation can be a barrier: coordination between food service providers and sites can be difficult. Leadership at the institutional level is required.
	Even if decision-making is decentralised, **governance should avoid fragmentation**. Strategic planning is needed to break down organisational silos and ensure that sustainability is approached in a holistic way which connect environmental, economic and health objectives.

Thirdly, and most significantly, there were numerous considerations around the specifics of implementing and maintaining an SFP-related scheme. Though most of these considerations are relevant at the level of food-serving institutions, many of them are influenced by policy design and guidance. The key findings are summarised in Table 12.

Table 12: Summary table of implementation factors

Thematic area	Key messages
Contract design	Long-term contracts with gradual progression towards SFP targets create an enabling environment for suppliers and producers to invest and develop new products.
	Dividing contracts into **smaller, more manageable lots** increases their accessibility to smaller suppliers.
	Other contract innovations, such as 'indirect' or 'preferencing' schemes can support specific suppliers in a competitive tendering process.
Administrative burdens	There is a trade-off between simplicity and burden between actors. Political bodies such as municipalities introducing new policies may pass the information and administrative burden on to the institutions intended to implement it. Similarly, institutions may pass administrative burdens on to suppliers. **Raising**

	information barriers may hinder implementation by institutions and participation by small suppliers.
	Where possible, **training, guidance and support** should be offered to ease the transition to a new procurement scheme.
	Collaboration and networking can reduce information barriers and administrative burden. Third parties such as civil society can play a facilitation role here.
	Engagement with the market and communication between actors can ensure that institutions and suppliers are aware of each other's needs and limitations.
Strategies to manage cost increases	There is widespread **perception of increased ingredient cost** associated with SFP schemes. However, **this does not necessarily need to translate into increased food service cost.**
	Direct financial support from policymakers or bodies can reduce financial barriers, requiring less adaptation from institutions.
	Cost-balancing strategies were widely mentioned as examples of how institutions can adapt but stay cost-neutral. Reducing food waste, improving efficiency, substituting ingredients for cheaper/more seasonal ingredients and reducing meat or fish were all regularly highlighted.
	Some cost-balancing strategies have synergies with economic, health and environmental goals. Effective SFP schemes should make the most of these opportunities.
Stakeholder engagement	**Participatory engagement**, interdisciplinary and cross-sector collaboration were often highlighted as enabling factors.
	Involving stakeholders within specific institutions in decision-making can increase buy-in.
	Specific bodies or committees can act as a vehicle for stakeholder engagement both at the level of an individual institution and a municipality or political body.
Training canteen staff	**Canteen staff are crucial** for food preparation, serving and disposal, and therefore play a key role in the successful implementation of SFP schemes. This is particularly relevant where cost-balancing approaches are required.
	Staff should be supported to realise new standards or utilise unfamiliar ingredients.
	Offering staff adequate training, participation in decision-making and opportunities for certification or career development is likely to contribute to realising wellbeing aims.

Monitoring and evaluation	Properly understanding food service in an institution prior to making changes is an important step for identifying opportunities and monitoring progress.
	Effective evaluation is hindered where there is inadequate data, such as regarding the carbon footprint of locally-procured or otherwise certified foods. Supporting data collection and availability would support better evaluation.

3.8.1 Local economic and productive characteristics

Local inequalities

The success of SFP-scheme implementation will be influenced by local characteristics which influence the procuring body. There is a risk, if not managed appropriately, that SFP-related schemes will reinforce, rather than address, patterns of inequality.

Such concerns have been raised in the context of Brazilian school feeding programme (PNAE) policy, which is implemented locally. Analyses of the scheme suggest that "outcomes of localising the quality-oriented economy can vary significantly from one municipality to another" (149) due to uneven tax revenues and uneven local capacities. Regional inequality can influence the operational capacity of the municipality (129) its leadership and local networks (128,130) as well as physical infrastructure such as road quality (67).

Similarly, research was identified which analysed the geographic determinants of SFP-related schemes through quantitative regression analyses of datasets such as the US Farm-to-School (FTS) census. Some notable findings from the US include that county-level income averages had a positive association with the extent of school local food purchases, and the share of residents in poverty had a negative association (165). A similar analysis of FTS continuity found that smaller school districts with more free- and reduced-price meals, which relied on federal reimbursement, were less likely to continue on the FTS scheme (141). These findings indicate that the affluence of local areas can influence the rate of adoption of SFP-related policies and activities, with less affluent areas suffering as a result. Policy design and implementation should be mindful of such dynamics.

Local productive capacity

One finding which is rather intuitive, but was confirmed in the literature is that the extent and availability of 'local' food production matters when 'local' food is an objective. The natural endowments of areas and the types of foods produced are likely to influence what can be procured locally in those areas.

This was identified in statistical observations including in Italy, where municipalities with larger local farms were more likely to introduce local and organic food procurement measures (166), and in the US where the presence of local direct-to-consumer agricultural production had a positive, but modest impact on the probability of a school making local food purchases (165).

As well as primary production capacity, the ability to process food into usable forms locally may influence the success of local food schemes. This has been highlighted in cases including in Brazil, where food service managers suggested that “aspects related to the region’s productive fabric […] can hinder the implementation of local purchasing”, including uneven food processing capacities (130). This limitation was highlighted clearly in the case of Kiuruvesi, Finland, where centralised processing capacity in Finland resulting in the milk and beef of locally-reared cows being transported away for processing, in the process losing the benefit of a short supply chain and no longer being considered ‘local’ (105). Whilst demand for local food could help develop this capacity, there is a need for sufficient infrastructural investment in processing capacity to support schemes which prioritise local production. The more manufactured the food used in public settings is, the more difficult it may become to procure this locally.

Even if ‘local’ is not the priority in an SFP-related scheme, the distance of desired food producers and suppliers from purchasing bodies has an influence on the ability to deliver economically. Logistical difficulties in terms of cost and infrastructural challenges have been identified in organic fruit and milk procurement for Latvian schools (139), in regions of Brazil (124) and in healthy food deliveries to rural Canada (144). It may be the case that smaller suppliers have reduced capabilities to deliver longer distances economically, leading to price barriers which reduce the uptake of an SFP-related scheme.

Closely related to regional inequalities in governmental capacity and income, inequalities in productive capacity can hinder alternative procurement models such as SFP-related schemes, particularly where ‘local’ food is encouraged. Recognising and making available the ability to redress capacity imbalances, where possible, would help ensure more regions can successfully apply such policies.

3.8.2 Kitchen and site infrastructure

Another rather intuitive consideration identified in the literature was that the need for adequate kitchen infrastructure on-site in the bodies serving and procuring food. Whilst stipulating environmental or ethical criteria is still possible in a cook-chill system with centralised meal preparation, it is clear that for many advocates of SFP-related practices, ‘freshness’ of food and the preparation of meals from minimally-processed ingredients is a core component (see 3.2).

As a result, advocates for SFP-related schemes have been hindered in places where hot meals have not typically been prepared and served on site, such as schools in BC, Canada (145). Similarly, experiences from the Food for Life scheme in UK hospitals found that patient meals often used cook-chill methods due to minimal kitchen space available (104). Where the institution has less control over their kitchen, they may find it more difficult to make changes (81,104). However, this may vary within and between institutions: staff canteen and visitor food service in hospitals may have on-site preparation capacity even if patient meals do not, for example (104) and schools within the same country may vary in terms of infrastructure or staff capacity, as was found in the case of a nutritional intervention in Croatian schools (110). This would suggest that there are no blanket rules which can be applied, and that policy or intervention implementation needs to be suited to specific contexts.

The need to process food on-site is closely related to the ability of primary producers and suppliers to offer processed products (see 3.8.1). Caterers may prefer pre-prepared products, such as chopped and frozen vegetables, to save in cooking time and effort, or for health and safety reasons, but small and local producers may be less able to offer such products. There is a risk of an incompatible pairing in which institutions lacking the space or resource to cook from scratch are looking to buy from suppliers without the infrastructure to offer processed food. Such experiences have been documented in the case of the Brazilian PNAE, with smallholder farmers lacking the resources to upgrade their food processing capacity (67,129). Similarly, health and safety concerns were described as hindering procurement of organic food in Belgian hospitals (61) and food from smallholder farmers in Brazil (67).In such situations a compromise is required to facilitate the food distribution: engaging with the market prior to procurement to understand mutual capacities and needs emerged in the literature as one possible solution (see 3.8.6 for more discussion of this). Cook-chill systems in which the off-site producer procures fresh products and prepares from scratch could also bridge this gap. Where kitchen facilities require improvement to prepare from scratch, the procuring body needs assurance that this is a worthwhile investment. This is where long-term visions and political leadership can play a role (see 3.8.3), with studies suggesting that ad-hoc approaches to reforming food service are not sustainable in the long-term (167).

As well as physical infrastructure, the way kitchens and sites are managed may restrict or enable implementation of SFP-related schemes and practices. For example, caterers who do not own kitchen infrastructure in a particular site may encounter additional challenges in monitoring things like energy and water usage, presenting a barrier to their effective management (168), and not owning or controlling the physical infrastructure may hinder the ability or willingness to invest in changes (104). Within the kitchen, its size and processes may impact how a scheme is implemented: in Denmark, for example, where interviewees suggested that larger kitchens had more complex planning and processing procedures than smaller kitchens, making organic conversion more difficult in those settings (107).

Beyond kitchen infrastructure, other structural limitations of sites may limit SFP-related schemes and associated activities, such as consumer interventions. Healthcare settings were particularly highlighted in this regard, with hospitals being documented as having structural issues which impede uptake such as test requirements, ward rounds and so on interrupting food service (162), and some care homes involved in FFL pilot activities having built environments which restricted the ability to improve the meal service setting or carry out adjacent food activities with residents (120,122). Where food is side-lined as a secondary activity this could be more pronounced, so cultural changes and commitments in leadership to re-prioritise food could be part of the solution (see 3.8.3 on leadership).

These findings suggest that it is inappropriate to apply a ‘one size fits all’ approach to SFP-related schemes. Whilst broad objectives can be shared, how this is implemented should take account of sector-related specificities and how the physical infrastructure and management of kitchens may vary even within the same sector. Place- and context-based considerations are required for smooth implementation.

3.8.3 Political and personal leadership

Political vision and leadership

The evidence identified in the literature consistently points to the importance of policy frameworks and political support in implementing SFP-related schemes.

Food and procurement policy plays a key role in creating an enabling environment for institutions, as well as the frameworks and tools for procuring institutions to deploy in their decision-making. This has been suggested in a variety of circumstances, contexts and schemes. For example, institutions reporting higher awareness of legislative capabilities in relation to food procurement in Arkansas, USA were reported as procuring more local food (169) and case studies from Italy, Brazil and Finland (3), amongst others (49,131) have referred to the importance of national regulatory and policy environments.

Policy frameworks are closely complemented by political objectives and support. Political support is regularly seen as an enabler for action: case studies in Sweden, Italy, Scotland and Denmark, for example, have highlighted the key role of political will (24,26). Such political support can benefit when procurement policy joins up with other, existing governance objectives – such as the promotion of public health and reduction of obesity (119). Similarly, in experiences where political support has not been sufficient, this has been documented as a barrier: some stakeholders in German cities suggested that long-term, food-related issues lacked political support (140), for example, and a reflection on the UK's Public Sector Food Procurement Initiative (PSFPI) suggested that it lacked necessary political backing, leading to unclear issue ownership which restricted uptake (57).

One method of demonstrating political vision and leadership is through the setting of clear, quantified and time-bound targets. Such targets display a long-term vision and continuity of political will (142). The role of clear targets in encouraging and enabling food-procurement-related changes has been cited in examples including Munich, Germany (42), Malmö, Sweden (142) and notably in Denmark, where clear, time-bound political goals are regularly cited as important factors in enabling an organic procurement policy (26,29,56). Such demonstrably long-term commitments and the political continuity they can help encourage investment to overcome possible infrastructural barriers for producers (see 3.8.1) or caterers (see 3.8.2).

Many of the case studies identified in the literature relate to municipal procurement. Rules established at a municipal or local level may have contrasting relationship with policy enacted at higher levels. In situations where municipal objectives or policies align with, or even exceed the ambition of national or international (i.e. EU-level) objectives, this can be an enabling factor, as has been suggested to be the case in Catalonia, Spain (170). By contrast, where national procurement recommendations and local objectives are not aligned, this may be a limiting factor, as in Mouans-Sartoux, where it was suggested that French national school meal standards were misaligned with the municipality's sustainability agenda (161). EU-level procurement legislation in particular has been highlighted in many previous pieces of research as being a limiting factor of local action in Wales (151), Finland (138), Denmark (56,125) and Liège, Belgium, where the limitations of competitive tendering rules were described as "difficult barriers to overcome" (171).

Action on sustainable procurement on a local level can be helped or hindered by national and international frameworks and policy. Supportive political environments with complementary national and sub-national/municipal frameworks and clear, long-term goals and support from policy-makers can help create an enabling environment and providing confidence for stakeholders to make necessary investments.

Personal commitment and leadership in institutions

As with the role of leadership and commitment at a political level, the literature consistently pointed to the need for these factors at the level of the institution. A food and drink strategy or policy within the institution can help provide organisational focus and is considered a demonstration of commitment from leadership to the sustainability or health objectives (104,167).

Within institutions, highly-committed and personally-motivated individuals, sometimes termed food 'champions', were regularly identified as a necessary feature for successful scheme implementation. In particular, the role of commitment from figures in leadership roles was common across institution types: school headteachers and senior management were identified as having particular influence on school meal service and food culture (49,172); commitment from senior decision-makers in universities was seen as crucial in 'Healthy Universities' case studies across Europe (53); similarly in care homes in the UK (121,122), and a nutritional policy in Western Australian health services was reported as having a perception of fairness due to the executive-level leadership (116). Their influence as leaders has an important role in both determining policies but also demonstrating commitment to the issue.

Even before all institutional leaders display commitment to a procurement scheme, highly-motivated 'champions' with influence inside institutions can play an important role. As one study which conducted qualitative analysis with practitioners across SFP-related civil society activities in the UK and Canada identified, champions "break down silos within an institution" and are "essential in this phase of development because the functions they are fulfilling lack system embeddedness, and therefore require unusual levels of personal courage, talent and creativity" (69) to drive forward the sustainable procurement agenda. Further studies from the USA reinforce this: interviews with school food-service professionals in the Upper Midwest and Northeast regions suggested that they were aware that buying locally entailed extra effort, but were motivated by concern for "their farmers" (85), and participants in a 'Fish-to-School' programme in Oregon highlighted that "having motivated and passionate program leaders at the school was a requisite step noted by interviewees", a champion who connected stakeholders, organised funding and adjacent educational activities (136). Similarly, the experience of some researchers who failed to encourage a US military base to procure locally led those authors to recommend the identification of an in-base champion to advocate the cause and help overcome some structural constraints (126).

Personal commitment at the level of the institution is complemented by personal commitment within catering staff or canteens. The personal motivation of chefs has been highlighted as an enabling factor in Vienna, Austria (26) and in Denmark (137). Such

motivation and commitment from catering staff can be nurtured and encouraged through appropriate training and engagement, this is discussed in section 3.8.9.

Clearly, personal commitment and leadership can play a key role in overcoming structural challenges within institutions. However, some studies also highlighted that reliance on personal commitment may entail risks for continuity, such as in situations with high personnel turnover (126). Past schemes, including the PSFPI were judged to have failed in part due to too much reliance on individual efforts (57). This delicate balancing act was well summarised in one Food for Life evaluation, which suggests “it is essential to have someone driving the programme forward in each school. But some FFLP coordinators pointed out that there was a danger of the programme becoming too dependent on their personal input, commitment and championing” (92). Embedding practices beyond the people who instigate it – such as through food-related policies and strategies, both at the political level and in the institution, could help reduce this risk.

3.8.4 Structures of decision-making

Centralisation

The nature and level of decision-making can have an influence on the success of SFP-related schemes. In general, the examples identified in the evidence review pointed towards decentralisation as being favourable for encouraging innovative procurement measures.

Managing food services and contractors locally, with each institution able to make its own decisions, was considered an enabling structure for local food purchasing in British and Canadian educational institutions (69). The AGRI-URBAN project similarly identified the strengthening of local decision-making capacity as an important action to enable innovative and local procurement (146). Where institutions or municipalities were restricted in their decision-making, research has presented this often as a barrier: centralised platforms for procurement products may hinder using local produce, as was reported in examples of US military bases (126) and a hospital in Aspi, Italy (61). It should be noted that in some other cases, centralisation has been considered beneficial: one study of institutional procurement in New York City, USA suggested that centralised purchasing allowed for economies of scale and “the ability to have products specially formulated to meet nutrition standards and consumer tastes writ large” (112) . These divergent experiences may in part be a result of different aims: *local* food from small suppliers may in particular benefit from decentralised decision-making, whereas food that meets some other form of requirement (such as a particular health criteria, or organic certification) could be achieved through centralised economies of scale.

The extent of decision-making centralisation relates closely to the policy environment. As was described in section 3.8.3, local political vision or leadership may be constrained by national or international policies. Whilst some institutions or municipalities will be enabled by national frameworks that provide guidance which they can adapt or exceed others will be constrained by those policies.

Each level of decision making experiences policy implementation differently. One study looking at the implementation of ‘Appetite for Life’ nutritional standards in a Local

Educational Authority in Wales makes this point clearly: as national policy filters to local implementation, additional competing interests are found at each level. Schools experience local concerns of parent acceptability and the requirement to maintain a viable meal service. For national policymakers, the ”emphasis was to look at the effects of policy on uptake after implementation”, whereas for schools the “uptake had to be considered at the outset, before implementation” (113). This suggests that rigid policy implementation from a central point may be a barrier: policies or voluntary schemes should at least be sufficiently flexible to be adapted to the needs and nuances of specific contexts (81,93).

For institutions, ability to make decentralised decisions may enable innovative procurement, particularly in regard to local food. However *within* institutions, fragmentation appears to be a barrier: as in Denmark, larger organisations such as hospitals with multiple food service entities experienced coordination and management issues in advancing their organic conversion (137). Even rather predictable factors such as being spread across multiple buildings and food service providers, as may be the case in some universities for example, has been highlighted as creating practical difficulties for things like training and monitoring of kitchens (173). This suggests that, at the level of the institution, clear and unified vision and action is required: this can be further enabled by the leadership at that institution (see 3.8.3) as well as how they engage with their staff (see 3.8.9).

Competing priorities and fragmented agendas

Regardless of the level of decision-making, there is a need for governance to avoid fragmentation and integrate agendas relating to food procurement and other objectives. This was regularly highlighted in the literature, with publications which reviewed SFP-related schemes pointing to the need for alignment, with policy supported by “complementary game changers and actions” to facilitate transformative change (1,20,62).

The risks of fragmented policy-making agendas and organisational silos was identified across a range of settings. In a paper documenting the failure of a Hungarian healthy school food initiative, the competing priorities and agendas of government departments and low priority of school catering were highlighted as key factors (109). This can be accentuated when the different aspects of food are treated separately. Strategic planning which integrates environmental, health and social aims into food policies is needed. Across countries aiming to encourage the use of ‘neglected and underutilised species’ in procurement, for example, experience pointed towards a “disconnect that exists between the agriculture, environment, health and nutrition sectors and the lack of coordination between the many sectors that need to be involved” (127). Meaningful political integration of sustainability means governance strategies need to approach sustainability in a holistic way, encompassing multiple environmental and social (138,152).

A lack of agenda integration has similarly been highlighted as a barrier at the level of specific institutions. Analysis of Food for Life pilots and implementation has pointed towards schools not having established strategies around health and wellbeing which link across portfolios (81), similarly in hospitals nutrition and food quality was described as often being given insufficient priority (104). In these cases, better understanding of how good food provision links to these institutions’ core objectives (education and health,

respectively) could assist in facilitating the better integration of food, and raising it as a priority.

The importance of integrating food and sustainability agendas is further highlighted by evidence from where this has been successful. Across various case studies in Europe, the inclusion of environmental and social priorities in procurement was considered a factor for success, with municipalities realising that they are able to support local economic development and environmental action simultaneously (24). These joined-up approaches are similarly identified in cases such as Ghent, Belgium, where the municipal policy, including food procurement, benefited from its integration of food and climate agendas (58) and in East Ayrshire, Scotland, where the success of a much-referenced local procurement policy was attributed in part to the council's joined-up strategies on health, rural de-population, jobs and environmental sustainability (26).

The integration of agendas and overcoming silos closely relates to the role of political and personal leadership, such as policies, strategies and individual champions which is discussed in section 3.8.3.

Themes common across policymakers and institutions

Across the findings discussed, there have been various parallels in which themes can be broadly applied to both SFP *policymakers* such as governments or municipalities and within *specific institutions* like an individual hospital or prison. Navigating these themes can be supported by third-party civil society organisations. A graphical representation of some of these common themes and how they manifest at decision-making levels are summarised in Figure 13.

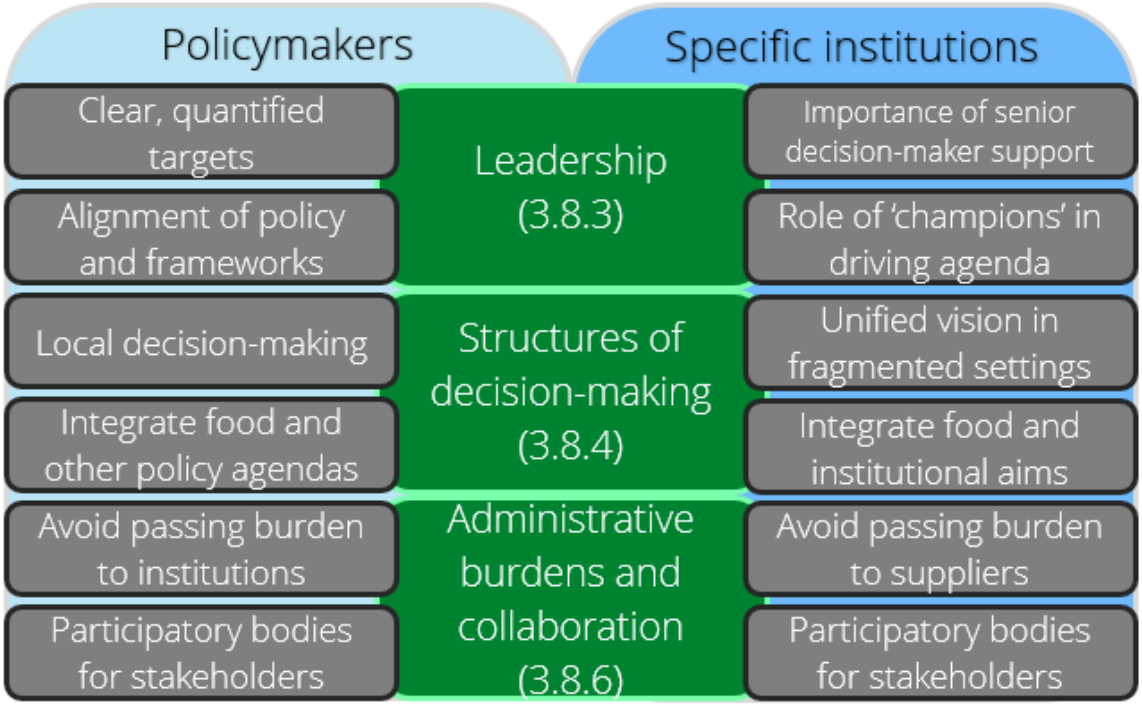

Figure 13: Graphical representation of themes common to policymakers and institutions. Designed by authors.

3.8.5 Contract design

When instituting SFP-related schemes, how contracts are designed can be influential. In particular, two key elements were repeatedly referenced in the literature: providing long-term contracts and innovative contract design, such as splitting contracts into smaller parts more attractive to small suppliers or other criteria which give them a competitive advantage.

Length of time for change

The evidence identified generally points towards the benefits of taking a gradual, progressive approach to contract design with long-term goals. One review paper of sustainable food procurement strategies in health care settings stresses that SFP-related schemes “should be taken as a progressive journey” (167), something reinforced by case studies, such as from a hospital in Belgium, in which the gradual approach to fresh and seasonal procurement was indicated as an enabler of the policy (61). The sequential development of local and organic procurement in school in Rome, Italy, has similarly been highlighted as an example of this approach with each new procurement phase since 2001 adding more emphasis to quality of produce with additional criteria (24,26,142). Supporting this further is evidence of the reverse happening: stakeholders involved in implementation of public food nutritional standards in the USA suggested that the short timelines for implementation made the process more difficult and obstructed its success (88,93).

Longer-term contracts create an enabling environment by giving confidence to suppliers and producers in the direction of the market, allowing them to invest and develop new products. Where short-term contracts are issued, such developments may be discouraged (119). In this sense, the mechanism of change is much like that for political vision and support (see 3.8.3).

Innovative contract design: splitting into lots, preferencing schemes

Another way in which contract design can facilitate an enabling environment for small, local or other ‘alternative’ suppliers is by dividing procurement contracts into smaller, more manageable parts. This is regularly highlighted in the literature as a strategy to be more accessible to SMEs and increase uptake of policies.

Such strategies have been highlighted across various European case studies, including in East Ayrshire, Scotland which broke procurement contracts into lots and Malmö, Sweden, where separate contracts were offered for products more likely to be met by local supply (26,142). Such approaches can be supported by digital systems: the ‘Dynamic purchasing system’ (DPS) in Bath and Somerset, England, is an example of how small producers benefit from regular mini-competitions (50). Where single procurement contracts have been used, this has been highlighted as a barrier for local, organic suppliers (110). As a result this strategy is often cited as a beneficial one across SFP-related literature and analysis (see, for example, (2,6,24)).

Other innovative contract design approaches can also be taken to support alternative and values-based food provisioners. One typology presented in (2) highlights three such schemes: ‘Reservation schemes’, which reserve some share of procurement opportunities to a specific category of supplier; ‘Preferencing schemes’, a mechanism to give

advantages to a defined category within a competitive process, and 'Indirect schemes' where contractual conditions are placed on intermediary companies which target specific beneficiaries. One such example of 'indirect' and 'preferencing' schemes (depending on the institution specifics) is the use of 'Most Economically Advantageous Tender' (MEAT) criteria in Europe, in which market price is one consideration amongst many. Other considerations in the competitive process can be designed in such a way that benefits specific suppliers, such as by awarding points based on certification criteria (e.g. the share of organic products), transport distances (to encourage local food), judgements on quality and so on. Such approaches are regularly cited in European case studies as a way of meeting EU competition rules whilst supporting local suppliers (see for example (167), or case studies from the 'GPP Good Practice' site, e.g. (16,33,38,41,71,79,172).[62]

3.8.6 Administrative burdens and collaboration

Information barriers and administrative costs

The literature consistently pointed to information barriers, excessive bureaucracy or a lack of knowledge about the market – from either the supplier or the procuring institution – as possibly hindering SFP-related schemes.

Institutions require understanding and technical knowledge related to sustainable procurement (62). This includes adequate training and guidance on how to implement a new policy, alongside the time required to do so (see 3.8.5). Stakeholders involved in implementation of nutritional standards in parts of the USA highlighted a lack of guidance or training on operationalising new nutritional standards as limiting their ability to implement them (93,117). Where policies are introduced which restrict specific foodstuffs, such as unhealthy food, some examples from the US and Australia indicated that the burden of identifying compliant and non-compliant food was on the individual institution, which added complexity and led to "a cost [being] borne by those who the policy is regulating" (116,174). Similarly, institutions have highlighted a lack of knowledge on available suppliers and how to purchase from them (42,130,169). What these examples all point towards is that institutions procuring food often perceive that municipalities or other bodies introducing policy should support them with guidance and training to navigate a new procurement process (167).

Just as policymakers may shift administrative burden onto institutions, institutions may pass it on to producers and suppliers, which can in turn limit their participation in SFP-related schemes. The transaction costs of engaging in complex tender processes was highlighted as a barrier in Brazil (67), including documentation requirements such as food safety which may be more arduous for smallholder producers (129). The challenge of health and safety documentation has similarly been highlighted as a barrier in Farm-to-School activities in BC, Canada (145), and in a hospital in Belgium (61).

This experience is mirrored in regards to other forms of certification, such as organic, or for specific schemes. Whilst institutions highlighted the clear benefit of "making sure the farmers were vetted" and encouraging them "to adopt more sustainable practices" (69),

[62] https://ec.europa.eu/environment/gpp/case_group_en.htm

the costs of adhering to specific certification procedures can be prohibitive for suppliers (140). Where institutions get certification, such as in the Food for Life scheme, some institutions find the “prescriptive award-related criteria” to be “daunting and unrealistic” (81,92). The Organic Cuisine Label in Denmark helped alleviate this in part by a national waiver of fees for inspection related to the certification (56), reducing the barriers for institutions.

Overall, these findings suggest that there is a balance to be struck in the simplicity and burden of each actor. Increased simplicity for a municipal or political body instituting a new policy may increase burden for the institutions meant to implement it, who find themselves without sufficient training or guidance. Similarly, simplicity for the procuring institution may mean less accessibility to small suppliers. This trade-off was well documented in pilots in Serbia (110) and Latvia (142), and is closely related to the contract design (see 3.8.5): contracts which are more accessible to suppliers may entail a greater administrative cost to institutions. Another review of alternative procurement schemes in school meals highlights this trade-off and suggests that the perceived responsibility often lies with the municipality or procuring body to enable changes in practice by supporting and guiding small suppliers and producers through the tendering process, such as by making it easier and offering training (3). One way in which this trade-off can be managed is through dialogue, discussed below.

Managing trade-offs through market engagement, networking and collaboration

Whilst there are clear bureaucratic and information-based barriers related to alternative procurement schemes, one approach regularly cited which can help in mitigating these trade-offs is the use of collaboration and network building.

Building relationships and trust between stakeholders, such as institutions, suppliers and civil society organisations, is seen as a precursor which supports local and values-based procurement (110,169). This can be facilitated by external guidance, counselling and support. Third-party and civil society organisations have been highlighted as playing a key facilitation role in educational institutions (69), healthcare (167) and municipal procurement (42). In Denmark, the support and training offered to kitchens throughout their organic conversion has been presented as an important factor (56,107). What network-building and third-party guidance offer is an ability to address information barriers by ensuring actors have consistent understandings and knowledge of how they can reform their procurement practices.

Another key element of network building and market engagement is ensuring that institutions and suppliers are both aware of each other’s needs and limitations. A US Department of Agriculture project providing growers with data on school district purchasing helped those school districts improve local food purchasing, as suppliers were able to respond to school demand (153). Understanding the constraints of institutional demand and local or seasonal supply is a two-way street, however: as highlighted in the analysis of institutional food procurement programmes in Brazil, equal emphasis should be put on the capacity of small actors to supply large, formal buyers as there should be on the procedures of large buyers to do business with small actors. Both need to be flexible and adjust to be successful (67,131). This relates in part to ensuring menus and seasonal food

production are aligned, identifying compromises on the extent of food processing (see 3.8.2) and so on, so that the supply can meet the demand. This means that as well as suppliers aiming to grow foods demanded by institutions, institutions can adjust their menus to reflect local, seasonal growing capacity. One mechanism for understanding this and coming to a compromise is through pre-tender market engagement: such strategies have been highlighted in case studies from Slovenia, Finland and France (142), for example. More broadly, encouraging dialogue and collaboration across the supply chain is regularly cited as an enabling factor (140,151,167).

What this evidence points to is that, although there are some challenges related to the bureaucracy and availability of information to support alternative food procurement schemes, these are not insurmountable barriers. Municipalities or institutions can offer guidance to suppliers on new processes, and third party actors can play a key role in facilitating collaboration. Engagement with the market before releasing a tender can help develop a mutual understanding of needs and capacities, so that suppliers and institutions can reach compromises which facilitate successful procurement schemes.

3.8.7 Strategies to manage cost increases

As was discussed in some detail in section 3.6.5, an increase in the cost of ingredients may be perceived as a *feature* of SFP-related schemes. However, whether this translates to an *outcome* of increased food service costs, or decreased food service profits is not clear, and appears to be highly contingent on programme design specifics. In particular, two approaches were identified which demonstrate the variety not just of SFP-related interventions but approaches to ‘sustainable food procurement’: direct financial support may facilitate ingredient substitution with minimal disruption, whereas cost-balancing strategies tend to represent more holistic *conversions* to the way food is approached.

Direct financial support

In a smaller number of cases, direct financial support was provided to support institutions with the cost increases associated with SFP-related schemes.

These include specific grant funding available in the USA for ‘Farm to School’ programmes (103,111), which one quantitative analysis using FTS census data showed to be instrumental in supporting schools in purchasing locally-grown items (108). A ‘Fish to School’ local seafood programme was similarly dependent on grant funding for purchasing the ingredients and funding the educational programmes (136). Such funding or reimbursement based-policies “can increase FTS procurement without disrupting normal cost-minimizing purchasing behaviour” (154).

Some limited examples were also identified in Europe, municipal investments to subsidise meal services were highlighted with examples of the difference in costs associated with organic or local procurement being met by the municipality in Lens, France (79) or by project funders in Munich, Germany (142).

By directly removing the financial barrier, such policy and financial support can help maintain current behaviours and practices with minimal disruption to institutions. This is an intuitive mechanism and likely an unsurprising result. There is a notable contrast however, between this approach which essentially facilitates ingredient substitution without changes

in practice or culture, compared to the kitchen 'conversion' approach or whole-settings interventions which look at streamlining and reforming the entire food service to facilitate 'better' food, described below (see 3.2 for more on holistic interventions). This contrast is emblematic of the wide range of approaches to 'sustainable food' which may fall under the SFP umbrella.

Cost-balancing strategies

If financial support to address cost increases is a form of expanding capacity, cost-balancing strategies can be thought of as 'trimming the fat'. Improving efficiency of how food is procured, prepared, served and disposed was a very common approach identified in the literature.

Generally speaking, opportunities to improve the cost-efficiency of food services centre around a few key actions:

- Reducing food waste;
- Improving energy and water efficiency;
- Substituting ingredients for cheaper alternatives such as using less-regularly-utilised cuts of meat or vegetables grown in season;
- Changing menu composition to reduce the use of meat or fish and increase vegetable protein

Some combination of these changes were made in a large range of documented examples including reducing meat and food waste in a Food for Life case study (150); reduced meat and fish to fund local organic procurement in Finland (105); reduced meat, using seasonal vegetables and reduced waste in Munich, Germany (51,75), local organic procurement being achieved at no extra cost in Mouans-Sartoux, France through increased use of vegetable proteins (44); buying higher quality local meat but using offcuts and reducing waste in East Ayrshire, Scotland (28,38), and so on amongst other examples (6,32,72,95,172).

Largely, these are reported by stakeholders involved in SFP-related schemes as a factor for success. Some modelling of food service interventions in Italy have similarly quantified the impacts, suggesting that the cost of transition to local and organic vegetables "can be negligible by the reduction of animal proteins consumption" (63), with other studies suggesting that food waste reduction could lead to a 6-11% reduction in food service costs (9).

One of the best examples of cost-balancing approaches identified was in Denmark, where the organic 'conversion' process in public kitchens involves increasing the share of organic procurement with no additional budget being made for ingredients. The organic conversion "becomes dependent on the possibility of streamlining the public kitchen food production system" (107), which the sources identified indicate was achieved primarily through reduced meat and increased vegetable consumption and lower waste (26,51,71). Although for kitchens this conversion is to be cost-neutral, some €4 million per year was released to finance the planning, education and training to facilitate the organic conversion (56), and kitchens were able to access a digital 'Food Basket' tool to support them in menu planning and maintaining these cost efficiencies (6).

There are some interesting parallels which can be drawn between cost-balancing strategies and reducing greenhouse gas emissions (see 3.3). The cross-country analysis in (13) is particularly illuminating (see Figure 6, discussed in 3.3.2), where it found that 'local' procurement schemes did have lower emissions per meal than 'conventional' schemes not because of the distance travelled, but rather because local schemes had different menu compositions which were typically higher in vegetable content. This suggests that, in striving to balance the costs of local, organic or otherwise-defined 'sustainable' food, reduced GHGs may be a co-benefit. For policymakers or institutions looking to support both environmental and economic aims, this synergy should be exploited. However, changes to menu composition or ingredients sourced, such as using meat offcuts or trying to reduce waste, may also require additional training for staff (see 3.8.9), or support through digital tools which may support in economic menu design (6) or in designing lower-carbon menus (4).

The positive synergies which can be achieved between cost-balancing strategies, staff training and engagement and economic, health and environmental goals suggest that holistic approaches – kitchen 'conversion' rather than ingredient 'substitution' – is likely to be a fruitful avenue for pursuing SFP-related schemes and realising their professed benefits.

3.8.8 Stakeholder engagement

One of the most cited factors for successful SFP-related scheme implementation was collaboration and the engagement of stakeholders to develop buy-in. Participatory engagement with stakeholders and multi-level, multi-disciplinary governance was widely encouraged across a range of publications which reviewed examples and implementation of SFP-related activities in a range of institutions and locations (14,20,42,69,146,147,167). Such interdisciplinary and cross-sector collaboration was considered "critical to the successful development and implementation" of a local food sourcing scheme in Los Angeles, USA for example (29), and the importance of cross-sector partnership has been highlighted in Latin America (131) and Europe (137). Such collaboration can be facilitated by third-party and civil society organisations working on food, sustainability and nutrition issues.

This factor closely relates to the levels of governance in which decisions are made (see 3.8.4), the policy and leadership environment (3.8.3) and networks and communication built to break down information barriers (3.8.6). Whilst stakeholder engagement is implied in many of these areas, it is not a necessary component: (politically) decentralised decisions are not necessarily participatory, and leadership does not necessarily co-design policies. Stakeholder engagement may *support* and *be supported by* those other areas, however. This relationship between themes is depicted in Figure 14.

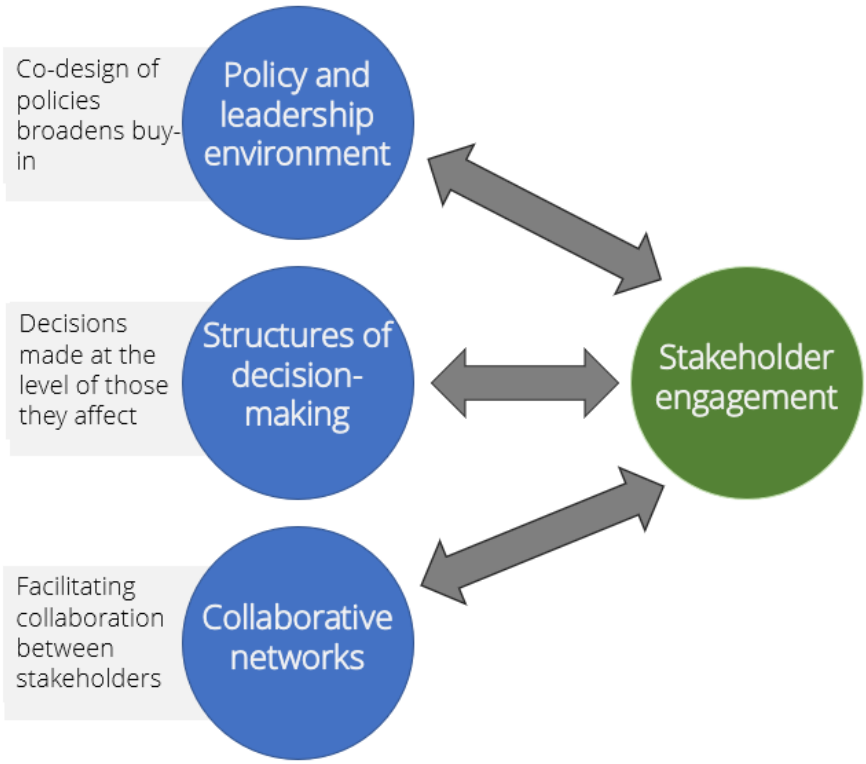

Figure 14: Representation of interaction between stakeholder engagement and other themes. Designed by authors.

It is distinct in that it suggests that decisions made at a decentralised level should also be participatory, that networks for guidance and information sharing should also be for genuine collaboration, that food policies should be co-designed with relevant actors.

Collaboration of stakeholders relevant to a specific institution or supply chain was regularly referenced: developing diverse partnerships between schools and their caterers, for example, was highlighted as an enabler of sourcing local fish in Oregon, USA (136); the FFL programme was considered successful in its involvement of catering and school personnel, students and parents in decision making (57,92). In situations where such broad stakeholder engagement and buy-in was not pursued, or was unsuccessful, this has been highlighted as a limiting factor. In some pilots of FFL in care homes for example, some staff were disengaged and did not see the activities as relevant to them, which was described as a limitation (120), and the failed case of a healthy school food initiative in Hungary was put down in part by researchers to the fact that “the two critical actors of the systems, namely the actual service providers and the children, have the least possibility to influence the operation of the system” (109). In other words, when people have change enacted *upon* them, rather than being active agents of that change, they may be less supportive of its aims.

