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Reducing food waste and food insecurity in the UK: The architecture of surplus food distribution supply chain in addressing the Sustainable Development Goals (Goal 2 and 12.3) at a city level

Shova Thapa Karki, Alice C. T. Bennett and, Jyoti L. Mishra

Abstract

The paradox that tonnes of food is wasted while people go hungry has raised concern from national and international authorities. In developed countries, reducing these problems has focused on surplus food distribution as a 'win-win' solution contributing to sustainable development goals. While the existing literature acknowledges the role of third-sector organisations, research on the supply chain of surplus food distribution and the coordination among actors is limited. This research explores actors and organisations in the value chain of surplus food distribution at the city level. Based on semi-structured interviews and participant observation, our findings highlight the need for a coordinated effort between actors as an essential arrangement to capture the value of surplus food. Despite the close cooperation, hierarchical power relationships exist between organisations in the supply chain. We unpack challenges in the surplus food supply chain, such as lack of a legislative framework for food donations and organisational sustainability issues that have forced third-sector organisations to work independently to reduce the uncertainties of food quality and quantity. We shed light on the practical implications by highlighting how multiple stakeholders could improve the efficiency of surplus food distribution.

Keywords – Surplus food distribution, Food waste, Sustainable development goals (SDGs), Zero Hunger, Supply chain management, City level,

1. Introduction

The recognition of food waste as a pressing global sustainability challenge has received increased attention from national and international commitments (Lemaire and Limbourg 2019, Papargyropoulou et al. 2014). The Sustainable Development Goal (SDG) for sustainable consumption and production (SDG 12 – 12.3) aims to "halve per capita global food waste by 2030 at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses" (UN 2015:22). Similarly, the Courtauld Commitment 2025 (C2025) in the UK brings together organisations across the food sector to make food and drink production and consumption more sustainable and develop solutions to cut related waste by at least one-fifth in 10 years (WRAP 2018). These commitments are particularly important for developed countries where the distribution of food loss and food waste is not only high (Gustavsson et al. 2011, Lundqvist et al. 2008), but there is also an unexpectedly high level of food insecurity (Gentilini 2013). To tackle this paradox of food waste and food insecurity, donation and distribution of surplus food to people in need has been recognised as a potential solution to both problems in academic and policy debates (Garrone et al. 2014a, Mourad 2016).

Framed within the food waste mitigation perspective, surplus food distribution is positioned at the junction of food systems, social welfare and third-sector systems (Galli et al. 2019). Given the multifaceted nature of the food waste and food insecurity problem, collaboration and coordinated efforts between public, private, and third-sector actors in the supply chain is essential (Priefer et al. 2016, Thyberg and Tonjes 2016). Although an increasing role is played by third-sector organisations in surplus food distribution (Baglioni et al. 2017, Garrone et al. 2014b), some researchers have criticised the involvement of third-sector organisations in reducing pressure on governments to address the structural issues associated with food waste and food poverty (Arcuri 2019, Caplan 2017). Despite these critics, the role played by third-sector organisations in surplus food distribution has been acknowledged by national and international institutions and documented in research widely (Bramanti et al. 2017). Given their prominent role, they are considered as social innovation filling various gaps in the welfare system (Baglioni, calo et al. 2017).

Extant literature on third-sector organisations and surplus food distribution, however, have been limited to the micro level involving single organisations and their arrangement of surplus food distribution (Alexander and Smaje 2008). Studies including several organisations have broadened the scope of analysis by exploring the value of surplus food (Blake 2019a) and management of surplus food (Midgley 2014), and providing an overview of initiatives at a city level (Facchini et al. 2018). Similarly, studies on surplus food interventions, have focused on non-profit actors examining their relationships with different stakeholders and the importance of intellectual capital to reduce barriers (Baglioni et al. 2017, Bramanti et al. 2017). These studies reveal surplus distribution as a private arrangement between organisations and third-sector organisations playing brokerage role between food donors and recipients. Similarly, given the conflicting goals of the organisations involved, there are inherent tensions between actors leading to various challenges and inefficient operations (Bramanti et al. 2017, Tarasuk and Eakin 2003).

To improve the efficiency of the supply chain, it is essential to understand actors and their relationships in the supply chain for the mobilisation of actors and also to develop a shared vision for sustainable development (Derqui et al. 2016, Sonnino and McWilliam 2011). However, research on the supply chain of surplus food distribution and the coordination among actors is limited. Given the complexity in relationships among actors in different stages of supply chain, there is a need to adopt a macro view for a holistic analysis of actors involved, unpack the mechanism of surplus food distribution, and challenges they face in the process. Mapping actors and their interdependencies in the supply chain enables unpacking the areas of potential conflicts and synergies, which are important to identify innovative solutions for addressing SDGs in the food waste context (Garrone et al. 2014b, Halloran et al. 2014).

Given these research gaps, our aim in this paper is to take a macro view to examine surplus food distribution supply chain at the city level. Focusing on cities is important because of their increasing significance in terms of creativity, innovations and grassroots movements along with the pressing socio-economic and sustainability challenges they face (Mulas et al. 2015). Cities are also a prime focus for addressing the SDGs to meet the target of cities and communities being

inclusive, safe, resilient and sustainable (Goal 11) (UNDP 2016). Furthermore, by taking the city as our unit of analysis we depart from existing micro-level studies that focus on investigating one organisation, existing initiatives and the value and meaning of surplus food. Adopting a macro view, we explore the flow of surplus food from the commercial and non-commercial supply chains involving multiple actors and stages. This will enable identifying and addressing challenges in improving the surplus food supply chain, which is often considered inefficient in reaching wider populations (Bramanti et al. 2017, Diaz-Ruiz et al. 2019). Our research is guided by the following questions:

1. How do different actors in the supply chain coordinate surplus food distribution?
2. What challenges do they face at different stages of the supply chain and with what implications?

Our findings contribute to the literature on food waste prevention, surplus food distribution, and third-sector organisations in four ways. First, taking a macro view, our analysis maps the main actors and the coordination of surplus food distribution at a city level. While our findings show cooperation and collaboration between them, there are also hierarchical power relationships between actors in each group. Second, our findings highlight the existence of partnership involving the main actors in surplus food distribution and the enabling role played by the partnership in facilitating the management of surplus food. The revelation of such collaborative practice challenges existing studies that have identified surplus food distribution as an individual arrangement only. Third, our research advances the existing studies on third-sector organisations involvement in surplus food distribution, by unpacking revenue models and challenges faced by individual actors. The crucial need for the third-sector organisations to survive and continue providing food to beneficiaries forces organisations to adopt various revenue models. These revenue models lead to competing tensions, exclusions and inherent inefficiencies in accessing and distributing surplus food. These issues are pertinent in deriving appropriate actions and minimising challenges to ensure the sustainability of the supply chain. Fourth, we highlight the role of surplus food distribution in addressing SDG 2 and 12.3 through Triple Bottom Line values

(Seuring and Müller 2008), where involvement of local councils, retailers, charities and social enterprises could generate multiple benefits for a resilient city. Finally, our findings have implications for policy by highlighting the importance of policy framework protecting actors and facilitating food donation to reduce a number of challenges highlighted in this study and other studies.

With this brief introduction, the remaining paper is structured as follows. In the next section, we review extant literature around the debates on food waste and food poverty, surplus food distribution as the potential solution, and the role of the third-sector organisations. Section 3 provides the description of the study context, our chosen methodological approach and data analysis strategies. This is followed by findings, and discussions in Section 4. Finally, we conclude with our contributions and implications shading light on future research in Section 5.

2. Literature Review

2.1 Food waste, food poverty and surplus food distribution as the 'win-win' solution

Food waste refers to the decrease in food for human consumption in the supply chain through loss, disposal, damage or diversion away from the human supply chain for other purposes (FAO 2014, Stuart 2009). The complexity of coordinating stakeholders in the food supply chain is the main cause of the increase in food wastage (Govindan 2018). As such, food is wasted at all stages of the food supply chain (FSC) from the initial stages of production to the final stage of consumption. Food loss at the initial stages arises due to the lack of effective physical infrastructure and technologies for production, post-harvesting and processing (Gustavsson et al. 2011). Food wastage at the final stages of the FSC is through retail, hospitality, and consumption (Parfitt et al. 2010). With the loss of one-third of edible food produced for human consumption, food waste has economic, environmental and social implications (FAO 2013, Papargyropoulou et al. 2014). The high amount of food waste and rising food insecurity in developed countries, as such, is a paradox of 'scarcity within abundance' (Galli et al. 2019:290).

According to the FAO, *"food security exists when all people at all times have physical, social, and economic access to sufficient, safe and nutritious food to meet dietary needs and food preferences for an active and healthy life"* (FAO 2009:8). In this regard, food insecurity concerns the availability of food – unlimited and certain; quality of food – nutritious and safe; and accessibility of food – sufficient and affordable (Garratt 2015). In developed countries, the issue of food poverty[1] has received less attention than 'poverty' and rarely been linked to the issue of well-being (Baglioni et al. 2017). As a result of this, the problem of food waste and food insecurity is framed from a food waste mitigation perspective with solutions focusing on two aspects with specific contributions towards addressing SDGs – food banks as a solution to food poverty and reducing hunger (SDG 2) and food distribution as a solution to food waste and associated environmental impacts (SDG 12.3) (Champions12.3 , Pollard and Booth 2019). Food banks, as an integral part of the lived experience of poverty in developed countries have been researched extensively, focusing on the rise of food banks, the impacts of seeking food assistance on users, and the inequalities it mediates through grouping of users as 'others' (Garratt 2015, Middleton et al. 2018, Purdam et al. 2016, Tarasuk and Eakin 2003, van der Horst et al. 2014). In this research, we focus on food distribution as a solution to the problems of food waste and poverty.

Food distribution refers to giving away fit-for-purpose food voluntarily to food aid organisations to redistribute to people in need (Lipsinki et al. 2013). It is important to recognise that the food waste hierarchy (Papargyropoulou et al. 2014) acknowledges prevention of food waste at the source as the preferred option for reducing food waste. However, food waste is unavoidable at different stages of the supply chain due to multiple factors related to crops that are not harvested or overproduced, unsold food from retailers due to demand and supply forecasts, aesthetic issues, incorrect or damaged packaging, and cancelled orders (Garrone et al. 2014b, Priefer et al. 2016). As such, the second-best strategy to prevent food waste has been the distribution of food for human consumption through donations (Alexander and Smaje 2008, Deloitte 2014). Food

[1] In this paper, we use food insecurity and food poverty interchangeably, given that in English debates food poverty is generally used to refer to food insecurity (Midgley, 2012).

distribution could reduce food waste by shifting the term and meaning of food from 'waste food' to 'surplus food'. Surplus food refers to food that is edible, safe and reusable but excluded by producers and retailers and not sold to or consumed by the intended customers (Garrone et al. 2014b). In this shift, food flows from the commercial supply chain to non-commercial networks, and the value being sought changes from profit generation to wider social, economic and nutritional values (Blake 2019a).

