





UNIVERSITY OF LJUBLJANA

FACULTY OF ECONOMICS

MASTER'S THESIS

**LIMITATIONS OF MORE EFFECTIVE REDISTRIBUTION OF  
FOOD WASTE FOR CHARITY PURPOSES IN SLOVENIA**

Ljubljana, June 2018

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## **INTRODUCTION**

Food waste and loss are important global efficiency issues. In the most recent decade, awareness of the problem is on the rise. Over the last few years the subject has become more widely researched and debated among the media, politicians, business and industry, academic researchers as well as the general public (Chen, Jiang, Yang, Yang, & Man, 2017). The United Nations' Food and Agriculture Organization (hereinafter: FAO) reports that of all the food produced for human consumption globally, a third is wasted and does not serve its intent as a source of nutrition for people (FAO, 2015). This represents the volume of 1.3 billion tons of wasted nutrition source potential (Gustavsson, Cederberg, & Sonesson, 2011). Wasting food has wider consequences. Every kilogram of wasted food also means that energy, water and other resources used in the production cycle were wasted. Predictions and trends estimate further growth of the issue as the annual volume of wasted food in 2020 is estimated to be 126 million tons (Segrè, 2012). The rising public concern on the topic shows the need for additional research and action.

Reducing food waste is an important option in increasing food availability (Garnett, Garrone, Melacini, & Perego, 2014; Gustavsson et al., 2011) as there are almost 800 million people that are food insecure globally (FAO, 2015). On top of that, we see rapidly growing need for the supply of food as the human population is predicted to reach over 9 billion in 2050 (FAO, 2015). The issue of undernourishment is not only linked to developing countries. Estimates show that there are nearly 43.6 million people who experience food insecurity in Europe (Gentilini, 2013). Contrastingly, European citizens produce 179 kilograms of food waste every year per capita (O'Connor, 2013). The total volume of food wasted in Europe could potentially feed 200 million people (FAO, 2015).

Food insecurity can also be found in Slovenia - almost 6 percent of people in Slovenia were materially deprived in 2015. A full 8 percent of households could not afford a meal with meat (or vegetarian equivalent) at least every other day or could not afford quality food as reported by the Statistical Office of the Republic of Slovenia (hereinafter: SURS). At the same time 150,000 tons of food is wasted annually in Slovenia in total, or 27 kilograms of edible food per capita (SURS, 2016a).

Existing research and literature mostly focuses on households as the origin and driver of food waste (Papargyropoulou, Lozano, Steinberger, Wright, & Ujang, 2016). Other stages of the food chain have not yet been studied much, as they bear a lower share of food waste emissions. The study of Garrone et al. (2016) focused in particular on drivers that lower the amount of food waste and increase the amount of food saved for human consumption. The study recognized the problem as being highly under-studied. In the field of food waste, especially from an economic and social perspective as well as from the alternative charity use viewpoint, no research has been yet done in Slovenia. There are many international

studies focusing on different perspectives on the problem of food waste, however, many cannot be used due to the market of researchers' specificity (different culture, legislation, political system or different stakeholders involved, etc.). To achieve progress in the field of food waste and its alternative use, structured research recommending practical action is needed.

Recovery is one of the most highly recommended food waste management practices by the European Parliament (hereinafter: EP) and the European Committee (hereinafter: EUC), yet it is not widely implemented (EP, 2008; EUC, 2014). To improve the current situation it is important to study all the limitations that are present and interfering with the effectiveness of solutions for redistribution of food waste. The Study of Schneider (2013) concludes that less than 3.3 percent of excess bread and pastries were donated to social welfare organizations. The European Federation of Food Banks (hereinafter: FEBA) reports that through their entire international network, less than 1 percent of food waste has been recovered as donations in Europe in 2015 (FEBA, 2015). The study of Bilka, Wrzosek, Kolozyn-Krajewska and Krajewski (2016) found food donations to be one of the best ways to manage excess food. However, the study also found that the solution is not widely practiced, despite its existing potential. Even though Slovenia is one of the most successful European countries in reducing food waste, 27 kilograms per capita of edible food still gets thrown away each year (SURS, 2016a). It can be concluded that some barriers for effective redistribution of discarded food to charity and other re-use models must exist.

The aim of this thesis is to analyze the limitations of using food waste as a source of charity donations adopting a broad scope which examines different stakeholders in the food supply chain as the source of food waste. The focus of the research will be on the limitations met in practice by stakeholders distributing food waste to people in need. It is intended to serve as a basis from which, future improvements in the Slovenian food waste distribution can be proposed. Food waste as a potential source of charitable food donations will be examined through a study of current situation and possible improvements.

The purpose of the study is therefore to discover the challenges of effective edible food waste redistribution from the stakeholders in the food supply chain as a source of food waste, to people in need (reached through charity organizations' efforts) in Slovenia.

Therefore, the Research Question of this thesis is: "Why is more edible food waste not recovered for redistribution as food donations in Slovenia?". With the term "edible food waste" we describe edible food that ends up as waste but could be recovered as donations to people in need. A similar definition is adopted by Bloom (2010), describing food waste as wasted edible items that are directly linked to human action or inaction.

The objective of the proposed research is to conduct a descriptive list of limitations as seen by charity organizations as well other stakeholders (farmers, retailers, restaurants and other companies) dealing with food waste for more effective distribution of discarded food for charity purposes. Those will serve as a foundation for practical implications.

We start the thesis with existing literature overview. At the beginning the focus is on the definitions of important terms for the purpose of clarifying addressed issues. Furthermore, sources and reasons for formation of food waste are studied. The drivers and implications connected with food waste are subsequently taken into detailed consideration. The theoretical part of the study is finished with a description of the current situation in Slovenia regarding food waste volumes, practices, policies and its connection with food insecurity in Slovenia. The empirical part of the study includes qualitative analysis of in-depth interviews made with different stakeholders in the food supply chain to discover the main obstacles they face which prevent or interfere with donating food to charity. Finally, practical implications for changes are drawn from the previously identified limitations.

## **1 FOOD WASTE**

### **1.1 Definitions of food waste, food loss and other terms**

As food waste is a complex issue, precise definitions are needed as a basis for its research. Organizations and authors tend to base their research on different typologies of food waste and, therefore, results differ and cannot be directly compared. Lundqvist, Fraiture and Molden (2008) emphasize the importance of using better terminology in further research and political agenda.

For the purpose of clarity we first define all the basic terms of the topic. We adopt a definition of food and food supply chain as defined by EU framework Food Use for Social Innovation by Optimising Waste Prevention Strategies (hereinafter: FUSIONS).

**Food** stands for “any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be consumed by humans” (FUSIONS, 2014). The definition of food also covers water, drinks, chewing gums and any other substances that are integrated into food during the production cycle.

**Food supply chain** (hereinafter: FSC) is described as “the connected series of activities used to produce, process, distribute and consume food” (FUSIONS, 2014). The FSC begins when raw materials enter the system of food production. It is important to note that all products which are ready for harvest or slaughter are already included in the FSC, not just those harvested or produced and afterwards not used. The FSC ends at the point when food is consumed or in any other form exits the FSC (FUSIONS, 2014).

### 1.1.1 Definition of food waste

There are three main definitions of food waste used by researchers in the field (Papargyropoulou et al., 2014; Parfitt, Barthel, & Macnaughton, 2010).

The first definition originates from the FAO. It defines food waste as »wholesome edible material intended for human consumption, arising at any point in the FSC that is instead discarded, lost, degraded or consumed by pests« (FAO, 1981).

Stuart (2009) expands the FAO definition of food waste. In this definition, food waste also consists of edible matter being intentionally fed to animals. It also includes all by-products of food production that could be - but are not, used for human consumption.

Smil (2004) suggests adopting a wider view of food waste. It includes both previously mentioned definitions, further adding the concept of over-nutrition to the definition. Over-nutrition is defined as the difference between the energy value needed and the energy value of food consumed per capita (Smil, 2004). The concept of food waste in Smil's definition is the widest, as it covers the whole scope of potential nutrition sources being lost globally.

As Stuart's definition provides a wider definition of food waste, it can elucidate more opportunities for improvement measures. Therefore, for the purposes of this Master's thesis, the second definition will be used. The first reason is that it is also adopted by other researchers on similar topics (Partiff et al., 2010; Papargyropoulou et al., 2014) and it also provides comparability to existing research. Smil's definition also holds great potential but it is yet to be researched and defined further if it is to be of empirical use.

### 1.1.2 Distinction between food waste and food loss

In order to achieve objectivity in the food waste problem, most scholars use the division between food loss and food waste, proposed by the FAO (FAO, 2012).

Therefore, **food loss** refers to “the decrease in edible food mass available for human consumption” (FAO, 2012). All the stages of FSC should be included. It does not only recognize the total quantity of food lost, but also the deterioration of quality. It can lead to loss of economic and nutritional potential of food and therefore adds up to the total amount of food loss (FAO, 2012).

**Food waste** involves the aspects of food loss that are connected with human decision. Food waste means discarding food that still has nutritional and economic value (FAO, 2012). In the literature, food waste is most often connected with the behavior of retailers, food services and consumers, but in reality it takes place through all stages of FSC.

Food loss is mainly linked to inefficiencies in the FSC. For example, a lack of sufficient technology, poor infrastructure, inefficient logistics processes, lack of skills, knowledge

and management and poor access to markets all result in food being lost. Additionally, weather factors, natural disasters and negative economic trends have an impact (FAO, 2012).

Food waste is mostly connected to human action or inaction. Its main cause is human behavior. In the global FSC there is a complex problem as, for businesses, throwing food away is often cheaper than re-using it (FAO, 2015) and at the same time consumers in developed countries often feel that they can afford to throw food away.

The FAO introduces a general distinction between food loss and food waste linking them to the stages of the FSC. In their framework food losses are mostly linked to the initial phases of the FSC - agricultural production, harvesting, and manufacturing. Food waste mainly occurs later, during the distribution, marketing and consumption stages (FAO, 2015). Gustavsson et al. (2011) do not directly link definitions to the stages of FSC, but to the drivers behind it. Food loss is caused mainly by logistical and infrastructural limitations, while the food waste is primarily related to human behavioral factors. Integrating both frameworks mentioned above, we can conclude, that while both food loss and food waste can be linked to the specific phases of the FSC, they are interrelated and spread throughout the whole FSC. Food loss can be greatly reduced by investments in infrastructure and education (Papargyropoulou et al., 2014). Reducing food waste is a more complex issue as it originates from human behavior. Sometimes in practice, the distinction is not completely clear: is the cause only the lack of external factors or it is partly behavioral and linked to human inaction? It is clear that food wastage can happen at all stages of the FSC (even at the former stages) when linked to human action and inaction.

For the purpose of the thesis we are focusing mostly on the food waste. This is why a clear distinction of both is needed. The main focus of the thesis is on avoidable food waste as defined by Papargyropoulou et al. (2014) (see the definition below in the chapter 1.1.3).

### **1.1.3 Definitions of other important terms**

The distinction between food loss and food waste is important from a research and policy standpoint, and therefore, is most widely discussed. Below, other important terms connected with food waste are defined for the purpose of clarity throughout the research.

**Food surplus** is “food produced beyond our nutritional needs” (Papargyropoulou et al., 2014). It includes the quantity of food that is produced, retailed or prepared to be served yet is not consumed by people (Garrone, Martin, Alessio Covic, Melacini & Perego, 2014).

To clearly demonstrate the extent to which food waste can be avoided, Papargyropoulou et al. (2014) suggest a further division of food waste into avoidable, unavoidable and possibly avoidable.

**Avoidable food waste** is the food thrown away which is edible some time before its disposal. It could be that the food is no longer wanted, has been left to go past its “best before date” or that a part of it is not edible anymore due to spoilage. As it is difficult to clearly set the definition, it includes food that is perceived as edible by a majority of people (Papargyropoulou et al., 2014).

**Unavoidable food waste** is described as parts of food that are thrown away and are never considered edible under normal circumstances (Papargyropoulou et al., 2014). This can, for instance, include pear cores, skins of citrus fruits and meat bones.

**Possibly avoidable food waste** refers to food that can be consumed in some situations while not in others (Papargyropoulou et al., 2014). Potato skins are a good example. It is difficult to clearly define (and measure) the precise amount of food waste that could potentially be avoided. The distinction mentioned above is a good starting point for further research.

## **1.2 The global magnitude of food waste**

In the last few years an increasing number of studies are examining the magnitude of global food waste (Gustavsson et al., 2011; Parfitt et al., 2010; Smil, 2004). Lundqvist et al. (2008) state that as much as 50 percent of all food that is produced is lost or wasted in the FSC. Stuart (2009) evaluates that Europe and North America discard between 30 and 50 percent of their food production quantities. Just a third of that amount is enough to feed all malnourished people across the globe (Stuart, 2009). The studies of Gustavsson et al. (2011) and FAO (2012) both discovered that the relative share of the food produced for human consumption which is discarded, is around 30 percent globally. That amounts to 1.3 billion tons per year (FAO, 2012; Gustavsson et al., 2011).

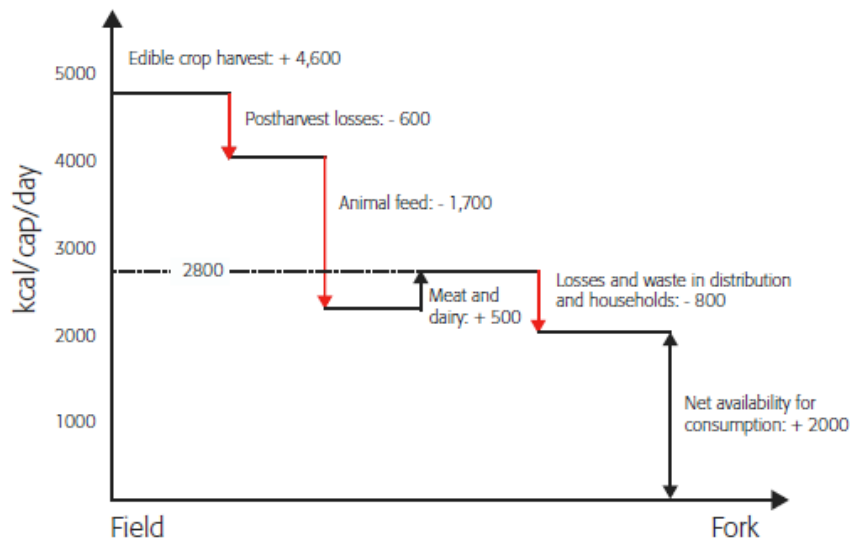
Bloom (2010) also estimates that in the US almost half of all food produced is wasted. Gustavsson et al. (2011) state that developed countries are the main and most severe source of food waste. The estimated quantities are between 280 and 300 kilograms per capita per year for European and North American countries (Gustavsson et al., 2011). According to the study of O’Connor (2013) countries in the EU waste 179 kilograms per capita of food yearly, which does not include waste from the agriculture and harvesting phases of FSC. That means 88 million tons of food is wasted every year in the EU Member States alone. The costs associated with that amount of food are assessed to 143 billion euros (Stenmarck, Jensen, Quedsted, Moates, 2016).

Developed countries are the biggest producers of food waste. Relative per capita, the amount is significantly lower in developing economies. An average annual food waste of Sub-Saharan African countries and Southeast Asian countries is between 120 and 170 kilograms per person (Gustavsson et al., 2011). This represents almost half of the average

amount predicted for the European and North American countries. The global per capita food produced can help to put the severity of the problem in scope. An average of about 900 kilograms per year per capita in Europe and North America which is much higher when compared to the 460 kilograms per year per capita in sub-Saharan Africa, South- and Southeast Asia (Gustavsson et al., 2011).

The study of Smil (2004) reveals that there are food losses through the whole FSC or what he terms “from field to fork”. In Figure 1, food losses are presented in the form of calories. It can be seen that the initial level of calories at the point of harvest is 4.600 kcal per capita per day globally. At the end of the FSC, only 2.000 kcal per capita per day remain and end up consumed by people (Smil, 2004). We can see that caloric loss is substantial.

Figure 1. Global food loss through the FSC in calories per capita



Source: V. Smil, *Improving Efficiency and Reducing Waste in Our Food System*, 2004; J. Lundqvist et al., *Saving Water: From Field to Fork – Curbing Losses and Wastage in the Food Chain*, 2008.

### 1.3 Drivers of food waste through the supply chain

Food is wasted at all stages of the FSC (Smil, 2004; Lundqvist et al., 2008; Parfitt et al., 2010; Gustavsson et al., 2011). Table 1 displays the origins of food waste according to their stage in the FSC, providing examples of the most common food waste drivers. Previous research shows that the main source of food waste emissions in the FSCs of developed countries is the consumer or in the final stage of FSC (Gustavsson et al., 2011). Mourad (2016) stressed the importance of looking beyond the “producers/consumers dichotomy” and examining the whole chain and its stakeholders in integrated perspective. The research on food waste should not only focus on consumer practices. They suggest widening the research and focusing on social institutions and public policies when addressing the issue of food waste (Mourad, 2016).

Table 1. Stages of FSC with the most common origins of food waste

<b>Stages</b>	<b>Contributory Factors</b>
<b>Agricultural Production</b>	<ul style="list-style-type: none"> <li>• Overproduction due to supply contracts with retail companies</li> <li>• Selection of products at the farm gate regarding weight, size, shape and appearance standards set by large distributors</li> <li>• Market-regulated prices that in some cases do not justify the expense of harvesting</li> <li>• Crop damage and destruction during harvest</li> </ul>
<b>Manufacturing</b>	<ul style="list-style-type: none"> <li>• Rejection, or party trimming of irregularly sized products Processing losses</li> <li>• Product damage caused by manufacturing process</li> <li>• Contamination during the production process</li> <li>• Food spoilage due to insufficient packaging</li> <li>• Excess production of the supermarket's own brands (that cannot be sold somewhere else)</li> <li>• Excess stock due to 'take-back' systems between producers and retailers</li> <li>• Cancellation of orders in the short term</li> </ul>
<b>Distribution and Wholesale/Retail</b>	<ul style="list-style-type: none"> <li>• Interruption of the cold chain through the distribution process</li> <li>• Lack of cold storage</li> <li>• Non-compliance with minimum food safety standards, e.g. microbial contaminations and pesticide residues</li> <li>• Insufficient packaging causing product damage</li> <li>• Retailers ordering a wide range of products and brands from the same producer in order to get lower prices</li> <li>• Inaccurate prediction of orders and final demand, a gap between both</li> <li>• Marketing strategies like 'buy one get one free'</li> </ul>
<b>Hospitality Industry</b>	<ul style="list-style-type: none"> <li>• Oversized dishes</li> <li>• Buffets at fixed prices, motivating people to get more than they can eat</li> <li>• Difficulties in assessing the daily demand</li> <li>• EU hygiene rules, e.g. two-hour guarantee on unrefrigerated products</li> </ul>
<b>Households</b>	<ul style="list-style-type: none"> <li>• Lack of planning concerning food purchase</li> <li>• Inadequate (big) pack sizes, often connected with cost-saving</li> <li>• The purchase of new products, which consumer 'does not like' after trial</li> <li>• Impulsive purchasing</li> <li>• Misperception of date labels ('best before', 'use by')</li> <li>• Lack of knowledge regarding food storage</li> <li>• Lack of skills for food preparation – edible food discarded together with inedible</li> <li>• Inefficient meal planning and quantity assessment</li> </ul>

Sources: J. Gustavsson et al., *Global Food Losses and Food Waste*, 2011; C. Priefer et al., *Food waste prevention in Europe – A cause-driven approach to identify the most relevant leverage points for action*, 2016.

Table 2 shows the share of food waste through the stages of FSC in EU-28 in 2012. It is evident that the relative shares of sources of food waste emissions in EU are in line with the trend for developed countries – by far the biggest share of food is discarded at consumers' level. Most of the studies on food waste therefore provide solutions that address consumer behavior. Taking into account a wider perspective, legislative changes and cooperation with the industries are also needed to reduce waste and make food production more sustainable (Parfitt et al., 2010).



Table 2. Stages of the FSC and their shares of total food waste in the EU

Source	Share of total food waste in percentage
Agricultural production	11
Manufacturing	19
Distribution, wholesale and retail	5
Hospitality industry	12
Households	53

Source: A. Stenmarck et al., *Estimates of European food waste levels*, 2016.

In summary, the focus of the thesis is to provide a holistic view of the whole FSC, but while specifically addressing organizations and companies involved in the food supply process rather than individual consumer' behavior. The results of previous studies are used as a theoretical background on causes of food waste at different stages in the FSC with strategies for prevention. Various authors have studied individual links in the FSC and proposed reduction strategies limited to only one FSC level. The levels of FSC with the most common causes of food waste and previously identified strategies for prevention or reduction can be found in Table 3.