As with market engagement (3.8.6), in some cases external facilitation by specialist third parties was presented as a useful method to engage stakeholders and develop support for the reform process, as was the case in some FFL pilots in care homes (121,122) and the Danish organic conversion (56).

One of the key mechanisms for achieving participatory engagement and stakeholder buy-in is through the creation of specific bodies or committees around food. Different contexts

and locations reported different names for such bodies, but often served broadly the same principle of acting as a vehicle to bring together stakeholders involved in the procuring, serving and consuming of food. Case studies, including those of municipal food policies that contain public procurement as part of their remit, highlight the role of this co-creation in giving citizens agency, such as in Ghent and Liège, Belgium (58,171), Mouans-Sartoux, France (161) and Catalonia, Spain (170). Similar principles of food-based committees within institutions were regularly mentioned, such as 'School Nutrition Action Groups' in FFL schools (81), or 'Healthy University Steering Groups' (53). The power of such committees is bringing senior leaders (who ideally have a personal commitment to sustainable procurement, section 3.8.3), catering staff and consumers, such as students, together to find common ground and develop "broad-based ownership and buy-in" (53).

Two examples of such committees are particularly notable:

- In Brazil, stakeholder committees such as the Intersectoral State Commission on School Feeding (CEIA in Portuguese) were considered an important mechanism to help implement the PNAE in some municipalities (129), and urban food security councils and school boards serve as vehicles to overcome the disconnect between institution and producer (67). A quantitative analysis using longitudinal data on share of funds going to family farming found that the presence of school feeding programme councils was associated with a greater increase in the percentage of foods procured from family farming, from which the authors infer that "local participatory democracy was associated with a better implementation of the farm-to-school regulation in Brazil" (175).
- In Italy, the use of 'Canteen Committees' which bring together school stakeholders, including parents, to influence decision-making were cited as an enabling factor of local organic procurement schemes (26). An analysis of surveys issued to public functionaries in Lombardy found that the introduction of organic procurement was higher in situations where it was proposed and encouraged by catering service management, canteen committees and municipal administration. In other words, broad buy-in from relevant stakeholders is associated with the adoption of SFP-related measures, which for the authors "confirms the critical role played by stakeholders in [public sector food procurement]" (166).

Overall, these findings point to multi-stakeholder groups being an important factor in enabling the success of SFP-related schemes. These findings are in line with those of a literature review conducted in (3), that multi-stakeholder groups "co-produce knowledge and outcomes in ways which go beyond what municipalities would be able to do under a traditionally managed approach", and that "successful cases of alternative [food procurement schemes] are almost always characterised as having strong goodwill, commitment and trust between actors" (3).

3.8.9 Training canteen staff

Closely related to facilitating change by reducing information barriers (see 3.8.6) and developing broad-based buy-in (3.8.8), one group of stakeholders whose participation is particularly key to the successful implementation of a procurement scheme is canteen staff. Thinking of the stages involved in a food service (see section 1.3.2 for the

conceptual model), *sourcing* of food is only one stage and must be followed by its *preparation, serving* and *disposal.* Canteen and kitchen staff are the actors responsible for these moments and so their perspective is important. Recognising their role in successful implementation of schemes and ensuring that they are sufficiently trained, engaged and consulted on how menus are changing, how to encourage consumption (particularly of 'less appealing' healthy foods), their agency in managing waste and so on is very regularly referred to in publications reviewing SFP-related schemes in multiple European settings (14,20,42,167).

Two regularly-referenced case study locations highlight the role of staff training: organic procurement in Malmö, Sweden and in Denmark, with some papers specifically referencing Copenhagen's organic conversion (26,142). These experiences point to the role of staff training helping to develop personal involvement in the project and a sense of ownership (172). Where cost-balancing strategies are adopted, such as menu redesign to reduce meat consumption of food waste reduction (see 3.8.7), training staff in these practices is a key part of ensuring they are successfully adopted (32). In Denmark in particular, the availability of training funds to support catering staff is considered an important aspect of the policy: some €4 million per year was made available to finance the process of organic kitchen conversion, educating, training and motivating food-service professionals to encourage their buy-in to the objectives (29,56,107).

The importance of supporting staff to realise new standards or policies is equally stressed elsewhere, such supporting staff in designing menus which use unfamiliar ingredients in the US (88,136) and UK (26,121,122). As was experienced with the Organic Cuisine label in Denmark, offering staff certification and recognition for this process can validate their efforts and increase personal support, as was also experienced in a FFL care home pilot (121).

Staff-focused approaches are also important for realising benefits to staff wellbeing, which could benefit when staff feel a sense of pride and involvement with the work. It is notable that Denmark, where training staff and establishing ownership has been particularly emphasised, is also where there have been claims of benefits to staff (see 3.6.4). Much like for consumers engaged in designing policies (3.8.8), being an active agent of change rather than a passive recipient of new instructions matters in determining how successful a scheme will be.

3.8.10 The importance of monitoring and evaluation

A final theme which regularly emerged as the importance of data collection, monitoring and evaluation. Understanding the state of food service in an institution prior to making changes is a beneficial activity both for identifying an appropriate plan for action, but also evaluating the progress which has been made (53,116). Monitoring specific elements of the food service were highlighted:

- Monitoring the energy and water consumption in kitchens, as well as the amount of waste being produced enables efficiency gains to be identified as well as verification that new processes introduced are being effectively embedded (167,173).

- Where menus have been redesigned, monitoring the nutritional quality of meals is recommended. This is particularly relevant in areas like hospitals and other healthcare settings where specific nutritional needs may be more complex, and adequate nutrition can play a role in patient recovery (97). Such monitoring is relevant to other settings as well: in Rome, for example, the quality of local, organic school meals is routinely checked by specialist dieticians to ensure suitability (42). Evaluating recipes, and the uptake of meals can help to determine nutritional uptake and health impacts, which may support stakeholders in advocating for and designing SFP-related schemes (see 3.5) (176).
- Monitoring and evaluation of the carbon footprint of meals served is important from an environmental perspective. Establishing a baseline of carbon emissions in a meal service is an important first step and enabler of further work to reduce that, such as targets (6). In Helsinki, for example, a study was undertaken to footprint the municipal meal service, but this activity was stressed by stakeholders as not being a goal in itself, but an indicator of how to proceed towards other goals (16).

In situations where robust monitoring and evaluation did not occur, research has identified this as a limitation: for example, a lack of methods to monitor the share of organic foods in Denmark meant that around half of projects assessed in one paper could not establish a robust baseline for pre- and post-analysis of organic food procurement, weakening the evidence base of its impact (137). Similarly, the UK PSFPI was criticised in another paper for not having a clear, measurable target at the outset (57). In this sense, the approach of 'Target, Measure, Act' can go beyond being relevant just to food waste[63]; such an approach is relevant for multiple sustainability metrics.

It should be noted that a lack of evaluation is not always due to a lack of effort from stakeholders. In some cases, there are external difficulties in accurately measuring impact. In the case of conducting carbon footprint analysis, limitations of insufficient data were reported in a hospital in Stockholm, Sweden (61), in Ghent, Belgium (58) and Mouans-Sartoux, France (161). In particular, this relates to the challenge of measuring changes such as local or organic food procurement. Whilst menu composition change can use national or regional average emission factors, substituting an ingredient for its local or organic equivalent requires highly granular carbon emissions data to robustly evaluate. As was described in the case of Mouans-Sartoux, "national data was not precise enough to yield useful results" (161). Such issues go beyond locality and also require nuance regarding different production methods, especially for highly-contested ingredients such as beef. Such data challenges go beyond the realm of public procurement, but have an influence on the evidence which is available.

The importance of data monitoring and evaluation is also demonstrated by those case studies which have been repeatedly identified in this report. Where data has been generated and made available, this has acted as a catalyst for further research and insight: take, for example, the US Farm-to-School Census. This survey has created a large scale dataset which has been accessed and used by researchers in subsequent analysis

[63] https://champions123.org/publication/call-global-action-food-loss-and-waste

(see, for example: (108,141,165), and the discussion in 3.8.1), offering insight into the determinants of procurement schemes' adoption and continuation. More standardised data collection on procurement decisions which can be tied to other location-based factors or institution-based decision making could further unlock valuable additional research.

Better data collection and reporting is an important factor in understanding the effectiveness of SFP-related schemes and allowing for evidence and best practice to be shared. In short, better monitoring and evaluation of outcomes would support endeavours such as this report. Despite a growing body of evidence, authors still indicate that public food procurement is "an underexplored topic" for which more evidence would be beneficial (1). Other reviews have identified that few conduct robust analyses with a clear baseline or control for comparison purposes, relying rather on case-study style 'showcasing' of particular schemes (3), a finding which has generally been affirmed here. In particular, measurements relating to specific outcomes described in this project, such as carbon emissions, non-economic and non-monetary valuations are useful for policy-makers (81). Improved evaluation along these terms would help further build the case for change.

4.0 The scale of opportunity in England

A secondary objective of the project was to build upon the findings of the rapid evidence assessment and attempt to investigate the possible scale of impacts which could be achieved through the adoption of sustainable public food procurement across England. Whilst the scope of the analysis is England only, many of the findings and conclusions drawn will be relevant to other UK nations. Due to limitations with the data, the estimates presented in this section are simplified assumptions based entirely on secondary data. It must be stressed that they are therefore **not precise estimates** but rather exploratory attempts to get an **indication of the scale of opportunity in England.**

The section is structured as follows: The starting point for the analysis was to form an estimate of the number of meals served and expenditure on food and catering services in England: these are detailed in 4.1. Information from the REA informed an exploration of 'low-carbon' menus in public sector food (4.2), which also includes an estimate of the current carbon footprint of public meal services. Finally, the possible social economic benefits of 'local, sustainable' procurement schemes are analysed in section 4.3. The methodology employed at each stage is detailed briefly throughout. For a comprehensive discussion of methodology and limitations, see the methodological appendices (sections 9.0, 10.0 and 11.0)**.**

4.1 The scale of public procurement in England

4.1.1 Meals served in the public sector

4.1.1.1 Method

The estimate of the number of meals served in public food service was formed by a bottom-up approach using data and assumptions formed for each specific sector. The sectors, and which parts were included in scope for each of those, is detailed in Table 13.

Table 13: Sectors in scope

Sectors	Areas included
Education	Schools[64]
	Further and higher education
Healthcare	Patients
	Healthcare staff
	Care homes
Other	Prisons
	Military
	Civil service office workers

[64] Defined as state-funded schools (primary, secondary and special provision) and state-funded nurseries. Includes estimates of breakfast clubs but not out-of-term holiday food provision. See section 9.1 for more.

The scope of analysis is the impact of public sector procurement covering Education (schools, colleges, and universities), Healthcare (NHS funded hospitals and care homes), Prisons, the Military and Government canteens. Non-public sector alternatives, such as independent schools and private healthcare, have not been included. All care homes have been included in the modelling as care homes have a mix of self-funded and state-funded residents. Some areas which would be relevant did not have sufficient data for forming estimates: notably, primary care and meals served to healthcare visitors, such as in hospitals, were not estimated.

The exact method for estimating meals served varied depending on the sector and data available. In many cases, the basis of estimates were formed using data on the number of consumers, whether employees or attendees (such as students), in a specific sector, combined with estimates on how many meals these consumers eat in a public setting per day. A brief summary of the approaches taken and an assessment of the confidence in those estimates is displayed in Table 14. More detail, including references to specific datasets and assumptions are found in the methodological appendix (section 9.0).

Table 14: Summary and assessments of methods used to estimate meals served

Sectors	Areas included	Brief description of method	Assessment of estimate*
Education	Schools	Data on student numbers weighted by data on school meal uptake. Multiplied by informed assumption on meals per day and the number of days in a school year.	Reasonable approach without direct measurement or reporting.
	Further and higher education	Adjusting previously-used data for scope and time frame. Sense checked against student population.	Limited confidence; relies on dated evidence
Healthcare	Patients	Data on inpatient meals requested, published by NHS England. Does not cover primary care.	Reasonable, using best available dataset
	Healthcare staff	Data on staff numbers combined with unevidenced assumptions about the number of meals consumed per FTE-day by job role.	Limited confidence; highly sensitive to assumptions.
	Care homes	Data on care home residents. Assumes that all meals are consumed in the care home.	Reasonable approach without direct measurement or reporting.
Other	Prisons	Data on prison population. Assumes all meals are consumed in the prison.	Reasonable approach without direct measurement or reporting.
	Military	Data shared by MOD regarding food service in England. Known to not include all of the contracts and bases.	Despite missing some data, it is expected this covers most meals and in most cases is directly measured.
	Civil service office workers	Data on staff numbers combined with assumptions about the share of staff eating in canteens. Assumption based on observed food and catering expenditure.	Limited confidence; highly sensitive to assumptions, although assumption used has some evidential basis.

Colour-coding of estimates: green: estimates which are reasonably accurate, red: those with limited confidence due to assumptions needed.

The challenges in forming an estimate of meals served in publicly-funded institutions show the importance of more, better and consistent data on the number of meals served. Capturing and reporting such data is proposed as part of the Defra consultation which this work complements. Whilst the scope will not necessarily cover all institutions mentioned here, future reporting should lead to improvements in current data, further improving estimates made in this report.

4.1.1.2 Estimate

We estimate that the public sector serves approximately 1.9 billion meals per year in England. Where possible, more recent data was utilised, with the exception of certain sectors where COVID-19 was expected to cause substantial disruption. In this sense it is likely most accurate to a recent pre-COVID date, such as 2019/20. It remains to be seen in which areas COVID and changes from the pandemic will impact public sector food service. This is broken down by area in Table 15 and displayed in Figure 15.

Table 15: Estimate of meals served through the public sector in England

Sectors	Areas included	Estimated meals served (millions)
Education	Schools	736
	Further and higher education	244
Healthcare	Patients	140
	Healthcare staff	219
	Care homes	429
Other	Prisons	82
	Military	23
	Civil service office workers	9
Total		**1,882**

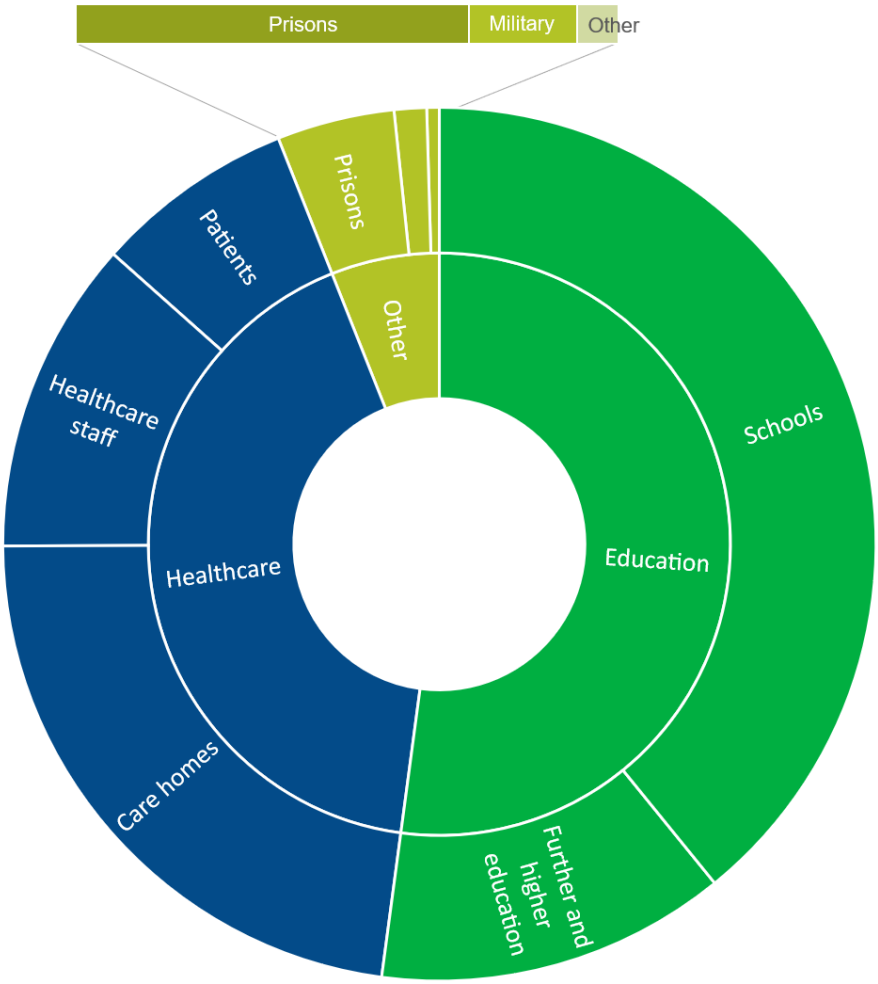

Figure 15: Estimate of meals served through the public sector in England

This estimate can be compared to other estimates: data from Horizons (2011), previously cited in a number of publications including in WRAP (2013)[65], suggests there could be as many as 2.4 billion public sector meals in the UK, though the details of how this was calculated and differing scopes (private hospitals are included in their analysis, for example, and their estimate is for the entire UK rather than England) mean they may not be directly comparable. If scaled by England's share of UK population, approximately 84%, the estimates become very comparable (within approximately 10%).[66] More recently, the National Food Strategy[67] also estimated that 1.9 billion meals were served, but this appears to be for the entire UK, whereas the scope in this analysis is England. From the available references, similar data sources were used, but they recognise their estimate to likely be an underestimation due to data unavailability in some areas which we have formed rough estimates of, such as healthcare staff.

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[65] https://wrap.org.uk/resources/report/overview-waste-hospitality-and-food-service-sector

[66] https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates#timeseries

[67] https://www.nationalfoodstrategy.org/wp-content/uploads/2021/07/National-Food-Strategy-The-Plan.pdf

Further details on the estimates and breakdowns by any relevant subcategories are presented in the methodological appendix (9.1).

4.1.2

4.1.2.1 Method

As with meals served (4.1.1), data on public sector expenditure was calculated on a sector-by-sector basis and responded to available data identified. In some cases, it relies on the estimates of meals served: any uncertainties in meals are therefore reflected in uncertainties of expenditure. The method and data used in each sector is summarised in Table 16.

Table 16: Summary and assessments of methods used to estimate food service expenditure

Sectors	Areas included	Brief description of method	Assessment of estimate*
Education	Schools	Approximate price-per-meal based on UIFSM allowance and DFE data. Scaled based on same assumptions as meals served.	Reasonable approach without direct measurement or reporting.
	Further and higher education	Data on food service expenditure taken from HESA for universities. Expanded to further education based on student numbers.	Reasonable data for higher education, but limited confidence in other estimates.
Healthcare	Patients	Data on food service expenditure and food waste disposal, published by NHS England. Does not cover primary care.	Reasonable, using best available dataset
	Healthcare staff	Data from WRAP (2013) on cost per meal across multiple food service settings. Multiplied by estimate of staff meals.	Limited confidence; uses dated cost estimate and is sensitive to meals served assumptions.
	Care homes	Data from WRAP (2013) on cost per meal across multiple food service settings. Multiplied by estimate of care home meals.	Limited confidence; uses dated cost estimate, but a reasonable estimate of meal numbers.
Other	Prisons	Expenditure data from central government procurement software. Price-per-prisoner-per-day values broadly consistent with other estimates.	Reasonable, using best available dataset
	Military	Data shared by MOD on food service in England. Costs specific to meal types. Some contracts not included.	Despite missing some data, it is expected this covers most meals and in most cases is directly measured.
	Civil service office workers	Expenditure data from central government procurement software, adjusted to estimate local government expenditure.	Reasonable data for central government, but limited confidence in local government estimate.

Colour-coding of estimates: green: estimates which are reasonably accurate, orange: combine more and less accurate estimates of meals and expenditure in one sector, red: those with limited confidence due to assumptions needed.

As with the number of meals served, data on food service expenditure is expected to be improved for some sectors through the reporting mechanism being consulted upon. This should help reduce some uncertainties and allow for better tracking of expenditure over time.

4.1.2.2 Estimate

We estimate that approximately £4.9 billion is spent on procurement of food and catering services in public settings in England. This is broken down by sector in Table 17 and displayed in Figure 16.

Table 17: Estimate of expenditure on food and catering within the public sector in England

Sectors	Areas included	Estimated expenditure (£ million)
Education	Schools	£1,746
	Further and higher education	£711
Healthcare	Patients	£632
	Healthcare staff	£550
	Care homes	£1,142
Other	Prisons	£63
	Military	£42
	Civil service office workers	£19
Total		**£4,905**

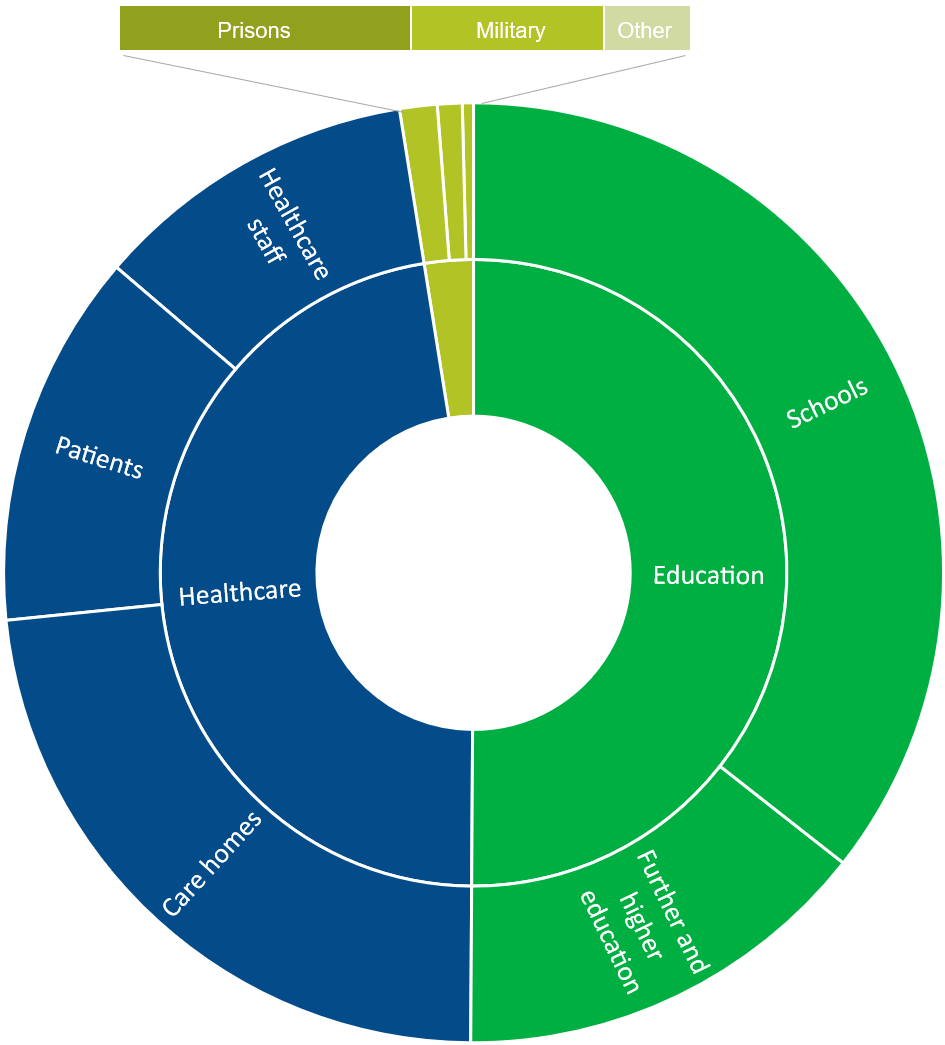

Figure 16: Estimate of expenditure on food and catering services in the public sector in England

Of this total expenditure, around half (52%) is estimated to be expenditure on ingredients or foodstuffs, about 41% on labour with the remaining costs elsewhere (energy, water, waste treatment, administration and so on). Whilst this presents an approximate 'average' split, the relative cost of each factor will vary between sectors.

Comparing Figure 15 and Figure 16, some interesting findings can be observed. The education and healthcare sectors are clearly the two most significant in terms of scale. Meals for administrative or office-based staff plays a relatively small role, likely due to the competing food sources (packed lunches, local shops and so on): the trend towards working from home throughout the COVID-19 pandemic will only have reduced this further. The relatively higher spend-per-meal in healthcare than education is likely to reflect larger portions for adults and possibly complex meals to meet specific nutrient requirements of patients. However, it should be noted that staff meals in healthcare are particularly uncertain estimates (see 4.1.1). Due to the low cost of prison food service, driven in part by the use of prisoner labour, it has a much smaller financial footprint than it does in terms of meals served. These findings, and others, are discussed further in methodological appendix section 9.2.

This figure is notably divergent from the previous estimate of £2.4 billion per year, cited in 'A Plan for Public Procurement'[68] and subsequently elsewhere, including the National Food Strategy.[69] This difference is to be expected: the previously cited £2.4 billion figure dates from approximately 2010[70] and was based on adjusted estimates from nearly ten years before that.[71] The lack of traceable methodology for the previous estimate makes specific comparisons challenging

What this suggests, however, is that the scope of public food procurement and the amount spent on it is far higher than has previously been thought. This may mean that public procurement strategies have a far higher potential to have a real economic influence, which is evaluated further in section 4.3.

4.1.3 Regional adjustments

The estimates of meals served (4.1.1) were subsequently adjusted to form estimates of meals served by English region. The expenditure (**Error! Reference source not found.**) was similarly adjusted for the purposes of further modelling (see 4.3.2), though it is noted that at present, expenditure on food and catering services is not necessarily conducted in the region in which the meal is served.

4.1.3.1 Method

In nearly all cases, the same principle was applied to the method. This involved identifying a comparable proxy for dividing meals per region, typically based on the share of total consumers in each region. It therefore assumes that the average meals per consumer are constant in each region. As an example, the share of Further Education students in each region was identified, and this share was then multiplied by the total meals served to estimate the meals served in each region. Similar processes were conducted for expenditure for the purposes of modelling localised expenditure (4.3.2), where it assumes that the average spend per meal is the same in all regions, with regional share of consumers therefore the key driver of differences. A summary and assessment of the methods used for each sector can be found in Table 18, this is elaborated upon in the methodological appendix (section 9.2).

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68 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/332756/food-plan-july-2014.pdf

69 https://www.nationalfoodstrategy.org/the-report/

70 http://data.parliament.uk/DepositedPapers/Files/DEP2010-0520/DEP2010-0520.pdf

71 See, for example: https://webarchive.nationalarchives.gov.uk/ukgwa/20031221024554/http:/www.defra.gov.uk/farm/sustain/procurement/index.htm and https://webarchive.nationalarchives.gov.uk/ukgwa/20060120120000mp_/http:/www.defra.gov.uk/farm/sustain/procurement/pdf/GF%20Leaflet.pdf

Table 18: Summary and assessments of methods used to form regional adjustments

Sectors	Areas included	Brief description of method	Assessment of estimate*
Education	Schools	Adjusting total meals served and expenditure based on share of students per region. Assumes meals served and expenditure per student are on average the same.	Reasonable assumption, but creates a simplified estimate which is likely inaccurate.
	Further and higher education	Adjusting total meals served and expenditure based on share of students per region. Assumes meals served and expenditure per student are on average the same.	Reasonable assumption, but creates a simplified estimate which is likely inaccurate.
Healthcare	Patients	Data on meals served and expenditure available directly from the ERIC dataset. Some adjustments to harmonise regions used.	Reasonable, using best available dataset. Regional harmonisation could be improved.
	Healthcare staff	Adjusting total meals served and expenditure based on share of staff per region. Assumes meals served and expenditure per staff are on average the same.	Reasonable assumption, but creates a simplified estimate which is likely inaccurate.
	Care homes	Adjusting total meals served and expenditure based on share of residents per region. Assumes meals served and expenditure per resident are on average the same.	Reasonable assumption, but creates a simplified estimate which is likely inaccurate.
Other	Prisons	Adjusting total meals served and expenditure based on share of prisoners per region. Assumes meals served and expenditure per prisoner are on average the same.	Reasonable assumption, but creates a simplified estimate which is likely inaccurate.
	Military	Data for specific contracts assigned to those areas, other regions and totals adjusted based on overall share of MOD staff.	Reasonable, using best available dataset. Regional harmonisation could be improved as some effectively double counted.
	Civil service office workers	Adjusting total meals served and expenditure based on share of workers per region, by type. Assumes meals served and expenditure per worker are on average the same.	Limited confidence: local government estimate in particular is based on a rough proxy.

Colour-coding of estimates: yellow: estimates which use best available data but remain uncertain, orange: reasonable assumptions but simplified estimates likely to be inaccurate, red: those with limited confidence due to assumptions needed.

In general the regional adjustments are less robust than the total estimates. The assumptions made are necessary simplifications based on available data: as data collection improves, these will be able to be refined significantly. As a result, differences between regions are driven almost entirely by the differences in number and size of public

sector institutions in that region, rather than specific local economic conditions. These estimates should therefore all be understood as rough approximations.

4.1.3.2 Estimate

The total estimated meals are presented graphically in Figure 17. This suggests that of the total meals served the distribution is relatively even, with the South East, London, and North West all having between 14-16% of the total meals served. Eastern England, the West Midlands, South West and Yorkshire and the Humber then each have around 10-11% of the total meals, with only the East Midlands and North East falling below this.

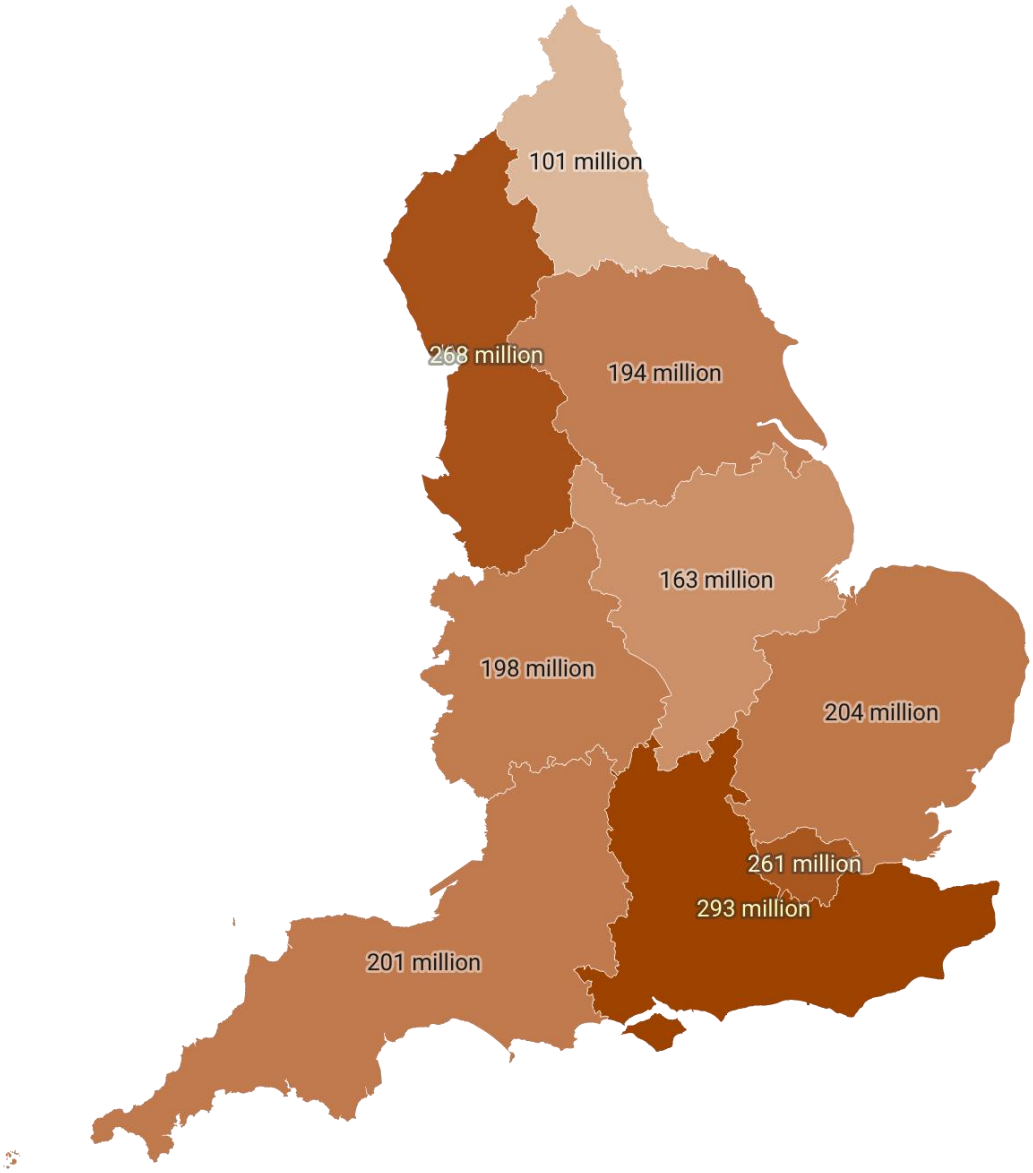

Figure 17: Map of regional estimates of number of meals served in public settings

The split of regional expenditure can be seen in the methodological appendix (9.3). It does not necessarily reflect where meal service expenditure currently happens, but can be used to estimate the impacts of more localised expenditure (see section 4.3.2).

4.2 The greenhouse gas footprint of public procurement and reduction scenarios

Using the estimate of meals served in public settings described in section 4.1.1 and informed by the findings of the REA (see 3.3), an analysis was undertaken to explore the possible GHG footprint of meals served in public settings and how this could change. This section presents a brief description of the methods (4.1.1), which are described in much greater detail in the methodological appendix (section 10.0), before quantifying an estimate of the possible GHGs associated with public meal service in England under the status quo (4.2.2). This analysis is then the basis of some scenario modelling based on changes to menu composition and food waste (4.2.3). This is intended to present a high-level overview of what could be achieved through caterers adopting menus based on their GHG footprint. For caterers looking to enact such actions, other third-party tools could be beneficial.[72] Such modelling also has the possible application of target-setting for institutions once they are measuring their meal footprints.

4.2.1 Method

This analysis relies heavily on the work done by Valeria de Laurentiis (4), using the detailed data which was established for the carbon footprint of school meals in primary school meal services in England. The methodology is described in detail in the methodological appendix (section 10.0), what follows is an abridged summary, broken into key steps.

4.2.1.1 Establishing the GHG footprint of primary school meals

Although (4) is focused on primary schools, such dishes cited could reasonably be expected across a range of food settings for other populations. As a result, this was considered a useful starting point for analysis.

The analysis in (4) used cradle-to-plate life-cycle assessment (LCA) data for ingredients, and factors in transport, cooking and so on for meals served in primary schools (the average being 1,059 gCO_2e), and for a range of nutritionally ‘best practice’ recipes. From this, it derives a system of ‘traffic light’ boundaries: the upper and lower bounds within which a meal can be considered to be relatively ‘low’ or ‘high’ in its climactic impact. Using the boundaries provided by (4) and making conservative adjustments for the absolute lower and upper bound of primary school meal services, a range of ‘traffic light’ groupings were established, with ‘red’ meals being those which have a higher footprint (such as a beef stir fry with rice) and ‘green’ being those with a lower footprint (such as a fish fillet or vegetable burger with couscous and vegetables). These are presented in Table 19. These boundaries form the basis of subsequent analysis.

[72] The analysis here relies in large part on work done by de Laurentiis in (4), which can also be accessed here. Other tools proposing a similar function are available, for example here or here.

Table 19: Traffic light groups for primary-age children, in gCO_2e / meal

Meal grouping	Lower bound	Upper bound
Green	450	741
Amber	742	1376
Red	1377	1900

4.2.1.2 Conversion to other populations

The analysis in (4) was based on primary school meals. Whilst the dishes themselves may be 'typical' dishes for canteen cooking that one could expect in other settings, it is reasonable to suggest that primary-age children may have smaller portions than other groups. The 'traffic light' boundaries were therefore adjusted to account for different portion sizes based on recommended calorie intake of different age groups

4.2.1.3 Adjustment for plate waste disposal

The analysis in (4) represents a 'cradle-to-plate' analysis, so included excessive production from food loss and waste upstream and in preparation, but not the impact of food wasted by consumers which then subsequently requires disposal. An adjustment was therefore made to account for *plate waste.*

Estimates of waste per meal in each setting were formed based on two sources: previous WRAP research on hospitality and food service (HaFS) settings in 2013[73] and large-scale, long-term analysis in four European countries by Malefors et al.[74] This involved adjusting for the share of total waste which was plate waste and harmonising different sector scopes into a single estimate. This is described in detail in the methodological appendix (section10.3). Using the number of meals served (see 4.1.1) it was possible to derive an estimate of the volume of plate waste. These were then multiplied by an average disposal emissions factor, taken from WRAP research on the UK food system's GHG emissions, which suggests approximately 0.12 tCO_2e emitted for each tonne of food waste disposed in HaFS settings.[75] Note this is likely to be an underestimate due to the scope of that analysis and current data limitations. Multiplying this by the estimated plate waste allows for deriving the total emissions. This is presented in Table 20.

Table 20: Estimated plate waste and disposal emissions per setting

Sectors	Areas included	Estimated plate waste (tonnes)	Plate waste disposal (tCO2e)
Education	Schools	21,000	2,490
	Further and higher education	6,000	680

[73] https://wrap.org.uk/resources/report/overview-waste-hospitality-and-food-service-sector

[74] https://www.mdpi.com/2071-1050/11/13/3541

[75] https://wrap.org.uk/resources/report/uk-food-system-ghg-emissions Table 9. This is based primarily on food going to energy-from-waste recovery or to landfill, with some recycled. Due to the scope of the analysis it is likely to understate the emissions. This is discussed in the **technical report**.

Healthcare	Patients	6,000	730
	Healthcare staff	4,000	520
	Care homes	27,000	3,270
Other	Prisons	4,000	430
	Military	1,000	120
	Civil service office workers	200	20
Total		**69,000**	**8,260**

Discrepancies in the total and summing of subsectors is due to rounding.

These emissions are additional to the cradle-to-plate emissions estimated based on data in (4). The waste also has an embodied footprint, based on the share of each plate which was wasted. This was calculated for use in the scenario analysis (4.2.3) and is described in the methodological appendix (section 10.3.3).

4.2.2 Estimate of current carbon footprint

Based on the GHG emissions estimates described above (4.2.1) and the meals served in public settings (4.1.1), it was possible to scale up data and form an estimate of GHGs associated with food across public settings. This DEFAULT scenario is based on the observed meal composition and footprint in (4), with a roughly even share of 'green' (35%), 'amber' (35%) and 'red' (30%) meals. The average footprint, split into the emissions of producing a meal and disposing plate waste, are summarised in Table 21.

Table 21: Estimated emissions from public sector food service

Sectors	Settings	Cradle-to-plate meal emissions (tCO_2e)	Plate waste disposal emissions (tCO_2e)	Total DEFAULT emissions (tCO_2e)
Education	Schools	948,900	2,490	951,390
	Further and higher education	334,860	680	335,550
Healthcare	Patients	191,540	730	192,270
	Healthcare staff	299,950	520	300,470
	Care homes	586,060	3,270	589,330
Other	Prisons	112,370	430	112,800
	Military	30,930	120	31,050
	Civil service office workers	11,890	20	11,910
Total		**2,516,500**	**8,260**	**2,524,800**

Discrepancies between stated totals and summed totals are due to rounding.

This suggests that **some 2.5 million tonnes of CO_2e could be associated with the consumption and disposal of food in public settings.** The range of results from the

simulations based on the menu ranges suggest it could be as low as 2.2 $mtCO_2e$ or as high as 2.9 $mtCO_2e$.

Comparing this to WRAP's estimate of the UK's consumption-based food system emissions in 2019 of 158 million tonnes[76], this suggests that approximately 1.6% of the UK food system's footprint (1.3 – 1.8%) could be influenced directly by public procurement, before accounting for possible knock-on effects in private consumption. However, the two approaches were very different in methodology and so are not necessarily directly comparable, they are put together just to give a broad indication.

4.2.3 Scenario analysis

The same model which was used to estimate the DEFAULT scenario (4.2.2) was used to explore scenarios which altered the parameters, exploring possible changes in carbon emissions. In particular, two key parameters were altered: the *menu composition,* i.e. the split between 'green', 'amber' and 'red' meals, termed MENU scenarios and the *amount of plate waste* (WASTE scenarios). These were also considered in conjunction, with both menu composition and waste rates changing, these are the WASTE-MENU scenarios. These are not meant to be exhaustive of changes which could be made under SFP-related schemes: efficiency of kitchen appliances, changing the treatment method of food waste and the distance travelled by food, for example, could be considered. However, based on the findings of the REA (3.3) menu composition was the most substantial factor, with findings around transport emissions subject to much more uncertainty.

4.2.3.1 Menu change scenarios

The MENU scenarios involve a redistribution of meals across the different traffic light categories, so that an on-average lower GHG footprint is served. In all cases, red meals are eliminated, with different distributions between amber and green, which would reflect differing levels of ambition. The amount of waste in each scenario is considered constant, meaning no meaningful difference to plate waste rates are observed. The scenarios are summarised in Table 22. For simplicity, all scenarios apply evenly to all settings.