Distribution of surplus food through donations to food charities has been recognised as an effective means to tackle the problem of food insecurity and food waste in many developed countries, such as the US, Australia, Canada and European countries (Baglioni et al. 2017, Midgley 2014). These have been supported by legislative measures. For instance, the US Environmental Protection Agency has developed an explicit waste hierarchy framework addressing food waste and implemented the 'Good Samaritan Law' to facilitate food donation by protecting retailers and third-sector organisations (Mourad 2016). In the EU, only Italy has extended this law facilitating food donations whereas Belgium and France have laws that obliges supermarkets to donate surplus food to charities, receiving tax credits in return (Deloitte 2014). Similarly, Spain has introduced corporate tax credits for companies covering the fair market value of their food donations (De Pieri et al. 2017). However, while governments, the commercial sector and third-sector organisations see surplus food distribution as a 'win-win' solution to achieving SDGs (Pollard and Booth 2019), researchers have argued that such framing neither reduces food waste nor food insecurity (Caplan 2017, Mourad 2016).

2.2 Role of third-sector organisations in surplus food distribution

Third-sector organisations play an intermediary role in distributing surplus food between food donors and end-users, i.e. communities or household in need (Alexander and Smaje 2008, Baglioni et al. 2017, Blake 2019a, Mourad 2016). These organisations differ in terms of their role in food distribution: logistics organisations collect surplus food and distribute to other organisations but not to end users, front-line organisations provide surplus food to end users, and

hybrid organisations collect as well as provide surplus food to end users (Bramanti et al. 2017). Similarly, the distribution of surplus food through these organisations has taken various forms, such as social supermarkets, food pantries, soup kitchens, social cafes, and community food centres (Blake 2019a, Bramanti et al. 2017). In providing surplus food to the beneficiaries, three practices are predominantly common among the organisations. These include social eating (eating meals prepared by the organisations in a communal setting, such as cafes); social distribution (providing food to be cooked at home or eaten at home, such as ready meals, emergency food parcels, and food from food pantries), and social cooking (communal cooking and eating sessions with a specific focus on education and awareness in cooking) (Blake 2019a). Despite these understandings (Table 1), research is particularly scarce on the nature, characteristics and interventions of third-sector organisations in the surplus food supply chain (Bramanti et al. 2017).

(Table 1 here)

Table 1 provides an overview of existing literature on third-sector organisations and surplus food distribution. The table shows that existing studies are skewed towards charity organisations involved in surplus distribution, the management of surplus food distribution, the relationships between the main stakeholders (donors, communities and public actors), and organisational challenges. In the UK context, Alexander and Smaje (2008) is the first study[2] exploring the role of FareShare as a national charity organisation and find tensions and hierarchical power relationships between organisations involved. Recent studies in the UK have focused on multiple organisations, broadening the scope of analysis. For instance, Midgley (2014) explores key issues in manging surplus food and the importance of social framing in surplus food distribution. Looking at the city-wide initiatives in London, Facchini et al. (2018) report the inefficiency of the current surplus food distribution initiatives due to the fragmented nature of such efforts and organisations working independently from each other. Blake (2019a), however, explores the

[2] Migdley (2014) refers to Hawkes and Webster (2000) as the first study looking into surplus food distribution but states that it was carried out in a period when only three food distribution organisations existed in the whole of the UK.

multiple ontologies of surplus food and argues that the meanings, values, and outcomes associated with surplus food change as a result of different practices involved in the flow of food from the commercial to the non-commercial sector.

Studies outside the UK mostly comes from other European countries[3] where the focus has been on non-profit organisations' role in surplus food distribution. In a case study of Italy and Germany, Baglioni et al. (2017b) emphasise the importance of trust-based relationships between non-profit organisations and three important stakeholders of surplus food distribution – food donors, policymakers, and end users. Looking from a social innovation perspective, Baglioni et al. (2017) argue that third-sector organisations are creating new relationships to solve the problem of food waste and food poverty by filling various unmet needs, such as the nutritional needs of end-users, social responsibility needs of retailers, and welfare needs, by supporting public actors. Going one step further, Bramanti et al. (2017) in their case study of four countries in the EU, i.e. Italy, France, Germany and Spain, identify strengths and weaknesses regarding three intellectual capitals, i.e. relational, structural, and human, and their importance for non-profit organisations in improving the efficiency of surplus food distribution. Finally, DePieri et al (2017) explore the regulatory framework of surplus food recovery and distribution affecting various stakeholders and their capabilities.

While the studies listed in Table 1 contribute to an understanding of organisations involved, nature of existing interventions and challenges faced by the organisations in surplus food distribution, this study adopts a macro approach in mapping actors and organisations and their interdependencies in the supply chain of surplus food distribution. As noted by Govindan (2018) food loss and waste is a supply chain issue, and the complexity associated with reducing food waste requires the involvement and cooperation of a variety of actors and organisations in the supply chain rather than individual groups tackling the issue (Diaz-Ruiz et al. 2019, Facchini et al. 2018, Lipsinki et al. 2013). Given that various types of organisations are involved, such as charities,

[3] These papers come from a larger research project on Foodsaving in Europe (Baglioni Calo et al. 2017).

private, social enterprises, established and new start-ups in different stages of the supply chain (Facchini et al. 2018, Harvey et al. 2019), it is important to look at the whole supply chain to identify the main players, what roles each are playing and how these actors are coordinating surplus food distribution with what barriers and constraints.

Therefore, in this research we aim to fill this gap and explore in-depth the actors and their interdependencies in coordinating the surplus food distribution in the supply chain. We explore this in the UK context, where data is limited and fragmented (Midgley 2014), despite a high percentage of food insecurity, i.e. around 10.1% of the people aged 15 and over were food insecure in 2014 (Loopstra et al. 2015). Similarly, there is a growing number of people in food poverty. For instance, the Trussell Trust, a Christian social action charity running the largest food bank network in the UK, supplied 1,332,952 emergency food supplies to people in crisis in 2017-18 (Trussell Trust 2018). Various issues such as rising food costs and unemployment, but particularly neo-liberal policies associated with welfare reforms (delay in payments, errors in benefit distribution, and changes in benefit schemes) have created hardship pushing people to rely on food banks (Blake 2019b, Garratt 2015, Purdam et al. 2016). In these contexts, understanding the existing organisations and processes at the city level could inform food security and food waste policy and provide valuable insights on the role of cities in addressing several SDGs, i.e. SDG 2, SDG 11, and SDG 12 in the UK context.

3 Methodology

3.1 Study context

The context of our research is a coastal city in South East England. The city is at the vanguard when it comes to adopting sustainability strategies. It is the first city in the UK to write a food strategy, which has received traction from other cities for transferrable lessons. Moreover, the council developed a new economic strategy in 2018 to be one of the sustainable cities in the UK focusing on the circular economy and community engagement for resilience. In terms of socio-economic features, the city is a densely populated area with a high proportion of 20-25 years old,

representing 13.5% of the population (ONS 2017). While the South East is the most affluent region, 46% of the city's population live in the 40% most deprived areas of England (IoD 2019). The city has a strong enterprise community with 13,950 enterprises and 2,300 third-sector organisations. These factors provide a strong case to explore the extent of food poverty and the surplus food distribution system in the city. Further, addressing the sustainability challenges of food waste with the potential to contribute to food security and food poverty will be important for developing food strategy for other cities in the UK and other developed countries.

3.2 Organisations included in the study

Given the exploratory nature of the research, the study adopts a qualitative approach to data collection and analysis (Midgley 2014). To facilitate the data collection and recruitment of participants, an understanding of the surplus food distribution at the city level was essential. Hence, one of the authors did internship in 2019 with one of the organisations to understand the context of food waste, surplus food generation and distribution. Similarly, within the same time period another author attended three local events organised by various social enterprises and charity organisations to engage with local experts and entrepreneurs operating in food waste and food poverty issues in the city. While these interactions allowed us to get an understanding of various actors and organisations involved in the surplus food system, our position with respect to the organisations and study participants is from an outside perspective (Aguinis and Solarino 2019).

Through our interactions, we learnt about the existing partnership between a number of organisations in the city, the Food Alliance[4] (FA) that has been running for two years. FA is a partnership between six organisations tackling food waste by working with food donors to distribute surplus food to people in need in the city and surrounding areas. Identifying this partnership enabled us to develop detailed inclusion and exclusion criteria to select organisations

[4] The names have been anonymised for all the organisations included in the study due to ethical requirements.

for data collection at a city level in terms of their role and prominence (Table 2). The criteria included in the selection of the organisations are in line with the existing studies with a focus on studying different legal forms, i.e. profit and non-profit, different roles in surplus food distribution, i.e. logistics, front-line and hybrid, and different levels of representation i.e. national, regional and local organisations (Baglioni et al. 2017, Blake 2019a, Midgley 2014).

(Insert Table 2 here)

Considering these criteria, we included six members from the Food Alliance operating at different levels and scales. For instance, British Food Collection and Food Distribute are a franchise of the national organisations while operating independently. They are large in scale of operation, well-established and connected to food suppliers and charity organisations, while others are based locally. Also, through snowballing (Midgley 2014) we included four other organisations including community fridges, a community pub using surplus food to provide affordable food to the local community, and an unemployment project supporting unemployed people with surplus food. We excluded the extended organisations (small charities, cafés (16) and lunch clubs (14)) from our study and decided to include the main players in the supply chain to get an in-depth understanding of the experiences, motives, processes and challenges faced by these actors (Blake 2019a). As the small cafés and clubs were getting food from the main actors including these main actors was more relevant to our study in terms of understanding the coordination of the surplus food distribution supply chain at the city level. We also excluded food banks as these were not functioning to tackle food waste but solely food insecurity, and food banks are part of the emergency food network with different systems of referrals to access surplus food. Including every organisation was not possible for this research, and we acknowledge this as a limitation of our study. In total, we included 10 organisations in our study with different legal forms, level of operations and with different roles in the surplus distribution system (Table 3).

