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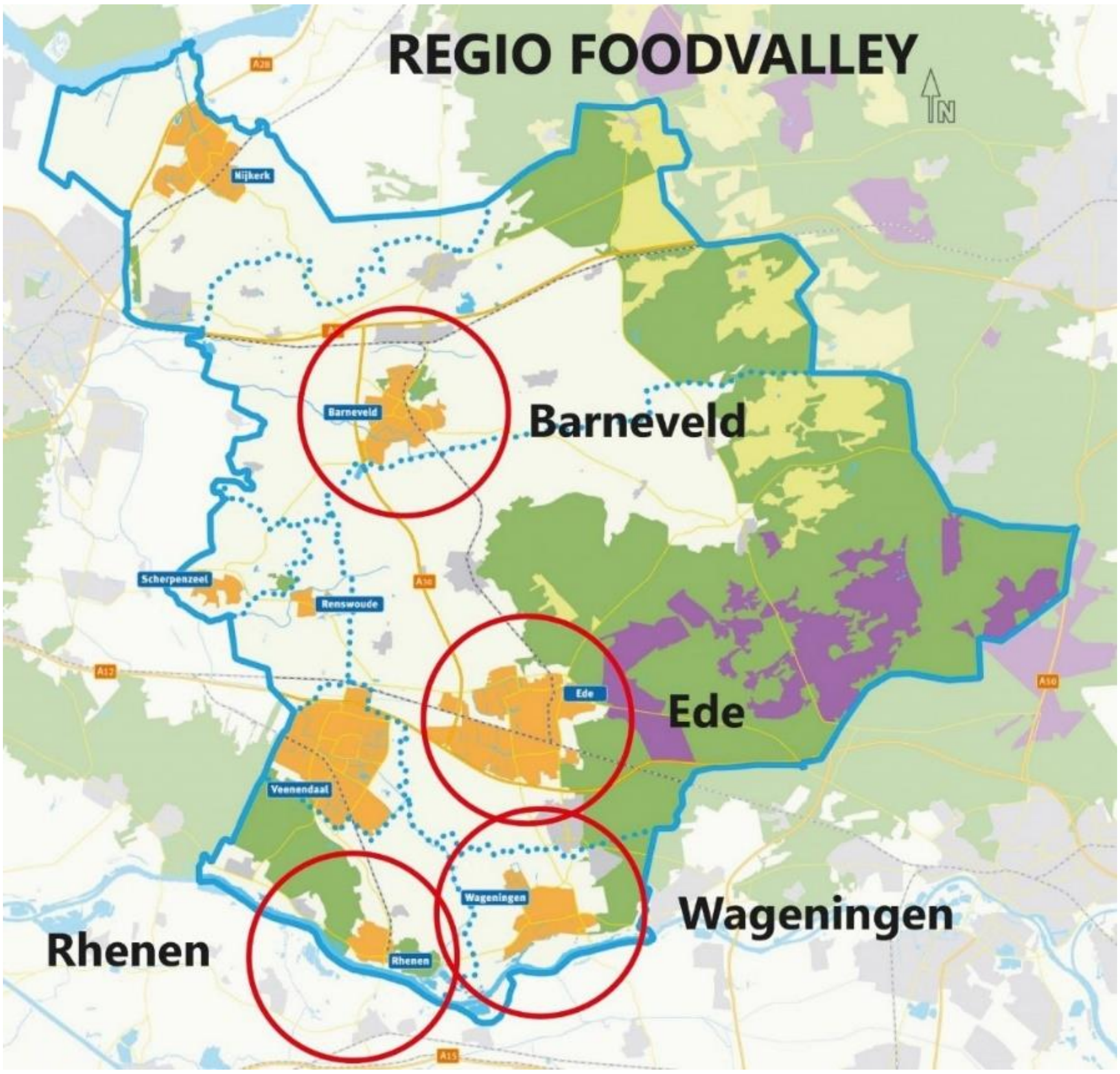

FOOD WASTE AND CIRCULARITY AMONGST SMALL-SCALE RETAILERS WITHIN THE FOODVALLEY REGION

A RESEARCH AND RECOMMENDATION PUBLICATION BY THE STUDENTS OF THE WAGENINGEN UNIVERSITY EUROPEAN WORKSHOP COURSE

COMMISSIONED BY
FOODVALLEY REGION
Samareh Bloemberg & Suzan Klein Gebbink

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Executive summary

This report provides an analysis of the current food waste situation of small-scale retailers in Barneveld, Ede, Wageningen and Rhenen, on which recommendations are based to reduce food waste and improve circularity in the food retail sector. This project is commissioned by the Foodvalley Region. The data collection methods used in this research are interviews and surveys conducted with experts, retailers, and consumers.

Different conclusions have been derived from the results. Firstly, retailers have indicated that they have little to no food waste, as they have several general and retail-specific strategies to prevent this. However, this is found to not always be the case as perceptions of what food waste is, differ between retailers. Moreover, organic waste separation rates are low and circular waste treatment options are currently not a common practice yet. This can largely be attributed to low levels of collaborations amongst relevant stakeholders and limited cognition on circularity. However, both consumers and retailers show a willingness to participate in both food waste reduction and circular initiatives. The regulation framework sometimes hampers the retailers from partaking in food waste reduction initiatives but exposes opportunities for circular ones. Finally, several initiatives are being used among retailers, of which some are well-known already. Nevertheless, there are still opportunities for more exposure and a wider variety of initiatives.

Following the conclusions, several recommendations for the Foodvalley Region have been set up. The first entails the creation of a platform for the sharing of knowledge and the forming of collaborations amongst relevant stakeholders. The second is organising awareness campaigns targeting both consumers and retailers. The last recommendation is to combine the waste streams via a collective waste collection practice.

Chapter 1: Introduction

As pointed out in the 2030 United Nations Agenda, food waste is a very pressing sustainability issue due to its social and environmental impacts worldwide (United Nations, 2018). In the Netherlands, around 5 million kilograms of food is wasted daily in the entire food chain, including consumers, supermarkets, restaurants, and other institutions (NL Times, 2019). The Netherlands has put food waste problems at the top of its national agenda in accordance with the Sustainable Development Goals, which aim at reducing food waste by 50% by 2050(Ministry of General Affairs, 2016).

Within this context, the Foodvalley Region is working on contributing to this goal by operating as a testing ground for food waste reducing initiatives. The Foodvalley Region is currently functioning as a framework for cooperation. The Foodvalley Region wants to come up with a new strategic plan for the year 2021 till 2025 aiming to improve circularity and to reduce food waste. This is in line with the core message of Moerman's Ladder (see Figure 1), which says that food waste is better dealt with the higher up the ladder one goes (Janssen & Van der Hei, 2018). However, the Foodvalley Region has indicated that there is a lack of knowledge on where and how food waste in the retail sector occurs, which initiatives create the biggest impact, and which barriers exist to reduce waste and improve circularity within the Foodvalley Region.

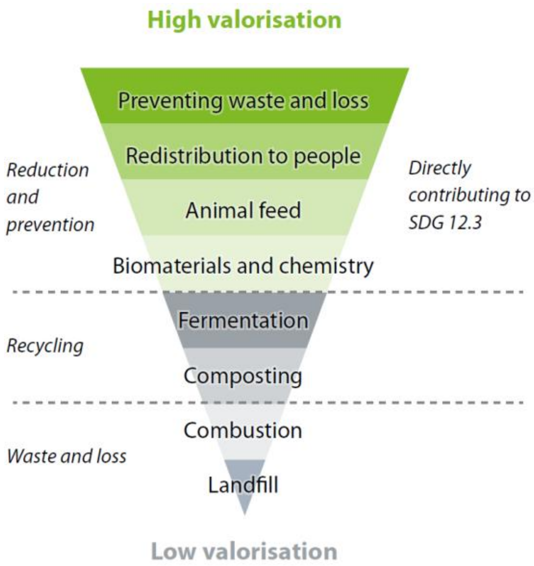

Figure 1: Ladder of Moerman (Janssen & Van der Hei, 2018)

The purpose of this project is to provide the Foodvalley Region with recommendations on strategies to reduce food waste and improve circularity for small-scale food retailers in the city centres of Ede, Wageningen, Rhenen and Barneveld. Within the scope of this project, retail food waste is defined as food that is discarded by small-scale retailers. Circularity, then, is defined as the process of reusing and recycling waste before it has entered the linear waste management system to give it a higher value in the Ladder of Moerman (see Figure 1). The focus of this research is on all small-scale food retailers, such as butchers, restaurants, bakeries and vegetable stores. From point forward, small-scale retailers will be referred to as "retailers". Since sufficient research has been conducted on food waste in supermarkets, these retailers have been excluded from the scope of this research. In this report, a multidisciplinary analysis of the baseline situation will be presented to discover potential improvements in retail food waste practices within these four municipalities of the Foodvalley Region.

1.1 Data Collection

The Foodvalley Region has indicated that research is needed on the food waste practices of retailers, their waste streams, the consumer perception of food waste and a policy and stakeholder analysis related to food retailers. Therefore, these four topics are the starting point of this research. The project group was organised according to a matrix structure. In this structure, each team member is part of a geo- and expert group, where each group had a specific task. The expert groups were tasked with the development of research methods, after which the geo-groups carried out the research in their respective municipalities. The matrix structure, as applied in the European workshop, has been visualised in Table 1. Lastly, a management team was tasked with the coordination of the project and the delegation of additional tasks.

Table 1: European Workshop Matrix used in this project (*S = Student; E = Expert group)

Expert	E1	E2	E3	E4	MT
Geo	Consumer perception analysis	Retail food waste practices analysis	Waste stream analysis	Policy and stakeholder analysis	
Geo 1: Barneveld	S1.1	S1.2	S1.3	S1.4 + S1.5	S1.5
Geo 2: Ede	S2.1 + S2.5	S2.2	S2.3	S2.4	S2.5
Geo 3: Rhenen	S3.1	S3.2	S3.3 + S3.5	S3.4	S3.5
Geo 4: Wageningen	S4.1	S4.2	S4.3	S4.4	S4.2

Fieldwork was conducted in the city centres of the municipalities over the course of nine days, from the 1st until the 9th of June 2021. The data collection methods used in this research are surveys, semi-structured interviews (both online and in-person), and observations. One survey was conducted with consumers and a separate one was conducted with retailers. In addition to this, interviews were done with experts and retailers. For more details on the questions asked, please refer to Annexe A through F. Table 2 below shows how many surveys and interviews have been conducted in every municipality. To ensure the privacy of the interviewees, specific names of persons, companies, and products are not included in this report. Moreover, this report contains several general findings. These findings have been derived from a collection of different interviews conducted by the students. Only for specific examples, will a reference to "personal communication" be added in text.

Table 2: Amount of data collected

	Consumer surveys	**Retailer surveys**	**Retailer interviews**	**Expert interviews**
Barneveld	105	21	22	4
Ede	150	12	19	3
Rhenen	100	11	10	3
Wageningen	113	24	22	3
Total	468	68	73	13

From the data gathered in the field, five themes were derived that most accurately represent the findings. These themes include food surplus and organic waste stages, regulations and perceptions on food safety, knowledge and awareness, collaboration, and consumer acceptance. A chapter has been dedicated to each of the themes in which findings will be discussed in detail.

Chapter 2: Food Surplus and Organic Waste Stages

This chapter introduces different stages of organic waste within a retail business in the municipalities of Ede, Rhenen, Wageningen and Barneveld with the aim to give a clear overview of the waste practices of retailers. This is relevant to know, as it shows in which stage most progress can be made to either reduce food waste or improve the circularity of the organic waste stream. The different stages (see Figure 2) will be further explained in the following paragraphs, in the context of the retailers in all four municipalities.

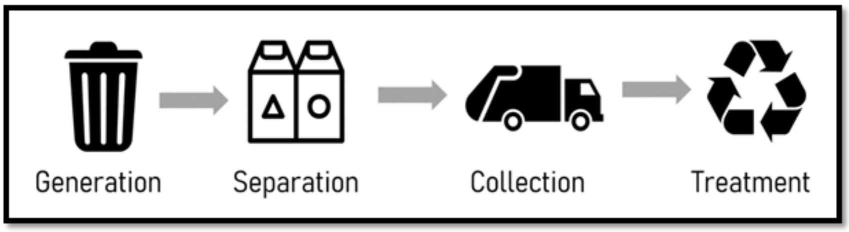

Figure 2: Organic waste stages including generation, separation, collection and treatment.

2.1 Generation

The generation phase involves the process of where and how food waste occurs. According to an interview conducted with a supply chain expert, most of the food waste occurs during the processing phase within the retailers and during exposure to consumers. The transportation of food in the Netherlands is efficient and therefore does not generate a lot of waste (Supply chain expert, personal communication, June 2021). Similarly, all of the retailers surveyed in four municipalities do not think any waste occurs during transportation and they agree that most waste occurs during exposure to consumers and the food processing phase within the retailer.

Most of the retailers contacted during the fieldwork indicated that they hardly generate any waste. Though, during the observation, it appears retailers still generate a considerable amount of food waste. For example, during an interview with a restaurant in Ede, it became clear that they still had about one bin of residual waste-filled every day, which is about 240 litres of waste (personal communication, June 2021). The estimation of food waste can be difficult for retailers due to different understandings of what food waste entails, as is going to be explained in further detail in Chapter 4. Another reason can be the difficulties to estimate the volumes of food waste since the generated food waste is being thrown in the residual waste container.

Another finding is that the volume of waste generated differs among different types of retailers. Restaurants generate more waste than other retailer types due to leftover foods from plates. Some retailers, such as butchers and speciality shops, limit their waste generation almost to the bare minimum. Butchers in general have smaller volumes of food waste as the meat can be reused for new products such as sausages (Butcher Wageningen, personal communication, June 2021). Even though Too Good To Go is well known among retailers in all municipalities, only a limited number of retailers collaborate with them. This is also due to the inability of some retailers to collaborate with such initiatives. For instance, Too Good To Go is not suitable for restaurants to use since the waste generated mostly consists of plate leftovers from consumers which cannot be sold again through this platform. Thus, the diversity of food waste hampers the possibility for one-size-fits-all solutions.

Finally, there are common practices of retailers that are observed to prevent waste in all four of the municipalities. Examples include selling products that are close to their expiration dates, repurposing them into a new product or giving away food to employees or customers for free (see Figure 3). Even though some retailers apply solutions to prevent food waste, these are not a very common practice yet. Financial reasons form an important consideration for store owners to reduce their waste generation. For example, both the owners of a fermentation shop and a café in Wageningen mentioned that because their margins are small, it would be unfeasible for them to throw leftovers away (personal communication, June 2021). According to surveys conducted, 54 retailers are missing out on 0-10% of their revenue, seven retailers miss out 11-20% and one retailer 21-30%. This shows that there are also financial opportunities for retailers to cut costs via food waste reduction.

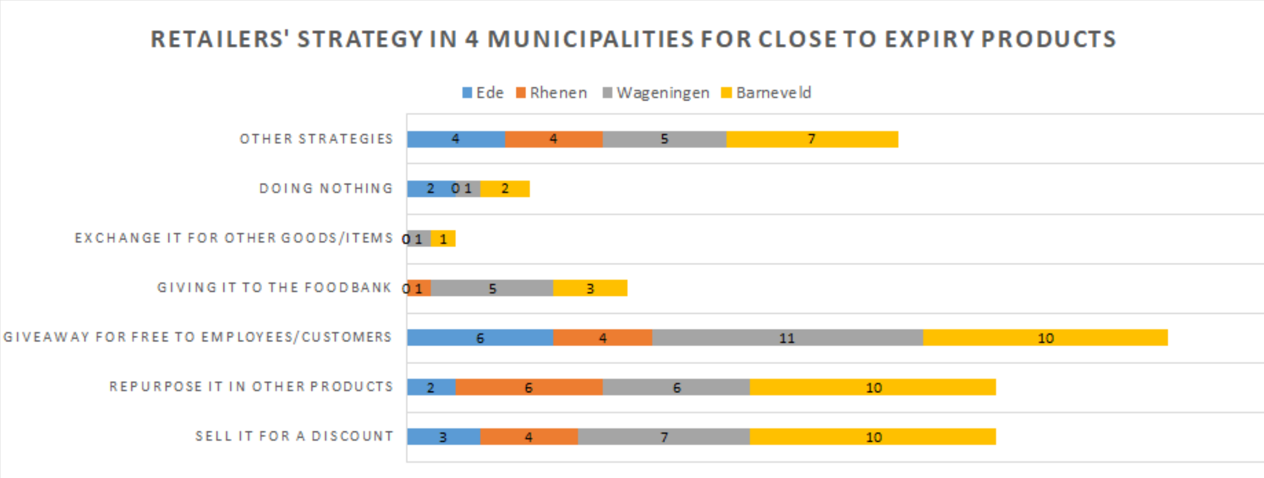

Figure 3: Different strategies of retailers to deal with close to expiry products in the municipality of Ede, Rhenen, Wageningen and Barneveld. Numbers on the columns illustrating the number of retailers in each city, employing the different strategies given on the left side of the figure. Other strategies category includes strategies such as collaborating with Too Good To Go, consuming it at home, freezing the product or feeding the animals.

2.2 Separation

The next stage is the separation stage, which is a stage where there is a lot to gain as retailers from all the municipalities indicated they are mostly throwing the organic waste into a residual container. A recurring problem for the retailers is the difficulty to separate their organic waste as private companies are often not offering an extra green bin in their contract. Another obvious finding was that Barneveld and Rhenen retailers mentioned that the volumes of the waste are too little to separate into a green bin. Other reasons mentioned differ between municipalities, which include reasons such as the fact that retailers are too busy, not being aware of an extra organic bin, financial reasons, or the lack of space outside the store.

The retailers within the four municipalities separate their organic waste for other purposes and local solutions. The separation purposes differed according to the retailers' food waste quality. Food surplus separated for Too Good To Go needs to be edible. A local purpose is that shops and restaurants are giving edible food to the Foodbank. Non-edible food waste from some retailers is picked up by farmers for private purposes, though this is only done to a small extent. Noteworthy is the fact that only retailers in Barneveld and Ede are composting some of their food waste (see Figure 4), though this is only done in small quantities.

Figure 4: Separated organic waste in a bin for compost in Barneveld (left), and a residual waste container in Ede, where all the waste is being disposed in and not separated (right).

2.3 Collection

After separation, the next step is the collection of food waste. In all municipalities, most of the retailers' food waste is collected by private companies. In the Netherlands, the municipality is only responsible for collecting household waste. Each retailer is individually responsible for how the waste is being collected (De Afvalmanager, 2019). The retailers, therefore, have an individual contract with a private waste collecting company. This means that several different companies pick up the waste of the retailers in the cities. According to a board member of Waste Collective Wageningen, this is problematic as it leads to inefficiency with more costs and traffic in the city (personal communication, June 2021). He mentioned that there is a lot of discrepancy within the waste collection domain and confirmed that retailers are responsible for the waste collection of their stores.

2.4 Treatment

The final step in the organic waste stages is the treatment of food waste. Each retailers' waste is being treated by the private waste company that the retailers have a contract with. In each municipality, the retailers do not know what happens to the waste afterwards. Noteworthy is a snack bar retailer in Barneveld who believes that his residual waste that is collected by a waste collector will later be separated and recycled (personal communication, June 2021). However, in the municipalities of Barneveld and Rhenen, most of the food waste is being collected as residual waste and later being incinerated (Private waste collector Barneveld, personal communication, June 2021; Milieu Centraal, n.d.). In the municipalities of Ede and Wageningen, some waste collection companies collect the residual waste from retailers, from which they later separate the organic waste in their treatment plants. This is then later either composted or turned into biogas (Private waste collector Ede, personal communication 2021). However, it is important to highlight that this is not a common practice. An exceptional case from the municipality of Barneveld and Rhenen is that two fish stores work with companies collecting leftover fish parts which are turned into biogas (Personal communication, June 2021).

Chapter 3: Regulations and Perceptions on Food Safety

Working in the food retail sector means complying with rules to ensure the safety of the customers. This section provides a brief overview of the policy framework the retailers have to work within and explains in what ways the retailers experience this framework. This is important to know, as this shows in what ways potential solutions have to work around the current policy framework.

All retailers of the four municipalities work within a similar policy framework, with no municipality directly influencing the policies for the retailers. The retailers must adhere to the Dutch national 'Warenwet' and the European General Food Law, which together create a strict framework around food safety. The General Food Law contains all the rules surrounding food safety and food quality, and these are the same for the entire European Union (Ministry of Agriculture, Nature and Food Quality, 2019). The Dutch government has translated those rules into laws in the 'Warenwet'. The ground rule of the 'Warenwet' is that food products may not endanger the health or safety of the consumers, and it describes the requirements that food products must meet (Ministry of Agriculture, Nature and Food Quality, 2019). None of the municipalities included in this research have added extra municipal policies or regulations targeting food-related retailers to the ones that have been decided upon in the General Food Law and the 'Warenwet'.

It is agreed upon by retailers in all four of the municipalities that strict food regulations contribute to more food waste. Retailers from every municipality have indicated that they feel like they need to throw away food, even when it is still fit for human consumption, due to the strict regulations on expiration dates. Retailers from Wageningen and Ede explained that they apply the 'inspect-smell-taste' rule regularly at home when a product has exceeded its expiration date (personal communication, June 2021). However, retailers are obliged to stick to the expiration date at their businesses. One retailer in Wageningen stated that all retailers from the municipalities seem to agree: *"If you have strong food safety regulations, you have to accept food waste. It is one way or the other."* (Fishmonger, personal communication, June 2021). However, every business has its strategies to prevent this waste as much as possible, as is explained in Chapter 2.

Retailers from all four municipalities have indicated that these strict regulations occasionally hinder them from participating in initiatives to reduce food waste or improve circularity. While in Ede the majority of the retailers indicated this, these findings were a bit less prevalent in the other municipalities. In Barneveld, some retailers expressed that they were cautious about delivering products to the Foodbank or selling them through Too Good To Go, as they did not want to receive complaints on the insufficient quality. A restaurant manager in Rhenen expressed that most of his products have to be consumed within 48 hours after opening and that potentially hazardous products need to be treated with great care, which prevents him from giving the products to an initiative like the Foodbank (Personal communication, 2021). In Ede and Wageningen, the short expiry dates of products are mostly mentioned as barriers for participation in initiatives. A final barrier that retailers from both Ede, Barneveld and Rhenen have mentioned, is the Feed Ban regulation of 2002 in the General Food Law (European Commission, n.d.). This regulation prohibits feeding animals destined for human consumption with organic waste. However, other circular organic waste treatment options are allowed within the current policy framework, like composting or the generation of biogas.

Even though the strict policy framework leads to extra food waste, retailers from all four municipalities have expressed that they do not want to create unsafe situations for their customers. The policies ensure a high level of hygiene and safety, and this is valued by the retailers. Some retailers in Rhenen have expressed specifically that they would be in favour of less strict policies, but that they do not want this to be at the expense of the consumers. Related to this is that the retailers have to maintain a good reputation for their business. Retailers from Rhenen, Wageningen and Barneveld have expressed that ensuring safety is also necessary for their reputation, as customers can evoke bad publicity if they complain about falling ill after consumption. This shows that retailers always need to maintain a balance between the safety of their customers on the one hand and reducing food waste and improving circularity on the other.

Chapter 4: Knowledge and awareness

Knowledge and awareness include the three related aspects: different perceptions about food waste, snowball effect and exploring interconnectedness. This chapter contributes by providing an insight into the knowledge retailers have of the issue of food waste and their role within it.

4.1 Different perceptions about food waste

Three key findings were discovered across the different municipalities, namely that retailers initially think they generate little to no food waste, that retailers have different perceptions on what is considered food waste, and that their cognition of the term circularity is limited. All findings will be discussed in more detail below.

As briefly indicated in the waste generation stage of chapter one, many retailer interviews across the four municipalities indicate that almost all retailers claim to generate little to no food waste. Though this might be true for some retailers who have a sustainable or circular business model or who sell food products that produce little waste in general, different reasons may be attributed to this response of the remaining retailers. For example, it was discovered that most retailers agreed that food waste was an issue that businesses should be preventing. This indicates that the practice of wasting food is seen as socially undesirable behaviour. Thus, retailers may be biased or wanting to portray a socially desirable image of themselves (Lavrakas, 2008). In addition to this, a general lack of knowledge about what food waste entails may influence the answer of retailers, leading us to the second key finding.

This initial statement by retailers about the quantity of food waste can be explained by the different perceptions of what food waste is. For example, a restaurant in Ede initially said they did not generate any food waste, but upon further probing, they indicated that they do generate organic waste in terms of vegetable peels, potato peels and citrus peels (Personal communication, June 2021). The reason they did not consider it food waste is because to them it was inevitable and of little value. However, four retailers indicated in their survey that they do consider these same peelings as food waste. In contrast to this, certain restaurants agreed that these peelings are considered food waste but disagreed on the end-of-life stage and instead used them for circular purposes to prevent them from being wasted. These examples highlight the diversity of different perceptions towards whether a product is considered waste, and what should happen with that waste.

Interviews with retailers revealed that most retailers were either unfamiliar with the concept of circularity and its role in their specific industry or had limited knowledge on the topic itself. Clear differences were seen in response to this question. A few exemplary retailers showed clear signs of knowledge about circularity and even illustrated their knowledge with examples of how they utilise it within their retail establishment. For instance, a fermentation store located in Wageningen thrives off of circularity. The food they can no longer sell directly is fermented to extend its life. Furthermore, the food waste they cannot repurpose themselves, such as the leaves of vegetables, are brought back to the farmers for their personal composting (Personal communication, June 2021). On the opposite side of the spectrum, a handful of retailers simply stated not knowing about the concept whatsoever, therefore also not knowing of any applications of this within their industry. Important to note is that this lack of knowledge and awareness does not automatically mean that such retailers do not make use of circular initiatives, but they are just unaware that their actions may be classified as circular. Most retailers, however, fall somewhere between these two categories. In these interviews, retailers stated to know about circularity but did not elaborate on the depth of their knowledge. Some retailers even asked for some clarification from the interviewer to ensure they had the same conception of the term.