Table 22: MENU scenario descriptions

Scenario:	Description	Sectors	Share of meals 'green'	Share of meals 'amber'	Share of meals 'red'	Waste:
MENU_1	All red moved to amber	All	33%	67%	0%	*unchanged*
MENU_2	Even share amber and green	All	50%	50%	0%	*unchanged*
MENU_3	All red moved to green	All	67%	33%	0%	*unchanged*
MENU_4	Entirely green	All	100%	0%	0%	*unchanged*

[76] https://wrap.org.uk/resources/report/uk-food-system-ghg-emissions

Due to use of value ranges for each traffic light, each scenario was simulated 500 times for each setting in which it applied.[77] The averages of emissions in each setting were then taken and combined. The results for all four scenarios, and a comparison with the DEFAULT scenario, are presented in Table 23.

Table 23: Results of MENU scenarios. All values in tCO_2e

Sectors	Areas included	DEFAULT	MENU_1	MENU_2	MENU_3	MENU_4
Education	Schools	951,400	806,400	742,100	670,500	533,600
	Further and higher education	335,500	285,900	259,700	234,900	186,300
Healthcare	Patients	192,300	161,500	148,600	134,600	107,300
	Healthcare staff	300,500	255,600	231,800	210,300	166,800
	Care homes	589,300	502,100	453,100	414,700	328,000
Other	Prisons	112,800	95,000	87,100	79,100	62,100
	Military	31,100	26,200	23,800	21,800	17,200
	Civil service office workers	11,900	10,100	9,300	8,400	6,700
Total		**2,524,800**	**2,142,800**	**1,955,600**	**1,774,400**	**1,408,000**
Change from baseline (DEFAULT)		**0%**	**-15%**	**-23%**	**-30%**	**-44%**

This suggests that the most extreme dietary change, moving all meals to 'green' recipes (under 741 gCO_2e for primary school meals) could save as much as 44% of the total carbon footprint, or 1,120,000 tCO_2e. However, even more modest dietary shifts, such as removing all 'red' meals and evenly splitting the meal service between 'green' and 'amber' meals (MENU_2) could reduce emissions by nearly one quarter.

4.2.3.2 Food waste scenarios

The WASTE scenarios consider the change in emissions associated with a change in the amount of plate waste, quantified as a percentage change from the default. This includes a change in both *embodied* and *disposal* emissions associated with food waste. The three WASTE scenarios are based on the DEFAULT dietary scenario, leaving this unchanged. The scenarios are summarised in Table 24. For simplicity, all scenarios apply evenly to all settings.

[77] This is discussed further in the **technical report.**

Table 24: WASTE scenario descriptions

Scenario:	Description	Sectors	Share of meals 'green'	Share of meals 'amber'	Share of meals 'red'	Waste:
WASTE_1	DEFAULT menu, plate waste reduced by 30%	All	35%	35%	30%	*-30%*
WASTE_2	DEFAULT menu, plate waste reduced by 50%	All	35%	35%	30%	*-50%*
WASTE_3	DEFAULT menu, plate waste reduced by 80%	All	35%	35%	30%	*-80%*

Each scenario was based on the DEFAULT with variable waste rates. The results are summarised in Table 25.

Table 25: Results of WASTE scenarios. All values in tCO_2e

Sectors	Areas included	DEFAULT	WASTE_1	WASTE_2	WASTE_3
Education	Schools	951,400	935,600	925,100	909,300
	Further and higher education	335,500	331,200	328,300	323,900
Healthcare	Patients	192,300	187,600	184,500	179,900
	Healthcare staff	300,500	297,200	295,000	291,700
	Care homes	589,300	568,600	554,700	533,900
Other	Prisons	112,800	110,000	108,200	105,400
	Military	31,100	30,300	29,800	29,000
	Civil service office workers	11,900	11,800	11,700	11,600
Total		2,524,800	2,472,200	2,437,200	2,384,600
Change from default		0%	-2%	-3%	-6%

These suggest savings of nearly100,000 tCO_2e could be realised through a 50% reduction in plate waste alone (WASTE_2), rising to as much as 140,000 tCO_2e with drastic reductions in plate waste of 80% (WASTE_3).

When compared with the MENU scenarios, it is clear that reductions in waste, whilst important, are overshadowed by the scale of reduction achievable through dietary change. This in part reflects a limited scope of the waste analysis, looking only at plate waste, but also that embodied emissions are much more significant than disposal emissions. As the data suggests that in most sectors, upwards of 90% of plates are being consumed, the scope for plate waste reduction is relatively small. However, this is using aggregated data and subject to uncertainties based on the assumed 'average' meal. In individual institutions where substantial plate waste is observed, striving for its reduction is clearly a 'no regrets' strategy to reduce the carbon footprint, although it cannot lead to reductions as large as those through menu change.

4.2.3.3 Combined menu and food waste scenarios

A third set of scenarios were considered which combined menu changes and waste reduction. These were used for the purposes of sensitivity-testing the relative scale of changes to food waste and menu composition. In particular, they were seeking to address the question of: what if menu changes cause food waste to go up? A move to healthier, more vegetable-heavy meals could entail more rejection, especially in certain categories (such as school children) so this should be considered. The scenarios considered are summarised in Table 26. For simplicity, all scenarios apply evenly to all settings.

Table 26: WASTE-MENU scenario descriptions

Scenario:	Description	Sectors	Share of meals 'green'	Share of meals 'amber'	Share of meals 'red'	Waste:
WASTE-MENU_1	MENU_3 and waste reduction by 50%	All	67%	33%	0%	*-50%*
WASTE-MENU_2	MENU_3 but waste increased by 50%	All	67%	33%	0%	*50%*
WASTE-MENU_3	MENU_4 but waste increases 100%	All	100%	0%	0%	*100%*

Again, these scenarios were based on the average of 500 simulations in each sector for MENU_3 (in WASTE-MENU_1 and WASTE-MENU_2) and for MENU_4 (in WASTE-MENU_3). The results are presented in Table 27.

Table 27: Results of WASTE-MENU scenarios. All values in tCO_2e

Sectors	Areas included	DEFAULT	WASTE-MENU_1	WASTE-MENU_2	WASTE-MENU_3
Education	Schools	951,400	651,600	689,500	564,200
	Further and higher education	335,500	229,700	240,100	194,700
Healthcare	Patients	192,300	129,100	140,100	116,200
	Healthcare staff	300,500	206,400	214,300	173,200
	Care homes	589,300	389,900	439,500	367,900
Other	Prisons	112,800	75,800	82,300	67,300
	Military	31,100	20,900	22,700	18,600
	Civil service office workers	11,900	8,300	8,600	6,900
Total		**2,524,800**	**1,711,700**	**1,837,100**	**1,509,000**
Change from default		**0%**	**-32%**	**-27%**	**-40%**

Comparing the WASTE-MENU results to the MENU results, some striking results are identified. Whilst combining food waste reduction and menu changes (as in WASTE-

MENU_1) is of course beneficial, increases in plate waste associated with menu changes do not substantially undermine the carbon savings associated with menu change. In WASTE-MENU_2 and WASTE-MENU_3, where plate waste *increases* are simulated alongside menu changes, the decrease in emissions from the menu charge far outweigh the increase in emissions from waste. Consider WASTE-MENU_2: whereas the associated menu change alone (MENU_3) would reduce emissions by about 30% when compared to DEFAULT, those same menu changes *with* a 50% increase in plate waste would still see an approximately 27% reduction compared to the DEFAULT scenario. This would suggest that concerns about increased food waste should not be considered as a significant deterrent to menu change.

Crucially, this only considers the emissions of food served in the public sector setting. If food is wasted because it is rejected by consumers due to its flavour, being unfamiliar or other preferences, there is a risk that consumers will purchase extra food outside of the food service to compensate. This could either be in no longer purchasing public sector food, leading overall meals served to go down, or purchasing but then wasting it and buying something else subsequently. Whilst this would not impact the emissions in the public food setting, such rebound effects would have a negative impact more generally, and would not be a desirable outcome. As a result, designing low-carbon menus which are palatable and accepted by consumers remains crucial.

4.3 Local, sustainable procurement: scaling economic benefits

Using the estimates of expenditure on food and catering services in England (**Error! Reference source not found.** and 4.1.3) and the findings relating to economic impact from the REA (3.6), an analysis was undertaken to explore the possible economic returns of broadly-defined ‘sustainable food procurement’, with a focus around procuring food locally and from small suppliers, as this was where most evidence was identified. This section presents two calculations: a rough approximate estimate of the possible monetised social benefits of more widespread SFP in England (4.3.1) and the possible local economic activity associated with local procurement (4.3.2). In both cases there is a short methodological description and summary of the scenario and results, both of which are detailed further in methodological appendices (section 11.0).

4.3.1 Monetised social returns

As described in the REA (see 3.6.1), one of the common ways in which the impacts of SFP schemes were discussed in the literature was through ‘Social Return on Investment’, in which social benefits to suppliers, to procuring bodies, to consumer health and the environment are attributed a monetary value which is then compared against the initial investment. This part combines the findings of section 3.6.1 with the estimated expenditure on public sector food and catering (**Error! Reference source not found.**). to indicate the possible monetised social benefits of more adoption of SFP practices.

4.3.1.1 Method and scenario

A small range of values between £3.04 and £6.19 return for £1 invested were taken from the literature (see 3.6.1 and Table 28). From this range, the minimum, first quartile, mean, third quartile and maximum were taken, with a weighted randomised simulation then carried out 1000 times, generating a distribution of values. This range formed the *main* scenario estimate.

Table 28: Range of identified SROI results

Place	Social return per £ invested
Plymouth	£3.04
Nottinghamshire	£3.11
Calderdale	£3.70
Kirklees	£5.12
East Ayrshire	£6.19

The *main* scenario was complemented by a *conservative adjustment* scenario, in which the values were reduced by 32%, an adjustment which reflects possibly higher deadweight and displacement. A third scenario, the *best estimate* was also created, based on the values derived from Plymouth and Nottinghamshire (39). It was considered the *best estimate* due to methodological differences in the range of values identified, with these values being most closely aligned to the available data of total food service expenditure.

Total food and catering service expenditure was adjusted to estimate the ingredient expenditure, with approximately **52% of total expenditure suggested as being on procurement and ingredients.**

The total ingredient expenditure was multiplied by an assumed share which could be diverted to 'sustainable food procurement' broadly defined, here understood to primarily represent local procurement from small suppliers. As all of the examples identified came from Food for Life analyses, the results estimate the impacts of more widespread procurement along the lines of Food for Life. The results presented here are based on **50% of the ingredient budget** being spent on local or otherwise 'sustainable' food, as an example case to explore the potential impact. This was applied evenly in all sectors.

The diverted food expenditure was then multiplied by SROI values for each scenario, the range of which is displayed in Table 29.

Table 29: SROI (£ per £ food budget invested)

Value	Main	Conservative adjustment	Best estimate
Minimum	3.04	2.06	
First quartile	3.11	2.10	
Mean	4.25	2.87	3.08

Third quartile	5.15	3.48	
Maximum	6.19	4.19	

4.3.1.2 Results

The results of the scenarios are detailed in Table 30. It suggests that were 50% of the ingredient budget diverted (i.e. about £1.3 billion) to broadly-defined 'sustainable food procurement', such as that represented by the Food for Life Served Here standard, this would lead to between £2.6 and £7.9 billion in monetised social returns, with a 'best estimate' of approximately £3.95 billion. The very substantial range indicates the uncertainty inherent in these figures: the differing methodologies and scopes, possible understated impacts (such as environmental impacts) and different local contexts mean that it is difficult to offer a suggestion more precise. However, in all cases – even when conservatively adjusted – there is the suggestion of a very substantial return.

Table 30: Range of SROI estimates, 50% of budget on SFP. Values in thousand GBP.

Value (all £ billion)	Main	Conservative adjustment	Best estimate
Minimum	£3.90	£2.64	
First quartile	£3.99	£2.70	
Mean	**£5.45**	**£3.69**	**£3.95**
Third quartile	£6.61	£4.47	
Maximum	£7.94	£5.37	

This was further divided by stakeholder group to form very indicative estimates, based on the estimates from Nottinghamshire and Plymouth (see (39)). The results are presented in Figure 18. This suggests that local businesses could stand to benefit over £2 billion in monetised social benefits with more widespread SFP adoption. Central and local government could benefit around £470 and £200 million respectively. Given the proposed expenditure in this scenario of approximately £1.3 million, this suggests that around half of the expenditure could be recouped in benefits direct to central and local governments.

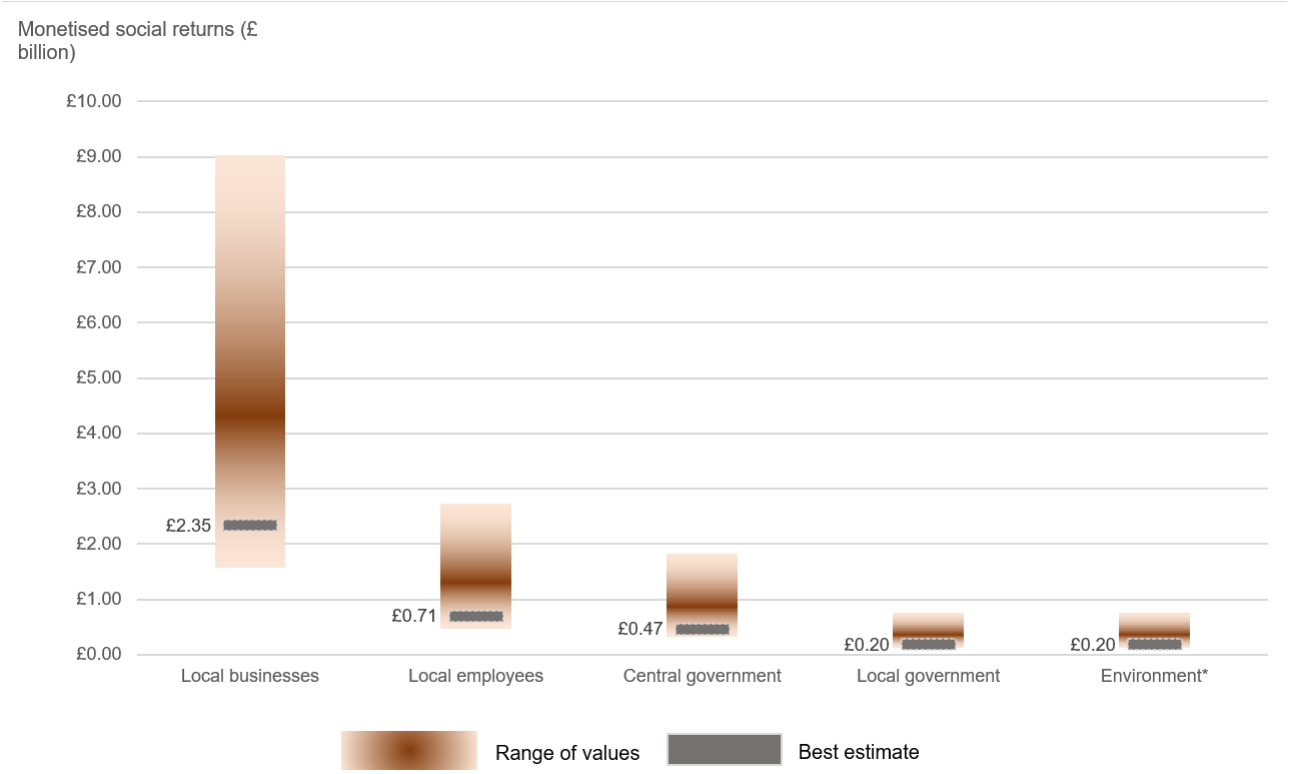

Figure 18: Indicative monetised social returns by stakeholder group
****Environment estimates are likely to be an understatement due to limited scope which could be quantified.***

4.3.2 Local economic activity

A second calculation was made based on the estimates of regional expenditure (see **Error! Reference source not found.** and 9.3) and estimates of local economic activity using 'Local Multiplier' (LM3) methodology, taken from the REA (see 3.6.2). These were used to indicate the possible regional outcomes from more localised expenditure.

4.3.2.1 Method

A range of values were identified from the literature (see 3.6.2), which were categorised as being an 'SFP intervention' (Food for Life, local food, organic food) or 'conventional' (based on four 'conventional' services in (13)). From these, a minimum, mean and maximum value were derived, presented in Table 31. These values include £1 of activity spent by the procuring body, so represent between £0.8 - £1.50 *additional* economic activity in SFP interventions and £0.6 - £1.3 *additional* economic activity in 'conventional' meal services. These values were then multiplied by the total regional food and catering service expenditure (see 4.1.3).

Table 31: Range of LM3 values. Total activity.

	SFP Intervention	Conventional
Minimum	1.8	1.6
Average	2.1	2.1
Maximum	2.5	2.3

4.3.2.2 Results

The results suggest that a total of around £10.5 billion (£8.8bn – £12.3bn) of economic activity could be generated through local procurement (see 11.2.2 for a table with regional breakdown). Discounting the initial investment in food and catering services, the *additional* economic activity is estimated as about £5.6 billion (£3.9bn - £7.4bn). This additional breakdown is presented by region in Table 32.

Table 32: Estimated additional local economic activity associated with SFP

	SFP interventions	
Region	**Range**	**Average**
South East England	£0.6bn to £1.2bn	Approximately £0.9bn
London	£0.5bn to £1.0bn	Approximately £0.8bn
North West England	£0.6bn to £1.0bn	Approximately £0.8bn
East of England	£0.4bn to £0.8bn	Approximately £0.6bn
West Midlands	£0.4bn to £0.8bn	Approximately £0.6bn
South West England	£0.4bn to £0.8bn	Approximately £0.6bn
Yorkshire and the Humber	£0.4bn to £0.8bn	Approximately £0.6bn
East Midlands	£0.3bn to £0.6bn	Approximately £0.5bn
North East England	£0.2bn to £0.4bn	Approximately £0.3bn
Total	£3.9bn to £7.4bn	Approximately £5.6bn

However, based on the findings of (13), there is substantial local economic benefit to having public food service in the first place: as shown in Table 31, so-called 'conventional' food services may generate comparable local economic activity, in particular when considering the role of local staff. Based on the LM3 values for 'conventional' food services, between £7.4bn - £11.2bn of total local economic activity could *already be happening* in a situation of 'conventional' food services (discounting initial investment, £2.9 bn - £6.3bn additional activity). Comparing SFP and 'conventional' food services, it is therefore suggested that the *added* benefit from changing to SFP-related interventions for local economic activity is between £437 million and £1.09 billion in local economic activity. This range is displayed for each region in Figure 19.

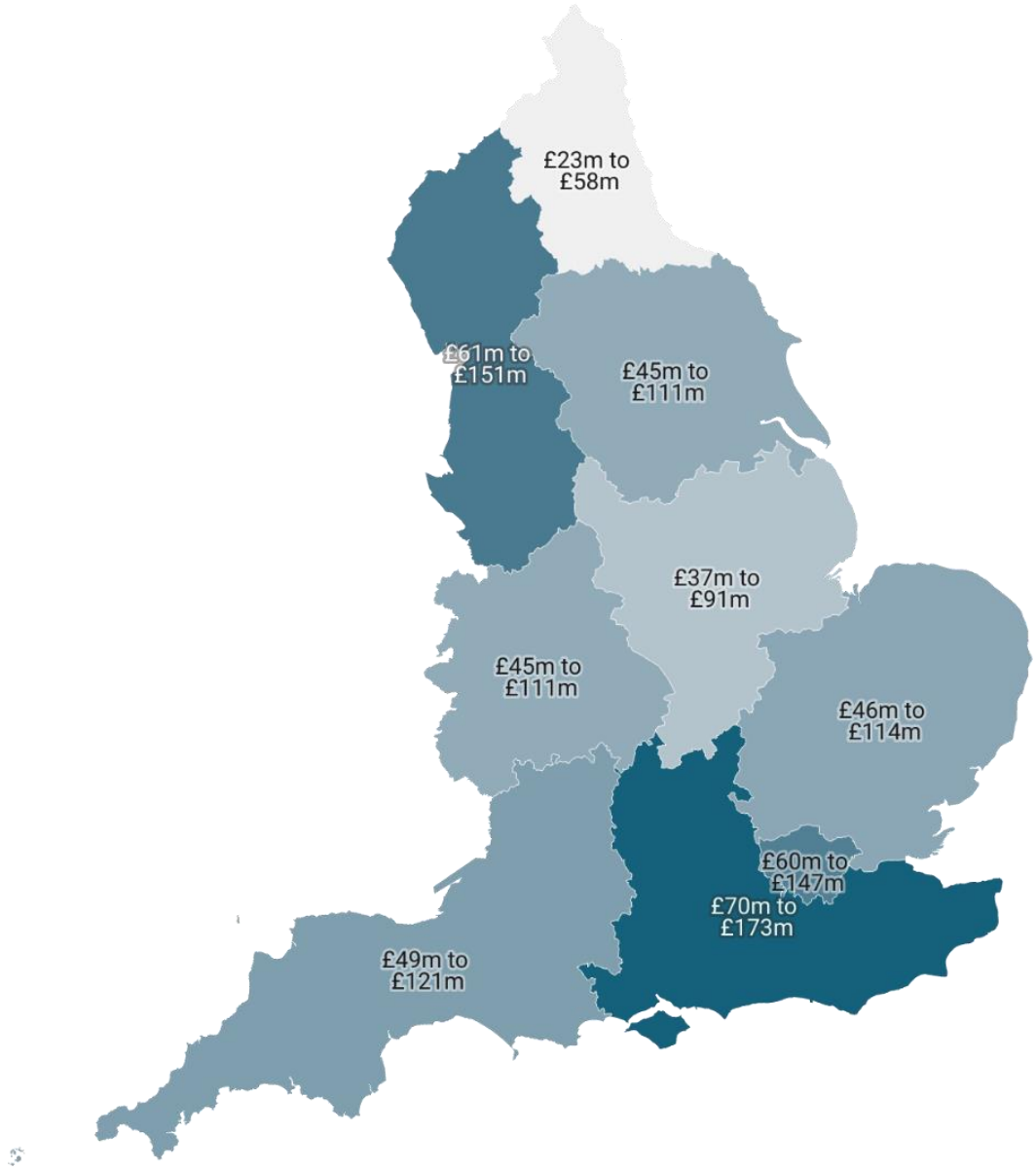

Figure 19: Approximate added economic activity associated with moving to SFP, by region

As the conclusions are drawn in large part from the findings of (13), they are uncertain. As highlighted in section 3.6.2, more comparative studies would be beneficial to identify the added benefits of specific procurement policies. Nonetheless, the results point towards possibly substantial additional economic activity being generated in all regions.

5.0 Conclusions and limitations

5.1 Conclusions

Public procurement: the potential for transformational impacts

Revisiting the theory of change (see 1.3.2), there is a clear logic through which reform of public procurement could lead to wider changes across both the institution and the wider food system. The studies identified throughout the rapid evidence assessment (REA) were generally consistent with the *belief* in SFP-related schemes leveraging systemic change. No evidence was identified which directly contradicted the theory of 'sustainable food procurement' delivering benefits across the environment, health and economy. This potential of **transformational impacts** is why SFP has received increasing attention amongst food systems analysts and policy experts in recent years both domestically and abroad.

The theory of change was not refuted, though not enthusiastically confirmed either:

1. The introduction of new rules or guidance on procurement must be translated into meaningful differences in the public plate.

This was the most conclusively answered of the dependencies. Firstly, it is suggested that the perception of 'sustainable food procurement' must go beyond just *what* ingredients to consider *how* food is prepared, served and communicated about (1.3.2). Cultural shifts around food appear to be better supported by 'whole settings' interventions, such as those in schemes like Food for Life. Whilst there is no single successful model, some key commonalities between successful schemes has been identified (see 3.8). These lessons are further condensed into suggest 'best practice' for policymakers and institutions looking to implement sustainable food procurement (section 5.2).

2/3. The extent of individual impacts will depend on how consumption of public food interacts with consumption outside of the institution. To reshape broader societal impacts, public food service must lead to aggregate changes in demand for particular goods.

The second and third dependencies were less regularly investigated. Few studies observed impacts at the level of the food system, so how and when procurement schemes translate into meaningful change is still uncertain. References to synergies and trade-offs across the system were identified (3.7.1) though rarely critically evaluated.

Encouraging evidence was identified around food production practices being shaped by public demands and more research and evidence of this nature would be beneficial to understand **environmental** impacts.

For **health** impacts, whilst some positive findings around healthy food consumption were observed both in and out of public institutions, more research is needed to on how and when the food consumed in institutions complements or contradicts the food on offer outside the institution, and what impact this has on consumers' diets and health overall.

For **economic** impacts, useful methodologies and studies help to quantify the benefit of procurement schemes, but more work is needed to embed these impacts in the context of the decision to replace an existing 'conventional' scheme; existing food service may generate more benefits for local businesses and workers than is often acknowledged. The *net* impacts of procurement schemes should be considered against their objectives to better understand possible systemic effects

Due to the range of themes considered, it is unsurprising that the findings were mixed, with many nuances in specific areas. There were also some areas where synergies appear between the outcomes: healthier meals often means a greater share of vegetables, which is associated with lower environmental impacts, and these can be procured more locally to support small producers. From the lessons on uptake and implementation (3.8) it is clear that policy direction is not enough: implementation, design, communication, collaboration and participation all matter significantly, and may be the difference between little-to-no impact and cases with more substantive outcomes.

Updated estimates for public sector food

This project also outlines some indicative figures to quantify that potential: feasible emission savings of around 1 million tonnes CO_2e through nutritionally-supported changes to menu composition across England; some £3.95 billion in monetised social benefits (£2.6 - £7.9 billion) if 50% of ingredient expenditure was directed to local producers (4.3.1); some £437 million to £1.09 billion in added local economic activity from changing 'conventional' food and catering services to more localised ones (4.3.2).

In forming these estimates, this project provides novel estimates of the size of the public sector food service in England, in some cases updating very outdated figures (4.1). This suggests that public food expenditure may have been previously substantially underestimated. Such estimates, and further improvements to them through direct data gathering, can provide critical information to understanding the scale and impact of public sector catering and its potential for leveraging food system transformation across the country.

5.2 Suggested best practice for policymakers and institutions

Following the overview of how to SFP has been conceptualised (3.2), the synergies and trade-offs with the wider food system (3.7) and in particular key lessons on uptake and implementation (3.8), some of the key findings have been condensed into a suggested 'best practice' guide for both policymakers (whether at national or municipal/local level) and for specific institutions. This guide is not definitive and may vary in specific contexts, but highlights practical considerations from this report's findings. It is summarised in Figure 27.

It presents a path for policymakers and institutions separately. Despite this, there are many similarities between the two, due to key lessons and themes recurring at both levels. First, the *scope* should be considered*:* defining 'sustainable food' but also the scope of a

‘sustainable food procurement’ intervention, beyond just the ingredients (see 3.2). Holistic approaches are recommended here. At both levels, participative decision-making and supportive environments should be encouraged in which stakeholders are engaged. In both cases, the transition should be supported by engaging the supply chain, collaborating with stakeholders and third-party organisations and offering guidance. Particularly important for institutions is the idea of *cost-balancing strategies*, covered in 3.8.7. In all cases, the results should be measured and monitored to understand compliance and impact. These steps are presented as loops because the process should be iterative and continuous: policies and interventions should evolve through experience and learning.

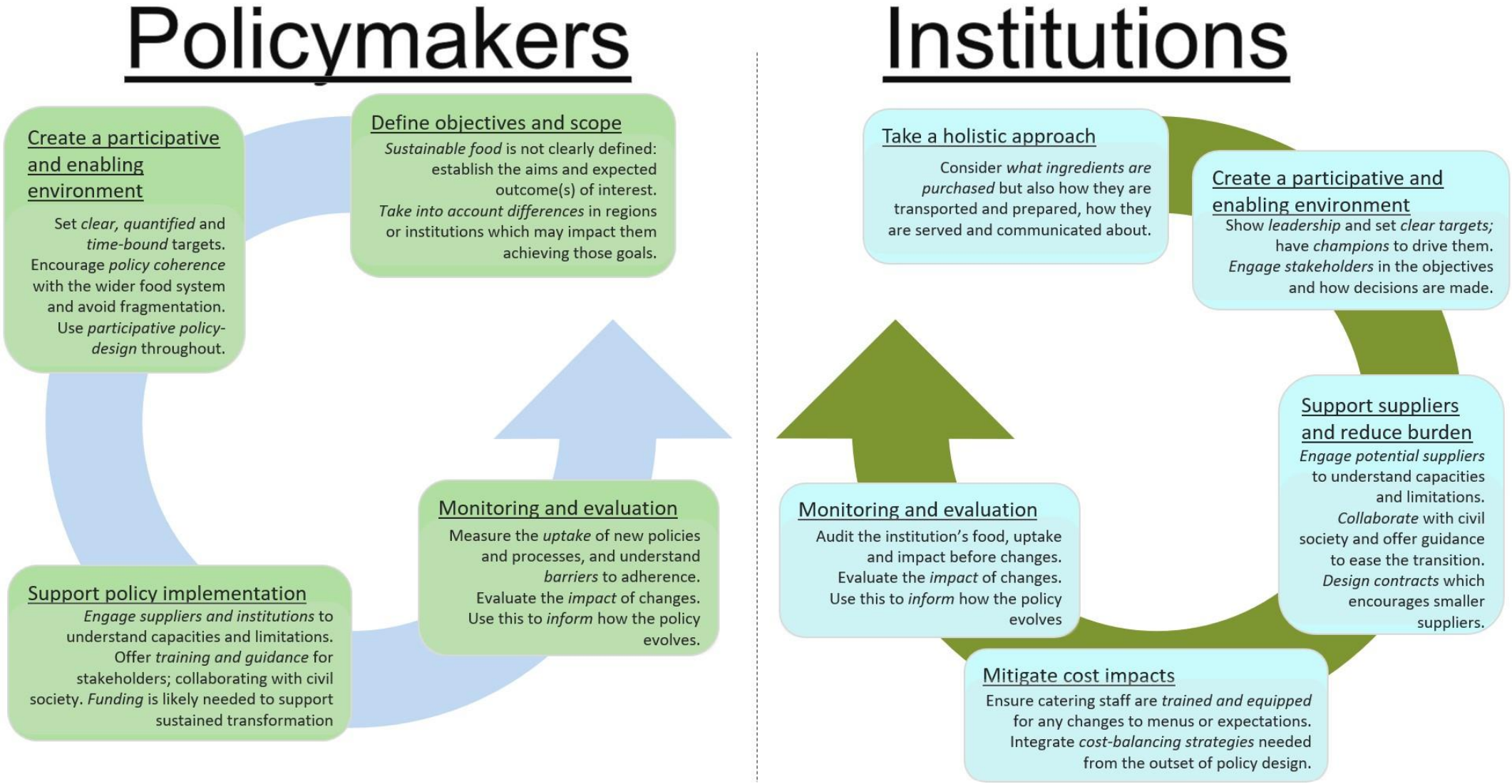

Figure 20: Suggested 'best practice' guide for policymakers and institutions. Designed by authors.

5.3 Evidence gaps and areas for future research

The REA (3.0) conducted provides an important insight into how SFP-related schemes are defined, how they operate and what evidence exists about their outcomes. The exploratory modelling tried to quantify these impacts (4.0). From this experience, questions remain open. In particular, questions around how public food procurement decisions interact with wider societal and food system dynamics, such as:

- Can procurement schemes influence on-farm management decisions and lead to meaningful changes in methods of food production?
- Do SFP-related schemes create additional economic activity and social value, or do they relocate existing activity?
- Does the serving of low-carbon diets or healthy food in public settings lead to a reduction in dietary emissions and an improvement in consumer health, or does this lead to reduced public food consumption and/or 'compensation' in private food consumption, or other rebound effects?
- Can public sector food service shape consumer habits, tastes and values, or is the food service constrained and shaped by intransigent preferences?
- How does SFP complement or contradict wider food system policy environments, and what policy coherence is needed to achieve their transformational potential?

Such questions are fundamental to linking SFP-related schemes to wider food system dynamics. Whilst some of the identified evidence does allude to synergies and trade-offs with the wider food system (see 3.7), at present the evidence or proof of concept is insufficient to offer detailed, conclusive answers to such questions.

In light of this, recommendations are made for future research which could address some of the challenges identified and drive forward the evidence base:

Recommendation one: establish a greater consensus on defining 'sustainable food' and 'sustainable food procurement' measures

As a previous literature review relating to public sector procurement concluded, "there is no commonly agreed definition of the composition and features of an alternative [public sector food procurement] model" (3). This finding has been validated in our research. A wide range of schemes such as targeting organic food, local food, food meeting certain nutritional criteria, or some form of multicomponent intervention looking at all of these factors may all fall under the same umbrella of 'alternative', 'values-based' or 'sustainable' public food procurement. Such 'values' are subjective and may vary between time and place as to what is considered important. This on the one hand enables the idea of SFP to be applied to the values most relevant in one place, a beneficial flexibility. On the other hand, the equation of 'sustainable' with any form of 'values-based' procurement may be inaccurate: there may be trade-offs between different objectives, such as local economic development and reduced greenhouse gas emissions, for example.

As SFP-related schemes vary in direction, they also vary in scope, with some being more or less holistic (see 3.2). This means that we must "avoid generalising the claimed impacts

of one type of PSFP model to others with very different features" (3) and limits the ability to make comparisons.

This project attempts to address this problem in two ways: firstly, by presenting a framework for understanding SFP-related interventions (see 1.3.2) which could be refined and utilised by practitioners and researchers. Secondly, through its thematic approach to analysis, the report looks at broad themes and learnings from diverse examples, but in doing so is limited in having conflated the experiences of very different schemes. Without a clearer, agreed framework for defining *what* an SFP-related scheme is and the scope of an intervention, making accurate comparisons is likely to remain a challenge.

Recommendation two: research on SFP should demonstrate better transparency of data and methods, particularly for case-study style evidence

Considering the outcomes reported, the findings of the Strength2Food review were similarly supported here: "very few studies actually analyse the *impacts* of [public sector food procurement] models" and those that do "lack transparency in reporting their methodologies and data", rarely having a baseline or comparator, rather "showcasing a successful scheme or programme" (3). There are some notable exceptions, such as the independent evaluations of the FFL scheme (e.g. (81)), with transparent data and clear, robust comparisons.

Whilst this report brings together a significant body of evidence regarding SFP-related scheme outcomes, one of the clear conclusions is how in many areas, the evidence relating to outcomes is small or suffers from limitations. The large number of case studies, particularly in the grey literature are often – though it must be stressed, not always – limited in the transparency of methods, data and lacking robust baselines (or, at least, lacking this information in a readily accessible form). Greater transparency of data and methods would be beneficial.

Recommendation three: the implementation of standardised data capture about food procurement across different settings. Where possible, datasets should be made accessible for researchers and analysts to further improve the evidence base on sustainable procurement

Related to the previous recommendation about data and methodological transparency is the role of reporting and creating new datasets which can be used to further develop the evidence base. As was found through the modelling process, existing data on the scale of public food procurement in England is currently piecemeal and limited. More systematic data capture about the size and expenditure of institutions and their procurement decisions, tracked over time, would have the potential to unlock future research and insights. The Farm-to-School census in the US, which was referenced across a number of different studies (e.g. (108,141,165), is a good example. By tracking SFP-related procurement decisions over time and making this data accessible, quantitative analysis on the introduction and extent of procurement decisions can be undertaken. Such data could also be used to explore how procurement decisions relate to other indicators such as local land use, as in an important study from Sweden (see 3.4.2). Whilst introducing some additional burdens for reporting organisations, the benefits of such data generation is an

important step for unlocking potential future research and insight which is central to achieving desired systemic effects.

Recommendation four: further research which examines the theory of change of sustainable food procurement to better understand how it interacts with the wider food system.

One of the challenges identified was in evaluating how public procurement could lead to systemic changes across the food system. Often, the professed outcomes of public procurement rely on a series of logical assumptions. There is no evidence to suggest that the logic of the theory of change is wrong. However, public food procurement is one small part of a much larger and more complex food system, itself embedded in societal and economic complexities. Studies which look at the *observed outcomes* where SFP-related schemes have been initiated are crucial for understanding these parts interact and the extent to which the purported benefits of SFP are actually realised, and the potential for synergies and trade-offs with the wider food system.

Some limited evidence was found of on-farm environmental management changing as a consequence of public procurement policies (see 3.4.2). For downstream health-related impacts, mixed results were identified, with some positive results for self-reported behaviours and preferences, but at the same time little evidence linking interventions in school food to changes in health outcomes such as obesity rates (see 3.5.3). The crucial role that studies like these have is that they *stress test the assumptions* which underpin the theory of change of sustainable food procurement (see 1.3.2). More robust research on observed outcomes in areas where such schemes have been undertaken for a long time – such as in Sweden, or Denmark, in Brazil, the USA or the UK – would be invaluable in improving this evidence base and informing the evidence base. Whilst such research is undoubtedly more resource intensive, it would provide an important insight.

Recommendation five: avoid de-contextualised statements of SFP scheme impacts. Using comparisons of the same location pre- and post-intervention, or comparing SFP and so-called 'conventional' services is needed for fuller understanding of *net* impacts. In particular, economic studies exploring comparisons between food service types would offer valuable insights.

Other than in a small number of cases where public food procurement is being introduced for the first time, SFP-related schemes are introduced as a replacement for an existing, so-called 'conventional' food service. To accurately evaluate their impacts, therefore, how the situation has *changed* due to the introduction of the scheme needs to be considered. In other words, for procurement to have a meaningful effect it is the *net* impact which is of relevance. In some cases, this is captured well: looking at the carbon footprint of a food service before and after menu changes, for example (3.3.1), or how uptake of fruits and vegetables changed due to an SFP-related scheme or intervention (3.5.1), for example, in which case a baseline was established against which changes could be measured.

In other areas however, notably in economic outcomes (3.6), the impact of the SFP-related scheme are often presented in isolation without a robust baseline. This risks overstating the impact by downplaying or in some cases completely ignoring displacement effects: for each winner in a new food procurement contract, there are losers from the old

contract. Benefits in terms of jobs provided or economic security for one supplier may mean fewer jobs or insecurity for another. In the case of local procurement schemes, the intention may not be to change the economic benefits but to localise them. If this is the case, this should be adequately communicated to ensure value *created* and value *relocated* are not conflated. In any case, evaluation which establishes a robust baseline before an intervention or uses comparison cases of 'conventional' procurement are highly beneficial. As one example across five countries demonstrated, the local economic impact of 'conventional' food service may still be comparable to 'local' procurement (see 3.6.2), although the overall analysis suggests there could still be between £437 million - £1.09 billion in local economic activity generated by switching to localised procurement in England (see 4.3.2). More research, particularly on economic impacts which takes a more holistic, comparative view of net impact would be beneficial.

5.4 Limitations

This section briefly describes some of the main limitations of each of the report sections, focusing on limitations of the method and approach rather than that of the evidence identified. The limitations for each section are discussed in more detail in the methodological appendices (see 7.0, 9.0, 10.0, 11.0)..

Rapid evidence assessment limitations

Searches were specific to food in public sector settings. Literature on the outcomes associated with food more generally, including in non-public hospitality settings, would likely still be relevant and applicable to public settings. Inclusion of such evidence would have widened the project scope to unrealistically large. However, findings from other non-public sector settings can and should also be considered where relevant.

Search terminology may have led to possibly-relevant papers being overlooked, particularly those which focus on serving interventions or specific mechanisms of change, such as the role of nudges in reducing food waste or healthy diet in patient recovery.

Evidence on uptake and implementation was not systematically reviewed, instead being captured within the evidence identified through searches about outcomes. Specific searches could have identified more evidence here.

Time and resource constraints led to prioritisation of available papers, meaning some 'possibly relevant' ones were not included in the review. Additional findings may have been overlooked, therefore. The scale of evidence identified means this is unlikely to have led to any fundamental changes in conclusions.

Search location and language restrictions may lead to British and European evidence being over-represented in the evidence base.

The timings of the search process mean that subsequently released papers and analysis were not included, though numerous possibly-relevant publications have subsequently been released. This is somewhat unavoidable whenever the search process is carried out, though it is noted that some particularly high-profile reports came out in this time (notably, the FAO's 'Public Food Procurement for Sustainable Food Systems and Healthy Diets')

Modelling of the scale and potential of SFP

Evidence of the number of meals served in each sector were in many cases based on reasonable assumptions. In some cases, notably further and higher education, healthcare staff and civil service staff the results are highly sensitive to assumptions.

Some possibly-relevant sectors are missing from the analysis, most notably the meals of visitors and outpatients served in retail settings in hospitals.

Regional adjustments of food service size and expenditure are particularly uncertain, relying on a simplification that the meals per consumer are the same, and that spend per meal is consistent. Variation is therefore driven by the variation in customer numbers. In reality, the price-per-meal is likely to vary as well.