(Insert Table 3 here)

3.3 Data collection and interview guide

Data for this study were collected using face-to-face semi-structured interviews and participant observation. We adopted purposive sampling technique to select the participants from each organisation for data collection. We selected either a founder or a manager and, in their absence, a logistics coordinator for data collection due to their knowledge of the day-to-day operations of their organisation (Midgley 2014). As these organisations have limited core employees involved in day-to-day operations, including the core people for interviews was important and relevant to this study. Where possible, we included both the founder and the logistics coordinator for data collection. In total, we interviewed 12 participants from the organisations listed in Table 2. In addition to interviews, we also collected secondary information, such as annual reports, websites, databases, and YouTube videos.

For our interview topic guide, we referred to prior literature on surplus food distribution, which has covered surplus distribution interventions, administrative logistics, the management of surplus food, and organisational barriers in surplus food distribution (Alexander and Smaje 2008, Bramanti et al. 2017, Melacini et al. 2017, Midgley 2014). Guided by this literature, our interview topic guide covered four areas: i) the profile of the organisations and framings for operating in the food waste sector; ii) the role of the organisation in the surplus food distribution supply chain; iii) the coordination of surplus food distribution in the supply chain; and iv) challenges and constraints faced by the organisations. Covering these areas, we go beyond existing studies, identifying not only the organisations but their interrelationships, and the mechanism and logistics of surplus food distribution at the city level.

3.4 Data analysis

Our data analysis was guided by an inductive qualitative approach, which enables methodological flexibility in analysing data associated with social reality (Patton 2014, Thomas 2006). It involves detailed reading of raw data, i.e. interviews, to derive concepts and themes based on interpretations drawn from this data without using any prior models or conceptions (Gioia et al. 2013, Thomas 2006). Using this approach, data was analysed in several steps, Table 4. We adopted an iterative approach to move between the data and the existing literature, which enabled understanding the emergence of data and the conceptualisation of the codes and themes within the appropriate theoretical issues. The data structure and different stages of coding and generation of themes are given in Figure 1.

(Table 4 here)

(Figure 1 here)

4 Findings and Discussion

4.1 Organisational mission and framing

The framings used by the organisations included their understanding of the implications of food waste and their reasons for operating in the food waste sector. In terms of framings, organisations also differed in how they saw the role of food waste mitigation and surplus food distribution strategy in solving the food security problem.

Most of the organisations have a strong environmental focus and consider the environmental impacts of food waste as a driver for operating in the sector. For them, intercepting surplus food and distributing it to those in need is the best option to reduce negative environmental impacts. These included reducing carbon footprint by limiting the disposal of food to landfill, the impacts of intensive agriculture and the waste of resources involved in making food available to consumers through supermarkets. For the organisations, this meant that value should be

captured from surplus food, reducing costs at different levels in the supply chain. As Luke from The Meal from Waste Initiative states:

> "…so much of the Earth's resources goes into growing this food in the first place or transporting it on aeroplanes. At the same time, the amount of food that is wasted is remarkable".

After the environment, the most common motivator for distributing surplus food is social aspects, with organisations aiming to address food insecurity. Organisations, such as the British Food Collection, the community pub, and the community fridges considered social framings as the main driver for their involvement. However, there were some differences observed between the organisations in adopting these framings. For instance, Laura from The Unemployment Project stated, *"we have people coming here that have got no food*". Similarly, Jose from The Community Fridge B explains, "*It started off as a social issue, but also considering that there is a huge waste of food, so trying to then combine the two*". However, Glenn from the Leftovers Association states that "*food waste is an environmental problem and the social problem of food poverty has causes and solutions that are distinct from the problem of food waste. We are not going to stop the issue of entrenched poverty and deprivation by getting fruit and veg from farms that would otherwise be wasted*".

These quotes highlight that while some organisations see surplus food distribution as the obvious solution to serve those in need, for others it is far from the solution to the challenges of poverty. However, those organisations adopting social framings when they engage with communities use environmental framings to reduce social stigma around using 'waste food'. Peter from Community Fridge A mentions, *"tackling food poverty is our main priority, but when we email or communicate to our participants, we only use language around food waste to reduce social stigma for users"*. While this social framing is important for driving actions (Midgley 2014), putting an alternative environmental framing in communication is important in reducing social stigma.

In addition, organisations were using surplus food for community engagement through local events and school events. Organisations that do not provide food directly to end-users were

mostly using these platforms to generate awareness and using food to connect to local communities by talking about cooking, healthy eating and wasting behaviours. In this process of connecting and educating communities, they also generate wider social impacts. As stated by Dominic from British Food collection, *"we organise surplus suppers to target social isolation and increase connectivity by bringing people together and providing anyone in need a free meal"*. The generation of social impacts for wider communities and their involvement in surplus food distribution have positioned third-sector organisations as a social innovation filling a unique gap and solving various societal problems (Baglioni, Calo et al. 2017).

4.2 Coordination of surplus food distribution

While investigating the coordination of surplus food distribution in the supply chain at a city level, we found the existence of a surplus food ecosystem comprising of multiple types of organisations. In this ecosystem, food flows over two different domains, from the commercial to the non-commercial sector generating multiple values (Blake 2019a). Looking closely at the ecosystem, three key issues emerged in the coordination of surplus food distribution: actors involved and their interdependencies, collaborative practice between members to facilitate recovery and distribution, and management and operational issues. In the following sections, we explain these in detail.

4.2.1 Actors and their role in the supply chain

Three key actors are identified based on their role in surplus food distribution: Suppliers of surplus food (food donors); Collectors intercepting food from the suppliers (logistic organisations) and providing to the Distributors; and Distributors providing surplus food to the communities (hybrid and front-line organisations). Surplus food move through these actors' in three key phases – recovery, allocation and distribution, figure 2.

The first group of actors are 'Suppliers' who provide food and are positioned in the recovery phase of the supply chain. Actors in this group include farmers, processors, distributors and

supermarkets, the hospitality sector and other independent retailers. Surplus food collected from agriculture and animal farming is mostly fresh produce, fruits and vegetables. However, the main bulk of surplus food is collected from wholesalers, supermarkets, and small and independent retailers. The surplus food collected from retailers includes fresh, tinned, and prepared food as well as ready-to-eat dry items (crisps, biscuits). In addition to retailers, surplus food is also collected from the hospitality industry, and others, such as theatres, restaurants, food banks, and charities. Despite the retailers being the biggest supplier of surplus, food collection only reaches the 'tip of the iceberg' of food waste given the amount of food that is wasted by the retailers. As Luke from the Meal from Waste Project points, *"the food we collect is only 'scratching the surface', we know supermarkets waste more food, but we don't get it all".*

The second group of actors are the 'Collectors', who act as intermediaries between Suppliers and Distributors and are placed in the allocation phase in the supply chain. There are three main organisations in this group operating at the local and regional level: British Food Collection, Food Distribute, and The Leftover Association. These actors provide surplus food to each other and to other organisations in the surplus food supply chain. For instance, The Leftover Association intercepts food from the Suppliers but also provides to British Food Collection and Food Distribute. Similarly, they also receive food from food banks. In addition to arranging the recovery of surplus food, the Collectors play an important role in sorting and monitoring of food for safety before its allocation to other organisations. Collectors do not have any direct contact with end-users and they mostly focus on allocating food to a variety of charities beyond those operating in the food sector, such as homeless and unemployment charities, and youth groups. The main goal to target charities is to benefit from existing systems and processes for logistical simplicity and also to reduce competition for the same purpose. As Dominic from British Food Collection states,

> "We go through the charities because we don't want to compete with them as these are already set up with their own distribution for food and clothing and are also visible in the city".

The third group of actors are the 'Distributors' who operate within their community and play an important role in collecting food and making it available through various means such as food pantries and parcels or providing cooked food in cafes and food supermarkets. These actors provide food to end-users through two routes. The first route is the emergency food system (EFS) which is focused on reducing food poverty, and so also distributes food that is not surplus food. There are 17 food banks in the city providing food assistance and to which access is means-tested in some way. As such, the EFS is not part of the surplus food distribution system but is a food assistance system. The second route is the community food system (CFS), which includes all initiatives actively involved in distributing surplus food as a way to reduce food waste. Organisations in the CFS and the Collectors also receive food from EFS. In CFS, there are three main organisations, The Meals from Waste Initiative, Community Fridges and the Community Pub. Particularly, the Community Pub and the Meals from Waste initiative are classed as hybrid organisations (Bramanti et al. 2017) as they collect surplus food from Suppliers and Collectors and distribute to the end-users.

(Figure 2 here)

At the surface of the surplus food ecosystem, we see harmonious relationship between actors in each group, working collaboratively in each phase from recovery to allocation to distribution. However, looking closely we observe inherent tensions and hierarchical power relationships among actors, between groups and also within groups. For instance, food suppliers have more power over other actors as they are the sole food providers and without their donation the surplus food ecosystem would not survive. Hence, they control what is to be donated, when, how and to whom. With such dependency, third-sector organisations are in a subordinate position to the food suppliers. Alexander and Smaje (2008) also point to this issue of dependency and power dynamics, the dominant role played by food donors and the subordinate position of third-sector organisations. However, within the third-sector organisations we also observe similar power dynamics on the basis of organisational prominence, i.e. national, regional or local. Being

national, large in size, and having operated for a number of years, Food Distribute were more privileged in getting surplus food than other organisations in the group. These power dependencies and hierarchical power relationships directly affects the supply of food, which is exacerbated by the lack of food waste management framework and supporting policies encouraging food donations. Retailers in the UK are neither obliged to donate food nor are there appropriate policies directing the management of food waste. For instance, Sainsbury's use surplus food to create bioenergy, which is more economically viable than food donation. Moreover, the lack of policies protecting food donors also means that food safety and reputation is at stake. Hence, given the lack of policy context, the involvement of commercial and non-commercial organisations, and vulnerable people needing food, trust-based relationships and collaboration between all actors and organisations is key to coordinate the surplus food distribution supply chain (Baglioni et al. 2017).

4.2.2 Collaborative practice to facilitate food recovery and distribution

Looking at the city-level initiatives, we found an existing partnership, the Food Alliance (FA), coordinating different members of the surplus food supply chain, Figure 3. The establishment of FA was arranged and supported by the local council. As Sam from the Meal from Waste initiative explains,

> "the council decided that they weren't going to give individual funding anymore and they were wanting collaboration between initiatives and projects working on the same issues. So, we collaborated and created the Food Alliance and were awarded three years funding."