4.2 The snowball effect

There have been examples of retailers influencing waste practices of other retailers through spreading knowledge and awareness, a phenomenon called the snowball effect. This was observed in Barneveld when a single retailer started working with Too Good To Go to reduce their food waste. This retailer told a greengrocer, who has since adopted it and shared this with other retailers in the vicinity (Greengrocer Barneveld, Personal communication June 2021). This allows the knowledge to disseminate through the community, stimulating others to change their waste management practices for the better. This shows that one retailer can have a rather big effect when it comes to changing food waste or circular practices. These retailers might not always realise the impact of food waste which is further explored in the next aspect of interconnectedness. To conclude, when the snowball effect occurs, the retailer has set into motion a pattern of change which can lead to a way bigger impact when all taken together.

4.3 Exploring interconnectedness

The following subchapter explores the interconnected nature of the food waste issue. Food waste is an issue that includes many different actors playing their part in it. Interconnectedness thus refers to how these different parts can be linked to one another to create mutual benefits. Three key findings were discovered, namely: retailers fail to see the relevance of their participation in initiatives as standalone actors, retailers are unclear on the new purpose their waste can take on, and that despite this, there are commendable examples to be found among retailers in the four municipalities.

First, a majority of the interviewed retailers failed to see the relevance of their participation in initiatives that combat food waste. When asked why they see no use in partaking, several reasons were provided by the retailers about constraints due to their size, which will be elaborated on in Chapter 5. However, knowledge and awareness about interconnectedness do factor into this. As the reasons for not partaking in initiatives are predominantly related to the size of the retailers' establishments, it can be concluded that the knowledge and awareness of the bigger picture they are part of are not sufficiently present among retailers. In other words, retailers do not have enough knowledge of opportunities that may present themselves when collaborating with other retailers, which may lower the barriers for future participation in initiatives.

Moreover, it is important to mention that retailers are not only unaware of the role they can play in the reduction of food waste and increase of circularity, but that they are also unaware of the purpose their waste can have for themselves or other retailers. This indicates a lack of knowledge of existing connections. Retailers state that if they were approached by other retailers or initiatives about what outputs they would need, that they would be interested to work with them.

Notwithstanding the previous findings, several exemplary cases of interconnectedness among retailers were found. A restaurant owner in Ede who is considered an expert in circularity gave a promising example of the value interconnectedness can have. In the interview, the interviewee mentioned that a colleague from the industry was about to throw away expired fruit juices, as they had no further purpose for it. The owner of the restaurant informed them of what this restaurant could use them for to avoid them from going to waste (personal communication, June 2021).

"*He was going to throw them [expired fruit juices] away since he did not think there was any other option for them. If we weren't friends, I wouldn't have been able to get the juices from him and they would have gone to waste. Now I have created high-quality orange and apple vinegars from what they considered waste"*

The abovementioned example is a perfect example of the importance of increasing knowledge about the interconnected nature of the food waste issue, and the value that can be derived from it.

Chapter 5: Collaboration

This chapter provides an insight into the different relationships between relevant stakeholders. This includes the relations of retailers with retailers, with consumers, with external organisations and with the municipality.

5.1 Retailer – Retailer

Generally, there is little to no cooperation between the retailers in each of the cities, except for the retailers in Wageningen. The only kind of relationship that was observed between retailers in three of the municipalities was the sharing of residual waste bins. From the gathered data, two different reasons for this collaboration were identified. First, some of the collaboration with waste bins is done purely due to the location of the shared residual waste bins. Therefore, it is difficult to classify this arrangement as purposeful collaboration. Contrary to this, purposeful collaboration on the sharing of waste bins is found in Barneveld, where multiple retailers share a residual waste container.

A common reason for the lack of active collaboration is the relatively small amount of food waste most of the interviewed retailers generate. The retailers are generally not aware of the amount of food waste they generate as a collective. For this reason, the necessity to collaborate is often undervalued by retailers. This finding also relates to the lack of waste separation amongst the retailers, which is already analysed in the first chapter of this report.

Despite the lack of collaborations between retailers, the willingness to start collaborating is present. The majority of the retailers spoken to are open for collaborations with other retailers but do not have the knowledge to establish this collaboration. Moreover, there is a lack of initiative-taking amongst the retailers. From the conducted interviews, it was found that many retailers are willing to cooperate with other retailers but are waiting to be approached. No action is taken by retailers to improve the collaboration between them. There are, however, also examples of successful collaborations between retailers such as the Wageningen Waste Collective. More details about this collaboration can be found in the Wageningen Geo-report (Annexe K).

5.2 Retailer – Consumer

Throughout the four municipalities, there was a difference in collaboration between the retailers and consumers. Generally, this collaboration was mainly based on initiatives coming from the retailers. In three municipalities, little collaboration between the retailers and the consumers was identified. The most prominent form of collaboration is within restaurants. Examples of this include offering different portion sizes and making doggy bags available. Furthermore, initiatives like offering leftovers to the less privileged were identified within the municipality of Rhenen.

Despite the observed initiatives such as the doggy bags and different portion sizes, concerns amongst the retailers related to these initiatives were also identified. When offering different portion sizes, restaurant owners are concerned about the time it takes to prepare, as well as whether they will be associated with a snack bar. Moreover, by offering doggy bags, restaurants face risks of the possibility that consumers will get sick after eating the food from the doggy bags. This can eventually lead to bad reviews, and thereby negatively impacting the reputation of a restaurant. Therefore, the use of doggy bags and different portion sizes is not widely accepted amongst retailers.

An interesting finding from the municipality of Wageningen is the fact that retailers feel pressured to take initiative regarding their food waste, due to the positive attitude of consumers towards sustainability and their environmental awareness. The feeling of pressure amongst retailers in Wageningen shows that consumers can have a significant impact on the food waste practices of retailers. The municipality of Rhenen already aims to increase the awareness of their inhabitants on this issue in the nearby future. The role of the municipality within this collaboration will be further analysed in the fourth section of this chapter.

Only in the municipality of Ede, no collaboration between retailers and consumers was identified. This lack of collaboration can be related to the importance of knowledge on the actions of both parties. Data from Ede has shown that both consumers and retailers are not aware of each other's behaviour, leading to a lack of collaboration between the two parties. Retailers are not actively promoting food waste reducing initiatives, meaning consumers do not get exposed to them. This does not only lead to a miscommunication of values between the retailer and consumer but also missed opportunities for more active collaboration between the two parties.

5.3 Retailer – External organisation

Throughout the different municipalities, there was a relatively limited number of collaborations with external organisations. The interaction is limited by knowledge, quality and quantity, and regulatory barriers. Though there are specific barriers for the collaborations per external organisation, there are also general barriers. The first general barrier that is experienced in all the municipalities is the lack of exposure to initiatives. Retailers are often not made aware of the existence of initiatives, as the initiatives do not regularly reach out to form collaborations with them. Rhenen was the only municipality where there was a difference between food waste-related and circular initiatives. The retailers were quite familiar with a variety of initiatives that reduce food waste, but less so with ones that focus on circularity. Another barrier is the lack of significant quantities of waste. This was especially the case in Barneveld and Ede, where retailers mentioned having little waste. Therefore, they did not perceive any need to engage with external organisations, as they did not believe they could contribute significantly. Another general barrier that was also observed in Barneveld and Ede was the strictness of the national regulations concerning food safety. Namely, the regulations hamper the ability to collaborate with farmers who would otherwise be able to repurpose food waste in their practices.

The organisations which retailers collaborate with included the Foodbank, Too Good To Go, as well as farmers in close vicinity to the municipalities. Too Good To Go is well-known amongst the different municipalities, however, only a few retailers engage and participate with the organisation. Wageningen experiences the largest interaction with external organisations, with several retailers frequently using their platform. The other municipalities also showcased the use of the Too Good To Go platform, which were used by bakeries and other shops with highly perishable products. The reasons for the collaboration with Too Good To Go were financial and sometimes driven by the knowledge that the food in the Too Good To Go boxes gets a worthy destination.

Collaboration with the Foodbank was observed in Rhenen and Barneveld, and Foodsharing Wageningen took on a similar role in Wageningen. However, the general interaction with the Foodbank remains somewhat limited. This can be attributed to the relatively low quality of the food surplus. Lastly, food waste-related collaborations with farmers were also observed in Ede and Barneveld. Here, bakeries and greengrocers separated their residual organic waste which was collected by the farmers. After pick-up, the organic waste is used for private purposes by the farmers. However, this connection was not widespread, which may be due to food safety regulations and the directness of contact that is required between the retailer and the farmer.

5.4 Retailer – Municipality

To start with, the municipalities of Wageningen and Ede each had a form of collaboration between the municipality and retailers in the past. Despite these collaborative efforts, each of the municipalities' retailers mentioned having had little to no contact with the governmental organisation, which has not changed recently.

In Wageningen, if a retailer sought contact with the municipality, they were encouraged to initiate contact with external organisations instead of the municipality directly taking on the problem at hand (Representative Wageningen municipality, personal communication, June 2021). Moreover, the inner-city manager of Ede mentioned that the municipality lacks the required knowledge to help retailers with food waste issues and indicated that the help of external organisations would be useful (personal communication, June 2021). Conversely, in Barneveld and Rhenen none of the retailers were continually in contact with the municipality other than the initial contract signing to open the business for operation.

The lack of communication has multiple causes. First, the question of who the responsibility lies with must be addressed. The perception of responsibility differs between the municipalities and retailers. Where some retailers feel they are responsible but have insufficient means to deal with the food waste issue, other retailers would like to see more initiative from the municipality. Conversely, the municipality emphasises individual contracts between retailers and waste companies. Additionally, some municipalities feel they do not have the means to initiate a project with retailers due to the time and effort investment. It has become obvious that both the municipality and the retailers operate with significant effort, financial, and time constraints. Moreover, who is responsible is not so clear cut due to the many parties who are involved in waste management.

Still, as was described in the other relationships, there is a general willingness to collaborate on food waste-related topics. There are many opportunities for collaboration on food waste-related topics and interactions between the municipality and retailers. Recommendations on how to address the challenges described above will be discussed in the last chapter.

Chapter 6: Consumer acceptance

Although this project revolves around retailers, it is essential for those retailers to understand the wants and needs of their consumers. Without this awareness, retailers may underutilise their existing initiatives, take actions that are not well-received by consumers, or take no action at all. Findings revealed the acceptance of specific initiatives (see Table 3), but also how to predict and steer the behaviour of consumers towards using initiatives in general. The key findings regarding consumer acceptance were consumers' intentions to use the surveyed initiatives were relatively high, positive relations between intention and the variables of attitude, subjective norms, ease of use and time available were found, and that targeting those variables can lead to higher intentions to stimulate the use of initiatives.

First, results from the 468 consumer surveys that were conducted showed that consumers have a high intention to use the measured initiatives (see Figure 5). Although consumers show a lower intention to use some initiatives, such as the doggy bags and the buying of circular products, most of the surveyed consumers across the four municipalities do intend to use the proposed initiatives in the future (see Figure 5).

Table 3: Initiatives included in the survey

1. Buying suboptimal foods at a discount
2. Asking for doggy bags at restaurants for leftovers
3. Buying new products that are made with food waste
4. Choosing a suitable portion size when ordering food
5. Using tips and recipes to reduce food waste

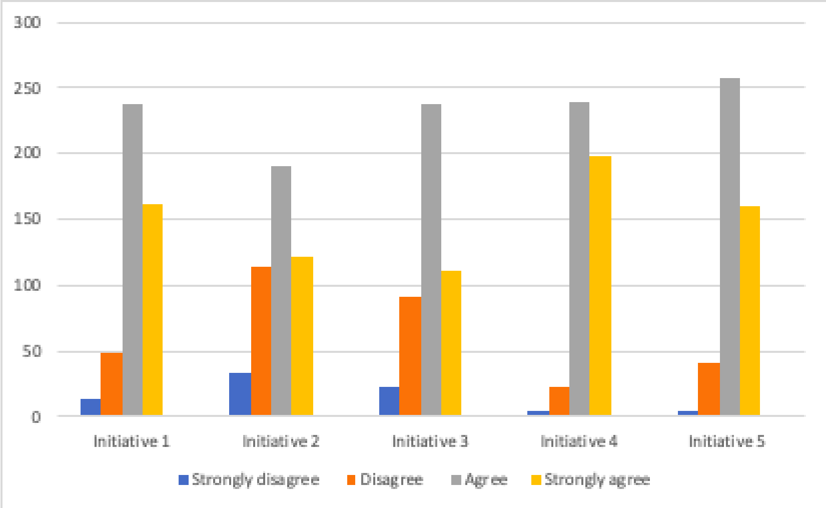

Figure 5: intention to use initiatives

The analyses conducted with the consumer survey data showed that there is a positive connection between intention and the other variables of attitude, subjective norms and perceived behavioural control. Please refer to Table 4 for a short description of the terms.

Table 4: Definitions of used terms

Attitude	A positive or negative evaluation of an initiative
Subjective norms	A positive or negative evaluation of an initiative by one's social group
Perceived behavioural control	Whether the initiative is considered easy to participate in or not

Taking doggy bags as an example, having a positive attitude towards the use of them is strongly related to the intention to use them (see Table 5). The same can be said for the way people in the consumer's social circle evaluate the initiative. On the other hand, knoswledge about the issue of food waste influences intention, but at a negligible level. Similar findings were discovered for the remaining initiatives. For more information on those remaining initiatives, please refer to Annexe G.

Table 5: Correlations between the intention to use a doggy bag and other variables

				Perceived behavioural control			
		Attitude	Subjective norms	Knowledge	Ease of use	Time available	Participation of others
Intention doggy bag	Pearson Correlation	.717**	.577**	.106*	.374**	.213**	.116*
	Sig. (2-tailed)	0,000	0,000	0,025	0,000	0,000	0,013
	N	457	453	453	444	455	456

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Analyses show that the better one's attitude is towards initiatives in general, the higher the level of intention to participate in initiatives (see Annexe G). Important to note here is that this regards the attitude towards initiatives in general, not just a specific one. Thus, if more initiatives are evaluated positively by consumers, the more likely it is they will participate in a retailer's initiative.

In the process of creating positive attitudes, it is also important that the people who the consumers care about, approve of the initiative itself, meaning that subjective norms still play a prominent role in determining the consumer's intention to participate. This indicates that when targeting attitude, it is important to target a wide audience or to incentivise consumers on spreading the message to friends and family.

Moreover, for perceived behavioural control, only ease of use and time available influence intention. Thus, the easier an initiative is to use and the less time it takes, the more likely it is for consumers to have a high intention of using initiatives. On the contrary, results show that the actual knowledge of food waste, as well as whether people deem it useless to participate when others do not participate does not influence intention.

Finally, the analyses show that intentions influence behaviour in a positive way. This means that consumer behaviour can be targeted to stimulate the use of initiatives. This is done through targeting attitudes, subjective norms, ease of use and time available.

Chapter 7: Conclusion

The aim of this research is to conduct an analysis of the current situation and reasons for the occurrence of food waste amongst small-scale retailers in Ede, Barneveld, Wageningen and Rhenen, on which recommendations to reduce food waste and improve circularity will be based.

First, most of the retailers in all four of the municipalities have indicated they generate little to no food waste, though this was found to not always be the case. The reason for this could be the different perceptions amongst retailers on what food waste is and the value of this generated food waste. Although there are still many practices aimed at reducing food waste, mainly due to financial reasons, most retailers do not recognise that food waste can still be used for circular purposes. As separation rates are low and circular treatment is not a widespread practice yet, there are significant opportunities for improving the circularity in the retail sectors of the city centres. These opportunities are substantial because it has also been shown that circular options, such as biogas and composting, are highly feasible within the current policy framework.

The fact that the circularity of the food waste system amongst retailers is minimal can be attributed to numerous factors such as a limited cognition on the value of food waste, and a lack of collaboration amongst relevant stakeholders. Additionally, private waste companies do not always offer a green bin in their contracts, hampering retailers from separating. The low volumes of organic waste have been indicated to be another factor for retailers to not separate this waste. In three of the municipalities, there are cases in which retailers share residual waste bins, which indicates a potential for the sharing of organic waste bins.

Furthermore, findings have indicated that collaboration between all relevant stakeholders is hindered by the lack of responsibility taking. Namely, all interviewed stakeholders are not sure who should be responsible for establishing and improving future collaborations. Regarding the relation between the retailers and the municipality, hardly any collaboration is identified. Retailers have high expectations from the municipality, and although they are willing to help, some members of the municipality have indicated they do not possess the required knowledge or resources to successfully assist retailers. As for the retailers, knowledge on potential collaborations is not present as they are often unaware of their role in relation to circularity and food waste. This, in turn, hampers them from taking responsibility. Nonetheless, commendable examples where a snowball effect has been set into motion have been identified. Such examples help to ensure promising actions combatting food waste gain traction with other stakeholders.

Moreover, the potential for more collaboration between retailers and external organisations was found to be restricted due to strict food safety regulations. The relation between retailers and food safety regulations is a dual one, as they both assist retailers to ensure the safety of consumers, but also hinder them in taking part in more food waste reducing and circular initiatives. As such, many retailers show reluctance to join external initiatives.

Although willingness to work with external organisations is present, the lack of exposure to these organisations is a significant barrier for the potential collaboration with retailers. Retailers are often not aware of the existence of external organisations, as the external organisations do not regularly reach out to form collaborations with them. This can also be connected to the limited collaboration between retailers and consumers. In three of the four municipalities, retailers were somewhat unaware of the willingness and needs of consumers with regards to food waste reducing, or circularity increasing initiatives. This has led to retailers not actively promoting their efforts and therefore receiving limited interaction from consumers. Data has shown that consumers have the intention to participate in initiatives, should they be given the chance. Results have also indicated that this intention can be increased, and that behaviour can be predicted and steered in the retailers' favour.

Based on these findings and connections, several recommendations were created for the Foodvalley Region and relevant stakeholders.

Chapter 8: Recommendations

In response to the lack of communication and collaboration, which has been a recurring problem, it is recommended that the Foodvalley Region takes a leading role in setting up a regional knowledge and collaboration platform. The main purpose of the platform would be to connect key stakeholders, such as retailers, experts, municipality workers and external organisations, and to facilitate knowledge sharing between them. The Foodvalley Region could take on a facilitating role in this platform. The first step for the Foodvalley Region would be to reach out to "initiators" within each of the municipalities. These initiators can be considered stakeholders with exemplary practices or knowledge on tackling food waste. In accordance with the snowball effect, their existing network would be encouraged to join, which would create the base for the platform. In addition to this, the Foodvalley Region could refer their existing contacts who have indicated they require help with reducing food waste and increasing circularity to the platform. To establish a successful platform, direct communication between all stakeholders is of utmost importance, for which the design of a mobile application is recommended. With the use of this application, easy and regular updates and invites can be shared amongst the retailers. Examples of these can be invitations to organised meetings, updates on new initiatives or creative ideas related to food waste. Through communicating within this platform, knowledge can be shared amongst the different stakeholders and new collaborations can be formed.

The second recommendation pertains to the creation of knowledge and awareness campaigns focussing on both consumers and retailers. The consumer-related campaigns should be focused on bringing awareness about initiatives taking place on the retailer level. This can include both initiatives started by the retailer, and collaborations with external organisations such as Too Good To Go. As indicated by the findings, there are different ways to target the consumers' intentions to use these initiatives. This can be achieved by developing positive attitudes, communicating how others feel about using the initiatives and highlighting the ease of use, as well as the little time it takes to participate. In addition to the consumer campaigns, the retailer campaigns should be targeted at exposing them to the various (external) initiatives that can aid them with the reduction of food waste or the increase of circularity. These exposure campaigns should be designed in collaboration with the various initiatives to best communicate their respective advantages to the retailers. Furthermore, it would be beneficial to emphasise the benefit of circular initiatives as these initiatives are underrepresented. Important to note is that a campaign is not a one-size-fits-all solution as not all initiatives can be used for all retailer types. As such, more than one campaign is needed to create a significant impact.

To overcome the decentralisation of the current waste collection system, it is recommended to combine food waste streams via a collective waste collection practice. As retailers have indicated that waste separation is hindered by the small volumes of waste they produce, combining waste streams can help increase separation rates. Additionally, the increased volumes allow for the residual food waste to be repurposed more easily. Moreover, by combining waste streams, the operational waste collection costs for waste collection companies, and therefore also the individual retailers, can be reduced. A good example of this is the waste collective in Wageningen which highlights how a collective waste collection system could be operationalised. Once more, the Foodvalley Region could play a prominent role in establishing the line of communication between the retailers and even play a role in setting up a trial waste collection collective as part of their Living Lab collaboration programme. These collaboration programmes could then address the various volume and monetary challenges related to the current waste management system.

The combination of these recommendations will contribute to a more circular and collaborative food system in the Foodvalley Region, where the willingness of retailers and consumers to reduce food waste and improve circularity can be transformed into action.

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Appendices

Annexe A: Consumer survey

Dear respondent,
Thank you for participating in this survey. This survey is part of a commissioned project on food waste reduction by Foodvalley Region. The survey will take about five minutes. There are no right or wrong answers within this survey. Of course, all data within this survey will be treated confidentially and anonymously.

Thank you again for your cooperation!

1. In which municipality do you buy most of your food?

O Wageningen O Barneveld
O Ede O Rhenen
O None of the above O I don't do the shopping in my household

2. In which municipality do you currently live?

O Wageningen O Barneveld
O Ede O Rhenen
O Other ______________________________

3. At what types of stores do you buy most of your food? Choose all that apply.

O Bakery O Local market
O Butcher O Supermarket
O Green grocery O Other _______________________________

4. Age: ____________
5. Gender: O Male O Female O Other

6. How many persons do you mostly buy food for (including yourself)? ____________________

7. I think it is good to...	Strongly disagree	Disagree	Agree	Strongly agree
Buy sub-optimal foods (e.g. deviating appearance, or nearing expiry date) if they were on discount	O	O	O	O
Ask for a doggybag at a restaurant if I had leftovers	O	O	O	O
Buy new products that are made of food waste, such as beer made from old bread	O	O	O	O
Have different portion sizes to choose from when selecting a dish at a restaurant	O	O	O	O
Use recipes and tips on how to use food going to waste if retailers offered it	O	O	O	O

8. Most of the people who are important to me would approve of me...	Strongly disagree	Disagree	Agree	Strongly agree
Buying sub-optimal foods at a discount	O	O	O	O
Asking for a doggybag at a restaurant for my leftovers	O	O	O	O
Buying new products that are made of food waste	O	O	O	O

Choosing a different portion size when ordering food	O	O	O	O
Using tips and recipes to reduce food waste	O	O	O	O

9. I feel like...	Strongly disagree	Disagree	Agree	Strongly agree
I have enough knowledge on how to reduce food waste	O	O	O	O
It is easy to partake in, or use waste reduction initiatives (e.g. asking for a doggybag at a restaurant)	O	O	O	O
I have enough time to partake in food waste reduction initiatives (e.g. picking up suboptimal food at retailers at a particular time)	O	O	O	O
There is no point in partaking in food waste initiative if others don't do the same	O	O	O	O

10. I plan to...	Strongly disagree	Disagree	Agree	Strongly agree
Buy sub-optimal foods (e.g. deviating appearance, or nearing expiry date) if they were on discount	O	O	O	O
Ask for a doggybag at a restaurant if I have leftovers	O	O	O	O
Buy new products that are made of food waste, such as beer made from old bread	O	O	O	O
Choose a different portion size when ordering food	O	O	O	O
Use recipes and tips on how to use food going to waste if retailers offered it	O	O	O	O

11. I already...	Strongly disagree	Disagree	Agree	Strongly agree
Buy sub-optimal foods if they are on discount	O	O	O	O
Ask for a doggybag at a restaurant if I have leftovers	O	O	O	O
Buy new products that are made of food waste	O	O	O	O
Like to have different portion sizes to choose from when selecting a dish at a restaurant	O	O	O	O
Use recipes and tips on how to use food going to waste when retailers offer it	O	O	O	O

12. How much do you know about food waste?

- Nothing at all
- Not much
- Somewhat
- Very much

13. How much impact do you think food waste has on…	No impact	Minor impact	Moderate impact	Strong impact
Climate change	O	O	O	O
Plants and animals	O	O	O	O
Economic costs	O	O	O	O
Water quality and quantity	O	O	O	O
Soil quality	O	O	O	O
Global food availability	O	O	O	O

14. Do you know any initiatives besides the ones mentioned in the survey? If yes, list them here:

Thank You!

Annexe B: Retailer survey

Survey food waste small scale retailers

We, students of Wageningen University & Research, are currently conducting a project commissioned by the Foodvalley Region aimed at reducing food waste and improving circularity within the municipalities of Wageningen, Ede, Barneveld and Rhenen. We are focussing on small-scale retail businesses within the food sector. Your answers to the questions will help us to understand how much food exactly is wasted for different retailers. If you want to stay anonymous, you can skip question 1. Thank you for your time and for helping with this research.

1. What is the name of your enterprise?

………………………………………………………………………………………………..

2. What kind of retailer are you?
   - o Butcher
   - o Bakery
   - o Restaurant
   - o Cheesemonger
   - o Vegetable shop
   - o Fishmonger
   - o Hospitality (hotel, restaurant, café, snackbar)
   - o Market
   - o Other:……………………………………………………………..

3. In which municipality is your enterprise located?
   - o Ede
   - o Wageningen
   - o Rhenen
   - o Barneveld

4. Who is your main supplier?
   - o Farmer
   - o Retailer (wholesale)
   - o Intermediary
   - o Other: ……………………………………………………………

5. Do you separate your waste?

o Yes (go to question 6)

o No, I deposit everything in one bin (if so, you can skip question 6)

6. Fill in the following table about your waste separation (cross out what does not apply):

Waste category	I separate this category (cross when applicable)	This category is collected … times per week/month	What is the content of your waste bin in L or m^3
Paper		…… times per week/month	…… L/m^3

Organic		…… times per week/month	…… L/m^3
Plastic		…… times per week/month	…… L/m^3
Glass		…… times per week/month	…… L/m^3
Residual waste		…… times per week/month	…… L/m^3

7. What is the content of your waste bin? *Only answer this question if you answered question 5 with 'no'*
    - o ……………… L
    - o ……………… m^3

8. What percentage of the food you intend to sell is not sold (and thrown away or sold with a discount)?
    - o 0 to 10%
    - o 11 to 20%
    - o 21% to 30%
    - o 31% or 40%
    - o 41% or more

9. What percentage of revenue do you miss out on due to products you which you don't sell (which you throw away or sell for discount)?
    - o 0% – 10%
    - o 11% - 20%
    - o 21% - 30%
    - o 31% - 40%
    - o 41% or more

10. Due to which processes related to your store does most waste occur? Please indicate in the table below and fill in per row.