Table 3. Theoretical overview on causes of food waste at different stages in the FSC with strategies for prevention

FSC stage	Causes of food waste	Strategies for prevention /reduction	References
Production stages	Overplanting and overproduction	Communication and cooperation among farmers; Re-usage as animal feed; Alternative marketing channels	Gustavsson et al., 2011; Stuart, 2009; Priefer et al., 2016
	Products rejected due to food safety regulation	Raising knowledge among food chain operators	Gustavsson et al., 2011
	Un-harvested crops due to low market prices	Marketing cooperatives; Improved market facilities	Kader, 2005
	Quality and aesthetic food standards of the buyers	Direct sales to consumer; Markets for sub-standard products.	Stuart, 2009; Segrè & Falasconi, 2011; Partiff et al., 2010
	Damaged products due to inefficiencies during production and processing	Investment in infrastructure and transportation	Kantor et al., 1997

table continues

*continued*

<b>FSC stage</b>	<b>Causes of food waste</b>	<b>Strategies for prevention /reduction</b>	<b>References</b>
Retail stages	Damaged packaging	Markets for sub-standard products	Parfitt et al., 2010; Segrè & Falasconi, 2011
	Product damage due to spoliage during transportation	Investment in transportation; Greater knowledge among food chain operators about safe handling of food products	Eriksson et al., 2012; González-Torre & Coque, 2016
	Overstocking due to difficulty in predicting consumer demand	Research on consumer preferences; Innovative packaging for longer shelf life	Stuart, 2009; Segrè & Falasconi, 2011; Parfitt et al., 2010,
	Blemished, wrong-sized, misshapen products	Direct sale to consumers; Greater public awareness through education	Stuart, 2009; Gustavsson et al., 2011; Garrone et al., 2014
	Large supply of temporary/ holiday foods	Markets for sub-standard products; Greater public awareness through education	Segrè & Falasconi, 2011; Gustavsson et al., 2011
	Product returns	More efficient planning through consumer preference research; Better communication between stakeholders	Garrone et al., 2014
Food service stages	Preparation of quantities due to difficulty in predicting the number of customers	Research on consumer preference; Food recovery projects	Stuart, 2009; Segrè and Falasconi, 2011
	Rejection of products due to food safety regulation	Greater knowledge within the food chain operators	Gustavsson et al., 2011
	Non-compliance with commercial standards	Greater public awareness through education; Food recovery projects	Garrone et al., 2014; Segrè and Falasconi, 2011

Sources: J. C. Buzby & J. Hyman, *Total and per capita value of food loss in the United States*, 2012; C. Ciciatiello et al., *The value of food waste: An exploratory study on retailing*, 2016.

According to economic theory of profit maximization, companies should be highly motivated to avoid surplus production and waste (Buzby & Hyman, 2012; Garrone et al., 2014). Even if this is true in the majority of cases, waste is sometimes unavoidable.

During the food manufacturing process the main factors leading to food waste, as identified by Garrone et al. (2014), are exceeded internal sell-by date, failure to follow

commercial standards and internal rules for packaging. Other reasons are poor treatment of products and packaging defects, mistakes and damages were previously identified in a study of Kantor, Lipton, Manchester and Oliveira (1997). Most produce goes through several selection processes. In the case of fruit and vegetables these contribute a large proportion of total waste. For packaged items, individual pieces are carefully selected to reach the uniform weight across all packages (Priefer et al., 2016). The importance of the problem is recognized and has been address as the number of European marketing standards for fruit and vegetables was reduced from 36 to 10 in 2009. In addition to public standards, strict internal rules of powerful distributors and their contract terms lead to food waste (Priefer, Jörissen, & Bräutigam, 2013). Therefore, the trading sector still demands standardized products. The perceived negative implications of of food waste are overcome by the efficiency of logistics, storage, packaging and distribution processes (Cicatiello, Franco, Pancino, & Blasi, 2016).

The main sources of food waste in the retail stage of FSC are (Garrone et al, 2014; Cicatiello et al, 2016): inappropriate product packaging due to internal and official standards, inappropriate product itself, products reaching their sell-by date and product returns. Retailers demand uniform sizes, appearance and quality of produce. Researchers agree that this is one of the significant drivers of food waste at retail level of the FSC, even though no study has yet evaluated the volume of wasted food due to these reasons (Kader, 2004; Buzby, Wells, & Hyman, 2014). The vast assortment of sensitive products, such as as raw meats in the supermarkets is another great source of food waste. Such products have short shelf-life and are sensitive to the handling process. Every occurrence of inappropriate handling, break in the cold chain or potential contamination leads to large batches of produce being thrown away (González-Torre & Coque, 2016). Combining more products into packages can lead to food waste, especially when offering packages of fast diminishing foods. A few studies have found that when one product in the package is spoiled, the whole package gets thrown away as it is too expensive to open, re-package and resell the remaining edible parts (Gruber, Holweg, & Teller, 2016; Priefer et al., 2016). All of these factors have important influence on the volume of food waste at the retail level of the FSC.

The origins and reasons for food waste emissions vary greatly between developed and developing countries (Gustavsson et al., 2011; Lundqvist et al., 2008). Research shows that the overall volume of food waste in developed countries can be compared to developing countries. However, there is a significant difference in the source of food waste. In developing countries more than 40 percent of food waste originates from the early stages of the FSC, food production, harvesting and storing. In developed countries, more than 40 percent of the food waste emissions can be linked to the latter stages of the FSC – retail and consumer stages (Gustavsson et al., 2011).

Several leading causes behind food waste in developing countries were identified by Thi, Kumar and Lin (2015). They found that insufficient transport and storage infrastructure, combined with severe climatic factors (high peaks in temperature and humidity) contributed greatly to food waste. The study of Lundqvist et al. (2008) also discovered that the volume of food waste at the initial stages of FSC is the largest in hot and humid regions of developing countries. These conditions encourage fast decline in quality, safety and nutritional value of food.

Despite post-harvesting and transport operations being more efficient in developed countries, there are still differences between types of crops and produce (Lundqvist et al., 2008). The majority of the food waste volume in industrialized countries originates at the final stages of FSC - wholesale, retail, consumers. The problem is most severe at the consumer level as consumers and households are a source of over 40% of the total food waste in developed countries (Lundqvist et al., 2008, Lipinski et al, 2013).

The volume of the consumer generated food waste emissions varies greatly between more and less developed countries. In Europe and North-America the average per capita quantity is between 95 and 115 kilograms each year, while in sub-Saharan Africa and Southeast Asia, it is only between 6 and 11 kilograms (Gustavsson et al., 2011).

#### **1.4 Food waste management frameworks and practices**

Different frameworks, policies and practices have an impact on regulating food waste. These frameworks mostly address waste management, production and consumption practices. Two frameworks with the biggest international impact on food waste are the Waste hierarchy and the Sustainable Consumption and Production frameworks.

**Waste hierarchy** is the most prevalent concept prescribing sustainable waste management. Waste hierarchy was first addressed in the European policy in the 1970s. Actions started with the Directive on Waste in 1975 and the EU's Second Environment Action Program in 1977 (EP, 2008). After that the Waste hierarchy became one of the most widely used frameworks in the world in terms of waste management. Although the framework advises to take social and economic factors into account, in most countries it is implemented mostly with regard to the environmental perspective (Papargyropoulou et al., 2014). Lack of consideration on social and economic factors is especially harmful in the case of food waste.

One of the most integrated frameworks dealing with the waste issue is the **Sustainable Consumption and Production** (hereinafter: SCP) program. The United Nations Environmental Program (hereinafter: UNEP) described the goal of the SCP in 1994 as limiting the use of natural resources, toxic materials and the amount of waste in the processes of delivering and consuming goods and services (UNEP, 2015). The framework

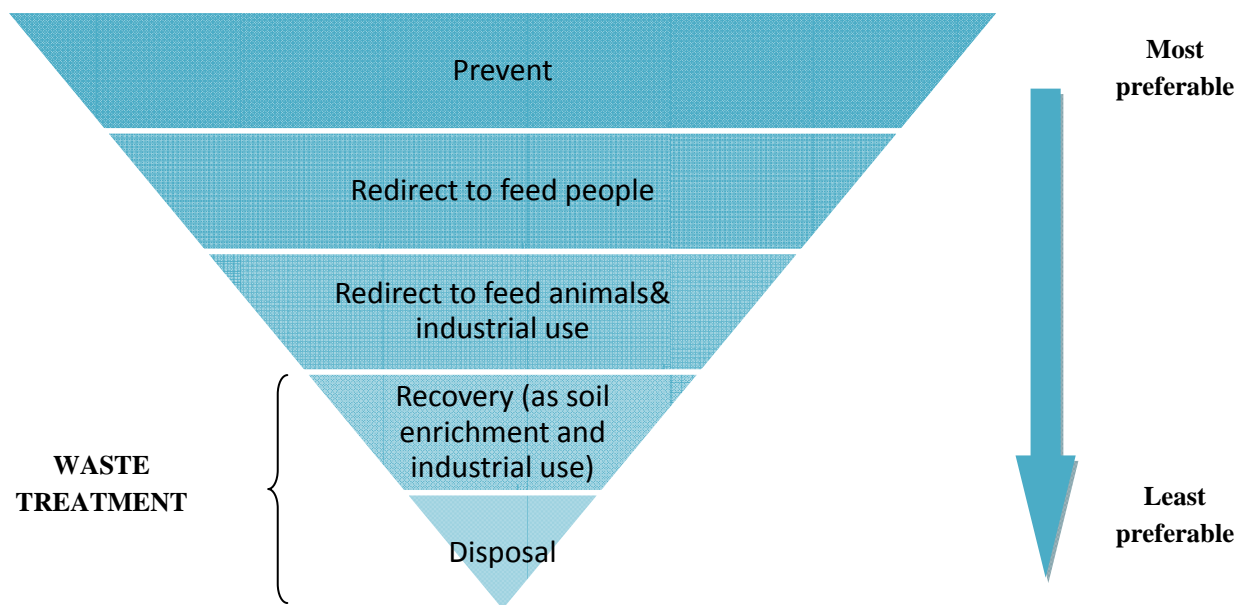
takes into account the wide scope of production and consumption practices. In its core definition, the reduction of waste is mentioned, and it also addresses food waste specifically. The aim of the framework is the preservation of the environment and the easing of the burden of human production. The SCP addresses both producers and consumers as important sources of food waste emissions. Before the framework, consumers were thought as the main pain point when tackling the food waste issue, while the SCP emphasizes all of the stakeholders in the FSC bear a share of the responsibility (UNEP, 2015). According to the SCP framework waste is not an isolated problem, but is connected with sustainable resource management through the whole product/service life-cycle. Tukker et al. (2009) found FSC management, sustainable acquisition practices, eco-labeling and waste volume reduction as some of the most effective SCP focused practices.

The waste hierarchy framework has been partly adapted when it comes to food waste management, leading to the **Food recovery hierarchy** or, as some call it, the “Food wastage hierarchy” or “Food use hierarchy” (EUC, 2014). Mourad (2016) studied organizational efforts to minimize food waste and found that most of the organizations follow the Food recovery hierarchy framework. The hierarchy ranks among the most appropriate responses that limit the volume of food waste. These are: reducing food waste, redistributing surplus food to people in need, redirecting it for use as animal feed, recovering energy through energy production plants, and finally, disposal in a landfill (in order of most to least preferable), as can be seen from Figure 2.

There are some other less known waste management frameworks, predominately used across Asia, that follow very similar principles. Liu et al. (2016) describe the most prevalent Asian framework named “3Rs”. In its basic principles it is very similar to the Food recovery hierarchy. The majority of frameworks list the most acceptable and desired actions to be: first reducing, then re-using and finally recycling waste emissions (Papargyropoulou et al., 2014).

The most preferable option from an economic, social and environmental perspective is for surplus food to be “reused” for human consumption (Buzby & Hyman, 2012; Garrone et al., 2014; Gentilini, 2013; Kantor et al., 1997; Parfitt et al., 2010; Schneider, 2013;). Reusing food surplus is described through actions as food donations to charities and people in need. The surplus food can be served to people as grocery products or as prepared meals. Even though this is a widely discussed theoretical option, research shows that its implementation is limited. Financial and logistical challenges are among the most important to overcome for successful practical implementation (Garrone et al., 2014; Kantor et al., 1997). As an addition, food safety regulations and other rules about food handling are also important sources of challenges (Garrone et al., 2014).

*Figure 2. Food recovery hierarchy*



Source: FEBA & EuroCommerce, *Food Donation Guidelines: Every meal matters*, 2015.

The framework of the Food recovery hierarchy is not fully applied to the re-direction of food waste for animal feeding purposes in the EU. That practice became illegal in 2002 (Salemdeeb, Zu Ermgassen, Kim, Balmford, & Al-Tabbaa, 2017). The use of limited kinds of food waste as animal feed is still permitted provided it can be clearly proven that there is absolutely no contamination risk. As that is difficult to prove, and the costs and risks involved outweigh the benefits, this option is rarely used in practice. The difficulty of implementation results in only around 3 million tons being recycled as animal feed in the EU annually (Salemdeeb et al., 2017) – around 3 percent of total food waste (Monier et al., 2010). Outside the EU, this re-direction method is more widely used due to different legislation and lower limitations. In some Asian countries food waste is an important feed source for modern pig production. A larger share of food waste gets redirected to animal feed in some countries – for instance, 35.9 percent in Japan and 42.5 percent in South Korea (Salemdeeb et al., 2017; Ma, Yin, & Liu, 2016). Further research and risk estimates are needed for potential legislative changes that could enable such food waste re-direction practices in the EU. There are great differences in implications between countries, and therefore, the potential for improvements exist.

When all of the approaches mentioned above are no longer suitable, food can no longer be reused and is not fit for human or other consumption. The method of recycling is the next option of choice. Recycling can be described as withdrawal of food from the waste stream and using it for other purposes. One option is transforming it into animal feed or compost (Papargyropoulou et al., 2014). Also some pharmaceutical and nutraceutical companies use food waste as input and transform it into valuable materials for further production of goods

and medicine products (Garrone et al, 2016). The last and least preferred method is to use the food waste in “*waste-to-energy plants*” to produce energy. In that way at least some of the energy used for food production gets renewed and the negative environmental impact of food production gets reduced (Papargyropoulou et al., 2014).

All the processes mentioned above use food waste as input and produce valuable outcomes. The last option in the Food recovery hierarchy is disposal, whereby food waste is sent to landfill, incineration plants or disposal sites. This is a highly un-sustainable option from an environmental, social and economical perspective (Garrone et al, 2016). In addition, alarming recent data shows that an average of 40 percent of bio-waste (food waste included) ends at landfills in the EU (Papargyropoulou et al., 2014). Decomposition of food items in landfills and the resulting gas emissions further burden the environment.

Some authors differentiate between “weak” and “strong” activities when it comes to food waste management. Weak activities target solely the improvement of food waste management, not taking into the account a wider picture of long term risks. The researchers, therefore, propose the use of strong actions which suggest appropriate patterns of production and consumption towards sustainability in the long term (Tukker et al., 2009; Mourad, 2016). In their opinion, the focus should be on strong actions such as prevention, instead of on recovery and recycling. In that way the underlying causes for food waste are addressed and not only its symptoms and consequences.

Another important concept describing the relative potential of transformation of excess food to food waste and its prevention is the **degree of recoverability** (hereinafter: DoR) (Garrone et al., 2016). The possibility of recovering individual food products at different levels of the FSC varies greatly. Unsold food at the grocery store with dented packaging has higher DoR than un-harvested grain in the field that should undergo physical transformation to be fit for human consumption. The DoR describes the relative effort needed for individual products to be recovered and used for human consumption. It takes into account internal and external factors - physical potential for recoverability and the required management activities of such transition (Garrone et al., 2016). Food waste with higher DoR should be a priority for further actions and recovery. The concept can be helpful when strategically designing an action plan for food waste reduction. A long term goal is that all items with high DoR will be reused and donated to people in need. Loss is the greatest in the case of letting these products go to waste when opportunity costs are taken into account.

## **2 DRIVERS FOR THE FORMATION OF FOOD WASTE**

Food supply chains are becoming more complex every year. The global population is transforming, getting from agriculture societies to living in big cities. There are new

challenges in the distribution process as FSCs are becoming more complex. Several reasons for are the: increasing geographical distances between the location of production and the location of consumption, rising expectations of consumers when it comes to the variety of choice, rising demand for animal products, fruits, vegetables and other perishable products, the rising importance of public health, environmental sustainability, ethical prejudice, stricter rules for food handling, labeling of food, etc. (Lundqvist et al., 2008). Below some of the drivers with most striking implications for food waste are discussed in more detail.

## **2.1 Global trends**

### **2.1.1 Urbanization**

Urban population is rapidly growing. A half of the global population already lives in the cities. This share is expected to grow even further by the United Nations (hereinafter: UN) to two thirds of the global population by 2050 (UN, 2014). At the same time there is a steep decline in the number of people working in the agriculture sector (UN, 2014). In order to feed the high share of the population living in cities, FSCs have expanded in length and have become more complex. On top of that, the transportation infrastructure had to evolve in order to support these transitions (Parfitt et al., 2010). At the same time, the consumer expectations of convenience and variety of choice are growing which adds further complexity to FSC (Lundqvist et al., 2008). In order to keep food affordable for everyone in urban areas the higher costs of logistics and marketing were not transmitted to the end customers, keeping prices low. All of the mentioned factors have higher food waste emissions as implications at all levels of FSC.

### **2.1.2 Socio-economic growth and dietary transition**

Changes in socio-economic and employment structures have consequences in diversified consumption habits and expectations. Growth of household incomes, particularly in Brazil, Russia, India, China and South Africa (so called BRICS countries) led to the transition in dietary habits. The demand for starchy food products declined, and at the same time consumption of fresh fruits and vegetables, meat, fish and dairy is growing rapidly. It is not just that the production of these items is more resource intensive, they are also more perishable and have shorter expiration dates (Lundqvist et al. 2008). The transition of diets and of consumption patterns of developing countries towards the consumption habits of developed countries could have serious implications. These would be harmful not only from a national health perspective (obesity and related diseases) but even more from the global environmental perspective (Paillard, Dorin, Le Cotty, Ronzon, & Treyer, 2011). This shift towards consumption of perishable products in combination with underdeveloped infrastructure might lead to a high increase in global food waste (Segrè, Falasconi, Politano, & Vittuari, 2014). The transition of consumer habits differs between



different developing countries (mostly in regard to national culture). That is why in India the demand for meat did not grow significantly in the last decade, while the same cannot be said for China with the record growth in demand for meat products (Partiff et al., 2010).

### **2.1.3 Increased globalization of trade**

In the last decades, there has been a steep growth in international trade and food products are no exception to the rule. International trade is growing more than 3 times faster than the global economic output (FAO, 2003). With rising markets integration and modern transportation processes due to increased trade, the conditions for agricultural produce exports are also improving greatly. The World Trade Organization (hereinafter: WTO) estimates the agricultural produce to be one of the biggest categories in the global trade of merchandise and primary products, accounting for the 9.5 percent of trade in 2014 (WTO, 2015). These developments meet the demands of more knowledgeable, demanding and picky consumers.

Conditions for global food trade have improved in last decades through the cutback on protectionist measures (tariffs and export subsidies), the improvement of transport infrastructure and other factors. As a consequence global food trade grew significantly - from 1500 Gkcal/day in 1961 to over 7000 Gkcal/day in 2003 (Paillard et al., 2011). The growth in global food trade is still strong, reaching 7 percent between 2010 and 2014. In 2014 total value of world trade in food accounted for 1,486 billion USD (WTO, 2015). Some of the products most suitable for international trade are processed foods. Around 10 percent of all of the processed food products sold were sold internationally in the last decade (Parfitt et al., 2010). Nowadays consumers can choose from a wide variety of products from countries all over the world. That offers them demanded variety and also price-availability of food products.

Globalization provided conditions for growth of agricultural trade but at the same time destabilized internal and local food markets. Liberalization of new open markets makes local producers vulnerable to low-priced imports. Sometimes the local producers cannot offer the quality or the price that would be competitive to imported products. In many developing countries big multinational chains have become the main actors in transition to offering food products in grocery stores and supermarkets (Parfitt et al., 2010). These are potentially a big threat to local producers, suppliers and retailers. There are two potential direct food waste implications – firstly unsold local produce from local retailers, that becomes food waste. The second consequence is lowering of food prices because of the more affordable food imports. That lowers the value of food in the eyes of businesses and consumers and can therefore be a driver for more food waste.

As the global economic growth is expected to slow down, this will also reflect on international trade. The Organisation for Economic Co-operation and

Development (hereinafter: OECD) and the FAO estimate that the agricultural trade will grow with half a speed than in the previous period (OECD & FAO, 2016). Limitations in available national natural resources put even bigger emphasis on food trade. International food trade is the only option to provide food security for some of the countries. Trade in food and agricultural goods is especially important for three regions facing structural shortages. Middle East and North Africa, so called MENA region, and Asia face a shortage of natural resources. In the Sub-Saharan Africa as the third problematic spot, the problem lies elsewhere. Their food production is growing at a slower rate than the population growth which will result in further instability if not managed properly (Paillard et al., 2011). The predictions show that developing countries will become big net importers of agricultural products. According to the estimates, that can result in their trade deficit of almost 35 billion USD by 2030 (FAO, 2003). It can become a cause of further local instabilities in the areas and harm the local producers and industries.