FA acts as the hub for the organisations in the supply chain, sharing the database of surplus food as generated by supermarkets. Through this shared database, members can coordinate their activity and identify and inform others of what food needs collecting and who will be collecting this food, hence avoiding overlaps and ensuring speedy collection of food. Including different actors from the surplus food supply chain, the FA aims to strengthen the relationship between them to share the resources, build financial sustainability, and develop a stronger voice to

advocate for policies tackling food waste and food insecurity. All the organisations from the Collectors and some from the Distributors are members of the FA connecting local businesses and retailers to provide food to vulnerable people.

One of the organisations from the FA, the City Food Collaboration, coordinates the FA and also manages the Emergency Food System and Community Food System. It is important to note the unique role of the City Food Collaboration in the surplus food supply chain as they neither collect any food nor distribute to people in need, but operate as an umbrella organisation bringing together all the other organisations working in food waste and food insecurity. Similarly, they are not a charity, but a not-for-profit company limited by guarantee supporting local businesses, social enterprises, and charities. As such, their role is a strategic one: it includes writing a food strategy, collaborating with other charities, social enterprises and engaging with communities through cookery school to cook, learn new skills, and enjoy food together to generate awareness of food values and waste. Particularly, their role in coordinating the FA is an important one. As Sara from City Food Collaboration states:

> "We set up the Food Alliance to figure out how we can better work together. It is about sharing information – when someone has surplus food, it goes around the network. We meet four times a year to plan for events to engage businesses to donate, a volunteer celebration party, and media outreach".

(Figure 3 here)

The FA is evidence of collaborative activities and shows the importance of such collaboration and the role of different actors in such partnerships. Particularly, the role played by public bodies in supporting such collaboration and providing seed funding is worth noting. Similarly, the role of City Food Collaboration in coordinating the FA shows the need for a multi-actor approach to identify solutions and improve efficiencies in food waste mitigation (Diaz-Ruiz et al. 2019). Despite the existence of such a partnership, the limited amount of food available in comparison to the

demand meant that some organisations were operating independently to reach out to a number of food suppliers. While reaching out to multiple suppliers could be considered as buffers in a commercial supply chain, in the non-commercial supply chain this can lead to competition between organisations for limited resources. This is important in the UK context where surplus food distribution is still in its 'infancy': only 2% of surplus food generated by retailers is distributed and 98% is used for energy or disposed of (Facchini et al. 2018). In this regard, having multiple organisations intercepting the limited surplus food could make it difficult to reach end-users and also to use the food before it perishes.

4.2.3 Management and operational issues

Two management and operational issues were important in the coordination of surplus food distribution. These included the role of volunteers as service providers and the integration of hybrid revenue models to achieve financial sustainability.

Volunteers heavily support the actors in almost every phase of the supply chain and play crucial roles in recovering surplus food, managing the recovered food adhering to safety protocols, and distributing to the organisations or communities. In the case of providing cooked food to the community, they also engage in preparing food, serving it, and cleaning venues. Given that the surplus food distribution system is mainly managed by third-sector organisations, their governance and employees are entirely different from commercial organisations. These organisations have very few paid employees and most of the workforce are volunteers from different socio-economic status. In this context, the benefits of surplus food distribution include empowering individuals in the community by developing skills for future employment and building confidence through social interactions and social relations. In many cases, the volunteers first started to engage with the organisations as an end-user using the services and receiving benefits. The experience of receiving benefits encouraged them to contribute back to these organisations by becoming a volunteer, serving others like them, and enhancing community feeling and belonging in the name of sharing food. Chloe from Food Distribute explains:

> "We have 150 volunteers who volunteer with us weekly; many people are vulnerable and come from different backgrounds. We train these people and support them into employment. Last year, 25 volunteers got into full-time employment".

Along with the volunteers running the operations, the organisations were also utilising different revenue models to self-sustain their activities. For instance, Food Distribute operate on a subscription basis, charging member organisations an annual administrative fee to access surplus food. The Meals from Waste Initiative use a participatory pricing mechanism as their business model, i.e. 'pay as you feel' cafes and food stores. However, they integrate a hybrid revenue model to subsidise the cafe through other private catering events. The Community Pub, on the other hand, operates a minimum price system to cover their expenses and employee costs, particularly the chef. Similarly, the Unemployment Project charges people £1.50 for a large plate or 60p for a bowl. However, their charging system is open: when people walk in without any money to pay, they provide free food or ask them to pay later or make in-kind donations.

While the aim of revenue models is to be self-sustained, the nature and variation of revenue models have had mixed impacts, such as reducing access to surplus food as a result of subscription fees, competition between organisations to access surplus food from organisations providing free surplus food, and widening the participation of communities in the project initiatives through being inclusive in practice and putting a price and the flexibility to pay in kind/cash. Subscription fees to access food has unintended consequences as cautioned by Midgley (2014) by reproducing market mechanisms and excluding of vulnerable communities.

4.3 Challenges faced by the organisations

The findings identified three challenges faced by third-sector organisations in the surplus food distribution supply chain: supply challenges, organisational sustainability challenges and policy challenges.

Supply challenges faced by the organisations include informal and individual contractual arrangements leading to uncertainty around food stock and quality, and competition among the organisations involved. Contacts with food suppliers were mostly informal and individual contacts based on cold-calling every supermarket in the area or visiting every shop informing them about their work. While this has helped them to bring on board many wholesalers, supermarkets and individual outlets, this also means that their relationships with the food suppliers are one-to-one rather than formal contracts which promises continuity. In addition to this, the lack of policies obliging retailers to donate surplus food leads to two key challenges: uncertainty regarding food stock and quality, and competition between organisations to access food. The surplus food is collected from both the organisations in the Collectors and the Distributors group. Hence, all the organisations are competing against each other and targeting every retailer they can to secure surplus food to provide to the community. This is not only chaotic but also creates conflict between organisations in accessing food and contributes to logistical challenges. As stated by Sara from the City Food Collaboration,

> "There is only so much surplus food out there that we can get and there are a lot of different people wanting to collect it. You have lorries going backwards and forwards from one place to another and dropping off you know".

While Food Alliance was established to reduce such challenges and facilitate cooperation, asking the organisations to stop using their existing relationship and divert their attention solely on the Food Alliance is counterproductive. It is also fruitless given the time spent in building those individual contacts and relationships. But continuing with diverse collectors rather than a single platform, such as FA is logistically unstainable when organisations are travelling farther creating inefficiencies rather than providing surplus food to those organisations that are in the locality or vicinity of the retailers. Recovery of surplus food from these geographical clusters could not only reduce logistic challenges but also the competition between organisations in the short term. As for the long-term, managing surplus food through FA can solve the supply challenges.

Similarly, competition as a result of supply challenges also arise as a result of outreach and establishment. For instance, Food Distribute is a national organisation and has been operating for a number of years, developing close relationships with retailers, British Food Collection, however, is a relatively new charity but have been able to reach out to the wider retailers to collect surplus food. As the recent entrants, British Food Collection has caused some competition between them and Food Distribute. However, despite the close relationships and wider outreach, both organisations face the uncertainty of food stock, both quality and quantity. As Chloe from Food Distribute mentions,

> "Our main challenge is tackling surplus food…sometimes our food stock is really low, and we don't have enough food to distribute. While it is good to have less food, it is frustrating when we know that there is food out there that we should be tapping into and we are not getting enough to distribute to people in need".

This looks like not only an inefficient supply chain but also a vicious cycle, where the irregularity of the surplus food supply fuels competition among organisations in accessing food and competition fuels irregularity of food stock. The organisations in the supply chain operate in a very uncertain environment, directly affecting communities in need.

Organisational sustainability challenges include economic sustainability, draining of resources, and growth challenges. Given that the majority of the organisations responsible for collecting and distributing surplus food are not-for-profit organisations and social enterprises, their business models (revenue generation and the nature of employee relationships)raise a fundamental problem of organisational sustainability affecting growth. With limited full-time paid staff and the need to train volunteers, they are overloaded on the amount of work they have to do in recovery and distribution on top of fulfilling the requirements for funding, i.e. completing funding applications and gathering evidence for reporting. Despite bringing positive impacts, the management and training of volunteers is a huge responsibility for the organisations, draining their time and limited personnel resources (Alexander and Smaje 2008). In addition, this creates inefficiencies in surplus food distribution (Bramanti et al. 2017), affecting their growth in the

management of food recovery and subsequent distribution, which can contribute to food waste generation if the food is not sorted and distributed quickly. As Dominic from British Food Collection mentions,

> "the biggest challenge is growth. We have so many people…charities saying we could really do with this and there is so much food out there but getting around to all of them is difficult. We had to put the brakes on it…stuff like that all comes in very quickly, but funding comes in a lot slower. You have to have the funding to back up what you are trying to do".

As discussed previously, the adoption of revenue models for organisational sustainability also fuels competition between organisations to access food. For instance, the subscription fee to access surplus food from Food Distribute means that those charity organisations who cannot afford such a subscription are competing to get food from British Food Collection and The Leftover Association. As Sara from the City Food Collaboration explains,

> "There is a competition between British Food Collection and Fare Distribute, because essentially the former is offering a free service, whereas the latter you have to pay for. And they kind of come on to their turf, if you see what I mean".

The uncertainty associated with food availability and the challenges affecting organisational sustainability clearly show that there is a need from both the demand and supply side but given their situation and subordinate status in relation to food suppliers, third-sector organisations are unable to fill all the gaps. The existing assumption that third-sector organisations are solving the food waste and food insecurity problem in the name of social innovation is undermining their contributions by burdening them and leaving them isolated without support. It also neglects the fact that recovery, management, allocation and distribution require resources that they do not have. As indicated by Alexander and Smaje (2008), the piecemeal welfare model of surplus food distribution is not only a failure but also creates disincentives for organisation to improve their practices. This directly links to the third challenge associated with the lack of a supportive environment and the policy context.

Policies associated with food safety and food donation are challenges faced by the organisations. Particularly, the confusion regarding sell-by dates and use-by dates reflecting the 'true' shelf life of products are important food safety issues creating food waste at retailers, households and also the surplus food distribution organisations. As Chloe from Food Distribute explains, *"we collect and redistribute within 'the date' or it can't be distributed."* Similarly, Sara from the BHFC argued that sell-by dates mean that *"there is a whole world of food waste out there that is just not useable"*. As retailers are waiting until the last date to extract the economic value, when surplus food is provided to the third-sector organisations they cannot utilise them fully on time contributing to the generation of food waste. Alexander and Smaje (2008) in their analysis of FareShare observed that out of 536 kg of food offered by Sainsbury's they had to reject 104 kg due to the food being unfit for human consumption. From these, another 85 kg is rejected at the FareShare depot. This directly links to the issue raised by Facchini et al (2018) that despite having the potential and opportunities the surplus food distribution in the UK is limited in outreach. One way to support this is by having food waste management policy directing retailers to provide surplus food regularly to the organisations and shifting their focus of extracting maximum value. This is essential given that retailers in our case study city are now selling on food waste to pound shops instead of donating to make more profit. This directly affects the sustainability of the surplus food supply chain as well as the potential to contribute to food security. Hence, appropriate policies to trigger corporate actions is crucial to increase surplus food donation and reduce food waste simultaneously (Derqui et al. 2016).