	Least relevant	Moderate relevant	Most relevant
During transport to your enterprise	O	O	O
During storage in the stockroom	O	O	O
In the kitchen or creation process	O	O	O
During or after exposure in the store (e.g.: when food is displayed to the customer such as; on the plate of the guest or a product which is in the display or unsell)	O	O	O

11. Name six food products which are thrown away most in your company. Make a distinction between which products are suitable for human consumption and what not.

Suitable for human consumption	Not suitable for human consumption

12. What strategies do you employ when a product almost reaches its expiration date?
    - o Sell it for a discount
    - o Repurpose it in other products
    - o Give away for free to customers/employees
    - o Give away for free to the food bank
    - o Exchange it for other goods/items
    - o Nothing
    - o Other: ……

13. How do you personally feel like you are handling your food waste within your company? Give yourself a grade from 1 to 10.

1	2	3	4	5	6	7	8	9	10

Thank you very much for your participation!

Annexe C: Retailer interview questions

Introduction

We are students from Wageningen University conducting a research project in the Foodvalley Region, specifically in the municipalities of Ede, Wageningen, Rhenen and Barneveld. The goal of our research is to identify waste streams that lead to food waste in small scale retailers such as yourselves. Before creating a management plan, we find it incredibly important that your insights are addressed first in order for us to understand the food chain in the Foodvalley Region. We hope we can improve our understanding about this topic and our relationship with you with the help of this interview.

General questions

1. Could you tell us a bit about yourself?
2. Are you familiar with the word circularity in your (type of retailer), for instance in a purpose to reduce food waste?
3. How do you handle your food waste and why do you choose to do so?
    a. Transportation, consumption, who, how many times, etc?
    b. Motives: Financial, environmental
4. Are you familiar with initiatives focusing on the reduction of food waste and improvement of food waste circularity?
    a. Are you already working with some initiatives to reduce your food waste and increase your company's circularity?
        i. If yes, how exactly? Ex: Too Good to Go, doggy bags, food banks.
        ii. If no: If you were being approached by such an initiative; would you be interested in working with them? (network)?
    b. What is stopping you from engaging with initiatives?
5. Are you familiar with policy developments regarding food waste reduction, reuse, and recycling?
    a. Do you experience any barriers regarding policies/regulations?
    b. Do you experience any other challenges within the handling of your food waste?
    c. What would you need to overcome these policy barriers and general challenges?
6. What would you need to both reduce food waste and improve food waste circularity in your retail-shop?
    a. Policy
    b. Subsidy
    c. Waste stream improvements
    d. Initiatives
7. According to your answer for question 12 in the survey, could you please give some estimations?

Concluding Message

Thank you again for taking the time with us to conduct this interview. You can be assured that your contribution will contribute to our greater goal of eliminating food waste in the food valley region and ultimately throughout the Netherlands. We hope for you the best of luck in your initiatives towards this cause, and we wish you a prosperous future.

Annexe D: Policymaker interview questions

Introduction
Prepare for every interview your own introduction, depending on who you're interviewing and your personal preferences. The questions below are a small guide, but might not be strictly necessary in some cases.

General questions
1. Could you tell us a bit about yourself? (Personal context)
2. Are you familiar with the concepts of food waste and circularity?
3. What is your perception on food waste?
4. Do you know the Foodvalley region?
5. In what field is your expertise exactly?

Questions on current policies
1. Can you tell something about the relation between the municipality and the Foodvalley region?
2. What are the current policies or projects/initiatives around handling food waste in your municipality?
3. Does your municipality have policies or projects/initiatives regarding circularity of food waste?
    a. How do these influence consumers?
4. Are there any regulations related to food waste for the small-scale retailers?
5. Does the municipality help small-scale retailers in reducing their food waste or becoming more circular and if so, how?

Questions on policies yet to be developed:

6. As a municipality, what are your plans for the future in relation to food waste reduction/circularity?
7. If you were to change anything about your current approach, what would that be?

Annexe E: External organisation interview questions

Introduction

Prepare for every interview your own introduction, depending on who you're interviewing and your personal preferences. The questions below are a small guide, but might not be strictly necessary in some cases.

General questions

1. Are you familiar with the concepts of food waste and circularity?
2. What is your perception on food waste?
3. Do you know the Foodvalley region?
4. In what field is your expertise exactly?

Information about initiative and network

1. Could you tell us about yourself?
    a. What does your company do? (context)
    b. What are your aims/and goals? (motivations)
    c. What are your strategies to attract consumers to become part of your initiative?
2. Could you describe the network in which you operate?
    a. Who do you work with? (Ask towards small scale retailers?)
        i. *What is your relationship like with these parties/stakeholders/companies?*
    b. How do you expand your network?
    c. How would you describe your position within this network? (what kind of role?)

Policy-related questions

1. Are you familiar with policy developments regarding food waste reduction, reuse, recycling? (Policy-related barriers)
2. Have you been part of any policy developments concerning your field?
3. How does governmental policy influence your day-to-day operations?
4. Do you experience difficulties with regard to regulations/policy in your day-to-day operations?
5. Do you experience difficulties with regard to regulations/ policies in the realization of future objectives?

Annexe F: Waste stream expert interview questions

Introduction

We are students from Wageningen University conducting a research project in the Foodvalley Region, specifically in the municipalities of Ede, Wageningen, Rhenen and Barneveld. Before gathering this data, it is important for us to understand the food chain in the Foodvalley Region. We hope we can improve our understanding about this topic with the help of this interview. We would like to thank you for your time for this interview.

General questions

1. Could you tell us a bit about yourself? (Personal context)
2. What is your perception on food waste?
3. Do you know the Foodvalley region?
4. In what field is your expertise exactly?

Chain topic:

1. How does the supply chain look (in general) for retailers?
2. What are the steps from farm until the retail shop, and sometimes further after that?
3. How does a food waste stream for the retail sector in the Netherlands look like? What are the chains and the boundaries of that system?
4. Are there any other things to consider when we are trying to understand the supply food chain? Any pitfalls?

Waste stream topic:

1. How do you measure a food waste stream? What kind of methods are easy to use?
2. Do you have general data for the Netherlands (or municipality specific) of food waste streams? How much is supplied and wasted? What is its composition and the amount?
3. What are the main pitfalls in collecting waste stream data? What do we need to be careful of?
4. Are their differences in waste streams in the four municipalities? If so, what are the biggest differences?
5. What food waste could be recycled/reused that currently isn't being done?

Optional

1. Which food waste practises are currently practised by retailers in the Food Valley?
2. What are the main pitfalls when identifying a food waste stream?

Annexe G: Consumer survey analyses results

Table 1: Correlations between the intention tobuy suboptimal foods and other variables

				Perceived behavioural control			
		Attitude	Subjective norms	Knowledge	Ease of use	Time available	Participation of others
Intention suboptimal foods	Pearson Correlation	.615**	.490**	.110*	.172**	.160**	.060
	Sig. (2-tailed)	0,000	0,000	0,019	0,000	0,001	0,203
	N	460	455	457	445	458	459
**. Correlation is significant at the 0.01 level (2-tailed).							
*. Correlation is significant at the 0.05 level (2-tailed).							

Table 2: Correlations between the intention to buy circular products and other variables

				Perceived behavioural control			
		Attitude	Subjective norms	Knowledge	Ease of use	Time available	Participation of others
Intention circular products	Pearson Correlation	.679**	.566**	.128**	.165**	.201**	.068
	Sig. (2-tailed)	0,000	0,000	0,006	0,000	0,000	0,146
	N	455	453	457	444	458	459
**. Correlation is significant at the 0.01 level (2-tailed).							

Table 3: Correlations between the intention to choose suitable portion sizes and other variables

				Perceived behavioural control			
		Attitude	Subjective norms	Knowledge	Ease of use	Time available	Participation of others
Intention portion sizes	Pearson Correlation	.470**	.491**	.094*	.178**	.195**	.068
	Sig. (2-tailed)	0,000	0,000	0,043	0,000	0,000	0,146
	N	462	457	460	447	461	462
**. Correlation is significant at the 0.01 level (2-tailed).							
*. Correlation is significant at the 0.05 level (2-tailed).							

Table 4: Correlations between the intention to using tips and recipes to reduce food waste and other variables

				Perceived behavioural control			
		Attitude	Subjective norms	Knowledge	Ease of use	Time available	Participation of others
Intention tips and recipes	Pearson Correlation	.431**	.420**	.182**	.215**	.198**	.095*
	Sig. (2-tailed)	0,000	0,000	0,000	0,000	0,000	0,041
	N	461	456	459	447	458	460
**. Correlation is significant at the 0.01 level (2-tailed).							
*. Correlation is significant at the 0.05 level (2-tailed).							

Table 5: Ordinal regression results between intention, attitude, subjective norms and perceived behavioural control

							95% Confidence Interval

		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	Intention = 1	5,465	1,062	26,485	1	0,000	3,384	7,546
	Intention = 2	9,616	0,931	106,589	1	0,000	7,791	11,442
	Intention = 3	14,423	1,090	175,177	1	0,000	12,287	16,559
Location	Attitude	2,297	0,223	105,771	1	0,000**	1,859	2,735
	SN	0,922	0,211	19,059	1	0,000**	0,508	1,336
	PBC	0,853	0,207	16,999	1	0,000**	0,448	1,259
**. Regression is significant at the 0.01 level (2-tailed).								

Table 6: Ordinal regression results between intention and the perceived behavioural control variables

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	Intention = 2	1,587	0,575	7,632	1	0,006	0,461	2,714
	Intention = 3	5,218	0,629	68,754	1	0,000	3,985	6,452
Location	Knowledge	0,247	0,151	2,677	1	0,102	-0,049	0,543
	Ease of use	0,618	0,154	16,118	1	0,000**	0,316	0,919
	Time	0,418	0,139	9,025	1	0,003**	0,145	0,690
	Participation of others	0,193	0,110	3,039	1	0,081	-0,024	0,409
**. Regression is significant at the 0.01 level (2-tailed).								

Table 7: Ordinal regression results between intention and the perceived behavioural control variables

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	Intention = 1	4,035	0,746	29,286	1	0,000	2,574	5,497
	Intention = 2	7,788	0,767	103,233	1	0,000	6,286	9,290
	Intention = 3	11,387	0,900	160,200	1	0,000	9,623	13,150
Location	Intention initiative 1	0,460	0,166	7,712	1	0,005**	0,135	0,784
	Intention initiative 2	0,758	0,131	33,568	1	0,000**	0,502	1,015
	Intention initiative 3	0,372	0,149	6,257	1	0,012*	0,081	0,664
	Intention initiative 4	0,686	0,188	13,271	1	0,000**	0,317	1,056
	Intention initiative 5	0,471	0,188	6,283	1	0,012*	0,103	0,840
**. Regression is significant at the 0.01 level (2-tailed).								
*. Regression is significant at the 0.05 level (2-tailed).								

Annexe H: Barneveld

GEO-report Barneveld

NAME
GRACE RUHAMAH NYARKO
VICTORIA LEFVÈRE
DAAN BERKHOUT
MARLOT RIJKERS
ROSA VAN GESTEL

GEO-specific highlights

- While food shops and hospitality retailers are engaged in some internal and external food waste prevention activities, there is potential to increase circularity in the whole food chain.
- Most small-scale retailers in Barneveld dispose of food waste in the residual waste, which is mainly collected by a private company and incinerated.
- The findings show a willingness to reduce food waste and increase circularity among small-scale retailers, however, knowledge, financial constraints and lack of collaboration hinder them from taking the lead.
- Consumers in Barneveld show a positive attitude and intention towards participating in food reduction initiatives; however, the current behaviour implies there may not be enough (awareness of) opportunities.
- The following recommendations are formulated:
  - Combining food waste streams of multiple small-scale retailers.
  - Establishing an organisation that takes a leading role in starting communication.
  - Sharing knowledge on specific food waste reducing and circular initiatives and their benefits.

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Chapter 1: Introduction

One of the sustainable development goals of the United Nations is the 50% reduction of food waste by the year 2050 (FAO, 2019). To contribute to this goal, the Foodvalley Region works on new strategies to reduce waste and improve circularity within the food chain. The organisation is interested to learn more about where and how food waste occurs, which initiatives create the biggest impact, and which barriers hamper these initiatives. The synthesis report contributes to the formulation of strategies that the Foodvalley Region can perform to reduce food waste and increase circularity in the small-scale retail sector.

While the synthesis report elaborates on all the municipalities, this GEO-report focuses on the specific situation in Barneveld. Although being part of the Foodvalley Region would suggest that Barneveld is involved in many developments towards sustainable food systems, it appears that city-specific visions and research regarding food waste are limited. Therefore, the objective of this GEO-report is *to explore how small-scale food retailers in Barneveld handle their food waste, what barriers hamper initiatives to reduce food waste and how consumers perceive initiatives to reduce food waste*. This contributes to a better understanding of what general and retail-specific strategies can be recommended to work towards the sustainable development goal. Food waste is defined here as food that is destined for human consumption but ultimately not used for this purpose. Food waste takes place at the end of the food chain, that is, at the retail and final consumption level (Soethoudt & Timmermans, 2013).

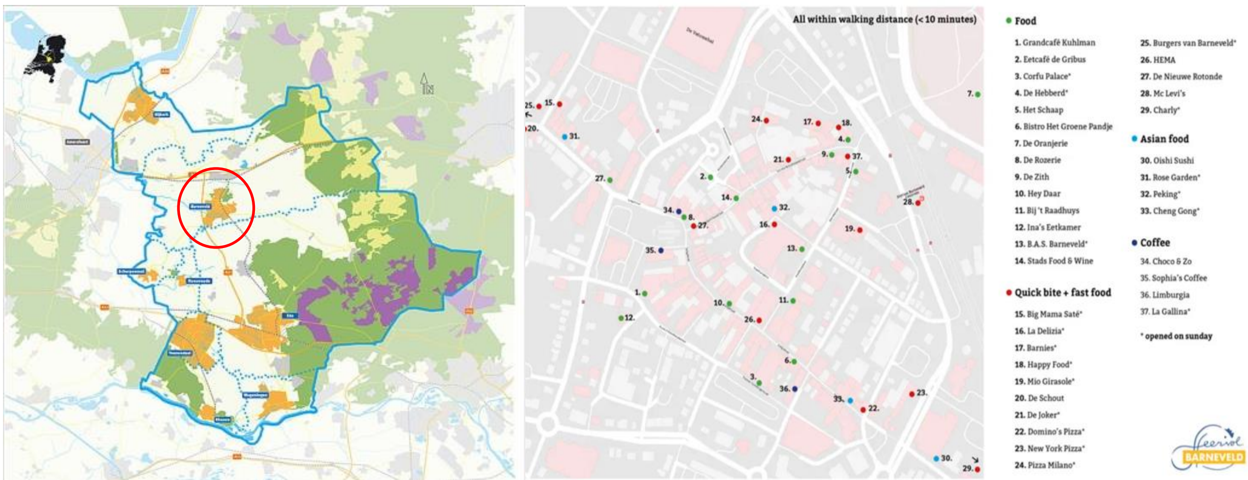

Figure 6: Map Barneveld City in the Foodvalley Region. Source: Valleihopper, 2021. Good to goight: City-center streets and retailers. Source: Barneveldcentrum, 2021.

As part of the Foodvalley Region, Barneveld is a village located in the province of Gelderland (see Figure 1). The municipality consists of 60,000 inhabitants and is known for its poultry farming, trading and Protestant community (Allecijfers, 2021). Figure 1 shows the locations of the different types of small-scale food retailers in the centre. Although the figure does not include vegetable shops, butchers and bakeries, they are part of the small-scale retailers in this research.

The data collection methods used to analyse the small-scale retailers were interviews, surveys and observations. To determine consumer perception, (online) surveys were distributed. Additionally, several important stakeholders were interviewed such as a private waste company and municipality representatives. Table 1 presents an overview of the data collection methods. All interviews were recorded and documented in detailed notes, and in some cases fully transcribed. The detailed notes and transcriptions were used to code and analyse the interviews using AtlasTI. For statistical analysis of the consumer and retailer surveys, the SPSS software was used. Further details on specific data analyses methods are presented in the synthesis report.

Table 6: Data collection according to the different categories.

Method	**Quantity**	**Details**
Consumer surveys	105	
Retailer survey	21	8 food shops 13 hospitality service
Retailer interviews	21	8 food shops 13 hospitality service
Municipality reps.	3	
Waste company interview	1	

Of the 42 small-scale retailers in the centre of Barneveld, 27 (64%) participated in either an interview, survey or both. The small-scale retailers can be divided into hospitality services (restaurants, cafes, lunchrooms and snack bars), and food shops (butchers, bakeries, vegetable shops and chocolatery). The three Barneveld municipality representatives interviewed were experts of waste-related (food) issues. These interviews were used to further understand the food waste policies and legislative context.

From the gathered data, four themes appeared to be key in combating food waste and circularity problems: food surplus and organic waste stages, food safety and regulations, awareness and knowledge and collaboration. These themes form the structure for the different chapters in this report. The last chapter focuses on linking the findings in the different themes, drawing an overall conclusion and providing Barneveld-specific recommendations. Notice that small-scale retailers will be written as "retailers" in the report.

Chapter 2: Food surplus and organic waste stages

This chapter is dedicated to explaining the stage through which food becomes waste. The stages are categorized into generation, separation, collection and treatment. The practices that retailers in Barneveld perform in those stages are analysed in this section. Based on the analysis, it was possible to identify the flows of food waste for the retailers of Barneveld's city centre (see Figure 2). The following sub-chapters will give a detailed understanding of the stages in this model.

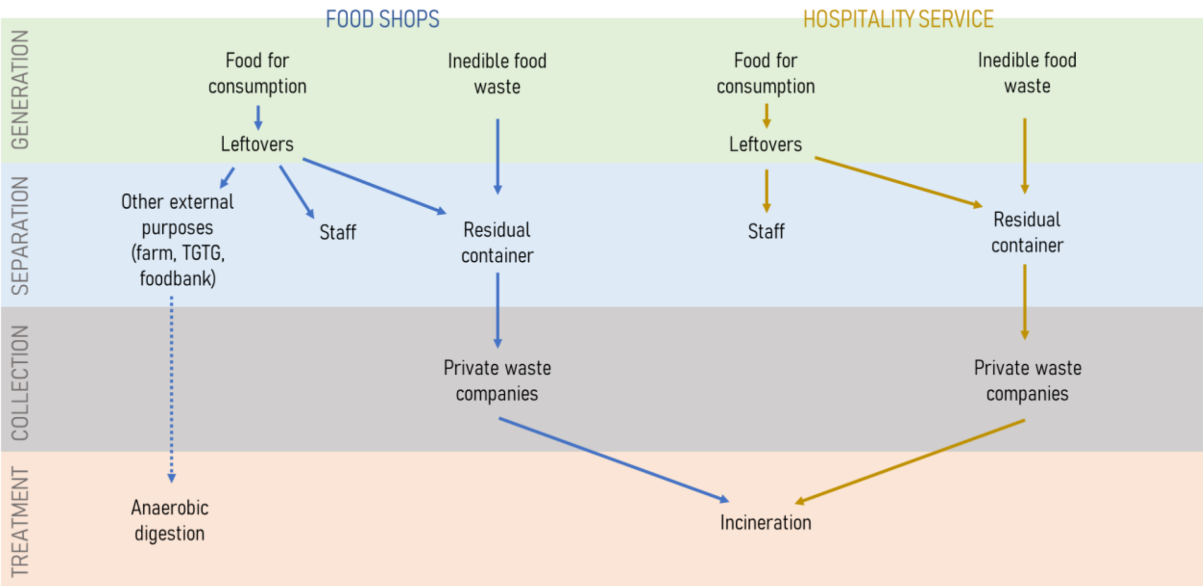

Figure 2: Current situation of the flows of food waste for small-scale retailers in the centre of Barneveld.

2.1 Generation

The generation stage involves practices that determine the number of food products that either cannot be sold or end up in the waste bin. A key motive for retailers to reduce their generated food waste is financial losses. For instance, two bakeries, a vegetable shop, a lunchroom and a restaurant mentioned losing revenue as a reason for attempting to reduce their food waste (Lunchroom, personal communication, June 2021; Restaurant, personal communication, June 2021). From the retailer survey four retailers indicated they lose 11-20% of their revenue, compared to the other 16 retailers indicating 0 –10%. An example how they try to prevent food from being wasted is that all retailers use kitchen monitoring, such as careful planning of the stock, estimating what is needed and local fresh purchasing of products. One hospitality retailer mentioned their engagement in using local products:

"We are not pre-ordering a lot of food. We don't have space. But also because we don't want to. We buy all our food locally. It is only two minutes away from here. When we need food, we jump on our bike and buy it immediately." (Lunchroom, personal communication, June 2021)

Practices like these prevent the purchasing of too many products and reduce the risk of products being unsold or wasted. Additionally, seven food shops mentioned they use discounts to stimulate consumers to buy suboptimal products. Nine retailers mentioned unsold products are reused to make new products such as minced meat, soup or even leftover menus (e.g., Sjieke Kliekjes) (Restaurant, personal communication, June 2021). Another frequently mentioned practice that prevents wastage is giving leftover food to employees, in food shops as in the hospitality sector. An overview of the waste prevention practices that were mentioned during the interviews is given in Figure 3.

In terms of quantity, at least eleven retailers started the interview saying they hardly have any food waste. Among them were three butchers, five hospitality retailers and two speciality shops (cheese shop or chocolatery). Though, from the observations it appears that there is a considerable amount of food being waste (see Table 2). Findings showed that most waste is generated in restaurants due to leftovers on the plate, though they consider it as smaller volumes. Smaller volumes are mostly applicable for stores such as a butcher, vegetable shop or speciality shop. Butchers for instance do not have a lot of food waste as almost all meat is used in other products such as minced meat or put in the freezer.

The estimation of the quantity of food waste disposed of in the residual bin every week is quite difficult for most retailers. For instance, a restaurant retailer stated:

"We do not plan our purchases very carefully because we have a large menu. This makes it difficult to estimate our waste." (Restaurant, personal communication, June 2021)

Retailers who gave an estimation of their food waste quantity ranges from 0.5 to 420 kg per retailer per week. Findings showed that the quality of food products often determines the amount of food waste generated. For example, when the meat changes colour but is still edible, it can be used for new products. However, if the quality of meat appears to be too low to the extent that it could not be sold to consumers, used to make new products or used by themselves, it is disposed of as waste.

Motivations for preventing the generation of food waste are mostly financial or because retailers think it is a shame to waste food in principle. For example, a lunchroom retailer mentioned:

"I don't like food loss. I don't like throwing things away. I think it is a shame, and it also costs a lot of money." (Lunchroom, personal communication, June 2021)

Still, several barriers that restrain retailers from food waste prevention practices were identified. For example, while offering different portion sizes could lead to less food waste in the hospitality sector, some retailers mentioned that they do not do it due to associations with snack bars, lower profitability, or the fear of losing customers (Restaurant, personal communication, June 2021). Though they were aware that it could lead to more food waste, the latter seemed to be of lower priority. The barriers could explain why despite the existing engagement in food waste prevention practices, retailers in Barneveld still dispose of a considerable amount of food.

Table 7: Average quantities of food waste in kg per week for different types of retailers.

	Type of retailer	The average quantity of food wasted in kg per week (not consumed by humans)*
Food shops	Vegetable shops	45
	Butchers	0.5
	Bakeries	225
	Speciality shops (cheese shop, chocolatery)	10
	Fishmonger	n.d.
Hospitality service	Including restaurants, cafés, lunchrooms and snack bars **	420

* The calculations for the quantities are based on the interviews, questionnaires, observations and literature.
** Source: Samen tegen voedselverspilling, 2020.

Figure 3: Waste prevention practices between different types of retailers in Barneveld.

2.2 Separation

The next step identified within the theme food surplus and organic waste stages is the separation of waste. Currently, twenty out of 21 retailers mentioned throwing some or all of their organic waste into a residual waste container (see Figure 4). Results show that the most important reasons for not separating organic waste from other waste is because private waste companies do not offer a green bin in their contract, or retailers are too busy to separate their waste (Restaurant, personal communication, June 2021). The reasons for not separating the organic waste in an extra organic waste bin are presented in Figure 5 for different types of retailers. This includes bakeries and hospitality services only, as barriers were not mentioned by the other type of retailers.

Figure 4: Residual waste containers of a restaurant without separating the

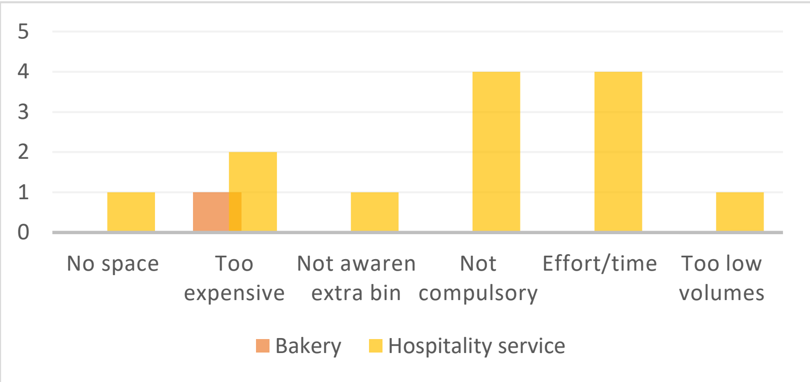

Figure 5: Barriers for not separating organic waste in extra bin between different types of retailers in Barneveld.