Greenhouse gas emission scenarios were extrapolated from in-depth evidence from primary schools, with scaling based on overall calorific demand. Whilst the typical meals are a good demonstration of catering more broadly, this may overlook specific nuances and nutritional needs in certain sectors (such as military or healthcare).

Explored food waste scenarios consider only reductions in plate waste. Reductions in preparation and storage waste would also have benefits which have not been quantified.

The quantification of Social Return on Investment (SROI) relies on trying to harmonise values with different scopes and methodologies which may not be comparable. It is unclear to what extent differences are the result of methodological nuances and specific local conditions, given the small number of example cases. The range of possible results is a reflection of this uncertainty. This was to some extent unavoidable given the available evidence.

The Local Economic Multiplier (LM3) calculations harmonise results from different examples which represent different programmes, achieving different levels of SFP. To some extent, this means the overall results reflect a ‘realistic’ range based on real-life experiences. On the other hand, this means that nuances between what kind of activity could be generated under more or less ambitious schemes is not identified.

6.0 References

This details the in-text references identified through the Rapid Evidence Assessment. Other in-text footnotes are supplementary, additional information to assist in reading the report, not necessarily identified through the Rapid Evidence Assessment.

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7.0 Appendix: Key case studies

Location	SFP-related scheme	Links and further reading
Brazil	The Brazilian school feeding programme (PNAE) is a public policy designed to support children's nutrition. Some form of mandatory school feeding has been in place in Brazil since 1955, but since 2009 the PNAE has included a quota that a minimum of 30% of school procurement must be organic, agroecological production from family farms. The scheme has required engagement across line departments of education, health, and agriculture. This has enabled local farmers to introduce organic farming and supply schools with good quality and highly nutritious produce. The latest figures suggest an average of 25% of local procurement has been attained nationwide. The PNAE is suggested to create multiple benefits including access to fresh produce, nutrition, hygiene, good health and education, environmentally beneficial agriculture, and local & rural economic development.	FAO Regional Office for Latin America and the Caribbean: https://www.fao.org/americas/noticias/ver/en/c/1043379/ See also: (124) (149) (66) (123) (128) (177) (68) (130) (175) (67) (178) (147) (129)
Denmark	The Organic Public Procurement strategy was launched by the Danish government in 2012. The aim was to create better public meals, reduce climate emissions and increase the organic farming area. The scheme is structured with 4 public policy initiatives: procurement goals; financing; labelling; and NGO capacity building, and 3 organic sector initiatives: supply chain collaboration; organic schools for food service; and education for kitchen workers. The combination of these initiatives built collective motivation and critical mass in green transformation in public kitchens. In 2015, the new Danish Organ Action Plan was launched with the aim of doubling the organic farmland by 2020 from the 2007 baseline. This target was met, with the Plan further	Denmark Government, Organic Action Plan for Denmark: Working together for more organics https://en.fvm.dk/fileadmin/user_upload/FVM.dk/Dokumenter/Landbrug/Indsatser/Oekologi/7348_FVM_OEkologiplan Danmark_A5_PIXI_English_Web.pdf See also: (179) (71) (180) (56) (181) (107)

	contributing to meeting the national goal to reach 60% organic in all public kitchens. The Danish city of Copenhagen exceeded this target and achieved 90% organic food in 2015, without an increase in meal prices.	(137)
Finland	The Finnish food public policy aims to increase organic production with institutional kitchens obliged to act as "path-breakers" and as good examples through local and organic food. Serving sustainable meals is encouraged with local, organic, seasonal, and vegetarian all presented as options to promote sustainability. The goal was for 5% of meals by catering units to be based on local, organic, vegetarian, or seasonal raw materials by 2010, with the target rising to 15% by 2015 and 20% by 2020. Various proposed indicators were intended to track progress through organic purchases, land use etc. Steps to Organic is a Finnish voluntary organic training programme to support professional kitchens increase the use of organic ingredients. Launched in 2002, by 2015 over 2280 kitchens participated with 80% of these being municipal kitchens. To date, 8% of all professional kitchens and 20% of public sector kitchens are involved.	See, for example: (16) (138) (105) (182) (119) (183)
United Kingdom	The Soil Association's Food for Life campaign encourages healthy and sustainable eating, while also educating people about where their food is sourced, how its grown and cooked and emphasising the importance of well-sourced ingredients. The programme operates with schools, nurseries, hospitals, and care homes to grow knowledge and develop key skills that will lead to long-term change. The scheme has helped influence UK policy with the Government's National Food Strategy, commissioned in 2019, holding many of the key values of Food for Life. These include healthy and affordable food for all; enhance the natural environment; build resilient and sustainable agriculture sector; and create a thriving food system. The Food for Life Served Here certification supports public and private sector caterers to serve fresh, local, and sustainable food. Ongoing since 2009, around 2.6 billion meals meeting the standards have been served in that time,	Food for Life: https://www.foodforlife.org.uk/ See also: (134) (43) (82) (122) (104) (80) (92) (81) (184) (150) (39). (135) (52)

	creating health impacts in school children, supporting local enterprise, and addressing inequalities in local communities.	
United States of America	The Farm-to-School is a US-based programme that aims to transform the food system, including the way kids eat, grow, and learn about food. The goal is to increase access to local food and nutrition education, benefitting children's health, creating stronger family farms, and building thriving communities. The programme seeks an equitable food system and believes actions to achieve this should revolve around six shared community principles: economic and environmental justice; health; racial equity; workers' rights; and animal welfare. In 2020, National Farm to School Network issued a Call to Action for themselves and the whole food system. The goal is by 2025, 100% of communities will hold power in a racially just food system. To date, Farm-to-School is active in 42% of US schools, has engaged 23.6 million students and has contributed to around $789 million USD spending on local food. In addition, the US Department of Agriculture awards grants to schools which support the planning, development and implementation of school programmes. In 2021-22, grants were served to some 6,800 schools.	National Farm to School Network: https://www.farmtoschool.org/ USDA Farm to School Grant Programme: https://www.fns.usda.gov/cfs/farm-school-grant-program See also: (86) (84) (111) (85) (154) (83) (103) (185) (141) (87) (165) (108)
Europe	The EU GPP criteria, developed by the European Commission, aims to support public authorities to ensure that the goods, services and works they require are procured and implemented in a way that lowers their environmental impacts. The final version of the EU GPP criteria for food was published in 2019, with the scope covering food, catering services and vending machines. The GPP is a voluntary instrument with participating member states and public authorities having to comply to the guiding principles of free movement of goods and services and freedom of establishment; Non-discrimination and equal treatment; Transparency: Proportionality and Mutual recognition.	European Commission, EU GPP criteria for food procurement, catering services and vending machines: https://ec.europa.eu/environment/gpp/pdf/191106_JRC118360_EU%20GPP%20Food%20catering%20criteria_TR5_final2.pdf EU Green public procurement – food and catering services: https://www.sei.org/wp-content/uploads/2019/10/3-enrico-degiorgis-191111-eu-gpp-criteria-food-and-catering-services.pdf

	The criteria should be formed of either Selection Criteria, Technical specifications, Award criteria or Contact performance clauses. Each criterion is also determined by its environmental targets and ambitions and classified as either core or comprehensive.	European Commission GPP Good Practice: https://ec.europa.eu/environment/gpp/case_group_en.htm

8.0 Methodological appendix: REA

8.1 Objectives

The aim of the project was to understand the role of procurement in improving sustainability outcomes, with a definition of sustainability which encompasses environmental, economic and social outcomes. The REA was also intended to identify possibly relevant data for use in the quantitative analysis and model development (see 4.2 and 4.3).

The approach taken by the REA was in line with the guidance provided by Defra in 2015 on producing Quick Scoping Reviews and Rapid Evidence Assessments.[78]

The REA sought to answer two research questions:

Primary question (RQ1): *What evidence is there about the effectiveness of public sector procurement of food and catering services in reducing greenhouse gas emissions?*

Secondary question (RQ2): *To what extent can public sector food and catering services deliver improved food system and health outcomes, increase sustainability, reduce inequality, support local economic growth and wider socio-economic outcomes in light of Brexit and recovery from COVID-19?*

The primary question therefore focuses on environmental sustainability, or more specifically the contribution of food consumption to climate change. The secondary question addresses questions of sustainability more broadly, including social and economic objectives.

The scope of the project was initially focused exclusively on *outcomes* only, i.e. the impact of public food procurement schemes on defined health, economic and environmental metrics and outcomes. As the REA progressed, this scope was expanded to include lessons on uptake and implementation. This was due to the wealth of evidence being identified regarding these areas in the literature already identified.

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78 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/560521/Production_of_quick_scoping_reviews_and_rapid_evidence_assessments.pdf

However, given the amount of evidence identified through the outcome-focused searches, additional searches focusing on *process* were not made. Additional evidence could in theory have been identified were this the case.

8.2 Search protocol

Critical components of the research questions were identified by defining the population, intervention, comparator and outcome, in line with the PICO model. This is displayed for RQ1 and RQ2 in Table 33 and Table 34 respectively.

Table 33: RQ1 PICO Table

Question	What evidence is there about the effectiveness of public sector procurement of food and catering services in reducing greenhouse gas emissions?
Population	Procurers and caterers of public food service
Intervention	Any changes to the operation of food procurement
Comparator	The procurer or caterer of public food service prior to the intervention; other procurers or caters of public food service without the intervention
Outcome	Changes in the carbon intensity (CO_2 equivalent) of public sector food service (e.g. the production of food served, the composition of food served, the amount of waste generated, the energy used in preparation)

Table 34: RQ2 PICO table

Question	What evidence is there about the effectiveness of public sector procurement of food and catering services in reducing greenhouse gas emissions?
Population	Procurers and caterers of public food service
Intervention	Any changes to the operation of food procurement
Comparator	The procurer or caterer of public food service prior to the intervention; other procurers or caters of public food service without the intervention
Outcome	Changes in the health implications of food served by public sector services; impacts of public sector procurement choices on economic growth, local supply chains and SMEs; impact of public sector procurement on food system dynamics, e.g. improved practices in wider (including private) catering services, increased availability of local/organic supply etc.

Keywords for the literature search were identified based on the PICO elements and research questions. Synonyms, antonyms and conceptually similar terms for terms were determined using the research team's knowledge. As well as terms around carbon, environment, health and economy, some additional searches were carried out relating to themes identified in RQ2; namely coronavirus and Brexit. Due to the time of the literature search, carried out in October 2021, it was not expected that extensive evidence would be found relating to Brexit or coronavirus.

Academic searches were carried out using EBSCOhost. A full list of the search strings used and number of results identified in each search (before removing duplicates) can be found in Table 35.

Table 35: Log of academic searches

Search criteria	Number of results
AB ("public sector" OR "public-sector" OR government* OR institution*) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (environment* OR "greenhouse gas*" OR carbon OR climate")	79
SU ("public sector" OR "public-sector" OR government* OR institution*) AND SU (procur* or cater* or "food procur*") AND SU (food OR canteen OR meal OR menu OR kitchen)	36
AB ("public sector" OR "public-sector" OR government* OR institution*) AND AB (procur* or cater*) AND AB (food OR canteen OR meal OR menu OR kitchen)	410
AB (city OR "city council" or mayor* OR municipal) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen)	254
AB ("public sector" or "public-sector" OR government* OR institution*) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND TX (covid or coronavirus or covid-19)	16
AB ("public sector" or "public-sector" OR government* OR institution*) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND TX (brexit)	1
AB (education OR schools OR universit* OR "higher-education" OR "higher education" OR "further-education" OR "further education") AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (environment* OR "greenhouse gas*" OR carbon OR climate)	87
AB (education OR schools OR universit* OR "higher-education" OR "higher education" OR "further-education" OR "further education") AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (energy OR LCA OR "life-cycle assessment" OR "life cycle assessment" OR emissions OR footprint)	42
AB (education OR schools OR universit* OR "higher-education" OR "higher education" OR "further-education" OR "further education") AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (sustainab* OR organic)	49
AB (education OR schools OR universit* OR "higher-education" OR "higher education" OR "further-education" OR "further education") AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB ("animal welfare" OR biodivers*	7
AB (education OR schools OR universit* OR "higher-education" OR "higher education" OR "further-education" OR "further education") AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (health* OR diet* OR lifestyle	146
AB (education OR schools OR universit* OR "higher-education" OR "higher education" OR "further-education" OR "further education") AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (*security OR "social justice" OR labour OR labor OR safety OR migrant	45
AB (education OR schools OR universit* OR "higher-education" OR "higher education" OR "further-education" OR "further education") AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (diet OR meat OR fruit OR vegetables OR nutrition)	126
AB (education OR schools OR universit* OR "higher-education" OR "higher education" OR "further-education" OR "further education") AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (econ* OR grow*)	65
AB (education OR schools OR universit* OR "higher-education" OR "higher education" OR "further-education" OR "further education") AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (smallhold* OR local)	82

AB (education OR schools OR universit* OR "higher-education" OR "higher education" OR "further-education" OR "further education") AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (employ* OR job OR SME)	32
AB (education OR schools OR universit* OR "higher-education" OR "higher education" OR "further-education" OR "further education") AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND TX (covid OR coronavirus OR covid-19)	7
AB (education OR school OR universit* OR "higher-education" OR "higher education" OR "further-education" OR "further education") AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND TX brexit	0
AB ("Health and social care" OR hospitals) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (LCA OR "life-cycle assessment" OR "life cycle assessment" OR waste OR energy)	10
AB ("Health and social care" OR hospitals) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (sustainab* OR organic)	8
AB ("health and social care" OR hospital OR healthcare) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (environment* OR "greenhouse gas*" OR carbon OR climate)	44
AB ("Health and social care" OR hospitals) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (*security OR "social justice" OR labour OR labor OR migrant)	0
AB ("Health and social care" OR hospitals) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (econ* OR grow*)	8
AB ("Health and social care" OR hospitals) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (smallhold* OR local)	8
AB ("health and social care" OR hospital OR healthcare) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (health* OR diet* OR lifestyle OR hygiene)	143
AB ("health and social care" OR hospital OR healthcare) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND TX (covid OR coronavirus OR covid-19)	4
AB ("health and social care" OR hospital OR healthcare) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB Brexit	0
AB (prison OR jail OR courts OR "armed forces" OR military) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (environment* OR "greenhouse gas*" OR carbon OR climate)	3
AB (prison OR jail OR courts OR "armed forces" OR military) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (LCA OR "life-cycle assessment" OR "life cycle assessment" OR waste OR energy)	3
AB (prison OR jail OR courts OR "armed forces" OR military) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (sustainab* OR organic)	3
AB ("Health and social care" OR hospitals OR healthcare) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB ("animal welfare" OR biodivers* OR water)	5
AB ("Health and social care" OR hospitals OR healthcare) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (health OR diet OR lifestyle)	57
AB ("Health and social care" OR hospitals OR healthcare) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (*security OR "social justice" OR labour OR labor OR migrant)	3
AB ("Health and social care" OR hospitals OR healthcare) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (safety OR hygiene)	16
AB ("Health and social care" OR hospitals OR healthcare) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (meat* OR fruit OR vegetables)	5
AB (prison OR jail OR courts OR "armed forces" OR military) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB ("animal welfare" OR biodivers* OR water)	3
AB (prison OR jail OR courts OR "armed forces" OR military) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (health* OR diet* OR lifestyle)	10

AB (prison OR jail OR courts OR "armed forces" OR military) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (employ* OR job OR SME)	2
AB (prison OR jail OR courts OR "armed forces" OR military) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND TX (covid OR coronavirus OR covid-19)	0
AB (prison OR jail OR courts OR "armed forces" OR military) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND TX (covid OR coronavirus OR covid-19)	0
AB (prison OR jail OR courts OR "armed forces" OR military) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (*security OR "social justice" OR labour OR labor OR migrant)	5
AB (prison OR jail OR courts OR "armed forces" OR military) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (safety OR hygiene)	9
AB (prison OR jail OR courts OR "armed forces" OR military) AND AB (procur* OR cater*) AND AB (food OR canteen OR meal OR menu OR kitchen) AND AB (econ* OR grow*)	10
AB "farm to school" AND AB impact	26

In addition to academic searches, it was identified that possibly-relevant information would be available in the grey literature. In order to minimise bias in the search strategy and ensure that relevant grey literature was identified, additional searches were carried out using Google.[79] As agreed with the steering group, due to the large number of results which would be identified through Google, only the first 100 were exported for consideration in each search. The complete list of searches and the approximate total search results are presented in Table 36 for context. In many cases, the same search was conducted twice, with a limitation on results to PDF files in one search to bypass web pages and focus on publications and reports.

Table 36: Log of Google searches

Search criteria	Number of results (millions)
("public sector") AND (procurement OR catering) & food OR canteen OR kitchen OR meal OR menu) AND (sustainable OR environment)	38.6
("public sector") AND (procurement OR catering) & food OR canteen OR kitchen OR meal OR menu) AND (sustainable OR environment) type:pdf	6.9
("public sector") AND (procurement OR catering) AND (food OR canteen OR kitchen OR meal OR menu) AND (sustainable OR environment OR methane OR "greenhouse gases" OR carbon OR climate OR LCA OR emissions OR intensity OR seasonal)	19.1
("public sector") AND (procurement OR catering) AND (food OR canteen OR kitchen OR meal OR menu) AND ("carbon emissions" OR "carbon intensity")	1.1

[79] Initially, it was unclear whether Google (i.e. the main search engine) or Google Scholar would be better suited for identifying grey literature, so a test search was carried out using a simple, generic search string: *Sustainable AND food AND procurement AND "public sector"*. This was searched on both Google and Google Scholar, with the first 30 results compared for type of publisher: it was found that Google.co.uk found possibly-relevant webpages from a variety of organisations including governmental sources, NGOs, the European Union as well as University websites and publications. By contrast, all results identified through Google Scholar were academic, and would therefore likely be duplicates of those found through the EBSCOhost search. As a result, it was decided that Google.co.uk was a preferable avenue.

("public sector") AND (procurement OR catering) AND (food OR canteen OR kitchen OR meal OR menu) AND ("carbon emissions" OR "carbon intensity") type:pdf	0.2
("public sector") AND (procurement OR catering) AND (food OR canteen OR kitchen OR meal OR menu) AND (seasonal OR "animal welfare" OR biodiversity OR organic OR water)	0.4
("public sector") AND (procurement OR catering) AND (food OR canteen OR kitchen OR meal OR menu) AND (seasonal OR "animal welfare" OR biodiversity OR organic OR water) type:pdf	0.0
("public sector") AND (procurement OR catering) AND (food OR canteen OR kitchen OR meal OR menu) AND (waste OR "food waste" OR energy OR "energy efficiency")	14.0
("public sector") AND (procurement OR catering) AND (food OR canteen OR kitchen OR meal OR menu) AND (waste OR "food waste" OR energy OR "energy efficiency") type:pdf	5.4
("public sector") AND (procurement OR catering) AND (food OR canteen OR kitchen OR meal OR menu) AND (health OR healthy OR diet OR dietary)	39.6
("public sector") AND (procurement OR catering) AND (food OR canteen OR kitchen OR meal OR menu) AND (health OR healthy OR diet OR dietary) type:pdf	6.7
("public sector") AND (procurement OR catering) AND (food OR canteen OR kitchen OR meal OR menu) AND ("food security" OR "social justice" OR "economic growth" OR local OR "local economy" OR smallholder OR SME)	29.8
("public sector") AND (procurement OR catering) AND (food OR canteen OR kitchen OR meal OR menu) AND ("food security" OR "social justice" OR "economic growth" OR local OR "local economy" OR smallholder OR SME) type:pdf	6.2
("public sector") AND (procurement OR catering) AND (food OR canteen OR kitchen OR meal OR menu) AND ("coronavirus" OR "covid-19")	9.2
("public sector") AND (procurement OR catering) AND (food OR canteen OR kitchen OR meal OR menu) AND ("brexit")	1.1
("school" OR "schools" OR "education") AND ("procurement" OR "catering)" & ("food" OR "canteen" OR "kitchen" OR "meal" OR "menu") AND ("sustainable" OR environment)	107.0
("school" OR "schools" OR "education") AND ("procurement" OR "catering)" & ("food" OR "canteen" OR "kitchen" OR "meal" OR "menu") AND ("sustainable" OR environment) type:pdf	36.8
("school" OR "schools" OR "education") AND ("procurement" OR "catering)" & ("food" OR "canteen" OR "kitchen" OR "meal" OR "menu") AND ("carbon emissions" OR "carbon footprint" OR "carbon dioxide" OR "CO2")	17.9
("school" OR "schools" OR "education") AND ("procurement" OR "catering)" & ("food" OR "canteen" OR "kitchen" OR "meal" OR "menu") AND ("carbon emissions" OR "carbon footprint" OR "carbon dioxide" OR "CO2") type:pdf	4.6
("prison" OR "prisons" OR "justice system" OR "army" OR "armed forces") AND ("procurement" OR "catering)" & ("food" OR "canteen" OR "kitchen" OR "meal" OR "menu") AND ("sustainable" OR environment) type:pdf	8.5
("prison" OR "prisons" OR "justice system" OR "army" OR "armed forces") AND ("procurement" OR "catering)" & ("food" OR "canteen" OR "kitchen" OR "meal" OR "menu") AND ("carbon emissions" OR "carbon footprint" OR "carbon dioxide" OR "CO2")	8.4
("prison" OR "prisons" OR "justice system" OR "army" OR "armed forces") AND ("procurement" OR "catering)" & ("food" OR "canteen" OR "kitchen" OR "meal" OR "menu") AND ("carbon emissions" OR "carbon footprint" OR "carbon dioxide" OR "CO2") type:pdf	0.7
("hospital" OR "hospitals" OR "healthcare" OR "health care" OR "health" OR "social care") AND ("procurement" OR "catering)" & ("food" OR "canteen" OR "kitchen" OR "meal" OR "menu") AND ("carbon emissions" OR "carbon footprint" OR "carbon dioxide" OR "CO2")	19.2
("hospital" OR "hospitals" OR "healthcare" OR "health care" OR "health" OR "social care") AND ("procurement" OR "catering)" & ("food" OR "canteen" OR "kitchen" OR "meal" OR "menu") AND ("carbon emissions" OR "carbon footprint" OR "carbon dioxide" OR "CO2") type:pdf	4.8
("hospital" OR "hospitals" OR "healthcare" OR "health care" OR "health" OR "social care") AND ("procurement" OR "catering)" & ("food" OR "canteen" OR "kitchen" OR "meal" OR "menu") AND ("sustainability" OR "environment") type:pdf	32.3

In addition to these searches, publications were recommended by the identified interviewees. The interviews were held over November 2021. As a result of being held

after the search and screening process (see below), there were numerous duplicate files and websites identified. After screening the resources shared by interviewees for relevance and removing duplicates of those already identified through Google and academic searches, a total of 23 additional (of which three were academic, and twenty grey literature) were identified.

The searches being conducted in October 2021 means that there may be subsequently-published evidence which could have been relevant to this review. These include academic papers,[80] policy briefs[81] and perhaps most notably, a substantial report publication by the Food and agriculture Organization of the United Nations.[82] It would have been preferable to include such evidence, however it is likely that more would be published in the time spent analysing that – and so on. As a result, articles identified subsequent to the end of the search and interview process were not included in this review.

8.3 Screening out process

Search results were then screened in two phases. For academic literature, the first screen was conducted based on the title, to identify those papers which were clearly not relevant and could be removed. The second screen was then based on the abstract of the publication. Due to the large number of papers identified, at the second stage priority was given to those which looked to be clearly relevant rather than 'borderline' cases. These papers were then all read in full: this presented a third opportunity to screen out those papers which had appeared relevant but were not.

For the grey literature, due to use of Google searches, the approach had to be slightly different. The search process exported website URLs. After removing duplicates, the URLS were screened to remove those which were clearly not relevant; this included, for example, general information websites or news websites (such as Wikipedia, or the BBC), as well as location-specific procurement policy documents (such as for schools, or councils). The second screen was then focused on a quick-scan of the report or webpage content: looking at the title, the first page, a quick scan or search for relevant keywords. In some cases, the websites identified through the searches had multiple possibly relevant publications. It was at this point that these were separated, so the review was of publications (in some cases, webpages) rather than websites more broadly. As with academic papers, some were subsequently removed after full reading of the text.

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[80] See for example; https://doi.org/10.1016/j.wasman.2022.01.006 and https://doi.org/10.3390/nu14061174 about plate waste

[81] https://www.eci.ox.ac.uk/news/2022/0316-SMEs-enhance-food-system-resilience.html

[82] https://www.fao.org/3/cb7969en/cb7969en.pdf Note that whilst this report is not included in our analysis, many of the case studies discussed therein are also covered in academic papers by the same authors which have been captured in this REA>

A summary of the steps and number of publications at each step is presented in Figure 21. The REA design and screening process subject to oversight by a project author from City University.

Due to time and resource constraints in the analysis of the substantial dataset, papers were prioritised at the second screen according to those which were considered most relevant by the author offering oversight, and these were read as priority. As a result, some of the papers identified during the search process which were possibly or slightly relevant were not captured. As a result, the review cannot be said to be systematic: between possible limitations in the search process, timings and those papers not considered due to time and resource constraints, some possibly relevant information will have been missed. However, given the breadth and depth of the evidence which was identified, the review is certainly comprehensive, even if not exhaustive.

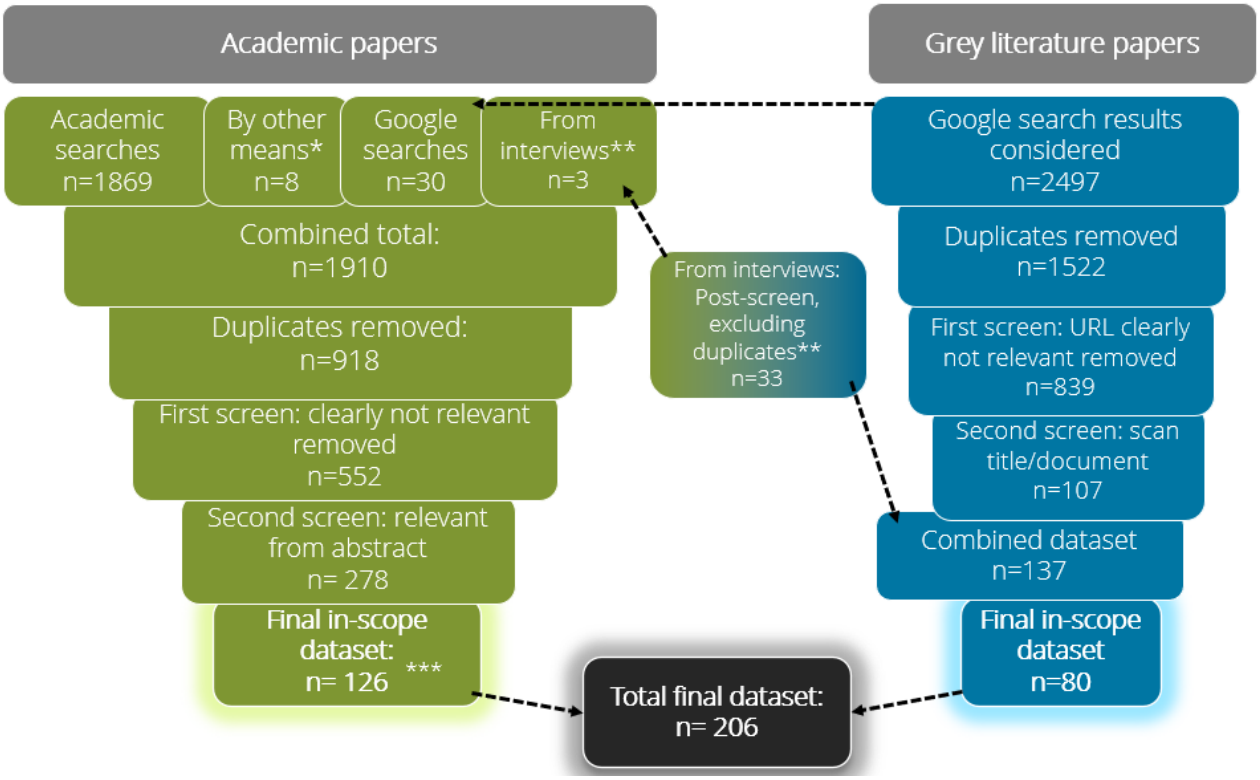

Figure 21: summary of REA screening process.
includes papers of which the authors were already aware, shared by colleagues or identified coincidentally in the course of day-to-day work.
****** due to timings, duplicates from searches identified by interviewees were excluded prior to the combined total.***
******* those filtered out at this point a mixture of those read in full and considered not relevant, those inaccessible or not accessible in English despite having an English abstract.***

8.4 Evidence extraction

Upon full reading of a paper, evidence was extracted to inform critical appraisal and answering the research questions. Basic bibliographic and citation details (author, year,

journal title) were extracted using a referencing software (Zotero) for academic papers. For grey literature papers, these were captured manually. Additional information from reading the paper was extracted through use of an online form: each paper was given a unique identifier against which form responses were matched to bibliographic information. A team of four researchers analysed papers. A summary of the form is presented in presented in Table 37.

Table 37: Data capture form

Area heading	Description of what was captured
Type of evidence	i.e. grey or academic literature
Research design	Which methodology grouping and a short description of research design
Population (food service body considered)	*Which food service settings were discussed*
Geographic scope	Which country, or countries, discussed, including specific subnational areas like states or cities
Intervention	A brief description of the intervention presented
Outcome	A brief overview of outcomes discussed
Evidence pertaining to the primary question (environment-GHG)	Detailed discussion and quotations relating to greenhouse gas emissions findings, if relevant
Evidence pertaining to the secondary question (environment-other)	Detailed discussion and quotations relating to other environmental findings, if relevant
Evidence pertaining to the secondary question (health&social)	Detailed discussion and quotations relating to health and social findings, if relevant
Evidence pertaining to the secondary question (economy)	Detailed discussion relating to economic findings, if relevant
Other evidence relating to food-system effects or disruptions	Summary of findings and references to wider food-system impacts and recent events (the COVID-19 pandemic and Brexit), if discussed
Evidence relating to uptake, implementation and lessons learnt	Other findings not related to outcomes but related to dependencies and process which impact the implementation, uptake and success of procurement schemes

Much of this evidence was written as short paragraph free-text by reviewers. This evidence was then subsequently grouped into themes based on reading the reviewer notes. These themes form the basis for the structure presented in the report (throughout section 3.0), each subheading corresponding to an identified theme.

8.5 Scope of evidence

For each paper documented, elements of the *scope* of analysis were documented. Considering the total dataset firstly based on the noted *location* of a specific intervention or case study, the most documented region was Europe, with North America the second most represented region. The number of papers identified in each region is presented in Figure 22.

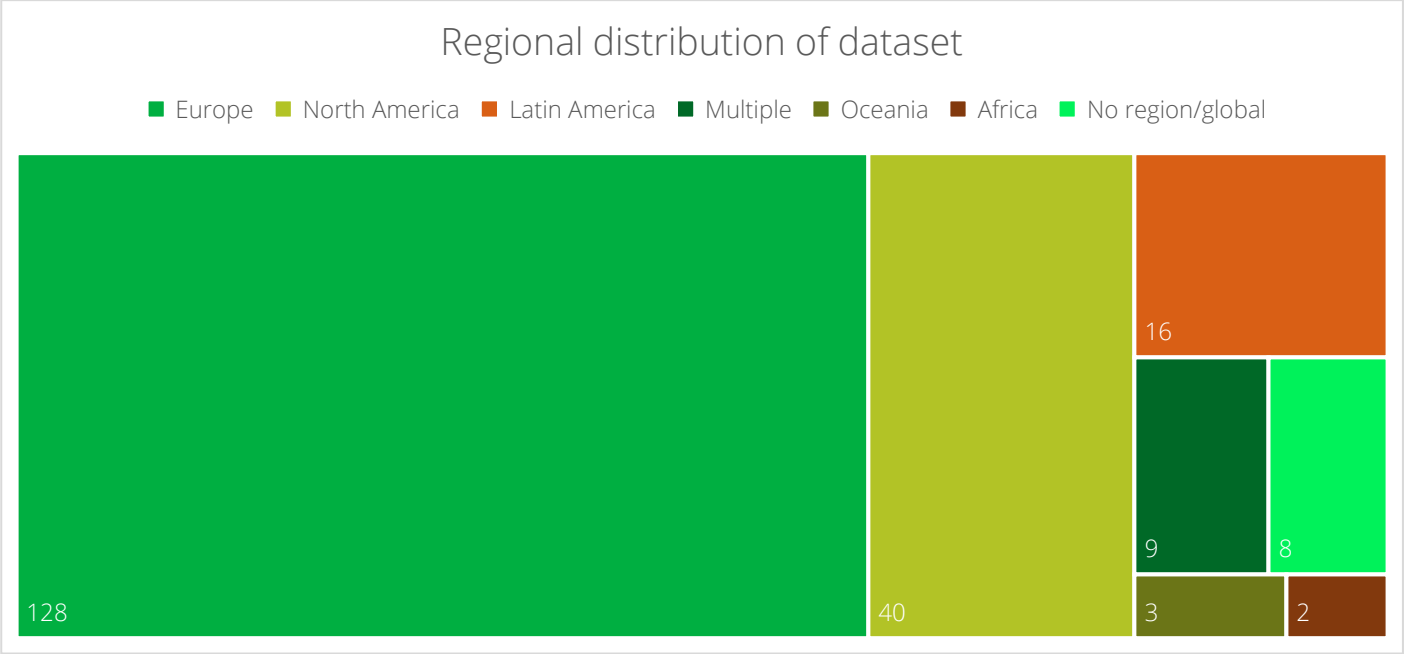

Figure 22: Regional distribution of data

This uneven distribution may reflect differences in economic development, if SFP schemes are more likely to be documented and evaluated (in English) in higher-income countries. The distribution may also reflect biases related to the search procedure and process: searches were conducted in English and search terminology may have biased towards publications from areas where English is spoken more widely. Papers in other languages without English text, such as in Portuguese, were screened out as part of the search process (see 8.3) and accessing a wider variety of languages could have identified additional evidence from other regions, including more lower-income countries. The possibility of search-method-related biases is further suggested when the regional evidence is broken down by *type* of evidence. As is displayed in Figure 23, the prevalence of European data is driven in large part by the identification of abundant grey literature in Europe. This was in part through specific prolific examples such as the FFL scheme[83], and European projects including FoodLinks[84], Strength2Food[85] and

[83] https://www.foodforlife.org.uk/

[84] https://www.foodlinkscommunity.net/foodlinks-home.html

[85] https://www.strength2food.eu/

'GPP Good Practice'[86], for which many grey literature reports were identified. This may also reflect limitations in the search process: grey literature papers were identified via Google searches using Google.co.uk (see 8.2) from a UK-based computer. As Google provides location-based search results, these searches may have disproportionately returned UK- and Europe-based evidence. The same search conducted elsewhere in the world may return different results.

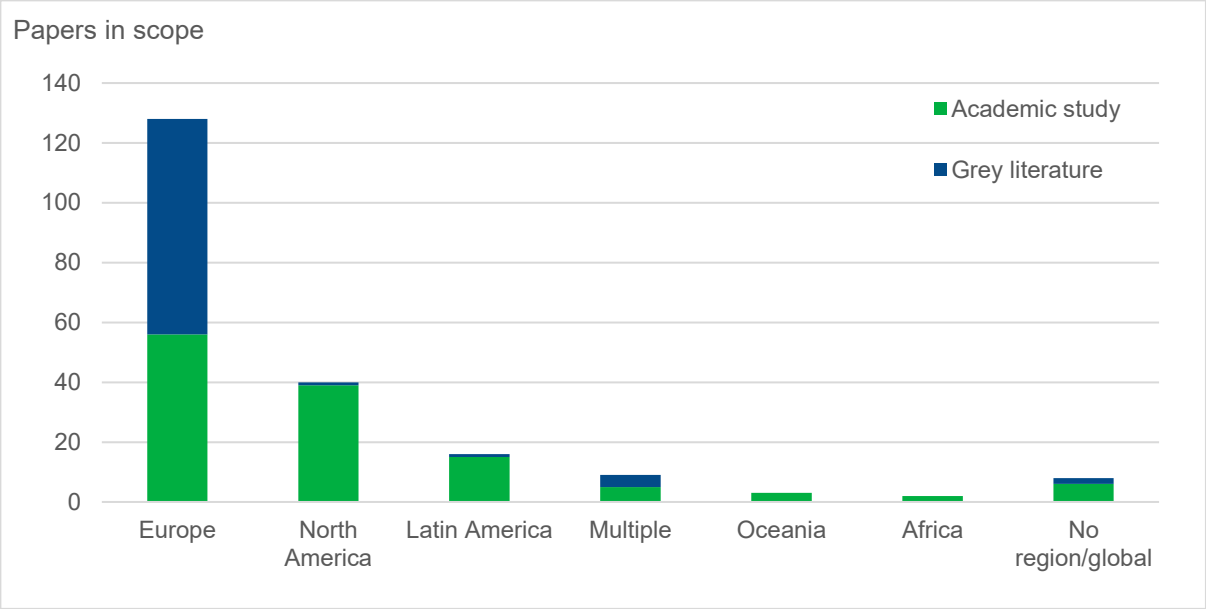

Figure 23: Distribution of data by region and type of paper

A second key scope-based consideration relates to the food service institutions which an intervention of SFP scheme focuses on. Each paper was coded based on the institutions covered, with each paper possibly referring to more than one institution type. The distribution of the dataset is presented in Table 38.

Table 38: Dataset by institution mentioned

Institution mentioned	Number of papers	Share of dataset*
Education	142	69%
Health and social care	50	24%
Justice and defence	13	6%
Administration	17	8%
General, or unspecified	38	18%
Other public sector	3	1%

Note that the sum of the percentages in this column exceed 100%, as some papers referred to more than one institution type.

[86] https://ec.europa.eu/environment/gpp/case_group_en.htm

By some distance, education was the most commonly discussed institution in the literature, with over two-thirds of papers making explicit reference to procurement of food for education. This is a combination of evidence relating to school food procurement and catering services in universities. 'Health and social care' is the second-most referenced category. The importance of these two categories ahead of others, such as administrative meals or meals in penal and military services, is likely to be, in part, a reflection of the number of meals served (see section 4.1.1). Nearly one-fifth of papers discussed public procurement in general terms, without specifying which sub-sectors were covered. This was the case for example when municipal or urban procurement strategies were discussed but it was not clear for which sectors the municipality procured food.

The preponderance of information related to educational meals, particularly school meals, is possibly to be expected. School food is likely to be largely influenced by governmental funding and decisions, whereas other sectors (such as healthcare) may have less public-sector control in some circumstances. School food and children's nutrition are emotive and politically salient issues, particularly in lower-and middle-income countries.[87] As well as the importance of ensuring adequate energy and nutrients, healthy food in schools may be perceived as an investment in the development of good habits and taste preferences throughout life.[88] It is therefore relevant in countries of all income levels. Considering the three regions with the most identified evidence, meals in education are mentioned in 70-80% of all papers across regions (Figure 24). Whilst there are some small nuances, between regions, such as healthcare meals being referenced more regularly mentioned in Europe than other regions, the distribution of evidence broadly points towards a common pattern across regions in which public food procurement schemes focus on the educational sector.