Increasing demand of consumers for wide choice of the variety of products from all over the world is a driver for global food trade. At the same time it is also a driver for the emergence of food waste. The implications of global trade and global FSCs on food waste have not yet been studied in depth (Gustavsson et al., 2011). Some authors suggest that better connections between the stakeholders in the FSC could be the driving force behind the reduction of food losses (Segrè et al., 2014). In most of the developed countries we can also find some other potential drivers for food waste, for instance, growing number of single person households and ageing population (Parfitt et al., 2010).

## **2.2 Economic drivers**

### **2.2.1 Information asymmetry**

Unpredictable circumstances do not enable the producers to plan the quantity of crops precisely. Another changing factor is time as a farmer cannot have a fixed schedule for planting, transplanting and harvesting, depending on external weather conditions. Market prices for the crops can change at any time. However, the farmers' cost structure and quantities produced are pretty rigid. That results in the potential gap when the market price does not even cover the harvesting costs for the farmer. In order to minimize economic losses sometimes the producer unwillingly has to leave a part of the crops un-harvested (Segrè et al., 2014). Also because of diminishing returns, after most of the produce in a field have been harvested, it raises the marginal costs for every additional unit to be harvested. Therefore, even in the economic theory it makes sense to let the part of the produce in the field (Buzby & Hyman, 2012). On the other hand that is not preferable from the global food waste perspective.

Planting more crops than needed to avoid the potential risk of inadequate quantities leads to food surplus. Farmers are usually the most fragmented and not effectively organized

stakeholders. Therefore, much bigger buyers of their produce (distributors, retailers, producers) have better negotiating position. In the contracts they decide on the quantity in advance and the farmer must be able to supply it to get paid the agreed price (Gustavsson et al., 2011). In favorable years with no bad weather and no diseases that risk avoiding practice leads to big surplus and the increase in food waste emissions.

Empirical studies have confirmed crops being left in the fields are a substantial source of waste – 4.27 percent of fruits and vegetables are left on the field at the agricultural level in Italy (Segrè et al., 2012) and 7 percent of planted fields remain un-harvested in the United States (Kantor et al., 1997).

### **2.2.2 Unequal positions of stakeholders in the value chain**

Value chain should bring benefits to all of the stakeholders and elevate the value of all of their activities. However, under specific circumstances, it can potentially result in just the opposite and negatively affects some of the stakeholders.

In the theory, the relationships between the stakeholders in the FSC should be win-win and synergetic. However, in reality this condition is often not met as the interactions are not always transparent and the stakeholders can be in competitive relations (Segrè et al., 2014).

Another condition that should be met for the FSC to be the most effective and provide win-win results for all of the stakeholders is the balance of power. Farmers are in many cases the smallest and most fragmented actors. In addition, they are not effectively organized in comparison with other stakeholders up the chain. Most often they negotiate and cooperate with more powerful and better organized stakeholders. These as a consequence have the power to force the terms of contracts upon them. A result of that are for instance specific standards by which they can reject fruits and vegetables (Gustavsson et al., 2012), even when they are perfectly safe for consumption. These inequalities are also a reason for asymmetric price transmission.

### **2.2.3 Asymmetric price transmission**

Small stakeholders at the bottom of supply chain are not in the position of being able to set the price of goods they produce (Segrè et al., 2014). They are in the position of price takers. The nature of the FSC and unequal relationships between stakeholders transfer the prices from the second part of FSC to the stakeholders at the beginning of the chain.

In the supply chain stakeholders' costs and prices are interrelated and they should theoretically be in equilibrium. Every external change causes inequalities and results in new adjustments and a new profit division between the stakeholders. When that occurs, all players are trying to maximize their share of profits. When the position and the power of shareholders are equal they will all keep their share of profits. As we already mentioned,

there is a strong imbalance in power between the stakeholders in the FSC. That enables only some of the players to get the advantage of these price transmissions (Segrè et al., 2014). All the others are forced into the position of price-takers, which results in the imbalance or unfair share of the new profits.

#### **2.2.4 Underdeveloped infrastructure**

Underdeveloped infrastructure is one of the important drivers of food loss mostly in developing countries. Lack of sufficient infrastructure (roads, railways, ports, vehicles etc.) for effective distribution, transportation and storage, causes food losses, even more when the food is perishable (Segrè et al., 2014).

Some of the main factors resulting in the food loss in developing countries are outdated harvest and postharvest techniques, lack of sufficient equipment and lack of storage facilities (Segrè et al., 2014). Scholars emphasize that improvements in developing countries have to be done simultaneously (Paillard et al., 2011). Any advance in harvesting techniques without the infrastructural development could lead to a steep increase in supply. Consequently there would be low prices on the market (smaller value of food leading to more waste) and problems with appropriate storage of all the surplus quantities of food. That could possibly result in a substantial amount of food waste (Paillard et al., 2011). These implications occur every time the local supply is way greater than the local demand, either to low local purchasing power, high surplus in the quantity of agricultural produce or underdeveloped infrastructure. The development of local and national infrastructure proved to have positive impact on the growth of a local food-processing sector. It opened new business opportunities in the local areas and gave farmers the chance to diversify their marketing channels and therefore lower the risks of production they are facing (Parfitt et al., 2010).

### **2.3 Other drivers**

#### **2.3.1 Environment and climate**

Environmental factors have big implications on the volume of seasonal food production and therefore also on food waste. They are mostly concerning the agricultural stage of FSC (in developing countries also post-harvesting stage and storing of food as infrastructure is often inadequate to cope with the extreme weather conditions).

Level of severity of weather conditions varies with geographical position of a country. That dictates the power of government and producers to react in cases of extreme events. In the areas with severe natural disasters, the responses are mostly weak and cannot reverse the outcome of damage (Segrè et al., 2014). That leaves the farmers with even greater risk and further threatens their position and power in the FSC.

Also climate change might play a role as a driver of food waste. Due to the climate changes the farmers need to adjust to new crops. There is a potential for the lack of knowledge in agronomic and management techniques needed by farmers for the new crops. That can possibly result in higher volume of food waste. It is not yet clear how exactly the climate change affects the food production and food waste emissions (Segrè et al., 2014) but it is becoming more often debated as a potential driver and therefore further research on the topic is needed.

### **2.3.2 Legislation**

Legislation has a big influence on the volume of food waste. There is a longstanding conflict of interest between the two issues – taking care of consumers’ health on one hand and the goal of reducing the quantity of food waste emissions on the other (Priefer et al., 2013).

The standards for food production are implied from the governments as well as from the powerful stakeholders. The produce that does not fit the aesthetic and visual criteria usually remains un-harvested or is thrown away during the selection process (Segrè et al., 2014). Standards proposed by the EU for fresh fruits and vegetables got more flexible in the recent decade, while the internal standards of big distributors still play an important role in food production and the emergence of food waste (Stuart, 2009).

Labeling is another case of government implied rules that can be a potential cause for food waste. The European Commission (hereinafter: EC) described that the misunderstanding over date labels between consumers is very common (EC, 2010). Consumers have troubles differentiating between the concepts behind date labels as “sell by”, “use by” and “best before”. The consequence is a significant amount of waste of food that is still perfectly safe to be consumed (EC, 2010; Parfitt et al, 2010; Visschers, Wickli, & Siegrist, 2016).

The topic of food waste is connected with many regulatory frameworks and different legislation bodies. It touches the areas of food safety, waste management and financial and tax codes in the EU (Vittuari, Politano, Gaiani, Canali, & Elander, 2015). In the study of Waarts et al. (2011), they identified legal limits set by European Law to have an important influence on the volume of food waste. EU’s project against food waste FUSIONS made an overview of EU legislation with potential implications on food waste – 20 legislative acts are directly linked to food waste with many others implicating it (Vittuari et al., 2015). Tight food safety legislation is one of the most commonly highlighted causes of food waste by food operators (Tokareva & Eglite, 2015) and it also obstructs and sometimes prevents the charitable efforts of redirecting excess food to people in need (Lucifero, 2016).

### **2.3.3 Policy**

Food waste can be directly connected to agricultural and food policies. Political concepts aimed at providing stability to agricultural sector and FSC as whole sometimes in practice have just the opposite effect. Some of those efforts that in practice brought negative consequences were direct supports to producers formerly implemented by the EU Common Agricultural policy (Segrè et al., 2014). These can be directly linked to excess quantities of produce, which destabilized the market and resulted in increased emissions of food waste. After that reforms were implemented and further actions that could potentially lead to the rise in food waste volume are avoided (Segrè et al., 2014).

Extreme weather conditions have direct impact on the amount of food waste. When combined with other previously mentioned risks primary food producers bare there is an evident need for their protection through public policies and measures (Segrè et al., 2014). Even though the government bodies are well aware of that, there is still lack of appropriate measures that would be sustainable and would not have negative long term market implications.

#### **2.3.4 Culture and societal norms**

Culture influences food waste even beyond consumers' behavior. Religious and traditional holidays in a country create peaks in demand, being difficult to predict and measure and can therefore lead to excess supply (Segrè et al., 2014), which presents a potential source of food waste. Some foods are typically consumed at certain holidays and not much through the year. High peaks must be forecasted and managed accordingly to reduce the consequential food waste.

Culture also defines public moral perspective of food value. Some authors noted that low prices and wide availability lowered the perceived value of food in many societies (Segrè et al., 2014). These have social, ethical and ecological implications. For the producers, distributors, retailers and consumers can be more morally acceptable to waste food because of perception of abundance and its discounted economic value (Segrè et al., 2014).

#### **2.3.5 Private standards**

Internal rules and regulations forced upon all the FSC stakeholders by the ones with more power (mostly producers, distributors and retailers) might be a potential reason for food waste (Stuart, 2009; Segrè et al, 2014; Katajajuuri et al., 2014), as already previously discussed in the Chapter 2.3.2. The incident of food aesthetic and quality standards implied to the whole FSC by the companies is closely linked to developed economies. The origin of the strict standards comes from the need to market uniform products and packages internationally even when they are supplied from different sources. Contrastingly, these standards are positive for the consumer protection. They know what to expect and can assume the known quality of the products they are buying in the supermarkets (Lucifero,

2016). Downsides of these private standards are complex selection processes during which high share of edible produce is being thrown away.

### **3 IMPLICATIONS OF FOOD WASTE**

Implications of food waste cover wide variety of dimensions. Food waste does not only reflect the unused potential for achieving global food security and wasted economic potential. Also all natural and other means used in the whole production cycle are wasted (FAO, 2012). Stuart (2009) in his research points out the need to raise awareness of the less obvious implications of food waste as wasted resources. He mentions wide specter of environmental and social implications. Every kilogram of food waste represents some opportunity costs. From social perspective it presents the excess food that is not delivered to people. From the environmental perspective it is a lost opportunity of re-using or recovering it and therefore bears further ecological burden when wasted (Garrone et al., 2016).

#### **3.1 Ecological dimension**

Climate change is becoming a global problem and therefore the ecologic consequences of food waste are taken more seriously (FAO, 2012). Food production is resource intensive and therefore comes with high ecological costs (Lundqvist et al., 2008). That is even more important as The World Economic Forum (hereinafter: WEF) predicted that natural resource usage would grow to twice the amount of global capacity in next 15 to 20 years (WEF, 2010). At the same time United Nations Environment Programme (hereinafter: UNEP) estimates that one quarter of the global agriculture capacities might disappear as a consequence of natural factors (water scarcity, invasive insects and land degradation) (UNEP, 2011). Food production is highly invasive for the nature while at the same time it is closely linked and connected with the natural factors. Therefore additional care and measures should be taken to protect the environment to ensure the food security (and safety) in the long run.

Food production bears implications for a high share of all greenhouse gas emissions – even as high as 22 percent (Lundqvist et al., 2008). That can be compared to the ecological burden of the whole industry sector, and even higher than the transport sector (Garnett, 2011). Therefore, food production creates negative environmental print and the amount that ends as a food waste creates further negative ecological implications.

When food gets to the disposal point its ecological burden is significant. The Waste and Resources Action Programme of the United Kingdom (hereinafter: WRAP) estimates that every kilo of food waste generates the equivalent of about 4.5 kilos of carbon dioxide (WRAP, 2007). When disposed of, global food waste generates annually a 4.4 Gt CO<sub>2</sub> equivalent, or about 8 percent of total anthropogenic greenhouse gas emissions (FAO,

2012). That means if food waste was represented as a country it would be the 3rd biggest country in the world according to its greenhouse gas emissions (FAO, 2012). The waste sector as whole can be linked to approximately 3 percent of global greenhouse gas emissions (Department for Environment, Food and Rural Affairs, 2011). Around 50 percent of that share can be linked to food waste (Department for Environment, Food and Rural Affairs, 2011). Study done in the UK by WRAP (2007) linked roughly 3 percent of national greenhouse gas emissions directly to avoidable food waste. Most of the studies on the issue in the recent decade stress out the importance of additional attention and measures needed to effectively deal with the issue, even if taking only the environmental factors into account. Department for Environment, Food and Rural Affairs (2011) pointed out food waste as a priority waste stream for further actions.

Disposal of surplus food at landfills have the most severe environmental consequences. As biodegradable waste in general consists of a large share of water, it therefore burns at lower temperature and it is not sufficient for the incineration plant. Consequently, most of the food waste worldwide is deposited in landfills (Priefer et al., 2013). When the waste is decomposing in landfills, methane and carbon dioxide are produced (Bernstad Saraiva Schott, Wenzel, & la Cour Jansen, 2016; Eriksson, Strid, & Hansson, 2015). To make the environmental implication worse, only a small share of waste facilities outside Europe possess the technology that enables the collection of methane (Priefer et al., 2013).

When talking about food waste, environmental implications wider view should be adopted. Important implications are carbon emissions coming from all stages of food production and consumption, even before it becomes waste. All the activities leading to the end point of food waste already have greenhouse gas impacts (Lundqvist et al., 2008). The emissions from the processes of food manufacturing, transportation, refrigerating, marketing, retail and others should be added up to the total amount of greenhouse emissions that emerge from food waste at the landfill. That gives us the real image of the severity of environmental implications.

17 percent of EU's direct greenhouse gas emissions and 28 percent of its material resource use can be directly linked to the food value chain (EC, 2010). Barrett and Scott (2012) also highlighted the FSCs as an area with great potential for contraction of greenhouse gas emissions. They estimate that preventing food waste only in the UK has the potential of 456 million tons of greenhouse gas emissions reduction by 2050. That can be compared to reducing the number of personal vehicles in the UK for 20 percent in environmental terms (WRAP, 2007).

Another food waste implication is the waste of water. That includes water being used directly through the production process or “virtually” through all the stages of FSC (Segre et al., 2014). Reducing food waste would mean a lower total amount of water required for the agriculture sector (Lundqvist et al., 2008). Term “virtual water” refers to the general



amount of water that is used in all the countries combined for the production of goods consumed at the national level (Priefer et al., 2013). WRAP (2009) estimates that the water footprint linked to the food wasted at the consumer phase accounts for 6.3 million m<sup>3</sup> of virtual water yearly. The avoidable food waste can be linked to 5 percent of total UK water usage (WRAP, 2009).

Other environmental consequences of food waste are over-use of natural resources, for instance, soil nutrients, water and energy, the disturbance of the natural cycles of nitrogen and phosphorus as they are used in food production as fertilizers (Smil, 2004), biodiversity and animal welfare (Garnett, 2010) and the potential for environmental pollution through the different processes at all levels of the FSC (FAO, 2015; Lundqvist et al., 2008).

### **3.2 Economic dimension**

The FAO estimated the market value of wasted food products in 2012 worldwide to 936 billion US dollars – around 800 billion euros. Such amount of economic loss can be compared to the GDPs of a whole country the size of the Netherlands or Indonesia for example (Segrè, 2012).

National studies in the United States have explored various origins of food waste. They recognized that up to half of the food waste originates from the consumer stage and estimated its economic cost to be more than 161 million USD a year only in the US (Evans, 2011; Buzby et al., 2014; Thyberg & Tonjes, 2016). Study of households' waste in the UK proposes that the food with the potential of consumption, but wasted instead have the economic value of around 12 billion pounds – around 13.7 billion euros (Quested, Parry, Easteal, & Swannell, 2011; WRAP, 2013). WRAP's study found out that the average household in the UK wastes approximately £470 a year worth of food that could otherwise be eaten (WRAP, 2013).

Some estimates predict food waste to cost the restaurants in the UK between 2 and 3 percent of their total output (Papargyropoulou et al., 2014). In the hospitality sector food waste present significant costs as they also pay for its disposal and logistics. That amount must be added on top of the opportunity costs of the products that get thrown away, as well as the costs of purchasing, storage and handling. Better waste management practices present business opportunity for companies providing substantial savings. Moreover, dedication to the goal of food waste minimization would result in more effective internal processes and lower use of food inputs (Pirani & Arafat, 2016) leading to more savings for the companies in the restaurant and hospitality sector.

Next of the important economic implications is that food waste is inevitably leading to the increase in food prices. That mostly harms the farmers and the consumers as the stakeholders in the FSC (Gustavsson et al., 2011). Marginal costs of each unit of food that

is wasted must be transferred to the prices of other products. Therefore running the FSC more effectively as well as the investments in means and processes could have the long term implications of lowering the overall prices of food and increasing its availability (Gustavsson et al., 2011; Lundqvist et al., 2008). Also UNEP stressed out the importance of the economic potential in the food waste. They recognized the potential through the cost savings, identifying new business opportunities and increasing employment in the long term (UNEP, 2011).

### **3.3 Social dimension**

The fact that food waste exists at such scale globally, compared to insufficient food supply to some and the world hunger issue raises the question of social implications. Social implications focus around the ethical and moral factors of wasting much needed resources, mostly regarding the gap between wasteful practices on one hand and food poverty on the other (Evans, 2011; Stuart, 2009). Porpino, Parente and Wansink (2015) found out that in developed countries low income households discard similar amounts of food than high income household. After all, food security is an increasingly pressing global issue that can be found in developing and also developed countries (UNEP, 2011; FAO, 1981)

At the World Food Summit in Rome in 1996, the FAO defined food security as “when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO, 2006). Food waste reduction through all stages of the FSC presents the main opportunity for reaching global food security in the long term (Papargyropoulou et al., 2014). Food waste can be even seen as the factor that is compromising food security (Lundqvist et al., 2008). With the growth of global population food security is becoming of growing importance and more commonly researched and discussed (Gustavsson et al., 2011; Lundqvist et al., 2008).

There are not only differences in access to the global FSC between the wealthy and the poor countries there are also big differences within the countries. While the diversity of food supply globally nowadays is the highest, also the number of people affected by food poverty is increasing simultaneously (Papargyropoulou et al, 2014). That is not limited to the poorer countries as food poverty is prevalent also in developed rich countries. It should be a common goal that all the people globally have the access to nutritious and safe food items (Godfray et al., 2010). Food insecurity is usually linked to limited access to food due to purchasing power and prices of food. In the developing countries food insecurity is usually not the problem of physical access but of financial unavailability. Therefore all the activities connected with lowering the relative share of food waste will consequently lower the overall prices of food and increase accessibility for the most vulnerable (Lundqvist et al., 2008; Gustavsson et al., 2011).

Wasting the fundamental potential of food as the nutrition source for human race should be seen as immoral by the society (Parfitt et al., 2010). As food waste hierarchy takes into account mostly environmental perspective (Papargyropoulou et al, 2014), social aspects of food waste management are mostly overlooked and edible food is therefore re-used instead of being redistributed to the people in need.

## **4 FOOD WASTE AND POVERTY IN SLOVENIA**

Food waste is gaining importance in Slovenian public perspective. That is not only because of the general EU policies on food waste but also because Slovenia is dealing with some specific challenges.

One of the key challenges for Slovenia is how to increase crop production despite limited natural capabilities. Over 80 percent of agricultural production in Slovenia is engaged in animal production and out of 477.000 hectares of agricultural land most of it is permanent grassland. Agricultural holdings in Slovenia cultivate about 850 square meters of arable land per capita while in the neighboring countries that number is between 1.3 and 5 times higher. Therefore, it is not surprising that Slovenia is a net importer of food – less than half of food consumed in Slovenia is produced in the country (SURS, 2017). All of these are reasons to focus special attention to the problem of food waste.

In 2015, 55.000 tons of still edible food was thrown away – on average 27 kilograms of food per inhabitant (SURS, 2017). As we have seen in the Chapter 3 the consequences of food waste extend to many areas and therefore it is necessary to consider the efficiency of existing systems of food production and consumption, their interactions, and impact on the quality of life and the environment.

### **4.1 Sources of food waste in Slovenia**

In the last three years 143.000 tons of food has been discharged yearly on average. Per capita share of food waste is increasing from 64 kilograms in 2013 to 73 kilograms in 2015 – a 14 percent increase. Out of 73 kilograms – 27 kilograms of food per capita discarded was still edible (36 percent of all food waste). Out of those 27 kilograms – 20 kilograms were thrown away by the end consumer and 7 kilograms has been lost previously in the supply chain (SURS, 2016a).