Seven out of 21 retailers indicated that they also separate their organic waste for other purposes and local solutions (see Figure 6). These purposes differ according to the food quality. Two stores, a vegetable shop and a bakery, with edible food surplus, collaborate with Too Good To Go which is a application that allows customers to purchase unsold food a discount to prevent it from being thrown away. However, bread from the bakery separated for the Too Good To Go-app purposes has to be of higher quality compared to vegetables since consumers will not buy one-day old bread (Bakery retailer, personal communication, June 2021). A vegetable shop retailer confirmed edible food with some spots can still be sold (Vegetable retailer, personal communication, June 2021). It was found that separating food for the Too Good To Go-app was mainly for financial reasons as mentioned by the bakery and the vegetable shop. The vegetable shop retailer mentioned saving 10 000 euros per year through this app (Vegetable retailer, personal communication, June 2021).

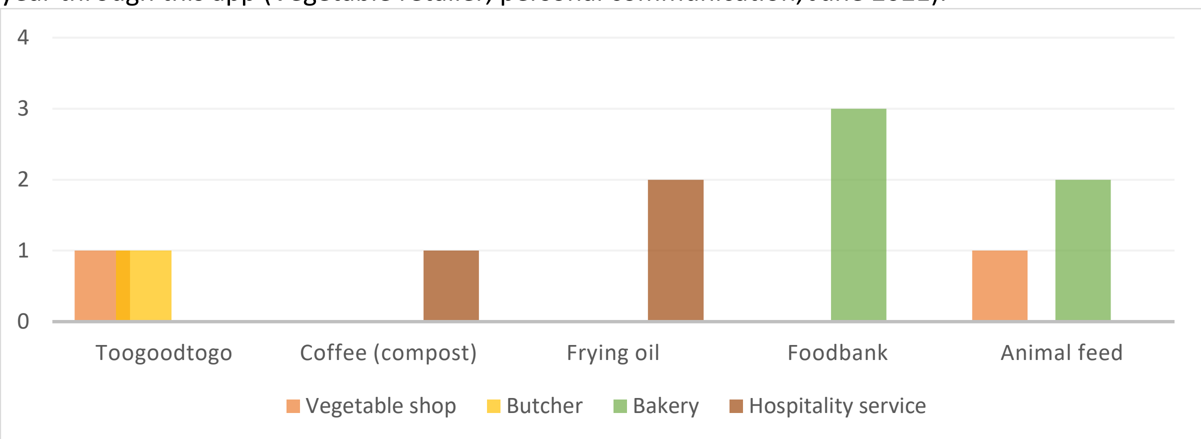

Figure 6: Separating organic waste with different purposes for different retailers in Barneveld.

Additionally, bread that is sent to the Foodbank needs to be edible and preserved in the freezer to maintain the quality. Food separated for animal feed on a local farm can on the other hand still be non-edible. Other purposes observed are the use of coffee grind/peels store in a separate bin for compost at home or reuse of cleaned frying oil stored in cans or gallons (see Figure7) (R. A retailer mentioned they are reusing their frying oil since it was a continuous practice (Restaurant, personal communication, June 2021). A lunchroom retailer took the coffee grinds to their house for compost (Lunchroom retailer, personal communication, June 2021).

2.3 Collection

After separation, the next step is to examine how the food waste is collected. While the municipality in Barneveld is only responsible for collecting the waste of households (Representative municipality, personal communication, June 2021), retailers are responsible for arranging how their waste is collected themselves. This means that each retailer must have a contract with a private company to collect their waste. Only one restaurant has their organic waste picked up by the municipality of Barneveld since they use the organic household bin of the neighbours (Restaurant, personal communication, June 2021). From the observations it appears that there are three different private companies that collect the waste from retailers in Barneveld. One of them is predominant; this company collects the waste of 18 retailers.

The representative of the municipality perceived the contracts with multiple private companies as inefficient. According to her, it will save money and time when food waste can be collected by one private company. She spoke about a collaborative idea of using one private company by different retailers in the past which never happened (Representative municipality, personal communication, June 2021). However, the retailers said they never heard of this plan but retailers, they still showed a willingness to sign a waste contract altogether.

2.4 Treatment

The last phase is the treatment of organic waste. After an interview with the largest waste collector it appears that most of the food waste that is disposed of in the residual, ends up being incinerated. They mentioned it is cheaper burning all of the waste instead of recycling it (Private waste collection company, personal communication, June 2021). After asking the retailers what happens to the waste, it appeared that none of the retailers knows what happens to the waste after it is being picked up by a private company. There is even one snack bar retailer who believes that his collected residual waste will be separated and recycled (Snack bar, personal communication, June 2021). Besides incineration of the food waste, there is one fishmonger who takes the fish waste towards a treatment plant for biogas (energy) production (Fish monger, personal communication, June 2021). This indicates that currently a rather unsustainable treatment is used for food waste, which does not seem fitting in a circular food system. Incineration can be considered unsustainable due to its higher negative effect on global warming compared to food waste prevention techniques (Schott & Andersson, 2015).

Regarding all waste stages, differences can be distinguished between the food shops and hospitality service: the latter has the largest amount of food waste going into the residual, which is eventually

Figure 7: Separating coffee for compost (left), frying oil can (middle) and crates for foodbank (right).

incinerated. Additionally, the food shops separated some of their food leftovers for external purposes such as the farm, Too Good To Go or the Foodbank, while hospitality retailers mainly focused on more internal solutions such as composting coffee at home and giving leftovers to staff. These differences are made explicit in Figure 2 by presenting food shops on one side, and hospitality on the other.

Chapter 3: Food safety and regulation

Although repurposing (almost) expired food products or leftovers may increase circularity in the food chain, tensions with food safety arise. Retailers must deal with regulations for food safety and inspections by the national and European government. An example of a regulation is the use of expiry dates on food products. This is compulsory except for e.g. salt, unprocessed vegetables and bread that is meant for consumption on the same day (NVWA, n.d.-a). “Best before”-dates indicate the day on which the product is still of high quality. Products can still be sold when this date is due. On the contrary, products with a “use by”-date cannot be sold when the date is due as they pose serious safety risks. The NVWA, the national authority for food and wares, carries out sample inspections regarding these expiry dates, temperature control, storage, hygiene and vermin in the food retail sectors (NVWA, n.d.-b).

The findings from the interviews indicated that, in general, the retailers in Barneveld do not experience barriers from these food safety regulations concerning reducing food waste. However, one market butcher perceived temperature regulation for meat as restrictive. The meat has to be tested at a certain temperature; however, this temperature leads to faster growth of microbiological organisms and therefore a lower shelf life and more food waste. The testing refers to a self-control system HACCP that is compulsory for meat retailers to ensure a hygienic production process. The NVWA checks if these retailers own and use this system (NVWA, n.d.-c). Although the market butcher perceived the regulations as restrictive and unfair, she also acknowledged that this testing is important for safety reasons. Furthermore, retailers that worked with relatively sensitive products such as meat, showed in general more concern about food safety than for example vegetable shops. Findings suggest that when leftover food products are used for external initiatives such as the Foodbank or the Too Good To Go -app, concerns about quality are raised. Especially when donating leftover food, a vegetable retailer worried about being accused in case the quality would be insufficient (Vegetable shop, personal communication, June 2021). This could be the reason why some retailers just prefer to throw away the food to not risk receiving any accusations later.

Chapter 4: Awareness and knowledge

The purpose of this theme is to analyse the awareness and knowledge of food waste reduction and circularity within various stakeholders, retailers and consumers in the municipality. The theme focuses on the different perspectives on food waste, the snowball effect, opportunities of exploring the interconnectedness between retailers, consumers and stakeholders and the exposure for existing initiatives within the municipality.

4.1 Retailers

4.1.1 Different perspectives about food waste reduction and circularity

In the interviews, eight out of 21 retailers indicated they had knowledge of food waste reduction and knew about the concept of food waste circularity. An example is a restaurant that explained circularity as mainly about the reuse of a product (Lunchroom, June 2021). Eight retailers also mentioned they had no knowledge on food waste reduction and circularity but after further probing, it was noted they are involved in reducing and reusing food waste. A restaurant mentioned they made sauces with almost spoiled tomatoes or used almost expired stocks for new meals (Snack bar, personal communication, June 2021). As was highlighted in the first theme, each retailer engages with food waste. Therefore, it can be assumed that each retailer is aware of food waste to some extent.

Also, 90% of the retailers only considered leftover foods (either on the plates of the customers or at the end of the day-sales) as food waste, while ignoring unavoidable waste such as peels of fruits, vegetables and eggshells. However, there were two exceptions: a lunchroom mentioned they had coffee waste that could be reused, and a restaurant mentioned using their orange peels for cocktails (Lunchroom, June 2021; Restaurant, personal communication, June 2021). These findings indicate that the knowledge and awareness on food waste reduction and circularity are diverse and interpreted differently among retailers.

4.1.2 Snowball effect

The snowball effect is when retailers and consumers have a big influence on the reduction and circularity of food waste by sharing ideas on how to reduce or reuse food. Though this was not actively observed amongst most of the retailers and consumer, a few instances were recorded. A vegetable shop mentioned he joined the Too Good To Go initiative because his retailer friend told him of the benefits (Vegetable retailer, personal communication, June 2021). Another retailer also mentioned she joined the Foodbank because a customer told her about it (Baker, personal communication, June 2021). Also, a retailer mentioned he used a website that filters recipes to match the left-over products in the kitchen (Snack bar, personal communication, June 2021). These active retailers could be a starting point to inspire more retailers and consumers to reduce their waste since some retailers mentioned they would join in if others started (Restaurant, personal communication, June 2021). These forms of networking play an important role in increasing knowledge and awareness.

4.1.3 Opportunities of exploring the interconnectedness

The findings suggest that retailers in Barneveld generally are not aware of the interconnectedness of the food waste issue. This refers to the way retailers see the value and opportunities to reduce food waste collectively. It was found that multiple retailers did not think their volume of food waste was enough to make a meaningful impact and participate in initiatives to increase circularity. Among them was a cheese shop and a lunchroom. The latter was interested in reusing their coffee waste, but feels that it would be useless, almost silly, to give their relatively small amount to another company or initiative. As a result, this waste often ended up in the residual bin (Café, personal communication, June 2021). If most retailers knew their waste could be used by other retailers, more waste could be reused and recycled.

4.1.4. Exposure to existing initiatives

Interviews indicated there was little to no exposure to existing initiatives. Ten of the retailers mentioned they know about the Too Good To Go-app and seven of them also know about the Foodbank. However, five of the retailers which are all restaurants were not knowledgeable on any of the initiatives or external organisations that are associated with the reduction of food waste. Those who were exposed to initiatives either ignore it or do not see the reason for joining as they think they cannot make any impact when they join. The latter was the case for a cheese retailer, who had been approached by multiple initiatives. When asked to mention some of the names, he said he could not remember (Cheese retailer, personal communication, June 2021). This issue can also be linked to the issue of interconnectedness, as e.g. a collective approach to reducing food waste could make a bigger impact than they initially thought. However, if retailers were involved, they often do not share the benefits of these initiatives with other retailers, which does not stimulate further exposure. Therefore, though in some cases it can be argued there is a lack of exposure to initiatives, the previous observations indicate that exposure is not the be-all, end-all solution. Still, this does not necessarily diminish the need for higher rates of exposure to initiatives and the collaborations that come from exposure can yield many benefits.

4.2 Consumers

This section presents how consumers in Barneveld perceive food waste reducing initiatives. The initiatives include buying discounted suboptimal food products, asking for doggy bags, buying new products made with leftovers, choosing suitable portion sizes and using tips and recipes to reduce food waste. Figure 8 presents an overview of the percentage of consumers that responded positively regarding their attitude, social norms, intention and current behaviour towards these initiatives.

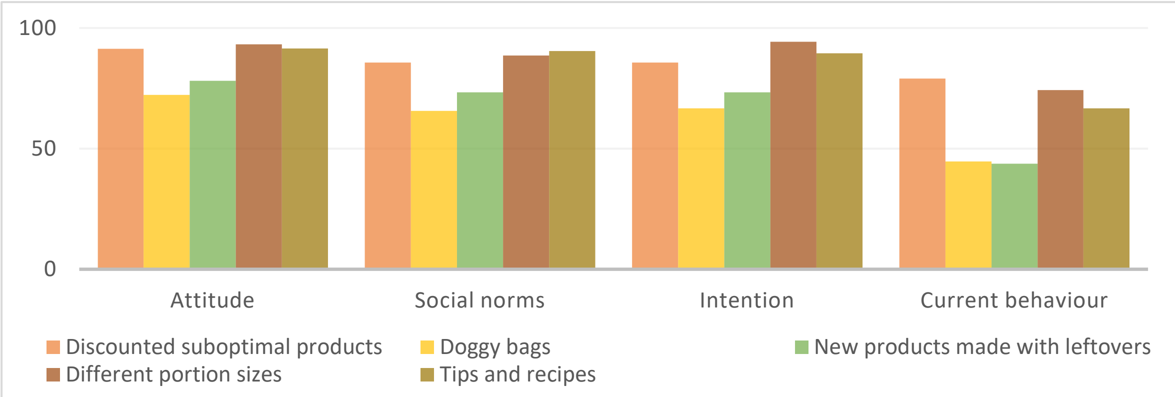

Figure 8: Overview of % of consumers that responded positively regarding their attitude, social norms, intention and current behaviour towards the initiatives.

Overall, the attitude of the consumers towards the food waste reducing initiatives is positive. This could be due to their perception of the issue of food waste: 95% of the respondents stated that food waste has either a moderate or even strong impact on e.g., climate change, economy, water quality and global food availability. Approximately 59% of all respondents agreed that the different food reducing initiatives can be regarded as good types of behaviour, while 31% strongly agreed to it. However, even though their attitude is generally positive, the consumers seem slightly less confident about the approval of the initiatives by their most important social contacts. Especially asking for a doggy bag when they had leftovers appears to be a type of behaviour that may not be fitting within all respondents' social norms. Namely, 34 out of 105 consumers indicated that their most important social contacts would not agree with stating that the use of doggy bags is a good initiative. A similar pattern can be found for buying new products that are made with food leftovers. Still, the intention of consumers to use the food waste-reducing initiatives in the future remains positive, indicating that among the respondents there is a willingness to partake in these practices. Especially the intention towards choosing suitable portion sizes was found to be very high, with 99 out of 105 consumers (strongly) agreeing to perform this behaviour in the future.

While the consumers show positive attitudes towards the initiatives and even intend to use them, they were not always certain if they can perform this behaviour. The findings suggest that most respondents think it would be easy to participate, as well as that they have enough knowledge for this. However, time appears to be a more critical factor: 46% felt that they do not have enough time to e.g., pick up leftover food products at retailers at a fixed time. In terms of usefulness, although 37 consumers indicated that it would not be useful to participate in these initiatives if others do not, 67 thought it would still be valuable.

Answers to the questions about current behaviour show that especially the initiatives of doggy bags and new products made with leftovers are not currently used by the consumers (see Figure 8). In combination with the generally positive intention towards these initiatives, indicates a gap between the consumers' willingness and the current (possibilities of) participation. For example, consumers often only take doggy bags when it is offered, while restaurants only offer doggy bags when it is requested by consumers (Restaurant, personal communication, June 2021).

Chapter 5: Collaboration

Besides the knowledge about the different initiatives, the food surplus handling and regulation, another highly relevant theme to consider is the collaboration between different parties. Indeed, communication has been mentioned by stakeholders as the main weakness. In the coming section, the relationships between retailers, municipalities, consumers, and external organisations will be described.

5.1 Collaborations between retailers

As for the collaboration between retailers, the findings show that there is a limited amount of existing collaboration. For instance, there is a common WhatsApp group that includes most of the retailers. However, it is mainly used for formal information instead of creative or innovative ideas such as food reduction:

"There was a person that came with another idea for collaboration. But was asked politely to not do it. It is purely a business app for the stores and entrepreneurs. So, ideas, not really." (Restaurant, personal communication, June 2021)

An alternative form of collaboration observed was the sharing of a residual waste container. Interviews indicated two restaurants, a butcher and a grocery store shared the same residual container as there was not enough space for a personal residual waste container (Restaurant, personal communication, June 2021; Butcher, personal communication, June 2021). Aside this, findings indicate that there is little to no collaboration between retailers regarding opportunities related to the reduction of food waste. This collaboration only exists for residual waste instead of food waste in general.

Additionally, there are significant barriers for retailers to initiate collaborative efforts. Three hospitality retailers and a vegetable shop retailer explained why they are not collaborating with other retailers. For instance, a lunchroom retailer mentioned they are not collaborating as they only have small food waste volumes (Lunchroom, personal communication, June 2021). Another barrier mentioned by two restaurants was that they do not have enough time to start a collaboration with other retailers and this could be due to the competitive nature of the various retailers (Restaurant, personal communication, June 2021). Also, a vegetable shop retailer mentioned that starting an initiative is highly time-intensive and difficult to get it running (Vegetable shop retailer, personal communication, June 2021).

5.2 Collaborations between retailers and the municipality

Regarding the topic of food waste, no form of collaboration was observed between the municipality and the retailers. Eight retailers explicitly mentioned that they do not have any contact with the municipality. One small scale retailer mentioned that the only moment of contact they had with the municipality was during the signing of several administrative contracts when starting their business (Restaurant, personal communication, June 2021). Still, a representative of the municipality expressed their willingness to communicate with retailers as illustrated by the following quote:

"It is something we can think about [more contact with retailers] but it is quite a lot of work and not our main objective. I think it would be better if everybody would organize this together. When all the retailers and restaurants work together, it would be easier." (Representative of the municipality, personal communication, June 2021)

This leads to an underlying issue, namely, an unclear definition of responsibility. A lunchroom mentioned it was their responsibility to manage and separate the waste, however, they also mentioned this to be highly challenging considering the financial consequences (Lunchroom, personal communication, June 2021). A representative of the municipality of Barneveld pointed towards the involvement of private waste collection companies, saying that they could play a more central role in the move towards a reduction of food waste and circularity. They also mentioned the responsibility of retailers:

"I think the municipality is not responsible for waste collection, and that retailers should arrange this themselves, that is, if they want to be more circular." (Representative of the municipality, personal communication, June 2021)

Seven retailers have voiced a general willingness to participate in collaborative initiatives concerning food waste and as was mentioned previously, the municipality is also willing to collaborate. Therefore, the clear intention and willingness of both parties to get involved presents an interesting opportunity for circularity.

5.3 Collaborations between retailers and external organisations

Of the retailers that were interviewed, ten retailers are aware of external organisations such as the Foodbank and Too Good To Go. As showcased by a bakery and a vegetable store, local food shops can make use of organisations such as Too Good To Go. These retailers actively engaged with Too Good To Go's services to handle food surplus. Though it is relevant to collaborate with external organisations for local food shops, it is more complicated with restaurants since they mainly have the leftovers on the plate of customers (Restaurant, personal communication, June 2021). As such, it is more feasible for restaurants to use a doggy bag in purpose of reducing waste as the volume of food surplus is generally low (Restaurant, personal communication, June 2021).

Aside from the collaboration with these organisations, the two bakeries and the vegetable shop, collaborate with local farmers. In this relationship, the retailers supply the farmers with food waste surplus which can be used for personal purposes (Bakery, personal communication, June 2021). National regulations hamper the upscaling of these types of collaborations, as they may come into conflict with food safety regulations as described previously. However, the relationship does illustrate possibilities for collaboration between retailers and external organisations.

A different retailer, a lunchroom shop, argued that there is space for the development of new organisations and collaborations. In their case is the concerned of reusing their coffee grounds:

"If there would be a solution for our coffee grounds (2 buckets/day). That would be amazing. It is really good coffee, but unfortunately, you can only use it once. So I would be open for collaboration with other organisations." (Lunchroom, personal communication, June 2021)

The willingness to collaborate with external organisations differ greatly depending on the type of food surplus, and the volume of food waste surplus generated by the retailers. Establishing appropriate collaborative efforts is therefore highly challenging, as there are no on-size-fits all solution. However, the general willingness to collaborate does provide an excellent starting point to explore opportunities for collaboration.

Chapter 6: Conclusion

Focusing on the municipality of Barneveld, the objective of this report is to explore how food retailers handle their food waste, what barriers exist and how consumers perceive initiatives to reduce food waste. This contributes to a better understanding of what general and retail-specific strategies can be recommended to reduce food waste and improve circularity. To be able to achieve this objective, this section will describe the synthesis between the four themes and from there suggest recommendations for Barneveld.

6.1 Linking the themes

Several overlapping characteristics become clear when comparing the four themes: (1) food surplus and waste stages, (2) food safety and regulation, (3) awareness and knowledge and (4) collaboration. The most interesting interaction is between the collaboration theme and the other themes.

Addressing the communication challenges could have a significant positive impact food waste reduction and circularity as there is a general willingness to collaborate amongst retailers. In some case, there was neither knowledge on initiatives, nor interest in participating. However, there were also instances where there is an explicit willingness to collaborate, but a lack of knowledge on existing initiatives. Therefore, awareness of collaborative efforts could help foster collaborative efforts between different stakeholders. This could, eventually, increase the snowball effect and make sustainable practices more widespread throughout Barneveld. Additionally, Kasza et al. (2019) suggest that to balance the food waste reduction and food safety risks, it is crucial for consumers, entrepreneurs and public actors to collaborate and share knowledge. This way, all actors are more likely to control food safety risks within solutions towards a circular food chain. Kasza et al. (2019) highlight the importance of public authorities to be open to new ideas and solutions for repurposing food waste or leftovers.

It was found that many retailers believed they did not have significant waste to contribute to initiatives. Herein lies a dilemma, as the collective food surplus of all retailers would be sufficient to contribute meaningfully to increasing food waste circularity. However, this requires many retailers to participate, which in turn requires elevated levels of coordination and communication. Currently, this communication is non-existent other than the strictly business-oriented WhatsApp group. Therefore, there is an opportunity for an external facilitating party to bridge the gap between retailers and external organisations.
There is an opportunity for retailers with similar waste compositions to collaborate. Many retailers minimise their waste within their business as much as possible, however, apart from several exceptions, this does not translate into widespread collaboration. As such, there is a clear coordination and communication bottleneck to organise this. As was observed in the waste separation chapter, many retailers cannot afford to use a green waste bin, either due to spatial limitation, time limitation or private company contract constraints. The individual contracts between waste collection companies and retailers form a barrier for collaboration, as collective contracts could increase the returns to scale and solve the spatial and financial bottlenecks.

Lastly, there is a general lack of awareness of consumer perception amongst the retailers, which, if addressed, could decrease the total generation of food waste. Namely, though some restaurants associate negatively with the use of different portion sizes as well as doggy bags, the consumer surveys indicate a significant interest in doggy bags and portion sizes.

6.2 Recommendations

Overall, the findings suggest that retailers in Barneveld show willingness to reduce food waste. However, potential can be gained regarding collaborating and sharing knowledge on food waste separation and collection, as well as initiating this communication between the retailers, public and private actors and consumers. Therefore, based on the synergistic challenges, several specific recommendations can be formulated to address the different problems concerning food waste reduction and circularity. The first recommendation is as follows:

1. Establishing an organisation that takes a leading role in starting communication

Communication and collaboration have been pointed out as recurring issues regarding the reduction of food waste. This is important for not only combining food waste streams but also for sharing knowledge on initiatives to reduce food waste, dealing with food safety and consumer perception.

Enhancing this requires communication between all actors involved, being the retailers, private waste companies, public authorities and consumers. As many retailers in Barneveld showed that initiating this is not a priority in their business, it is recommended that overarching organisations such as the Foodvalley Region or the municipality take a leading role in starting the communication. For instance, an online platform where all the stakeholders have access to information regarding food waste and circularity should be created. The Foodvalley Region could take a leading role and organise general meetings to discuss with all the different stakeholders the needs and ideas of all. This also could be done through the platform by giving updates and information on upcoming events. This will be valuable, as retailers can easily transform their willingness to participate into action, as well as collaboratively come up with solutions. Additionally, increased communication between retailers can enlarge the snowball effect that is highlighted as important to stimulate participation in food reducing initiatives.

2. Combining food waste streams of multiple retailers

Considering the small volumes of waste and the willingness of retailers to make their food chain more circular, it is recommended to combine the food waste streams of multiple retailers. This way, sufficient volumes can be collected more easily by companies that repurpose food waste. When organic waste is separated and collected in a larger volume for private companies, the waste can be converted into value-added products which is more beneficial than burning it. It is important to communicate the possibilities and preferences, to organise this collaboration in such a way that it is effective for all retailers. As explained in the previous recommendation, Foodvalley Region could be the starting point of this communication by using the Living Lab approach. This provides opportunities for retailers, private companies and initiatives to brainstorm together and experiment with pilots. All stakeholders, including the Foodvalley Region, should be involved in evaluating these pilots, so that they can be adjusted and optimised. The Living Lab will enable the stakeholders to create a tailored and effective solution for combining retailers' waste streams and making the food chain more circular.

3. Sharing knowledge on specific food waste reducing and circular initiatives and their benefits

To be able to participate, the retailers must know about the possibilities to reduce food waste and circular initiatives and how it could benefit them. This should be improved with campaigns such as food festivals or events focussing on ending food waste and increasing awareness about the problem. These events can bring retailers and external organisations together and network. As a WhatsApp group was only seen as a formal information source by retailers, a Facebook group could be created by the Foodvalley Region to share pictures, tips and ideas about circular initiatives or how to reduce food by being creative with leftovers for example. The findings showed that the waste practices are often determined by financial motivations. Providing information would help them realize that food waste reducing initiatives can also increase their revenues. Additionally, translating the possibilities and benefits from the retailers to the consumers is crucial, as they are also involved in many foods reducing initiatives. During the campaigns and on the Facebook group retailers can let consumers know what the possibilities are, as well as align consumers' perception with the retailers' practices. This way, consumers might be more willing to participate, while retailers become more aware of consumers' preferences.