5 Conclusions

5.1 Theoretical contributions

In this research, taking a macro approach we investigated actors, their roles and relationships, the coordination of surplus food and challenges faced by the organisations in supply chain of surplus food distribution at the city level. Our findings showed the existence of a surplus food ecosystem with multiple interrelated organisations where food moved from the commercial to

the non-commercial supply chain. In this flow, the linguistic aspect of food changed from food waste to “surplus food”, generating a new identity and multiple social, economic and nutritional values. Our findings provide insight that complement and add to existing understandings of food waste prevention, surplus food distribution and third-sector organisations.

First, mapping actors at the city level our findings showed a coordinated effort between multiple actors in the supply chain. Despite this coordination, our findings reveal hierarchical power dynamics between actors, particularly between suppliers and third-sector organisations. Our observations are similar to Alexander and Smaje (2008) and Baglioni et al (2017), where they emphasise donors having more power than third-sector organisations and only specific third-sector organisations taking a privileged role. Going one step further, our findings also show the hierarchical power relationships between third-sector organisations in accessing surplus food. Hence, despite the coordinated effort, there were inherent tensions and challenges, mostly due to the limited donation of surplus food and supermarkets looking to fulfil their main goal, i.e. profit-making. This highlights the importance of appropriate policies supporting and obliging retailers to donate food. Similarly, given the food safety and reputational issues, protecting food donors and third-sector organisations from liability is equally important (Mourad 2016). In such context, while there is a need for a ‘carrot and stick’ approach to policies for retailers to increase food donation for the wider good, what third-sector organisations need is support from public bodies in facilitating their activities (De Pieri et al. 2017).

Second, our findings reveal the existence of a partnership, the Food Alliance (FA), in the city. FA plays an important role in facilitating a number of activities, particularly creating a one-stop point for food donation, maintaining a database of food availability, timely collection of food, reducing logistic inefficiencies and efficiently allocating available food on time. Hence, they enhance supply chain efficiency, reduce competition and improve food stock and quality. This is also important in maintaining food geographies, reducing carbon emissions as a result of food collection, and improving food quality and quantity (Midgley 2014). These findings challenge prior claims that organisations are working independently to each other (Facchini et al. 2018). Our findings

emphasise that given the complexity associated with, and the scale of, food waste and food insecurity problems, working together is very important as no single actor or organisations can solve on their own (Diaz-Ruiz et al. 2019). This includes government bodies developing supportive policies to encourage food donation and facilitating third-sector organisations' activities through initiating joint collaboration. Similarly, collectors working together in their geographical areas to provide food to charities in their neighbourhood to avoid inefficiencies and timely utilisation of food. And finally, the distributors focusing more on providing quality and variety of food and engaging communities generating wider impacts. These clear and specified roles will not only reduce competition to access food but will enable actors to work together rather than independently. In long-term, working together, mobilising volunteers from different socio-economic background, and engaging communities through food can enable deprived communities to regain and utilise resources to achieve resilience (Blake 2019b).

Third, unpacking surplus food distribution at a city level, we found differing revenue models and various challenges associated with organisational sustainability and food supply. The survival needs of third-sector organisations has forced them to adopt various revenue-generation models. While this allows organisations to generate revenue to self-sustain their operations, it can also lead to competition and the exclusion of some organisations with limited resources. In addition, these can also reproduce commercial transactions and inequalities by limiting participation from organisations who cannot afford to pay (Midgley 2014). Similarly, the uncertain and unreliable donation of food is the direct result of the lack of formal contractual relationships. The lack of contracts in one hand affects regular food supply, in other hand reliance on individual people is even more problematic when these individuals move on from their jobs and a new person comes with differing values and attitudes towards surplus food donation. In such cases, the organisations not only lose the contact but also the privilege of collecting the surplus food. Hence, the challenges of maintaining the relationships and collecting food from different retailers drains resources and abilities from third-sector organisations. Our findings are similar to Bramanti et al.'s (2017) observations of four European countries where they highlight the lack of structured processes in food donation affecting food quality and distribution.

Fourth, we contribute to the role of surplus food distribution by addressing sustainable development goals (SDGs) on food, especially SDG 2 and SDG 12.3. Organisations were using different value proposition to attract wider communities, breaking the boundaries and reducing the stigma that surplus food is about 'second-hand food for second-hand people' , by inviting people from different backgrounds and situations to come together. The revenue models enabled revenue generation for these organisations and for beneficiaries to participate in different ways, hence generating wider impacts at the city level. For communities, the food they receive and interactions with other allows them to build resilience (Blake 2019b). For food donors, these benefits are transferred from profit to social values (Blake 2019a) improving corporate social responsibility values and a business case for sustainability.

5.2 Practical Implications

One of the main challenges of the surplus food distribution supply chain, we found is the lack of a legislative framework requiring supermarkets to donate surplus food, which has created uncertainty in food stock and competition between organisations. Despite the potential to increase food recovery by 60 times in the UK (Facchini et al. 2018), our participants stressed the challenges associated with the limited availability of the surplus food. This clearly indicates that there is a supply but not enough motivation to contribute to food donation. Hence, the UK needs to follow the example of other EU countries to develop a regulatory framework on food donation and simplify the recovery and distribution of surplus food to people in need. Similarly, as liabilities and corporate reputation are affecting retailers' engagement in the food donation (Alexander and Smaje 2008, Baglioni et al. 2017), 'Good Samaritan Laws" like those in Italy and the US might provide the necessary support for the retailers and third-sector organisations in freely donating and distributing the food (Baglioni et al. 2017). Furthermore, in countries where there is legislation to donate surplus food in exchange for tax incentives (e.g. France and Spain), these kinds of incentives might provide a business case for retailers to engage in regular food donation, ensuring that the system is sustainable and they are getting benefits (Mourad 2016). Moreover,

food donation for distribution is becoming a moral obligation for businesses beyond corporate social responsibility (Harvey et al. 2019), hence, it is important that businesses form contractual relationships with third-sector organisations to regularly donate food.

While prevention of surplus food is the best option, surplus food is inevitable. This implies that distribution to people in need is the second-best option. However, relying solely on third-sector organisations for the management of surplus food is not sustainable, particularly when these organisations are struggling themselves to generate revenue. The surplus food sector has seen bottom-up initiatives, but there is also space for start-ups, such as online food sharing platforms to reach out to wider populations. Similarly, public bodies need to be visible and play an important role in this surplus food distribution ecosystem by facilitating start-ups and supporting third-sector organisations by providing necessary resources, as seen in the case of European countries, where local authorities provide offices and locational facilities free of charge for organisations to base their office or establish a warehouse (Baglioni et al. 2017). Different types of support from public bodies is important given that third-sector organisations are playing the crucial role of filling the gaps created by social welfare systems and utilising their own resources to solve the problems. In such case, facilitation from public bodies can magnify the effort of these organisations bringing rippled effect to the society developing community resilience and contributing to SDGs.

As SDGs act as a guiding framework for government bodies to address various social, environmental and economic issues, our analysis at the city level in mapping the surplus food distribution supply chain highlights the role of various actors in addressing the SDGs through waste prevention. Given that cities are facing immense pressure from urbanisation, inequalities, and consumption (Mulas et al. 2015), the surplus food supply chain and its activities can contribute to meeting the SDGs by being inclusive, visibly present in communities, educating and engaging on food waste, integrating people from different situations, increasing community resilience and reducing social isolation (Blake 2019ab. Similarly, volunteers are an integral part of the supply chain, playing a crucial role in all stages of the supply chain, from food interception to

management and distribution (Blake 2019a). Involvement in these activities allows the volunteers, coming from different paths of their life and socio-economic condition, to engage with others like them and interact with new people in a community and in the process develop skills, confidence, and qualifications for employability. Moreover, as government bodies are concerned about social inclusion and isolation issues, surplus food distribution can address these challenges by bringing together a variety of people, increasing interactions and connectivity. In this way, the potential for these initiatives to address the SDGs goes beyond food by reducing inequalities (SDG 10), empowerment of vulnerable people, such as young, women, and unemployed (SDG 5), and developing partnerships and collaboration between actors (SDG 17) through the sharing of knowledge, experience and technology.

5.3 Limitations and Future Research

One of the main limitations of our research is that we only focused on the third-sector organisations involved in surplus food distribution to the people in need at the city level. There are several other organisations, both private and individual, involved in surplus food distribution, either for beneficiaries or to engage communities through education and cooking. Future research exploring the role of such organisations in the surplus food distribution supply chain could provide a richer context. Research on these different initiatives could explore the linkages between private, government and third-sector organisations' role in managing food waste and food insecurity at the city level (Galli et al. 2019). Similarly, digital platforms and other technologies has facilitated peer-to-peer food donation and distribution, such as OLIO and "Too Good to Go" (Harvey et al. 2019); there are also existing initiatives where restaurants are giving away food at closing time. Future research may investigate these initiatives and the users involved in them to map the users' segment. Further, the third-sector organisations while complying with food safety regulations, also produce food waste, which has not been explored by many, except by Alexander and Smaje (2008). Exploring waste generation could link the organisations in the surplus food distribution to wider urban actors at a city level.

6 References

Aguinis, H. and Solarino, A. M. (2019). Transparency and replicability in qualitative research: The case of interviews with elite informants. *Strategic Management Journal* **40**(8): 1291-1315.

Alexander, C. and Smaje, C. (2008). Surplus retail food redistribution: An analysis of a third sector model. *Resources Conservation and Recycling* **52**(11): 1290-1298.

Arcuri, S. (2019). Food poverty, food waste and the consensus frame on charitable food redistribution in Italy. *Agriculture and Human Values* **36**(2): 263-275.

Baglioni, S., Calo, F., Garrone, P. and Molteni, M., Eds. (2017). *Foodsaving in Europe - At the Crossroad of Social Innovation*. Switzerland, palgrave Macmillan, Springer Nature.