From the waste analysis conducted by the SURS in 2016, proportions of food waste through stages of FSC have been identified as found in Table 4. If we compare the data for Slovenia with the proportions that Stenmarck et al. (2016) identified for the EU-28 (look at Table 2), there are some deviations. In Slovenia, above the EU-28 average share of food waste originates from manufacturing (EU-28: 19 percent), retail (EU-28: 5 percent) and

food service industry (EU-28: 12 percent), and below the average at the stage of the main source of waste – consumers (EU-28: 53 percent).

Table 4. Origins of food waste through FSC in Slovenia

Food waste origin in the FSC	Proportion of total food waste (in percentage)
Manufacturing	24
Retail stores	9
Food services and institutions (restaurants, schools, hospitals, etc.)	19
Households	48

Source: SURS, *Food in wastage*, 2016.

Such data comparison is not completely representative because of the different nature of both studies – as the SURS’ study originates from waste analysis agricultural sector is not included (or not studied separately). That is not surprising if we take into account that 48 percent of Slovenian household units (most of agricultural premises are small family owned businesses) have their own home composting systems (Ministry of the Environment and Spatial Planning, 2016), and therefore food waste has not been included in the study. Those differences obstruct the direct comparison with the studies for the EU-28.

## 4.2 Food waste management practices in Slovenia

As already mentioned above, a surprisingly high number of Slovenian households have their own home composting systems – 48 percent. That proves as a very common, highly efficient and environment friendly practice for food waste management at an individual level.

Other food waste that comes into public waste management system is managed through different methods. The most common are biogas plants with anaerobic processing – 60,000 tons or 43 percent of total food waste. 36,000 tons or 24 percent of total food waste ends up in the composting systems (aerobic processing). 18 percent goes through other processing for example oil refining. 15 percent or 21,000 tons of food waste still end up in landfills. Emissions due to food waste in landfills represent 3.4 percent of all greenhouse gas emission. Of course, the goal is that as little food waste as possible ends up in landfills, and the number is very slowly, but gradually, falling (SURS, 2016a).

### **4.3 Food insecurity in Slovenia**

**Food security** is defined as a state when “all people, at all times, have physical and economic access to sufficient, safe and nutritious food.” It should match individuals’ dietary needs enabling them living an active and healthy life (FAO, 2006).

Threshold for risk of poverty in Slovenia is set at 1,295 euros per month for household with 4 members. In 2015, 287,000 or 14.3 percent of people in Slovenia lived below the risk of poverty threshold. 5.8 percent of population or 116,000 people have been seriously materially deprived (SURs, 2016b). 20 percent of households reported they had trouble living through the month with their income. A full 8 percent of households were not able to afford a quality meal (with meat or vegetarian substitute) at least every second day or were not able to afford quality food in 2015 (SURs, 2016a).

Food insecurity is a pressing issue in Slovenia, and many charity organizations are trying to facilitate solutions. The most common is the distribution of food with longer shelf life to the people in need. Karitas distributed food packages to 102,285 people in 2015 with 2,669 tons of food in total (Karitas, 2016). Slovenian Red Cross distributed food to over 132,000 people in 2015 (Slovenian Red Cross, 2015). That proves that there is pressing need for food donations nowadays in Slovenia until more sustainable changes for the guaranteeing of food security are adopted in the long term.

### **4.4 Legislation regarding food safety in the EU and Slovenia**

Legislation regarding food in Slovenia represents a combination of influences of the United Nations (hereinafter: UN), European Union (hereinafter: EU) and national implementation. Food hygiene and safety is therefore determined at three levels, starting with the most general.

At the level of the UN international food standards are harmonized. The Codex Alimentarius or "Food Code" was established by the FAO and the World Health Organization (hereinafter: WHO) in 1963. Its main purpose was to protect consumer health and to promote fair practices in the international food market. Through decades the Codex Alimentarius has established its position as the legal foundation for the food trade, including all the stakeholders in the FSC as well as legislative and political bodies internationally. Its member nations cover 99 percent of the global population. Even though its application is voluntary, Codex rules usually present a foundation for the national legislations of member states (FAO, 2016).

Part of the Codex is “hazard analysis and critical control points” (hereinafter: HACCP). Practices prescribed in HACCP have been enforced through the EU legislation. In the Regulation (EC) No 853/2004 on the hygiene of foodstuffs it is written that: “EU countries

must encourage the development of national guidelines based on HACCP principles, with the possibility of EU-wide guidelines if this is thought necessary” (EC, 2004).

The principles regarding food safety and consumer protection fall under competences shared between the EU and Member States. The latter are responsible for implementing and enforcing EU food legislation, while at the EU level Regulation (EC) No 178/2002 defines the general guidelines behind the food legislations. The same regulation also sets up the European Food Safety Authority (hereinafter: EFSA) that presents the framework for the safety tests for food (EC, 2017). Current rules on hygiene of foodstuffs became applicable in 2006 with the Regulation (EC) No 852/2004, 853/2004 and 854/2004. The 2004 rules harmonized and simplified the hygiene rules. New rules implemented a single hygiene policy to be implemented by all food operators through the FSC. It also includes practices for independently managing food safety by each organization dealing with food (EC, 2017a).

The new hygiene rules can be summed up into following principles (EC, 2017a):

- Food safety has to be provided through the whole FSC.
- Food business operator bears primary responsibility for food safety.
- Procedures based on the HACCP should be implemented at all levels of FSC. All stakeholders should follow basic common hygiene demands.
- Flexibility of rules for food produced in remote areas and for traditional methods of production.

All of those are directly applicable in Slovenia. The topic of food waste is connected to food and food safety regulation in the EU but also have wider implications. Other important legislation demands for it can be found in waste management and financial codes (Vittuari, 2015). The EU directives are driven by the motive of preserving consumers’ health. Therefore sometimes they can act as the limitation for reducing food waste or even as an amplifier for its emissions. Also a study of Waarts et al. (2011) concluded that legal limits set by European Law play important role for the generation of food waste in the agriculture.

#### **4.5 EU and Slovenian policies aimed at reducing food waste**

The problem of food waste is gaining importance and is increasingly tackled by the EU policies. Limiting food waste has been named a priority in the EU action plan for the Circular Economy presented by the EC in 2015. One of the Sustainable Development Goals is aimed at reducing food waste. The goal for the Member States is to lower the per capita food waste at the retail and consumer level to 50 percent of the volume in 2015 by 2030. Another wider goal is to lower food waste emissions through the whole FSC (EC, 2016; European Parliamentary Research Service, 2014).

Through the measures taken in the last years it is evident that EU recognizes the implications and missed opportunities in the food waste. They are focusing on making Europe more competitive and resource-efficient through food waste reduction (Garrone et al., 2014).

One of the most visible has been the European project FUSIONS. 21 institutions and 13 Member States were cooperating in the project. It had important implications on a common system of food waste auditing and the preparation of protocols for unified food waste framework in the Member States (Priefer et al., 2013; FUSIONS, 2016).

The United Kingdom is one of the most active countries when it comes to tackling the issue of food waste, as their WRAP initiative started already in the year 2000. The main objective is to limit the total amount of all kinds of waste through private and industrial sector (Priefer et al., 2013). Reducing food waste is one of the main goals of WRAP for several years and therefore The United Kingdom is one of the leading countries when it comes to knowledge and data collected on the national food waste footprint.

European Parliament has taken a leading role in one of the issues generating unnecessary food waste at consumer level. In its resolution on how to avoid food waste in 2012, the European Parliament asked the Member States to expand the definitions on the meaning of “date labeling” of food items and expand public knowledge on the topic in order to avoid edible and safe food being thrown away by the consumers. The proposition was based on the EU-27 consumer market study from 2012 that only 36 percent of consumers correctly understood the meaning of the “best before” date (Valant, 2015). It also called on the EC to issue recommendations regarding refrigeration temperatures and to start activities for food waste reduction in the other stages of FSC. Their recommendations were enhanced activities on dual-date labeling and selling foods that are close to the expiration date or are damaged with special discounts (Valant, 2015). These have the potential to limit the amount of food waste at retail and production levels up-stream the FSC.

To support sustainable local agricultural production and consumption actions are taken also at the EU level. Some of those measures with the influence on food waste are for example (EC, 2017b):

- Support for agricultural management in form of training, product withdrawals, promotion and communication tools, harvest insurance, farmer-owned stabilization funds, etc.
- Encouraging greater consumption at EU level with measures like school local fruit schemes and supports for free distribution of local fruits and vegetables to public institutions and charities.

- Fruit and vegetable Aid Scheme with aim to stabilize the prices of agricultural products in the EU, the fruit and vegetables withdrawal program supports the producers' organizations who then distribute free products for social or charity purposes.

Following the EU guidance, the national governments are taking measures with aim to reduce food waste. In Slovenia one of the measures is tax reduction for companies from the food sector that donate food to charity organizations. The Financial Administration of the Republic of Slovenia (hereinafter: FURS) states that the donors are entitled to tax relief up to 0.3 percent of taxable income (FURS, 2017).

## **5 QUALITATIVE RESEARCH – LIMITATIONS PERCEIVED BY STAKEHOLDERS IN THE FSC FOR DONATING SURPLUS FOOD**

### **5.1 Research problem and objectives**

The overall aim of the thesis is to analyze the use of edible food that ends up as waste for its potential as a source of charity donations and provide a whole picture regarding current limitations for distributing food to the people in need. It should be seen as ground research for future potential of realistic improvements in the field of food waste distribution in Slovenia. Food waste as a potential source of charitable food donations is examined through a study of the current situation and limitations currently presented for greater efficiency, with a list of potential improvements as seen by the stakeholders.

The emphasis of the research is on the FSC as whole, not the individual stages or stakeholders, but on interconnectedness and cooperation between the links. The general picture connecting previous research of individual stages serves as another step in the discovery and understanding of food waste generation and potential reduction and/or redistribution of it. The small Slovenian market can serve as a model for similar research pattern in other countries, as food is perishable goods and therefore distributed mostly locally (especially surplus food). Slovenia could serve as a model country because of lower number of entities involved in the FSC (smaller and less complex system) and shorter geographical distances that need to be covered for successful food redistribution. Previous international research shows diversity in findings for the individual stakeholders and stages. Our goal is to connect that partial information into a descriptive overview framework for the Slovenian market through the limitations that the system as whole is facing.

Therefore the Research Question is: “Why more edible food waste is not recovered by redistribution as food donations in Slovenia?” The objective of the proposed research is to conduct a descriptive list of limitations present in the Slovenian market that are interfering



with food waste distribution to the people in need (alternative to discarding it). Limitations are described as seen by the charity organizations as well by other stakeholders (farmers, retailers, restaurants and others) dealing with food waste in practice. The proposed framework can serve as a foundation for practical implications and changes of food donating environment in Slovenia with food waste becoming a more important food donation source. The purpose of the study is therefore to discover the limitations for more effective redistribution of edible food waste from companies to the people in need by charity organizations in Slovenia.

With the term “edible food waste” we describe edible food that ends up as waste but could be recovered as donations to people in need. Similar viewpoint is adopted in definition of Bloom (2010) describing food waste as only concerning wasted edible items that are directly linked to human action or inaction.

## **5.2 Methodology**

### **5.2.1 Source of data**

As no previous study or theory regarding limitations for food waste redistribution in Slovenia has been conducted we followed qualitative research methods. Those are used when the goal is not measurement but systematic search of answers (Berg, 2007). Semi-structured in-depth interviews with various stakeholders in the FSC have been conducted to get a broad representative picture of the current situation of each individual stakeholder and the interactions between them. All interviews were recorded, transcribed and common parallels in mentioned issues were drawn to found similar patterns. Every limitation mentioned by more than one respondent was used for further research and connected with previous theoretical findings.

### **5.2.2 Research method**

Qualitative research methods are used when researchers need to gain deeper understanding of the social and cultural context. Such an approach is the most suitable when you want to study a particular subject in depth and gain useful insights that drive human actions and decisions (Myers, 2013).

Research will be exploratory as there is a need to clarify the understanding of a problem, as we are not sure of the precise drivers for the issue. Exploratory research is commonly used for gaining wider picture of the situation, to gain new insights and connections and to study complex topics in the new light (Saunders Lewis, & Thornhill, 2009). As most of the research done on the topic is focused at one stage of the FSC, exploratory research is the most suitable to gain new insights and describe the situation as a whole.

Data is collected through semi-structured interviews. Semi-structured interview as a method of data collection will allow covering all the important aspects that are beneficial for our research and at the same time allow participants to express their opinion freely about the factors they see crucial. That provides different views and opinions that were potentially not predicted in advance. The same could not be achieved with the structured interview. We follow pre-formulated list of questions, but leave the space to change the order of questions or to add additional questions as also suggested by Berg (2007) to research some of the mentioned topics in depth or for better understanding. The interview process was designed with laddering approach in mind. That framework prescribes starting the interview with the more general questions which allows the interviewees to find the connections they consider meaningful. The researcher does not stop the respondent even when the answers differ from the expected and change the initial path of the interview (Veludo-de-Oliveira, Ikeda, & Campomar, 2006). That allows us to gain a broader insight, and to discover some unpredicted patterns as the research question demanded.

Interview questions focus on the current actions (and inactions) regarding food waste creations and distribution, perceived issues and limitations that lead to food waste generation and limit its potential recovery and their interaction and cooperation with other stakeholders in the FSC. As the subjects are different stakeholders with different roles in the FSC, questions have to be adjusted accordingly. To provide consistency across interviews they start with similar sets of questions (Bryman & Bell, 2011). Further on questions slightly differ according to the role of stakeholder in the FSC to gain the most useful insights for the purpose of the research (see Appendixes D–I). The initial list of questions also grew through the interviewing process itself, as some of the subjects introduced new concepts that were included in the list of questions for further research in following interviews, to gain broader perspective of previously mentioned concepts. All pre-formulated lists of interview questions can be seen in the Appendixes. Selected concepts and pre-formulated questions were not shown to the respondents in order not to guide or limit their answers.

For the analysis of the results the data provided is recorded, contracted and structured into meaningful arrays of subjects. Berg (2007) suggests content analysis as the most suitable tool for interview analysis, conducted through systematic analysis of all the collected materials with the purpose to gain new insights of the problem.

### **5.2.3 Research instruments**

We try to adjust to the participants about their preferred meeting location and therefore the most of the interviews are conducted in the field. Selection of the instruments must be done accordingly. First of the instruments is the questionnaire that we prepare in advance and adjust accordingly to the role of the interviewee in the FSC. As regards monitoring responses Paulus, Lester and Dempster (2014) recommend following instruments for

taking field notes – writing notes by hand, audio recording of the responses or typing them in the laptop or mobile device. We choose to audio record the interviews as it allows us to interact with the participants during the conversation (Paulus et al., 2014) and it is important that the interviewer “listens, also to the meaning underneath the words, and reflects back what he heard for confirmation of respondent” (Bryman & Bell, 2011). Mobile devices have proven themselves to be an efficient way to collect interview data while in the field (Paulus et al., 2014) so therefore a smart phone is used for the recording. We are also taking notes during the interview when necessary – in case of recognizing non-verbal communication signals that might be relevant or when a specific relevant term is used. We allow the possibility that for some of the respondents, phone call or email communication is more suitable and in those cases adjust the tools when necessary.

#### **5.2.4 Research sample**

Sampling is purposive, using the research question as a guideline to what categories of subjects need to be the focus of attention – as suggested by Creswell (2007). Non-probability sampling (no random basis for choosing subjects) is the most suitable, as subjects must be relevant to the topic and also provide the variety in the resulting sample (Creswell, 2007). We target different stakeholders active in the field of food donations distribution as they have the most insights into the current situation. The problem is analyzed through their subjective opinion and underlined with further research of secondary sources. To obtain critical mass of data obtained, the snowballing technique is used – asking respondents to suggest other possible interviewees, assuming they know other people involved in the topic (Creswell, 2007). The goal is to continue with the interviews until the category is saturated with data, while keeping in mind that the issue at hand is more important than the total amount of interviews constructed, while making sure that the subjects interviewed “represent various voices” (Myers, 2013). The goal is triangulation of subjects – finding a variety of people representing diverse views in order to obtain a certain breadth of opinion (Rubin & Rubin, 2012).

#### **5.2.5 Data analysis**

The goal of the analysis is transforming data into meaningful conclusions regarding the research question. For effective analysis of the results the data provided is recorded, with the consent of the subjects, and then listened to and analyzed repeatedly while writing down important and meaningful parts. Written data will then be contracted and structured into meaningful arrays of subjects. Berg (2007) suggests content analysis as the most suitable tool for interview analysis, conducted through systematic analysis of all the collected materials with the purpose to gain new insights of the problem. The approach used for analyzing will be bottom-up, by finding tentative context in the responses, linking them into common themes that represent individual limitations. The findings are further on linked to existing literature whenever possible (Bryman & Bell, 2015; Myers, 2013).

### 5.2.6 Limitations

We are aware of the fact that the chosen research strategy has some limitations. As the sampling is not random, findings may be biased, cannot be generalized and lack external validity. That is more important for quantitative than qualitative research. Even more, the objective of the research is not to find generalized data but in-depth problem description. Therefore, those limitations can be taken into account. Another limitation can be seen in subjective opinions being the data source. In-depth interviews will reveal the opinions of the interviewees and those are not necessary generalized opinions of other stakeholders at their stage of the FSC. There has been no similar research done yet in the Slovenian market and the results cannot be compared and tested directly. Therefore, the results can present a starting point and encourage further in-depth research of the problem in Slovenia. As objective of the research is to gain aggregated data as representation of whole FSC, further analysis of individual links in the FSC would be welcomed with wider samples to gain further insights.

## 5.2 Research findings

The sample consists of 12 interviewees that represent different links in the FSC. We contact initial respondents with personal e-mail request. At the end of interviews, we ask them for recommendations of other suitable interviewees. Almost all of the sent requests received positive answers, which shows that the topic is of high interest for the respondents.

Table 5. Research sample overview

<b>Stage in the FSC</b>	<b>Number of different organizations</b>	<b>Roles of the respondents inside the organization</b>
Agriculture	1	MSc Student of Agriculture, works at family owned farm
Food manufacturers	2	Head of R&D, Corporate Communications Director
Food retailers/ Supermarkets	2	Corporate Communications
Restaurants	2	CEO, owner & CEO
Charity organizations	4	Founder, Director, Active volunteer, Project coordinator
Politics	1	Food Supply Chain Relationships Ombudsman

Whenever possible, we try to gain responses from respondents with different roles inside the same stage of the FSC. Some of the responding organizations (mostly bigger companies) preferred to answer the questions through e-mail, as usually there is not just one person in the organizational structure that would deal with the topic directly or have all the answers themselves. Therefore, corporate communication offices handled the questionnaires inside their organizations in some cases. Sample overview connecting respondents with the individual stage of FSC can be found in Table 5. Political bodies are not a direct part of FSC but hold significant influence for food distribution, and are therefore included as one of the stakeholders.

The duration of the interviews conducted in person - from 1 up to 3 hours - shows that the topic is of high interest of respondents and that they are prepared to discuss it in detail. Each individual subject in the sample is presented in more detail in Appendix C.

From the answers gathered it was possible to formulate content parallels leading to similar limitation perceived. Every limitation mentioned at least by two respondents was further researched and included in the model.

In Figure 3 we can see the limitations placed at the level of FSC at which they originate or are linked to. In addition to the stakeholders among the FSC, also 3 other stakeholders outside the FSC are included as they have the influence on food waste (the media, the government and the legislation bodies). The diagram gives us the whole picture of inefficiencies through the system of food distribution and missing links for more effective redistribution of surplus food to donations. Some of the limitations are linked to individual stakeholders in the FSC (while influencing whole food waste flow and stakeholders), while others (numbers 2, 3, 4, 5, and 11) are systemic at macro level and have impact on all parties involved. In the following paragraphs all the limitations discovered through the research are further described as being seen by the responses of different stakeholders in the FSC.

### **5.2.1 Defining food and waste and its influence on perception**

Charity organizations as well as other stakeholders are very careful with the use of terms when it comes to donated food. At all times they avoid calling it “food waste” because of its potentially negative perspective, as can be seen in Table 6.