The combination of these recommendations will contribute to a more circular and collaborative food system in Barneveld, where the willingness of retailers and consumers to reduce food waste can be transformed into action.

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Annexe I: Ede

GEO-report Ede

NAME
ISABELLE SCHUITE
HUGO KORF
XIAOXI XIA
BERTHA NKHATA
JASPER KORTBEEK

Geo-specific highlights

- Retailers have different perceptions on the concept of food waste: “*I do not have any food waste”* (First response majority of retailers).

- Opposing perceptions on food safety regulations; they ensure high food safety standards, but also increase unnecessary food waste and hinder circularity.

- Financial motives push small-scale retailers to reduce their food waste.

- A lack of collaboration between stakeholders is found, although the willingness to start this is present.
  - Retailers do not have enough knowledge about how to manage their waste.

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Chapter 1: Introduction

Food waste has become top on the agenda for the European Union who has a target of 50% reduction of food waste by 2050 (Chinie, 2020). The Foodvalley Region does also want to contribute to the achievement of this target. In order to do so, they have commissioned a project which researches the current situation among small-scale retailers in several municipalities, including Ede. There are many issues that contribute to the increase of food waste among small-scale retailers in the food sector. Through the research findings four key areas which contribute to the issue have been identified, namely the difficulties found in the waste management system, the duality of food safety regulations, a lack of knowledge and awareness about the issue and a lack of collaboration among key stakeholders.

The objective of this report is to give a detailed account of the existing situation regarding food waste and circularity amongst the small-scale retailers in the city centre of the municipality of Ede, from which municipality-specific recommendations will be derived.

1.1 City characteristics

Ede has an area of 318.62 km2 and is located at the centre of the Netherlands, in the province of Gelderland (CBS, 2020). It has a population of 115,710 people living in ten living areas (CBS, 2019). The main research area consists of the city centre of Ede. Here, many different types of retailers, such as restaurants, cafes, butchers, snack bars, and more can be found There is also an open market held every Saturday and accommodates a lot of retailers from outside the municipality itself who are in the food business.

Chapter 2: Data collection methods

Due to the various causes and stakeholders related to food waste, different data collection methods were chosen to cover the aspects of it in a comprehensive manner. The main data collection methods are surveys, interviews and observations. For more details on the reasoning behind the chosen methods, please refer to the synthesis report.

The collected primary data was gathered over the course of two weeks, both in person and online. Specifically, the consumer surveys as well as the retailer surveys and interviews were conducted in the city centre of Ede and the expert interviews were primarily conducted online. An overview of the amount of data collected can be seen in Table 1. To analyse the gathered data, SPSS and ATLAS.ti were used.

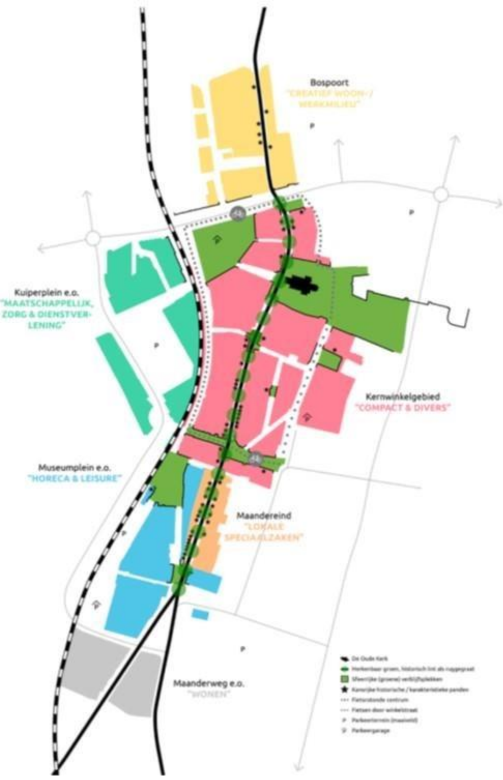

Figure 1. Map of research area (Gemeente Ede - Levendig Centrum, n.d.)

Table 1: Amount of data collected.

Consumer surveys	Retailer surveys	Retailer interviews	Expert interviews
150	12	19	3

Chapter 3. Food Surplus & Organic waste stages

As described in the introduction, four chapters were identified from the gathered data. The first chapter of the geo-report is related to the food surplus and organic waste stages of retailers in the city centre of Ede. The chapter is divided into four stages: generation, separation, collection and treatment. Every stage will be described and analysed in the following sections (see Figure 2).

3.1. Generation

Waste generation entails the process of where and how food waste occurs (Waste stream expert, personal communication, June 2021). Based on the conducted retail surveys, within the transportation, storage and food preparation phases, hardly any food waste is generated. Despite these well-managed phases, the retailers still generate food waste. According to a supply chain expert at WUR, most food waste occurs at the end of the supply chain, meaning the stage at which food is exposed to, and handled by, consumers (personal communication, June 2021). This statement is supported by the data gathered from the retail surveys, as four retailers explicitly said that most food is wasted after exposure to the consumer. An example of this is the food waste generated due to food safety regulations, which will be elaborated on in the next chapter.

Retailers have different motives behind reducing their generated food waste. A key motivation is linked to financial losses. For instance, two restaurants, a cheese shop, a coffee shop and a fish monger indicated the lost revenue related to food waste is their primary reason for attempting to reduce it (personal communication, June 2021). An example of how retailers reduce their generated food waste is through careful monitoring of one's food stock as well as through balancing supply and demand (Poulterer, personal communication, June 2021). Other motivations include environmental concerns and ethicality. The owner of a restaurant said, "I actively try to avoid wasting food, after all, there are people in the world who struggle to feed their families on a daily basis" (personal communication, June 2021).
Another way of reducing the generation of food waste is by offering different portion sizes. Most of the restaurants located in Ede offer different portion sizes. Only one restaurant owner chooses to not offer different sizes as they do not want to get associated with a fast-food restaurant (Restaurant, personal communication, June 2021). However, this restaurant does make smaller portion sizes and reduces the amount of side dishes to generate less food waste (Restaurant, personal communication, June 2021).

The results of the retailer surveys and interviews revealed specific data about the waste generated by each retailer per week or month. Three restaurants and a greengrocer were very open and had accurate information to share. For example, one restaurant said that they had about one bin of residual waste full every day, which is about 240 litres of waste (personal communication, June 2021).

3.2 Separation

Although waste separation is a common practice at the household level, where 60% of all waste is being separated (Rijksoverheid, n.d.), data suggests the opposite for retailers in Ede. Ten out of nineteen retailers disposed their food waste in a residual waste bin without separating. An interview with a restaurant revealed that all restaurants located at Museumplein are unable to separate their waste as the waste bins available to them are only dedicated to residual waste (personal communication, June 2021). The bins made available to these retailers are determined by the private waste collection companies, therefore giving the retailers themselves no possibility to improve their waste separation. Nine retailers separated their waste, however only five restaurants mentioned they separated their organic waste into a separate organic bin (see Figure 3). Furthermore, two restaurants in Ede separate and dispose of all their food waste themselves through different strategies such as composting, fermentation and private animal feed, leading to zero food waste. Despite the lack of retailers separating their waste, four retailers have indicated a desire to improve this in the future, if support is offered by the municipality or some other overarching organisation.


Figures 3 and 4: Organic waste bin by a restaurant in Ede (left) and a residual waste bin of one of the retailers, where all the waste is being disposed in (not separated) (right)

3.3 Collection

The third phase of the waste stages deals with the waste collection. Unlike household waste, which is collected by the municipality, retailers need to have their waste collected by a private company (Municipality Barneveld, personal communication, June 2021). Four of the interviewed retailers in Ede said they have a contract with a private waste company who collects their waste. The waste company mostly collects all the waste in one bin and then separate this waste at a later stage by themselves (Restaurant, personal communication, June 2021) (see Figure 4). Assumed is that the retailers that were interviewed also got a contract with a private waste company, but this was not mentioned in the interview.

In addition to the general contracts with waste collection companies, retailers have specific waste streams collected by external initiatives or companies. For instance, one restaurant collects expired juices and beer from other retailers to make high-quality vinegars of it (see Figure 5), which are then used in their own establishment (personal communication, June 2021). Another restaurant works with an external company who collects their coffee grounds and orange peelings to create new products from (personal communication, June 2021). The fish monger that was interviewed mentioned that the food waste goes to a processing plant. Two small retailers, the cheese monger and the Stroopwafel stand, disposes her small amount of waste at home.



Figures 5 and 6: Vinegar of expired juices and beers (left) and fermented leftovers (right)

3.4 Treatment

The final phase of the waste stages deals with waste treatment. Five retailers indicated that they were unaware of how their waste is being treated after collection (Personal communication, June 2021). To get clarification on the waste treatment process, an interview was conducted with a waste collection company. In this interview, they revealed that the residual waste bins are collected, after which they themselves separate organic waste. This organic waste is then either composted or turned into biogas (Personal communication, June 2021).

For the external collection initiatives and companies mentioned in the collection phase, treatment varies. Generally speaking, these external collection companies take the waste and either create new products from it, or give their waste a new destination. Despite the positive effect these external initiatives have on the amount of generated food waste, scalability remains an issue. This was mentioned by the restaurant working with the citrus peels collection initiative, as they have had issues with oversupplying them in the past (Personal communication, June 2021).

Chapter 4. Food Safety

The food safety chapter focuses on the retailers' perceptions of the regulations related to food safety. Besides the general food safety law, which is to be adhered to on an EU-level (EUR-Lex, n.d.) the municipality of Ede also has an appointed advisory Food Council to advise them on policies to be implemented (Gemeente Ede, 2018). The data collected in Ede revealed two conflicting perceptions of the regulations amongst retailers.

First of all, a small number of the retailers valued parts of the regulations because ensuring food safety was one of their primary concerns. An example of a food safety regulations which was positively viewed by these retailers is the regulation of cooling temperatures. Compliance with this regulation is checked thoroughly and sometimes monitored digitally which according to some of the retailers helps them maintain high levels of hygiene and food safety. For example, at a dairy company in Ede, the temperature of their products is measured online, and they comply with very strict regulations on the expiration date of the cooling device (personal communication, June 2021).

On the other hand, the majority of the interviewed retailers indicated that strict food safety regulations could indeed lead to food waste. For example, food may have to be thrown away because of the expiry date, even when the food is still fit for human consumption. Since businesses must abide by the law, food that could have been consumed, is instead wasted due to regulations. For example, the same dairy retailer said that consumers can apply the "kijk, ruik, proef" (inspect, smell, taste) test to check whether the food is edible at home, but this is not allowed in the store because retailers are responsible for the safety of consumers, which eventually leads to more food waste (personal communication, June 2021).

Due to these strict regulations, the majority of retailers argued that they cannot join any initiative. One of the restaurant owners continued to say: "We deal with very strict [food safety] regulations about the handling and keeping of chicken due to the nature of the product. Keeping chicken longer than intended could make customers sick, which is why we have short expiry dates on our products. This also prevents us from participating in other initiatives, such as donating our food to the Voedselbank, for instance" (Poulterer, personal communication, June 2021).

Another observation made is the discontent with old initiatives which have been banned due to food safety regulation such as the Feed Ban Regulation of 2001, which banned the feeding of left-over foods to all farmed animals due to the potential of spreading zoonotic diseases and cross-contamination (European Commission, n.d.). Many retailers have since tried to find alternative solutions for dealing with their food waste, including one restaurant owner who will soon own their own pigs to feed leftovers too. These pigs are not intended for human consumption, and thus exempted from the Feed Ban law.

Chapter 5. Knowledge and Awareness

Following the food safety chapter, the third chapter of knowledge and awareness is presented. The chapter consists out of four different, but related, aspects. The aspects that are discussed in this chapter are: different perceptions about food waste and circularity; snowball effect; exploring interconnectedness and consumer perception.

5.1 Different perceptions about food waste and circularity

Interviews and surveys with retailers resulted in two main findings, namely that retailers have different perceptions of what food waste actually entails, and that the knowledge of circularity greatly varies among retailers. Starting with the former, data from the 12 conducted retailer surveys highlighted the different perceptions of food waste. For example, two of the three restaurants who completed the survey indicated that leftover vegetables, such as salad, may still be suitable for human consumption. The other restaurant deemed none of their products suitable for human consumption and instead listed their leftover vegetables together with other products such as animal bones as not suitable. This is further backed up by the findings of the retailer interviews, all retailers claimed to have little to no food waste. Although this may be true for some, further questioning was needed to reveal whether there were food products they did not perceive as food waste. This turned out to be the case for most of the retailers, with food products falling in the organic waste category, such as vegetable peels or citrus peels, being disregarded most frequently. The reasoning behind this is that the retailers never considered these products as suitable for human consumption in the first place, therefore not deeming it valuable enough to save for any other purposes. On average, food returning from consumers' plates were most definitely seen as food that had gone to waste.

Moving on with the latter of the two findings, retailers' perceptions of and knowledge about circularity within their industries varied greatly. To exemplify this, one of the interviewed restaurants when asked if they knew about circularity, answered briefly by saying they heard about it before, but did ask for clarification to ensure they had a correct understanding of the term (personal communication, June 2021). On the opposite side of the spectrum, one of the interviewed restaurants had a very clear conception of circularity, which even played a key role within their establishment (personal communication, June 2021). The remaining interviewed retailers simply stated they knew about circularity but did not elaborate on the depth of their knowledge of this topic.

5.2 Snowball effect

Although some of the municipalities in this research showed clear signs of the so-called 'snowball effect', this effect was not observed among retailers in Ede. Whereas initiatives gained traction in other municipalities due to the communication between retailers themselves, the retailers in Ede seemed to act more isolated from one another. Only two retailers, consisting of one dairy retailer and one bakery, were identified who participated in Too Good To Go. These retailers had collaborated in the past but indicated not to have told other retailers in the area about their participation in the initiative.

Although the snowball effect was not actively observed within the city centre of Ede, potential actors who could stimulate this effect were found. In the case of Ede, one of the interviewed restaurants specialized in circularity mentioned they provide classes to other restaurants and chefs throughout the whole country (personal communication, June 2021). With this, they aim to inspire other retailers to repurpose what they see as waste into new, high-value and high-quality products. Although their classes are not specifically conducted on a local level, they may be seen as a starting point for the snowball effect to take off from.

Within the municipality of Ede, the snowball effect was more visible among the surveyed consumers. Oftentimes, the participating consumers would provide more information through informal talks with the surveyors. In such conversations, it was often brought to light that someone in their direct environment was knowledgeable about, or familiar with the concept of food waste or circularity. These people, such as family or friends relayed their knowledge to them, which they said to pass on to their own network again. Thus, among consumers knowledge and awareness seems to be spread with the use of the snowball effect, thereby gaining traction among consumers fast.

5.3 Exploring interconnectedness

Through conducting the interviews with retailers, it became clear that some retailers fail to see the relevance of their participance in initiatives that combat food waste or increase food circularity. Oftentimes, retailers indicate that their business is too small to make an impact on a larger scale and therefore do not do anything at all. Some of the examples mentioned by retailers are that they struggled to come up with, or participate in, food waste solutions as they deal with smaller quantities of waste, fewer employees and other resource constraints. Nonetheless, if retailers do not become part of the solution, the targets surrounding reducing food waste cannot be achieved.

Despite the previous finding, examples of successful retailers who utilised the interconnected nature of the issue were found in the interview data as well. The first example is from a restaurant located in the city centre of Ede, who stopped throwing away their coffee grounds and citrus peels to instead collect them for an external organisation focused on creating circular food products (personal communication, June 2021). Another interview with a restaurant specialised in circularity, the interviewee referred to a recent collaboration with an acquaintance in the industry who sells fruit juices. The interviewee mentioned their acquaintance was about to throw away fruit juices that had expired due to selling smaller quantities during COVID-19 (personal communication, June 2021).

"He was going to throw them [expired fruit juices] away since he did not think there was any other option for them. If we weren't friends, I wouldn't have been able to get the juices from him and they would have gone to waste. Now I have created high quality orange and apple vinegars from what they considered waste".

This example highlights that the knowledge about how the output or waste from one stakeholder can be a valuable input for another differs among retailers. Furthermore, it also shows that retailers who do have knowledge of this, are contributing to an increase in food circularity.

From a consumer perspective, similar results were found. Consumers were asked about whether there is a point in partaking in food waste reducing initiatives if others do not do the same. As can be seen in Table 2, more than a third of the respondents indicated that they do not see the point in participating if others did not either. Only 34 respondents (22%) strongly disagreed with the statement. With this information, it becomes clear that consumers may not be fully aware of their role in, and contribution to, the reduction of food waste. It can be concluded that, in order to stimulate consumers in partaking in food waste initiatives and thus contribute to food waste reduction, they need to be made aware of their what their individual impact means.

Table 2: Response Q9.4 - There is no point in partaking in food waste initiative if others don't do the same

Response	Frequency	Percentage
Strongly agree	8	5.3
Agree	48	32

Disagree	60	40
Strongly disagree	34	22.7
Total	150	100

5.4 Consumer perception

A careful analysis of the consumer surveys showed a relatively high level of consumer acceptance of existing initiatives. To start, a concise overview of the survey participants is provided in Tables 3 and 4. In Table 3, it can be seen that all age categories were represented to some extent. More than a third of the survey respondents were younger than 25, whereas a fifth of the respondents were 65 or older. Table 4 shows that over half of the survey respondents indicated to be female.

Table 3: Age

Response	Frequency	Percentage
< 18	17	11.6
18 - 24	35	23.8
25 - 34	23	15.6
35 - 44	7	4.8
45 - 54	13	8.8
55 - 64	20	13.6
65 - 74	27	18.4
> 74	5	3.4
Total	147	100

Table 4: Gender

	Frequency	Percentage
Male	55	37.2
Female	93	62.8
Other	0	0
Total	148	100

Although no specific differences in results were found based on age, gender did show distinctive results. For instance, 20 percent of all male respondents indicated to have a negative attitude towards existing initiatives, compared to only eight percent of all female respondents (see Table 5). Similar results were found for two other categories, namely subjective norms and intention. No striking differences were found for the remaining categories of perceived behavioural control and behaviour. From this, it can be concluded that female respondents in Ede evaluate existing initiatives in a more positive light, which can be taken into consideration for the targeting of consumers in the recommendation stage.

Table 5: Cross-tabulation results - age and attitude

Response	Strongly disagree	Disagree	Agree	Strongly agree	Total
Male	1	10	35	9	55
Female	0	7	61	24	93
Total	1	17	96	34	148

The consumer survey asked questions on five specific initiatives that are currently in use by retailers (see Table 5). Currently, initiatives one, four and five are used more frequently compared to initiatives two and three, as can be seen in Table 6. Informal talks with the survey participants provided arguments as to why doggy bags and circular products are used less by consumers. First, survey respondents indicated that they feel ashamed to ask for doggy bags and that they are rarely offered by food retailers. Secondly, the respondents made it known that they are not aware of many, if any, circular products in the shops they frequent.

Table 6: Tested initiatives and frequencies of use in number of consumers

Initiatives	**Frequency**
1. Buying suboptimal foods at a discount	115
2. Asking for doggy bags at restaurants for leftovers	61
3. Buying new products that are made with food waste	52
4. Choosing a suitable portion size when ordering food	98
5. Using tips and recipes to reduce food waste	88

Although differences can be observed between the acceptance of the individual initiatives, generally speaking, the acceptance of initiatives is present. As can be seen in Table 7, the 132 of 150 respondents had a positive attitude towards food waste reducing initiatives in general. Additionally, 130 out of 148 respondents indicated that the people they care about would receive their participation in such initiatives in a positive way as well. Furthermore, 118 out of 150 respondents felt they had the ability and resources to enable them to participate in food waste reducing initiatives. These results are reflected in the current behaviour and future intention to participate in such initiatives. Table 6 again shows that currently, 87 out of 150 people are already partaking in one or more of the tested initiatives, and 130 out of 150 intend to do so, or keep doing so, in the future.

Table 7: Frequencies

	Attitude	Subjective norms	Perceived behavioural control	Intention	Behaviour
Strongly disagree	1	2	0	1	7
Disagree	17	16	32	19	56
Agree	97	92	102	99	70
Strongly agree	35	38	16	31	17
Total	150	148	150	150	150

The relatively high level of acceptance may be explained by the level of knowledge about food waste and its impacts consumers claim to have. Table 8 shows that 124 respondents out of 149 said to have a decent amount of knowledge about food waste, of which 34 claim to know a lot. Similarly, the results in Table 9 show that, on average, 143 out of 150 respondents think that food waste has a moderate to strong impact on issues such as climate change, plants and animals, economic costs, water and soil quality and the global availability of food. Therefore, the high levels of awareness may have a positive impact on the current and intended participation in food waste reducing initiatives.

Table 8: Knowledge

	Frequency	Percentage
Nothing at all	1	0.7
Not much	24	16.1
Somewhat	90	60.4
Very much	34	22.8
Total	149	100

Table 9: Impacts

	Frequency	Percentage
No impact	1	0.7
Minor impact	6	4
Moderate impact	71	47.3
Strong impact	72	48
Total	150	100

Chapter 6. Collaboration

This chapter provides an insight into the different relationships between relevant stakeholders. This includes the relations of retailers with retailers, with consumers, with external organisations and with the municipality.

6.1 Relation between retailers

After analysing the interviews with the retailers, a pattern could be identified. Within the city centre of Ede, there is a lack of collaboration between the retailers. None of the interviewed retailers mentioned any form of existing collaboration between the retailers within the city-centre. In the past, before COVID-19, one dairy retailer collaborated with a bakery located in the city centre of Ede. After COVID-19, both retailers decided to collaborate with Too Good To Go instead (Dairy retailer, personal communication, June 2021). Therefore, there is no existing collaborating between the retailers anymore. Only a small number of cafes and restaurants at the Museumplein make use of shared bins located on the side of the square. Despite the shared bins, the retailers spoken to did not mention any argument for sharing these bins. Assumably, the use of these bins is not based on any form of collaboration between the retailers, but simply due to the shared location of the bins. As explained in the first chapter, these bins are placed and owned by a private waste company, meaning that collaboration at the waste disposal level is inevitable for these retailers.

Despite the lack of collaboration between retailers, most of the retailers spoken to did argue that the willingness to collaborate is present, only the knowledge how to do so is lacking.

"*I think that some kind of organisation that facilitates and helps with initiating collaboration could be useful. I think that looking for solutions together can help. As an individual, you cannot do that much"* (Café, personal communication, June 2021).

The willingness of the retailers indicates that there are opportunities to improve the relations between retailers in order to reduce their overall waste of food.

Apart from the retailers located in the city centre of Ede, seven market stall holders were also interviewed. During the analysation of this data, an interesting finding was discovered. One of the market stall holders is giving his food waste to the bakery and from this bakery the food waste gets a different purpose. An example is the delivery of food to the Foodbank. Furthermore, another market stall holder is giving his food waste once a week to a local farmer, who uses this food waste for private purposes (personal communication, June 2021). Due to the regulations on food safety, food waste cannot be used for animal feed anymore, hampering the implementation of more circular processes on a large scale.

6.2 Relation between retailers and external stakeholders

Within this relation, the external stakeholders can be identified as external organizations who can collaborate with retailers with the goal to reduce their food waste. These are referred to as initiatives. Two examples are Too Good To Go and 'Restaurants van Morgen'.

Within the municipality of Ede, only Too Good To Go was mentioned during interviews when asked about known initiatives within the municipality. In addition, only two retailers were actively collaborating with this organization. These retail shops were a dairy retailer and a bakery. The reason for this collaboration is twofold: the financial profits and the knowledge on what happens with the food afterwards (Dairy retailer, personal communication, June 2021). First, due to partaking in Too Good To Go, not only the amount of food waste is reduced, but the owners also manage to make a small profit on the boxes sold. Additionally, due to the availability of the boxes, the dairy retail owner attracts a more diverse group of customers to his shop, which can eventually lead to a larger number of total customers. Second, one of the retailers explicitly mentioned that he wanted to know what happens with his food waste after he gave it to another retailer or initiative. With Too Good To Go, he knows exactly what happens with his food waste and that it gets a worthy, new destination (Dairy retailer, personal communication, June 2021).

Apart from the two retailers who are actively collaborating with an initiative, only one of the other retailers spoken to was in collaboration with an external stakeholder. A common reason for this lack of collaboration with initiatives is the absence of large amounts of food waste. Most of the spoken retailers did not have much food waste, and if they had any, they would give it away for free to either their staff or customers. Another reason is related to the food safety chapter. Due to strict regulations on food safety, some of the retailers are not able to participate in any kind of initiative. The food they are serving is not suitable for reuse purposes, like the Foodbank or the Too Good To Go boxes.

As described above, there are not many retailers actively collaborating with initiatives, but some of the spoken retailers did argue that they are willing to collaborate if they are being approached by one.

"*I know that there are retailers who want to improve their food waste practices but just do not know how to do so. There is no communication within the municipality Ede and between different municipalities"* (Café, personal communication, June 2021).

This means that a more active communication between the initiatives and the retailers could lead to more collaboration between the two parties. In the following section, the relation between the retailers and the municipality will be described and analysed.

6.3 Relations between retailers and consumers

From the conducted interviews, no form of collaboration between retailers and consumers could be identified. The main cause is the lack of knowledge of both the consumers and the retailers on each other's behaviour and motives for taken measures. From observations in retail establishments, it could be seen that there was no active promotion of initiatives in any of the businesses that were visited, except for one. Exposure for such initiatives is crucial, in order to stimulate interconnectedness between the two parties. If a consumer is unaware that a store either has an own initiative or participates in initiatives that reduce food waste or increase circularity, they are unlikely to interact with this initiative as it is not clear that other consumers use them as well. In addition to this, retailers may get the wrong perception of their customers as the lack of interaction with their initiative can come across as disinterest.

During the informal talks with consumers during and after the filling in of the survey, it was highlighted that innovative initiatives are not receiving the attention they deserve. Often, interested consumers asked what they should think of when talking about new food products made from food waste. The surveyors had examples ready such as mushrooms grown on coffee grounds or beers made out of old, stale bread. Most of the time, these circular products were received very well by the consumer, but they also indicated to have never seen or heard of such products. This may be due to the initiatives being small-scale, a lack of exposure, or a combination of both. This goes to show that giving existing initiatives, both implemented by the retailer him/herself or by the collaboration with an external initiative and both large and small, a platform to increase their exposure can stimulate the uptake of initiatives among consumers.

