Co-designing food waste services in the catering sector

ABSTRACT This paper presents results from the action research project, where sustainability professionals, local businesses and academic researchers collaborated on exploring barriers for food waste recycling in SMEs food outlets in order to inform local policy and business practices in Bristol, UK.

The researchers conducted face-to-face, qualitative surveys of 79 catering businesses in three diverse areas of the city. The action research methodology was applied, where a range of co-researchers contributed towards study design and review The research reveals the main barriers to recycling and how such perceptions differ depending on whether the respondents do or do not recycle, with "convenience" and "cost" being the main issue according to the already recycling participants. On the other hand, participants who do not recycle state that their main reason is "not enough waste" and "lack of space.

Participants recommended a range of measures, which could improve the current food waste services in Bristol. For example, they suggest that business engagement should address the barriers voiced by the participants applying the framings used by them, rather than assuming restaurants and cafes are not aware of the issue. By inviting a variety of non-academic stakeholders into the process of research design and analysis, the project addressed the imbalances in knowledge production and policy design Despite the local and qualitative focus

23   of this paper, the results and research methodology could act as a useful guide for conducting

24   food waste action research in the policy context.

1. Introduction

1.1. The landscape of food waste in the UK

27   Food waste is a complex problem. It arises from each stage of food handling; from

28   growing, processing, preparation, retail to consumption. There are no empirical national-scale

29   calculations of food waste alone, but it is estimated that the annual food waste in the UK totals

30   around 10 million tonnes (Mt). This quantity is associated with estimated emissions of 20 Mt

31   greenhouse gases (mostly through landfills releasing methane) and an economic cost £17 bn

32   (WRAP, 2017). Therefore, tackling food waste presents a significant policy opportunity to

33   tackle climate change, hunger and save money.

34   The UK is a signatory to the international frameworks dealing with food waste, such as

35   UN's Sustainable Development Goals (UN, 2015) and EU Waste Framework Directive

36   (Papargyropoulou *et al*., 2014). Despite the commitments to the ambitious international

37   targets, there is little national legislation in place (Priestley, 2016).

38   Waste in the UK is managed by the devolved countries and the local authorities.

39   Currently, there are no mandatory food waste regulations in England (ibid.) and the government

40   favours voluntary approach, such as the Courtauld Commitment 2025, where its signatories

41   (nearly 100 retailers, local councils, and manufacturers) aim to decrease waste from food and

42   packaging by 20% between 2015 and 2025 (WRAP, 2018). Commercial waste is managed

43   privately, although businesses are under the Duty of Care, meaning that they have to "take all

44   reasonable steps to ensure that the waste is managed correctly throughout its complete journey

45   to disposal or recovery" (DEFRA, 2016). In practice, many do not choose to recycle or prevent

46   waste; with the catering and hospitality industry alone leaving 0.92 Mt (or 3.6 Mt CO_{2eq})

47 annually in the UK (WRAP, 2017). According to House of Commons (2017), 41% of waste

48 from hospitality sector[1] is food waste and 43% of waste is sent for disposal.

49   In contrast, Scotland and Northern Ireland are ahead of England in terms of business

50 waste legislation. Businesses in Scotland and Northern Ireland producing more than 5kg of

51 food waste per week are obliged to set up a separate waste collection (Scottish Environmental

52 Protection Agency, 2016; Department of Environment, Northern Ireland 2015).

53 *1.2. Bristol's answer to food waste issues*

54   Bristol, a city in the southwest of England with some 442 000 residents, is the area of

55 this study (BCC, 2016). The city aims to become carbon neutral by 2050 (BCC, 2015). It also

56 published a Zero Waste strategy setting out a vision and objectives for significant diversion of

57 waste from landfill by 2030 (BCC, 2016).

58   The city is home to over 1000 hospitality and catering businesses (Carey, 2011). There

59 is no data on the food waste practices and quantities in the area, however, Carey (2011)

60 presumes that:

61   *"most shops, cafes, restaurants and large-scale kitchens are unlikely*

62   *to separate out food waste and that it is therefore taken to landfill with*

63   *all other waste through private contractors (...) more research is*

64   *needed to establish the volume of food waste generated by the city,*

65   *including commercial food waste, and to explore collaborative*

66   *solutions that can serve the city as a whole".*

67 In the absence of mandatory recycling or mandatory edible surplus redistribution, cross-

68 sectoral partnerships and charities play a significant role in food waste via prevention and

69 recycling in the catering sector. There are no overarching data on redistributed or recycled

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[1] Defined by WRAP (2018) as pubs, restaurants, hotels and quick service restaurants.

70 food, however some notable examples are documented via case studies, such as FareShare and

71 Sustainable Bishopston Traders' Food Waste Recycling Service (BGCP, 2015; Resource

72 Futures, 2013). FareShare redistributes surplus food from retailers, restaurants and

73 manufacturers to the local groups working with vulnerable people. FareShare transfers 30-40

74 tonnes of food to the charities in the wider Bristol region, supporting 150 organisations in

75 Bristol and neighbouring municipalities (BGCP, 2015). However, it can be argued that due to

76 restrictions on redistribution (i.e. charities cannot accept warmed or cooked food, FareShare,

77 2018), catering sector is not able to work extensively with surplus food charities.

78   Another example of a local initiative is Sustainable Bishopston Traders' Food Waste Service.

79 In 2013, they trialled a co-ordinated food waste collection scheme (Resource Futures, 2013).

80 The scheme conducted a survey of the local needs, secured a discounted deal, promoted it in

81 the local media and organised a catering staff visit to the waste treatment site. The food waste

82 scheme was well documented, however after the successful trial period, it ended due to issues

83 with waste contractors.