Therefore, it is important to emphasize, that when talking about food waste and its redistribution in form of donations I only use the first term with the purpose to stress out that edible and perfectly safe food is being thrown away instead of being used as donation. The term is being used only for the clear purpose of the thesis and the research (not talking

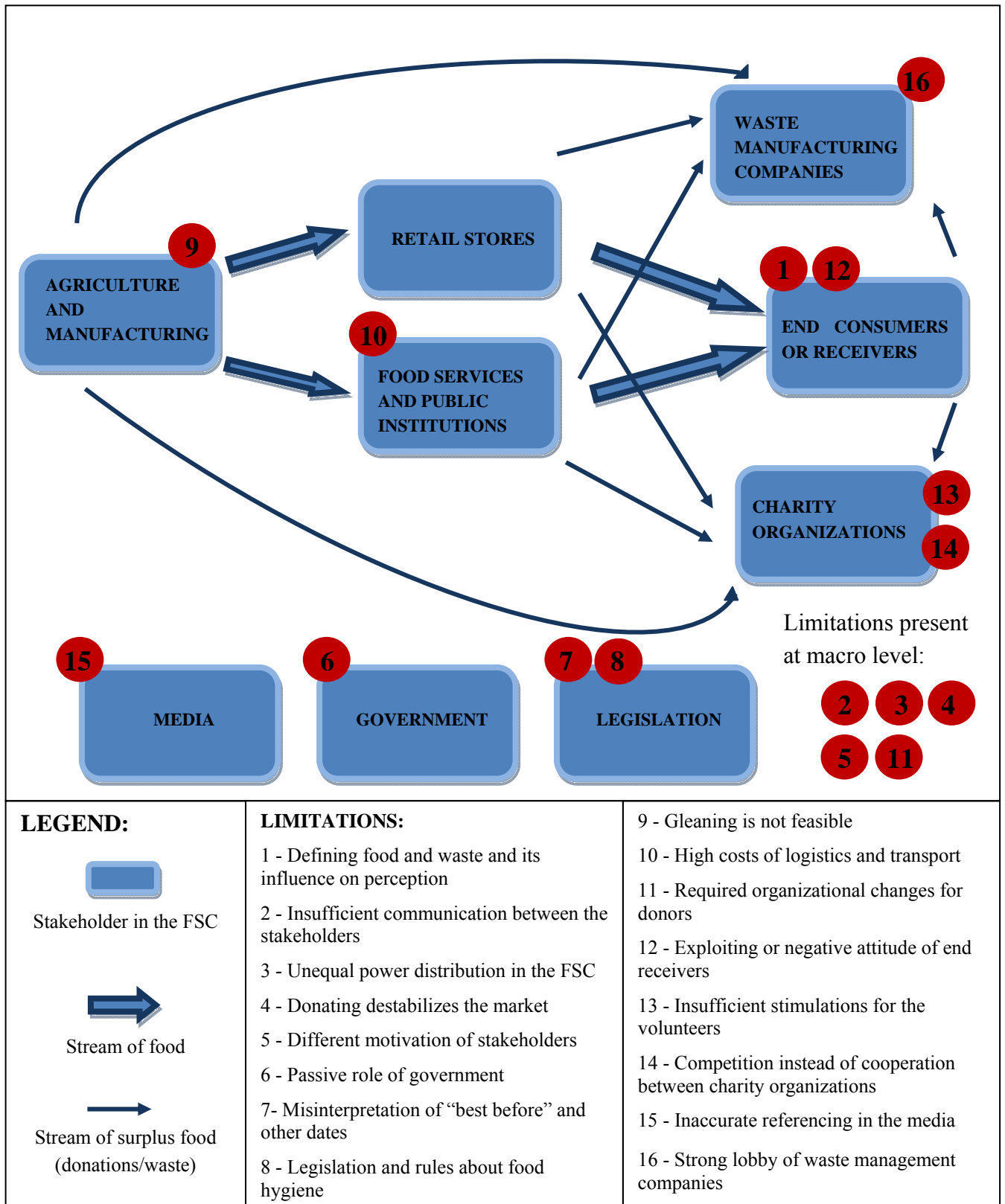
about food in general but the food that is thrown away) and should not be seen with negative connotation.

The emphasize of the interviewees should be seen as important when dealing with food, waste, and donations and every stakeholder involved should be careful of the terms being used. Misconceptions of terms used could present a potential barrier for the donors or end receivers that will consume the food (as Mr. Podlesnik emphasized with rhetorical question: *“Would you be happy if you got food waste donated to you?”*). Also Mourad (2016) in her research describes that food recovery operations involve accessing “extra”, “excess” or “wholesome food” and it is rarely called in its definite form as “waste”.

Table 6. Respondents’ statements on Limitation number 1: Defining food and waste and its influence on perception

<b>Limitation nr. 1: Defining food and waste and its influence on perception</b>	
<b>Agriculture</b>	/
<b>Food Manufacturer</b>	/
<b>Food Retailer/Supermarket</b>	<i>“Food waste is an inappropriate term in our opinion as food we donate is unimpaired, safe and before its expiration dates”</i> (Mercator).
<b>Restaurant</b>	/
<b>Charity Organization</b>	<i>“Would you be happy if you got food waste donated to you?”</i> (Podlesnik)
	Podlesnik suggests only the term food should be used at all times when describing food donations as those are unimpaired regarding all standards for food.
	<i>“We renamed the project from »Surplus Food« (Slovenian: “Viški hrane”) as it was named at the beginning, into »Donated Food« (Slovenian: Donirana hrana) as that term does not have negative connotation in the eyes the receivers of donations”</i> (Podlesnik).
	<i>“We are not dealing with food waste”</i> (Novit).
<b>Politics</b>	/

Figure 3: Diagram of FSC, food and surplus food stream and limitations



## 5.2.2 Insufficient communication between the stakeholders

*“If relationships between the stakeholders in FSC would be better organized and they would communicate better about the quantities planned, they could all invest into more optimized production. That would lower the amount of waste”* said Mr. Podgoršek in the interview. That implies that more optimized communication and collaboration between stakeholders is needed and is currently present as limitation for lowering the amount of food waste. Other responses related to the issue can be seen in Table 7. One of the most important issues connecting with insufficient communication is food delivery refusal.

Refusal of the food supplied is one of the common practices between suppliers and supermarkets. The process as such is needed to assure the agreed quality of distributed food. Anyhow, sometimes produce gets refused just because of the wrong shape or for being visually unappealing (Podgoršek) or even when just the print on the label is smudged or has a mistake (Podlesnik).

Project “Donated food” has an agreement with their donors to contact them when a supplier leaves refused goods behind as it is too costly to pick them up if they are not able to sell them anywhere. They face a problem how to document such donations as they are not recorded (see Table 7). Some level of consolidation between stakeholders could potentially solve the issue and bring the compromise for the established practice in such occasions. Mr. Podgoršek has drawn attention to another issue when inappropriate communication works as a limitation for effective food distribution – unjustified food delivery refusal in case of high stock by the bigger stakeholders with stronger negotiating position.

Another good practice of avoiding food waste through cooperation happened in 2016 when one of the retailers announced that in a short notice they will start buying only lettuce of standardized size. Farmers were afraid they will have to discard most of their harvest as it was in the middle of season. With the help of external authorities, they settled the dispute in favor of both parties. They organized an educational day for the producers and prolonged the implementation of the new standards. Because of the change now consumers pay for a piece of lettuce instead of its weight. That results in less food waste at two different stages of supply chain: as farmers can better plan their produce and revenues in advance and as consumers in store do not tear less appealing parts away in order to pay less and those parts get sold instead of being directly discarded as whole (Podgoršek). From such instances we can see that cooperation of stakeholders is crucial in lowering the total amount of waste.



Table 7. Respondents' statements on Limitation number 2: Insufficient communication between the stakeholders

<b>Limitation nr. 2: Insufficient communication between the stakeholders</b>	
<b>Agriculture</b>	/
<b>Food Manufacturer</b>	/
<b>Food Retailer/Supermarket</b>	/
<b>Restaurant</b>	/
<b>Charity Organization</b>	Food delivery refusals: <i>“If there are 5 rotten bananas in the batch they refuse the whole batch. It can be understood as it would take a lot of working hours to browse through all the supplies”</i> (Podlesnik).
	Food delivery refusals: <i>“The problem lies in the records as this food is not evidenced anywhere in the supermarket database and the supplier usually does not care what happens with it. We have a problem as we do not know how to record such donations”</i> (Podlesnik).
	Food delivery refusals: <i>“It sometimes appears that some entities refuse the batch if the sales have been lower than expected and they have high stock. If you look long enough for the mistake you can always find it. It is more convenient to do so, as cancellation of order results in fines. Anyway, I must stress out that such practices are rare”</i> (Podlesnik).
<b>Politics</b>	<i>“If relationships between the stakeholders in FSC would be better organized and they would communicate better about the quantities planned, they could all invest into more optimized production. That would lower the amount of waste”</i> (Podgoršek).
	Food delivery refusals: <i>“I do not consider it negative as it ensures the agreed quality of food”</i> (Podgoršek).
	Food delivery refusals based on visual standards: <i>“... for instance meat of brighter color that is perfectly safe for consummation”</i> (Podgoršek).
	Example of good practice from one of the biggest Supermarket chains in Slovenia - organizing an educational day for other stakeholders to be able to follow new internal standards for purchasing; prolonged implementation of new standards for other stakeholders to have time to adapt (Podgoršek).

### 5.2.3 Unequal power distribution in the FSC

Usually big supermarkets have supreme negotiating power inside the FSC. That is not surprising if we know that in EU 5 supermarket chains have 50 percent market share, in Austria 2 chains 70 percent and in Slovenia 3 supermarket chains 60 – 70 percent market share (Podgoršek). Other responses on unequal power between the stakeholders in FSC can be seen in Table 8.

Farmers and food manufacturing companies are the least well connected. Because of their fragmentation they all have weaker negotiating position (Podgoršek). Consequence of that

is also low share of profit they receive. That can lead to more food waste as the low profits do not cover further investments into logistics and packaging facilities (Podgoršek).

Table 8. Respondents' statements on Limitation number 3: Unequal power distribution in the FSC

<b>Limitation nr. 3: Unequal power distribution in the FSC</b>	
<b>Agriculture</b>	/
<b>Food Manufacturer</b>	/
<b>Food Retailer/Supermarket</b>	/
<b>Restaurant</b>	/
<b>Charity Organization</b>	<i>"It sometimes appears that some entities refuse the batch if the sales have been lower than expected and they have high stock. If you look long enough for the mistake you can always find it. It is more convenient to do so as cancellation of order results in fines. Anyway, I must stress out that such practices are rare"</i> (Podlesnik).
<b>Politics</b>	<i>"High market power of supermarkets is a reason every supplier is afraid to lose the business and will accept all the conditions, fair or unfair"</i> (Podgoršek).
	Farmers and food manufacturing companies are the least well connected. Because of their fragmentation they all have weaker negotiating position (Podgoršek).
	<i>"If the primary sector would have a fairer share of profits they would be able to invest more into logistics, packing and storage facilities that would positively influence the quantity of food waste"</i> (Podgoršek).
	<i>"It is all because of unequal negotiating positions. If you do not accept the terms provided your service can be cancelled. [...] This is a typical demonstration of unequal power distribution and is considered as unfair practice"</i> (Podgoršek).

One of the unfair practices as a consequence of unequal distribution of power are the returns of the unsold products from supermarkets to suppliers. The practice itself has appeared as some products (as dairy and meat products) can be safely processed into other food products even when the use-by date is reached (Podgoršek). Some of the suppliers are now paying provision for the right to not accept the unsold products back; cost for which they agree in the contract. But even if they implement this agreement they still take back the unsold products and give back the credit to the supermarket (Podgoršek). Such practices can distort aggregate data of food waste as the volume can appear lower at the level of retailers and higher at the level of food manufacturers. It also gives supermarkets the freedom to be less accurate with its volume planning and therefore leads to more waste.

As suppliers many times do not regularly produce food waste at their production facilities (as stated by Ljubljanske mlekarne), it is even harder for them to organize redistribution of the products returned. This limitation is interconnected with limitation number 2:

Insufficient communication between stakeholders, as different negotiating and power distribution positions limit open communication.

#### 5.2.4 Donating destabilizes the market

Table 9. Respondents' statements on Limitation number 4: Donating destabilizes the market

<b>Limitation nr. 4: Donating destabilizes the market</b>	
<b>Agriculture</b>	<i>"Public subsidies for surplus produce are not sustainable as they lower the market price of goods. They are allocated regarding the area planted instead the volume of produce, which does not encourage the quality and intensity of the production"</i> (Šraj).
<b>Food Manufacturer</b>	Mlinotest uses re-use strategy instead of donations as they cooperate with Italian producer of pig feed to process the food that is still usable and lower the amount of waste in that way (Mlinotest, 2017).
	Ljubljanske Mlekarne's answer when asked about losing customers to donations: <i>"we donate products to carefully selected groups that are in need of help"</i> (Ljubljanske mlekarne).
<b>Food Retailer/Supermarket</b>	Mercator said that <i>"We have never seen donating as a disservice"</i> . They explained further that <i>"donations can be made in different forms as donating time, work, services or products. We see more sense in donating food directly than donating funds for the purchase of food."</i> (Mercator).
	<i>"We are aware that every action has positive and negative consequences"</i> (Tuš).
<b>Restaurant</b>	/
<b>Charity Organization</b>	/
<b>Politics</b>	<i>"When we donate food it is important that receivers are really the people in need. I support such donating greatly. But when the donation ends in the wrong hands - that is when we are destabilizing the market. When the food is donated we are losing potential consumers and in the long run it is not sustainable as those donations are lowering the price in the market. That is endangering position of the smallest and most vulnerable stakeholders in the market. That is why it is so important for donations to really go to the most endangered people"</i> (Podgoršek).
	<i>"Where can we redistribute large quantities aimed at Russia to? [...] Slovenian market is very small and already one truck full of peppers imported can seriously destabilize our market. [...] So it is a good aim to redistribute those apples to the people in need, but we must know, that those people will not buy apples and that will influence their price in the market"</i> (Podgoršek).
	<i>"Government financial support measures always only reimburse the costs to help receivers overcome the crisis. But the support is not development-oriented. Farms are economic entities and if they are only covering their production costs they will fail in the long run. All stakeholders in the FSC must aim to produce the products that sell at fair price that also enables development. Development of new technologies is important for survival"</i> (Podgoršek).

Donating itself is a practice that destabilizes the market – every end receiver of donations is a potential customer lost. Respondents agreed that if the donation ends up in a hand of receiver that could not afford to buy it anyway, that is not distortion. That is hard to oversee and control accordingly so therefore there are anomalies and loss of profits because of donations (Podgoršek). That can be de-motivating for donors and is not sustainable in the long run.

Subsidies for farmers are one of the government's methods to deal with surplus production. As mentioned by the respondents those are also not a sustainable solution to deal with food waste (Šraj, Podgoršek).

Responses show that food producers and retailers (see Table 9) are well aware of disruptive force of donations. Even though Ljubljanske Mlekarne do not discard any products at all in their production cycle and therefore have no waste, they donate their products to many charities. Their answer when asked about possibility of losing customers to donations shows their awareness of market disruptive consequences of donations (Ljubljanske Mlekarne). Mlinotest found an interesting solution for production surpluses – not throwing surpluses to waste but instead cooperating with other producers to re-use them and in that way not disturbing the market and consumer demand. Such solutions are scalable and therefore sustainable in the long run. Even though the previously mentioned framework of FoodDrinkEurope in their Food Donation Guidelines (see Figure 2) places recovery for human food above recovery for animal feed (FoodDrinkEurope, 2016), such a practice is more sustainable than donations and could be used especially among food producers.

### **5.2.5 Different motivation of stakeholders**

Most of the interviewees mentioned conflict of interests as one of the most important barriers for successful distribution of food. Conflicting opinions about motivation for donating arose during the interviews, as seen from responses in Table 10.

Donating is generally considered an honorable act, and was also mentioned in the interviews as such – see responses from Podlesnik and Musić in Table 10. Sometimes it can be also driven by other motivating factors, for instance as a mean to achieve positive public reputation (Podlesnik). FEBA has very strong guidelines against exploiting positive reputation through support of their charitable actions (Novit). As mentioned at some occasion during interviews wherever there is money involved in the charitable acts, there is potential for the conflict of interests (Podlesnik, Musić). Mr. Podlesnik mentioned another potential motivation for donor companies. Through their operation and report they get better hold of their surpluses and through it to their inefficiencies (see Table 10). Study of WRAP (2014) also showed similar results – “donating practices raised the visibility of

food surpluses at the back of the store and, on occasion, enabled the store to identify waste prevention opportunities”.

Table 10. Respondents’ statements on Limitation number 5: Different motivation of stakeholders

<b>Limitation nr. 5: Different motivation of stakeholders</b>	
<b>Agriculture</b>	/
<b>Food Manufacturer</b>	/
<b>Food Retailer/Supermarket</b>	<i>“We aim to raise the share of donated food as we are highly connected with the environment we work in and are aware of the problem of food surpluses, and social insecurity that is present all around us. Our main motivation is to help others in need” (Tuš).</i>
	<i>“Our corporate social responsibility and humanitarian purpose are our main motivators. Of course, we all wish that social security would be prevalent and food donations would not be necessary. But since socially insecure people exist, we are always seeking new forms of cooperation in charity projects” (Mercator).</i>
<b>Restaurant</b>	<i>“I respect everyone that wants to help others. But it is different when they get paid for it. They should at least not hide it. Bigger charity organizations in Slovenia all have their employees and that potentially leads to conflict of interests. There are only few people in Slovenia that do not expect anything in return for their charitable work” (Musić).</i>
<b>Charity Organization</b>	<i>“Most of the companies have already received applications for help and/or donations. Some just threw it away and others chose to help” (Podlesnik).</i>
	<i>“I see that companies we cooperate with have different motives for donating. Firstly, it is about the human nature of company’s leaders, their will to help. Secondly, it can also be about publicity and marketing. Alternatively, we have a donor that donates large quantities and does not want to be published at all. A third possible advantage is that companies also get good overview of their effectiveness through our reports – we were able to see that as one company after year and a half of our cooperation managed to lower their food waste to one-third of their initial volume” (Podlesnik).</i>
	<i>“There are also some people that just want publicity when they do something charitable. There are many such individuals” (Podlesnik).</i>
	<i>“When I started donating food many politicians showed up to show their support. I think they just wanted publicity. When I needed their help, and support they were nowhere” (Musić).</i>
	<i>“It is a shame If the government only seeks their own benefits in the cooperation and support of charity. FEBA has very strict guidelines against politicians seeking publicity through charity support” (Novit).</i>
<b>Politics</b>	/

Study of Mourad (2016) similarly found that organizations and companies in the FSC have different interests – “actors and organizations focused on pollution and environmental impacts tend to promote recycling, businesses looking for economic benefits encourage the

optimization of processes and sales, and non-profit entities with social goals dedicate themselves to food recovery and redistribution”. These findings are also in line with the study of Garrone et al. (2014). Their case study research revealed that donations often occur as a result of goodwill of individuals. They are the one who turn to charitable organizations when surplus food is generated (Garrone et al, 2014).

Motivation for donating is therefore linked more to the internal nature of individuals in the company than external motivation factors – as mentioned in the interviews by Podlesnik. Derqui, Fayos and Fernandez (2016) in their study of motivation of food service companies concluded that food waste will only be reduced through initiatives that make food waste management “profitable” for firms.

### 5.2.6 Passive role of the government

Slovenian success at lowering amount of food waste in previous years has been more a consequence of external factors than government actions, as can be seen from statements of Podgoršek in Table 11. Also statements of Lukner, Novit and Musić (see Table 11) express the same passive approach from the government about the issue.

Another insufficiently regulated area is value added taxes when donating, as mentioned by Tuš, Mercator, Podgoršek and Musić. That presented big limitation for donor companies as can be seen from responses in Table 11. In the United States for example, tax initiatives for food donors exist already more than 20 years. Good Samaritan Act was passed in 1996 in the US to facilitate food donations and protect donors benefiting from tax benefits. Many other countries followed with similar acts to encourage donations (Mourad, 2016).

A potential legislative change in Slovenia is discussed right now that the government submitted for consideration in the parliament in March 2017. Mr. Podlesnik has been involved in the discussion with the government since the beginning and his statements can be seen in Table 11.

Table 11. Respondents’ statements on Limitation number 6: Passive role of the government

<b>Limitation nr. 6: Passive role of the government</b>	
<b>Agriculture</b>	/
<b>Food Manufacturer</b>	/
<b>Food Retailer/Supermarket</b>	<i>“It would be a big achievement if a tax relief would be adopted in the legislation for food donations” (Tuš).</i>
	<i>“Higher tax reliefs and more relevant regulations for donating food reaching “best before” dates would be big steps into the right direction” (Mercator).</i>

table continues

continued

<b>Limitation nr. 6: Passive role of the government</b>	
<b>Restaurant</b>	<i>"I was the only one raising nothing, I gave everything from myself. At the beginning I got the feeling that government is ashamed of its inaction. I believe my initiative triggered some changes"</i> (Musić).
	<i>"For me the biggest pain was that I had to pay value added tax when donating food. If I throw the same food to the neighbors' dog, I do not have to pay the tax. That was what bothered me the most"</i> (Musić).
<b>Charity Organization</b>	<i>"It is sad that we have not got any government support, they only support well established big organizations. [...] Our work presents support to efforts of government and local communities. That is why we would expect higher level of their support"</i> (Novit).
	<i>"If everything in the country would be functioning well, our help with food redistribution would not even be needed"</i> (Lukner).
	<i>"I see a problem in political leaders wanting to please people. When Slovenian Red Cross publicly announced, they will not be redistributing food that reached its "best before" date, politicians publicly joined their intentions to please the public. Other European governments are doing just the opposite and are raising awareness of food waste problem. Politicians should not follow the initiative or feedback of few receivers, their role is about raising awareness of the public"</i> (Novit).
	On legislative changes: <i>"The coordination with the government has not been simple, we started in 2013 already. We have cooperated well with the Minister of agriculture Mr. Židan. We also searched for new possible solutions in cooperation with the Ministry of finance"</i> (Podlesnik).
	On legislative changes: <i>"It defines who is the donor, who is the intermediary, what can be donated, how it can be stimulated with tax reliefs, and that government can co-fund the equipment needed for implementation of donating practices"</i> (Podlesnik).
	On cooperation with local government bodies: <i>"At every location we aim to include the local community"</i> (Podlesnik).
<b>Politics</b>	<i>"I see food waste as one of the priorities, and an important issue for Mr. Židan, the Minister of agriculture. But otherwise, I think nobody in Slovenia is systematically dealing with the food waste problem"</i> (Podgoršek).
	<i>"If we want to achieve the EU goal to minimize the volume of food waste until 2030 for 50 percent, we need simple system solutions. It has been easier to lower the volume from 140 kilograms to 70 kilograms per capita per year than it will be from 70 kilograms to 35 kilograms. I think the main reason we have been successful in lowering the volume of food waste has been the financial crisis, especially its long duration. Consumers became more rational and thoughtful about our buying behavior. Such behavior dispersed through the whole supply chain"</i> (Podgoršek).
	<i>"Many companies have avoided donating food as it presented a cost for them and it was cheaper to throw away than donate the food"</i> (Podgoršek).