6.4 Relation between retailers and the municipality

The relation between retailers and a municipality can be of great importance. In order to achieve a good relationship, communication is necessary. This means that the people working for the municipality should be in contact with the retailers from the city they are working in. Without any form of communication, the establishment of a good relationship will become difficult.

The relation between retailers in Ede and the municipality can be classified as minimal. None of the retailers are actively working together with the municipality. Furthermore, most of them argued that more transparency on regulations and projects the municipality is working on could have a motivating effect for the retailers. If they know what the municipality is working on and what the reasoning is behind their actions, this could lead to more motivation by the retailers to actively participate in certain initiatives.

"*We are not motivated or updated enough by the municipality. We need to do too much by ourselves*" (Restaurant, personal communication, June 2021).

"*There is a lack of communication on what to do and what happens with our waste afterwards. Due to the lack of transparency on this, we do not feel motivated to do more about reducing our food waste. Some kind of cooperation on the waste stream level would be useful for us"* (Restaurant, personal communication, June 2021).

"*We need more transparency from the municipality and other instances on what they do to their consumers, and I am also wondering what the goals of the municipality are regarding food waste on the consumer level"* (Dairy retailer, personal communication, June 2021).

These quotes indicate that more transparency and communication from the municipality could lead to more motivation for the retailers to do something with regard to their food waste practices. According to the inner-city manager of Ede, face-to-face contact between the municipality and the retailers is crucial in this collaboration:

"*If you want to get businesses involved, you have to be face to face with the retailers and visit them. You have to explain and facilitate solutions, otherwise businesses are not willing to participate"* (personal communication, June 2021).

This also indicates the room for improvement, which can be related to the perception of the municipality on the topic of collaboration. A policy maker working for the municipality of Ede mentioned that many projects, focusing on the reduction of food waste, are focussed on the consumer and household-level. Several projects have already been implemented in the last years, but only one of them was focusing on retailers, in this case, restaurants. The municipality of Ede collaborated with an initiative called 'Restaurant van Morgen', which tries to make the menus of restaurants more sustainable, including the reduction of food waste. Most of the involved retailers were enthusiastic about this project. Despite this successful project, creating awareness by the retailers is difficult according to the policy maker:

"*Retailers do not really pick up campaigns about awareness. They are quite willing to reduce food waste, but they do not know how to do so. Therefore, I want to know what the retailers need, in order to improve this awareness"* (personal communication, June 2021).

Furthermore, the policy maker mentioned that it will take a lot of effort for the municipality to improve the communication between the retailers and municipalities.

"*It will take a lot of effort for the municipality to communicate and influence the retailers. They can try to activate people and create awareness, but the municipality does not have all the knowledge to do so with retailers. Therefore, we try to connect the retailers to other organizations that have more knowledge and expertise on this topic*" (personal communication, June 2021).

This problem is related to the concept of responsibility. Who is taking responsibility to improve the collaboration between the different stakeholders? The municipality is actively searching for organizations with the necessary knowledge on this topic, to collaborate with the retailers in order to tackle the problem of food waste. This means that the municipality is trying to reach a more facilitating role within this relationship. Despite the good intentions from both the retailers and the municipality, two aspects are forming barriers in reaching this goal, namely time and money. Food waste is not the number one priority of the retailers, making profit is (Inner-city manager, personal communication, June 2021). Furthermore, lack of time is a big issue for the municipality to improve this relationship (Policy maker, personal communication, June 2021).

Chapter 7: Conclusion

The aim of this research is to conduct an analysis of the situation and reasons for the occurrence of food waste amongst retailers in Ede, which is helpful to give recommendations to reduce food waste. The following paragraphs explain the linkages between the results categorised in the four chapters in further detail.

First of all, a connection between the waste generation stage and the general level of knowledge and awareness on the issue of food waste has been discovered. Almost all retailers in Ede mentioned they have little to no food waste. However, further probing questions revealed that they did in fact produce food waste. This discrepancy between the statement and actual situation can be attributed to a lack of knowledge and awareness of what food waste entails.

Moreover, the separation and collection of the accumulated food waste proved to be an issue, which can partly be attributed to a lack of collaboration among relevant stakeholders. Due to the lack of opportunities provided by private waste collection companies, the ability to separate waste is hampered.

In addition to this, an overall lack of collaboration between all relevant stakeholders was observed. Data indicated that the stakeholders are unsure of who should be responsible for establishing future collaborations. Despite this observed lack of collaboration, the willingness among stakeholders to take action is present. This leads to the pressing issue of who should be responsible for initiating collaboration. Looking at the specific relations, different reasonings are found. Between retailers themselves, a lack of knowledge about the issue, as well as one another can be seen as the culprit. Since retailers hardly communicate with one another, they are unable to discover which outputs of one retailer can benefit as an input for the other.

Next, the relations between retailers and the three other stakeholders (external stakeholders, consumers and municipality) can be connected to each other. First, research findings revealed that there is a general lack of exposure of useful initiatives for retailers. Oftentimes, this lack of exposure becomes a barrier for collaboration, but even if awareness is present, the lack of these parties reaching out to one another forms a second barrier. Related to this, a limited connection between retailers and consumers was found. Retailers who partake or have come up with innovating initiatives often fail to communicate those to their consumers. Due to this lack of exposure, consumers are unaware of how they can contribute to food waste reduction, leading to the feeling of disinterest of consumers in food waste reducing initiatives by retailers.

Second, the data indicated that there was little to no collaboration between retailers and the municipality, but they both have the willingness to improve this collaboration. The municipality is aiming for a more facilitating role within this collaboration by bringing the retailers in contact with external organization whose expertise lies with food waste reduction or increasing food circularity.
Furthermore, a barrier to collaboration was found between stakeholders and external initiatives in relation to food safety regulations. Even though retailers are willing to collaborate with other external stakeholders, they are oftentimes unable to do so due to strict food safety regulations.

Based on these findings and connections, several recommendations were created for the Foodvalley Region, and relevant stakeholders, catered specifically to the municipality of Ede.

Chapter 8. Recommendations

The following recommendations could form a steppingstone for future change. One of the key findings was the need for the spreading of awareness and knowledge, as well as the facilitation of collaboration. Therefore, it is recommended to create a facilitating platform which is accessible to all important stakeholders. The Foodvalley Region, the municipality of Ede, and the local Food Council could have a prominent role in the creation and facilitation of this platform, and approach stakeholders to get involved. The platform can then be used to create awareness campaigns, put innovative initiatives in the spotlight, and to connect stakeholders who can benefit from one another, and more. To start such a platform, exemplary businesses and initiatives should be actively involved to serve as not only a starting point for collaboration, but also for inspiration. It is assumed that the

combination of exemplary stakeholders and the active outreach will kickstart the snowball effect and thus be an effective tool to combat food waste and increase circularity.
Next, it is recommended to incentivise retailers to actively reduce their food waste. Due to the leading financial motive most retailers have, communicating the benefits, including financial ones, of participating in waste reducing or circularity increasing initiatives is key. The increase of awareness of such opportunities is believed to be beneficial for all involved parties and contribute to food waste reduction and the increase of circularity within the food sector.

Lastly, to increase efficiency and circularity within the waste stream stages of the retailers and collecting companies, collaboration is needed. This can be achieved in different ways. First, there is an opportunity for private waste collection companies to start working together so that the individual waste streams of retailers can be collected on a larger scale, which would allow for waste separation. Another option would be for the retailers to actively collaborate and create a limited selection of private waste collection companies to work with in the municipality. The latter recommendation could be formulated as a local policy, according to the inner-city manager of Ede (personal communication, June 2021).

To conclude, it is clear that stakeholders will have to work together in order to tackle the issue of food waste. In order to do so, it is necessary to communicate with one another and to discuss potential solutions and recommendations. Most importantly however is to move beyond the conceptualised recommendations and to start working on the actual implementation.

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Annexe J: Rhenen

GEO report Rhenen

NAME

SELIN ALEKSIEVA

BENEDIKT BOPPRE

SJOERD VAN DER GOOT

WILLIAM MEREDITH-DAVIES

MARRIT VAN DE WITTE

GEO-specific Highlights

- Retailers indicate they generate little to no food waste.
- Organic waste separation rates of retailers are low.
- Most retailers do not have the know-how for circular waste management or repurposing options.
- Both retailers and consumers are willing to change their food practices, but indicate that this should not take up too much time.
- There are opportunities for collaboration between retailers and other retailers, consumers, external organizations and the municipality.

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Chapter 1: Introduction

1.1 Problem statement

Over the past years, food waste has become a more acknowledged problem that is associated with negative economic, social and environmental consequences (Aka & Buyukdag, 2021). One of the sustainable development goals of the United Nations is to reduce food waste by 50% by the year 2050. The Foodvalley Region in the Netherlands wants to contribute to reaching this goal and is currently working on strategies for this. In order to receive input for these strategies, they started commissioning a project concerning food waste and circularity in small-scale retail businesses for students of the Wageningen University. For this project, elaborated field work was conducted in four municipalities of the Foodvalley Region to generate municipality-specific insights into the food retailer practices and consumer perspectives on food waste and circularity. This report focusses on the findings of the municipality of Rhenen. The objective of this report is the following:

'The objective is to provide the Foodvalley Region with a detailed description of the current situation of food waste and circularity amongst small-scale food retailers in the city centre of Rhenen, of which a recommendation on strategies to reduce food waste and improve circularity will be derived.'

This report is built around five themes that have appeared to be key in combatting food waste and circularity problems in the four researched municipalities. These are food surplus and organic waste stages, regulations and perceptions on food safety, knowledge and awareness, collaboration and consumer acceptance. A combination of the findings of all four municipalities can be found in the synthesis report. Therefore, please refer to that report for a wider problem statement.

1.2 City characteristics Rhenen

Rhenen is a municipality in the province of Utrecht and a small city located close to the southern end of the 'Utrechtse Heuvelrug'. Figure 1 shows the city of Rhenen on a map. The city is located in a hilly area next to the Lower Rhine. The city of Rhenen has about 20,000 citizens (Alle Cijfers, 2021). Most of the food related retailers are located in the historical city centre, close to the Frederik van de Paltshof street. A high diversity of food retailers is based in Rhenen, as there are Indian, Asian, Italian and Dutch restaurants and snack bars, coffee shops, small oriental supermarkets, speciality stores, butchers, fish stores and bakeries. A list of all the food related retailers in Rhenen that participated in this research can be found in the synthesis report.

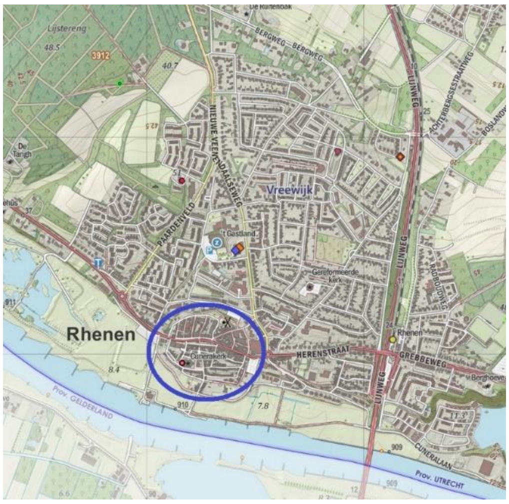

Figure 7. *Map of the city of Rhenen, the circle encompasses the city centre. Adapted map. Source: Jan-Willem van Aalst, 2017.*

1.3 Data collection methods

As there are several different stakeholders involved in the occurrence of food waste in retail business in the city centre of Rhenen, a diversity of data collection methods has been chosen to ensure all-encompassing data to the biggest extent. The data for this report was collected through surveys, interviews, observations and literature research. There have been two different kinds of interviews conducted, namely retailer and expert interviews. Both of them were semi-structured but touched upon different topics. All the retailers were asked the same interview questions, but the expert interviews were tailored to the expertise of the concerning expert. There were also two kinds of surveys, namely surveys for both consumers and retailers. Table 1 shows an overview of the number of conducted surveys and interviews.

Table 8. Quantitative details on data collection methods.

Data Collection Method	Number Conducted
Consumer surveys	100
Retailer surveys	11
Retailer interviews	10
Expert interviews	3

The data has been collected over a period of two weeks (01.06.2021-09.06.2021), and during this period several food retailers and consumers have participated in the research. All food related retailers in the city centre of Rhenen got contacted and asked for their willingness to contribute to the research. Unfortunately, not all retailers were willing or able to participate. The market square in the city centre served as the main spot for the collection of the consumer surveys. The data was collected on various days, both in the morning and afternoons, to ensure a diverse group of respondents. Thursday morning, which is the morning of the local market in Rhenen, was also included. The coming chapters will be dedicated to presenting and interpreting all the findings.

Chapter 2: Food surplus and organic waste stages

This chapter is dedicated to explaining the stages through which food becomes waste in the food retail sector of Rhenen. It reflects the food practices of the retailers and shows where most progress is still to be made. The stages of organic waste are the following: generation, separation, collection and treatment. The four stages will be explained in more detail and linked to findings in Rhenen in this chapter.

2.1 Generation

Waste generation can occur in different phases of the generation stage, namely either during transport, processes at the retail shop, exposure to consumers and finally during consumer usage. The consumer usage phase is not included in this report, as this research focusses on how organic waste is generated by the retail side.

In general, most of the waste is generated at the end of the supply chain. According to an interviewed supply chain expert, *"The majority of food surplus and organic waste generation is in the end of the supply chain, namely in the retailers' processes and the exposure to consumers."* (Supply chain expert, personal communication, June 2021). It was also indicated that because the Netherlands has an efficient transport system, there is low food waste in that phase. This is also in line with the outcome of the retailer survey, as all of the retailers indicated that the transport stage is not contributing to the food waste of their business. Of the nine retailers that filled in this specific question of the survey, one indicated that food waste occurred in the stockroom stage, three indicated that food waste occurred in the kitchen or creation process and seven indicated that the food waste occurred during or after exposure in the store. An overview of the most common strategies among retailers in Rhenen to reduce their food waste is shown in Table 9.

Table 9: Most common strategies among retailers in Rhenen to reduce food waste.

Strategy	Times used	Type of store
Repurpose leftovers in other products	7	Fish monger, vegetable shop, restaurant, specialty shop, bakery
Sell nearly expired products with a discount	4	Butcher, fish monger, vegetable shop
Give nearly expired products away for free to customers/employees	4	Fish monger, restaurant, butcher
Careful stock monitoring	4	Restaurant, snack bar
Freeze the ingredients	3	Restaurant, snack bar, bakery
Give leftovers away for free to the Foodbank	2	Bakery, restaurant
Collaboration with Too Good To Go	2	Fish shop, bakery
Buy half-fabricated ingredients (e.g. pre-cut meat, washed veggies)	2	Restaurant
Feeding organic waste to own animals	1	Specialty shop
Vacuum-packed ingredients	1	Restaurant
Using food waste monitoring programme to adjust portion sizes	1	Restaurant
Encouraging employees to sell products that are close to the expiry dates	1	Restaurant
Offering smaller portion sizes	1	Restaurant

2.2 Separation

The next stage is the separation stage, which is currently a stage in Rhenen where there is still a lot to gain, as only two of the twelve retailers indicated that they separate organic waste. Reasons for this are that some private waste companies do not offer a green bin in their contract, or the volumes of food waste are too small to purchase a separate green bin (Store 3, personal communication, June 2021). Small volumes of waste are mostly applicable for stores, e.g. butcher, bakery, fish store and ice cream store, while restaurants often generate more waste due to leftovers from plates. Some of the retailers also indicated that they do not really have a specific reason for not separating and they expressed that they would be willing to start doing it if another party asked them to. This shows that there are opportunities in Rhenen to increase the food waste separation rates.

Also, three retailers indicated that they separate their food waste for other purposes and local solutions. These purposes differ according to their food waste quality, two stores that still have edible food waste collaborate with Too Good To Go to sell their products for a discount through the app (Store 4, personal communication, June 2021; Bakery 2, personal communication, June 2021). The other retailer stores the non-edible food waste to feed his farm animals (Store 1, personal communication, June 2021).

2.3 Collection

In the Netherlands, private waste companies are responsible for the waste collection of the retailers. For this, the retailers have to set up a contract with a private waste company. Depending on the contract, retailers have different kinds of waste bins (Restaurant 3, personal communication, June 2021). The motivation for retailers to choose a certain waste company is not always clear. Some choose a company because their neighbour retailer also does it, some just search for their own company. Because of this, there are several different companies that pick up the waste of the retailers in the city centre of Rhenen. This is experienced to be problematic, as it leads to inefficiency and more traffic in the city centre (Municipality of Rhenen, personal communication, June 2021; Store 1, personal communication, June 2021).

2.4 Treatment

Currently, most of the companies that collect residual waste have a waste management strategy that entails burning the waste (Milieu Centraal, n.d.). As most of the retailers do not separate their waste, this ends up getting burned. Burning the waste is unfortunate, as this is a low value application and not circular. However, the waste treatment company of Store 4 processes non-edible parts of food waste into biogas, which is a circular option (Personal communication, June 2021). One store also indicated that they separate organic waste, but unfortunately the waste company does not publicly share the waste treatment process of the organic waste (Store 1, personal communication, June 2021). When asking the retailers about how the treatment companies treat their waste, all retailers except one indicated that they did not know the answer to this.

Chapter 2: Regulations and perceptions on food safety

This chapter describes the framework of the policies the retailers deal with regarding food waste and circularity and shows the perceptions the food related retailers in Rhenen have of these. This is relevant to know, as it provides an overview of where the opportunities are within the policy framework, and it indicates what possible future strategies for retailers need to work around.

3.1 Policy structure

The retailers of Rhenen have to work within a strict framework of policies and regulations that springs from both European and national law. The municipality of Rhenen is not responsible for the food retailer policies in Rhenen, as their policies focus more on the consumer side instead of the retailer side (Municipality Rhenen, personal communication, 2021). The municipality of Rhenen has also indicated that because they are a rather small municipality, they have limited financial possibilities and manpower right now to work on projects and policies for retailers. However, they have indicated that working together with the Foodvalley Region provides more options for them, as they can then contribute to a project instead of doing the entire project themselves (Municipality of Rhenen, personal communication, June 2021). Currently, the policies and regulations that the retailers must obey are described in the Dutch 'Warenwet' and the European General Food Law. These policies focus mainly on topics related to food safety, and there are few policies that target food waste or circularity directly. However, food safety related policies often have a clear link to these topics, as they might lead to more food waste or prevent circularity.

3.2 Perceptions and barriers

Most of the policies and regulations that hamper the retailers from reducing food waste or being more circular are related to food safety. The retailers agree that it is good to have rules regarding food safety, but also share the opinion that sometimes products that still seem fit for human consumption have to be disposed of (Bakery 1, personal communication, June 2021). When asked about the necessities to reduce more food waste or become more circular, a bakery and a restaurant gave less strict policies and regulations as an answer. The interviewee of a restaurant explained for example that products have to be consumed within 48 hours after opening and that during the entire process a cooling chain has to be guaranteed (Restaurant 2, personal communication, June 2021). Also, potentially hazardous foods like cooked rice or meats must be treated carefully, as consumption in an improper stage can have dangerous consequences for the human health.

In some cases, the retailers of Rhenen have found local and creative solutions that can surpass parts of these regulations. An example of this is using organic waste to feed the animals owned by the employees of the shop (Store 1, Personal communication, June 2021). If these animals are supposed for human consumption, it is not allowed by the European General Food Safety Law (European Commission, n.d.), but feeding your own animals the generated waste is a creative way to still give a new purpose to it. However, there are also circular options for waste that are allowed in this policy framework. Unfortunately, there are no local options for this yet in Rhenen, but the organic waste can be collected by companies that transform the waste into biogas or compost. However, there are opportunities for change in this, as the retailers of Rhenen have shown interest in giving their organic waste a more circular destination, as long as this will not take up extra time or money.

Even though food safety regulations can lead to extra food waste and thus financial losses, the retailers in Rhenen care more about the health of their customers. If it would be possible, they would like rules that are a bit less strict, but they don't want to endanger their customers. This is also reflected in the reluctance of some retailers to use initiatives like for example a doggy bag. Retailers then do not have control over the quality of the food anymore, as the customers decide for themselves when they consume it. This can lead to unsafe situations in case of improper consumption, which can also cause reputation problems for the retailers if a customer leaves a bad review (Restaurant 1, personal communication, June 2021). Another current problem with doggy bags is the chance of cross-contamination with COVID-19 if a leftover plate returns to the kitchen. Therefore, some retailers are a bit more cautious with using the doggy bags during the global COVID-19 pandemic (Restaurant 2, personal communication, June 2021). These examples show that retailers always need to find a balance between safety of their customers and employees and reducing food waste and improving circularity.

Chapter 4: Knowledge and Awareness

It has been shown that the lack of an employee's knowledge and awareness around the topic of food waste can be an internal factor that leads to more food waste within a business (RMY Özbük & Coşkun, 2020). In the case of Rhenen, many examples came to light that show that there is room for improvement in the levels of knowledge and awareness of the retailers. The coming chapter is dedicated to elaborating on these examples.

4.1 Different perceptions on food waste and circularity

When interviewing retailers about food waste, it has been experienced that nearly every retailer started the conversation with "I don't have food waste". This claim might be accurate for some retailers, but it is unlikely that this is the case for all of them. Many retailers appeared to respond better to questions related to products and processes at the retailer level than to questions concerning food waste. When asking questions about the processes instead, it appeared that there was definitely still some food waste. However, as also explained in Chapter 2, all retailers have their own strategies to prevent this as much as possible.

Where the retailers agreed on the fact that food waste is something that a business should prevent, there was more disagreement on what the end-of-life stage of the food waste is or should be. A description of food waste that was commonly given by the retailers of Rhenen is the expired products and the leftovers that costumers leave on their plates. As they see the negative consequences of this, both from a financial and environmental perspective, they stated that they try to prevent this as much as possible (Bakery 1, personal communication, June 2021; Store 1, personal communication, June 2021). But when the retailers were asked about practices concerning circularity, there were several different perceptions. Most of the retailers had little knowledge on the concept of circularity and were not aware of ways to contribute to this (Bakery 2, personal communication, June 2021; Store 2, personal communication, June 2021). The interviewee from Store 1, however, was familiar with the concept, but was not much in favor of it: *"To me, circularity is just a fancy word that scientists came* *up with in the last few years, while the thing that it reflects was already used by my parents in the 60s."* (Personal communication, June 2021). This shows that the term circularity itself might not be as familiar yet with the retailers as the term food waste, but that they might be working with the concept of circularity without realizing it concerns circularity already.

4.2 Exploring interconnectedness

During interviews with retailers, it came to light that for some retailers there is a big gap between the willingness to participate in circular initiatives and the know-how for this. As indicated in Chapter 2, retailers have several strategies to reduce food waste within their businesses. Over the years retailers have invested further into these strategies, as these are financially beneficial to them. However, they have not invested much in strategies to improve circularity. Retailers know who picks up their waste every week or month, but they do not know how this company processes their waste (Bakery 1, personal communication, June 2021; Store 2, personal communication, June 2021). It is often unclear to them that their waste can be used for a new sustainable purpose, or they have limited ideas on how and where to do this. However, they do state that if they would be approached by an initiative, they would be interested in working with them (Store 2, personal communication, June 2021; Restaurant 2, personal communication, June 2021; Restaurant 1, personal communication, June 2021). An example for this is Restaurant 3. After explaining there were companies that use coffee grounds to grow mushrooms, he shared his interest in working together with a business like this, as his business generates large amounts of coffee grounds (Personal communication, June 2021). During this conversation, he highlighted that communication about reusing options like this is of uttermost importance in getting retailers to join.

Chapter 5: Collaboration

Collaboration amongst different stakeholders in the supply chain leads to supply chain wide reductions in food waste (Bhattacharya & Fayezi, 2021). Firstly, these collaborations can happen in the core, which entails the stakeholders like the growers, distributors, retailers and consumers. Through vertical collaboration amongst these stakeholders, the gap between supply and demand can be closed (Bhattacharya & Fayezi, 2021). Secondly, these collaborations can also happen with supporting stakeholders in the supply chain, like for example governments, NGOs or universities. They can support the core of the supply chain in reducing food waste by designing policies and regulations or through sharing their expertise (Bhattacharya & Fayezi, 2021). Because it has been shown that collaboration within a supply chain reduces food waste, it is important to look at the qualities of these collaborations in Rhenen and find opportunities to improve these. The coming chapter is dedicated to exploring these opportunities.

5.1 Retailers with retailers

At the moment, there is not a lot of collaboration between different retailers in Rhenen, but most of the retailers do indicate that they would be willing to if this would be beneficial for them. According to the interviewee of Restaurant 3, reducing costs together is the main reason for retailers to work together, as this is financially attractive for them (Personal communication, June 2021). A collaboration that has come up a couple of times is the combination of different waste collection services for different food retailers in Rhenen. Right now, there are several different waste collection companies that pick up the waste a couple of times a week or month. Some of the retailers have expressed that they expect it to be cheaper and more efficient to combine this waste collection together (Restaurant 3, personal communication, 2021; Store 1, personal communication, June 2021). Another example for a possible collaboration is Store 3. The owner of the store explained that they generate so little organic waste that she does not want to separate it: *"Because I have so little organic waste, it will only be collected once a week. Then the organic waste will start rotting in my shop and I don't want that, as it can lead to unhygienic situations and unpleasant odours"* (Store 3, personal communication, June 2021). This shows that a potential collaboration amongst food retailers could be beneficial in improving circularity and it shows that there are some opportunities for these collaborations.