[87] See, for example, the World Food Programme's work and reporting in this area: https://www.wfp.org/school-meals

[88] See, for example: https://uk.sodexo.com/inspired-thinking/insights/encouraging-healthy-eating-in-schools.html and https://heas.health.vic.gov.au/schools/classroom/food-mood-and-learning

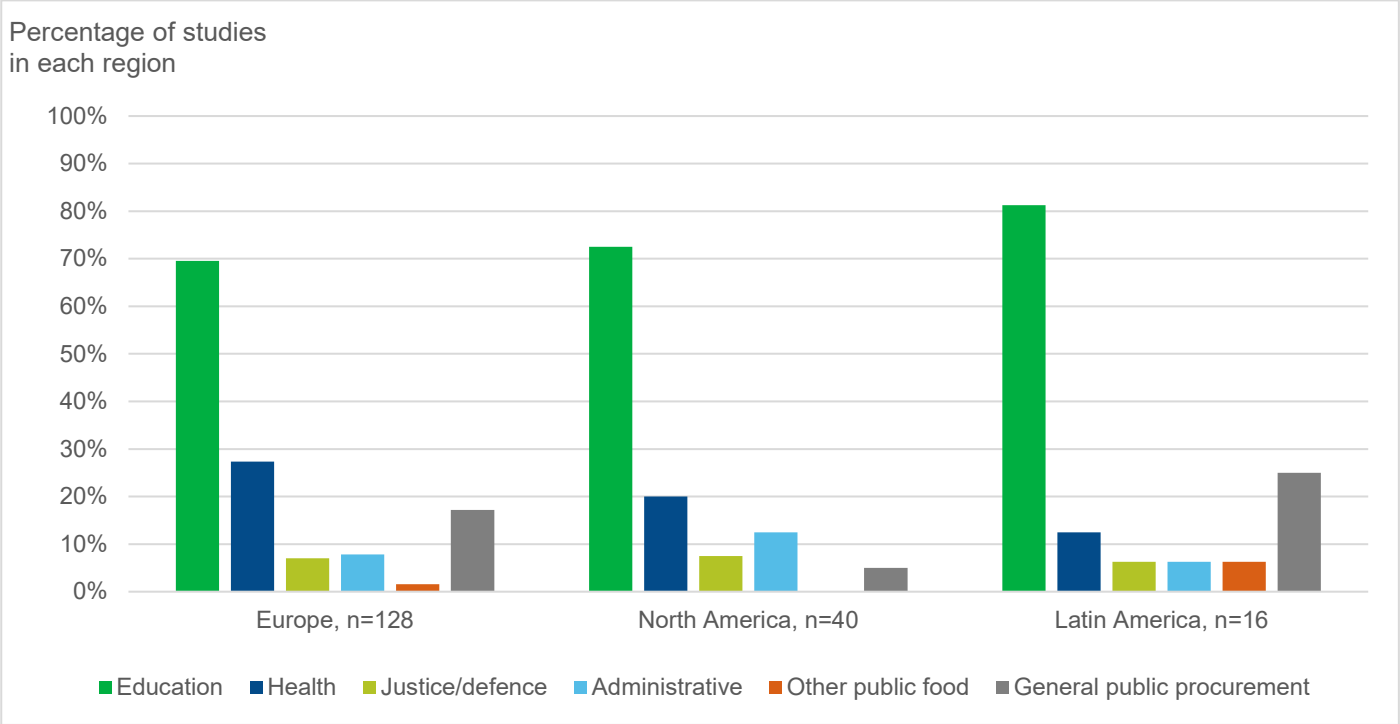

Figure 24: Share of evidence by region and sector discussed, sum of percentages can exceed 100% as multiple sectors can be covered in a single study

Considering the geographical scope in more depth, we find that the United Kingdom was the country which was most represented in the data. This includes both studies in which the UK was the sole focus and those where the UK was mentioned as a case study within a larger paper with evidence from multiple countries. The breakdown of the six most regularly identified countries is in Figure 25. Other European countries regularly mentioned included Italy, Denmark and Sweden. This amount of evidence was in part driven by repeated references to specific case studies in a number of papers. Notably, five case studies from the FoodLinks project were routinely referred to in subsequent publications: East Ayrshire, Scotland; Copenhagen, Denmark; Malmö, Sweden each being referenced in seven different papers (6,8,24,26,28,38,71,142,172,186,187); Rome, Italy being mentioned in six different papers (24,26,26,33,42,142,187), and Vienna, Austria similarly being identified in five papers (25,27,40,61,187). Therefore, this distribution does not necessarily point to more SFP/procurement schemes happening in these locations (although this may also be the case), rather that more evidence was available relating to them.

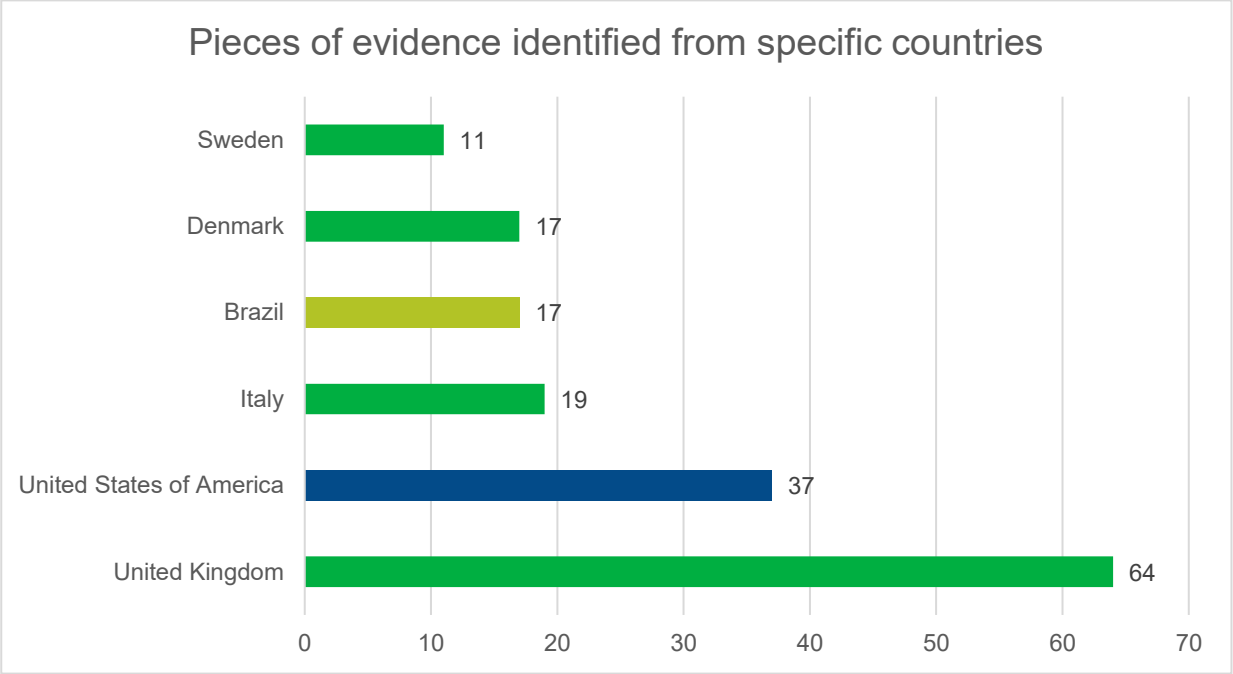

Figure 25: Evidence identified by specific country, colours represent different continents

This breakdown of evidence also points towards the importance of specific schemes and evaluations in advancing the evidence base. Considering the two non-European countries here:

- In Brazil, evidence centres around the implementation of the school feeding programme (PNAE), with most papers about Brazil referring specifically to this policy.
- Similarly, in the US the 'Farm-to-School' (FTS) programme was notably mentioned, at least 15 papers making explicit reference to FTS activities and the FTS grant programme. In particular, the US Farm-to-School Census created a large dataset which has been used in a number of papers to look at factors correlating to FTS participation and continuation (see 3.8). The facilitation of analysis through such datasets may therefore play an important role in advancing the evidence base.

Similarly in the UK, a significant amount of evidence – at least 20 papers – made explicit reference to or evaluation of the Food for Life (FFL) scheme. As well as being widely cited in third-party literature and summaries, FFL commissioned a series of independent evaluation reports which created a substantial evidence base relating to their intervention, which is widely cited.

Repeated references to specific case studies (such as the FoodLinks examples), specific datasets (the US FTS Census) and evaluations (the Food for Life evaluations) combined with identified biases in the search process suggest that this evaluation of geographic scope should be understood only as a breakdown of evidence identified in this search, not as a suggestion that more SFP activity is taking place in those countries identified.

8.6 Type and critical appraisal of evidence

Each paper was codified based on the type of methodology employed. As a starting point, these were taken from Defra's REA guidance[89], with papers categorised as *Qualitative; Quantitative experimental; Quantitative observational; Reviews* or *Economic studies.* However, the process of analysing the identified dataset suggested that this list was insufficient for capturing all of the methodologies utilised in SFP-related literature. Additional categories were based on reviewer notes of the methodologies employed: these included:

- **LCA-based** papers using life-cycle assessment or carbon footprinting,
- **Modelling/simulation** which included quantitative, prescriptive evaluation;
- **Anecdotal/reflective** which typically involved the views of authors involved in a project or scheme reflecting on that process;
- **General case study**, which was typically more descriptive of a single example, often with limited methodological detail as to how certain claims were made;
- **Mixed method**, all those studies which employed multiple methodologies in a single report;
- **Other**, those which did not fit into any of the other listed categories.

A breakdown of the dataset by methodology is presented in Figure 26. This figure is also broken down based on whether the identified paper was in the academic or grey literature. Three particular methods stick out as being commonly adopted across the literature: *qualitative* methodologies, *general case studies* and *quantitative observational* methodologies. These can be broadly categorised into some archetypal studies: *qualitative* studies often engaged stakeholders involved in SFP schemes or processes to share their view, *general case studies* typically described a particular place or scheme, the contract and impact and *quantitative observational* included pre- and post-analysis of a scheme, or using quantitative data to compare the outcomes observed by institutions in a scheme and those outside of it.

When comparing between academic and grey literature papers, there is a notable divergence. Quantitative approaches both observational and experimental were predominantly observed in academic literature. More qualitative approaches and specifically case studies were more commonly observed in grey literature papers. The five methods derived from the Defra REA guidance were better suited to describe academic literature than grey literature: some 80% of academic papers were categorised as *qualitative*, *quantitative observational, quantitative experimental, reviews* or *economic studies,* whereas just 31% of grey literature was categorised as such

89 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/560521/Production_of_quick_scoping_reviews_and_rapid_evidence_assessments.pdf

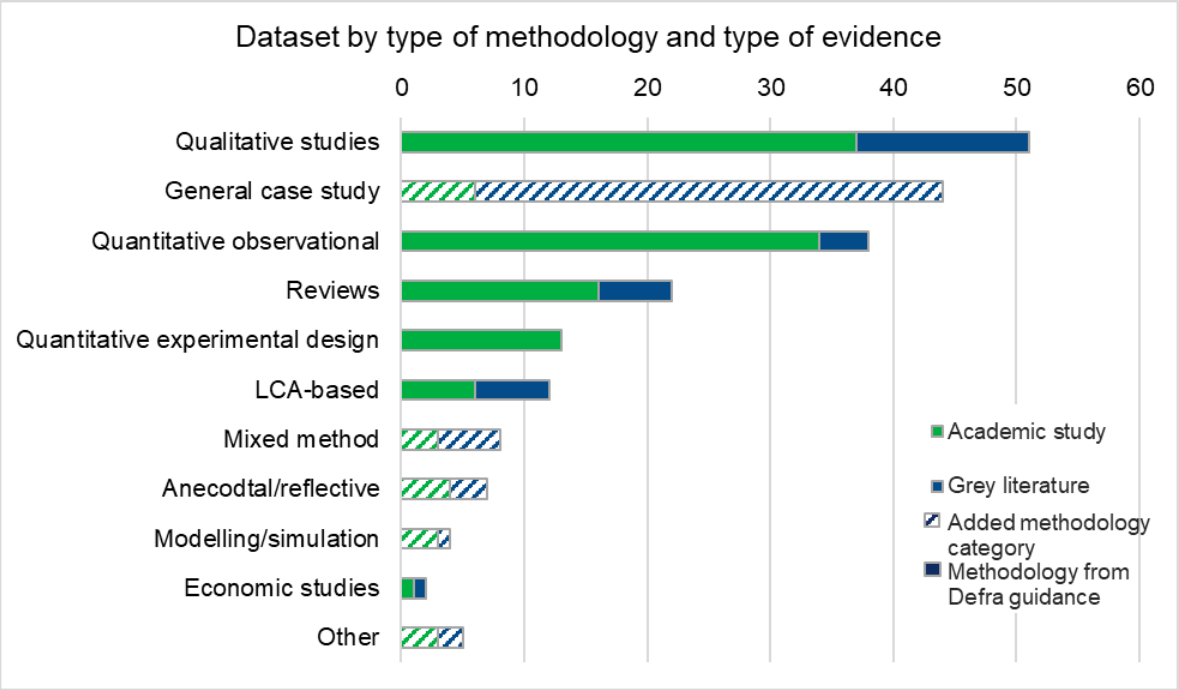

Figure 26: Dataset by methodology and type of evidence
Note: block-colour bars represent methodologies derived from the Defra REA guidance, striped-bars refer to methodology categories added by the authors.

In part, these differences reflect structural differences in how these papers are written: academic studies often have detailed method sections whereas grey literature such as general overview reports or case studies do not, even if the methods employed were similar. This may also reflect the purpose of different paper types: whilst some of the grey literature was evaluative in nature, much of it had a purpose of advocating for certain policies or concepts relating to sustainable procurement. In such a case, the methodology of analysis was of secondary importance, going beyond what the paper was hoping to achieve.

Whilst this difference in scope and purpose of papers is justifiable, where grey literature has omitted methodological information it is more difficult to have confidence in the robustness of its results. In line with the Defra REA guidance, during the REA every paper was assigned a confidence rating from one to three, one indicating ‘poor’ robustness and three indicating ‘excellent’ robustness. This was done to evaluate the methodology of the paper and the extent to which the authors minimised bias in the view of the reviewer. A comparison between the robustness scores issued for academic and grey literature papers can be seen in Figure 27.

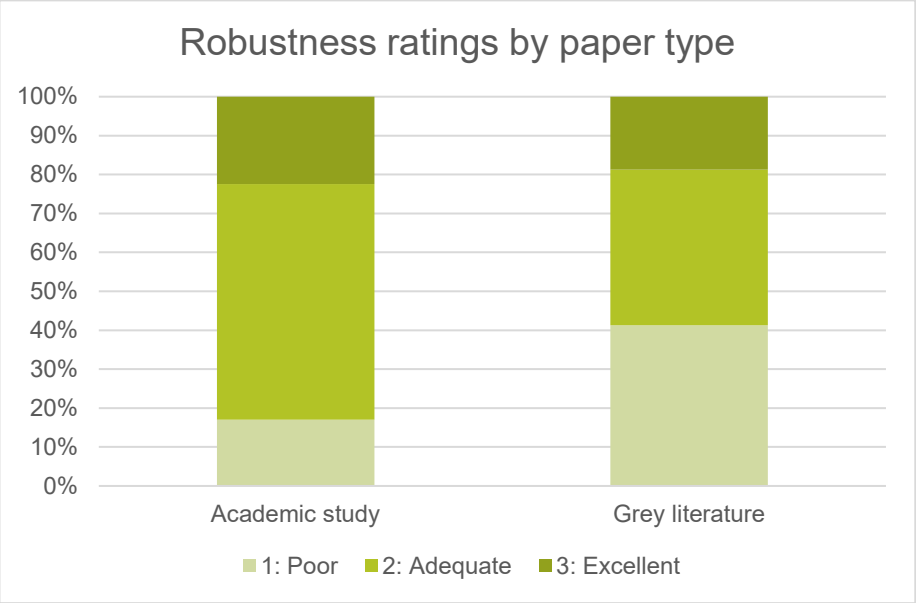

Figure 27: Robustness ratings by paper type

Whilst a comparable share, approximately 20%, of both academic studies and grey literature studies were assigned an 'excellent' robustness score by the reviewer, there is a marked contrast in the number of publications assigned 'poor' confidence, indicating a substantial risk of bias. Over twice the share of grey literature papers (41%) was judged as such when compared with academic studies (17%).

This was in part driven by different methodologies in different paper types: the overrepresentation of case study approaches in grey literature being a main driver, with 48% of case study papers given a 'poor' rating. This is not a judgement on these studies for their original purpose, where that purpose is advocacy or description. Rather, it is judgement of how useful this evidence is for this current review, noting that the evidence is often presented with few details on evaluation methods or how conclusions were come to.

However, it does not only reflect methodological differences. Considering *qualitative* studies, for which 37 academic and 14 grey literature publications were identified, just 8% of academic studies were considered 'low' robustness whereas 57% of grey literature was. This will largely be driven by the extent to which the methodology is detailed in the publication, as well as the approach taken: some grey literature was judged 'qualitative' insofar as it was based on expert interviews, but some case studies were based on interviews with a single expert, for example, which has a more substantial risk of bias.

An important caveat to note here is that the evaluations were based on the methodological evidence presented in the publication identified. In the case of quantitative analyses, case studies may present quantifications with little detail on how those figures were calculated – in some cases without citations to follow this question further. This means it is hard to judge the robustness of such a figure, but does not mean that the figures were not calculated in a robust manner. As an example, some references to carbon and financial savings in Vienna are made without details on how it

is calculated, or signposting as to where that can be accessed, but there may well be detailed and robust analysis which informs those figures (23,24).

Due to the thematic approach by which evidence from the total dataset is collated, no evidence is disregarded due to having been given a low robustness score, though the robustness of evidence informs the overall conclusions and evidence gaps (5.0).

8.7 Limitations

The REA was subject to some limitations briefly described below:

- The scope of the project was explicitly about public sector procurement, and so searches were geared to focus specifically on public-sector settings. However, the literature about food and its environmental, health and social impacts is much broader than just public-sector settings. In line with the conceptual model, it is intuitive and reasonable to suggest that findings related to the benefit of a healthy diet, or the carbon emissions of different meal types from other settings – whether for-profit private food service, or in private consumption at home – would be relevant and applicable to public food services. This would have made the review of such a broad scope that the evidence would likely have been very extensive, requiring much more resource to complete. The limited scope was justified, but does mean that the findings presented here may not adequately capture relevant findings from other settings/
- Within the search process, the terminology used may have led to certain possibly-relevant papers being overlooked. In particular, the constant use of ‘procurement’ and similar terms in search processes may have led evidence relating to other interventions in public canteens which are related to but slightly distinct from procurement – such as serving interventions, communications campaigns or ‘nudges’ – to be overlooked. The issue of food waste interventions in public settings such as school canteens and hospitals, for example, is likely to have a much more extensive evidence base than was suggested here.
- Related to the previous point, specific searches for mechanisms outside of the context of procurement could have led to further relevant results. To take one example, it was suggested by stakeholders in some literature that hospital patient recovery times were improved by the serving of fresh, local and healthy food. Direct analysis of this thesis was not identified, but this may have been the result of the focus on procurement-related literature. Searches of academic literature directly for the mechanism (i.e. the relationship between diet and patient recovery) could have uncovered more evidence to support the suggestion.
- The change of focus mid-way through the project, from exclusively relating to outcomes to considering both outcomes and processes which influence implementation, means that evidence was not systematically searched and screened for on the basis of what information it contained on implementation and uptake. The evidence identified in this area was still substantial, so this may be a

smaller limitation, but specific additional research on the conditions for success of SFP-related schemes could be beneficial.

- Time and resource restrictions meant that not all 'possibly' relevant papers could be considered in full: at the second screening stage, it was necessary to prioritise those seemingly 'most' relevant papers for inclusion in the final dataset. Some of the papers which were not read at this stage could have had useful information which would have supplemented or contested the findings.
- As discussed in the section on regional distribution of evidence (see Appendix section 8.5) the search process (particularly related to grey literature) may have had a bias towards European evidence. Language restrictions also may have led to evidence from other regions not being included.

9.0 Methodological appendix: the extent of public food service in England

9.1 Meals served

In order to estimate the impact of changes to the food service, it is necessary to understand its scope and size. WRAP published an estimate of the meals served in the public sector in 2013[90], based on data from 2011. As this data was not identified in a more up-to-date format, it was considered more appropriate to attempt to form new estimates where possible. These are compared with previous estimates in section 9.1.5.

The scope of this analysis is food served in public settings in England. The sectors in scope are presented in Table 39. Data included are primarily from 2019/20, to minimise anomalies which may have arisen due to the COVID-19 pandemic. In this sense, the estimates attempt to form a 'normal' or 'typical' estimate, though there may be some lasting changes in some sectors driven by the pandemic. In some cases we may expect this to have an impact on food procurement, such as with office workers working from home more frequently and therefore less likely to eat publicly procured food than before the pandemic. This is discussed in the sections where it is likely to contribute a substantial uncertainty.

Table 39: Sectors in scope

Sectors	Areas included
Education	Schools
	Further and higher education
Healthcare	Patients

	Healthcare staff
	Care homes
Other	Prisons
	Military
	Civil service office workers

9.1.1 Education

Identifying the number of meals served in education was done in two stages: schools and further/higher education.

9.1.1.1 Schools

For schools, data on the number of schools, percentage of students on free school meals (FSM) and headcount by school type was identified via ONS statistics.[91] Not all students eat school meals, however: to adjust for uptake of school meals, data from LACA was used.[92] This data included uptake of FSM and paid meals across three years (2015/16 to 2018/19). The average uptake of FSM and paid meals across these time periods were used. The LACA data was specifically for Key Stage 2, but was assumed to be broadly comparable for all age groups, including state-funded nursery.[93] The values derived from this process are detailed in Table 40.

Table 40: School meal uptake

Meal group	% of applicable students eating school meals
FSM	66%
Paid meals	39%

Using the number of FSM and non-FSM students and the rate of uptake for FSM and non-FSM meals, it was possible to derive a weighted uptake of meals for each school category. The results of this are displayed in Table 41.

[91] https://explore-education-statistics.service.gov.uk/find-statistics/school-pupils-and-their-characteristics Within this dataset, 'State-funded special school', 'Non-maintained special school' and 'Pupil referral unit' were grouped as 'Alternative provision'

[92] https://laca.co.uk/news/school-meal-uptake-research-revealed

[93] A note on nurseries: the application of KS2 figures for nurseries is particularly uncertain. Intuitively, it could be expected that fewer nursery-age children would take packed lunch, but DfE early years guidance states that parents are expected to pay for meals and other consumables, and academic research on the topic suggests "we do not know how many meals are eaten" in early years-settings due to part time attendance, with some studies suggesting up to half of early years settings using only packed lunches. Given these uncertainties and the small impact of the assumptions for nurseries on overall meal numbers, it has been kept consistent with the method used for other settings.

In addition to main school meals (lunches), in some cases schools may offer breakfast, such as through the National School Breakfast Club Programme.[94] Based on the National School Breakfast Programme Impact Report, at the peak of the programme some 375,000 students were provided with breakfast.[95] This represents around 4% of the total students identified. As a share of those students consuming school meals, based on the weighted uptake of school meals and number of students, the breakfast programme may have provided a meal for as much as 10% of those students who eat school meals. It should be noted that this was based on the peak figures, which may not necessarily be typical. Based on this rate of breakfast uptake, the **average number of meals per day for each student eating school meals is between 1 and 1.1.** For simplicity and to avoid basing results on the peak of the breakfast programme, the average (1.05) is taken. Out-of-term food provision through holiday activities and food programmes are not estimated.

The student numbers, weighted meal uptake and meals per day were combined with the number of days in the school year, taken as 190.[96] From this, it is possible to derive the total meals per year, this is also displayed in Table 41.

Table 41: Weighted meal uptake and estimated meals per year

School type	Number of students 2020/21	Weighted meal uptake	Meals per day	Meals per year (thousands)
Nursery	37,900	41%	1.05	3,084
Primary	4,660,300	44%		413,401
Secondary	3,493,500	44%		304,717
Alternative provision	150,900	51%		15,210
Total	**8,342,500**	N/A		**736,412**

Apparent discrepancies in summing columns is due to rounding.

Note that independent schools were excluded from the analysis, as the focus of this project was on the impact of public procurement rules. However, changes to public procurement may have knock-on effects in independent school procurement.

9.1.1.2 Further and higher education

For higher education, the starting point was a previous WRAP estimate that approximately 1,134 million meals are served in the total education sector, which is

[94] https://www.gov.uk/guidance/breakfast-clubs-programme-2021-2023

[95] https://www.magicbreakfast.com/news/national-school-breakfast-programme-impact-report

[96] https://commonslibrary.parliament.uk/research-briefings/sn07148/#:~:text=In%20England%2C%20local%20authority%20maintained,special%20or%20maintained%20nursery%20schools.

taken from a 2011 'Horizons' publication.[97] This estimate was for the entirety of the UK, so required adjustment to be an England-specific number. This was done in two ways to compare the results:

- Method one involved using the share of UK hospitality and food service waste arising in England (83%), derived from the same WRAP source.
- Method two involved looking at the share of full-time higher and further education students in the UK which are in England, using data from HESA. This came to 82%

After adjusting the total education meals by an approximate share of 82%, the total school meal estimate was subtracted (see Table 41). This came to an estimate of somewhere between 196 million and 205 million meals being served per year.

However, WRAP's estimate was quite dated, as the publication is from 2013. To further sense check this, the total education meals were first adjusted by the rate of population growth since then, which amounted to 5% for both the UK and England.[98] After doing this, and adjusting for the share in England, a total of approximately 244 million meals were served. This was treated as the final estimate.

To sense check this, the figure was compared against the number of students in HE and FE. Students in HE were taken from the aforementioned HESA statistics, which include those studying HE at a FE institution. [99] The number of FE students was taken from national education and training statistics.[100] The combined student number is presented in Table 42.

Table 42: Student numbers in FE and HE in England

Setting	Students
FE	2,579,872
HE	1,736,030
Total	**4,315,902**

Based on these student numbers and the estimated number of meals, this comes to approximately 57 meals per student per year in the food service. Due to using existing figures as the basis for this estimate, it is highly uncertain.

Based on the above, the total meals in the education sector is detailed in Table 43.

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[97] https://wrap.org.uk/resources/report/overview-waste-hospitality-and-food-service-sector

[98] https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates#timeseries

[99] https://www.hesa.ac.uk/data-and-analysis/sb262/figure-4

[100] https://explore-education-statistics.service.gov.uk/find-statistics/education-and-training-statistics-for-the-uk/2021#dataBlock-5ec4ed02-37d6-47d2-844a-d5c51ec3feeb-charts

Table 43: Total meals, education

Education type	Estimated meals / year (millions)
Nursery	3
Primary	413
Secondary	305
Alternative provision	15
Further and higher education	244

9.1.2 Healthcare

9.1.2.1 Patients

The number of meals served in healthcare settings was taken from the Estates Returns Information Collection (ERIC) dataset for 2019/20, a mandatory data collection for all NHS trusts including Ambulance trusts.[101] At the time of writing, 2020/21 data were available but it was judged that due to the disruption of the COVID-19 pandemic and lockdowns in 2020/21, which contributed to a 15% decrease in inpatient meal numbers when compared with 2019/20, it was more representative of a 'normal' year to use 2019/20 data.

Included in ERIC is an estimate of inpatient food services (see ERIC Table 17), which includes both the number of meals requested and the cost of food service meals. This estimates that a total of approximately 140 million meals were served in 2019/20. This is broadly consistent with the previous year (140.9 million), suggesting that the dramatic drop in 2020/21 (to 119 million) is the outlier, providing reassurance in the decision to use 2019/20 to represent a 'normal' year.

The ERIC dataset includes a breakdown by site. This was analysed to offer more nuance on the meal service, by breaking this into specific site types. This is displayed in Table 44.[102]

Table 44: Breakdown of meals served by healthcare site type

Health service type	Number of sites	Share sites reporting meal service	Number of meals requested
General acute hospital	219	98%	106,498,152
Specialist acute hospital	38	95%	7,165,638

[101] https://digital.nhs.uk/data-and-information/publications/statistical/estates-returns-information-collection/england-2019-20

[102] Note that 'Mental health and specialist services, including learning disabilities' groups three categories in the original data, '4. Mental Health (including Specialist services)'; '5. Learning Disabilities'; '6. Mental Health and Learning Disabilities'.

Mixed service hospital	41	78%	2,339,517
Mental health and specialist services, including learning disabilities	401	88%	17,121,674
Community hospital with inpatient beds	222	81%	5,652,098
Other inpatient	35	49%	425,413
Ambulance services	129	0%	-
Other reportable site	176	10%	317,340
Total	**1261**	**67%**	**139,519,832**

The majority of meals, by some distance, are served in general acute hospitals. Certain site types, such as ambulance services or 'other reportable site' display very small amounts of meals. This is not to say that food is not consumed there: staff canteens and other food service, such as cafés for visitors, may be present in a number of them. Staff canteens were considered separately (see 9.1.2.2), but data was not identified on the extent of visitor services, so they were not included in analysis. Similarly, it should be noted that this dataset does not include estimates for primary care services, such as GPs or other first points of contact. This is an understudied area and so is excluded from analysis at this point, though future data gathering on the extent of meal services in these settings would be beneficial.

9.1.2.2 Staff

To form an estimate of the number of staff who may be eating in canteens and food service in NHS bodies, data on NHS employees was taken from NHS England data. In line with the decision to use data on meals from before the COVID pandemic, to avoid biases driven by potentially temporary staff changes 2020-21, staff data from April 2019-March 2020 was used.[103] Because of irregular shift patterns in the NHS and the need for hospitals to stay open overnight and the weekends, the Full Time Equivalent (FTE) values were taken from this data. Assuming FTE in this data relates to the average NHS working week of 37.5 hours (based on the NHS website[104]) and a five day week on average (even though this may vary from week to week based on rotas), subtracting weekends, general and public holidays and annual leave comes to approximately 226 working days for each FTE worker.

To convert the number of staff and days worked into an estimate of meals, it was necessary to form assumptions about how many meals would be eaten in the hospital

[103] https://digital.nhs.uk/data-and-information/publications/statistical/nhs-workforce-statistics/march-2020

[104] https://www.jobs.nhs.uk/about_nhs.html

food service. Different assumptions were made for different staff types: in general, it is assumed that professionally qualified clinical staff and support to them will consume higher rates of food-service meals due to time pressures, as well as possibly longer shifts covering multiple meals. By contrast, infrastructure and other administrative staff who may be based in an office may be more likely to bring their own food. Based on this, it is assumed that clinical and clinical support staff eat one meal per FTE day in the food service, whereas other administrative staff eat 0.2 meals per FTE day. The latter assumption is based on estimates from a 2013 survey of British and Irish consumers, which suggested that 23% eat food "in the canteen".[105] This is displayed in Table 45.

Table 45: Meal estimates for NHS staff

Role	Staff numbers	Assumed number of food-service meals per shift	Total meals/year
Professionally qualified clinical staff	591,603	1	133,638,801
Support to clinical staff	340,977	1	77,024,281
NHS infrastructure support	179,583	0.2	8,113,315
Other staff or those with unknown classification	2,655	0.2	119,933
Total	1,114,818		218,896,330

Note that the estimates for more administrative or office-based NHS staff are highly uncertain in part because of how their working habits may have changed during and after the COVID-19 pandemic. If more workers spend some time working from home, they are likely to consume much less publicly procured food.

The resulting estimate suggests that more meals could in fact be eaten by NHS staff than by inpatients (Table 46). However, it should be borne in mind that this estimate is very sensitive to the assumption how many meals are eaten in the food service by each staff type, and is therefore highly uncertain. In addition to this, there are likely to be cafés catering to inpatient visitors such as family members. No data was identified on these so they are not included.

Table 46: Meals in hospitals

Healthcare type	Estimates meals / year (millions)
Patient meals estimate	140

[105] https://www.statista.com/statistics/303873/most-frequently-used-locations-for-eating-in-the-workplace-great-britain/ (Note: the original source report for this data appears to no longer be available online, so it is unclear what professions were captured in this survey. It is an approximate estimate only.)

Staff meals estimate	219
Total	**358**

9.1.2.3 Care homes

An estimate of the number of meals served in care homes was derived from the number of residents in care homes in England. This was identified via ONS data for 2019-20, summarised in Table 47.[106]

Table 47: Number of residents in care homes in England

Care home resident type	Number of residents
Self-funded care home residents	143,774
State-funded care home residents	248,153
Total	**391,927**

From this, some basic assumptions are made: that the average resident consumes three meals per day across every day of the year (365.25 days). The number of residents is taken to be the average across a year, with residents leaving care homes or passing away being replaced by new residents.

Based on the number of residents and those assumptions, a total estimate of **429.5 million meals** are served in care homes.

Combining the estimate for hospital patients, staff and care homes comes to a total of over 800 million meals being served in the healthcare sector each year.

Table 48: Estimate of number of meals in healthcare settings

Healthcare type	Estimated meals/year
Patients	140
Healthcare staff	219
Care homes	429
Total	**788**

106 https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/socialcare/articles/carehomesandestimatingtheselffundingpopulationengland/2019to2020

9.1.3 Other

9.1.3.1 Prisons

For prison meals, the Report of the Independent Review of NHS Hospital Food suggests that 93 million prison meals are served per year.[107] This references the prison population figures. From looking at the December prison population, where 82,771 prisoners were referenced (with a further 252 in Immigration Removal Centres), an assumption of three meals per day for 365.25 days comes to 91 million meals. The discrepancy possibly relates to our using the December estimate rather than the averages across the entire year. Nonetheless, it is sufficiently close and of a sound logic that it is assumed this will provide a reasonable estimate of prison meals.

Using the latest available figures, for February 2022[108], some 79,724 prisoners were reported in England and Wales. Filtering out those in Welsh prisons, an estimated 74,800 prisoners were reported in England. Assuming three meals per day over 365.25 days, this comes to a total estimate of 82,000,000 meals per year.

9.1.3.2 Military

An estimate of the number of meals consumed by Ministry of Defence (MOD) personnel was formed through communication with the MOD, who shared internal data regarding food service in England.[109] This was split between different contractual arrangements and service locations, including the MOD Training estate[110], Project Allenby Connaught[111], the Colchester garrison Private Finance Initiative, and through Project HESTIA.[112] This is not exhaustive of all PFI/PPP contracts: the MOD is large and complex, so not all meal data was available. However, it is expected that the main service is covered, with those not covered possibly representing another half million meals or so.

In some cases the data was directly on meals served, in others the data available was on transactions in the meal service, which was used as a proxy for meals served (assuming one meal per transaction). The total breakdown of meals, by meal type, is presented in Table 49.

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[107] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/929234/independent-review-of-nhs-hospital-food-report.pdf

[108] https://www.gov.uk/government/statistics/prison-population-figures-2022

[109] Personal communication with MOD, 2022.

[110] https://www.gov.uk/guidance/defence-infrastructure-organisation-and-the-defence-training-estate

[111] https://www.gov.uk/guidance/defence-infrastructure-organisation-service-family-accommodation-allenby-connaught

[112] https://www.gov.uk/government/publications/project-hestia/project-hestia

Table 49: Breakdown of MOD meals by type

Meal type	Number of meals
Breakfast	5,135,000
Lunch	12,064,000
Dinner	5,336,000
Total	**22,535,000**

9.1.3.3 Administrative offices

For other public sector administration, such as Civil Service or Local Authority offices, figures of the total administrative staff were taken from ONS statistics.[113] This lists approximately 968,500 FTE in public administration in 2021. This data is presented for the UK as a whole. To adjust to England, the same dataset does present the headcount of public sector staff by region. Whilst the scopes of these two figures do vary: the former is FTE public administration staff, the latter is headcount of total public sector employees (therefore including teachers, doctors, military), it is useful to get a rough idea of what share of staffing is in the UK. This indicates that across 2021, 80% of the UK's public sector staff are based in England. Combining these, an estimated 777,000 administrative staff could be identified in England.

After accounting for weekend days, 28 days of leave and 8 public holidays, an estimated 225 days are spent working. An assumption is then required to determine what share of administrative staff may eat from the public sector canteen. A survey undertaken in 2013 of British and Irish consumers suggests that 23% eat food "in the canteen", though this may differ between different professions and some staff may take packed lunch to the canteen.[114] Without further nuance on office and desk-based workers specifically, this is difficult to use: whilst it is likely to be no higher than 20% it may well be much lower. To further inform this assumption, available food and catering service expenditure was used. This data, detailed in section 9.2.3.3, suggests that approximately £18.8 million was spent on central and local government department food and catering services. This figure can be used to sense-check an estimate of meals: if we assumed that one in five (20%) of staff purchased a meal through the catering service, the expenditure per meal would be lower than £0.60. This suggests that the value is lower: an estimate of 5% of employees eating in canteens on average comes to £2.16 per meal. This is broadly consistent with WRAP's 2013 publication 'The

113 https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/publicsectorpersonnel/datasets/publicsectoremploymentreferencetable

114 https://www.statista.com/statistics/303873/most-frequently-used-locations-for-eating-in-the-workplace-great-britain/ (Note: the original source report for this data appears to no longer be available online, so it is unclear what professions were captured in this survey. It is an approximate estimate only.)

true cost of waste in hospitality and food service'[115], which is detailed further in section 9.2.

Based on this, a total estimate of 8.7 million meals are consumed by administrative government staff from the meal service. It should be noted that this estimate is highly uncertain, and is very sensitive to the assumption of how many staff eat in staff canteens. Furthermore, the estimates on which this is based come from data from before the COVID-19 pandemic. Given the disruption to office working patterns and increased working from home, this is likely to have become even lower. It remains to be seen to what extent these changes are long-term, or whether the meal service will revert to a pre-pandemic 'normal', so these estimates should be treated with caution.

9.1.4 Total

Based on estimates derived above, approximately 1.9 billion meals are served in public settings each year in England. This is broken down by sector in Table 50 and displayed in Figure 28.

Table 50: Estimate of meals served through the public sector in England

Sectors	Areas included	Estimated meals served (millions)
Education	Schools	736
	Further and higher education	244
Healthcare	Patients	140
	Healthcare staff	219
	Care homes	429
Other	Prisons	82
	Military	23
	Civil service office workers	9
Total		**1,882**

[115] [115] https://wrap.org.uk/resources/report/true-cost-waste-hospitality-and-food-service

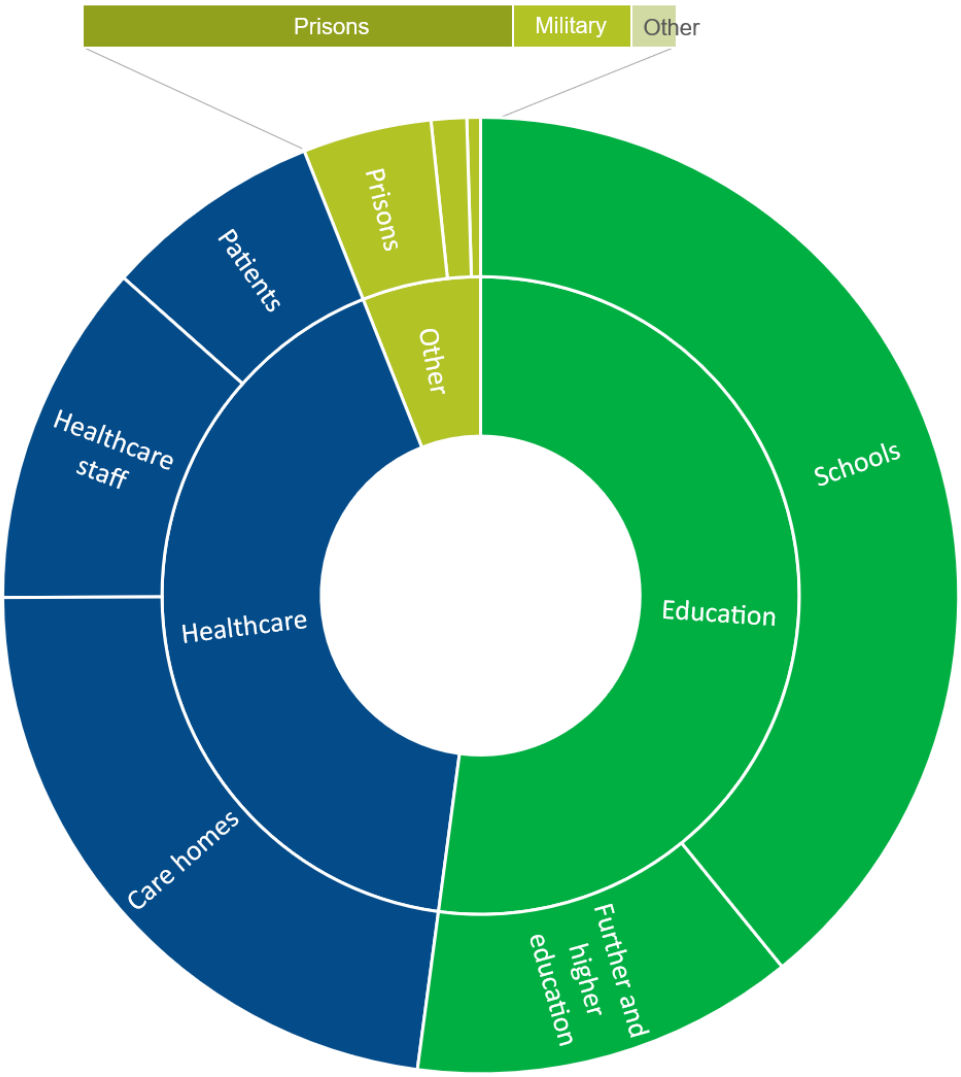

Figure 28: Share of meals in the public sector in England, by sector

9.1.5 Comparison

The most comprehensive other data identified for meals served in each of the public-food-service sector was in WRAP (2013).[116] This provides estimates of the meals served per year, which are based on estimates cited from 'Horizons for Success 2011'. There appears to be no publicly accessible data which updates this estimate, and as stated in previous Defra publications, relies on a variety of data sources for which the accuracy cannot be precisely stated.[117]

Given the data presented in these publications is over ten years old, it was considered worthwhile trying to derive original estimates rather than just using older and

[116] https://wrap.org.uk/resources/report/overview-waste-hospitality-and-food-service-sector

[117] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/183302/foodpocketbook-2012edition-09apr2013.pdf

inaccessible values. However, they provide a useful sense-check of the statements made and estimates derived. The most important thing to note which limits the comparability of the two is that the Horizons data is for the entire UK, whereas our estimates are for England only. In order to improve this, a rough proxy of our estimates extended to the UK is formed based on population: England accounted for 84% of the UK's population in 2020 from ONS statistics.[118] Using this as a proxy for scale, Table 51 presents a suggested UK value to improve comparison with the Horizons data.