84 *1.3. Research aims and objectives*

85   This research explores current food waste practices and barriers to food waste recycling

86 [2]in food outlets, with the aim of informing policies and business practices for improved waste

87 management in Bristol, UK.   In particular, this paper reports on the results of the qualitative

88 survey of 79 catering[3] businesses . In doing so, the paper answers the following research

89 questions: What are the main barriers to participation in the commercial food waste recycling

90 services? How can these barriers be addressed at the city and organisational levels? Therefore,

91 the paper contributes to the debates on food waste management at the organisational and policy

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[2] Food waste recycling is defined here as the waste management processes diverting inedible wasted food from the landfill, e.g. composting of anaerobic digestion.
[3] For the purposes of primary data collection, we define catering businesses as the following: cafes, restaurants, pubs, fast food takeaways and bakeries.

levels. The findings show how action research approach can address sustainability issues and contribute towards the knowledge creation.

2. Literature review

The literature on surplus food and food waste in the catering industry was reviewed according to three perspectives:

- reasons for food waste;

- proposed and implemented solutions;

- dominant discourses.

The academic literature on food waste in the catering industry tends to focus on conceptualising reasons for the problem (Goebel *et al*., 2015; Garrone *et al.,* 2014; Priefer *et al.,* 2016; Pirani and Arafat, 2016) and proposing systemic solutions (Priefer *et al.,* 2016, Mourad, 2016). Emphasis is often put on the international comparisons (Mourad, 2016; Priefer *et al.,* 2016, Sirieix *et al.,* 2017) and quantitative investigations (Porpino *et al.,* 2015; Silvennoinen *et al*., 2014, Pirani and Arafat, 2016). Only a few researchers show interest in reviewing waste management practices and discourses (Mourad, 2016; Thompson and Haigh, 2017).

Academics agree that food waste is a complex problem, which cannot be attributed to a single reason or sector (Goebel *et al.,* 2015; Heikkilä *et al*., 2016). Waste occurs both at the pre-consumer (e.g. food preparation) and post-consumer (purchased, but not eaten leftovers) stages, which can make business choices highly contingent on the external factors, e.g. customers or suppliers (Pirani and Arafat, 2016). Food quality requirements, lack of co-operation along the supply chain, errors in forecasting customer demand, and portion sizes repeatedly appear as the main reasons for food waste within the catering industry (Goebel *et al*., 2015; Garrone *et al.,* 2014; Priefer *et al.,* 2016, Heikkilä *et al.,* 2016, Pirani and Arafat,

115 2016). These studies predominantly used interviews and workshops with high-level

116 professionals to reach the above conclusions.

117 Thus, the solutions proposed reflect the composition of the participants' pool, i.e.

118 managers, academic experts, and policymakers. They suggest interventions at high-level

119 decision-making, e.g. "a multi-stakeholder dialogue" (Goebel *et al*., 2015; Priefer *et al.,* 2016),

120 "improving data availability and measurements by agreeing on the definitions of "food

121 waste/surplus food" or "mandatory collection of food waste" (Priefer *et al.,* 2016).

122 Nevertheless, interviews and workshops with food sector professionals yielded a few

123 recommendations are the operational level – most of them concerned with food waste

124 prevention. For example, recent studies suggested waste prevention ideas, such as offering

125 individual portion sizes, careful menu planning and improvement of internal routines (Priefer

126 *et al.,* 2016; Silvennoinen *et al*., 2014). Duursma, *et al.,* (2016) measured food waste in Dutch

127 restaurants and concluded this is an appropriate way of raising awareness among the kitchen

128 staff. Porpino *et al.,* (2015) conducted laboratory experiments demonstrating smaller starter

129 size outperforms persuading customers to reduce waste. Finally, Strotmann *et al*. (2017)

130 conducted an intervention study, where a set of measures (e.g. staff training, poster, improved

131 communication across the supply chain, change portion size, analysis of customer preferences)

132 contributed to a decrease in food waste in a cafeteria and a residential home. Although the

133 number of experimental and quantitative studies is growing, there is a gap in research

134 investigating the organisational side of food waste recycling.

135 Despite the aforementioned research gap, academics argue that the catering industry as

136 well as the policymakers are too focused on recycling rather than prevention and redistribution.

137 Mourad (2016) critiqued French and the US municipalities and food companies for promoting

138 predominantly recycling measures as an answer to food waste. She pointed out that this practice

139 is against the widely accepted hierarchy of waste, which seeks to prevent, then redistribute and

140 then recycle waste (Papargyropoulou *et al*., 2014). As a result, surplus food turns into a waste

141 commodity (Mourad, 2016).

142   However, even after reducing food production and redistributing surplus to people in

143 need, there will be "unavoidable waste" left, e.g. cores, egg shells or bones. It is estimated that

144 a quarter of food waste in catering is "unavoidable", a category defined by WRAP (2017) as

145 food not suitable for consumption. This fact alone justifies the need for research and policy on

146 effective food waste recycling services. Yet, despite the wide encouragement from the

147 policymakers, it is not clear how to introduce food waste recycling to the catering sector.

148   Food waste is a politicised issue. Mourad's (2016) paper differentiated between various

149 framings for food waste:

150   • **Social,** expressed as cooking collectively with surplus produce, Slow Food movement,

151   food banks, national policies to track food losses and redistributing surplus to tackle

152   ethical and food security concerns;

153   • **Environmental,** e.g. diversion from landfills by composting or anaerobic digestion;

154   • **Economic**, understood as **either** "resource efficiency" - managing losses and surplus

155   to maximise economic efficiency **OR** "a protest against capitalism" through radical

156   bottom-up organising (e.g. freeganism or Food Not Bombs).