5.2 Retailers with consumers

There are currently some collaborations between retailers and consumers in Rhenen, but most of these are initiated from the retailer side and cannot be influenced by consumers that much (Figure 2). An example of this is Bakery 1, which calls large underprivileged families at the end of the day when there is a lot of leftover bread (Personal communication, June 2021). They can come and pick it up for free, and if there are still leftovers after that, the remainder goes to the Foodbank. Several restaurants in Rhenen also offer smaller portions and doggy bags to match the different eating patterns of their customers. Currently, there are no initiatives or collaborations in Rhenen that are started from the consumer side. However, as it is the aim of the municipality to increase awareness of food waste of its inhabitants in the future (Municipality of Rhenen, personal communication, June 2021), there is definitely some potential for this to happen.

5.3 Retailers with the municipality

There is currently no clear collaboration regarding food waste and circularity between the retailers and the municipality of Rhenen (Figure 2), and several factors play a role in this. A first factor is that there is no direct link to the retailers in the policies of the Rhenen municipality (Municipality Rhenen, personal communication, June 2021). In the current policy documents, there are some short paragraphs dedicated to food waste, but the exact projects and goals are not decided yet. In these paragraphs, the focus is also only on the consumer end, as the municipality feels like there is currently more to gain there (Municipality Rhenen, personal communication, June 2021). The second factor is related to this, namely that the current global COVID-19 pandemic forces lots of the retailers to focus mainly on surviving financially. Therefore, topics like circularity are not the priority for them right now. This hinders the formation of new collaborations (Municipality Rhenen, personal communication, June 2021). Some efforts have been made by a municipal employee to initiate collaborations and discussions with retailers, but due to COVID-19 there was only a low attendance for the meetings. Nevertheless, it is within the ambitions of the municipality to start working more closely with the retailers once the circumstances start allowing it again (Municipality Rhenen, personal communication, June 2021).

5.4 Retailers with external organisations

Some collaborations between retailers and external organizations have become apparent during the research. In this report external organizations are defined as organizations who do not fall under the municipal or retailer definition, but other organisations that are involved with the reduction of food waste or the improvement of circularity.

Most of the retailers in Rhenen are quite familiar with a variety of strategies and initiatives that reduce food waste, but less so with strategies and initiatives that focus on circularity. Too Good To Go is the most widespread external initiative in Rhenen, as eight out of nine of the retailers interviewed stated that they were familiar with it. Despite, only two of the nine retailers contributed food to the initiative. The remaining seven interviewed retailers consisting of restaurants, snack bars, cheese mongers that indicated that initiatives like Too Good To Go does not fit for their business. This is primarily because the food waste they have is not suitable for human consumption anymore. This is the case in for example restaurants or snack bars, where most of the food waste is composed of leftovers from the customers (Store 1, personal communication, June 2021; Restaurant 2, personal communication, June 2021). Butcher 1 also does not participate in Too Good To Go, but he indicated that he has given it some thought (Personal communication, June 2020). He decided not to participate because most of the time he only has parts of baguettes as leftovers, and he feels like people would not be interested in having only this in a Too Good To Go box. Currently, existing initiatives or businesses that can repurpose waste like these leftovers or these baguettes are not actively promoting themselves in Rhenen. As only two of the eleven retailers said they separated organic waste, there is still a lot of organic waste in Rhenen that does not get separated. Therefore, businesses and initiatives that repurpose organic waste could really book some progress here if they create more exposure for themselves.

A finding that links to this is that retailers sometimes do not know what the impact of participating in initiatives can be. As they are not made aware of potential benefits for them or for the environment, they might not feel the need to participate in initiatives. An example of this is the waste collection company of Restaurant 1, who offers a discount if the business separates its own waste (Personal communication, June 2021). This is a clear positive financial impact that retailers are often unaware of. The two retailers that use Too Good To Go have also indicated that Too Good To Go has a financial benefit as well on top of the environmental benefits, which some of the retailers are also not aware of. These factors contribute to the lack of collaboration between retailers and external organisations.

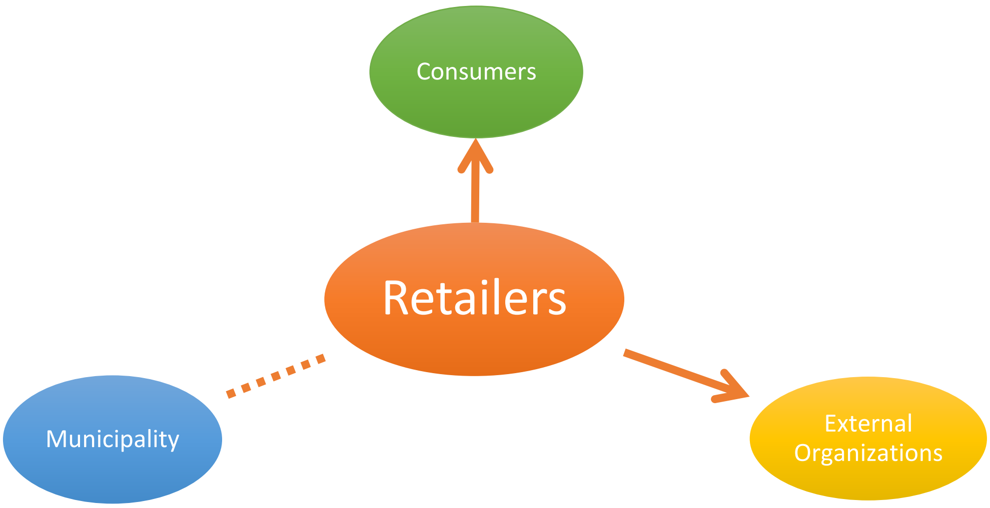

***Figure** 8. The diagram illustrating the collaboration between retailers in Rhenen and different stakeholders in the city. Currently, there is no clear collaboration between retailers and the municipality. The retailers are also the party that needs to initiate new collaborations with the consumers and the external organizations, as the latter parties currently do not put effort into forming new collaborations.*

Chapter 6: Consumer acceptance

To find food waste reducing and circular strategies for retailers, it is important to know the consumers' view on these strategies. Therefore, this chapter focusses on the consumer awareness and acceptance of certain strategies. This provides an insight into the preferences of consumers, which can then be used to find retail strategies fit for the consumers of Rhenen.

The consumers of Rhenen think that it is good to participate in waste reduction initiatives, with some diversity between the different options that were presented to them (Figure 9). They think that buying suboptimal food products is good when they are on a discount (49% agree and 36% strongly agree) and they are in favour of buying products that are made from food leftovers (47% agree and 22% strongly agree). They think the best options are having the possibility to choose between different portion sizes (47% agree and 51% strongly agree) and using tips and recipes to reduce food waste (56% agree and 37% strongly agree). The consumers think that asking for doggy bags is the least positive option of the five that were presented, as only 41% agreed and 22% strongly agreed. This indicates that in general, a large majority of the consumers sees the positive effects of participating in a waste reduction initiative.

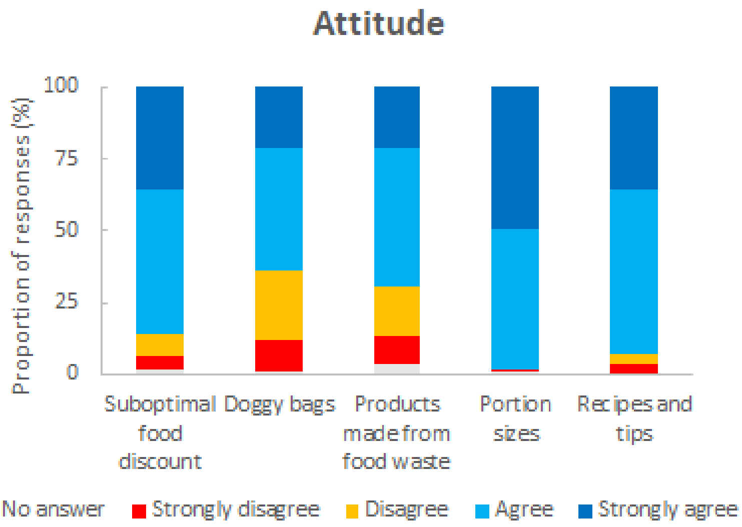

Figure 9. *Consumer attitude towards 5 food waste initiatives including: 1. Suboptimal foods if they are discounted, 2. Asking for doggy bags in restaurants for leftovers, 3. Purchasing products made from food waste, 4. Having suitable portion sizes at restaurants, 5. Using tips and recipes to reduce food waste if offered by retailers. These responses range from strongly disagree to strongly agree, collected from 101 surveys in the field.*

There are several factors that restrain the consumers of Rhenen from participating in food waste reduction initiatives, of which lack of time is the most important one (Figure 10). Of all the respondents, 52% indicated that they do not have enough time to participate in the initiatives, of which 8% indicated that they experience this very strongly. After that, the other three barriers that were presented were experienced approximately even. These barriers were the lack of knowledge on how to reduce food waste (28% agree and 2% strongly agree), a high threshold to participation (26% agree and 3% strongly agree) and the feeling that their own participation will not make a difference if others do not participate (30% agree and 4% strongly agree). Having a clear overview of these barriers provides a direction in which solutions for reducing food waste and improving circularity can be found.

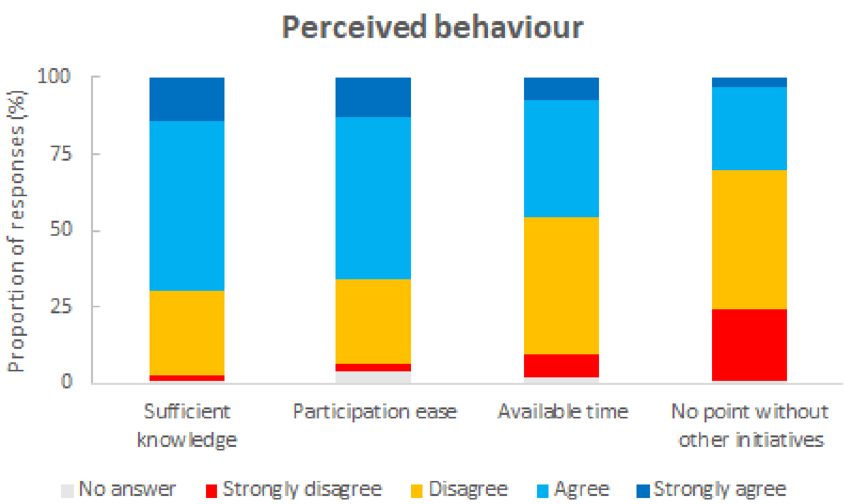

Figure 10. *Consumer perceived behaviour and attitude towards 4 statements including: 1. I have enough knowledge on how to reduce food waste, 2. It is easy to participate in initiatives, 3. I have enough time to participate in initiatives, 4. There is no point in partaking in food waste initiatives if others don't participate. These responses range from strongly disagree to strongly agree, collected from 100 surveys in the field.*

The consumers of Rhenen are willing to change their waste behaviour compared to the behaviour that they currently have. The data analysis shows that 78% normally buys suboptimal food products when they are on discount, 33% uses doggy bags in restaurants, 37% buys products made of leftover food, 59% chooses portion sizes that fit their eating patterns and 51% already uses tips and recipes to reduce food waste. However, for all the initiatives the percentage of people who are planning to use them in the future is higher compared to the current usage. This is 84% of the total respondents for the suboptimal food products, 61% for the doggy bags, 69% for products made of leftovers, 95% for choosing fitting portion sizes and 91% using tips and recipes for food waste reduction (Figure 11). This shows that the consumers really have the intent to change their food waste behaviour in the future.

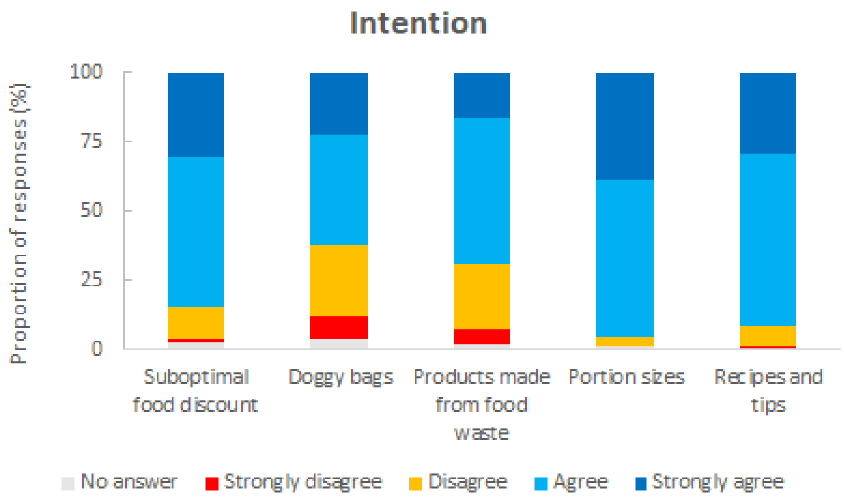

Figure 11. *Consumer intention to participate in 5 food waste initiatives including: 1. Suboptimal foods if they are discounted, 2. Asking for doggy bags in restaurants for leftovers, 3. Purchasing products made from food waste, 4. Having suitable portion sizes at restaurants, 5. Using tips and recipes to reduce food waste if offered by retailers. These responses range from strongly disagree to strongly agree, collected from 100 surveys in the field and 6 online consumer surveys.*

For shopping behaviour of consumers, it has been shown that awareness of and knowledge on food waste can decrease the food waste behaviour when this is combined with the intention to reduce food waste (Aka & Buyukdag, 2021). This finding shows that there are opportunities for change in Rhenen. The consumers are willing to change and as the barriers that retain them from participation are clear now, ways for retailers can be found that fit best with the consumers of Rhenen. In this way, the amount of food waste can be reduced, and circularity can be further improved.

Chapter 7: Conclusion

The aim of this research is to provide a detailed description of the current food waste situation amongst food retailers in Rhenen, in order to provide recommendations on how and where to improve. The coming paragraphs are dedicated to describing the most relevant findings and linking the four themes.

First of all, lack of knowledge and collaboration leads to less separation and less efficient collection of waste in Rhenen. Because some private waste companies offer limited organic waste separation possibilities, separation rates remain low. Also, a lack of communication and collaboration amongst the retailers prevents separation and a more efficient waste collection system. As the retailers do not collaborate, they do not share struggles and miss out on opportunities to overcome these struggles together.

Next to that, the retailers in Rhenen appear to be less familiar with circular initiatives than with food waste reduction initiatives. As retailers feel like they can financially benefit from food reduction initiatives but less so from circular ones, they are often unaware of the possibilities for their business to improve circularity. Therefore, less collaborations are initiated by the retailers. Other than that, the lack of collaborations is also related to the fact that initiatives, both for food waste reduction and improving circularity, do not reach out to the retailers to form collaborations. However, as the retailers have expressed their willingness to participate in both kinds of initiatives, there are opportunities for collaboration in this area.

Adding to this, it has been shown that existing food waste reduction initiatives are not always suitable for the retailers of Rhenen. As the food safety regulations are strict and some of the leftovers are not fit for human consumption, participating in an initiative like Too Good To Go is very hard for a part of the retailers. Also, as most of the retailers indicate they already have well-functioning food waste reduction strategies and they do not generate a lot of food waste, the emphasis should be on finding more circular options for the retailers in Rhenen.

Finally, there are opportunities to form better collaborations between retailers, consumers and the municipality, as they are all willing to improve their practices. The consumers in Rhenen have indicated that they have the intent to change their waste behaviour and have also indicated their barriers for this, of which lack of time is the most important one. Therefore, retailer strategies can be found that match the consumers' preferences. Next to that, even though the municipality and the retailers currently do not collaborate, the ambition is there to improve this collaboration.

Based on these findings and linkages, recommendations for Rhenen have been created that the Foodvalley Region can consider while drawing up new strategies for the region.

Chapter 8: Recommendations

The conclusions of this report have led to several recommendations on reducing food waste and improving circularity within the food retail sector in the city centre of Rhenen.

The first recommendation is the creation of a platform through which awareness and knowledge can be spread and collaborations can be formed. This platform needs to be accessible to all relevant stakeholders, such as the retailers, the municipality, several food waste reduction and circular initiatives, the waste companies and the inhabitants of Rhenen. As there are lots of opportunities for collaboration found between these stakeholders, it is necessary that this collaboration gets facilitated, so stakeholders can benefit from it together. For the municipality of Rhenen it would be beneficial if this platform is on a regional basis, as they have indicated a regional approach is more feasible for them in terms of finances and manpower. Therefore, the Foodvalley Region should take a leading role in setting up this platform, and this should happen in consultation with the other relevant stakeholders. Through the platform, collaborations can be formed, knowledge can be shared, and campaigns can be organized. It is important that experiences and impacts are shared, so the stakeholders can learn from each other and get inspired.

In this platform, it is very important that enough attention is paid to the existence of circular waste treatment options and the benefits of them. As the retailers stated that they hardly have any food waste and it has been found that they often do not use circular waste treatment options, the emphasis should be mostly on improving circularity. Because retailers have indicated that finances are often their main driver, it is of utmost important that the financial benefits of these circular waste treatment options are communicated properly to them.

To increase this circularity to the biggest extent, it is crucial that collaborations are formed between retailers and waste collection companies. As it has been indicated that some retailers do not separate because they generate too little volumes of food waste, it is important to establish collaborations that can overcome this. Retailers can for example combine their waste or make agreements on shared pick-up dates. This will both increase separation rates and reduce traffic in the city centre.

In conclusion, to further reduce food waste and increase circularity, it is of utmost importance that awareness is created, knowledge is being shared and collaborations are being formed. These recommendations provide information on where the opportunities for this are and how these opportunities can be seized. Taking these into account while drawing up the new strategies for the Foodvalley Region will contribute to the suitability of the strategies for Rhenen.

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Annexe K: Wageningen

Geo-report Wageningen

NAME
WENJIAO SONG
MAX PETIT
NOORTJE SCHALKER
CONNOR HOLLIS

GEO-specific Highlights

- (Local) external organisations are a suitable option to reduce food waste and improve circularity for small retailers in Wageningen.

- Promising local solutions for waste separation and collection among retailers exist but have not been used to their full extent yet.

- There is a mismatch between consumer intent and behaviour which can potentially be solved with awareness campaigns.

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Chapter 1: Introduction

This annex concerns the geo-specific report of the municipality of Wageningen, supporting the research for the Foodvalley Region as conducted by the European Workshop student team of Wageningen University. This conduction of research was requested by the Foodvalley Region to inform its' strategic plan 2020-2025 that aims to improve circularity and to reduce food waste. Given the current problem of food waste and marginal circularity within the Foodvalley Region, the objective of this geo-report is to analyse the baseline of the issue and the barriers that are currently present in Wageningen specifically. Following from this, the aim of this report is to provide recommendations to the Foodvalley Region on how to reduce food waste and improve circularity among retailers in Wageningen. Even though this report provides recommendations to the Foodvalley Region, the findings are also useful for the municipality of Wageningen itself.

1.1 Spatial characteristics

The FoodValley Region is an organizational entity covering a large multi-province region consisting of eight municipalities in the Netherlands known for their prime agricultural production potential. The four municipalities specifically studied in this research (as mentioned in the synthesis report to which this geo-report is an annex) are diverse in their populations and economies despite their relative proximity. These municipalities include Barneveld, Ede, Rhenen and Wageningen. The municipality of Wageningen comprises a 32.36 km^2 area with a population just over 38,000 people (Wedia, 2021) as can be seen in Figure 12. 88% of these residents' shops within the municipality of Wageningen (Consumer survey, June 2021). Furthermore, due to its' university and large student population, Wageningen has more of a 'sustainability' image than the other municipalities. Because of this, the retailers in Wageningen are influenced to act according to this sustainability objective. Furthermore, the focus of the Wageningen University towards life sciences and sustainability also influences the sustainable attitude of the city due to active collaboration between the University and the municipality (Municipal officer Wageningen, Personal communication, June 2021).

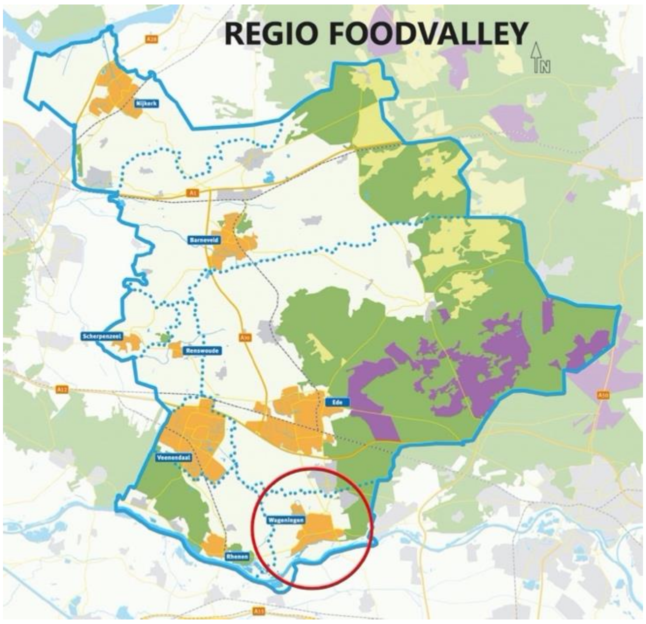

Figure 12: Map of the Foodvalley Region as a whole and Wageningen within the region (Wijmakennederland, 2021)

1.2 Research area

In terms of our research area, we focused our attention on the city centre of Wageningen where most of the municipality's retailers are located and most residents go shopping. Within the city centre, we further positioned ourselves around a central pedestrian street called the Hoogstraat which for about

350 meters served as our springboard to the numerous shops and restaurant lining the street. From there, the side streets off the Hoogstraat were also covered as well as some establishments slightly west and east of the Hoogstraat. Finally, besides the main streets, the area surrounding the main church of Wageningen served as a prime study area, especially during the Wednesday and Saturday market which saw many more informal shops and stalls set up in the square surrounding the building.

1.3 Data collection and methods

The data collection methods can be divided into three different categories, namely surveys, interviews and observations. Two different surveys were conducted: retailer surveys and consumer surveys. The amount of each category that was completed within our study area are as follows:

Table 10: data collection according to category

Consumer Surveys	113
Retailer Surveys	24
Retailer Interviews	22
Expert Interviews	3
Observations	24

This data was collected over the course of two weeks by means of approaching the consumers and retailers that fall within the research area and asking for an interview or conducting a survey, respectively. The experts were contacted via email or phone, after which the interviews were conducted both online and offline. Finally, non-interactive observations were also carried out to further flesh out the data possibly not covered by either the surveys or interviews specifically with the retailers.

1.4 Stakeholder identification

The stakeholders that were sampled came from a variety of backgrounds. These stakeholders can be divided into three main groups: consumers, retailers, and experts. The consumers included in this research range between 18 and 75 years old, of which 46% was between 18-24 years old.
Next, the retailer group comprised of 24 food businesses of various sizes and comprising a menagerie of products from bakeries, fish mongers, vegetable stores, butchers, cafés, and restaurants. However, large supermarkets were not included in this research, as they often are inflexible to adapt food waste practices according to local preferences. Also, retailers from the mobile market stalls were included, as the Wageningen market is quite popular (60% of the approached consumers does a part of his/her shopping there). Finally, the expert group comprised another diverse assembly mostly comprised of the university, non-profit organizations, corporations, and government agencies.
The experts were individuals from the university who had an expertise on specific topics within the research. Also, external experts and other people active within the food waste and circularity area of expertise were interviewed such as initiators of food waste reducing initiatives.
From the gathered data, four themes were identified. Namely, organic waste stages and waste collection practises, regulation perceptions, consumer and retailer awareness and behaviour and collaboration.

Chapter 2: Food surplus and organic waste stages

When analysing the waste stages, we categorised them in; generation, separation, collection and treatment as illustrated in

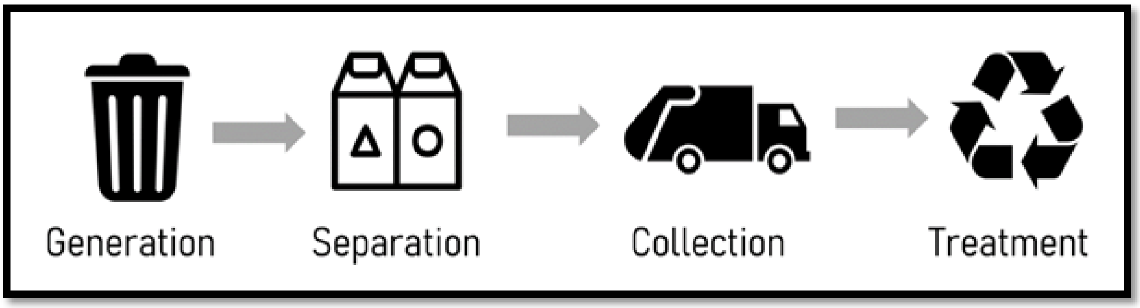

Figure 13. The treatment of waste from a store owner's perspective, the interviews with experts and retailers showed that most of the generation of waste takes place in the end of the food chain in the process stage and the exposure to consumer stage. The transportation towards the store is very efficiently done and generates little to no waste.