There are some notable differences. The scope covered between the two studies varies: children's homes and day care centres, private hospitals and independent schools are not included in our analysis, for example. In some cases it is unclear where the scopes differ, such as whether NHS staff meals are counted in 'healthcare' or 'staff catering in public sectors'.

In any case, when adjusting to the UK the results are fairly comparable: in education and healthcare, within around 10% difference. The most notable variation is in 'other public sector', and here it is less clear why given that the scope is supposedly the same. This may mean that previous data over-estimated some aspects, such as staff catering or Ministry of Defence, or indeed that we have understated the same.

However, in some cases we may expect the number of meals to have increased since 2013, notably in education and healthcare where an increase in population may be more notable than in administration, ministry of defence or prisons. Similarly, the introduction of universal infant free school meals would be expected to have increased the meals served in education.

Overall, this level of comparability gives some assurances that, although the figures are uncertain, they point to a broadly reasonable estimate of meals served.

More recently, the National Food Strategy[119] also estimated that 1.9 billion meals were served, but this appears to be for the entire UK, whereas the scope in this analysis is England. From available references, similar data sources were used, but they recognise their estimate to likely be an underestimation due to data unavailability in some areas where we have formed approximate estimates, such as healthcare staff.

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118 https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates#timeseries

119 https://www.nationalfoodstrategy.org/wp-content/uploads/2021/07/National-Food-Strategy-The-Plan.pdf

Table 51: Comparison of estimate with previous data

Data cited in WRAP (2013)			This estimate				
Scope		UK estimate (millions)	Scope comparison		England estimate (millions)		Proxy UK estimate (millions)
Healthcare	Healthcare HQs and Trusts	1,047		Healthcare staff may include this	358	788	938
	NHS hospitals and clinics						
	Private hospitals			Not included			
	Care homes - public sector				429		
	Care homes - independent						
	Children's homes & day centres			Not included	NA		
Education	Primary and middle schools	1,134			413	981	1,167
	Secondary schools				305		
	Nursery/preparatory schools			Nurseries yes, private preparatory no	3		
	Special schools				15		
	Independent & boarding schools			Not included			
	Training centres & further education colleges				146		
	Higher education				98		
Other public sector	Ministry of Defence	261			23	113	135
	Prisons				82		
	Staff catering in public sector				9		

9.2 Food service expenditure

9.2.1 Education

9.2.1.1 Schools

The total amount spent by schools on the school meal service was not identified. Instead, this was derived based on the number of meals served. Recent parliamentary research[120] indicates that £2.34 is allocated per school per day for Universal Infant free school meals (UIFSM) in 2020-21. This research also states that this "provides a rough guide to the amount of funding allocated for the free school meals of older pupils", suggesting that the price of procurement is largely comparable across age groups. It is worth noting that the £2.34 represents an overall average, with substantial variation likely. Information from the FSM pilot suggested costs varied between £1.90 to £2.60 per school[121] in the boroughs considered, and this could vary further in other regions. However, for the purposes of this indicative estimate, the average of £2.34 in an acceptable approximation, even if some of the regional nuances may be lost. Communication with the DFE suggested approximately £2.41 per meal taken in other settings.

These values were used to form a rough estimate of the cost of meal service: £2.34 for nursery and primary school meals and £2.41 for secondary and alternate provision meals. This was combined with student numbers and the adjusted meals per day estimates detailed in section 9.1.1, of 190 days with 1.05 meals per day (to account for some breakfast schemes). This was combined with the weighted uptake of meals also detailed in 9.1.1 to derive the total cost of school meals. This is presented in Table 52. There will of course be additional cost associated with packed lunches prepared by parents and guardians, but this is out of scope when considering public procurement.

Table 52: Estimated expenditure on school meals

School type	Number of students 2020/21	Weighted meal uptake	Meals per year (thousand)	Total cost (£ thousand)
Nursery	37,900	41%	3,084	721714%
Primary	4,660,300	44%	413,401	96735811%
Secondary	3,493,500	44%	304,717	73436853%
Alternative provision	150,900	51%	15,210	3665568%
Total	**8,342,500**	N/A		1,745,599

Apparent discrepancies in summing columns is due to rounding.

[120] https://commonslibrary.parliament.uk/research-briefings/sn04195/

[121] https://theconversation.com/is-2-30-enough-to-cover-the-cost-of-a-free-school-meal-24092

9.2.1.2 Further and higher education

The starting point for calculation of FE and HE expenditure was taken from HESA.[122] This included expenditure on catering operations by HE providers in England. This data is limited in that it includes conferences, which were not included in the meal estimate (see 9.1.1). It only represents HE, so assumptions had to be made for FE, leading to a very approximate estimate.

Table 53 presents the results of this HESA data. This is split into cost category, where the HESA data category 'other operating expenses' in the context of food service was understood to mean primarily ingredient sourcing. The 'other financial costs' category includes 'depreciation and amortisation' and 'interest and other finance costs' from the raw data.

Table 53: Expenditure on higher education meals

Category	Total expenditure (£ thousand)
Staffing costs	£144,977
Other operating costs (i.e. ingredients)	£180,947
Other financial costs	£10,538
Total	**£336,462**

Using this data, and the number of students in HE, it was possible to derive the average cost of food service per student per year as approximately £194. Based on the derived meals per year of approximately 57 per student per year, this suggests a price-per-meal of about £3.40. This seems high based on values used elsewhere including in schools (9.2.1.1) and in previous analysis of multiple settings, presented in 9.2.2.2) of around £2.60 per meal. This suggests that conferences, not included in the meal estimate, could create a bias, or that the meals estimated for HE is lower than the actual value. It confirms that the estimate of number of meals served is highly uncertain. Nonetheless, since the data was taken directly from an authoritative source, its total is used, as the uncertainties are more likely driven by the meals estimate.

To extrapolate to FE, we attempt to reduce this bias. Adjusting the HE price-per-meal downwards by 25% comes to £2.57, much more comparable with the figures taken from previous WRAP research and discussed in section 9.2.2.2. Multiplying this by the derived meals per year of 57 gets a value of approximately £145 expenditure per student per year. Scaling by the 2.6 million FE students (9.1.1.2) comes to approximately £375 million expenditure in FE meal service.

These values are summarised in Table 54. Note that due to the limitations with available data and the estimate of the number of meals, these are highly uncertain.

[122] https://www.hesa.ac.uk/data-and-analysis/finances/table-8

Table 54: Higher and further education food service expenditure

Education stage	Food service expenditure (£ thousand)	Notes
Higher education	£336,462	Observed from HESA data
Further education	£375,006	Very rough proxy derived from HE data
Total	**£711,468**	

9.2.2 Healthcare

9.2.2.1 Patients

Data for the cost of food service for meals served to hospital inpatients was taken directly from the ERIC dataset which was used for meals information (see 9.1.2.1).[123] This presents expenditure specifically for inpatient food service. In order to get a holistic view of the costs associated with serving food, the cost of the inpatient food service was summed with the cost of food waste disposal. This does not count additional costs associated with landfill disposal of food which is not segregated, so in reality the costs will likely be higher if segregation is not uniformly applied. These costs were grouped by the region in which the NHS site was registered, to observe possible variations. This is presented in Table 55.

Table 55: Inpatient food service costs by region

Region	Inpatient food service cost (£ thousand)	Food waste disposal cost (£ thousand)	Total food service cost (£ thousand)
North West Commissioning Region	£78,437	£207	£78,644
North East And Yorkshire Commissioning Region	£100,474	£177	£100,651
South West Commissioning Region	£121,691	£36	£121,727
Midlands Commissioning Region	£88,497	£63	£88,560
South East Commissioning Region	£123,580	£410	£123,990
London Commissioning Region	£59,853	£117	£59,970
East Of England Commissioning Region	£57,982	£104	£58,086
Total	**£630,514**	**£1,113**	**£631,627**

These costs are also presented on a per-meal basis. This took the food service and food disposal costs reported per site and divided those by the reported meals served. Sites which did not report a food service were excluded. Similarly, outliers were excluded. Outliers were defined by those which had a cost/meal (in £) or a food waste/meal (in g)

[123] https://digital.nhs.uk/data-and-information/publications/statistical/estates-returns-information-collection/england-2019-20

exceeding the inter-quartile range times 1.5 lower than the first quartile or higher than the third quartile derived from the dataset. This excluded some 53 sites which reported food service above £9.36 per main meal, or 19 sites reporting over 610g food waste per meal. In both cases these are likely to represent errors or incommensurable data: if the cost of all food service (inpatient, outpatient, staff) was reported and being divided by the number of inpatient meals, this could lead to an excessive cost per meal, for example. Excluding these outliers, the averages per region were derived.

Table 56: Price per meal of inpatient food services, by region

Region	Average cost food service / meal	Average food waste disposal cost / meal	Total cost associated with serving food / meal
North West Commissioning Region	£4.00	£0.03	£4.03
North East And Yorkshire Commissioning Region	£4.64	£0.04	£4.68
South West Commissioning Region	£4.54	£0.02	£4.56
Midlands Commissioning Region	£4.58	£0.01	£4.59
South East Commissioning Region	£5.08	£0.11	£5.19
London Commissioning Region	£4.08	£0.15	£4.23
East Of England Commissioning Region	£4.98	£0.03	£5.01
Average	**£4.56**	**£0.06**	**£4.62**

The total cost information is presented by type of healthcare institution in Table 57.

Table 57: Inpatient food service costs by healthcare type

Health service type	Inpatient food service cost (£ thousand)	Food waste disposal cost (£ thousand)	Total food service cost (£ thousand)
General acute hospital	£467,193	£777	£467,970
Specialist acute hospital	£37,183	£56	£37,238
Mixed service hospital	£13,261	£55	£13,316
Mental health and specialist services, including learning disabilities	£80,380	£124	£80,504
Community hospital with inpatient beds	£28,600	£45	£28,645
Other inpatient	£2,310	£4	£2,314
Ambulance services	£0	£0	£0
Other reportable site	£1,588	£53	£1,641
Total	**£630,514**	**£1,113**	**£631,627**

9.2.2.2 Staff

For hospital staff, values from WRAP's 2013 'The true cost of waste in hospitality and food service' was used.[124] Whilst the focus of this paper is on the cost of avoidable food waste, the appendices include details of the calculations which involved deriving financial costs per meal in different food service types. From this, the cost in pounds per meal component were derived: for ingredients, this was derived from the total purchasing expenditure and meals served in Table 37, energy costs per meal in Table 43, water costs in Table 48, labour derived from total cost in Table 54 divided by total meals served, fuel/transport costs in Table 61, administration in Table 64 and waste management in Table 70. The share of each meal made up by each component is presented in Table 58. The percentages were derived from the monetary estimate from 2013. Due to the paper being dated, this estimate was updated with an inflation-adjusted estimate (using an online tool[125]) for 2021. Due to the particular circumstances of inflation at the time of writing in 2022, as well as the fact that most cost-related data dates from 2021 or earlier, it was considered more appropriate to use that year as a reference point.

Table 58: Cost of meal service in different settings

Cost centre	Staff catering	Healthcare	Education	Services
Ingredients	46%	68%	66%	61%
Energy	7%	1%	1%	7%
Water	0%	0%	0%	2%
Labour	47%	30%	32%	29%
Fuel/transport	0%	0%	0%	0%
Administration	0%	0%	0%	0%
Waste management	0%	1%	0%	1%
£ meal (2013 estimate)	£1.95	£2.20	£2.44	£2.06
£ meal (2021 estimate)	£2.36	£2.66	£2.96	£2.50

Note that the percentage split presented here is different from those presented in the graphs in the main body of WRAP's 'True cost of waste' paper, as the latter look at the split of costs associated with avoidable food waste only, whereas the above is calculated based on the total food service costs per meal.

[124] https://wrap.org.uk/resources/report/true-cost-waste-hospitality-and-food-service

[125] https://iamkate.com/data/uk-inflation/

It is unclear whether staff meals in healthcare settings should be better categorised as 'staff catering' or 'healthcare'. As a result, the average of the two values (£2.51) is taken as a rough approximation of the expenditure per meal for healthcare staff. Based on this, and the estimated number of staff meals of approximately 219 million, the estimated total expenditure comes to £550 million.

9.2.2.3 Care homes

For care home catering, values from WRAP's 2013 'The true cost of waste in hospitality and food service' was used.[126] This is the same evidence as is detailed in section 9.2.2.2 and Table 58. The estimate of £2.66 expenditure for healthcare is used for care homes. This is multiplied by the estimated number of meals (157.5 million in self-funded care homes, 272 million in state-funded care homes) to form a total estimate of £1.1 billion in food service expenditure.

9.2.3 Other

9.2.3.1 Prisons

The expenditure on prison food service was taken from 2018-19 data from central government procurement software. This suggested a total expenditure on food and catering services of £63,282,589. Based on the days in a year and the number of prisoners (approx. 79,700, see 9.1.3.1), this comes to approximately £2.17 per prisoner per day. This is higher than the £2.10 daily food allowance documented in a 2020 Environment, Food and Rural Affairs committee[127], and previous reports from 2016 of £2.02 per prisoner per day.[128]

The apparent discrepancy is likely driven by the scope: communication with MOJ suggested a £2.12 *food* (i.e. ingredient) budget in 2022. The additional spend will be that on *catering* services and labour. This may appear as a very low figure, but due to the use of prisoner labour in kitchens, the labour costs are much lower than they would be for other sectors.[129] The expenditure data used suggested no more than 10% of the total food and catering budget was on catering, but this will vary between specific prisons and the decisions of governors.

Based on the number of meals served (9.1.3.1), a total budget of £63 million comes to approximately £0.72 per meal.

9.2.3.2 Military

Military expenditure on meal services were based on data shared by the MOD.[130] This included different calculation methods for different food service contract types, based on

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[126] https://wrap.org.uk/resources/report/true-cost-waste-hospitality-and-food-service

[127] https://committees.parliament.uk/oralevidence/1320/default/

[128] https://www.justiceinspectorates.gov.uk/hmiprisons/wp-content/uploads/sites/4/2016/09/Life-in-prison-Food-Web-2016.pdf

[129] https://committees.parliament.uk/oralevidence/1320/default/

[130] Personal communication with MOD, 2022.

data available. In most cases, this involved using the number of meals (see 2.1.3.2), combined with a cost per meal, by meal type, based on data shared by the MOD. The results of this are displayed in Table 59.

Table 59: Breakdown of estimated MOD meal expenditure by meal type

Meal type	Estimated expenditure
Breakfast	£6,621,000
Lunch	£23,699,000
Dinner	£11,418,000
Total	**£41,738,000**

9.2.3.3 Administrative offices

Some data was available on administrative staff food and catering expenditure from the central government procurement software. Discounting money spent by MOJ for the prison service (which is covered in 9.2.3.1), this suggests that the total food and catering spend by central government departments came to a total of approximately £12.5 million. This data only includes spend by central government employees. In order to make an adjustment to account for local government employees, the same data on public sector employment used in section 9.1.3.3 was utilised.[131] This suggests that across the UK, approximately 66% of FTE public sector employment is in central government, with 34% in local government.

Assuming that the average food expenditure per employee is roughly comparable across employment sectors, these relative shares were used to estimate local government food expenditure. This came to approximately £6.36 million. Combining these figures comes to approximately £18.8 million in food and catering expenditure in administrative positions.

9.2.4 Total

Based on combining the above calculations, we estimate that approximately £4.9 billion is spent on procurement of food and catering services in public settings in England. This is broken down by sector in Table 60 and Figure 29.

Table 60: Estimate of expenditure on food and catering within the public sector in England

Sectors	Areas included	Estimated expenditure (£ million)
Education	Schools	£1,746
	Further and higher education	£711
Healthcare	Patients	£632
	Healthcare staff	£550

131 https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/publicsectorpersonnel/datasets/publicsectoremploymentreferencetable

	Care homes	£1,142
Other	Prisons	£63
	Military	£42
	Civil service office workers	£19
Total		**£4,905**

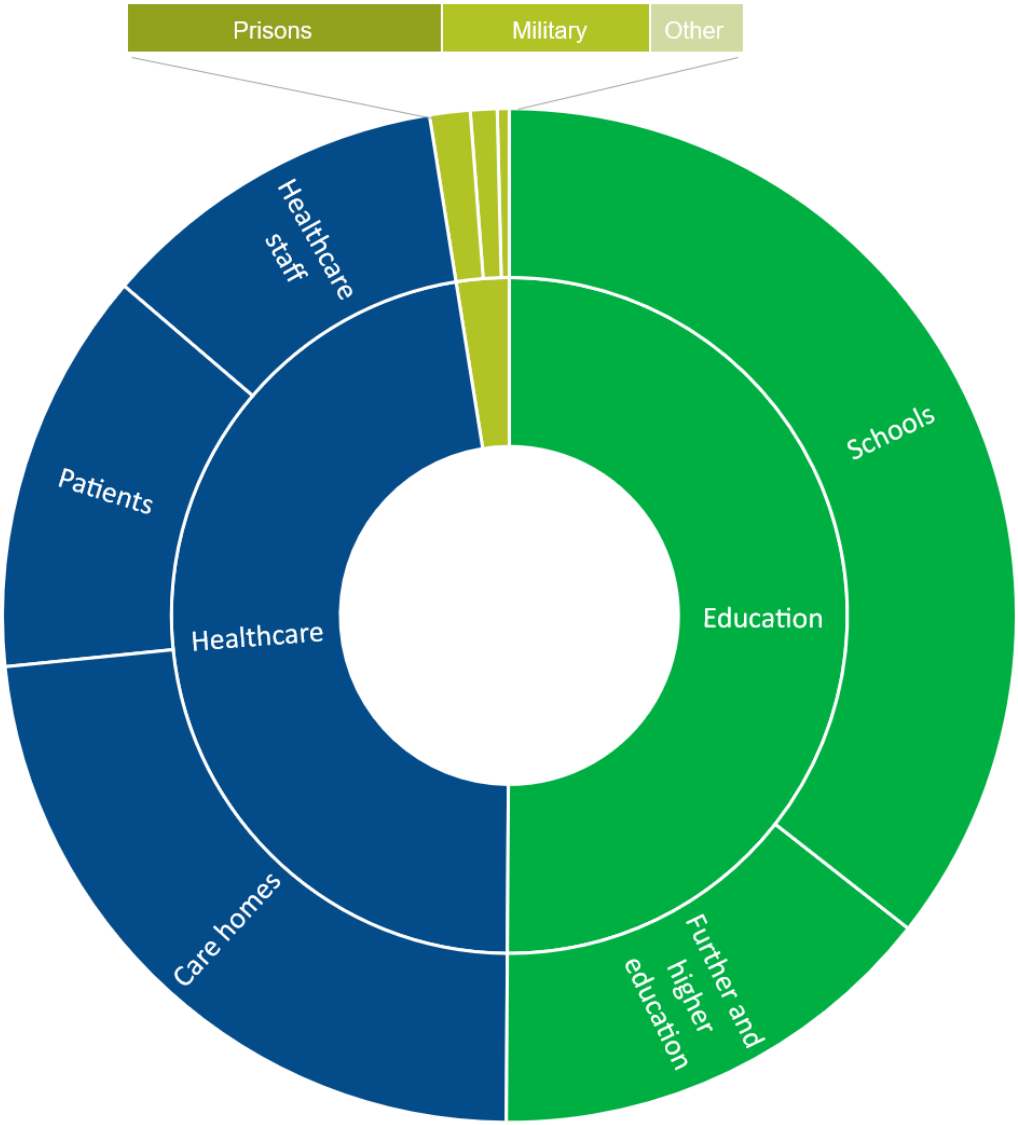

Figure 29: Estimate of expenditure on food and catering within the public sector in England

9.2.5 Comparisons

The most notable point of comparison for our estimate of expenditure is the estimate of £2.4 billion per annum procuring food and catering services, a figure which was cited in 'A Plan for Public Procurement'[132].

A substantial divergence was to be expected: the £2.4 billion figure dates from approximately 2010[133] and was based on adjusted estimates from nearly ten years before that.[134] Where referenced, the methodology has not been elaborated upon and little detail is offered. As a result, making more nuanced comparisons with the previous estimate are difficult. Given how dated the origins of the previous estimate are, such comparisons are unlikely to be useful. By providing a more up-to-date and transparent estimate which is replicable for future years, this report therefore fills an important data gap, one which will be further improved upon by better reporting and data capture from public sector bodies.

What this suggests overall is that the scope of public food procurement and the amount spent on it is far higher than has previously been thought.

9.3 Regional adjustments: meals served and possible expenditure

The estimates from sections 9.1 and 9.2 were further adjusted to make regional estimates. This was a necessary precursor to making estimates on economic impacts of localised procurement in specific regions (see 11.2). This section provides a brief summary of how estimates were formed for each subsector, based on data availability.

In most cases, the approach was to identify a reasonable regional adjustment of meal consumers, with the assumption that within each subsector, consumers in different regions consume meals at a roughly even rate.

At present, meals are served in specific regions, but the expenditure does not necessarily happen in the same region as the meal is served: centralised contracts in some cases may mean expenditure decisions are taken and spent away from the location of meal services. In a more localised procurement system, however, such expenditure may be allocated in the region of the food service. Therefore, below details a regional adjustment of both meals served and expenditure, assuming an 'ideal case' of regional expenditure being in line with regional meals served. This is then used for subsequent modelling of local economic activity (see 11.2). In most cases, the average expenditure in each setting

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132 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/332756/food-plan-july-2014.pdf

133 http://data.parliament.uk/DepositedPapers/Files/DEP2010-0520/DEP2010-0520.pdf

134 See, for example: https://webarchive.nationalarchives.gov.uk/ukgwa/20031221024554/http:/www.defra.gov.uk/farm/sustain/procurement/index.htm and https://webarchive.nationalarchives.gov.uk/ukgwa/20060120120000mp_/http:/www.defra.gov.uk/farm/sustain/procurement/pdf/GF%20Leaflet.pdf

is assumed to be constant across regions, so regional variations are driven by differences in number of meals served, rather than local economic conditions. This is a necessary simplification; improved data collection will allow for substantial refinement of these estimates.

9.3.1 Education

For **schools,** data on the number of students by school type and region was taken from the same source as student numbers in section 9.1. The regional share of students in each type is displayed in Table 61. Using the share of students as a proxy for the share of meals consumed and expenditure, this is multiplied by the total meals served and expenditure on school meals by school type (see 9.2.1.1). The totals for each school type are summed to regional values in Table 62**.**

Table 61: Regional distribution of students, by school type

Share of students per region in each category	E. Midlands	E. England	London	N. East	N. West	S. East	S. West	W. Midlands	Yorkshire & Humber
Nursery	7%	11%	22%	7%	14%	11%	6%	15%	7%
Primary	9%	11%	15%	5%	14%	16%	9%	11%	10%
Secondary	9%	12%	16%	5%	13%	16%	9%	11%	10%
Alternative provision	8%	10%	14%	6%	15%	17%	8%	13%	9%

For **higher education,** data was taken from HESA on the number of students enrolled by region of HE provider in 2019/20.[135] Only full-time students were considered, under the assumption that full-time students are significantly more likely than part-time students to be eating meals in university-provided canteens. Dividing the student enrolment in one region with the sum of enrolment in all English regions derives a percentage share of total enrolment. The relative share of students is used as a proxy for share of meals consumed and expenditure, so these figures are multiplied together. The results are presented in Table 62.

For **further education**, data from the DFE further education and skills geography tool provided breakdowns of students in each English region.[136] The share of students in each region was derived from this and used as a proxy for regional share of melas and expenditure. The total meals and expenditure were multiplied by these shares to form regional estimates. This is shown in Table 62.

Table 62: Estimate of meals served in education settings in England, by region.

	Meals served (millions)	Expenditure (£ million)

[135] https://www.hesa.ac.uk/data-and-analysis/students/table-11

[136] https://www.gov.uk/government/statistical-data-sets/fe-data-library-further-education-and-skills

Region	Schools	Higher education	Further education	Schools	Higher education	Further education
South East England	116	13	20	£274.42	£45.65	£51.39
London	115	20	23	£273.27	£67.42	£58.61
North West England	100	12	22	£236.37	£42.41	£57.28
East of England	83	7	13	£196.97	£24.73	£34.16
West Midlands	83	10	16	£195.96	£35.61	£42.08
South West England	67	9	13	£159.82	£31.59	£34.13
Yorkshire and the Humber	74	10	16	£176.00	£35.83	£41.05
East Midlands	63	10	13	£149.98	£33.41	£32.76
North East England	35	6	9	£82.81	£19.82	£23.54
Total	**736**	**98**	**146**	**£1,745.60**	**£336.46**	**£375.01**

9.3.2 Healthcare

For **hospital inpatients**, the ERIC dataset provided inpatient food service meals requested and cost broken down by commissioning region. These figures are used directly, save for one adjustment: in the ERIC dataset, the regions are based on NHS England commissioning regions. This has slight differences: East and West Midlands are both within the Midlands Commissioning region, and North East England and Yorkshire and the Humber are both within the North East and Yorkshire commissioning region. In order to break these estimates into estimates for each of the specific regions, a simple adjustment is made based on the relative share of population in Mid-2020 in each of those regions, taken from ONS statistics.[137] For the Midlands commission for example, West Midlands has approximately 55% of the population of the combined West and East Midlands regions, and East Midlands 45%. The meals served in the Midlands commissioning region are then split by these shares to form estimates for each region. The meals served and expenditure estimates can be found in Table 64.

For **staff food service**, the estimates for meals served (9.1) and expenditure (9.2) were adjusted for each region. Data on the breakdown of FTE staff by role and commissioning region were taken from the same NHS England dataset.[138] Because the total staff numbers used for estimating meals served were for the average of the year up to March

[137] https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland

[138] https://digital.nhs.uk/data-and-information/publications/statistical/nhs-workforce-statistics/march-2020 (Table 3)

2020, but the regional breakdown was presented for March 2020 only, the figures were converted into a share of each staff grouping in each region. This is presented in Table 63. This was then applied to the year-average staff figures from 9.1.2.2 to form an estimate of the regional breakdown of staff. The same assumptions as listed in 9.1.2.2 were applied in regards to number of days worked and meals consumed per FTE day worked. Similarly, the same assumption as in 9.2.2.2 on cost per meal was used, and held constant across the commissioning regions. As with inpatient meals, the Midlands and North East & Yorkshire commissioning regions were further divided into the English regions based on relative population shares. From this, a breakdown of meals served and expenditure regionally was formed, displayed in Table 64.

Table 63: Share of NHS staff by role and region

Region	Professionally qualified clinical staff	Support to clinical staff	NHS infrastructure support	Other staff
London	19%	15%	15%	24%
S. West	9%	10%	10%	6%
S. East	13%	14%	13%	10%
Midlands	18%	20%	18%	27%
E. England	9%	9%	10%	11%
N. West	15%	15%	16%	13%
N.E. & Yorkshire	16%	17%	17%	11%

For care homes, the same dataset used in section 9.1.2.3 to identify the number of care home residents was used. This contains evidence on the number of residents in each region, as well as a regional split between self-funded and state-funded care homes These figures were used to derive the share of self-funded or state-funded care home residents in each region. Using share of residents as a proxy for share of meals served and expenditure, these figures are combined with the total estimates to derive regional values. These are presented in Table 64.

Table 64: Estimate of meals served in healthcare settings in England, by region

	Meals served (millions)			Expenditure (£ million)		
Region	Patients	Staff	Care homes	Patients	Staff	Care homes
South East England	23	29	73	£123.99	£73.97	£194.95
London	14	38	37	£59.97	£96.16	£99.52
North West England	21	33	66	£78.64	£83.37	£176.83
East of England	14	20	53	£58.09	£51.49	£142.14
West Midlands	10	22	44	£48.76	£56.33	£116.67
South West England	27	21	49	£121.73	£52.30	£131.35

Yorkshire and the Humber	15	24	42	£67.77	£60.78	£110.89
East Midlands	9	18	38	£39.80	£45.97	£101.27
North East England	7	12	26	£32.88	£29.48	£68.74
Total	**140**	**219**	**429**	**£631.63**	**£549.85**	**£1,142.35**

9.3.3 Other

For **prisons,** the data source used for prisoner numbers (see 9.1.3.1) included a breakdown by prison. These prisons were matched to regions.[139] From this it was possible to derive the share of prisoners in each English region. Using this as a proxy for share of meals served and expenditure, this was combined with the total estimates to derive regional estimates. This is summarised in Table 65.

For **military,** the meals served and expenditure estimates were based on the locations of specific contracts for which data was available. Data from Project Allenby Connaught and Colchester were attributed wholly to the South East and East of England, respectively.

Data from the meals served in the HESTIA contract was adjusted to regional estimates based on the distribution of MOD personnel, taken from MOD statistics.[140] The share of total staff (military and civilian) in each region was assumed to be a roughly approximate distribution to those covered by the contract, so was used to adjust total HESTIA meals.

Data on meals served in the MOD training estate was available in regional groupings, however those were based on slightly different groupings to the English regions used elsewhere. Some adjustments were made: 'East' was assumed to refer to the East Midlands and East of England; 'North' the North East, North West and Yorkshire and the Humber; 'South East' to include South East and London. Meals served and expenditure were broken into these more specific regions based on the relative share of MOD personnel in those regions, from MOD statistics.[141]

Note that these region-based adjustments may overstate the number of meals in certain regions, notably the South East and East of England, because some barracks there are effectively 'double counted' by having separate estimates for meals served and for personnel distribution. However, given the relatively small number of meals served in these settings compared to others, notably education and healthcare, these biases are unlikely to have a substantial effect on the overall estimates.

These different contracts were then summed based on each region to get a total estimate of meals and expenditure per region. This is presented in Table 65.

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[139] Using a map of prisons available here: https://www.doingtime.co.uk/the-prisons/the-prison-map/

[140] https://www.gov.uk/government/statistics/location-of-uk-regular-service-and-civilian-personnel-annual-statistics-2020

[141] https://www.gov.uk/government/statistics/location-of-uk-regular-service-and-civilian-personnel-annual-statistics-2020

Table 65: Estimate of meals served in other settings in England, by region

	Meals served (millions)			Expenditure (£ million)		
Region	**Prisons**	**Military**	**Administrative offices**	**Prisons**	**Military**	**Administrative offices**
South East England	10	7.4	1.1	£7.52	£14.41	£2.29
London	11	1.0	2.0	£8.12	£1.77	£4.23
North West England	12	0.5	1.3	£9.01	£0.87	£2.82
East of England	10	2.2	0.6	£7.51	£3.95	£1.34
West Midlands	9	1.2	0.8	£7.18	£2.23	£1.63
South West England	6	6.7	1.0	£4.54	£12.15	£2.10
Yorkshire and the Humber	10	2.1	0.9	£7.49	£3.71	£1.87
East Midlands	10	1.3	0.6	£7.76	£2.33	£1.22
North East England	5	0.2	0.6	£4.16	£0.31	£1.34
Total	**82**	**23**	**9**	**£63.28**	**£41.74**	**£18.83**

For **administrative offices**, the estimates of total meals served and expenditure (9.1.3.3 and 9.2.3.3) were adjusted. This was done separately for central government and local government staff. A regional breakdown of central government staff was taken from Cabinet Office statistics for 2020.[142] From this, the share of staff in England was derived. Total estimated central government meals and expenditure were then multiplied by these shares to form regional estimates. For local government staff, a specific estimate of local government office workers was not identified. As a proxy, the regional distribution of public sector employment as a whole was taken, adjusted to form a share of staff.[143] This estimate is highly uncertain, however given the relatively small number of meals estimated as being consumed through public sector administration, this does not have a substantial bearing on results.

Table 66: Estimate of meals served in administrative settings in England, by region

Region	Meals served (millions)	Expenditure (£ million)

[142] https://www.gov.uk/government/statistics/civil-service-statistics-2020

[143] https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/publicsectorpersonnel/bulletins/publicsectoremployment/december2021

South East England	1.1	£2.29
London	2.0	£4.23
North West England	1.3	£2.82
East of England	0.6	£1.34
West Midlands	0.8	£1.63
South West England	1.0	£2.10
Yorkshire and the Humber	0.9	£1.87
East Midlands	0.6	£1.22
North East England	0.6	£1.34
Total	9	£18.83

9.3.4 Total

The total estimates of meals served is presented in Table 67. This is presented graphically in Figure 30.

Table 67: Total estimate of meals served per region

Meals served (millions)				
Region	**Education**	**Healthcare**	**Other**	**Total**
South East England	149	125	18	**293**
London	158	90	13	**261**
North West England	134	120	13	**268**
East of England	104	88	13	**204**
West Midlands	109	77	11	**198**
South West England	90	97	14	**201**
Yorkshire and the Humber	101	81	13	**194**
East Midlands	86	65	12	**163**
North East England	50	45	6	**101**
Total	**981**	**788**	**113**	**1,882**

Note that the sums of rows or columns and stated totals may differ due to rounding.

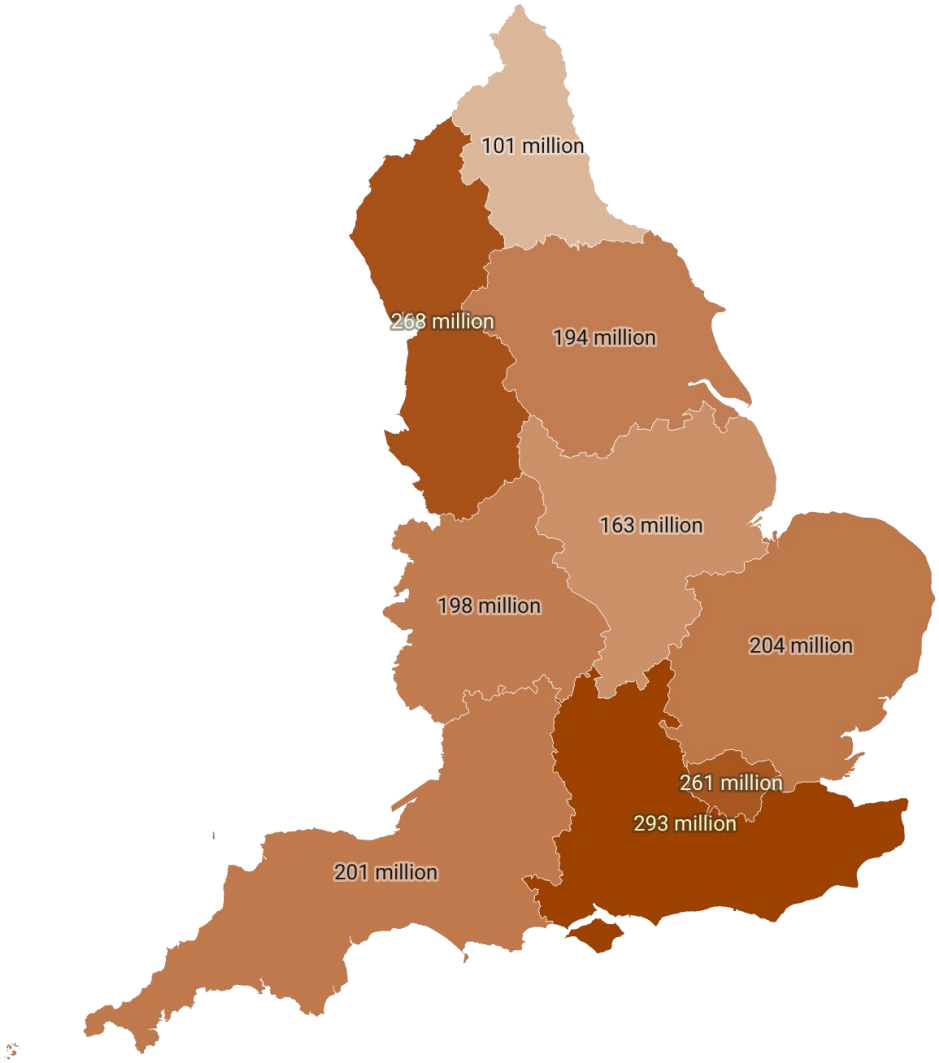

Figure 30: Map of regional estimates of number of meals served in public settings

Table 68 presents a regional distribution of the expenditure, distributed by where meals are served. In most sectors therefore the price per meal in each region is the same. As previously stated, this is likely not a reflection of reality where in some cases, food procurement is centralised and conducted outside of the region of meals being served. These figures were subsequently utilised for calculations of the possible local economic activity generated by localised procurement (see 11.2), where it is assumed that more expenditure *is* happening in the region in which food is served.

Table 68: Food service expenditure, adjusted to region of meals served

Food service expenditure (£ millions)				
Region	**Education**	**Healthcare**	**Other**	**Total**
South East England	£371	£393	£24	**£789**
London	£399	£256	£14	**£669**
North West England	£336	£339	£13	**£688**

East of England	£256	£252	£13	**£520**
West Midlands	£274	£222	£11	**£506**
South West England	£226	£305	£19	**£550**
Yorkshire and the Humber	£253	£239	£13	**£505**
East Midlands	£216	£187	£11	**£415**
North East England	£126	£131	£6	**£263**
Total	**£2,457**	**£2,324**	**£124**	**£4,905**

Note that the sums of rows or columns and stated totals may differ due to rounding.

10.0 Methodological appendix: Approximate GHG estimates

10.1 Meal 'traffic-light' system

Data on the GHG impact of meals is taken primarily from (4). This PhD thesis was judged to be a thorough and useful account of the carbon footprint of meals in primary schools. It relies on a systematic literature review of life-cycle assessment (LCA) data for different food products and the 2009 Primary School Food Survey (PSFS), a national survey on school dinners across the country. This survey used a nationally representative sample of 139 schools in England, documenting the food and drink items on offer each day in the school canteen across two weeks, and codified the items. The author of (4) focuses on 160 item codes which cover 65% of the frequency of the items; in short, most of a typical menu. This is done to produce a GHG (GWP) footprint and water footprint (WF) for each product item, alongside the impact of transport, packaging and preparing foods. It should be noted that this same data source has been used for other footprinting exercises (notably (5)), but as is detailed in (4) the scopes are slightly different. (4) accounts for transport, waste in the supply chain and loss of mass in cooking (i.e. looks at the GHG footprint per kg of cooked, rather than raw, produce). As a result, this was judged to be more accurate and in line with the scope and purpose identified for our purposes. It should be noted that the average school meal footprint from the analysis, of 1059 gCO_2e is highly comparable to the average footprint of meals in Helsinki (1.1 $kgCO_2e$) (6).

One of the strengths of the use of the PSFS dataset is that it documents actual recipes and meals which were cooked in schools, or recipes recommended to them. These include various well-known main dishes: chicken pesto pasta, fish fingers, beef bourguignon, chicken curry, chicken fajitas, salmon fish pie, vegetarian chilli with rice and beans; side dishes: potato mash, couscous and roasted vegetables; and desserts like apple crumble or fruit cobbler.

Given the possibility of a trade-off between environmental and nutritional objectives (the easiest way to reduce the carbon footprint of lunch is simply not to eat one, but that cannot

be recommended for obvious reasons!) this analysis focuses on what (4) terms 'best practice' recipes. This looks at a series of recipes identified to be 'best practice' from a nutritional perspective to assess their performance from an environmental sustainability perspective (see (4) table 5-12, or Table 69 in this report). These are categorised into a 'traffic light' system: a green carbon footprint when it is up to 741 gCO_2e, a red footprint when above 1377 gCO_2e per meal, and an amber footprint if it falls in between these two values.