157

158 Mourad (2016) critiqued the main discourses of waste management present in the French and

159 US governments. She found that the authorities rely on technological improvements and large-

160 scale optimisation of the existing supply chains, leaving the current modes of over-production

161 and over-consumption unchallenged. In other words, they are underpinned by the "economic"

162 discourse understood as "resource efficiency" rather than "protest against capitalism". In turn,

163 Mourad (ibid.) suggests sustainability solutions, which challenge "over-industrialization," and

164 "homogenisation" of food production.

165 Thompson and Haigh (2017) explore food waste framings through media analysis. They

166 describe a societal shift from arguing for "wartime resourcefulness" to contemporary concerns

167 about "feeding global population with limited resources" (ibid). Furthermore, they argue that

168 at the catering level, food waste is constructed as a moral issue and a matter of incompetency

169 in business management and food handling (ibid).

170   In summary, the academic literature provides comprehensive reasons for food waste

171 and suggests solutions at various levels of engagement. There are numerous empirical and

172 quantitative studies demonstrating effectiveness of certain specific measures. However,

173 academics have not focused sufficiently on addressing the organisational side of food waste

174 recycling in the catering sector – perhaps due to prevailing engagement with the most senior

175 staff. Research approaches exploring the barriers and practices together with the food waste

176 practitioners and food outlet staff members are therefore critical for providing appropriate

177 policy and managerial recommendations. The following section will elucidate why the

178 approach presented in this paper, action research, is suitable for closing the gap in the literature.

179 **3. Materials and methods**

180 *3.1. Methodology: Action Research*

181   The findings reported in this paper contribute to co-designing policy and organisational

182 recommendations related to food waste recycling in Bristol, UK. Hence, the overall

183 methodology applied was action research. Action research is characterised by an emphasis on

184 improving and informing practice while engaging with participants throughout the research

185 design, analysis and dissemination stages (McNiff and Whitehead, 2011). Sequential methods

186 design was applied in this project: the researchers started with the analysis of food waste

187 discourses (summarised in section 2). Then, they facilitated a series of meetings with 9 local

188 food waste practitioners (Appendix 1), who highlighted commercial food waste arisings as the

189 key challenge and a tangible opportunity for the city-scale policy. Figure 1 (below) describes

190 the research process: timescales, meetings and data collection.

191   **[INSERT FIGURE 1 HERE]**

192   The central point of the primary data collection was the qualitative survey, designed in

193 collaboration with the practice-based co-researcher (Author 2). Following the data collection

194 and preliminary analysis stage, co-researchers also contributed to the scrutiny of the results.

195   Action research is used in this study as it focuses on practical and applied knowledge,

196 and it strives to break down the hierarchies and imbalances in knowledge production (Hawkins,

197 2015). It acts as a conduit between practitioners, policymakers, and researchers. Moreover,

198 giving voice to the food waste practitioners and catering sector staff has important

199 epistemological implications for research and policymaking. It invites questions like: who

200 should design policies? Which questions should be researched? What constitutes as knowledge

201 in complex and transdisciplinary social settings? (ibid.).

202 *3.2. Qualitative surveys*

203   The qualitative design was applied in this study to derive diversity and "richness" of

204 answers and participants rather than statistical analysis of results (Jansen, 2010). Therefore, the

205 results do not aim to represent the whole catering sector, but they act as an evidence for co-

206 designing a policy specific to the local context. Qualitative face-to-face surveys are suitable for

207 exploratory research, where not enough studies on the issue were undertaken and in-depth

208 understanding is required to derive sound policy recommendations (ibid.).

209 *3.3. Data collection*

210   The researchers carried out 79 face-to-face surveys in January 2018. Businesses were

211   purposively selected, so each business type and research area (see Table 1 for area

212   characteristics) was adequately represented. Furthermore, the areas selected reflect the

213   diversity of Bristol's high streets. The sample size was determined so that the dataset achieves

214   saturation (Morse, 2015), i.e. most opinions are covered, there are visible patterns in data and

215   there is a considerable diversity within the sample itself.

216   **[TABLE 1 HERE]**

217   The majority of the interviews lasted between 5 and 10 minutes, however, in 8 cases

218   they lasted 15-25 minutes (including 1 waste facilities tour). Answers were recorded in writing

219   on a survey sheet. Two respondents opted for sending email responses instead of participating

220   in a face-to-face survey. The interviews were conducted with the staff at the front of the house

221   unless they specifically requested another staff member to contribute (e.g. an off-duty manager

222   or a chef). Since the level of seniority was not a requirement for participation, the survey

223   allowed to capture a more diverse range of experiences and opinions. Furthermore, the concise

224   survey design contributed to a high response rate as the day-to-day work wasn't disturbed, nor

225   was a separate meeting was required as the willing participants were recruited using the door-

226   knocking technique.

227   When distributing the survey, the researchers avoided prompting. They also took care

228   to rephrase questions when a language barrier arose. The researchers used empathetic and non-

229   judgemental language to encourage opinions from participants of all levels of seniority and

230   build trust, which is essential to disclose sensitive information. The survey asked 5 open-ended

231   questions about present food waste management practices (Q1), reasons for (not) recycling

232   (Q2), perceived barriers (Q3), and suggestions for improvement (both for catering sector, waste

233   companies and policymakers; Q4 and Q5). Finally, the survey included 3 demographic

234 questions (business type, location, membership in a traders' group) and an option to be

235 contacted in the future.