A tax relief of 0.3 percent of the taxable income has been effective from 2013 onwards. Most of the small and medium companies have never heard of it or took advantage of it (Šraj, Musić, Jurman), while Mercator has been aware of it and applies for it (Mercator).

Mr. Novit and Mr. Podlesnik both stressed out that cooperation with local community and their support is crucial and until now very successful. Both projects gained several communal facilities to operate from. Project Donated food also gained 11 employees through the system of public works (Podlesnik).

From everything mentioned above we can see that individuals and local communities are aware of importance of the charity organizations' effort. At the national level changes are being discussed as the EU directive is promoting measures against food waste. Contrastingly, neither system solution nor systematic plan to achieve it has yet been provided.

### **5.2.7 Misinterpretation of “best before” and other dates**

Sell-by, use-by, best before and other terms can be confusing for consumers. As the focus of my research is at the initial stages of FSC and not at end consumers, misinterpretation of use-by and best before dates is common limitation for effective donation of food that instead end up as waste.

Charity organizations have different ways of handling legislation regarding expiration dates. Slovenian food bank SIBAHE accepts and donates food with expired best before dates in original unopened packaging. Project Donated food accepts only pre-packed food which use-by or best before dates expire the same day so it is still before its expiration date. The marketing of foods after their 'best before' date has passed is not prohibited by EU legislation (apart from some specific food products). The condition should be met that the food is still safe and their appearance is not misleading. On the other hand, food passing its use by date is not considered safe for consumption anymore and should not be marketed (Valant, 2015).

In 2014, legislation has been changed in Slovenia regarding use of food after reaching its best before date. The implementation of the changes is still complex, as can be seen from statement of Mercator in Table 12. Mourad (2016) came to similar finding that “organizations are negotiating specific thresholds for moving food from one circuit to another, such as expiration dates that distinguish between saleable food, potentially donated food, and supposedly non-edible food to be thrown away”. EP report confirms Mercator's concern as it is not prohibited to clearly mark and sell products with expired best before dates, so far as it is assured that there is no health risk. As the companies are responsible for the safety of the sold items, the risk is too high and this is not a common practice (EP, 2012). Part of Mercator's answer: “*we could also raise distrust in the quality*



*of all the products we sell*” expresses liability concern and potential damage to reputation. That can be linked to the study of Waarts et al. (2011). Their results confirmed that producers set best before dates very conservatively in order to limit their risk in terms of product liability and potential damage to reputation. This is the same reason as why retailers decide to not re-label products which have passed their best before dates.

Table 12. Respondents’ statements on Limitation number 7: Misinterpretation of “best before” and other dates

<b>Limitation nr. 7: Misinterpretation of “best before” and other dates</b>	
<b>Agriculture</b>	/
<b>Food Manufacturer</b>	/
<b>Food Retailer/Supermarket</b>	<i>“So, this food is not food waste and at the same time it is not suitable for sale. If we sell those products inspection service can demand certificates of quality which can be extremely costly. That is why Mercator is not selling that food as we could also raise distrust in the quality of all the products we sell. Also, charity organizations do not accept such products. It is a field that raises many yet unanswered questions” (Mercator).</i>
	<i>“On the other hand, that also poses a question if the most vulnerable groups are receiving donations of bad, lower quality products or maybe even some that are not safe for consumption any more” (Mercator).</i>
<b>Restaurant</b>	/
<b>Charity Organization</b>	<i>“The problem is in low public awareness that food after best before date is not waste, but is still edible. Abroad it is a common practice to donate such food, but in Slovenia we still face resistance. End receivers of help and also some charity organizations say they feel less worthy if they accept or redistribute such food” (Novit).</i>
	<i>“After one of the biggest charity organizations in Slovenia publicly announced they will not redistribute food after its best before date, political figures followed their lead and publicly declared the socially impaired people should get only food other people buy in stores” (Novit).</i>
<b>Politics</b>	/

Mercator also stressed out the concern that: *“On the other hand, that also poses a question if the most vulnerable groups are receiving donations of bad, lower quality products or maybe even some that are not safe for consumption any more”*. That is another proof of conflicting public opinions about “best before” dates. The issue can be connected to the Limitation number 1 – Defining food waste and its influence on perception, as legislation about expire dates defines what is still edible and can be donated and what is considered waste.

As the problem is in misconception, media and public personas can be very influential. Mr. Novit mentions that in his statements (see Table 12). He sees a reason in politicians trying

to appeal to public. While the EU and some other foreign governments publicly accept and encourages donation of food after best before dates, Slovenian government is doing just the opposite and is not raising awareness of the issue (Novit).

### **5.2.8 Legislation and food hygiene rules**

Legislation regarding hygiene at food facilities is a necessary measure of all developed countries. Even small charity organization distributing food must be registered as food facility and follow all the rules and hygiene guidelines which is not easy to achieve when the operating workforce consists mostly of volunteers. But such rules can present a limitation when they are too tight or unadjusted for different areas, especially when allocating responsibilities between different stakeholders involved in the process of donating.

Limitations in practical implication of food hygiene rules can be seen from responses in Table 13. Also studies of Priefer et al. (2013), Waarts et al. (2011) and Lucifero (2016) confirmed that legal limits set by European Law are a significant driver for the generation of food waste and that they may come into conflict with the ambition of avoiding food waste.

Inspections are necessary, but can sometimes limit the effectiveness of food redistribution in charity organizations' efforts (see responses from Musić, Podlesnik and Pust in Table 13). From Mr. Podlesnik's statement on allocation of responsibilities between the stakeholders it can be seen that the charity organizations bear high risk and high responsibility which is not easy to ensure when most of the operations are run on the voluntary basis with many different individuals (Podlesnik).

To describe the problems organizations face when following all the obligations, let us take a look at distribution of warm prepared food. *"Such food represents 40 percent of volume of the food we distribute and it is also the one that our receivers value the most"* (Podlesnik). Mr. Podlesnik's statement on different indications on the labels (see Table 13) shows practical implication of different software of donor companies. That is a case of good practice how Food Safety Authority and other supervisory authorities can adapt the guidelines for the different occasions so they can be met in practice and still enable the donating of safe food instead throwing it away. The same was suggested also by the study of Garrone et al. (2014) with finding that an integrated approach to food waste and food security could be of significant value, especially in developed countries.

Other studies similarly recognized EU law as a limitation for dealing with food waste in some instances. Waarts et al. (2011) identified these legal limits set by European Law as a significant driver for the generation of food waste in primary production. EU's project against food waste FUSIONS made an overview of EU legislation with potential

implications on food waste – 20 legislative acts are directly linked to food waste with many others implicating it (Vittuari et al., 2015).

Table 13. Respondents' statements on Limitation number 8: Legislation and food hygiene rules

<b>Limitation nr. 8: Legislation and food hygiene rules</b>	
<b>Agriculture</b>	/
<b>Food Manufacturer</b>	/
<b>Food Retailer/ Supermarket</b>	<p><i>“Legislation has been adapted in previous years and the changes made supported the effort of charity organizations. Despite it all, we still fall behind other European countries. Legislation can still be a limitation for food donations” (Tuš).</i></p> <p><i>“We believe strict legislation is limiting charity organizations in the process of food distribution. Every change in the legislation about food hygiene requires the adjustment in the process how the food is delivered. For retailers it can mean extension of the work flow and additional work after the shops close in order to donate the food that remains” (Tuš).</i></p>
<b>Restaurant</b>	<i>“After I started donating food many inspectors visited my restaurant” (Musić).</i>
<b>Charity Organization</b>	<p><i>“Bureaucratic procedures are sometimes excessively implemented and are therefore limiting the process itself” (Pust).</i></p> <p><i>Some inspectors understand the limitations in practice while some just follow the written word. Food Safety Authority (Slo.: “Urad za varno hrano”) has to protect itself. But we see improvements made every year” (Podlesnik).</i></p> <p><i>“Our distribution facilities must be registered as food facilities and follow all the rules – we must have a list of allergens in the food and every volunteer must undergo HACCP training before they can start volunteering” (Podlesnik).”</i></p> <p><i>“We had a lecture about HACCP at the beginning – but I am not sure it is even possible to follow all the rules, even though we try to” (Pust).</i></p> <p><i>“Our organization has had many inspections. We guarantee for the safety of the food we serve... some receivers reported of being poisoned by the food we served. After the investigation it has been proven false” (Pust).</i></p> <p><i>“Last year our project has undergone 40 inspection visits regarding hygiene. [...] We have to tell every receiver the food they get has been prepared the previous day and has to be eaten today. We cannot control how long the receivers keep their food and when they actually consume it. Even if we take care of everything mentioned before there can be problems and it is impossible to prove that the problem stems from the food donated and not something else the receiver consumed. [...] Last year one of the receivers anonymously reported a food poisoning by the food he or she received. After the thorough investigation it was discovered that person had not even received our donations and the real reason was some personal dispute. [...] So, currently we have no knowledge of anybody getting poisoned by the food we distribute” (Podlesnik).</i></p>

table continues

continued

<b>Limitation nr. 8: Legislation and food hygiene rules</b>	
<b>Charity Organization</b>	On allocation of responsibilities between the stakeholders: <i>“We divide responsibilities with the partners in the contract. Association of Lions Clubs Slovenia bears high responsibility as an intermediary. We are obliged to transport all the food at our costs, follow the HACCP guidelines and bear responsibility for the quality and the safety of food from the acquisition point. We are obliged to compensate for any damage as a consequence of procedures taken against our donors as a consequence of the donations handed to our Association” (Podlesnik).</i>
	On redistribution of warm food while following all the standards: <i>“That food is classified as of high risk and that is why its temperature must be kept above 63 centigrade Celsius or below 5 centigrade Celsius at all times. Before warm food is packed and transported to the ramp where we receive it, the temperature will already fall below the allowed limit, and we should not accept it” (Podlesnik).</i>
	On different indications on the labels: <i>We also had problems because of different indications on the labels. As some retailers labeled warm prepared food we were able to take it and distribute it the next day, and as others did it was not allowed. Of course, companies will not adapt their whole software for that. [...] We found a solution through adaptation of official sanitary rules by Food Safety Authority where it is now written that warm food can be donated to the end receiver inside the 24 hour frame from the preparation time” (Podlesnik).</i>
<b>Politics</b>	/

### 5.2.9 Gleaning is not feasible

While gleaning is one of the most popular practices in food donating abroad, in Slovenia it is not very common, as can be seen from statements of Novit, Podlesnik and Podgoršek in the Table 14. Mr. Novit’s statement on not knowing the reason for uncommon gleaning practice in Slovenia shows there is interest for such activities but some unidentified limitations exist.

Gleaning is anti-waste and in most cases charitable practice well known abroad. When farmers do not yield whole of the produce (it can be because of insufficient size, because of low demand or just the price in the market do not justify the costs of harvesting) volunteers harvest the leftovers and use it. Foreign empirical studies have confirmed that crops being left in the fields are a substantial source of waste – 4.27 percent of fruits and vegetables are left on the field at the agricultural level in Italy (Segrè et al., 2012) and 7 percent of planted fields remain un-harvested in the United States (Kantor et al., 1997).

Table 14. Respondents' statements on Limitation number 9: Gleaning is not feasible

<b>Limitation nr. 9: Gleaning is not feasible</b>	
<b>Agriculture</b>	<i>"Sometimes farmers already plant some vegetables with the sole purpose of it being a fertilizer"</i> (Šraj).
<b>Food Manufacturer</b>	/
<b>Food Retailer/Supermarket</b>	/
<b>Restaurant</b>	/
<b>Charity Organization</b>	<i>"Sometimes we go and harvest remains in the fields, but it is very uncommon"</i> (Novit).
	<i>"I think it is not very popular as we only got a few donors that stood up to cooperate"</i> (Podlesnik).
	On not knowing the reason for uncommon gleaning practice in Slovenia: <i>"It would be very useful for us to know why so few farmers agree to such practices, we have no insight at the moment"</i> (Novit).
	<i>"We had previous negative experiences when letting people in the fruit orchard to harvest fruits for themselves for free. They damaged the trees and the equipment"</i> (Podlesnik).
	<i>"There are many reasons why I do not envision gleaning becoming a common practice in Slovenia in the next 5 years"</i> (Podlesnik).
	<i>"I only know of one case when the farmer from Prekmurje region had a lot of potatoes and the price in the market was that low that did not justify the harvest costs. He offered it to local charity. But that is an isolated case"</i> (Podgoršek).
<b>Politics</b>	<i>"Farmers are afraid that will become a standard for their work. Such practices in the long run lead to deterioration of the agricultural sector. It creates anomalies in the market and lowers the price and value of the produce in the long run"</i> (Podgoršek).

Through the interviews with other stakeholders some possible reasons for such practice to be exceptionally rare in Slovenia were identified as follows:

- Un-harvested produce becomes organic fertilizer for the fields if they plow it under. Otherwise they have to buy such fertilizers and those can be very expensive. *"Sometimes farmers already plant some vegetables with the sole purpose as being a fertilizer"* (Šraj).
- It takes some planning and organization of workforce for every harvest. You cannot just leave people unsupervised in the field. It can even be disturbing for your other activities (Šraj).
- It is considered unfair to its regular customers that still have to pay for the goods and could invoke resentment (Šraj).

- It is extremely hard from organizational viewpoint to find volunteers that would be prepared to do the harvesting in the middle of the day. It is even hard to find regular employees for the harvesting work (Podlesnik).
- Without knowledge and supervision people can do a lot of damage. *“We had previous negative experiences when letting people in the fruit orchard to harvest fruits for themselves for free. They damaged the trees and the equipment”* (Podlesnik).
- It is easier for a farmer to plough it under than to coordinate the harvest with some charity organization (Podlesnik).
- Another reason is that Slovenian farms are mostly small and the volume of unharvested produce is relatively low. It does not justify the organizational and logistic efforts (Podlesnik).
- There could even be bureaucratic problems if supervising authorities began to question the farmer about the employment relationship of the workers (Podlesnik).
- *“Farmers are afraid that will become a standard for their work. Such practices in the long run lead to deterioration of the agricultural sector. It creates anomalies in the market and lowers the price and value of the produce in the long run”* (Podgoršek)

*“These are many reasons why I do not envision gleaning becoming a common practice in Slovenia in the next 5 years”* (Podlesnik). We can see that there are many potential limitations for gleaning to become common food recovery practice in Slovenia as seen by opinions different stakeholders in the FSC. Not utilizing the practice of gleaning directly leads to more preventable food waste.

#### **5.2.10 High costs of logistics and transport**

One of the most commonly mentioned problems when donating food is logistics. Most of the organizations are collecting money for the purchase of their own vehicles for transport of donations (Novit, Podlesnik).

The statement of Mr. Podgoršek that it is not rational to expect the donor companies to also transport the food (see Table 15) goes hand in hand with experience of charity organizations. Mr. Novit said that they are cooperating with some local carriers who transport food free of charge in case when they get large quantities donated. He also mentioned that government support would be needed and appreciated on topic of logistics and transport. Similar is found in statement of Mr. Podlesnik in Table 15.

Mr. Podlesnik also sees transportation as one of the main obstacles. They wanted to expand their project also to food left at public institutions as schools and military centers. The project was stopped as the quantities of food were relatively small compared to geographic distance and logistics needed to run it. Statements of Mr. Podlesnik on high costs of transportation and logistics as seen in Table 16 formulated practical concern of cost of transportation being higher than the value of food donated. Another project that was

stopped because of high logistics costs was cooperation with restaurant chain Marché that was eager to donate fresh sandwiches that they replace in their display case every 4 hours because of their internal hygiene protocols (Podlesnik).

Table 15. Respondents' statements on Limitation number 10: High costs of logistics and transport

<b>Limitation nr. 10: High costs of logistics and transport</b>	
<b>Agriculture</b>	/
<b>Food Manufacturer</b>	/
<b>Food Retailer/Supermarket</b>	/
<b>Restaurant</b>	/
<b>Charity Organization</b>	On high costs of transportation and logistics: <i>“Is it worth it to drive 30 km and spend 3 hours to distribute 3 meals?”</i> (Podlesnik).
	On high costs of transportation and logistics: <i>“Due to their wide distribution net and distances the quantity did not justify the costs and they were not able to logistically provide the service”</i> (Podlesnik).
	<i>“If one of the public institutions or government would provide us with transportation vehicle, gas and public workers involved, then such a project would be feasible”</i> (Podlesnik).
	There is also the problem of suitable thermal containers and other equipment needed for transport of food, especially of food with high risk (for example meat products, fish, French salad, freshly prepared warm food, etc.) (Podlesnik).
	When one of the organizations wanted to expand their system of donors also with the hotels in the region, the main obstacle was finding suitable equipment (containers) to transport the food and to follow the HACCP guidelines which they are committed to do (Pust).
	<i>“Our organization would also support redistribution of fresh warm meals if we had the capacities needed. The system must be set this way so warm food travels fast to the end consumers”</i> (Novit).
	On high costs of transportation for volunteers: The problem is also that mostly it is <i>“a group of the same volunteers that transport food at their own costs and those can rise quite high for individual budget”</i> and that discourages some of the volunteers that are otherwise prepared to help (Pust).
<b>Politics</b>	<i>“It is not rational to expect companies that donated food to also transport it. That is a part of human psychology”</i> (Podgoršek).

Charity organizations many times do not have all the capacities needed, especially when it comes to the redistribution of warm food (see statements of Podlesnik, Pust and Novit in Table 15). In most of the organizations logistics is up to volunteers with their own vehicles which can be discouraging for the volunteers as costs can rise high (see statement of Pust on high costs of transportation for volunteers in Table 15).

The capabilities – both quantitative and qualitative – of non-profit organizations that collect and distribute surplus food play a key role in the recovery of surplus food (Garrone et al, 2014). Study of WRAP (2014) confirms resources required from charities to commit to regularly visit stores to collect food are one of the main limitations for such practices.

### 5.2.11 Required organizational changes for donors

Table 16. Respondents' statements on Limitation number 11: Required organizational changes for donors

<b>Limitation nr. 11: Required organizational changes for donors</b>	
<b>Agriculture</b>	<i>“Primary sector is at a disadvantage because the volume of produce is mostly fixed” (Šraj).</i>
<b>Food Manufacturer</b>	<i>/</i>
<b>Food Retailer/Supermarket</b>	<i>On donating meaning additional work for donors: “There is not much of additional work required as we only reorganized the existing processes” (Tuš).</i>
	<i>On donating meaning additional work for donors: “Preparing food for donating bears additional work for our staff. We see that additional time as a form of donation itself. Of course, also discarding food takes some preparation, but those processes are already implemented in our work routine” (Mercator).</i>
<b>Restaurant</b>	<i>/</i>
<b>Charity Organization</b>	<i>On inaccurate planning: “Probably that can be never predicted with 100 percent certainty” (Podlesnik).</i>
	<i>On donating meaning additional work for donors: “Donating food consumes time and energy of the supermarket employees – they need to pack everything, label it, put into boxes, prepare a record of all goods; instead of just throwing it in a container. [...] That is another responsibility for the employees that are sometimes already underpaid and not motivated” (Pust).</i>
	<i>“Sometimes donors have to adapt their software and that is important reason why integration is very time consuming and not simple at all.[...] Mercator’s internal evidence system is different from Tuš and different from Spar” (Podlesnik).</i>
<b>Politics</b>	<i>“Another reason for food waste are high expectations of consumers. We expect to buy freshly baked bread even if we enter the supermarket 5 minutes before its closing time” (Podgoršek).</i>
	<i>“The costs of food that gets thrown away are included in the higher price we pay for the products we buy. As long as we are willing to pay extra for that “luxury”, supermarkets will produce surplus and food will get thrown away” (Podgoršek).</i>
	<i>Different psychology that discount retailers adopt has good influence on lower volume of food waste. They do not supply all the products at all times and have smaller stock of the items. That is one of the reasons they can sell food at lower prices as “they do not bear the cost of food that is thrown away – not just the cost of disposal, also the price they paid to the distributor for the unsold goods” (Podgoršek).</i>



Food waste can never be completely avoided. At the level of retailers it is mostly connected with the inaccurate planning (Podlesnik, Podgoršek), as can be also seen from the statement of Mr. Podlesnik in Table 16.