Table 69: Carbon footprint of dishes (adapted from (4) Table 5-12)

Dish Code	Dish name	Carbon footprint (gCO2e)	Dish Code	Dish name	Carbon footprint (gCO2e)
Main dishes			***Complementary dishes***		
M1	Beef Bourguignon	2215	S1	Cauliflower rice	75
M2	Beef chow mein	1618	S2	Rice and peas	250
M3	Beef meatballs	1867	S3	Roasted root vegetables	37
M4	Chicken curry	696	S4	Runner bean slaw	36
M5	Chicken couscous	371	S5	Summer vegetable polonaise	131
M6	Chicken balti pie	440	S6	Winter red coleslaw	19
M7	Chicken chasseur	455	S7	Potato mash	37
M8	Chicken fajitas	490	S8	Couscous with roasted vegetables	79
M9	Chicken with rice	452	S9	Savoury rice	178
M10	Roast chicken	628	S10	Vegetable paella	243
M11	Lamb shepherd's pie	2064	D1	Apple and banana cake	50
M12	Pork meatballs	716	D2	Apple berry fool	187
M13	Macaroni and cheese with pork	803	D3	Apple flapjack	25
F1	Pollok fillet	145	D4	Banana cake	113
F2	Salmon and broccoli pasta	376	D5	Banana muffins	63
F3	Salmon fishcake	377	D6	Cocoa beetroot muffins	89
F4	Salmon and vegetable noodles	385	D7	Date and cocoa brownie	78
F5	Salmon fish pie	441	D8	Pear sponge	126
F6	Salmon pasta	400	D9	Rhubarb and custard cake	49
F7	Salmon pie	432	D10	Rice pudding and peaches	318

F8	Spaghetti marinara	520	D11	Rice pudding apricot compote	253
F9	Tandoori salmon	309	D12	Winter sponge	85
V1	Beetroot patties	266	D13	Oaty apple crumble	92
V2	Cheese quiche	421	D14	Oaty fruit crunch	80
V3	Vegetarian pie	470	D15	Peach and raspberry cobbler	95
V4	Vegetable lasagne	554	D16	Summer fruit yoghurt crunch pots	101
V5	Chilli with rice and beans	455			
V6	Quorn™ curry	281			
V7	Pizza with lentil sauce	381			
V8	Cheese quesadilla	349			
V9	Quorn™ and vegetable stir fry	323			
V10	Pizza	396			
V11	Quorn™ paella	475			
V12	Lentil and bean patties	136			
V13	Tortilla	434			
V14	Vegetarian burrito	357			
V15	Vegetable curry	550			

The data presented in Table 69 of ‘best practice’ (from a nutritional perspective) recipes formed the basis of our analysis. The data on carbon footprint from those meals was analysed based on the meal type, and is displayed in Figure 31. The meat-based mains are notable for their substantial diversity: whilst the lowest and 25th percentile meals are comparable in footprint to the average fish and vegetarian mains, the most impactful meat mains are 3-4x higher than the most impactful vegetarian and fish mains from a carbon perspective. As the author of (4) points out, there is a marked difference between recipes with ruminant livestock as the main ingredient and those with non-ruminant livestock.

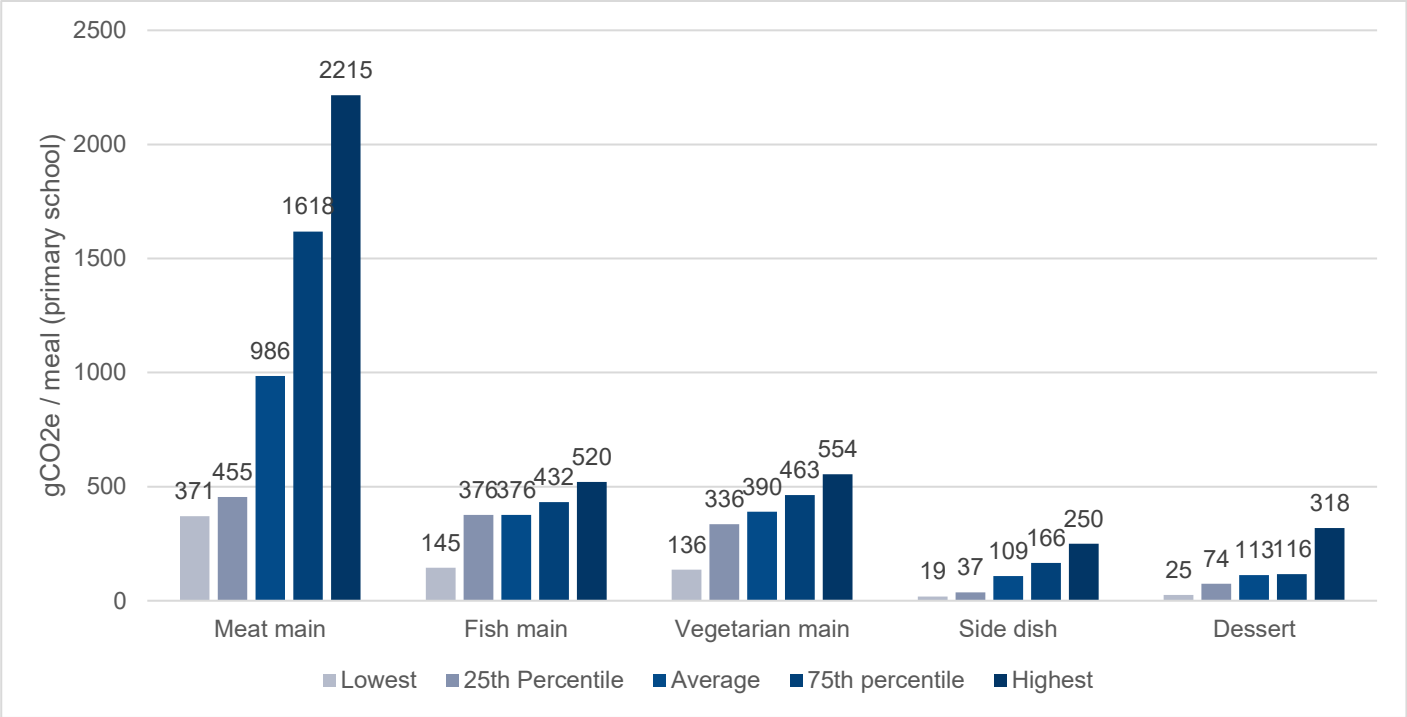

Figure 31: Carbon impact by meal type, primary school

The strength of using the 'traffic-light' grouping and targets as detailed in (4) – rather than, say, specific dietary restrictions – is that it allows for the substantial variety in main meals, including meat mains. By being relatively agnostic about specific ingredients (beyond other stipulations introduced, such as nutritional or seasonality requirements) allows a range of possible combinations with meat mains to still meet 'green' criteria. As data on the carbon footprint of different farming practices and management schemes improves, the case for switching meat which is served to those grown from higher environmental standards or using novel methods would be furthered.[144] Similarly, new recipes (such as those which blend meat-based protein and plant-based protein) could similarly meet target criteria. This avoids strict restrictions which may be considered politically difficult or unacceptable to some consumers, such as a fully vegetarian food service (see, for example, 3.5.3).

This data was then considered when combined, as main dishes would be complemented by sides and desserts in a normal food service. We assume that the boundary should apply to a full service (i.e. main + side + dessert), although a smaller meal (such as one without a dessert) could therefore be an easy solution to reduce the footprint, assuming that the lack of dessert in the meal service is not compensated for by purchase of extra food elsewhere, and does not reduce the overall nutritional adequacy of the customer's diet. The combined meals were taken by combining the respective groups, i.e. the 'Average meat (+side+dessert)' (1207gCO2e) is a summation of the average meat main

[144] There is an ongoing debate around the role of ruminant livestock in improving soil sequestration and methods to mitigate methane emissions (see, for example: https://www.sciencedirect.com/science/article/pii/S0959652620308830 and https://www.jswconline.org/content/71/2/156.short). Improved data would allow for distinguishing between different production practices.

(986gCO2e), average side dish (109gCO2e) and average dessert (113gCO2e). These are displayed by main meal component in Figure 32.

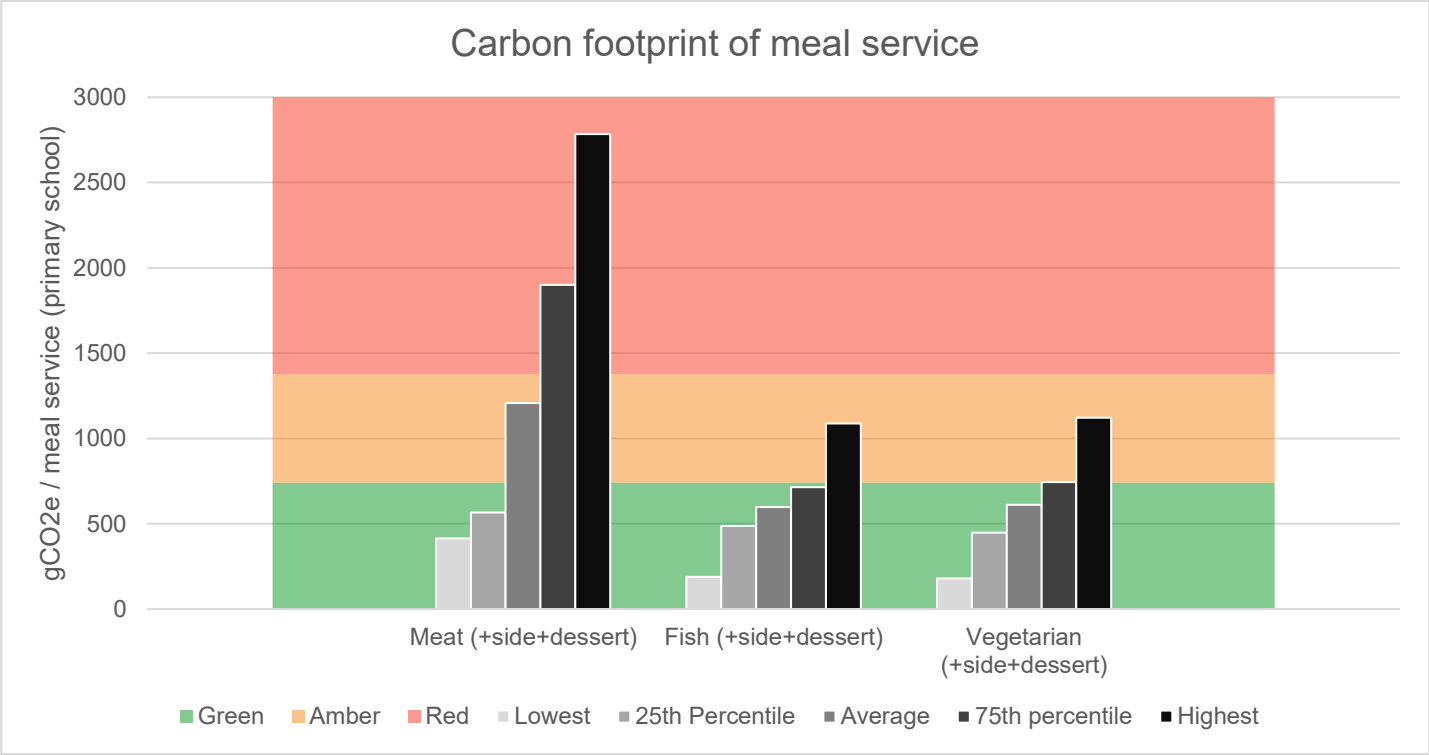

Figure 32: Carbon footprint of meal service, primary school

In order to integrate these categories into the meal service modelling, it was necessary to set a reasonable lowest and highest bound. (4) only provides the boundaries between categories. To do this, the meal service analysis presented in Figure 32 was utilised. Looking at the absolute lowest meal service, a full meal could be served with as little as 180gCO_2e if choosing all of the lowest options. Given that this is an extreme case, and we need figures that would be applicable across the course of a school year (i.e. with at least two weeks' worth of menus which could be repeated), it was considered more appropriate to look at the 25th percentile of carbon footprints. The 25th percentile vegetarian meal service (with side and dessert) would be 447gCO_2e, and the 25th percentile fish meal service 487gCO_2e. Based on this, a reasonable lower bound of 450gCO_2e was chosen, indicating that on average a 'green' meal service could be achieved between 450-741gCO_2e/meal. For the upper bound, a similar approach was taken: whilst the absolute highest comes to 2,488gCO_2e/meal, the 75th percentile of meat meals with side and dessert was calculated as 1,901gCO_2e/meal. The value of 1900gCO_2e was therefore chosen as the upper bound, indicating a realistic 'red' meal falling between 1377-1900gCO_2e. These boundaries are displayed in Table 70.

Table 70: Traffic light groups, in gCO_2e / meal

Meal grouping	Lower bound	Upper bound
Green	450	741
Amber	742	1376
Red	1377	1900

10.2 Conversion to other populations

The data on school meal footprints from (4) is based on the Primary School Food Survey. Whilst the meals described – such as lasagne, stir fry or curry – are broadly applicable to all meal services, the portion sizes for primary school children are not. As the carbon footprint of a food item is in part a function of its mass, a larger portion will have a larger footprint than a smaller portion. Therefore, to apply this insight to other services which serve adults, it was necessary to adjust the emissions with assumptions regarding portion sizes.

The recommended energy consumption, in kcal, for children aged 7-10 according to the NHS was between 1649-2032 kcal for boys and 1530-1936 kcal for girls.[145] The mean average of the values came to 1760. For teenagers aged 13-18, the NHS recommends a range between 2414-3155 kcal for boys and 2223-2462 for girls.[146] For adults, the recommended kcal intake is approximately 2000 for women and 2500 for men.[147] Using these as a guideline, it is possible to derive how much larger the average portion on a teenager's and adult's plate should be than those on a child's: a teenager's portion, based on calorific requirements, should be about 48% larger, and the average adult portion should be about 28% larger than those for a primary age child. Whilst there will be some nuances regarding calorific requirements, and whether meals served are in line with, do not meet or in fact exceed these requirements, these figures provide a useful starting point for adjusting the footprint of the primary meal service. These are summarised in Table 71. The mixed age/undefined children group is used for the subsectors 'alternative provision' and 'independent school', which may cover the entire school age range, and uses the average between primary and secondary meals. Further and higher education are classified as adults, and all other food services are also classified as adults. Note that hospital populations will be slightly more complex: a disproportionate amount of elderly people who may consume fewer calories, but also nutritionally vulnerable people who may require more calories or protein content. For simplicity, the average adult value is used for hospital patients.

Table 71: Adjustments for portion size by population group

Age group:	Method notes:	Scaling factor
Primary-age children	Taken from literature	1.00
Secondary-age children	Adjusted based on kcal consumption	1.48

[145] https://www.nhs.uk/common-health-questions/childrens-health/how-many-calories-does-a-child-of-7-10-need/

[146] https://www.nhs.uk/common-health-questions/childrens-health/how-many-calories-do-teenagers-need/

[147] https://www.nhs.uk/common-health-questions/food-and-diet/what-should-my-daily-intake-of-calories-be/

Mixed age/undefined children	Adjusted based on kcal consumption, average of primary and secondary students	1.24
Adults	Adjusted based on kcal consumption	1.28

Based on this, but using the same relative green, amber and red boundaries as defined for primary school children, portion-adjusted footprint 'traffic lights' can be derived for each population group. These are presented in Figure 33. As a meal increases in carbon intensity, it progresses from 'green', to 'amber' and then to 'red' as the most carbon-intensive meals. The minimum bound of the green meal service represents a likely reasonable lower bound of meals within existing recipe repertoires, but meals, with fewer components, smaller portions or redesigned recipes could fall below this.

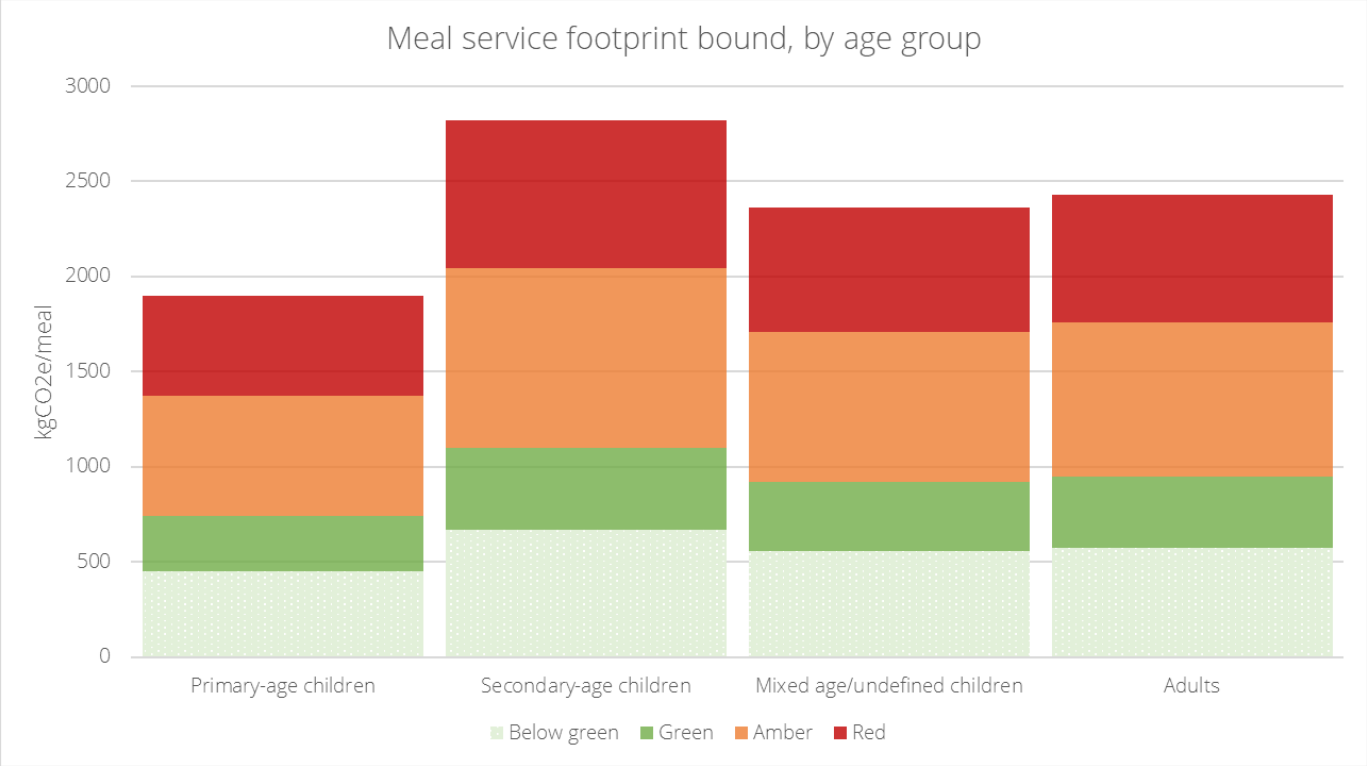

Figure 33: Meal service traffic lights by age group

10.3 Adjustment for waste disposal

The carbon footprint for meals described in 10.1, taken from (4), represents a *cradle-to-plate* analysis, i.e. the carbon footprint of food up until the consumption stage. This includes food losses and waste (FLW) upstream, such as FLW in distribution and preparation of food eventually served. However, it does not include the impact of the disposal of subsequent plate waste, i.e. the parts of the meal which have been left unconsumed. Understanding possible waste rates, and therefore the amount of food waste being disposed, was also an important step for creating scenarios that account for food waste. As a result, an adjustment was made to estimate the emissions associated with waste.

Food waste contributes to the carbon impact of a food service in two ways. Firstly: there is a carbon footprint associated with the production, processing, transporting and preparing of all food. For food which is then not consumed, this carbon has in effect been 'wasted'; the same amount of food could have been served whilst less was produced. This is referred to as the 'embodied' carbon. Secondly, there is then a carbon footprint associated with the disposal of food which has not been eaten. The impact of disposal will vary substantially based on what treatment methods are used (see 3.3.1). Generally speaking, embodied emissions are much larger than disposal emissions.

The embodied emissions are already captured in the emission factors discussed in section 10.1, which measures the plate of food served. These are not *additional* from the meal footprint, though it should be noted that excessive production represents an opportunity for emission reductions. However, the emissions associated with disposal of the food leftover is not included in those emission factors ((4) section 5.10.3). Although there will be disposal emissions associated with FLW at each stage of the supply chain prior to consumption, the focus here is on the disposal emissions associated with *plate waste*.

Carrying out the adjustment required distinct stages: firstly, identifying data on food waste in different settings (10.3.1), then scaling this data to estimates of total plate waste (10.3.2), from which embodied emissions were identified for the purposes of scenario modelling (10.3.3).

10.3.1 Data on food waste in different settings

The first stage in identifying the carbon impacts of plate waste is to form an estimate of the amount of plate waste in each setting. To do this, two different approaches were taken.

The first approach was to use data from previous WRAP research on waste in the hospitality and food service (HaFS) sectors, published in 2013.[148] Using the estimates presented in that research of the number of meals served and total weight of food waste per HaFS type, it was possible to derive an estimate of the weight of food waste per meal. This refers to total HaFS waste, i.e. including spoilage and preparation. This is already covered by the carbon factors used for each meal: to avoid double counting therefore, only plate waste is considered. The share of plate waste in contract catering was taken from WRAP research[149] as 36%. From this, it is possible to derive an estimate of the kg plate waste/meal. These steps are presented in Table 72.

[148] https://wrap.org.uk/resources/report/overview-waste-hospitality-and-food-service-sector. Note: some data used was also taken from the full technical report from the same period of research, which is no longer available publicly on the WRAP website. The full report also presents data for profit sectors, such as hotels and restaurants, which are not included here. 'Services' includes prisons and military.

[149] https://wrap.org.uk/resources/report/where-food-waste-arises-within-uk-hospitality-and-food-service-sector

Table 72: Calculation of food waste in each setting, based on WRAP data

HaFS type	Meals served (millions/year)	Food waste (tonnes)	Derived food waste (kg/meal)	Share plate waste	Derived plate waste (g/meal)
Education	1134	78700	0.07	36%	25
Healthcare	1047	122600	0.12		42
Services	261	59900	0.23		66
Staff catering	880	20900	0.02		18

The second approach was to use data from a large scale, multi-country analysis by Christopher Malefors and colleagues.[150] This study measured food waste across a engage of settings in four European countries, and across tens of thousands of 'quantification days', with strict quality criteria for inclusion. Even including only data which met the strictest criterion, some 780,000 portions across 1,445 days in the 'elderly care' sector had estimates of the weight wasted.[151] This study also presents food waste as a share of the food that was served, i.e., as a percentage figure. However, far fewer datapoints were available under this indicator than the 'waste per portion (g)' indicator. The latter, being comparable with the approach taken using WRAP data above, was therefore prioritised.

The average waste per portion under the strictest criterion was combined with the approximate share of waste per portion in each HaFS type.[152] This, and the derived plate waste values, are presented in Table 73.

Table 73: Calculation of food waste in each setting, based on Malefors data

HaFS type	Avg. waste per meal (g)	Plate waste (% of waste)	Derived plate waste (g/meal)
Canteen	50.1	43%	22
Elderly Care	128	66%	85
Hospital	112	40%	45
Preschool	80.1	35%	28
Primary school	59	41%	24
Upper secondary school	78.9	53%	42

These two approaches were harmonised and applied to the meal settings used in the main analysis of this report. Each data source has strengths and weaknesses: the WRAP data was observed specifically in the UK, making it more directly applicable. The Malefors data, however, captures additional nuances between settings, such as the difference between

[150] https://www.mdpi.com/2071-1050/11/13/3541

[151] Ibid., Table 9

[152] Ibid., Table 9 and Figure 5, respectively. Values read approximately off Figure 5.

hospital patients and care home residents, and is based on a substantially larger dataset. Whilst not from the UK, data from Sweden, Norway, Finland and Germany are likely to be broadly comparable. The categories from each data source were matched to the categories used in this project, the two values were then averaged to get a single value. This is shown in Table 74.

Table 74: Harmonisation of food-waste data per potion

Sector	Setting	WRAP category	Malefors category	WRAP-derived plate waste (g)	Malefors-derived plate waste (g)	Average value (g)
Education	Schools	Education	Multiple*	25	31	**28**
	Further and higher education	Education	Canteen	25	22	**23**
Healthcare	Patients	Healthcare	Hospital	42	45	**43**
	Healthcare staff	Staff catering	Canteen	18	22	**20**
	Care homes	Healthcare	Elderly care	42	85	**63**
Other	Prisons	Services	Canteen	66	22	**44**
	Military	Services	Canteen	66	22	**44**
	Civil service office workers	Staff catering	Canteen	18	22	**20**

note that Malefors provided estimates for preschool, primary and secondary school separately. These were harmonised into a single 'schools' estimate by weighting them by the relative share of meals served, based on the estimates presented in 9.1.1.1. 'Alternative provision' was grouped with secondary schools.

10.3.2 Scaling data to total plate waste estimates

By combining the values presented in Table 74 of plate waste per portion with number of meals served (see 9.1), it was possible to derive an estimate of the amount of plate waste generated in each setting. Next, this estimate was used to form an estimate of the GHG emissions associated with disposal of plate waste. To inform this, an emissions factor for disposal of an average tonne of food waste in hospitality and food service settings across the UK was used, taken from WRAP research.[153] This suggests that there are approximately 0.12 tCO_2e emitted for each tonne of food waste disposed in HaFS settings. This is based on most food going to recovery (energy from wate) or disposal to landfill, with a small amount being recycled.[154] Note that this is likely an underestimate: current data on disposal to sewer in HaFS is not available, meaning this has not been estimated, but it may be substantial. Furthermore, the scope of the analysis which informed the 0.12 tCO_2e estimate was that of the entire supply chain: disposal emissions associated with

[153] https://wrap.org.uk/resources/report/uk-food-system-ghg-emissions Table 9

[154] See https://wrap.org.uk/resources/report/food-surplus-and-waste-uk-key-facts Table 1

recycling of food was therefore not counted in *disposal,* being rather allocated to the creation of *new* products (such as energy or fertiliser). This in particular leads to a lower estimate from energy recovery and is likely to underestimate the total emissions. Despite these limitations, the figure serves as a useful indicative starting point. It could be further improved in future with data specifically on the disposal practices of public food service bodies, which would help identify possible improvements such as through the diversion from landfill to recycling. Instead, it represents a general average.

Combining this figure with the estimates of plate waste volumes, the disposal emissions associated with waste can be included. These are presented in Table 75..

Table 75: Estimated plate waste disposal emissions per setting

Sectors	Areas included	Estimated plate waste (tonnes)	Plate waste disposal (tCO2e)
Education	Schools	21,000	2,490
	Further and higher education	6,000	680
Healthcare	Patients	6,000	730
	Healthcare staff	4,000	520
	Care homes	27,000	3,270
Other	Prisons	4,000	430
	Military	1,000	120
	Civil service office workers	200	20
Total		**69,000**	**8,260**

Discrepancies in the total and summing of subsectors is due to rounding.

As previously stated, these emissions are additional to the meals presented in 10.1. Assuming that food waste is, on average, constant between menus means these values can be added to any menu averages used. However, the role of food waste and how reductions or increases may interact with menu changes is explored in 10.5.2.

10.3.3 Accounting for embodied emissions in food waste

As previously stated, embodied emissions in plate waste are already captured by the emissions associated with the meal, or plate, itself. However, estimating embodied emissions was necessary for subsequent analyses of food waste reduction. This section describes the process undertaken to form this estimate.

Firstly, the wastage in grams needed to be converted to wastage as a share of the meal. To do this, an 'average' meal was derived. WRAP has previously recommended the use of 420g as an 'average' adult meal size for the purposes of illustrating the amounts of food being redistributed.[155] This may not necessarily be appropriate for describing a canteen

[155] https://wrap.org.uk/resources/guide/reporting-amounts-food-surplus-redistributed-weight-and-meal-equivalents-wrap

meal service, where a consumer may eat multiple courses: a main/accompaniment and dessert.

This was compared against the recipes cited by (4) and presented in Table 69, which can be found online.[156] The recipes provide an estimate of primary and secondary school portion sizes. The weight of approximately 50% of each category (meat main, fish main, vegetarian main, side dish and dessert) were taken randomly. From this sample, average weight of each meal component can be derived. This is presented in Table 76. The sum total of these three values (446g and 644g for primary and secondary, respectively) is substantially larger than WRAP's recommended value for adult meals. There are some possible explanations: firstly, that secondary students may consume more than adults due to their calorific needs (see Table 71); secondly that lunches in canteens may represent a 'main meal' and therefore are expected to be larger than a 'normal' meal, such as one cooked at home; thirdly that large portions may both contribute to both waste and excess consumption, the 420g may be closer to an 'ideal' portion size. Additionally, we must consider that not every main requires a side component: some main recipes were very small, requiring more substantial sides, whereas others may not have a side and just be complemented by a dessert.

Table 76: Average weight per meal component from School Food Plan recipes

Meal component	Primary	Secondary
Main	223	318
Side	129	194
Dessert	94	132

Taking into account the above considerations, as the values taken from the School Food Plan recipes correspond directly to the meals and menus used for the cradle-to-plate analysis, these were prioritised ahead of the WRAP values.

To maintain consistency with the assumption of a meal containing main, side and dessert calculations used in section 10.1, this is taken for each primary school and secondary school. These values are then scaled to other populations using the calorific guide detailed in Table 71, allowing the value to be extended to adult portions. Because the relative size of observed recipes slightly differed from this calorific guide, the calculation is repeated with each primary and secondary as a starting point, then averaged, which is taken as the final value. These stages are presented in Table 77.

Table 77: Harmonising estimates of meal size. Values in blue were starting points for extrapolation.

	Scaling value	Observed totals (g)		Average value (g)
Primary school	1	446	435	440
Secondary school	1.48	660	644	652
Adult	1.28	571	557	564

[156] http://whatworkswell.schoolfoodplan.com/articles/category/52/recipes-menus

The estimates for primary and secondary schools were then grouped together to form a single 'schools' estimate, weighted based on the relative share of meals in each category (9.1.1). This weighted value came to 532g/meal.[157]

These meal sizes were combined with the estimates of food waste in different settings detailed in 10.3.1. These are presented in Table 78.

Table 78: Plate waste estimates by setting

Sector	Setting	Average value (g)	Meal size (g)	Plate waste as share (%)
Education	Schools	28	532	5%
	Further and higher education	23	564	4%
Healthcare	Patients	43	564	8%
	Healthcare staff	20	564	4%
	Care homes	63	564	11%
Other	Prisons	44	564	8%
	Military	44	564	8%
	Civil service office workers	20	564	4%

These shares suggest that very little of a meal is plate waste, which may not be consistent with anecdotal evidence of those working in the sector. This possibly means that the meal sizes used for these calculations are larger than those served where food waste was measured. This approach allows for the most consistency with the meal emissions method (10.1) so is used, though it should be noted that food waste could be understated.

With these shares, it is possible to derive the embodied emissions associated with food which is served but then wasted by consumers. This quite simply multiplies the share of waste by the carbon footprint of the meal. If in a hypothetical scenario, a meal had a carbon footprint of 1kg CO_2e, and an average of 10% plate waste, the embodied emissions of plate waste per portion would be 100g CO_2e (1kg multiplied by 10%). This process is used for calculating changes in emissions based on changes in waste rates, described in section 10.5.2.

10.4 Estimate of GHGs associated with meal service

Using the calculations detailed in the preceding sections, it was possible to derive an estimate of the carbon emissions associated with public sector food service. This was modelled for the purpose of scenario exploration (see 10.5).

Each setting was assigned a target population. Using the population-specific meal service traffic light boundaries (see Figure 33), for each grouping a random value was generated between the lower and upper bound. Because the upper and lower bounds reflected the 25th and 75th percentile green and red meals respectively, it was not considered necessary to adjust for the upper and lower tail of 'extreme' meals. As a result, the random numbers are evenly distributed. From this, a split was determined between the share of meals which are 'green', 'amber' and 'red' which, when combined, forms an estimate of the

[157] For grouping and weighting, 'preschool' was treated as primary school and 'alternative provision' was treated as secondary school.

footprint of an ‘average’ meal. Manipulating the split between green, amber and red formed the basis of scenario analysis.

As a basis of comparison, it was necessary to estimate the status quo or ‘baseline’ meal service. This was termed the DEFAULT scenario. In order to get an estimate of what the ‘default’ distribution between green, amber and red meals could be, the data presented in (4) was analysed. The author points to an average primary school meal footprint of 1,059 gCO_2e. This was used as a benchmark to try and recreate. The weighted average primary school meal was simulated 500 times to generate an average based on input criteria on the share of meals served in each traffic light category. This was done in a series of trial-and-error iterations:

- Assuming an even, 33.3% share for each traffic group returned an average footprint of 1,097 gCO2e across 1,000 simulations, which is 4% above the targeted value.
- Assuming a 40% share for each green and amber with 20% red returned a value of 985, some 7% below the target value.
- Assuming 50% of meals were amber and 25% each green and red returned a value of 1089, 3% above the target value
- Assuming 35% of meals were each green and amber, with the remaining 30% being red, returned an average value of 1,069 gCO2e, 1% above the target value. This was considered sufficiently close to be a viable default scenario.

Based on this, the assumed distribution of red, amber and green in the default scenario is 35% green, 35% amber and 30% red. This same distribution was maintained for all food settings.

Based on the above parameters, the DEFAULT scenario was calculated. Due to the use of randomised values within each green, amber and red grouping, the calculation for each food setting was simulated 500 times. The average of these simulations was then taken to form an estimate. These simulations only inform the cradle-to-plate estimate, which was summed with the disposal-related emissions estimated in section 10.3.2.

Table 79: Estimated emissions from public sector food service

Sectors	Settings	Cradle-to-plate meal emissions (tCO2e)	Plate waste disposal emissions (tCO2e)	Total DEFAULT emissions (tCO2e)
Education	Schools	948,900	2,490	951,390
	Further and higher education	334,860	680	335,550
Healthcare	Patients	191,540	730	192,270
	Healthcare staff	299,950	520	300,470
	Care homes	586,060	3,270	589,330
Other	Prisons	112,370	430	112,800
	Military	30,930	120	31,050

	Civil service office workers	11,890	20	11,910
Total		**2,516,500**	**8,260**	**2,524,800**

Discrepancies in summed emissions are due to rounding.

This suggests that some 2.5 million tonnes of CO_2e could be associated with the consumption and disposal of food in public food service. Whereas plate waste emissions were fixed using average values, the simulation approach for cradle-to-plate meal emissions allows establishment of a rough range. The range of values for the total DEFAULT scenario were from 2.2 – 2.9 $mtCO_2e$.

Comparing this to WRAP's estimate of the UK's consumption-based food system emissions in 2019 of 158 million tonnes[158], this suggests that approximately 1.6% of the UK food system's footprint (1.3 – 1.8%) could be influenced directly by public procurement, before accounting for possible knock-on effects in private consumption. However, the two approaches were very different in methodology and so are not necessarily directly comparable, they are put together just to give a broad indication.

10.5 Results: scenario analysis of GHG footprint

Using the same model which estimated the DEFAULT scenario (10.4), it was possible to explore other scenarios which altered parameters to explore possible changes in carbon emissions. Two key parameters were altered: the *menu composition,* i.e., the split between green, amber and red meals and the *amount of food waste*. These are only two of other possible SFP-related changes which could be made to food services: increased efficiency of meal preparation, changing the treatment method of food waste and changing the distance travelled by food, for example. The efficiency of transport and meal services are already captured within the analysis in (4) which informed the meal footprint, and as was found in the REA, the role of transport in meaningful emissions reductions is not always clear (see 3.3.3). Given the difficulty of estimating these elements and the smaller role they play in total food service emissions, it was decided to focus on the two parameters described.

10.5.1 Menu change scenarios

The MENU scenarios involve a redistribution of meals across the different traffic light categories. In all cases, red meals are eliminated, with different distributions between amber and green, which would reflect differing levels of ambition. The amount of waste in each scenario is considered constant, meaning no meaningful difference to plate waste rates are observed. The scenarios are summarised in Table 22. For simplicity, all scenarios apply evenly to all settings.

Table 80: MENU scenario descriptions

[158] https://wrap.org.uk/resources/report/uk-food-system-ghg-emissions

Scenario:	Description	Sectors	Share of meals 'green'	Share of meals 'amber'	Share of meals 'red'	Waste:
MENU_1	All red moved to amber	All	33%	67%	0%	*unchanged*
MENU_2	Even share amber and green	All	50%	50%	0%	*unchanged*
MENU_3	All red moved to green	All	67%	33%	0%	*unchanged*
MENU_4	Entirely green	All	100%	0%	0%	*unchanged*

Each scenario was simulated 500 times for each setting in which it applied. The averages of emissions in each setting were then taken and combined. The results for all four scenarios, and a comparison with the DEFAULT, are presented in Table 23.

Table 81: Results of MENU scenarios. All values in tCO_2e

Sectors	Areas included	DEFAULT	MENU_1	MENU_2	MENU_3	MENU_4
Education	Schools	951,400	806,400	742,100	670,500	533,600
	Further and higher education	335,500	285,900	259,700	234,900	186,300
Healthcare	Patients	192,300	161,500	148,600	134,600	107,300
	Healthcare staff	300,500	255,600	231,800	210,300	166,800
	Care homes	589,300	502,100	453,100	414,700	328,000
Other	Prisons	112,800	95,000	87,100	79,100	62,100
	Military	31,100	26,200	23,800	21,800	17,200
	Civil service office workers	11,900	10,100	9,300	8,400	6,700
Total		**2,524,800**	**2,142,800**	**1,955,600**	**1,774,400**	**1,408,000**
Change from baseline (DEFAULT)		**0%**	**-15%**	**-23%**	**-30%**	**-44%**

Discrepancies in summed emissions are due to rounding.

This suggests that the most extreme dietary change, moving all meals to 'green' recipes (under 741 gCO2e for primary school meals) could save as much as 44% of the total carbon footprint, or 1,120,000 tCO2e. However, even more modest dietary shifts, such as removing all 'red' meals and evenly splitting the meal service between 'green' and 'amber' meals (MENU_2) could reduce emissions by nearly one quarter.

10.5.2 Food waste scenarios

The WASTE scenarios consider the change in emissions associated with a change in the amount of plate waste, quantified as a percentage change from the baseline. This includes a change in both *embodied* and *disposal* emissions associated with food waste. The three WASTE scenarios are based on the DEFAULT dietary scenario, leaving this unchanged. The scenarios are summarised in Table 24. For simplicity, all scenarios apply evenly to all settings.

Table 82: WASTE scenario descriptions

Scenario:	Description	Sectors	Share of meals 'green'	Share of meals 'amber'	Share of meals 'red'	Waste:
WASTE_1	DEFAULT menu, plate waste reduced by 30%	All	35%	35%	30%	*-30%*
WASTE_2	DEFAULT menu, plate waste reduced by 50%	All	35%	35%	30%	*-50%*
WASTE_3	DEFAULT menu, plate waste reduced by 80%	All	35%	35%	30%	*-80%*

Each scenario was based on the DEFAULT simulated 500 times (see 10.4) with variable waste rates. The results are summarised in Table 25.

Table 83: Results of WASTE scenarios. All values in tCO_2e

Sectors	Areas included	DEFAULT	WASTE_1	WASTE_2	WASTE_3
Education	Schools	951,400	935,600	925,100	909,300
	Further and higher education	335,500	331,200	328,300	323,900
Healthcare	Patients	192,300	187,600	184,500	179,900
	Healthcare staff	300,500	297,200	295,000	291,700
	Care homes	589,300	568,600	554,700	533,900
Other	Prisons	112,800	110,000	108,200	105,400
	Military	31,100	30,300	29,800	29,000
	Civil service office workers	11,900	11,800	11,700	11,600
Total		2,524,800	2,472,200	2,437,200	2,384,600
Change from default		0%	-2%	-3%	-6%

Discrepancies in summed emissions are due to rounding.

These suggest savings of approximately 100,000 tCO_2e could be realised through a 50% reduction in plate waste alone (WASTE_2), rising to as much as 160,000 tCO_2e with drastic reductions in plate waste of 80% (WASTE_3).

When compared with the MENU scenarios (see Figure 34 for a comparison), it is clear that reductions in waste, whilst important, are overshadowed by the scale of reduction achievable through dietary change. This in part reflects a limited scope of the waste analysis, looking only at plate waste, but also that embodied emissions are much more significant than disposal emissions. As the data suggests that in most sectors, upwards of 90% of plates are being consumed, the scope for plate waste reduction is relatively small. However, this is using aggregated data and subject to uncertainties based on the assumed 'average' meal. In individual institutions where substantial plate waste is

observed, striving for its reduction is clearly a ‘no regrets’ strategy to reduce the carbon footprint.