3.4. Data analysis

237 The researchers coded participants' answers and analysed them using thematic-

238 discourse analysis (Braun and Clarke, 2006). Thematic Analysis allows the capturing of

239 patterns in the data in an inductive and systematic way (ibid.). The critical lens of analysis, and

240 the comparison of the languages present in the dataset and the literature were drawn from the

241 tradition of discourse analysis (Bax, 2011). Here discourse is understood as text or speech in a

242 social context, analysed with the reference to ideologies, policies, and agendas (ibid.).

3.5. Limitations and advantages

244 The analysis of survey data should not be statistically relied upon since the sample size

245 is not representative of the whole city. Seventy-nine participants and three neighbourhoods

246 cannot reflect the participation rate for some 1000 catering outlets located across all 34 wards

247 in the city. However, the nature of action research does not require results to be generalisable

248 as the focus of the survey is the themes and discourses derived from the qualitative data.

249 Similarly, the recycling participation figure might be an overestimation, as participants who do

250 not recycle could refuse taking part in the surveys or do not reveal its practices truthfully.

251 However, a high response rate and a range of honest and detailed responses from non-recycling

252 businesses encourage trust in the data.

253 The researchers encountered a language barrier in a few cases, which affected the

254 "richness" of the dataset, particularly in Easton. The researcher used plain language and

255 repetitions to encourage complete answers. For the future, the researchers recommend working

256 with interpreters.

257   The length of the questionnaire (5 open-ended questions) could potentially affect the

258 "richness" of data. However, a variety of answers, high response rate and the presence of

259 forward-looking insights suggest that the data achieved saturation. The researchers decided to

260 conduct a short survey, as this was more appropriate in busy, customer-facing environments.

261 **4. Results**

262   In total, 79 out of a population of 95 approached businesses responded to the survey

263 (83% response rate). Table 2 outlines the demographic characteristics of survey respondents.

264 The participating businesses were located in the following areas: city centre (39.2%),

265 Gloucester Road (40.5%) and Easton (20.3%). The smaller sample size in Easton reflects the

266 size of the area. They characterised themselves as the following: restaurants (29.1%), pubs

267 (12.7%), cafes (30.4%), fast food takeaways (22.8%) and bakeries (5%).

268 **[TABLE 2 HERE]**

269 The researchers generated three themes described in sections 4.2-4.4. The themes are as

270 follows: "Barriers or excuses?; "Need for top-down measures"; "Giving agency". After the

271 categorisation of answers in thematic patterns, the researchers investigated the language used

272 by the participants. As a result, dominant, emerging, and conflicting discourses were identified

273 and are described in section 4.5.

274 *4.1. Characteristics of participants who recycle food waste*

275   Out of 79 respondents, 42 (53%) confirmed that they already use food waste collection

276 services. Table 3 outlines the response by area and business type. The recycling rate is not

277 evenly distributed across the areas and business types, with Easton having much lower

278 participation rate than other areas. While restaurants achieved high recycling participation rate

279 (78%), takeaways and bakeries recycled the least (respectively 33% and 0% participation in

280 recycling services). Although the results are not statistically significant, they indicate that

281 participation in recycling services may depend on the type of the business and the location of

282 the catering business. As such, improved waste services could target its recipients according to

283 businesses in needs and potential priority areas.

284 **[TABLE 3 HERE]**

285 *4.2. Barriers or Excuses?*

286 Figure 2 summarises the main barriers to participation in food waste recycling, as voiced by

287 the food outlets employees.

288 **[INSERT FIGURE 2 HERE]**

289 According to the participants who don't recycle food, the main barriers are:

290 • Not enough waste (recorded 18 times, e.g. *"We have very little waste comparing to*

291 *other restaurants"* restaurant/Gloucester Road)

292 • Lack of space for bins (recorded 7 times, e.g. *"It's the practicalities of handling and*

293 *storing food waste on site until collection"* café/Gloucester Road)

294 • Cost (recorded 5 times, e.g. *"We used to do it, no it's too expensive for the amount of*

295 *waste produced"* café/City Centre)

296 • Convenience (recorded 5 times, e.g. *"It takes too much work to arrange"* restaurant/

297 Easton)

298 However, the landscape changes once the answers of participants, who already recycle

299 included:

300 • Convenience (recorded 20 times, e.g. *"It's laziness – there should be no excuse!"*

301 Café/Gloucester Road)

302 • Cost (recorded 16 times, e.g. *"I imagine it would be the price, it's easier for big*

303 *businesses like ours"* restaurant/ city centre)

304 • Lack of space (recorded 5 times, e.g. *"I'd assume it would not be feasible in small*

305 *spaces"* pub/ Gloucester Road)

13

306 • Knowledge gap (recorded 5 times, e.g. *"Not many people have the knowledge of what*

307 *can and cannot be recycled, for example biodegradable cups"* restaurant/ Gloucester

308 Road)

309 There is a clear discrepancy between the barriers mentioned by those who recycle and

310 those, who do not. It is questionable whether the issues of space and small quantities are the

311 complex, systemic barriers claimed or rather - are they "excuses", which could be overcome

312 with quality communication and simple measures? For example, a participant working in a café

313 on Gloucester Road said: "*we should emphasise how easy it is, for example, use myth busters*".

314 **4.3. Need for top-down measures**

315 Thirteen participants indicated that food waste recycling should be a legal requirement,

316 e.g. "*It should be done by the council, not waste companies*" takeaway/ city centre. Notably,

317 12 out of 13 answers came from participants, who already recycle. This result should not be

318 used as an extrapolation for the acceptance of compulsory food waste recycling policy. The

319 survey did not explicitly ask: "are you in favour of compulsory food waste management?".