Baglioni, S., De Pieri, B. and Tallarico, T. (2017). Surplus Food Recovery and Food Aid: The Pivotal Role of Non-profit Organisations. Insights From Italy and Germany. *Voluntas* **28**(5): 2032-2052.

Blake, M. (2019a). The multiple ontologies of surplus food. *Europe Now* **27**.

Blake, M. (2019b). More than Just Food: Food Insecurity and Resilient Place Making through Community Self-Organising. *Sustainability* **11**(10): 2942.

Bramanti, V., Coeli, A., Ferri, L., Fiorentini, G. and Ricciuti, E. (2017). A model for analysing non-profit organisation in the food recovery, management and redistribution chain. *Foodsaving in Europe - At the Crosssroad of Social Innovation*. S. Baglioni, F. Calo, P. Garrone and M. Molteni. Switzerland, Palgrave Macmillan, Springer Nature, Chapter 6, pg. 99 -130.

Caplan, P. (2017). Win-Win? Food Poverty, Food Aid and Food Surplus in the UK today. *Anthr. Today* 17-22.

Champions12.3. from https://champions123.org/.

De Pieri, B., Tallarico, T., Baglioni, S., Solerm U. and Ricciuti, E. (2017). European Policy for Food Security: The Surplus Food Redistribution Option. *Foodsaving in Europe - At the Crosssroad of Social Innovation* S. Baglioni, F. Calo, P. Garrone and M. Molteni. Switzerland, Palgrave Macmillan, Springer Nature, Chapter 2, pg.13-36.

Deloitte (2014). Comparative Study on EU Member States' legislation and practices on food donation. Brussels, Final report prepared by Bio By Deloitte for the European Economic and Social Committee.

Derqui, B., Fayos, T. and Fernandez, V. (2016). Towards a More Sustainable Food Supply Chain: Opening up Invisible Waste in Food Service. *Sustainability (Switzerland)* **8**(7).

Diaz-Ruiz, R., Costa-Font, M., López-i-Gelats, F. and Gil, J. M. (2019). Food waste prevention along the food supply chain: A multi-actor approach to identify effective solutions. *Resources, Conservation and Recycling* **149**: 249-260.

Facchini, E., Iacovidou, E., Gronow, J. and Voulvoulis, N. (2018). Food flows in the United Kingdom: The potential of surplus food redistribution to reduce waste. *Journal of the Air & Waste Management Association* **68**(9): 887-899.

FAO (2009). The state of food insecuity in the world Rome, Italy, Food and Agriculture Organisation.

FAO (2013). Food wastage footprint. Impacts on natural resources Rome, Italy, Food and Agriculture Organization publications. .

FAO (2014) "Mitigation of food wastage societal costs and benefits " Food Wastage FootPrint.

Galli, F., Cavicchi, A. and Brunori, G. (2019). Food waste reduction and food poverty alleviation: a system dynamics conceptual model. *Agriculture and Human Values* **36**(2): 289-300.

Garratt, E. A. (2015) "Food insecurity and food bank use."

Garrone, P., Melacini, M. and Perego, A. (2014a). Opening the black box of food waste reduction. *Food Policy* **46**: 129-139.

Garrone, P., Melacini, M. and Perego, A. (2014b). Surplus food recovery and donation in Italy: the upstream process. *British Food Journal* **116**(9): 1460-1477.

Gentilini, U. (2013) "Banking on Food: The State of Food Banks in High-Income Countries." IDS Working Papers, No.008, pg 1-18.

Gioia, D. A., Corley, K. G. and Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research: Notes on the Gioia methodology. *Organizational Research Methods* **16**(1): 15-31.

Govindan, K. (2018). Sustainable consumption and production in the food supply chain: A conceptual framework. *International Journal of Production Economics* **195**: 419-431.

Gustavsson, J., Cederberg, C., Sonsson, U., Otterdijk V., R. and Meybeck, A. (2011) "Global food losses and food waste - Extent, causes and prevention."

Halloran, A., Clement, J., Kornum, N., Bucatariu, C. and Magid, J. (2014). Addressing food waste reduction in Denmark. *Food Policy* **49**: 294-301.

Harvey, J., Smith, A., Goulding, J. and Branco Illodo, I. (2019). Food sharing, redistribution, and waste reduction via mobile applications: A social network analysis. *Industrial Marketing Management*.

IoD (2019). The English Indices of Deprivation 2019, Ministry of Housing, Communities and Local Government; https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019.

Lemaire, A. and Limbourg, S. (2019). How can food loss and waste management achieve sustainable development goals? Review. *Journal of Cleaner Production* **234**: 1221-1234.

Lipsinki, B., Hanson, C., Lomax, J., Kitinoja, L., Waite, R. and Searchinger, T. (2013). Reducing Food Loss and Waste. Washington DC, World Resources Institute, https://pdf.wri.org/reducing_food_loss_and_waste.pdf.

Loopstra, R., Reeves, A. and Stuckler, D. (2015). Rising Food Insecurity in Europe. *The Lancet* **385**(9982): 2014.

Lundqvist, J., de Fraiture, C. and Molden, D. (2008). Saving Water: From Field to Fork Curbing Losses and Wastage in the Food Chain. Stockholm, Stockholm Environment Institute.

Melacini, M., Rasini, M. and Sert, S. (2017). Surplus Food Redistribution: A Conceptual Framework. *Foodsaving in Europe - At the Crosssroad of Social Innovation*. S. Baglioni, F. Calo, P. Garrone and M. Molteni. Switzerland, Palgrave Macmillan, Springer Nature, Chapter 4, pg. 51-69.

Middleton, G., Mehta, K., McNaughton, D. and Booth, S. (2018). The experiences and perceptions of food banks amongst users inhigh-income countries: An international scoping review. *Appetite*: 698-708.

Midgley, J. L. (2014). The logics of surplus food redistribution. *Journal of Environmental Planning and Management* **57**(12): 1872-1892.

Mourad, M. (2016). Recycling, recovering and preventing "food waste": competing solutions for food systems sustainability in the United States and France. *Journal of Cleaner Production* **126**: 461-477.

Mulas, V., Minges, M. and Applebaum, H. (2015). Boosting tech innovation ecosystems in cities: a framework for growth and sustainability of urban tech innovation ecosystems Washington, D.C.: World Bank.

ONS (2017). UK Population Estimates (Density and Population) 2017, Office for National Statistics.

Papargyropoulou, E., Lozano, R., Steinberger, J. K., Wright, N. and bin Ujang, Z. (2014). The food waste hierarchy as a framework for the management of food surplus and food waste. *Journal of Cleaner Production* **76**: 106-115.

Parfitt, J., Barthel, M. and Macnaughton, S. (2010). Food waste within food supply chains: quantification and potential for change to 2050. *Philosophical Transactions of the Royal Society B: Biological Sciences* **365**(1554): 3065-3081.

Patton, M. Q. (2014). Qualitative Research and Evaluation Methods, Fourth Edition, Sage Publication.

Pollard, C. M. and Booth, S. (2019). Food Insecuirty and Hunger in Rich Countries - It is time for action against inequality. *International Journal of Environmental Research and Public Health* **16**: 1804.

Priefer, C., Jörissen, J. and Bräutigam, K. R. (2016). Food waste prevention in Europe – A cause-driven approach to identify the most relevant leverage points for action. *Resources, Conservation and Recycling* **109**: 155-165.

Purdam, K., Garratt, E. A. and Esmail, A. (2016). Hungry? Food Insecurity, Social Stigma and Embarrassment in the UK. *Socioloy* **50**: 1072-1088.

Seuring, S. and Müller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management. *Journal of Cleaner Production* **16**(15): 1699-1710.

Sonnino, R. and McWilliam, S. (2011). Food waste, catering practices and public procurement: A case study of hospital food systems in Wales. *Food Policy* **36**: 823-829.

Stuart, T. (2009). Waste. Uncovering the Global Food Scandal. Sustainable Restaurant Association, 2010. Too Good to Waste. Restaurant Food Waste Survey Report, London. Penguin, London.

Tarasuk, V. and Eakin, J. M. (2003). Charitable Food Assistance as Symbolic Gesture: An Ethnographic Study of Food Banks in Ontario. *Social Science and Medicine* **56**: 1505-1515.

Thomas, D. (2006). A General Inductive Approach for Analyzing Qualitative Evaluation Data. *American Journal of Evaluation* **27**(237-246).

Thyberg, K. and Tonjes, D. (2016). Drivers of food waste and their implications for sustainable policy development. *Resources, Conservation and Recycling* **106**: 110-123.

Trussell Trust (2018) "The Trussell Trust - End of Year Stats."

UN (2015). Transforming Our World: The 2030 Agenda for Sustainable Development. General Assembley 70 Session 16301 (October), 1–35.

UNDP (2016) "Sustainable Cities: Why they matter?".

van der Horst, H., Pascucci, S. and Bol, W. (2014). The "dark side" of food banks? Exploring emotional responses of food bank receivers in the Netherlands. *British Food Journal* **116**(9): 1506-1520.

WRAP (2018) "Surplus food redistribution in the UK: 2015 to 2018." Information Sheet.