There are other reasons why food waste cannot be completely avoided at level of organizations. Mr. Podgoršek (see his statements in Table 16) mentioned the influence of expectations of consumers to practices of supermarkets and how discount retailers can achieve lower prices through different expectations of consumers that allow lower amount of food waste. After all, consumers are the one that pay for such high level of service (Podgoršek). Mr. Šraj in his statement (see Table 16) mentioned inelasticity of supply for primary sector that makes it impossible for food waste to be completely avoided.

Donating food takes some organizational changes as it means additional work at the side of donor institution (and all the other stakeholders involved). That can be seen from statements of Ms. Pust, Tuš and Mercator on donating meaning additional work for donors in Table 16. Another problem for companies that are willing to donate food is internal recording of donations as mentioned by Mr. Podlesnik (see Table 16), that can present limitation for donating. Similar has been identified by previous studies. WRAP (2014) found internal processes as one of the main limitations for food donating by the supermarkets. The problem they acknowledged was that any associated cost savings of food donation will generally be offset by requirements for internal process reviews and changes, staff training and logistical considerations. Retailers have the motive to redistribute surpluses for further human consumption but complex internal processes and rules can obstruct the implementation. That was also confirmed by the responses we got during the interviews.

#### **5.2.12 Exploiting or negative attitude of receivers**

Receivers, their expectations and behavior influence donating practices and motivation of donors to cooperate. Cases mentioned in statements of Mr. Podgoršek, Mr. Podlesnik and Mr. Musić in Table 17 degenerate purpose of donating and even if very rare cast a bad image on the act of donating. Such donations are destabilizing the market and at the same time de-motivating donors. They also cast unfair image to other receivers. Some of the receivers even reported to get poisoned by food received, which thorough inspection later rebutted in all cases (Podlesnik, Pust).

Charity organizations are each using their own methods of identifying people in need. At Mr. Musić's restaurant receivers did not need any ID, it was enough that they just asked for it. He said that probably that is why each of the recipients wanted to share his or her story with him. At "Zavod Pod strehco" receivers identify themselves with a special card to get reduces price of the meal. *"It is very important that there is no stigma and no division between socially insecure and other customers. That is why the receivers identify*

*themselves with the card right at the end of service*” (Pust). At distribution facilities of project Donated food, they cooperate with other charity organizations that have their own list of socially insecure people in the area (as Karitas, Slovenian Red Cross, etc). Statements of Ms. Lukner and Mr. Podlesnik on documenting people in need show inefficiencies of formal listings (see Table 17). That was a reason they started making their own list of receivers. Every year they get more applicants and even though the volume of food donated is increasing it is never enough to help all of them (Lukner).

Table 17. Respondents’ statements on Limitation number 12: Exploiting or negative attitude of receivers

<b>Limitation nr. 12: Exploiting or negative attitude of receivers</b>	
<b>Agriculture</b>	/
<b>Food Manufacturer</b>	/
<b>Food Retailer/Supermarket</b>	/
<b>Restaurant</b>	<i>“There have been rare cases when people took advantage – once they wanted a free meal (as not being able to pay for it) and then ordered each 2 beers for the side for example. I said nothing, served them and at the end brought them extra box of fresh fruits to carry home. They never came again.”</i> (Musić).
<b>Charity Organization</b>	<i>“I heard from the volunteers from our distribution facilities about cases when a receiver came there in new BMW.”</i> (Podlesnik)
	<i>“People are different, each with their own personal distress, they are not all always grateful. Some demand and expect donations to belong to them, even starting fights. That is why organizations have to be careful, be prepared, have rules and structure and stick to it”</i> (Pust).
	That is also a reason why Zavod Pod strehco charge reduced price (0,50 EUR) for a meal even to socially insecure people. <i>“The purpose behind charging every meal comes from similar practices abroad and has shown successful in the field. It is for people to show respect for food they get. I believe the rate is low enough to be affordable also by people in need, and it is establishing respect towards food”</i> (Pust).
	<i>“Some receivers are also dissatisfied – I don’t eat hot dogs, you do not give enough meat in your packages, we get old bread, etc.”</i> (Podlesnik).
	On documenting people in need: <i>“A solution would be needed for periodically updating the data of receivers. Some people are insecure for some period and then not anymore”</i> (Podlesnik).
	On documenting people in need: <i>“many people in need are not recorded on official lists as socially insecure”</i> (Lukner).
<b>Politics</b>	<i>“There have been cases we hear about in media and read on forums when receivers of food packages drove there in Mercedes Benz.”</i> (Podgoršek).

### 5.2.13 Insufficient stimulations for the volunteers

As can be seen in the statement of Mr. Podlesnik in Table 18 charity organizations seem to have quite enough donors but a problem is in a number of volunteers.

Table 18. Respondents' statements on Limitation number 13: Insufficient stimulations for the volunteers

<b>Limitation nr. 13: Insufficient stimulations for the volunteers</b>	
<b>Agriculture</b>	/
<b>Food Manufacturer</b>	/
<b>Food Retailer/ Supermarket</b>	/
<b>Restaurant</b>	/
<b>Charity Organization</b>	<i>"There are more companies interested in donating but we just do not have enough volunteers to be able to distribute their donations"</i> (Podlesnik).
	The project "Donated food" is organized in a way that every day when the supermarket closes there must be one volunteer picking up the food for donation. <i>"That is every night, even during the day at the weekends"</i> (Pust).
	<i>"It is hard to find enough motivated people"</i> (Pust).
	Not all of the volunteers are reliable and sometimes the one in charge does not show up. That is bad for the relationship with a donor corporation (Pust, Podlesnik).
	<i>"It does not have to be financial; it could be as a free meal. I do not know how this is set up abroad but in Slovenia I see a blockage between organizations and their volunteers"</i> (Pust).
	<i>"If you employ someone you can demand something, but with the volunteers you cannot demand anything. But their responsibility is the same as if they would be employees"</i> (Podlesnik).
<b>Politics</b>	/

Ms. Pust described her experience as a volunteer (see Table 18). In her opinion some stimulation for the volunteers would be a positive change. They should be rewarded somehow – not necessarily in financial form but potentially with a free meal or something similar.

Also, not all of the volunteers are reliable and that can be bad for the relationship with a donor companies as mentioned by Ms. Pust and Mr. Podlesnik. *"If you employ someone you can demand something, but with the volunteers you cannot demand anything. But their responsibility is the same as they would be employees"* (Podlesnik). Ms. Pust believes this could be improved with better stimulation for the volunteers.

### 5.2.14 Competition instead of cooperation between charity organizations

Respondents believe that charity organizations are sometimes competing between each other, even when they work for a common goal – as can be seen from statements of Mr. Podlesnik and Mr. Novit in Table 19.

Table 19. Respondents' statements on Limitation number 14: Competition instead of cooperation between charity organizations

<b>Limitation nr. 14: Competition instead of cooperation between charity organizations</b>	
<b>Agriculture</b>	/
<b>Food Manufacturer</b>	/
<b>Food Retailer/Supermarket</b>	/
<b>Restaurant</b>	/
<b>Charity Organization</b>	<i>"We are constantly expanding the cooperation with other charity organizations" (Novit).</i>
	<i>"Our goal is open cooperation with other charity organizations" (Podlesnik).</i>
	<i>"There is no doubt charity organizations are competing with each other. Caritas publicly said they see us as a competition to them" (Novit).</i>
	<i>"Competition between organizations is a part of human nature. As we were not able to guarantee enough volunteers for distribution of food in all locations, we connected our efforts with Red Cross Slovenia. Our cooperation has always been very successful. But when it comes to media there can be a problem if all the partners are not mentioned in the right way. That has nothing to do with our work and the donated food, only with human ego. Now I ordered all the members of our association to mention our partners every time they speak publicly about our project" (Podlesnik).</i>
<b>Charity Organization</b>	<i>"Other organizations feel as they are left out, as Lions are collecting the food from Spar, while other organizations get nothing. Supermarkets cannot give food every day to someone else, there are over 100 organizations collecting food in Slovenia. Big supermarket chains cannot have big number of individual contracts with each of the organizations. They look at this rationally, through profits. That is why they are more willing to cooperate with organizations that have wider distribution nets. That is a reason for dissatisfaction between organizations. But we are all working with the same humanitarian goal" (Podlesnik).</i>
	<i>"Cooperating organizations are interconnected and are informing each other on daily basis. When we receive the donations one person is in charge to quickly sort out the food, decide what our organization can use in the next day and inform other organizations of the surplus they can take" (Pust).</i>
<b>Politics</b>	/

### 5.2.15 Inaccurate referencing in the media

Most of the interviewees mentioned the media as one of the potentially problematic aspects. In Slovenian media food waste and food charity donations are increasingly frequent topic (Podlesnik). As higher public awareness is crucial such publicity is deemed positive. But there are some evidences that the role of media is not always contributing in a positive way.

Table 20. Respondents' statements on Limitation number 15: Inaccurate referencing in the media

<b>Limitation nr. 15: Inaccurate referencing in the media</b>	
<b>Agriculture</b>	/
<b>Food Manufacturer</b>	/
<b>Food Retailer/ Supermarket</b>	/
<b>Restaurant</b>	/
<b>Charity Organization</b>	<i>"More publicity could encourage other volunteers"</i> (Pust).
	In some instances, local media are cooperative and interested in the topic, but not other media with wider publicity (Novit).
	<i>"Media always inflate the story"</i> (Musić).
	<i>"Media do not always write accurately. [...] Inaccurate referencing is a problem. That is why we have an agreement with all the partners and volunteers to always consult with each other before giving any statements about the project"</i> (Podlesnik).
<b>Politics</b>	/

Ms. Pust's statement in Table 20 shows that many volunteers and people that would be interested for cooperation are not aware of such projects. Mr. Novit mentions good cooperation with local media but not much support from bigger media houses. Mr. Musić said that *"media always inflate the story"*, stressing out also the negative impact. Mr. Podlesnik also mentions negative influence from the media when inaccurately referencing facts.

### 5.2.16 Strong lobby of waste management companies

Waste treatment and removal is defined by law and operated by few big international players in Slovenia. The companies selling food are recognizing food waste management as a costly practice (Jurman, Musić) and a strong lobby with entry barriers set high, which makes them a very powerful stakeholder in the FSC (Podlesnik). That can be seen from Podlesnik's statement in Table 21.

Table 21. Respondents' statements on Limitation number 16: Strong lobby of waste management companies

<b>Limitation nr. 16: Strong lobby of waste management companies</b>	
<b>Agriculture</b>	/
<b>Food Manufacturer</b>	/
<b>Food Retailer/Supermarket</b>	<i>In our stores we collect food waste separately and submit it to an authorized company that has all the permits and certificates required" (Tuš).</i>
	<i>"We cannot just throw away food waste, it has to be collected in special containers, and then we can submit those to a company authorized for bio waste management" (Mercator).</i>
<b>Restaurant</b>	<i>"10 – 20 percent of food in the restaurant remains unsold. All that food ends up in the container of the waste management company. All the restaurant owners are trying to reduce volume of waste to reduce their costs. That company is extremely big and profitable. They take waste oil to Austria, process it there and sell it back to Slovenia at a higher price. When I started donating meals I cut my waste management costs greatly" (Musić).</i>
	<i>"While we prepare all the meals after they are ordered and therefore do not throw away unsold meals, the remains from customers' plates presents big cost for us, as we can have up to 250 l of scraps daily and waste management is expensive" (Jurman).</i>
<b>Charity Organization</b>	<i>"There are companies that charge for waste treatment and removal. Then they burn it and sell the energy produced. This lobby is very strong" (Podlesnik).</i>
<b>Politics</b>	/

Mr. Musić in his statement (see Table 21) also mentions high power and costly services of food waste management companies, and how donating surpluses can actually lower the costs for food providers. High costs of food waste were also mentioned by Jurman restaurant (see statement in Table 21). Similar services are used and paid for by supermarkets as well (see statements of Tuš and Mercator in Table 21). They also mention the permits and the certificates that such providers need. These can present an entry barrier for other providers and therefore give higher negotiating power to waste management companies.

### 5.3 Recommendations

Through the research process potential solutions for many of the limitations arose. We propose the implementation of a common online platform that would connect donors (organizations, institutions, companies) with charity organizations. It would serve for more efficient organization of food redistribution. There are also some other potential solutions that could improve the situation.

### 5.3.1 Common online platform for food surplus distribution

WRAP (2014) suggest that food recovery would be done more efficiently (even up to 40 percent more) through retailer/charity interface (their study was focused on interaction supermarket-charity organization only) using IT and remote relationship management tools. Also in the study of Lasaridi et al. (2015) a web-based tool for waste prevention was implemented. There are many startups worldwide seeing it as a potential profit-making opportunity. One example is a mobile application from Chicago that connects American restaurants and caterers with local charities. They charge a fee to businesses that is proportional to their tax deductions for donating (Mourad, 2016). Slovenia has an app Foodsurplus from Smart Futuristic that specializes in marketing surplus food between companies (not yet used as a source of food donations) (SmartFuturistic, 2017).

During the interviews some of the similar solutions have been mentioned – *“one of our members last year organized a meeting with the government representatives and charity organizations to establish a common platform for food surplus distribution. Their interest was for donors to pay a fee for using it, which I see as a problem”* (Podlesnik); *“we (volunteers) were discussing option of using an app to see how much food remains and where, as quick dissemination of information is needed”* (Pust); *“I was talking with an owner of big HORECA company in Slovenia. They organized their food supply through an app to purchase food close to its “best before” date from other companies. Therefore, they serve high quality food at lower costs and prevent throwing food away”* (Podgoršek).

Therefore, a potential solution for many of the limitations discovered would be a common online platform that would connect donors (organizations, institutions, companies) with charity organizations. It would serve for more efficient organization of food redistribution. Donor would publicly post the information of food surplus they have. Any charity organization that would have resources needed (volunteers, transportation, storage, demand for that particular kind of food) could contact them directly through the platform and pick up the food at the specified time. If it is easier to imagine, we can describe the platform as “the Facebook for food surplus” for organizations.

We tested the proposition with some of the interviewees. In the following paragraphs we present advantages and disadvantages as seen from the respondents that represent various voices of potential users that could benefit from such platform.

One of the recognized limitations for higher effectiveness of food redistribution is in the competition instead cooperation of charity organizations; that could be improved with the common platform. *“A common platform would connect all the charity organizations to not see each other as competition”* (Pust). *“There are over 100 charity organizations in Slovenia collecting food. [...] Donors prefer to work with organizations with a wider net. That is a reason for dissatisfaction between organizations. But we are all working with the*

*same humanitarian goal” (Podlesnik). “Our organization and we (volunteers) are already using an app for coordination of our availability. [...] We have to make a use of the new technologies. Especially if they can help you achieve better response time. Information must be disseminated quickly” (Pust).*

A platform would also enable easier coordination of the donations. *“I believe a platform would be a big help for food donating” (Podgoršek). “Before the day ends nor employees nor volunteers know if any food will remain what quantity of it and what sort” (Mercator). “We can never know how much food we will receive. One time you might get a whole trunk of yoghurts and another time only bread (Pust). “When we receive 50 loafs of bread, we cannot redistribute them all in the same day alone. Solutions are needed. It is very difficult to coordinate the project as the volume of receivables is not known in advance” (Podlesnik).*

Such tool could enable donating for all companies and even motivate them to do so. At the same time, it would be raising public awareness of the problem of food waste. *“Such a project would be also good for promotion of corporate social responsibility of companies. It would have a very positive influence and media will love to report about it. They will have to publicly invite all companies to register and cooperate” (Musić).*

Common platform would be also very helpful in occurrence of extreme events such as: *“...there was a fire in the big storage facilities of Mercator that caused a power outage. They called me and asked me what we can take. We were able to organize two trucks to go there immediately. Those are extreme events” (Podlesnik). “In the case of extreme events it is also in the best interest of the company to donate the food quickly. They avoid costs of removal at least” (Podgoršek).* As most of the organizations have small capabilities for quick transport close to the location, their cooperation could bring to higher effectiveness of distribution.

Evidence and traceability are very important and should be enabled in the system. *“Records and traceability must be guaranteed. Where there is no traceability there is possibility of abuse” (Novit).*

There remains a problem of high cost of transportation and logistics, especially in the case of smaller quantities *“With government support for vehicles, gas and public workers it could be doable” (Podlesnik). “Such project could be also backed by the government as it could be very effective in lowering the amount of food waste” (Musić).* Another solution could also be in cooperation with agricultural cooperatives as they have their transportation means and could help with the distribution of food if stimulated properly (Podgoršek). As platform would enable better logistics and organization –for instance one organization could pick up food from more donors in the same area; organizations could divide geographical areas for picking up food; as quantities are known in advance they do not



have to drive twice to some locations - it also provides possibility to lower transportation costs.

As seen in the findings of the research following all hygienic guidelines and rules can be complicated and even risky for the donors. *“What if a company posts some food surplus and nobody responds. Will employees stay longer and wait for the response? Or will they just go home and leave the food there? The company could get fined for that in case an inspection arrives and they can even lose the certificate to operate”* (Podlesnik). That can only be improved by the closer cooperation of food safety authorities and charity organizations to find a way in which all the guidelines can be implemented in the process.

*“For some smaller companies it can be very rare, few times a year to have some food surplus. But on such an occasion they must know where to turn (Pust). “I assume it will take some time, but it will catch on. [...] It would be useful for many companies and even farmers. [...] Every restaurant owner must be able to handle the registration process by himself/herself”* (Musić). There could be a problem with the implementation, especially for the smaller stakeholders and farmers. *“For the smaller stores it is a question of the quantity of food that remains. A problem is also to find time and the interest for the entrepreneurs to use it. I doubt that small entrepreneurs would recognize some benefit in it”* (Podgoršek). *“Most of the farmers will not use it as there is a problem of computer illiteracy in the primary sector. But anyway, it is on the rise as younger generations are taking over farms. Still farming is time consuming and physically demanding work, if they work from 6am to 10 pm I doubt they will be posting something on the computer afterwards. Therefore, I think that it is better to focus on bigger organizations as agricultural cooperatives for instance. Those have administrative staff that could handle it. In that way, the platform could use the systemic solution already established in Slovenia. That also solves the problem of small quantities. Agricultural cooperatives even have their transportation means and could help with the distribution if stimulated properly”* (Podgoršek). Connecting with the cooperatives proved effective also in food waste reduction study done in Lithuania (Radzevičius, Ramanauskas, & Conto, 2016). Therefore they should not be excluded as another important stakeholder in the FSC.

Testing of the idea with the subjects and already established similar solutions abroad prove that a common platform is feasible to produce. Its implementation will require some time for the stakeholders to get used to using it. But most of the respondents believe that the solution is in the use of modern technologies and that those could bring positive changes.

From the opinions of interviewees we can draw some guidelines for the implementation for such or similar solution. It would be important to ensure traceability. At the moment each of the donors uses its own internal system of recording donations (Podlesnik). Common platform could improve that with standardized documentation provided for all stakeholders. It could also provide tools for easier record for internal control of the total

amount of donations for instance. The platform should be as simple to use as possible so the information can travel quickly and it is not time consuming for the users. Mr. Podgoršek mentioned the important stakeholders that should not be left out - unions and cooperatives. As the government must follow the EU initiatives to lower the amount of food waste for 50 percent until 2030 that could be an efficient step in the way of achieving it. Therefore the idea should be presented and discussed with the government. The results provided could serve as an initial market feedback and as a possibility for changes in the field.

### **5.3.2 Other recommendations**

Slovenia could become a role model regarding European food waste solutions because of its short geographical distances that can serve as a basis for closer stakeholder cooperation. With improved communication and cooperation between stakeholders we could overcome many limitations (regarding different motivation, passive role of government, market destabilization, unequal power distribution, inaccurate referencing in the media, etc.). A common platform described above is one of the possibilities for achieving that. Also a new political function added in 2015 – food supply chain relationships ombudsman shows awareness of the problem and provides solution for systematic improvements.

Potential tax reliefs as an additional motivation for donors are currently being discussed in the parliament. We hope to see some important improvements in Slovenia already in the short run. That would be our first and most important recommendation as it is also the most commonly mentioned limitation by the respondents. It has proven effective in many EU and other countries. In France for example, tax reliefs for donors were accepted many years ago and were even upgraded in the previous years to the current law that dictates to all the supermarkets to donate all edible excess food, getting fined if not doing so. Responsibilities for donating food are not prescribed by law and have to be coordinated between individual donor and the charity. Therefore, it is necessary to provide official liability rules to further motivate the donors with lower risks. Good Samaritan Act known in the United States for 20 years, and similarly implemented in many other countries, could effectively protect the donors. In the short run brochures with practical guidelines for donors could explain their liabilities to them as that has proven to be confusing even for big companies with experience in donating. Such measures are good motivation for donors.