320 Instead, the question was the following: "how could waste collection services be improved?".

321 Another popular suggestion was "lower price", mentioned by 12 participants. This

322 solution could be implemented as either policy or market measures. Participants disagreed on

323 whether recycling should be subsidised, e.g. "*Everyone should do it; businesses shouldn't be*

324 *subsidised to do so"* (café/Gloucester Road) vs "*State should subsidise it to convert to energy*"

325 (restaurant/City Centre). Some other ideas proposed by the participants were *"local targeting*

326 *of areas in need*" (takeaway/city centre or *"tax relief for green businesses"*

327 (Restaurant/Easton). Finally, achieving better value for money could be facilitated using

328 market measures, for example, a co-ordinated cost-efficient service for shopping centres,

329 markets, areas w large concentration of businesses etc. ("*Business Improvement Districts*

330   *should coordinate it*" restaurant/Gloucester Road). Figure 3 summarises the policy measures

331   recommended by the participants.

332   **[FIGURE 3 HERE]**

333   *4.4. Giving agency*

334   While large-scale and systemic measures are often preferable for addressing complex

335   issues like food waste, they are usually challenging and timely to implement. Meanwhile,

336   participants recommended a range of operational solutions, which could give the agency to

337   both catering staff and waste companies.

338   First, waste companies could improve their service by responding to the varied needs

339   of both smaller and bigger businesses (recorded 21 times). A staff member based in the city

340   centre restaurant suggests: "*They should offer different bag and bin sizes for small businesses*".

341   Flexible collection times could mitigate the space issues; the owner of a café located in the city

342   centre speculates "*since we don't have space to store an extra bin, we would appreciate daily*

343   *or on-demand collection*".

344   Second, improving communication (recorded 17 times) between the researchers, waste

345   companies, catering businesses, and customers could improve the food waste landscape.

346   Participants emphasised that the quality of the communication, rather than the quantity is the

347   key. In extreme cases, a lack of communication is the issue. For example, a manager of an

348   Easton restaurant recalls "*we've never even been offered recycling, only general waste!*".

349   Participants believe that business engagement should be meaningful and offer more than

350   factual information. A staff member at a Gloucester Road restaurant concluded that

351   "*conversations are better than leaflets*", while a participant from a Gloucester Road café

352   admitted "*We only had one door-knocking so far. Now you got me thinking about waste*".

353   Researchers also have a role in communicating the value of food waste recycling. The owner

of a Gloucester Road restaurant said: "*You need to demonstrate the undesirable effect of sending huge amounts of food waste to landfill when it could be converted into energy*".

The issue of recycling food waste is not communicated enough to the customers and between businesses. Meanwhile, participants suggested than championing the right attitude and pledges would create a social norm, for example, a staff member at an Easton café who recommends: "*we should be championing businesses who already do it, so others follow".* Additionally, a staff member of a city centre cafe proposes "*businesses should put a sign in the window, advertise it and make it a selling point*".

Finally, committing to food waste collection could result in co-benefits to the business (recorded 9 times). Participants, who already recycle shared that it helps them with stock management and saves money in the long term. For example, an owner of Gloucester Road café said: "*it increases awareness of what's happening in the kitchen and helps to manage stock*". A staff member of a Gloucester Road restaurant argues *"separation keeps the general waste low, you can save money as a result*".

4.5. Dominant, emerging, and conflicting discourses

Discourse analysis of the arguments used by the participants reveals that the most common frames used are:

- Environment/sustainability – dominant frame for those, who already recycle (e.g. "*We do not want our food waste to be sent to landfill when there is an opportunity for it to be recycled*" restaurant/ Gloucester Road)

- "Not our problem" – dominant frame for participants, who don't recycle, e.g. *"We don't have enough waste as we cook to order"* restaurant/ Easton; "*We have very little waste and donate all leftovers to neighbours and friends*" bakery/ Easton

- Ethical and normative, (e.g. "*it's a good deed, no food should ever be wasted*" restaurant/ Easton; "*I haven't thought much about it before but it's a company policy – we just have to do it*" Pub/ Gloucester Road)

- Competent business management - used **both** by recycling and non-recycling businesses (number), e.g. "*We're staying ahead of the law. It makes sense in the long term- it's better to do it now before it's enforced by law, it's good for our reputation*" restaurant/ city centre **but also** "*Main barrier is the cost. However, our menu is devised to minimise food waste. Food waste is expensive for businesses just as unsold stock*" café/Gloucester Road

Understanding the discourses used by non-recycling participants could help with effective engagement. The perception of "not having enough waste" ought to be tackled in the first place, for example, by referring to the regulations in Scotland and Northern Ireland. Second, applying "competency" framing could reach businesses who don't recycle due to practical reasons, like cost or space. Business engagement should contain a mix of information and tailored persuasion. This way, the communication will close the environmental knowledge-gap and emphasise shared benefits.

5. Discussion

5.1. The unexpected and unprompted

Although the questionnaire asked specifically about food waste recycling, 23 participants were keen to mention food waste prevention measures, such as menu control or formal and informal donations. Such conversations were unexpected and unprompted and often occurred as a justification for not recycling food waste. In the UK, regulations around donating food are quite strict, e.g. businesses cannot donate warmed or buffer food (FareShare, 2018). Yet, participants would admit that they regularly donate food informally to other staff members, friends or the homeless. It is unclear whether recycling has a negative impact on the

402 actions further up the waste hierarchy. Mourad (2016) suggests that small-scale and informal

403 donations get disrupted in favour of industrialised and formalised forms of exchange. However,

404 further research is needed to provide evidence on the relationships between informal and formal

405 waste conduits.