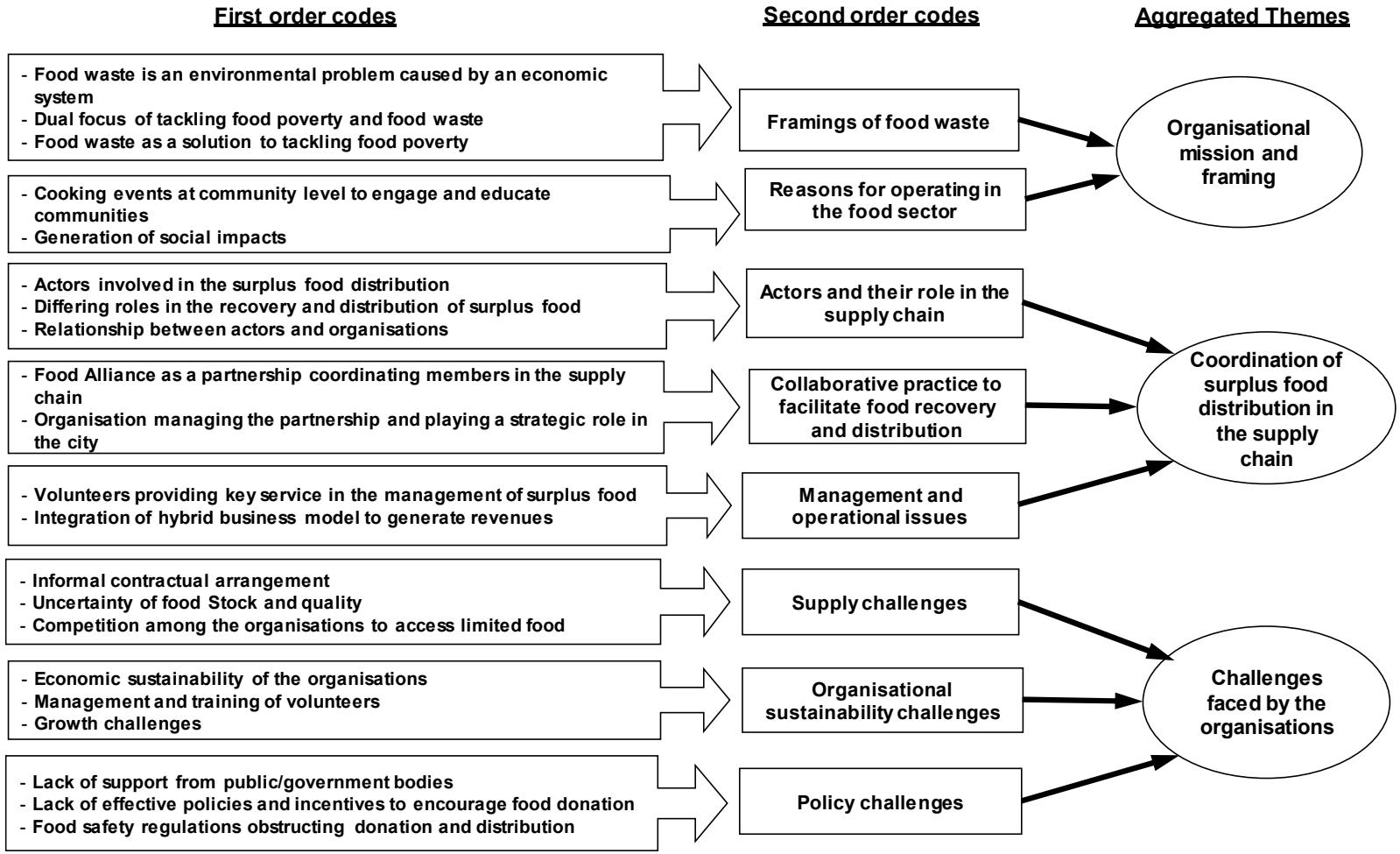

Figure 1 Data analysis structure showing coding process and development of aggregated themes

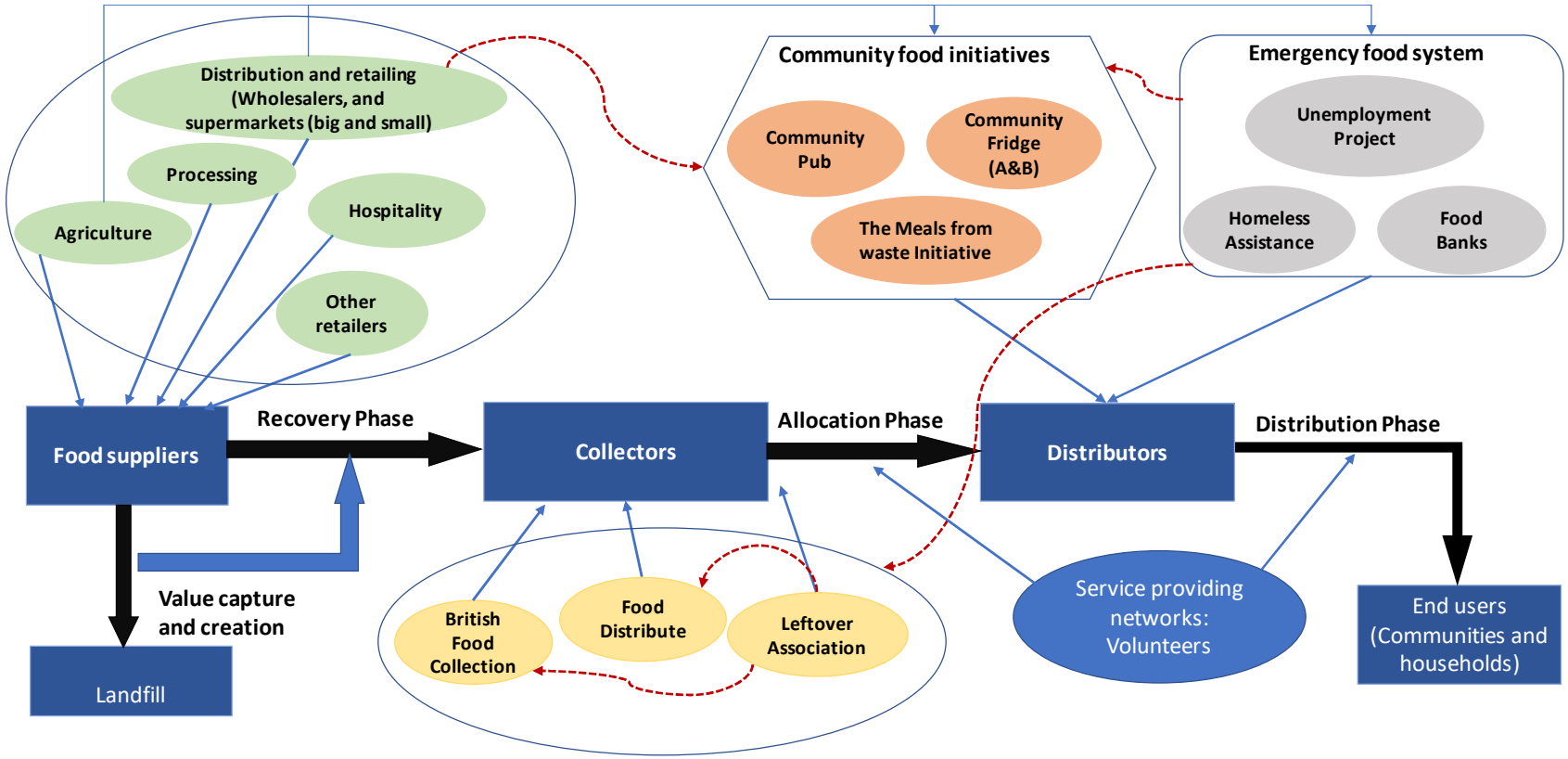

Figure 2. Surplus food distribution ecosystem showing multiple actors and organisations and their interrelationships

(Note: BOXES: Blue rectangle – Actors in the supply chain of surplus food recovery, collection, and distribution; Hexagon – Community food initiatives using surplus food to provide food to the communities and individuals in need; Curved rectangle – Emergency food system using food assistance to provide food to the communities in need with specific circumstances; Circle – Food Suppliers; Oval: Food Collectors from the suppliers and do not directly provide food to the end users

ARROWS: Black Thick arrows – Supply chain and actors in the supply chain; Blue thin arrows – Individual organisations and their position in the supply chain; Red dotted arrows – the complex supply chain where actors in different groups access food and provide food within and between the groups)

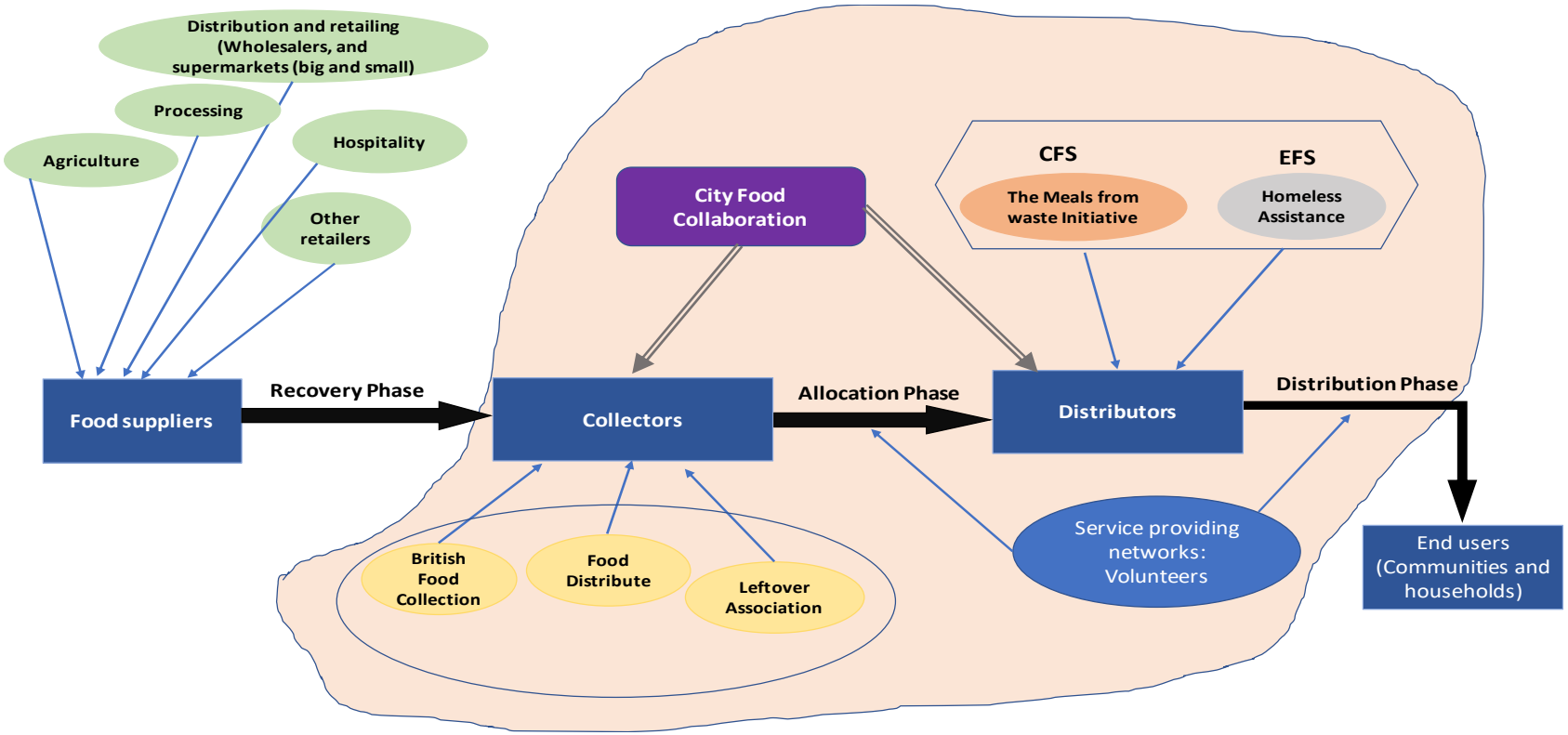

Figure 3. Food Alliance and the City Food Collaboration in the surplus food distribution supply chain