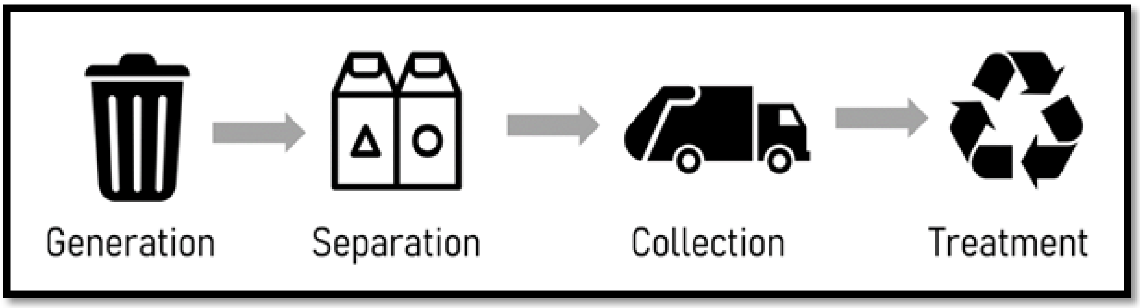

Figure 13: The four stages of organic waste

2.1 Generation

Regarding the (prevention of) waste generation, financial motives form an important consideration for store owners to reduce their waste streams. 19 retailers indicated in the survey that between 0-10% of their revenue is lost due to food waste. Additionally, five retailers said that they lose between 11-20% of their revenue. For all retailers, margins are small, so a reduction of waste and an increase of sold goods has already a relevant financial benefit. For example, both the owners of a fermentation shop and a cafe mentioned that because their margins are small, it would be unfeasible for them to throw leftover foods away (Personal communication, June 2021). To prevent this unwanted generation of waste, they try to estimate as accurately as possible how much food they should prepare for the day. Strikingly, the owner of the fermentation shop said that sometimes, he has trouble estimating the required amounts. As a result, he has had to turn away customers in the past. However, he was not bothered by this and just hopes that the customers will return in the future. As an additional strategy to reduce food waste and its financial consequences, store owners take the leftovers home for personal consumption. Another example is a snack bar buying potatoes and processing them to fries in their store (Personal communication, June 2021). They produce 5 kg of potato peels a day but no potato waste itself since they produce what they need on the spot. The snacks they sell are defrosted a day before depending on the expected demand and are therefore never close to the expiry date.

Based on the outcomes of the retailer survey, Table 11 was drafted. The data that was gathered from the interviews on the strategies to reduce food waste is not included in Table 11, as the present researchers did not employ a sufficient consistency in their questioning about topics that were also already in the survey. Nevertheless, in this next section, the contents of Table 11 will be elaborated on. First of all, the strategy to sell almost-expiring products for a discount is a strategy that is employed by all kinds of retailers. Repurposing foodstuff is mainly done in the hospitality sector, since these types of retailers have the freedom to do so. Small-scale mini markets, on the other hand, don't have the liberty to repurpose packaged products.

Giving produce away for free is a strategy that is used by all types of retailers except fish mongers. The reason behind this is explained by the store owner of a fish store, who said that "*I'm afraid people will get sick because fish goes bad quickly*" (Personal communication, June 2021).

Collaborating with the Foodbank is only suitable for a specific type of retailer; namely the one that sells produce that can be kept for longer without going bad. This includes for example packaged goods and bread.
Furthermore, in this table, only one retailer used the strategy of exchanging products. However, as mentioned previously, this table is based on the outcomes of the retailer survey only. The retailers that exchange goods frequently mentioned this in the interview that was conducted with them. Therefore, the 'real' number of retailers that employ this strategy in Wageningen is higher.

Table 11: Retailer strategies to reduce food waste according to the retailer survey

Strategy	Times used	Type of store
Sell it for a discount	10	Coffee shops, fish monger, cheese shop, bakeries, candy store
Repurpose it in other products	8	Ice cream store, coffee shops, restaurants, butcher, delicacy shop
Give away for free to customers/employees	12	Ice cream store, cheese shop, coffee shop, spice shop, restaurants, bakeries, candy store
Give away for free to the Foodbank	5	Delicacy store, mini market, coffee shop, bakery, sandwich bar
Exchange for other goods/items	1	Snack bar
No strategies employed	1	Restaurant

2.2 Separation

The next step that we have identified within the theme of organic waste stages and collection practices is the separation of waste, which depends on the practise of the retailer, the volume of the waste and the contract with the private waste collection service. Currently, 16 out of 24 retailers that were surveyed separate their waste. Only four out of 24 retailers separate organic waste. One hotel for example, separates its waste and has two containers for residual, glass, paper and plastic since the hotel has quite a large amount of waste (Personal communication, June 2021). Another example, a fishmonger, said that he has a specific waste bin which can be sealed off because it is for fish waste, and it also serves a specific purpose (e.g. food for other fish) (Personal communication, June 2021). That specific waste collection waste collection bin is provided by the waste collector specialised in fish waste. What was also encountered multiple times is the example of a small organic supermarket which holds particularly high sustainability values. It separates its waste carefully and thinks this is important both for the environment and the image of the store (Personal communication, June 2021). Overall, every store has different arguments for their waste separation practises.

Figure 14(left): Hotel De Wereld glass bin.   Figure 15(right): Hotel De Wereld residual, paper and plastic bins.

There are 5 out of all 36 retailers participated in our research in Wageningen that want to separate waste, but do not have space outside their store or restaurant for multiple bins to do so. The chef of a Food bar mentioned that she would like to separate organic waste, but currently she has to share her waste bin area with another restaurant (Personal communication, June 2021). Because both restaurants share only the waste bin area and not the multiple bins itself, there is no room for yet another waste bin. She mentioned that she has tried to contact the municipality in the past to solve this, but that no collaboration was established in the end. Besides, the owner of a café said that they did not separate their waste as they only have one large bin outside and don’t have the space for multiple separation practises (Personal communication, June 2021).

2.3 Collection

Continuing the waste stage's theme, the next step is the collection of waste. In the Netherlands, the municipalities are only responsible for the collection of households waste (Wastenet, 2019). Retailers are expected to arrange something for themselves. This means that each retailer must individually contact a waste collection company and sign a collection contract. As a result, neighbouring stores have contracts with different collection companies. In Wageningen, most of them have a contract with several different waste management companies or have so little waste that they bring it home to then dispose it in the bin for residents. For example, the owner of a cafe, located on the market square, has a contract with one company while the next-door café has hired a different waste collection company to collect its waste (Personal communication, June 2021). An interview with the centrum manager of Wageningen and board member of Waste Collective Wageningen, revealed that there is a lot of discrepancy within the retail waste collection domain and that there is lots of potential to be gained (Personal communication, June 2021). He confirmed that retailers are responsible for the waste collection of their own store. This brings several disadvantages, such as the waste collection trucks picking up waste inefficiently by driving through the shopping streets multiple times.

Figure 16: waste bin of for residual waste from a cafe. does not separate waste

2.4 Treatment

The last step of this first theme is the treatment of waste. It is known that many waste collection companies have basic recycling practises and organic waste is turned into biogas or fertilizer (ACV, 2021) (Ter Horst, 2021). But since we were not able to reach out to an expert from this field, data about how the waste is collected by the various collection companies is not provided here. Thus, we will not go into details about this last stage.

The generation, separation, collection and treatment of (food) waste in Wageningen is characterized by the occurrence of waste generation in the latter stages of the food chain. The main reason for food waste prevention for retailers are financial gains. Further solutions within the collection domain are explained in theme four.

Chapter 3: Food Safety

The next theme that was identified when assessing the collected data, is the perception of the retailers about regulations that are currently applicable to the issue of food waste and circularity. Upon being interviewed, the retailers either mentioned that they couldn't think of any regulations that were hampering them to reach the goal of reducing food waste and improving circularity, or they said something about the law dictating them to throw things out after a certain date because of the mandatory expiry date itself.

The latter policy barrier that retailers experience is due to the General Food Law (GFL). Across all member states of the European Union, the GFL states the requirements to which a business must adhere to ensure that all EU citizens are provided with safe food (European Commission, June 2021). The GFL applies to every segment of the food chain: it embodies the regulation of feed production, food transport, production, storage, and sale. Therefore, the retailers in the municipality of Wageningen are also expected to adhere to the GFL. The owner of a cafè mentioned that she thinks that soup can be kept in the fridge for up to five days, but that because of the GFL, the is obliged to throw it out after only two days (Personal communication, June 2021). However, since she does not like to have waste (also because she has rather small margins), she takes it home to share with her partner or gives it away to friends if she cannot consume it herself. Another finding related to the GFL is that the owner of a fermentation shop in Wageningen mentioned that he finds it hard to adhere to the GFL because fermented food can be stored for a much longer time than the original foods of which it is made (Personal communication, June 2021). Hence, he "works with the law loosely", but does put a label on his products.

Furthermore, there are three retailers who mentioned that in their daily lives (when they do their personal groceries or at-home cooking), they "just use their senses" to check whether a product is still edible (Personal communication, June 2021). However, in their restaurants or cafés, they are not allowed to do this to the same extent as they would at home, since they are afraid that the authorities will find out that they are selling products that are past the official expiration date or guidelines, leading to fining. One fishmonger mentioned that he was in his profession since he was eleven years old and feels like he is not taken seriously to some extent when he must adhere to the food safety rules, since his knowledge and craftmanship is not considered when judging whether fish is still suitable for human consumption. He stated ''If you have strong food safety regulations, you have to accept food waste. It is one way or the other.'' (Personal communication, June 2021). With that he points out an important trade-off between food regulations and food waste. But on the other hand, the retailer doesn't want to take any risk in selling or giving away fish which can potentially make people ill. He has a reputation to keep and is therefore willing to sacrifice the (financial) food loss.

Concluding this second theme, the most common finding is that retailers sometimes struggle with the General Food Law as drawn up by the EU. To circumvent this, the retailers choose to deal with this by making the right number of meals they expect to sell per day or eat the leftover food themselves, in case they have any.

Chapter 4: Knowledge and awareness

This next theme is about the interrelations between awareness and behaviour regarding the reduction of food waste and improvement of circularity. A distinction has been made between the awareness and behaviour of consumers, and that of the retailers.

4.1 Different perceptions about food waste

A highly significant finding that we encountered was the fact that almost all retailers, upon asking them whether they would be willing to answer a survey or participate in an interview on food waste and circularity, mentioned that they "did not have food waste". For two retailers we believed this to be probable due to the sustainable image they have and their sustainable business model (Personal communication, June 2021). However, for others, in the interviews in particular the reality of their situation would come forward and it was revealed that they did have more food or organic waste than they previously thought. This points to the difference in perception regarding food waste. As many businesses and consumers remain isolated in their opinions about food waste, many things that would not be considered as waste by some are thrown away due to the perception disparity. For example, the main type of waste that one fry shop generates, consists of potato peels which they throw away in the organic bin (Personal communication, June 2021). However, potato peels can be recycled for a ''higher'' purpose (see Figure 17) but the retailer is not aware of this. Currently, a start-up is already basing their business model on this (PeelPioneers, 2021). Also, the use of doggy bags varied among retailers. Some did not provide them to not make the customer uncomfortable or felt it did not belong within the image they want to show.

4.2 Exploring interconnectedness

Within Wageningen, we also noticed that spatially close retailers held widely different sustainability values and attitudes towards food waste reduction. This could either indicate that there is lack of communication between the retailers about this topic (and thus a lack of peer influence), or that it is not in the retailers' interest to hold sustainability values. From the retailer interviews, we gathered that the latter could be caused by financial reasons.

Thus, there seem to be two groups of retailers in Wageningen: the ones that are concerned with reducing food waste and improving circularity that have already established an interconnection with each other, and the ones that are not (yet) involved in reducing food waste. In the first case, one retailer has presumably served as a 'starting point' for collaboration, after which multiple connections were made. In the latter case, a starting point is not present. Therefore, in the recommendations part of this report, setting up collaborations is included. The knowledge that results from being in contact with a starting point is required to participate in a collaboration, which we will further elaborate on in chapter five.

4.3 Consumer awareness and behaviour

When it comes to consumer awareness, the municipality of Wageningen seemed to be unique to its neighbours given its young, student dominant population. When being asked in the survey about how much do you know about food waste, around 11% of our respondents stated that they know nothing or not much about it, while 66% and 20% of them mentioned they know somewhat and very much about it respectively. This result was potentially attributed to the average age of the respondents, who tended to be younger on average (88% of the respondents were 18 –24). However, in many cases neither the age nor the knowledge of food did directly translate into decisive action against food waste by the consumers. This led to the outcome in surveys and with consumers quickly claiming that they were only aware of food waste, but not acting upon reducing it.

4.4 Consumer survey outcomes

The most common outcome that was seen among the consumers was how they tended to be aware of the issue of food waste but did not necessarily commit their view to action.

The mismatch applies to a number of behaviours seen while the team was collecting data. For example, the use of doggy bags can be a strategy used by restaurants and other shops to allow extra food to be taken to go instead of wasted. The intent to use doggy bags was strong: 84% of the respondents to the consumer survey answered that they (strongly) agreed to the usefulness of doggy bags. However, when being asked about whether they actually used doggy bags, only 50% of the respondents mentioned that they do so. Consumers indicated that they felt feelings of shame or being afraid when requesting for it. Another example was the mismatch on the knowledge of food waste and being able to name a food waste-reducing initiative, of which less than half the consumers in Wageningen were able to do. Furthermore, 89% of the Wageningen consumers think that it is a good idea to buy products that are made from ingredients made from food 'waste', but only 42% answered that they transform this intent to actual behaviour. Here lies a large potential for a new kind of food products in the market. As one person said "*I think it's a good idea to buy food made from food waste, but I never see it.''* (Personal communication, June 2021). However, the mismatch between intent and behaviour is not present in all cases. Regarding the intention to buy sub-optimal food products, 92% of the respondents indicated that they were willing to buy said products. When asking them about their actual purchasing habits, 87% of the consumers answered that they do in fact purchase these products.

To conclude this chapter, consumer intent and behaviour are not always aligned, which shows a lot of potential. Besides, the consumer willingness to buy products made from food waste shows potential for new initiatives for reducing food waste. Regarding retailer awareness of initiatives caused by a lack of communication, a great potential is present that can be utilized in the future. When the retailers do show awareness of the food waste issue and initiatives to reduce it, this leads to local solutions for retailers which were found in Wageningen. These collaborations between retailers are further discussed in the next theme.

Chapter 5: Collaboration

Within this fourth theme, four types of collaborations can be identified. There are currently collaborations between retailers, between retailers and consumers, between retailers and external organizations, and between retailers and the municipality.

5.1 Retailer – retailer collaboration

In Wageningen, there have already been a considerable number of collaborations happening between retailers. Exchanging each other's leftover food and repurposing it into something new is the most seen collaboration between retailers. For instance, some shops take food that are about to be wasted if not consumed in time from other store and repurpose them into fermented food and other special dishes (Personal communication, June 2021). Adding on to this, a mushroom stall from the open market also works with one retailer: the market stall gives leftover mushrooms to this retailer who repurposes them into fermented products (Personal communication, June 2021). Another example, a organic supermarket, mentioned that their left-over bread goes to either Too Good To Go or a local chicken farm (Personal communication, June 2021). These are examples of repurposing waste along the ladder of Moerman as illustrated in Figure 17. The ladder of Moerman shows how food waste can be reduced and if food waste is generated, how it can be used in such a way that it creates the most value. Furthermore, besides working together to reduce food waste, sharing waste bins between neighbouring stores is also observed in Wageningen, Personal communication, June 2021).

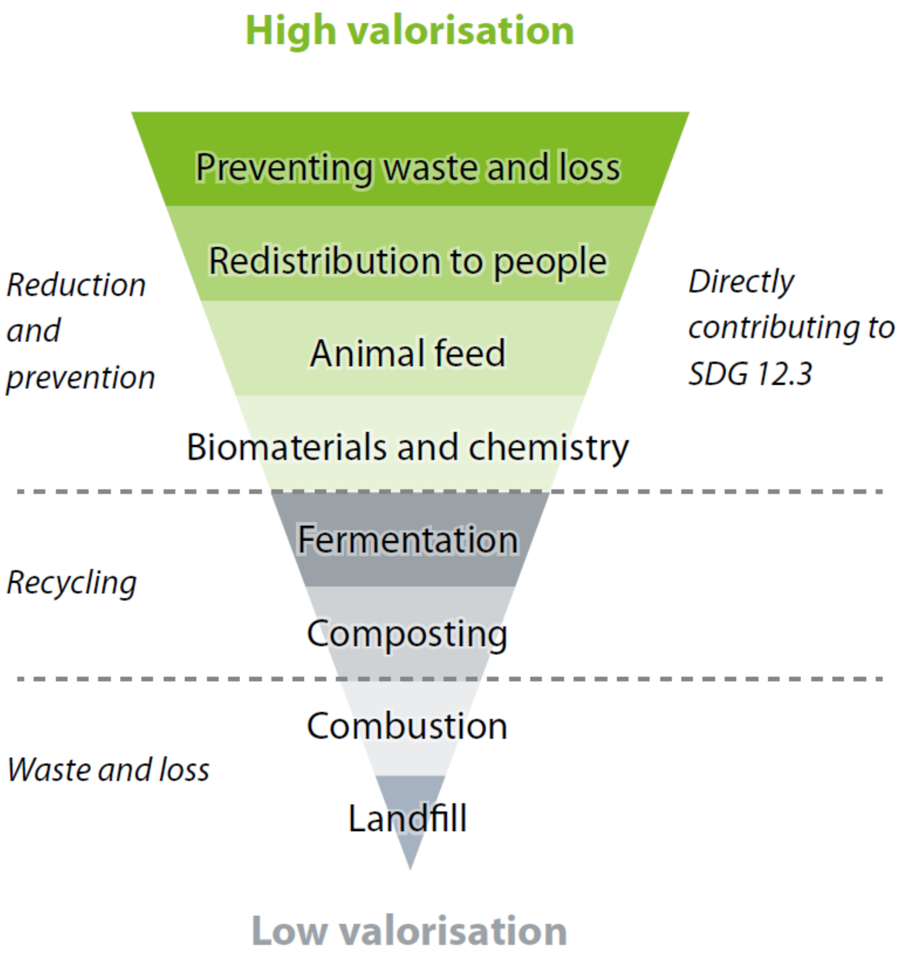

Figure 17: Ladder of Moerman (Rabobank, 2018)

5.2 Retailer – consumer collaboration

Another type of relationship is observed between retailers and consumers. Most restaurants in Wageningen provide doggy bags to consumers upon request, and some also provide different portion sizes. However, the latter is only happening in the more snack bar-type stores. Restaurants are aware of the opportunity but do not use it because they want to have a certain image. These initiatives can potentially reduce food waste by influencing consumers' consumption behaviours. However, there are also some drawbacks. According to two restaurant owners, who feel reluctant to provide consumers with doggy bags, their main concern is that they might have to take responsibility once their customers get sick after consuming food from the doggy bags because the consumers have kept the doggy bag for too long (Personal communication, June 2021). When it comes to providing different portion sizes, resistance mainly comes from the impracticality of preparing several different portions of the same meal (-ingredients). Moreover, one restaurant owner mentioned that making different portion sizes make them like snack bars, while they want to differentiate themselves from those snack bars, which provided us with a possible reason for their reluctancy. Another very interesting finding from Wageningen is that since the consumers here are very aware of food waste and circularity, retailers often feel pressure from the consumer side to take more active measures to reduce food waste and improve circularity.

5.3 Retailer – external organizations collaboration

Retailers in Wageningen also work with several external organizations. This mainly holds true for the chain-store retailers we interviewed. Most of the retailers showed positive attitude towards this external organization and view the collaboration with them as successful. They experience financial gains and they pointed out another very positive effect. The consumers using this initiative are different than the regular consumers, which means that the retailers are not losing business by consumers making use of the app instead of buying products for the regular prices. The app opens a new type of consumer for the retailer. However, there are four retailers who mentioned that they are more reluctant to work with the initiative. When asking the retailers two arguments emerged. The first reason is financial concerns. Retailers do not agree with the commission they have to pay to the organisation. Secondly, the extra effort the retailers have to put into cooperating with those large external organizations, especially when they have already found their own way of dealing with food waste, was not worth it in their view. Building on this, the owner of a sustainable shop told the research team that she prefers to work more with smaller, individual initiatives or small-scale external organizations, as they are more flexible and easier to work with (Personal communication, June 2021).

5.4 Retailer – municipality collaboration

A highly significant relationship is the collaboration between food retailers and the municipality. According to the municipality of Wageningen, some work on reducing food waste has already been done, but mainly with local supermarkets and farmers (Personal communication, June 2021). The municipality did introduce one initiative into Wageningen, which based on the data, is the most known external organisation among either retailer or consumers. The municipality also tried to work on raising people's awareness of the seriousness of the food waste problem. However, not much encouragement from the municipality side is given to retailers regarding reducing food waste in their shops. The chef from a Food bar said she once suggested the municipality to put reward on those retailers who did well on separate food waste, but no action was taken from municipality side (Personal communication, June 2021). In the relationship between retailers and the municipality, the most important, whilst often still lacking thing, is communication. The municipality official said that sometimes people reach out to the municipality for new ideas or initiatives about food waste reduction, but the main action of the municipality as a reaction to this is that the initiative is redirected to another external organization, instead of the municipality facilitating the dissemination of the initiative by means of creating a network or giving subsidies (Personal communication, June 2021). Another thing we observed during our data collection period is that it is still not clear who has the most power to take the leading action in reducing food waste and improving circularity. During an interview (June 2021), the owner of a fry shop said that he wanted to find a better way to reuse potato peelings, but that he has no clue how and who he can work with. At the same time, the answer we got from the municipality side was that instead of talking to the municipality, the shop owner should find help directly from Foodvalley Region or another external organization instead of the municipality. Who has the most power to take a leading action in this case still remains a topic available for further discussion?

Together with fifteen other retailers, the centre manager of Wageningen, initiated a waste collective wherein paper and plastic are picked up several times a week with a large bike by people who have a distance to the labour market (Personal communication, June 2021). The retailers who are participating all have a contract with one waste collector. The collective was initiated in agreement with this company who 'paused' the contracts of the participating retailers. The pilot started in May 2021, but many retailers are still reluctant to participate due to COVID-19 uncertainties. The pilot is inspired by a different waste collection project in a different municipality. Contrasting to the Wageningen version, however, is that this project is subsidized by the local municipality. In Wageningen, the waste collective is a non-profit organization which can have lower costs if more retailers join the collaboration. However, since the costs of waste disposal grew in the last years due to increased taxes on waste disposal, the contracts that retailers already had with waste collection services were cheaper than the newly proposed collaboration. In other words, the retailers' motivation for participating in the waste collective was a financial one. When it became apparent that collaborating would not be cheaper than signing individual contracts, retailers shied away from the collaboration. In the future, he sees potential to also pick up organic waste and to be able to do something better with it than the current treatment which is mainly the transformation to biogas or compost. According to him, “the ingredients for success” for a successful inner city waste collective are support among stakeholders, collaboration with the municipality, manageability, awareness among retailers and finances. In the concluding section of this report, his suggestions will be incorporated into the future recommendations for the Food valley Region. As a last note, he mentioned that retailers are often not concerned with their waste streams and are not aware of its (financial) potential. This could also form the basis for some future recommendations.

Chapter 6: Conclusion

After analysing all the data that was gathered during the two-week field work period, several findings have been highlighted as mentioned in theme one to four. Therefore, the first part of the objective, which is to analyse the current situation in Wageningen regarding food waste and circularity, has been outlined.

First of all, it was found that the main reason for food waste prevention for retailers are financial gains. This financial motive can be connected to the benefits of combining the waste collection practices of the retailers in the city centre. Uniting the waste collection of the retailers, for example through means of a collective (as explained in theme four) can provide financial benefits as well as aesthetic and environmental benefits because less waste collection trucks drive around the city centre.

Secondly, a mismatch between consumer intent and behaviour has been identified. This holds especially true for the use of doggy bags. However, since not all food-waste reducing behaviour is subjective to this mismatch, there is potential to reduce this mismatch when present. Also, there lies large potential in the willingness for consumers to buy food made from food waste.

Thirdly, from the interviews with the retailers, it was gathered that external organizations, both smaller or larger scale as well as local or non-local ones, are a suitable option for the retailers to reduce their food waste. In Wageningen specifically, several local solutions are in place, where retailers take each other's waste and repurpose it. What organization retailers prefer to work with depends on the size of the retailer as well as the financial margins and time space they have left to dedicate to working with these organizations.

Fourthly, several retailers mentioned that they are unsatisfied with current food safety regulations. The General Food Law requires the retailers to throw away food that is still edible (in their view) which attributed to the fact that most of the waste is generated in the process and consumer stage. Thus, a discussion on the trade-off between food safety regulations and food waste is something that needs to be addressed in the future.

Lastly, the communication between the municipality and retailers is relatively poor. This has two sides: communication that is lacking as a whole, and the fact that communication between retailers and the municipality is happening without the municipality adding value to the problem at hand. Therefore, the insufficient communication will form the starting point of our recommendations to the Food valley Region. This ties in with the second half of the objective for this report, which is to provide recommendations to the Foodvalley Region as to how the food waste in Wageningen can be reduced, and the circularity improved.

6.1 Recommendations

From the conclusions a couple of recommendations are derived which could function as a steppingstone for future change and are written for the commissioners, retailers, initiatives, waste collecting companies, consumers and other parties that are involved within the food waste reduction domain.

The first recommendation that this report has for the Foodvalley Region concerns the collaboration between retailers regarding waste collection practices. It is advised to start off the collaboration of neighbouring restaurants to share bins. Also, the bin-sharing on the market square can be expanded. Another recommendation is the stimulation of the current pilot project of a waste collection initiative. Currently the waste collective is focused on plastic and paper, but the initiator wants to target organic waste in the future as well If waste collection is done collectively, the retailers and consumers are able to build up waste volume together, identify local waste, connect waste to other retailers for cascading potentials and raise awareness about this topic among retailers. This initiative can be stimulated via subsidies from the municipality as is done in an already participating municipality

Next, this report recommends a revision of the communication of the municipality as a whole. This also entails the communication between the municipality and the consumers. What we mean with this is that the municipality could launch an awareness campaign aimed at consumers to lower for example the negative considerations that consumers currently have that leads them to not ask for a doggy bag, as well as the considerations that retails have to not give out said doggy bag. In other words, the municipality can play a role in reducing the mismatch between intent and behaviour.

The Foodvalley Region can also initiate a promotional campaign to break the taboo on the use of doggy bags, the use of different portion sizes or the purchase of food products made from food waste among restaurants and consumers. They can do so by means of the snowball effect. This means that a retailer, who serves as a starting point, could spread the information provided by the Foodvalley Region to their friends and then those friends would further spread the information to their friends in the community and elsewhere. This would be very beneficial in increasing awareness on food waste in Wageningen and throughout the Foodvalley Region. The snowball effect can also aid in inter-retailer communication in the sense that the knowledge on how to repurpose food “waste” of one retailer is communicated to another retailer. Through this campaign the retailers and consumers can become better informed and feel more confident about handling their food waste.

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