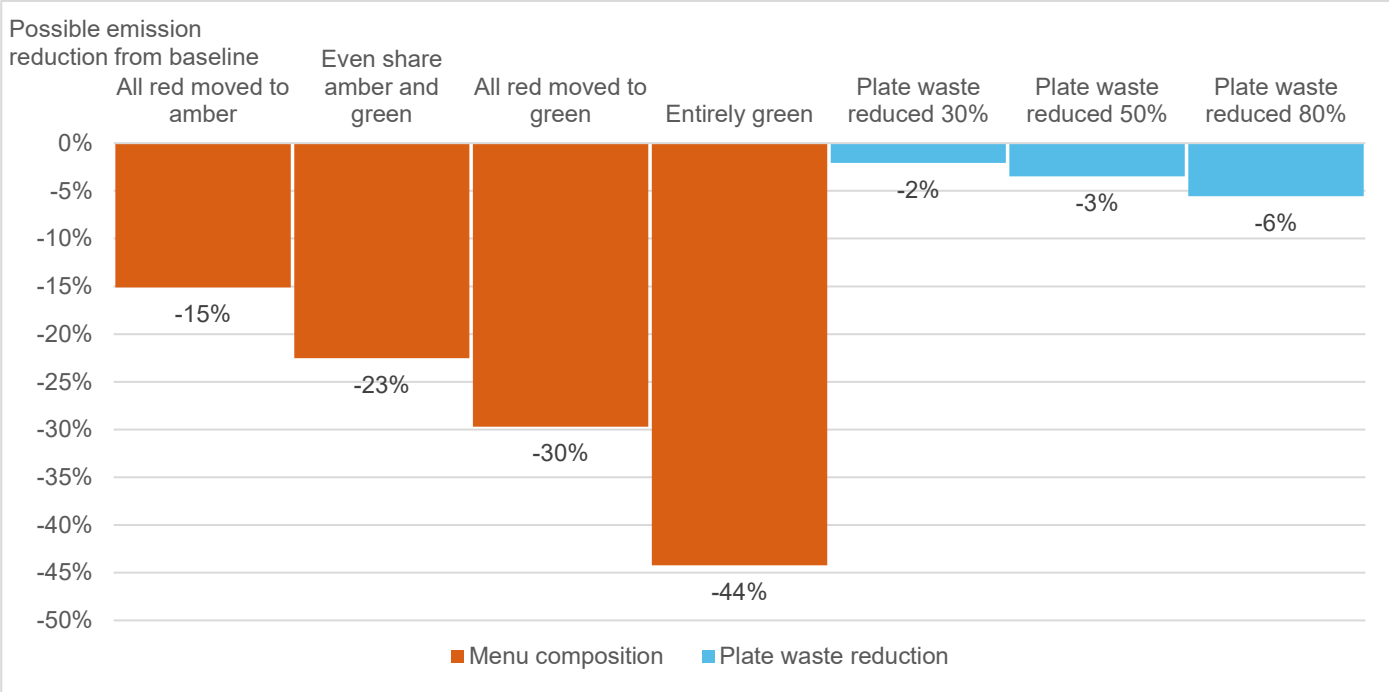

Figure 34: Modelled emission reduction scenarios

10.5.3 Combined menu and food waste scenarios

A third set of scenarios were considered which combined menu changes and waste reduction. These were used for the purposes of sensitivity-testing the relative scale of changes to food waste and menu composition. In particular, they were seeking to address the question of: what if menu changes cause food waste to go up? A move to healthier, more vegetable-heavy meals could entail more rejection, especially in certain categories (such as school children) so this should be considered. The scenarios considered are summarised in Table 26. For simplicity, all scenarios apply evenly to all settings.

Table 84: WASTE-MENU scenario descriptions

Scenario:	Description	Sectors	Share of meals 'green'	Share of meals 'amber'	Share of meals 'red'	Waste:
WASTE-MENU_1	MENU_3 and waste reduction by 50%	All	67%	33%	0%	*-50%*
WASTE-MENU_2	MENU_3 but waste increased by 50%	All	67%	33%	0%	*50%*
WASTE-MENU_3	MENU_4 but waste increases 100%	All	100%	0%	0%	*100%*

Again, these scenarios were based on the average of 500 simulations in each sector for MENU_3 (in WASTE-MENU_1 and WASTE-MENU_2) and for MENU_4 (in WASTE-MENU_3). The results are presented in Table 27.

Table 85: Results of WASTE-MENU scenarios. All values in tCO_2e

Sectors	Areas included	DEFAULT	WASTE-MENU_1	WASTE-MENU_2	WASTE-MENU_3
Education	Schools	951,400	651,600	689,500	564,200
	Further and higher education	335,500	229,700	240,100	194,700
Healthcare	Patients	192,300	129,100	140,100	116,200
	Healthcare staff	300,500	206,400	214,300	173,200
	Care homes	589,300	389,900	439,500	367,900
Other	Prisons	112,800	75,800	82,300	67,300
	Military	31,100	20,900	22,700	18,600
	Civil service office workers	11,900	8,300	8,600	6,900
Total		**2,524,800**	**1,711,700**	**1,837,100**	**1,509,000**
Change from default		**0%**	**-32%**	**-27%**	**-40%**

Comparing the WASTE-MENU results to the MENU results, some striking results are identified. Whilst combining food waste reduction and menu changes (as in WASTE-MENU_1) is of course beneficial, increases in plate waste associated with menu changes do not substantially undermine the carbon savings associated with menu change. In WASTE-MENU_2 and WASTE-MENU_3, where plate waste *increases* are simulated alongside menu changes, the decrease in emissions from the menu charge far outweigh the increase in emissions from waste. Consider WASTE-MENU_2: whereas the associated menu change alone (MENU_3) would reduce emissions by about 30% when compared to DEFAULT, those same menu changes *with* a 50% increase in plate waste would still see an approximately 27% reduction compared to the DEFAULT scenario. This would suggest that concerns about increased food waste should not be considered as a significant deterrent to menu change.

Crucially, this only considers the emissions of food served in the public sector setting. If food is wasted because it is rejected by consumers due to its flavour, being unfamiliar or other preferences, there is a risk that consumers will purchase extra food outside of the food service to compensate. This could either be in no longer purchasing public sector food, leading overall meals served to go down, or purchasing but then wasting it and buying something else subsequently. Whilst this would not impact the emissions in the public food setting, such rebound effects would have a negative impact more generally, and would not be a desirable outcome. As a result, designing low-carbon menus which are palatable and accepted by consumers remains crucial.

10.6 Applications of findings

The purpose of this analysis was to present a high-level overview of what could be achieved through caterers adopting menus based on their GHG footprint, looking at simplified scenarios in which all public-sector food adhered to specific targets or thresholds for the GHG intensity of meals. For caterers looking to enact such actions and adopt a lower-footprint meal service, third party tools could be used to help achieve this.[159]

From a policy perspective, the findings and modelling tool designed here could be used to help establishing targets for caterers. As identified in section 3.8.3, quantified targets set by leaders has been indicated as an enabler of successful SFP. In some places, such as Malmö, specific carbon targets have been applied. If data and tools to help institutions calculate their meal footprint were available, adopting a similar target-based approach could be a way of achieving the savings identified.

11.0 Methodological appendix: Approximate economic impact estimate

A second analysis was undertaken, using as its starting point the expenditure on ingredients and meal services. As with the GHG estimates (see 10.0), these apply findings from the REA (3.0). In this sense, they do not form original analyses of the *nature* of the impact, rather providing an estimate of the indicative scale based on the new estimates of meal service expenditure described in this report.

Two different approaches for which quantitative information was identified were applied. Firstly, based on evidence of the Social Return on Investment (SROI), the monetised impacts of an activity across stakeholders (11.1). Secondly, an estimate of local economic activity across three 'rounds' of spending was explored based on papers which used LM3 methodology (see 11.2). In both cases, the literature evidence used is that presented in the REA (section 3.6).

11.1 Social Return on Investment

11.1.1 Method

11.1.1.1 Literature identified values

The SROI values identified suggest a possible return of about £3 to £6 per £1 which is invested. It should be noted that the scope of the intervention, and the analysis, has varied between these studies. The analysis in Plymouth and Nottinghamshire, for example, is based on returns per £1 additional invested in local food (39). In the East Ayrshire study, the returns were based on the *additional* investment by the council above the cost of

[159] The analysis here relies in large part on work done by de Laurentiis in (4), which can also be accessed here. Other tools proposing a similar function are available, for example here or here.

providing non-Food-for-Life meals.[160] By contrast, the values in Kirklees and Calderdale (52) were based on the costs of administering the FFL programme, with expenditure on food kept constant (although there is a shift towards local procurement as part of the programme). By our understanding, such differences in scope could go some way to explaining the large variance in rates of return: in the high-return East Ayrshire value, for example, the 'investment' is only the marginal cost of procuring local food per meal, although local businesses benefit from the entire expenditure on that food including that cost which has been diverted from a 'conventional' meal service. In Plymouth and Nottinghamshire, the investment accounts for *total* additional expenditure on local food, and the extent to which this had increased, without taking into account the expenditure which would have otherwise been made on 'conventional' food if that were not the case.[161]

Similarly, the scope of what is included across these studies varies: the Kirklees and Calderdale analysis (52) considers elements of local society, such as parents and carers, and local charities/voluntary groups which are not included, to our understanding, in (39). SROI analysis is a subjective exercise, with 'value' having to be defined: it will always be difficult to make exact comparisons.

With these caveats in mind, given the small number of estimates, it was decided that despite the differences in scope, including all values would give a better estimate of the possible range of returns. This range is summarised in Table 86. More details of the sources of these estimates can be found in section 3.6.1. Kirklees and Calderdale are presented both separately and as an average because the original paper presented these as an average in most of its results.

Table 86: Range of identified SROI results

Place	Social return per £ invested
Plymouth	£3.04
Nottinghamshire	£3.11
Calderdale	£3.70
Kirklees	£5.12

[160] **A note on the East Ayrshire value**: the original paper, published in 2008, pre-dated our search boundaries so was not included in the main REA. However, the analysis has been much referred to (though often poorly cited) in the literature identified, particularly grey literature. Where identified, the value has been referred to as £6 return. However, the original analysis suggested £6.19. The reason for this consistent rounding down is unclear. For the purposes of the modelling, the £6.19 figure is used , though for consistency with the REA the range is generally referred to as 'between £3 - £6

[161] In other words: imagine school purchases of apples. From a low-cost, 'conventional' producer, let's say they cost £1,000. From a local producer, £1,130. In both cases (East Ayrshire and Plymouth/Nottinghamshire), £1,130 is spent with the local producer who then derives various benefits from it which are then monetised. In the East Ayrshire example, the SROI is calculated based on the marginal cost, i.e. based on £130, whereas the Plymouth/Nottinghamshire value is based on the total expenditure, or £1,130. These, naturally, lead to very different conclusions in the scale of benefits.

East Ayrshire	£6.19

11.1.1.2 Simulation of range

Based on this, a lower and upper bound of £3.04 and £6.19 was suggested. Of the identified values, an average was identified (mean 4.23, median 3.7), with a first quartile value of 3.11 and third quartile value of 5.12. Based on this, a randomiser was designed which takes a random value between 0 and 100. If between 25 and 75, the SROI value is randomly chosen between the first and third quartiles (3.11 and 5.12). If the random value is below 25, a random value is chosen between the minimum (3.04) and first quartile (3.11), if the random value is above 75, then a random value between the third quartile (5.12) and maximum (6.19) is chosen. This way, the random values roughly reflect the distribution of possible values, with most being concentrated in the lower range.

The outputs of this randomiser were simulated one thousand times. This created a range of SROI values which are presented in Figure 35: though there is a roughly even distribution of .values above 3.4, below this is where more than one-quarter of total values were identified, in line with the Plymouth and Nottinghamshire values both being below 3.2.

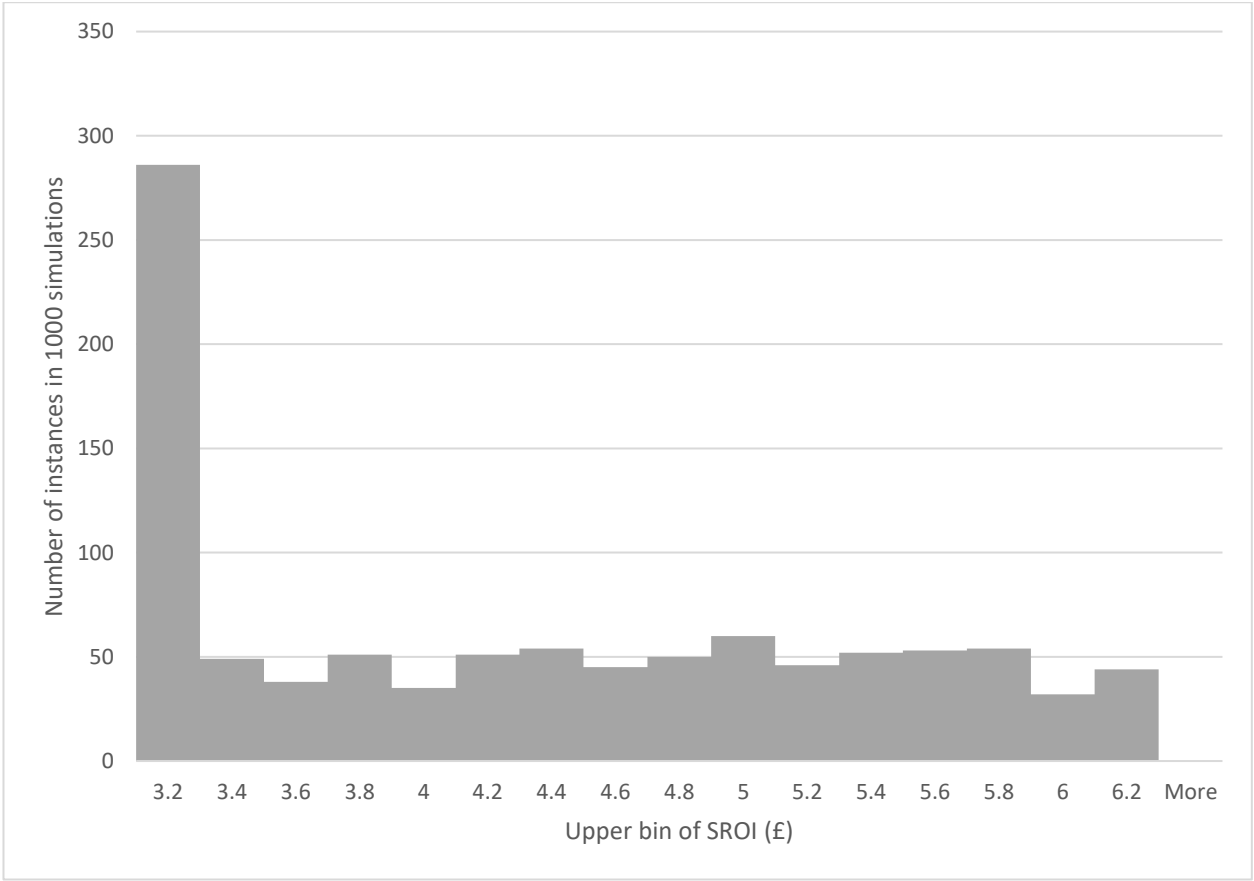

Figure 35: Frequency of SROI values across 1000 simulations

11.1.1.3 Conservatism adjustment

One of the criticisms levelled at SROI analyses (see (3)) in regards to public food procurement is that they do not adequately account for the value of what is already happening, or the contracts which they displace which may not be local/'ecological',

otherwise referred to as the deadweight and displacement. Whilst this criticism may exaggerate this, with deadweight and displacement included in estimates (see the discussion in section 3.6.1), it is suggested in this report that a comparison of SROI which is conducted for both for a 'conventional' and 'alternative' service, ideally before and after an intervention, would be needed to robustly evaluate the difference. Given this limitation, and the limitations due to different scopes of analysis of the original data (11.1.1.1), it was considered prudent to do some conservative adjustments of the values identified.

The analysis in Kirklees and Calderdale (52) includes detailed sensitivity testing in which factors like the deadweight and displacement are increased.[162] As we have not conducted an original SROI but are trying to amalgamate values, we cannot adjust our own deadweight but can use the sensitivity testing conducted in Kirklees and Calderdale to inform a possibly more conservative assumption. Based on the conservative SROI sensitivity testing, (i.e. excluding the scenario in which drop-off decreases), an average reduction of impact by 28% was observed. In situations where the deadweight and displacement are increased, reductions in impact were approximately 38% and 31% respectively. Averaging these different reduction values, an approximate reduction in impact by 32% is used to form a more conservative estimate of the SROI. Each of the simulated values described in 11.1.2 were therefore adjusted downwards by 32% to present an additional, more conservative estimate of impact.

11.1.1.4 Best estimate: local food procurement

As previously mentioned (see 11.1.1.1), the SROI studies identified rely on different scopes for their input value. Some of these scopes – such as the East Ayrshire calculation, looking at the marginal costs of Food for Life procurement – possibly lead to an exaggeration of the results. To try and address this, and form an estimate which is more appropriate to the scope of our analysis, an estimate was made specifically about expenditure on local food procurement. This is based on the SROI conducted in Plymouth and Nottinghamshire, which both used as their input value the total monetary value of spending on local food (see (39)). In this study, the SROI per £ invested was between £3.04 and £3.11. We take the average value of this, £3.08, as the main value. Therefore, whilst there is a large range of values identified as possible returns from 'sustainable food procurement', these values are treated as the 'best estimate' of the impact of more localised procurement from small producers.

11.1.1.5 Returns by stakeholder group

The results were further disaggregated based on which stakeholder group may experience the benefits. This was limited by the fact that different papers had different scopes: the estimate from Kirklees and Calderdale, for example, included health benefits and other benefits to local society such as through volunteering, which were not included in the Nottinghamshire and Plymouth estimates. Because the 'best estimate' was based on the Nottinghamshire and Plymouth estimate (11.1.1.4), it was decided to use the breakdown

[162] The East Ayrshire paper mentions sensitivity testing, but does not detail the results. The Nottinghamshire and Plymouth paper (39) does not include details of a sensitivity analysis. Whilst it is a limitation to base our adjustments on just one publication, it was where the most detail was identified.

by stakeholder provided in that paper. It should be noted that the limited scope of this analysis means that it may over-exaggerate how much monetised social return is going to the listed stakeholders, as in reality the benefits could be more widely dispersed. It should also be noted that the environmental benefit is likely to be an understatement, given the limitations in environmental returns estimates (detailed in section 3.6.1).

The share of social returns by stakeholder is detailed in Table 87.

Table 87: Share of social returns by stakeholder

Stakeholder group	Nottinghamshire	Plymouth	Average
Local businesses	69%	50%	**60%**
Local employees	15%	21%	**18%**
Central government	10%	14%	**12%**
Local government	3%	7%	**5%**
Environment*	2%	8%	**5%**

Environment estimates are likely to be an understatement due to limited scope which could be quantified.

11.1.2 Expenditure figures

Expenditure figures used per subsector are those described in section 9.2. Those figures refer to the total food and catering service expenditure: However, the SROI values typically refer to investment in ingredients. As a result, the expenditure values were adjusted.

Two sources for the approximate share of food service spend on ingredients were identified. Firstly, the average of the 'cost sector' values identified in WRAP's previous work (presented in 9.2) is used. For simplicity, the average of these values is taken and used across all sectors: this suggests that approximately 61% of the cost of food service is in the ingredients and sourcing itself, with 34% being spent on labour.

Another estimate, cited in the EU's GPP Criteria for Public Procurement indicates that a slightly smaller share is spent on procurement of ingredients.[163] The value presented in that paper for the UK, and the average for 7 EU member states (including the UK) is presented in Table 88..

Since it is not clear if there are any reasons to suppose one of these estimates is more robust than the other, the average of the UK estimate from each is taken (i.e. for procurement costs, 61% from WRAP and 44% from the EU GPP figure). This suggests that just over half of expenditure is on ingredients, and over 90% is on ingredients and labour (Table 88).

[163] https://susproc.jrc.ec.europa.eu/product-bureau/sites/default/files/contentype/product_group_documents/1581683081/170127_EU%20GPP%20Food%20catering%20criteria_TR2.0.pdf

Table 88: Combined share of costs by cost centre

Cost centre	UK (EU GPP)	Avg. 7 EU member states (EU GPP)	UK (WRAP)	Average UK
Labour costs	47%	44%	34%	**41%**
Ingredient costs	44%	46%	61%	**52%**
Other production costs	5%	6%	4%	5%
Management costs	4%	4%	1%	2%

Based on this, it is possible to combine the total food and catering expenditure estimates from 9.2 and share by area from Table 88 into an estimate of ingredient expenditure. This is presented in Table 89.

Table 89: Food procurement expenditure, by sector

Sector	Food and catering expenditure (£ thousand)	Ingredient expenditure (£ thousand)
Education	£2,457,100	£1,285,600
Healthcare	£2,323,800	£1,215,900
Other	£123,800	£64,800

11.1.3 SROI range

Based on the literature-identified SROI range above, and expenditure on ingredients (see 9.2), it is possible to derive some rough, approximate estimates of the social benefits of adjusting broadly-defined 'sustainable food procurement' strategies.

These calculations operate on the basis of an Excel-based tool. The key user input to define is the *share* of current food expenditure which could be diverted to 'sustainable' procurement (SFP). This does not account for value already created by the *existing* share which is 'sustainably' procured, such as those settings which already have Food for Life Served Here accreditation, as it was not possible to estimate this for each sector with current data availability. So a diversion of 20% of total expenditure to SFP could equally mean a setting with no procurement policy diverting 20% of their budget to SFP, or an institution which already spends 30% of its budget moving up to 50% being spent on SFP.

Using the estimated food expenditure and the share proposed for sustainable food, it is possible to derive the value which is being diverted to sustainable sourcing. The share can be determined for each sector separately.

This value is then multiplied by the various SROI estimates outlined in 11.1.1. From this, a range of estimates are produced: for each the *main* (11.1.1.2) and *conservative* (11.1.1.3) estimates, alongside a single *best estimate* (11.1.1.4). These include a minimum, first quartile, average, third quartile and absolute maximum. These are presented in Table 90.

Table 90: SROI (£ per £ food budget invested)

Value	Main	Conservative adjustment	Best estimate
Minimum	3.04	2.06	
First quartile	3.11	2.10	
Mean	4.25	2.87	3.08
Third quartile	5.15	3.48	
Maximum	6.19	4.19	

As the minimum and, particularly maximum values could be the result of methodological differences, focus is given to those in the interquartile range.

11.1.4 Results

The purpose of this exercise was to create an interactive tool for subsequent use. The exact monetary returns are largely dependent on the input value chosen for the share of current ingredient expenditure which could be diverted to sustainable sourcing. The stated results are based on a single scenario in which **50% of current food expenditure could be diverted to 'sustainable' food in all sectors.** This is an exploratory calculation to identify the possible scale of impact.

The results of the *main* scenario, *conservative*-adjusted scenario and *best estimate* are summarised in Figure 36.

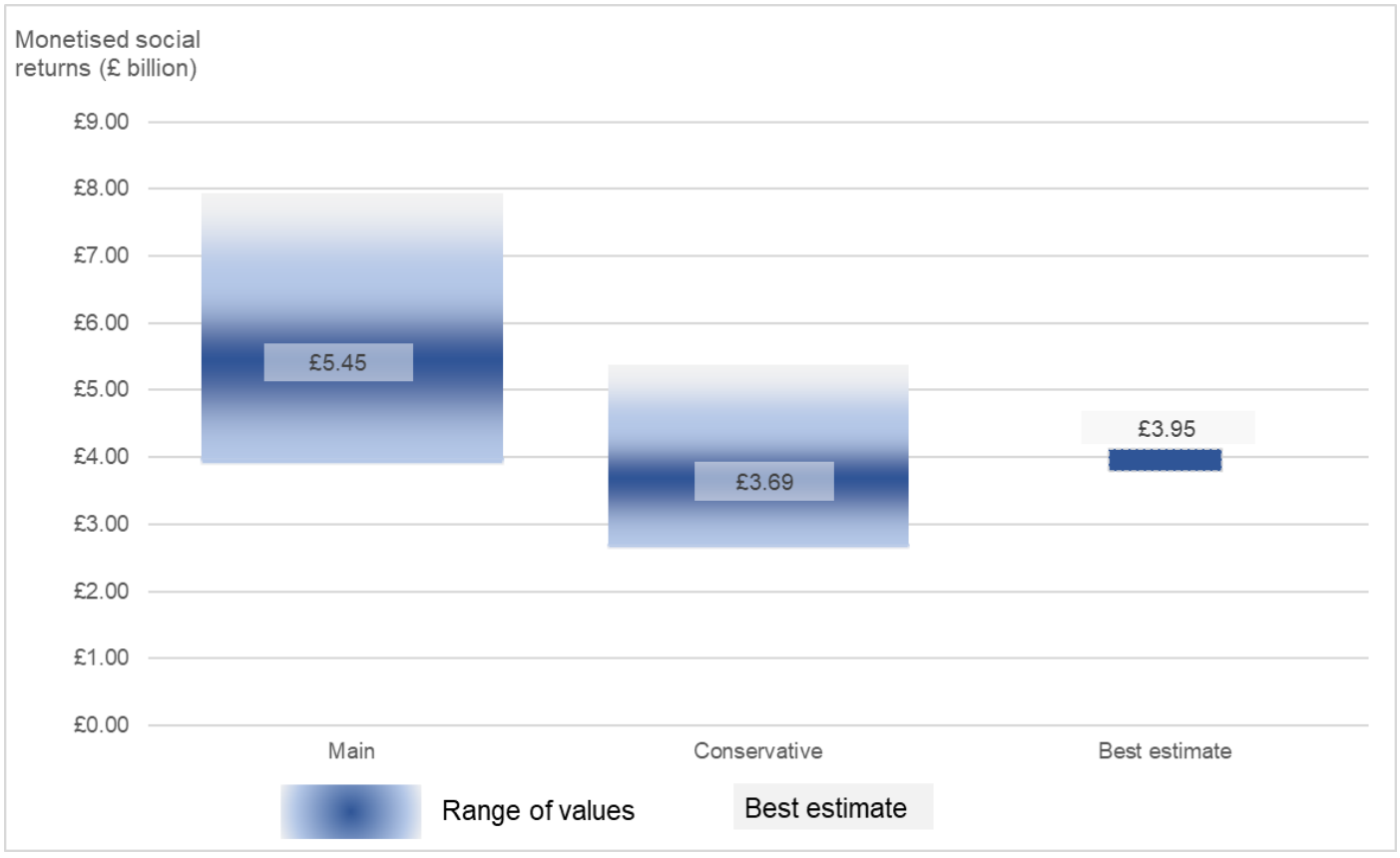

Figure 36: Range of SROI values, 50% of budget on SFP

This suggests that were 50% of the ingredient budget diverted (i.e. about £1.3 billion) to broadly-defined ‘sustainable food procurement’, such as that represented by the Food for Life Served Here standard, this would lead to between £2.6 and £7.9 billion, with a ‘best estimate’ of approximately £3.95 billion. The range of values are summarised Table 91.

Table 91: Range of SROI estimates, 50% of budget on SFP. Values in billion GBP.

Value (all £ billion)	Main	Conservative adjustment	Best estimate
Minimum	£3.90	£2.64	
First quartile	£3.99	£2.70	
Mean	**£5.45**	**£3.69**	**£3.95**
Third quartile	£6.61	£4.47	
Maximum	£7.94	£5.37	

This was further adjusted by the share of returns attributed to each stakeholder group (see 11.1.1.5). The results are presented in Figure 37. This suggests that local businesses could benefit with over £2 billion in monetised social benefits with more widespread SFP adoption, with central and local governments also benefitting with approximately £470 million and £200 million in returns respectively. Given that the proposed expenditure in this scenario is approximately £1.3 billion, this suggests that around half of the expenditure could be recouped in benefits directly by the central and local government. Given the substantial range and uncertainty, the costs could in theory be fully recovered – and this does not include possible further benefits such as those relating to better diet or health which could influence, for example, healthcare expenditure,

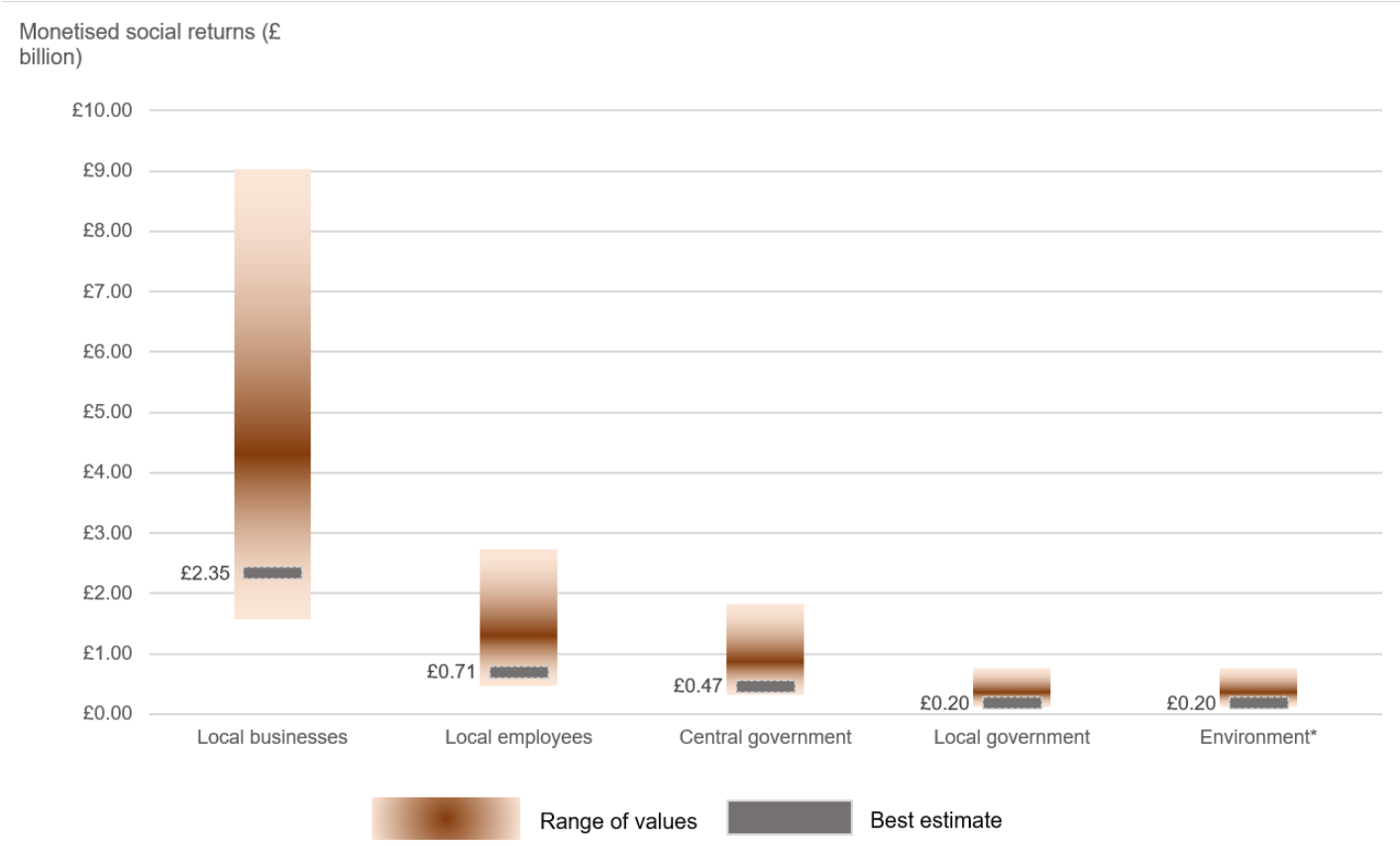

Figure 37: Indicative monetised social returns by stakeholder group
****Environment estimates are likely to be an understatement due to limited scope which could be quantified.***

11.2 LM3 calculation

A second set of calculations were conducted using as a starting point the evidence identified on Local Economic Multiplier in the literature (LM3). This approach scales those values by regionally-adjusted expenditure figures (see 9.3).

11.2.1 Method

Local economic multiplier calculations were identified across a range of examples, detailed in section 3.6.2. These represent a range of different interventions, as well as a range of scopes, with some focusing on ingredient procurement and others on the total food service expenditure. Despite these differences, for the purposes of estimating a rough approximation of local economic activity, the averages of all values were taken. Examples were classed as either being an 'SFP intervention' in the case of Food for Life, local food and organic food, or 'conventional' based on four 'conventional' meal services in (13) from the UK, Serbia, Greece and Croatia. From these figures, a minimum, mean and maximum value were derived. These values are presented in Table 92.

Table 92: Range of LM3 values. Total activity.

	SFP Intervention	Conventional
Minimum	1.8	1.6
Average	2.1	2.1
Maximum	2.5	2.3

These values were then multiplied by the estimated food service expenditure for each region (9.3). Rather than looking at a specific subset of food service expenditure, such as ingredient expenditure, this considers the entire value, taking on board the point raised in (13) that in some cases local *staff* expenditure can be important for local economic activity. Unlike the SROI calculations in section 11.1, it does not make any adjustments for the share of food procurement which is local or otherwise 'sustainable'. This is because the values the analysis is based on are real examples of local economic activity based on achieved local food and staff expenditure, rather than a theoretical ideal maximum (such as 100% of food and staff expenditure being local). It is not known exactly what share is 'local' in each piece of evidence. In this way, they represent real examples of 'achieved' local/sustainable procurement, which make them suitable proxies for estimating a 'real' or 'likely' outcome. There is more description of the LM3 studies used in section 3.6.2.

Because LM3 calculations are based on a £1 investment in food and catering services, the first 'round' of local economic activity is already accounted for in the values stated. In order to estimate the *additional* local economic activity, this initial investment was removed from a series of calculations. These are stated in Table 93. The results contain both *total* and *additional* calculations.

Table 93: Range of LM3 values. Additional activity.

	SFP Intervention	Conventional
Minimum	0.8	0.6
Average	1.1	1.1
Maximum	1.5	1.3

11.2.2 Results

The LM3 values were combined with regional expenditure to form estimates of local economic activity. Firstly, the *total* economic activity, which includes the initial investment in food and catering services by the procuring bodies. This is presented in Table 94.

Table 94: Estimated local economic activity from SFP. Total economic activity.

	SFP interventions	
Region	**Range**	**Average**
South East England	£1.4bn to £2.0bn	Approximately £1.7bn
London	£1.2bn to £1.7bn	Approximately £1.4bn
North West England	£1.2bn to £1.7bn	Approximately £1.5bn
East of England	£0.9bn to £1.3bn	Approximately £1.1bn
West Midlands	£0.9bn to £1.3bn	Approximately £1.1bn
South West England	£1.0bn to £1.4bn	Approximately £1.2bn
Yorkshire and the Humber	£0.9bn to £1.3bn	Approximately £1.1bn
East Midlands	£0.7bn to £1.0bn	Approximately £0.9bn
North East England	£0.5bn to £0.7bn	Approximately £0.6bn
Total	**£8.8bn to £12.3bn**	**Approximately £10.5bn**

This is an estimate of the *total* local economic activity, i.e. including the initial expenditure by procuring bodies. An estimate of the *additional* economic activity, i.e. the local economic activity minus the initial investment, is presented in Table 95. This suggests that, overall, approximately £5.6bn extra economic activity could be achieved through SFP-related interventions.

Table 95: Estimated additional local economic activity from SFP

	SFP interventions	
Region	**Range**	**Average**
South East England	£0.6bn to £1.2bn	Approximately £0.9bn
London	£0.5bn to £1.0bn	Approximately £0.8bn

North West England	£0.6bn to £1.0bn	Approximately £0.8bn
East of England	£0.4bn to £0.8bn	Approximately £0.6bn
West Midlands	£0.4bn to £0.8bn	Approximately £0.6bn
South West England	£0.4bn to £0.8bn	Approximately £0.6bn
Yorkshire and the Humber	£0.4bn to £0.8bn	Approximately £0.6bn
East Midlands	£0.3bn to £0.6bn	Approximately £0.5bn
North East England	£0.2bn to £0.4bn	Approximately £0.3bn
Total	**£3.9bn to £7.4bn**	**Approximately £5.6bn**

However, based on the findings of (13), there is a substantial local economic benefit to having food service in the first place: as they found, even 'conventional' food services can generate local economic activity, in particular due to local staff or procurement of local ingredients for practical and cost purposes rather than based on a specific policy. Based on the LM3 values for 'conventional' food services, between £7.8bn - £11.2bn of total local economic activity could *already be happening* in a situation of 'conventional' food services (discounting initial investment, additional economic activity: £2.9bn - £6.3bn). In this case. This suggests that the *additional* benefit of SFP-related interventions, in terms of local economic activity, is between £437 - £1,079 million in local economic activity. This range is displayed for each region in Figure 38.

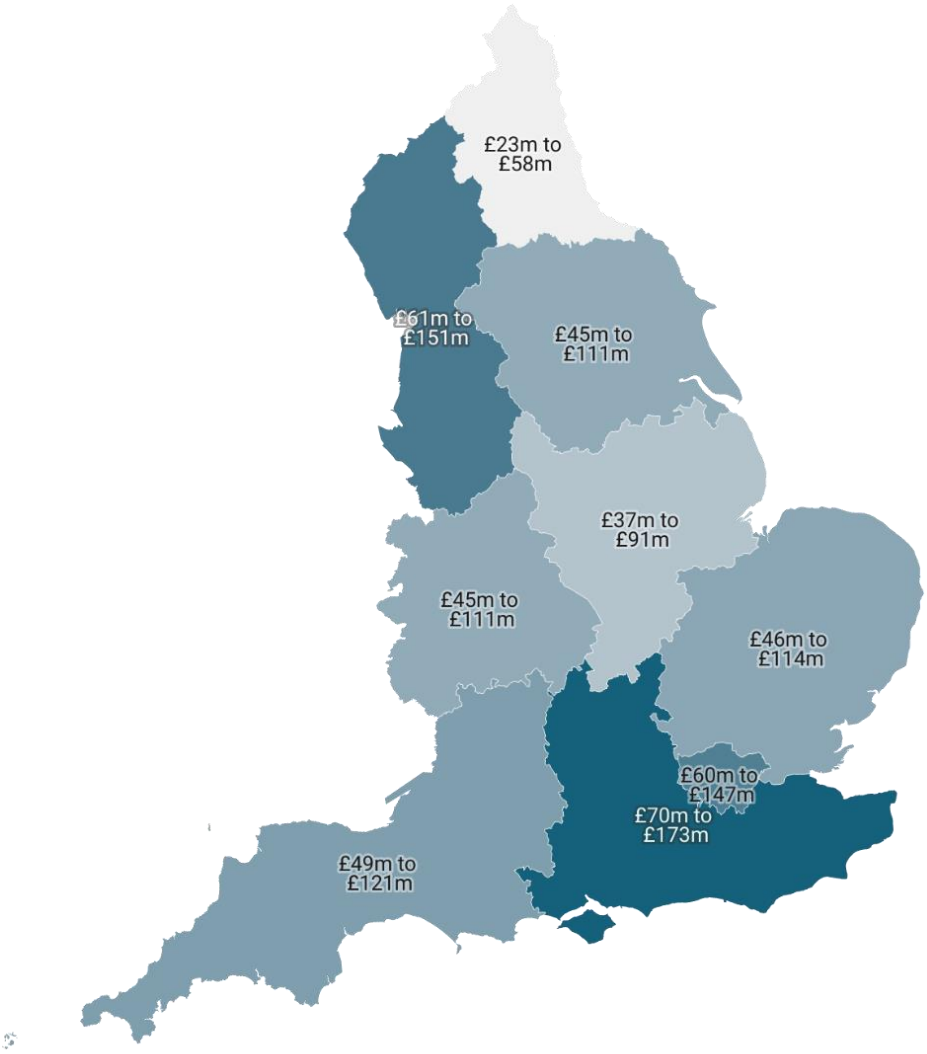

Figure 38: Approximate additional economic activity associated with moving to SFP, by region

These conclusions are based in large part on the findings of (13) and are uncertain: as highlighted in the REA (see 3.6.2), more comparative studies would be beneficial to identify the difference between so-called 'conventional' procurement schemes and SFP-related ones. Nonetheless, there is clear potential for local procurement to generate substantial additional economic activity in all regions.

12.0 Appendix: Interviews

Over the course of late 2021, interviews were held with ten individuals representing a range of stakeholders involved in sustainable food procurement in the UK. These interviews were part of the evidence assessment's search process (see 7.0) and were explicitly for the purpose of identifying evidence on *outcomes* of which interviewees were aware of and made use of in their work. The content of the interviews were not planned as part of the project's findings, and so have not been integrated into the main report. Nonetheless, there were some interesting points raised which are documented here for transparency. Many of the themes picked up in the interviews draw clear parallels to the issues raised throughout the Rapid Evidence Assessment.

Interviewees identified a **need for nuance** and a **holistic approach** to the sustainability question. Both encompassing all three ‘pillars’ of sustainability (environmental, economic, social) but also within those issues. Narrow metrics (such as only looking at greenhouse gases) could be problematic and encourage intensive practices which then cause other issues, such as increased biodiversity loss. They identified a need to recognise these challenges and where nuances may exist between competing demands. As part of this, they identified the need for **clear definitions.**

Many of those interviewed also highlighted the need for increased **knowledge and awareness** within all stakeholders. The employers and procuring bodies need to understand food procurement related issues and what they can do about them. Catering staff should be upskilled and trained to support changes. Consumers, too, need better awareness about sustainability and its relationship with food. Some highlighted fears of consumers rejecting menu changes, including, in the context of schools, the parents rejecting changes. Related to this was the importance of **competing options** such as local shops in and around the public institution, which need to also be selling healthy food.

Interviewees highlighted **cost pressures** and the challenges this introduces, with quality of food procured given a lower priority than the cost. However, some highlighted that locally procured food need not be more expensive with adjustments to menus.

The importance of **contract design** to support smaller suppliers was also mentioned, with practices such as smaller contracts, open tendering process and clear information being some ways in which smaller or ecological suppliers could be used. Having agile or flexible contracts was also proposed as a possible improvement.

Lastly, many raised the importance of **data.** They suggested there is insufficient data related to public sector procurement and some metrics (such as greenhouse gases) may not yet be being applied consistently. A related point was made about **enforcement**, with the suggestion that at present the Government Buying Standards has insufficient monitoring and enforcement of compliance, the lack of which means there is no strong incentive for public bodies to improve their procurement processes.