We see another possible solution in shortening of the FSC. If there are less intermediates involved in the process there is less possibility of ineffective communications and food losses. Suppliers should work hand in hand with their buyers when planning supplies and quantities. As agricultural produce is fixed in the short term and any unexpected changes lead to waste, primary sector has to be protected with similar measures as seen in case of Russian embargo. If done regularly on smaller scale and carefully redistributed to not disrupt the market it could lead to better bargaining position of smaller stakeholders and

support domestic production. As Šraj suggested in the interview, the shorter FSC also raises awareness and value of food in the eyes of consumers, as they get better idea of what it takes to actually produce the food they eat.

Mr. Podgoršek mentioned that situation could be greatly improved by changing the Law on Public Procurement for public institutions. Only wider systemic solutions can effectively help Slovenia to reach EU goal of downgrading food waste for a half until 2030. Therefore, public procurement could be more effectively organized to purchase local surplus food that would otherwise end up as waste. That could be done through the similar platform mentioned before, that one of the HORECA companies is already using. In that way public institutions would get perfectly safe food of local origin, higher quality, lower cost and avoiding food waste at the same time. Current rules for public procurement prioritize price as the main factor which inevitably leads to lower quality food used for the most vulnerable groups in public institutions – children, sick and the elderly (Podgoršek).

In our opinion, it is important to start publicly discussing the issue of food waste to raise awareness. That in larger part regards the food labeling with “best before” dates. A public consent is needed. This would encourage the work of charity organizations, give a positive signal to receivers of food donations, lower the amount of waste and even raise awareness between consumers to not throw food away just because its “best before” date has been reached.

## **CONCLUSION**

Even though Slovenia has one of the lowest per capita food waste in the EU, with 73 kilograms of food waste per capita there is still a lot of place for improvement. Even more so, when we take into account that average person in Slovenia throws away 27 kilograms of edible food. Contrastingly, nearly 6 percent of population is seriously materially deprived. Food recovery hierarchy describes that the most preferable option for food waste management is prevention. This is followed by actions of redirecting excess food to feed people, redirecting it to feed animals and only then to direct it to waste treatment as the least preferable option (but currently still the most common). Through the qualitative research 16 limitations have been discovered. These limit the effective redistribution of food to the people in need in Slovenia.

The study shows that in case of food donating we should not be talking about “food waste” as that term brings a negative connotation, especially to the receivers of food. Improved communication between stakeholders is needed for more precise planning in the production and purchase process to avoid food waste. Another problem is the unequal power distribution in the FSC – bigger stakeholders have superior negotiating power and some practices forced upon suppliers lead to food waste. Another limitation, that is not

commonly mentioned but is of big importance, is the fact that donating destabilizes the market – “people that get will not buy” which leads to further price drops which is not stimulating for donor companies. Stakeholders have different motivation for donating – from public image and media attention, to humanitarian tendencies of decision makers in the company, to a better record of inefficiencies in the purchasing process, etc. With a more active role of the government some common initiatives could be established to motivate all the donors. There are conflicting opinions about distributing food that reached its “best before” date but is still perfectly safe for consummation and the legislation is confusing for the practical implications. Legislation regarding food hygiene does not provide effective guidelines for food donating and is often limiting in practice. Quantities of food collected are typically small and therefore the high transportation and logistics costs are problematic. Gleaning is a common anti-food-waste measure in Western Europe but has proven not feasible in Slovenia. Inaccurate referencing in the media, required organizational changes, exploiting acts of the receivers, not enough stimulation for the volunteers, competition between the charity organizations and strong lobby of waste management companies are other limiting factors for the effective food waste recovery.

Some of the limitations discovered are similar to results of other studies done in other countries with the particular groups of stakeholders. That shows that individual limitations are similar in different countries and therefore solutions that prove effective in one market should be implemented also abroad. Contrastingly, there has not been a lot of research done on the FSC as a whole about limitations present on systemic and cooperation level. Low level of communication between the stakeholders, unequal power distribution in the FSC, market destabilization and different motivations of stakeholder are some of the limitations that can be discovered only with wider research of the FSC as whole, and represent a contribution to the previous research on the topic.

Further research on the topic is needed to raise awareness to the issue and enable practical changes. There is shortage of research in the field of food waste and food redistribution to charity in Slovenia. More in-depth research could be done at each stage of the FSC to find limitations and motivating factors for each level of stakeholders. A thorough review of all legislation on donating would be an important academic contribution to support actions in practice as there is a lot of confusion and lack of knowledge about liabilities, hygiene rules, legislation and tax incentives. We deliberately left out consumers from the study, even though households are the biggest source of food waste in developed countries. Consumer behavior studies are most prevalent when addressing the food waste problem, and therefore a lot has already been discovered in the field. We found none such studies particular for the Slovenian market, and comparison of consumer behavior could be linked with findings from abroad. A study of public communications regarding food waste in Slovenia and in other countries could prescribe communication guidelines for the topic. For wider research

European countries' measures against food waste could be compared along with their implications and serve as examples of good practice for other countries.

Food waste is a highly topical issue that is gaining importance in the last decade and we can see steep growth in public discussions, academic research, policy changes and public awareness. With an optimistic goal to lower the amount of waste for 50 percent in the EU until 2030, Slovenia (and other members) still has a long way to go. We hope that this and other similar studies can lead the way for the effective practical changes.

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## **APPENDIXES**



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## Appendix A: Summary in Slovenian language

### POVZETEK

Zavržena hrana je globalni problem, kateremu se v zadnjem desetletju namenja vse več pozornosti. Po podatkih Združenih narodov kar ena tretjina globalno pridelane hrane za ljudi, konča zavržena (FAO, 2015). To pomeni 1,3 milijarde ton zavrženega nutricionističnega potenciala (Gustavsson et al., 2011). Poleg tega vsak kilogram zavržene hrane pomeni tudi zavržene resurse, ki so vpleteni v proizvodnjo hrane – energija, voda, izraba zemlje, ipd. Zmanjšanje količine zavržene hrane se smatra kot pomembna možnost za reševanje globalnega pomanjkanja hrane (Garnett et al., 2014; Gustavsson et al., 2011). V letu 2015 je bilo 800 milijonov ljudi na svetu prikrajšanih za zadostno količino hrane za preživetje (FAO, 2015). Problem podhranjenosti ni povezan zgolj z državami v razvoju. Tudi v Evropi je podhranjenih 43,6 milijona ljudi (Gentilini, 2013). Za primerjavo – evropske države povprečno letno zavržejo 179 kilogramov hrane na prebivalca (O'Connor, 2013). Količina zavržene hrane v Evropi bi lahko nahranila 200 milijonov ljudi. Omejen dostop do hrane je prisoten tudi v Sloveniji. 6 odstotkov ljudi je bilo materialno prikrajšanih v letu 2015. 8 odstotkov ljudi si ne more privoščiti toplega obroka z mesom (oz. vegetarijanskim nadomestilom) vsaj vsak drugi dan in zaradi ekonomskih omejitev nima rednega dostopa do kvalitetne hrane (SURs, 2016b). V Sloveniji letno zavržemo 150.000 ton hrane in 27 kilogramov užitne hrane na prebivalca (SURs, 2016a). Povezava med omejenim dostopom do hrane za revnejše sloje prebivalstva in visoko količino zavržene hrane kaže na neučinkovitosti in omejitve pri primerni redistribuciji hrane, ki bi hkrati blažila obe težavi. Hierarhija predelave hrane (ang. »*Food recovery hierarchy*«) uvršča takšno preusmeritev kot najbolj sprejemljiv ukrep glede upravljanja z zavrženo hrano (EUC, 2014).

Namen magistrske naloge je ugotoviti ovire, ki so prisotne, da ne more biti večja količina zavržene hrane preusmerjena kot donacije ljudem v stiski. Problem je obravnavan celostno, skozi oči različnih deležnikov v verigi prekrbe s hrano ter deležniki v prostovoljskih organizacijah. Raziskovalno vprašanje se glasi: »Zakaj ni večja količina zavržene užitne hrane v Sloveniji preusmerjena v donacije pomoči potrebnim?« Končen cilj naloge je opisni seznam ovir, ki so prisotne v praksi in se z njimi srečujejo deležniki v verigi preskrbe s hrano.

Ker gre za nov celosten pogled na problematiko, ki predhodno še ni bil obravnavan, je bila uporabljena kvalitativna raziskovalna metoda polstrukturiranih intervjujev z različnimi deležniki. Polstrukturirani intervjuji so omogočili, da so intervjuvanci sami izrazili ovire, ki jih vidijo kot glavne težave v praksi. Med intervjuji so bile nato najdene vzporednice glede ovir, s katerimi se v praksi srečujejo pridelovalci hrane, trgovine, restavracije, prostovoljske organizacije ter politična telesa.

Identificiranih je bilo 16 sistemskih ovir, ki otežujejo redistribucijo odpadne hrane v dobrodelne namene. Tovrstne donirane hrane naj ne bi imenovali »zavržena hrana«, saj to vzbudi negativno in manjvredno predstavo pri ljudeh, še posebej prejemnikov. Potrebna je bolj učinkovita komunikacija med deležniki za učinkovitejše planiranje, nabavo ter redistribucijo hrane v izogib odmetu. Tretja ovira je neenakomerna porazdelitev moči med deležniki, s čimer lahko večji deležniki z več moči določajo pogoje, ki ovirajo učinkovito ravnanje s presežkom hrane. Četrta ovira je destabilizacija povpraševanja, ki jo povzroči doniranje hrane, saj posledično ustvarja nove presežke v ponudbi ter niža ceno. Podjetja, ki hrano donirajo, imajo različne motive za doniranje. Po zgledu drugih držav bi se lahko motiviralo več podjetij k doniranju hrane skozi davčne olajšave. Glede hrane, ki doseže rok »Uporabiti najmanj do« in je še popolnoma varna za uživanje, ni enotnega državnega konsenza o njeni uporabi in redistribuciji. Tudi zakonodaja o higieni živil ni prilagojena za primere doniranja hrane in večkrat omejuje preusmeritev zavržene hrane v praksi. Ker so količine dnevno zavržene hrane na posameznik lokacijah majhne in lokacijsko decentralizirane, vrednost donacij večkrat ne upraviči stroškov prevoza in logistike. »Gleaning« oziroma pobiranje nepobranih pridelkov s polj je v tujini pogosto uporabljen način za zmanjšanje količine zavržene hrane, ki se ga poslužujejo številne dobrodelne organizacije. V Sloveniji zaradi manjših kapacitet pridelovalcev in drugih faktorjev v praksi ni učinkovit. Nepravilno poročanje v medijih, potrebna reorganizacija znotraj podjetij za omogočanje donacij, potencialno izkoriščanje s strani prejemnikov, neprimerne spodbude za prostovoljce, tekmovalnost in nepovezovanje med dobrodelnimi organizacijami in močen lobij podjetij za predelovanje odpadkov so druge prisotne ovire, ki onemogočajo učinkovito redistribucijo viškov hrane v humanitarne namene.

Ovire, odkrite v raziskavi, se delno ujemajo z ovirami prepoznanimi v tujih raziskavah. To kaže, da obstajajo vzporednice in se lahko nacionalne rešitve, ki se izkažejo za učinkovite, uporabi tudi drugje. Večina raziskav se osredotoča zgolj na posamezne deležnike znotraj verige preskrbe s hrano. Nova spoznanja, ki pridejo iz povezav in odnosov med deležniki, lahko koristno pripomorejo k izboljšanju situacije. Nizka stopnja komunikacije med deležniki, neenakomerna porazdelitev moči med deležniki, destabilizacija trga in različne motivacije deležnikov so ovire, ki jih zgolj s fokusiranjem na posamezen člen oskrbne verige ne bi odkrili.

Zaradi geografske zgoščenosti ter nižjega števila deležnikov v primerjavi z večjimi državami, ima Slovenija možnost postati ena izmed vodilnih držav po deležu preusmerjenih viškov hrane v dobrodelne namene. Delujoče prakse se lahko v naslednjem koraku prenašajo med državami. Ena od predlaganih rešitev je skupna platforma za preumerjanje viškov hrane med vsemi vpletenimi organizacijami in podjetji. Preko skupne platforme bi lahko v realnem času komunicirali in koordinirali viške, da se jih čim večji delež pravočasno preusmeri. Dodatna spodbuda za nadaljna dejanja je odločitev Evropske Unije zmanjšati odpad hrane za 50 odstotkov do leta 2030.

## **Appendix B: List of abbreviations**

DoR – Degree of Recoverability

EC – European Commission

EFSA – European Food Safety Authority

EP – European Parliament

EU – European Union

EUC – European Committee

FAO – Food and Agriculture Organization of the United Nations

FEBA – European Federation of Food Banks

FSC – Food Supply Chain

FUSIONS – Food Use for Social Innovation by Optimising Waste Prevention Strategies

HACCP – Hazard analysis and critical control points

OECD – Organisation for Economic Co-operation and Development

SCP – Sustainable Consumption and Production

SURS – Statistical Office of Republic of Slovenia

UN – United Nations

UNEP – United Nations Environment Programme

WEF – World Economic Forum

WHO – World Health Organization

WRAP – Waste and Resources Action Programme of the United Kingdom

WTO – World Trade Organization

## Appendix C: Research sample – presentation of individual respondents

Table 1. Research sample – individual respondents

Stage in FSC	Organization or project	Person interviewed	Date of the interview	Method
<b>Agriculture</b>	Farm Šraj/ <i>Kmetija Šraj</i>	Uroš Šraj (MSc student of Agriculture, works at family owned farm)	February 25, 2017	In person
<b>Food manufacturer</b>	Ljubljanske mlekarne	Renata Lovrak (Corporate Communication Director)	March 13, 2017	E-mail
<b>Food manufacturer</b>	Mlinotest	Ana Velikonja (head of R&D)	March 20, 2017	E-mail
<b>Food Retailer/Supermarket</b>	Tuš	Laura Gričar (Corporate Communications)	March 1, 2017	E-mail
<b>Food Retailer/Supermarket</b>	Mercator	Mateja Suljič (Corporate Communications)	March 7, 2017	E-mail
<b>Restaurant</b>	Jurman	Anonymous (CEO)	March 7, 2017	In person
<b>Restaurant (also Charity organization*)</b>	Ham Ham	Enes Musić (owner and CEO)	March 7, 2017	In person
<b>Charity organization</b>	Ana's Little Star/ <i>Anina zvezdica</i>	Ana Lukner (founder)	January 18, 2017	Skype
<b>Charity organization</b>	Slovenian Food bank/ <i>Slovenska banka hrane SIBAHE</i>	Alen Novit (director)	February 2, 2017	In person
<b>Charity organization</b>	<i>Zavod Pod strehco</i>	Sonia Pust (active volunteer)	February 7, 2017	In person
<b>Charity organization</b>	Project Donated food ( <i>Zveza Lions klubov Slovenije</i> )	Zdene Podlesnik (Project Coordinator)	March 8, 2017	In person
<b>Politics</b>	Food Supply Chain Relationships Ombudsman	Jože Podgoršek (current Food Supply Chain Relationships Ombudsman)	March 14, 2017	In person

\*Note: Restaurant Ham Ham gained a lot of publicity in 2014 for their charitable acts of redistributing free food to people in need even though it was a privately owned restaurant, and was not registered as a charity organization. Experiences gained also shed light to the limitations charity organizations are dealing with.

## **Appendix D: Questionnaire for farmers**

1. Was there an occasion you can think of in the last 5 years that you had to throw away a part of the produce? Which kind of produce and why?
2. What do you usually do with the fruits and vegetables that remain unsold and are no longer suitable for sale at the end of the day in the market?
3. Do you excrete products that are not of right size or visual appearance? What do you do with it? Have you ever offered also those to customers at lower price?
4. Do you ever leave part of the produce un-harvested? What is the reason for it?
5. Have you ever considered donating surplus food? What are the main obstacles you see for such practices?
6. If you had some produce left that you would like to donate – which charity organization(s) would you contact?
7. If charity organization would contact you with a request to harvest produce left in the field to use it for charity – what pros and cons can you think of?
8. Do you perceive donating products unfair to your regular clients that still pay for it?
9. What are main factors you see against practice of donating food surplus?
10. Are you aware that there are tax reliefs for donors in Slovenia?
11. Can you think of any possible system change that would motivate you to donate food surplus?
12. Is there anything you would like to add?

## **Appendix E: Questionnaire for food manufacturers**

1. What kind of food do you throw away the most? Is it raw materials or finished products? What are the quantities?
2. Do you run any record of food waste?
3. Which are the most common reasons for dumping food?
4. Which food waste management practices are the most common?
5. What is the cost of food waste management for your company?
6. Do you donate food or cooperate with any charity organization? In what way?
7. Do you plan to increase or decrease the share of donated food in the surplus food in the future?
8. How much additional costs, work and organization does it take for food to be donated in instead to be thrown away?
9. What are main factors you see against practice of donating food surplus?
10. Can you think of any possible system change that would additionally motivate you/your company to donate food surplus?
11. Do you perceive donating products unfair to your regular clients that still pay for it?
12. Have your company ever had negative experience with donating food?
13. Are you aware that there are tax reliefs for donors in Slovenia?
14. Is there anything you would like to add?

## **Appendix F: Questionnaire for restaurants**

1. How much food usually remains unsold at the end of the day in the restaurant? What do you usually do with it?
2. Do you have to pay for the removal of food waste? To whom and how much?
3. What do you do with the scraps left on the plate by customers?
4. Are you offering smaller portions to guests if ordered?
1. Have you ever considered donating surplus food? What are the main obstacles you see for such practices?
2. Why would any restaurant prefer to throw edible food away than to donate it?
3. Do you perceive donating meals unfair to your regular clients that still pay for it?
4. What are main factors you see against practice of donating food surplus?
5. Are you aware that there are tax reliefs for donors in Slovenia?
6. If you had some food left that you would like to donate – which charity organization(s) would you contact?
7. Can you think of any possible system change that would motivate you/your company to donate food surplus?
8. Is there anything you would like to add?

## **Appendix G: Questionnaire for supermarkets**

1. What kind of food products do you throw away the most? What are the quantities?
2. Do you run any record of food waste?
3. Which are the most common reasons for dumping food?
4. Which food waste management practices are the most common?
5. What is the cost of food waste management for your company?
6. What motivated you/your company to donate surplus food?
7. Do you plan to increase or decrease the share of donated food in the surplus food in the future?
8. How much additional costs, work and organization does it take for food to be donated in instead to be thrown away?
9. What are main factors you see against practice of donating food surplus?
10. Can you think of any possible system change that would additionally motivate you/your company to donate food surplus?
11. Do you perceive donating products unfair to your regular clients that still pay for it?
12. Have your company ever had negative experience with donating food?
13. Are you aware that there are tax reliefs for donors in Slovenia?
14. Is there anything you would like to add?



## **Appendix H: Questionnaire for charity organizations**

1. Which are the main sources of food donations? Institutions, companies or individuals?
2. What kinds of food you usually distribute? What are the quantities?
3. How much interest is there among other companies for donating? What is their main motivation for donating?
4. Do you perceive cooperation between charity organizations important? Which other organizations are you cooperating with?
5. Which are the limitations for effective cooperation of organizations?
6. Which processes are the most difficult to carry out or take the most time in your organization?
7. Do you ever refuse or throw away donations?
8. Was there any new project you wanted to start that did not succeed? Why it did not succeed?
9. Who is responsible for safety of the donated food? Who would be hold accountable is hypothetical case that receiver gets poisoned from donated food?
10. Have you received any government support for your charity?
11. Is legislation limiting your effectiveness in any way?
12. Which legislative changes would you like to see implemented in the next years in the area of food donating?
13. What do you see as the biggest limitation for effectiveness of your organization?
14. Have you ever organized »gleaning«? If not, why not? Why do you think that practice is not so common in Slovenia?
15. Which solutions and changes from abroad do you find as the most effective in area of food waste and food donating?
16. Is there anything you would like to add?

## **Appendix I: Questionnaire for political functionary (the Ombudsman)**

1. Do you consider problem of food waste as being of high importance for the government?
2. What changes were done in the last years regarding tackling the food waste?
3. What could be further done to lower the amount of food waste in Slovenia in your opinion?
4. Do you see donating of food surplus as a good solution for lowering the amount of food waste?
5. Do you believe that relationships between the stakeholders in the food supply chain influence the amount of food waste? How?
6. Can you think of any good practices of cooperation between stakeholders to avoid food waste?
7. Who is responsible for safety of the donated food? Who would be held accountable in hypothetical case that receiver gets poisoned from donated food?
8. In your opinion, why would companies prefer to throw food away rather than donate it?
9. Do you know of any case where »*gleaning*« was organized in Slovenia? Why do you think that practice is not so common in Slovenia?
10. Which legislative changes would you like to see implemented in the next years in the area of food waste and food donating?
11. Which solutions and changes from abroad do you find as the most effective in area of food waste and food donating?
12. Would a common platform for distribution of food surpluses for all stakeholders (companies, institutions, farmers, charity organization) improve the current situation?
13. Is there anything you would like to add?