406 **5.2. Discussing results with co-researchers**

407 Following the action research protocol outlined in the section 3.1., the authors presented

408 the survey results to the co-researchers who were able to provide comments and compare the

409 findings with their up-to-date knowledge. Drawing from several years of experience in the

410 sustainability sector, co-researchers signalled the following complexities, which might arise

411 during the design of the improved food waste service:

412 • Whether food waste is charged by weight or volume (food waste is one of the heaviest

413   recyclables)

414 • Whether such service would repurpose food waste to anaerobic digestion, compost, or

415   animal feed.

416 Co-researchers agreed that sharing stories and discourses ought to help uptake. Traders

417 groups could act as knowledge sharing spaces; areas lacking such way of self-organising should

418 get help from the local authority with setting up such business community. They also agreed

419 that lack of space is the major issue for small businesses. However, a group deal and discount

420 could offer frequent collection, which would reduce the need for storage.

421 **5.3. Assessing results against the literature**

422 The paper presented a number of policy reccommendations suggested by the food outlet

423 employees. The ideas ranged from partnerships between council and waste companies, through

424 targeting the non-participating and deprived areas to finally- mandatory food waste recycling.

425 Nevertheless, there is no agreement among the policymakers and academics about whether to

426 treat food waste recycling as a matter of obligation or a voluntary business practice. The

427 English Government currently favours voluntary measures and is reluctant to adopt

428 compulsory food waste recycling since "there are more efficient options than restrictions in

429 this area and evidence suggests that restrictions would likely impose additional costs on

430 businesses, particularly SMEs" (EFRA Committee, 2015).

431 Similar concerns were expressed by the participants. Major barriers reflect the issue of

432 scale – recycling is more challenging for independent, small, and budget eateries as it is less

433 cost-effective and takes up too much space. This finding is in line with the literature on barriers

434 to sustainable practices for SMEs, who argue that small businesses experience more barriers

435 while engaging in sustainable actions (Lepoutre and Heene, 2006, Rizos *et al*., 2016). WRAP

436 (2015) echoes the argument of cost-effectiveness, stating that "businesses need to be producing

437 more than 40kg of food waste per week for a separate collection to be viable".

438 Yet, a look at the existing practices in Scotland and Northern Ireland challenges the

439 idea of "Not having enough waste". Scottish and Northern Ireland businesses are obliged to

440 separate food if they produce as little as 5kg of food waste. This approach is an example of the

441 government taking responsibility to establish a code of environmental conduct (Lepoutre and

442 Heene, 2006). At the moment, more research is needed to establish the effectiveness of the

443 mandatory approaches (Pirani and Arafat, 2014).

444 **6. Conclusions**

445 This paper presented results of the exploratory action research project investigating

446 commercial food waste collection services in Bristol. The aim of action research is finding out

447 which policies and interventions would work in a particular context. By bringing together

448 researchers and practitioners, the study can draw evidence for co-designed policies supported

449 by democratic voices and academic theory.

450   This paper opens new avenues for policymaking by suggesting initiatives and

451   discourses, which are likely to receive support within the catering sector. Such initiatives range

452   from mandatory collections to co-ordinated services operated by the partnerships between

453   traders' organisations and waste companies. Most importantly, the research brought attention

454   to the need of high-quality communication of the food waste information, which ought to be

455   tailored towards the relevant framings (e.g. sustainability, social norm, competent business

456   management). The researchers recommend that business engagement should address the

457   barriers voiced by the participants applying the framings used by the catering sector, rather

458   than assuming that restaurants and cafes are not aware of the issue. Participants recommended

459   a range of measures, which could improve the current food waste landscape in Bristol. They

460   emphasised that bottom-up and operational solutions will give agency to the catering sector.

461   The findings were grounded in a qualitative survey using sample size from a small

462   geographical area. Further research on the effectiveness of recycling policies is therefore

463   required. In particular, investigating recent food waste policies in Scotland and Northern

464   Ireland ought to be a priority. Finally, a large-scale survey conducted across Bristol could yield

465   recycling rate representative for the whole city.

466   **Abbreviations**

467   BCC – Bristol City Council

468   BID – Business Improvement District

469   BGCP – Bristol Green Capital Partnership

470   CO_2eq – Carbon Dioxide Equivalent

471   DEFRA – Department for Environment, Food, and Rural Affairs

472   EFRA Committee – Environment, Food and Rural Affairs Committee

473   EU – European Union

474   Mt- Megaton (10^9 kg)

475   SME- Small and Medium Enterprises

476   UN – United Nations

477   WRAP – Waste and Resources Action Programme

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584 *TABLES*

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Area	Characteristics
Easton	• Mostly independent businesses – Numerous independent businesses southeast Asian and African food outlets • Higher than average social deprivation (BCC, 2015) • Area targeted for street cleaning (BCC, 2017) • 88% residents concerned about climate change (BCC, 2016) • 91% residents think litter is a problem (BCC, 2016) • No Business Improvement District present[4] • Most common sociodemographic ACORN[5] categories: Aspiring Singles, Starting Out, Blue Collar Roots (ACORN, 2012)

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[4] Business Improvement District (BID) - a defined area in which a levy is charged on all business rate payers in addition to the business rates bill. This levy is used to develop projects which will benefit businesses in the local area. (HM Government, 2014)

[5] ACORN- a UK population segmentation tool, which categorises neighborhoods in 18 groups according to a wide range of commercial and open data on age of residents, ethnicity profiles, benefits, population density and housing

City Centre	• High concentration and large variety of catering businesses, including both independents and high streets chains, shopping centre, food markets, budget eateries and fine dining • Most common sociodemographic categories: Educated urbanites, Aspiring Singles and High-Rise Hardship (ACORN, 2012) • Business Improvement District covering part of city centre
Gloucester Road	• One of the UK's longest high streets with independents shops (Visit Bristol, 2018) • 88% residents concerned about climate change (BCC, 2016) • Most common sociodemographic categories: Prosperous Professionals, Educated urbanites, Aspiring Singles (ACORN, 2012) • Traders' Group and Business Improvement District covering part of Gloucester Road

586   *Table 1. Key characteristics of the areas surveyed in the paper*

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Area	Total count and percentage	Type	Total count and percentage
City Centre	32 (39.2%)	Restaurant	23 (29.1%)
Gloucester Road	31 (40.5%)	Pub	10 (12.7%)
Easton	16 (20.3%)	Café	24 (30.4%)
		Fast Food Takeaway	18 (22.8%)
		Bakery	4 (5%)

Table 2. Survey participants' characteristics.