Note: Light peach Shaded area: Food Alliance and the members of the alliance

BOXES: Blue rectangle – Actors in the supply chain of surplus food recovery, collection, and distribution; Purple curved rectangle – City Food Collaboration; Hexagon – Community food initiatives and Emergency food system using food assistance to provide food to the communities; Circle – Food Suppliers; Oval: Food Collectors from the suppliers and do not directly provide food to the end users

ARROWS: Black Thick arrows – Supply chain and actors in the supply chain; Blue thin arrows – Individual organisations and their position in the supply chain; Grey double arrows – City Food collaboration's linkages with Collectors and Distributors)

Table 1. Existing studies on third-sector organisational involvement in surplus food distribution

Authors (Year)	Research aim	Study method/Organisations included	Study country/City	Main Findings	Focus of the study
Alexander and Smaje (2008)	Analyse food donation by large retailers to the British Charity FareShare and its franchises for redistribution to charities	Participant observation and semi-structured interviews with logistic/operations manager Single case study - FareShare	UK Southampton	- Tensions across the tripartite relationship between retailers, franchise-holders and recipient projects - Subordinate power relationships running from recipients to FareShare and then to the retailers.	Single organisation
Midley (2014)*	Understanding what surplus food is, and how this resource is managed and utilised	Semi-structure interviews Multiple organisations - 5 third sector organisations at different levels (national, regional, and local) involved in surplus food distribution	UK North-east England	- Social framing and temporal qualities of food drive third-sector actions. - Third sector organisations position themselves as market actors resolving the problems of food system and the inequitable outcomes.	Understanding of what surplus food is and challenges in managing surplus food
Baglioni et al. (2016)*	Analysing the role of the non-profit organisation involved in surplus food recovery and redistribution	Comparative case study Semi-structured interviews and participant observation Multiple organisations, but non-profit actors only – 11 in Italy and 5 in Germany	Lombardi, Italy and Baden – Wurttemberg, Germany	- Different types of organisations with different roles – logistical (collecting food and providing to front-line), front-line (providing food to end users, and hybrid (doing both). - Different organisations have different relationships to the stakeholders, such as end users, food donors, and policy makers.	Non-profit organisations and relationships between different stakeholders

Authors (Year)	Research aim	Study method/Organisations included	Study country/City	Main Findings	Focus of the study
De Pieri et al. (2017)*	Analysis of existing European policy on surplus food recovery and redistribution and stakeholders involved	Review	EU	- Organisations have different roles in surplus food recovery and redistribution. - Differential nature of policy measures affecting different stakeholders - Lack of distinction between profit and non-profit organisations affecting the operations of non-profit actors - Food and national legislation create barriers.	Policies affecting different stakeholders in surplus food distribution
Bramanti et al. (2017)*	Identify the nature and characteristics of food charities	Participant observation and Semi-structured interviews No-profit organisations (NPOs): France – 5 Germany – 5 Italy – 20 Spain - 7	Four European regions – France, Germany, Italy, Spain	- Relational capital showing network size, heterogeneity and trust relationships - Structural dimensions related to internal organisational processes and knowledge - Human dimensions related to people involved, their attitudes, skills and knowledge. - Engagement of NPOs in innovation to provide better service to food donors and end users.	NPOs and the importance of building intellectual capital for efficient surplus food distribution and meeting social and environmental goals
Facchini et al. (2018)	Scrutinise the uptake and redistribution of surplus food as a potential food	Semi-structured interview with stakeholders Several enterprises and community-led initiatives	UK London	- Redistribution is fragmented and organisations working independently from each other. - Several logistic challenges create difficulties in long-term existence of organisations involved.	Existing initiatives and inefficiencies of surplus food distribution in the UK

Authors (Year)	Research aim	Study method/Organisations included	Study country/City	Main Findings	Focus of the study
	waste prevention strategy			- Despite limited in scale, organisations in the UK are making real impact in reducing food waste and food poverty - Different types of organisations exist at different levels connecting businesses with local charities, community projects and social entrepreneurs.	
Blake (2019a)*	Explore the ontological transition in the qualities of food as it shifts from being commercial food waste to food that feeds people in need generating social values	Participant observation with a major commercial food to charity redistribution and surplus food distribution organisation, interviews with 3 profit and not-for-profit surplus food distributors, and workshops and focus groups with retailers and food manufacturer and front-line charities	UK	- Food flows through the commercial and non-commercial domains with different motives and value generation. - The primary purpose of food in the commercial supply chain is to produce profit. - Surplus food is a food that has refigured its others value as social good than commercial value.	Flow of food from commercial to non-commercial domain and what becomes of food in terms of value generation
Present Study	Adopts a macro view in examining surplus food distribution supply chain at the city level and the coordination of surplus food distribution among	Participant observation and semi-structured interviews Multiple organisation in public, private and third sector organisations - 10 organisations in total	UK South east England	- Different types of organisations with distinctive role and power relationships - Framings adopted by organisations influence their approach and focus in terms of food waste or food poverty - To reduce the food supply challenges, a partnership was	Mapping of surplus food distribution supply chain at the city level identifying different types of actors, their role in the supply

Authors (Year)	Research aim	Study method/Organisations included	Study country/City	Main Findings	Focus of the study
	the actors involved in the supply chain			formed to facilitate collaboration between multiple actors and organisations. - Supply, organisational sustainability and policy challenges exist affecting the supply chain	chain, framing used for actions, their revenue models, and challenges faced.

Note: * Data for these studies came from larger projects.

Table 2. Criteria used for the selection of organisations to include in the study

Inclusion Criteria	Exclusion Criteria
I) Members of the Food Alliance; II) Permanent presence in and around the city; III) Recipient of all kind of food, i.e. fresh, perishable and long-lasting food; IV) Focusing on food waste and regularly using surplus food; V) Using surplus food with the aim to reduce food waste and food poverty VI) Differing legal form, size, and revenue models	I) Individuals involved in organising one-off events, such as soup kitchen and lunches; II) The focus of the organisation and the individual is to engage communities in cooking food; III) Not formally a part of the surplus food distribution system; IV) Emergency Food Network that operates in a different system of referral and mostly focuses on food banks. V) Individuals involved in distributing surplus food

Table 3. Third sector organisations and social enterprises operating in the surplus food supply chain

Name of the initiative	Legal Form	Level of operation	Aims and objectives	Main activity	Who they distribute to	Food collection source
City Food Collaboration (Facilitates the Food Alliance)	Not-for profit Company	Local	Aim to connect community groups, individuals, and organisations and Use food as a vehicle to talk about various issues	Food rescue operation that collects quality excess food from commercial outlets and delivers it, direct and free of charge, to charities	They run as a partnership; they do not distribute surplus food directly to individuals but to the charities.	Do not collect surplus food
Food Distribute	Charity	Affiliated to a national organisation, the local run independently	Redistribute surplus food, tackle food hunger, support volunteers	Intercept surplus from retailers and farms, distribute to 122 charitable projects	Charitable projects that support vulnerable people, volunteers	Businesses, warehouse, supermarkets, and Theatres and Restaurants
British Food Collection	Charity	Regional Level – South East	Redistribute surplus food, "Nourish the country", Education	Intercept surplus food from retailers and farms, distribute to over 100 charitable projects	Charitable projects, volunteers, Socially isolated people in 'surplus suppers'	Businesses, warehouse, supermarkets, and Theatres and Restaurants
The Leftovers Association	Charity	Local	Help farms to reduce food waste, raise awareness of this issue, create meaningful volunteer opportunities	Glean surplus food from farms and distribute to Food Distribute occasional meals in homeless charity and pay as you feel cafes	Organisations that distribute food surplus, volunteers, homeless communities, the public at occasional pay as you feel cafes	Farms
The Meals from Waste Initiative	Community Interest Company	Affiliated to a national organisation, the local runs independently	Intercept surplus food, redirect this food to the community	Pay as you feel café, pay as you feel Surplus food shop	Everyone who wants to come, volunteers	Businesses, warehouse, supermarkets, and Theatres and Restaurants, Charities.

Homeless Assistance	Charity	Local	Provide accommodation, support, and advice to homeless people feed homeless people	A street kitchen on Sundays using surplus food	Homeless people in Sussex	Businesses, warehouse, supermarkets, and Theatres and Restaurants
Community Fridge A	Charitable arm of a housing association	Local	Engage local communities in various groups, such as theatre and careers services, reduce food waste	Community groups, community fridge	Everyone who wants food, volunteers	Businesses, warehouse, supermarkets, charities, and Restaurants.
Community Fridge B	Charity	Local	A community education centre that aims to get people back into employment, Reduce food poverty among these people	Community groups, community fridge	Everyone who wants food, who registers. But this is usually the local community, volunteers	Businesses, warehouse, supermarkets, charities, Restaurants, and residents.
The Unemployment Project	Charity	Local	Offer support, advice, and education to the unemployed and those in poverty	Various projects including welfare rights an education, food project: 0.60p-£1.50 lunches using surplus food	The unemployed and those in poverty who visit the project, members of the public	Charities
Community Pub	Community Benefit Society	Local	To be 'more than a pub' by having a social impact on the community , the pub to be affordable for the local community	Art groups, dementia groups, social lunches	People who attend their lunch groups – older people and those who are socially isolated, anyone who comes into the Bevy for lunch on weekdays	Charities

Note: Organisations in the shaded rows are the members of Food Alliance

Table 4. Steps taken for data analysis

Steps	Process undertaken	Outcomes
Step 1	Reading of transcription by two members for initial coding	- Coding of interviews by two members of the team
Step 2	Testing the reliability of codes	- Sharing of codes with the research team - Identification of 21 first-order codes
Step 3	Clustering of codes to identify themes	- Analysing codes to identify overarching themes. - Codes were compared within and between the interview transcripts. - Formation of second order codes (8) and overarching themes (3) based on the conception of actors, operations, interventions and challenges (Gioia et al. 2013)
Step 4	Reviewing themes	- Discussion of identified themes with the research team - Examination of links between the codes - Identification of linkages between the themes within and between interviews
Step 5	Defining themes	- Discussion with the research team for the refinement of themes - Identifying linkages between first-order codes, second order codes and aggregate themes