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Area	Count and percentage of participants recycling	Type	Count and percentage of participants recycling
City Centre	18 (56%)	Restaurant	18 (78%)
Gloucester Road	19 (61%)	Pub	5 (50%)
Easton	5 (31%)	Café	13 (54%)
		Fast Food Takeaway	6 (33%)
		Bakery	0 (0%)

Table 3.. Proportion of participants already recycling food, outlined by area and type.

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FIGURES

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619 | Oct-Nov 2016 | Jan 2017 | Feb 2017 | May-Jul 2017

620 | **Ethics Application Process** | - Discourse Analysis of food waste across policy and academia - Participants' recruitment | Group discussion exploring local research priorities. Outcome: food waste in catering outlets selected | Monthly meetings with the Author 2 (practitioner) and other participants. Outcomes: agreed of the design of the qualitative survey, came up with questions exploring barriers and perceptions of food waste services

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623 *Figure 1. Stages of the research process: timescales, meetings*

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625 | Oct-Dec 2017 | Jan 2018 | Feb-Mar 2018 | Apr-Jun 2018

Additional ethical approval required – application process | Primary data collection: 79 qualitative surveys | Discussing draft with Author 2. Outcomes: echoed the barriers emerging from the survey, pointed out at potential local audiences for dissemination, suggested further grey literature for review | Dissemination of the results: journal submissions, city strategy meetings with the policymakers and waste company

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Not enough waste

Knowledge gap

Barriers to food waste recycling for catering sector

Convenience

Cost

Lack of space for bins
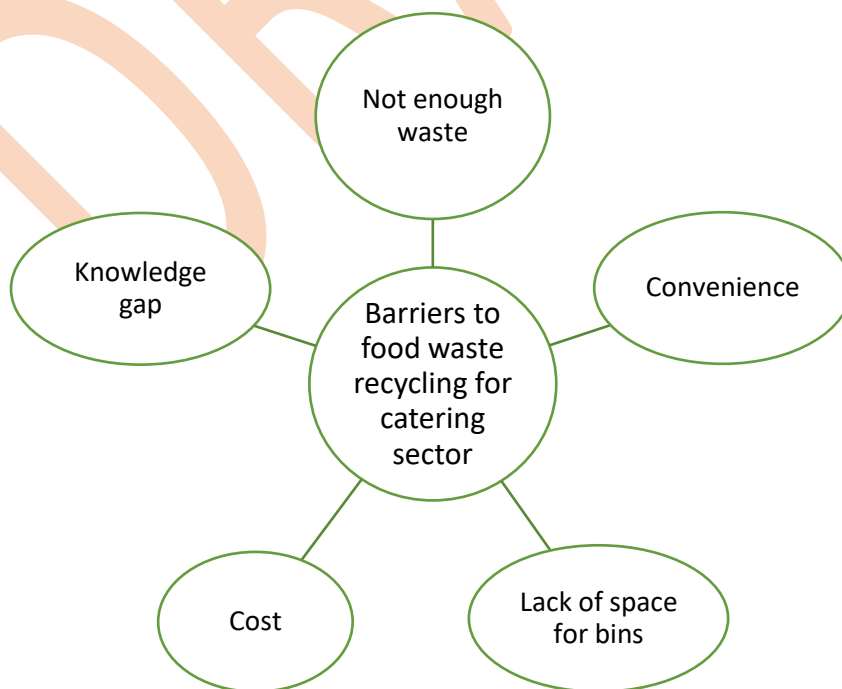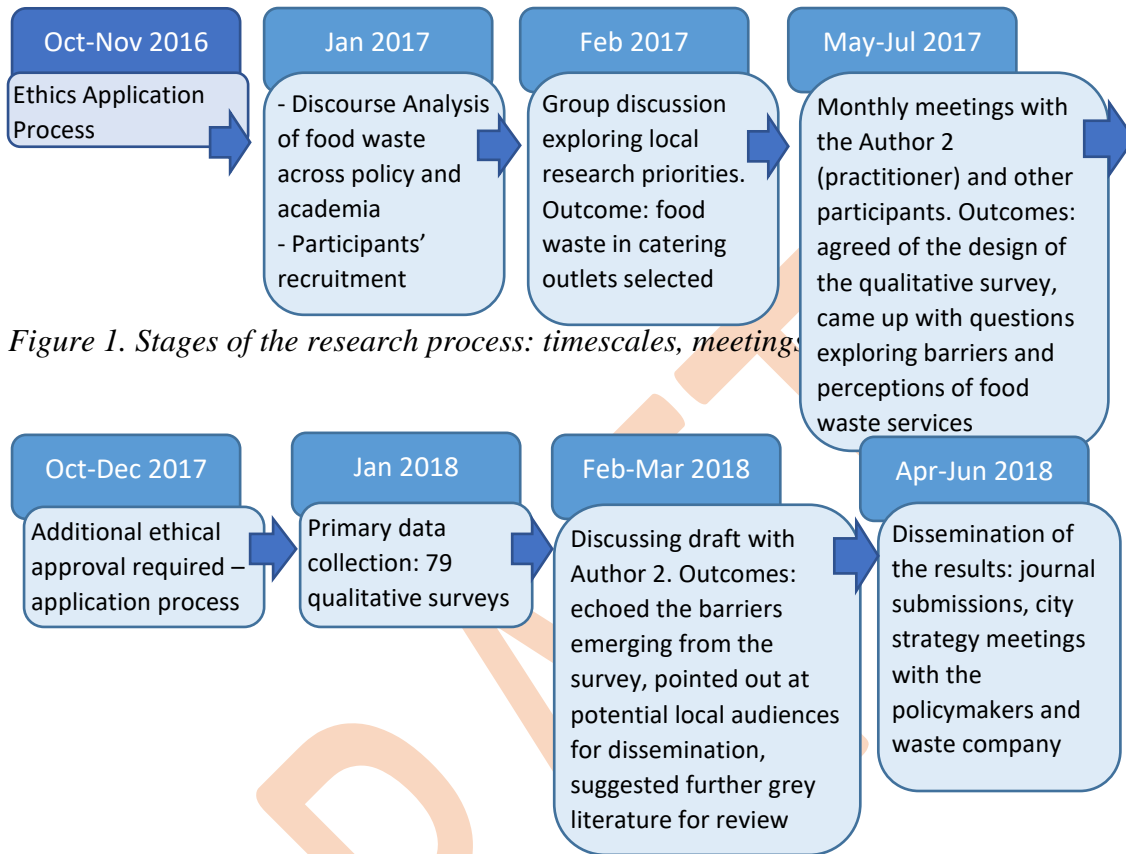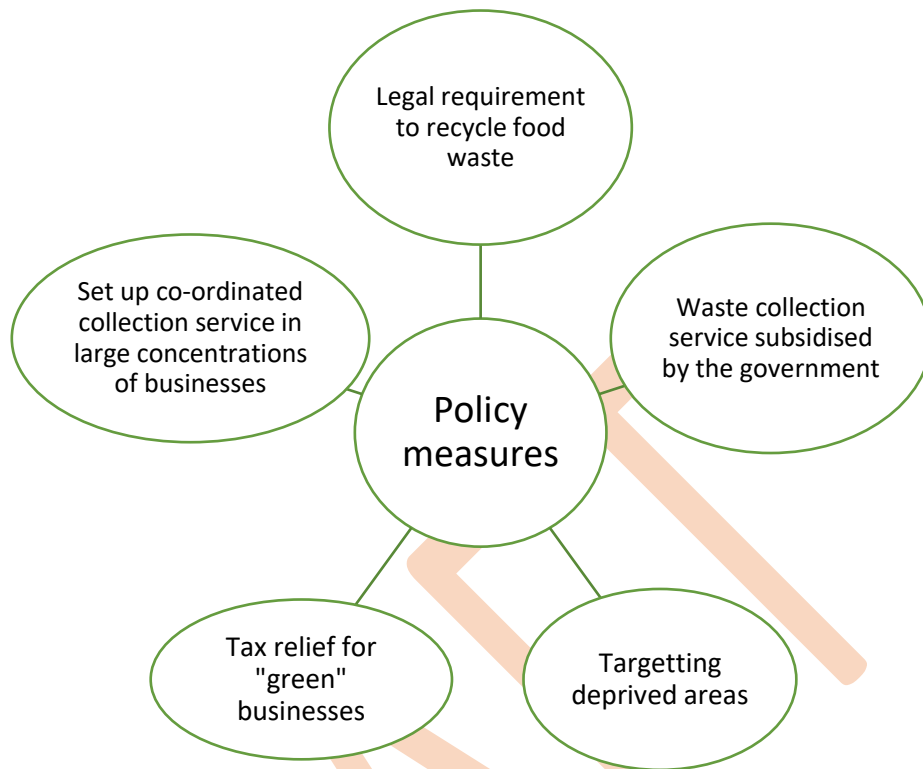
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630   *Figure 2. Barriers to participation in food waste recycling according to the food outlets*

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632   *Figure 3. Policy measures recommended by the participants*

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634   **APPENDICES**

635   *Appendix 1. List of the research contributors and authors. Practitioners listed below*

636   *contributed to the research design and the discussion of the results. NB. Table 2 and Section*

637   *3.3. describe the participants of the qualitative survey.*

Name	Occupation	Contribution
Author 1	Academic Researcher	Data collection, analysis, and write-up
Author 2/ Co-researcher 1	Civil servant and environmental consultant	Collaboration on research design and results

Author 3	Academic Researcher	Collaboration on each stage of the research
Author 4	Academic Researcher	Collaboration on each stage of the research
Co-researcher 2	Manager in municipally-owned waste company; oversees setting up of a commercial food waste collection service	Contribution towards research design and literature review
Co-researcher 3	Officer in municipally-owned waste company	Contribution towards research design and literature review
Co-researcher 4	CEO of Food Redistribution Charity – works with shops and food outlets on donating edible surplus food	Contribution towards research design and literature review
Co-researcher 5	Environmental Consultant- works on waste reduction in the commercial sector	Contribution towards research design and literature review
Co-researcher 6	Sustainability manager of a science centre (an education charity) – works on reducing waste and energy use during events, catering and day-to-day activities	Contribution towards research design and literature review
Co-researcher 7	Manager of the sustainable business network – offers tools and knowledge exchange for companies willing to reduce waste	Contribution towards research design and literature review
Co-researcher 8	Officer in Anaerobic Digestion company	Contribution towards research design and literature review

Co-researcher 9	Civil Servant in the Council Sustainability Team – manages long-term strategy and partnerships across the sectors	Review of the first draft

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