

# TAKING THE TRANSFORMATION PATHWAY

## FOOD WASTE PREVENTION MEASURES IN DAY-CARE CENTRES IN COPENHAGEN

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Lund University Centre for  
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## **ABSTRACT**

We are currently using the planet's limited resources in a very unsustainable way: around one-third of all food produced for human consumption is wasted each year, which has immense environmental, social and economic consequences. Even though ranked as one of the most sustainable countries in the world, Denmark still wastes annually food worth €1.1billion. To reduce the amount of food waste and all its consequences, preventing avoidable food waste is the most preferred option.

With the help of the transition theory as well as the theory of the diffusion of innovations, this thesis explores how innovations to prevent food waste can lead to a more sustainable food waste regime. The thesis contributes therefore to sustainability science through linking research on problem structures with a solution-oriented approach that seeks to understand, diffuse and scale up food waste prevention measures.

Destructive landscape changes, such as the financial crisis, global population growth, climate change and the ambitious future food waste reduction targets of the EU, cause an emerging visibility of food waste in all areas of society and put immense pressure on the underlying regime level. As suggested by the concept of transition pathways, regime actors, such as the government of Denmark and the city of Copenhagen, have started to react and adjust to the described landscape pressures. The identified innovation of food waste prevention measures in the case of day-care kitchens in Copenhagen tackles all main causes of food waste in the food service sector. If those innovations are stable and diffused to a certain extent, they might be adopted as add-ons by regime-actors. This can lead to a change of practices, an overall reduction of food waste and consequently to a transformation towards a more sustainable food waste regime. Regime actors could enhance the diffusion of the measures for example through the use of homophilous change agents, the promotion of perceived characteristics of the measures and the effective use of different communication channels.

**Keywords:** Food Waste, Food Waste Prevention, Food Waste Regime, Public Institutions, Sustainability, Transformation Pathway

**Word count (thesis): 13,828**

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And last but not least, I would like to thank our small LUMES-bubble for sharing the same passion, motivations, hopes as well as cynicism, fears and doubts and countless meals while bringing new perspectives, ideas and Spätzle into my life: *"Never doubt that a small group of thoughtful, committed people can change the world – indeed, it is the only thing that ever has."* (Margaret Mead)

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## **ABBREVIATIONS**

EU	European Union
FAO	Food and Agriculture Organization of the United Nations
IFAD	International Fund for Agricultural Development
IPCC	Intergovernmental Panel on Climate Change
UNEP	United Nations Environment Programme
WFP	United Nations World Food Programme

# 1 INTRODUCTION

## 1.1 FOOD WASTE AS SUSTAINABILITY CHALLENGE

“To ‘waste’ a resource is to inefficiently exploit its possibilities or fail to realize its full potential” (O'Brien, 2008, p. 5). When looking at the food system and the immense amount of waste we are generating, it is clear that we are currently doing exactly that: globally approximately 1.3 billion tons of food are wasted each year, which adds up to around one-third of all food produced for human consumption<sup>1</sup> (Gustavsson, Cederberg, Sonesson, Otterdijk, & Meybeck, 2011).

Because of this unsustainable usage of the planet's limited resources, food waste represents a sustainability challenge as it has significant impacts on our environmental, social and economic systems. Food waste intensifies all *environmental impacts* of our current food system, because “of the water, land, energy and other natural resources used to produce food that no one consumes” (FAO, 2014, p. 3). This puts enormous pressure on the earth system processes as a whole, leading to the crossing of biophysical thresholds which will have disastrous consequences for humanity (Steffen et al., 2015). To give an impression of the scale of the problem: around 1.4 billion hectares of land are globally used for the production of wasted food. This represents an area bigger than Canada and close to 30% of the world's agricultural land area (FAO, 2013a). Additionally, during the production of food that is later wasted, 3.3 gigatons of CO<sub>2</sub> equivalent are emitted (not accounting for greenhouse gas emissions from land use change), which makes food waste the third biggest greenhouse gas emitter after the U.S. and China (FAO, 2013a). If disposed into landfills, food waste also emits CO<sub>2</sub> as well as methane and may cause environmental pollution (Papargyropoulou, Lozano, Steinberger, Wright, & Ujang, 2014). In addition to these environmental consequences of wasting food, it also raises the *social question* about the ethical and moral aspects of wasting one-third of produced food when 870 million people go hungry every day (FAO, 2013b). Finally, food waste also has an immense negative *economic impact*. In addition to the final disposal costs (Papargyropoulou et al., 2014), it is estimated that the value of food wasted annually at the global level is between US\$ 750 billion – 1 trillion (FAO, 2013a, 2014).

Even Denmark, ranked as one of the most sustainable countries in the world (Emerson et al., 2014), is no exception when it comes to food waste. It is estimated that each Dane generates around 146 kg of food waste each year, which is just below the European average of 180 kg per capita (Katsarova, 2014). At the

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<sup>1</sup> “Industrialized and developing countries dissipate roughly the same quantities of food — respectively 670 and 630 million tonnes.” However, in “developing countries 40% of losses occur at post-harvest and processing levels while in industrialized countries more than 40% of losses happen at retail and consumer levels” (FAO, n.d.).

same time, more than 6,000 people in Denmark are homeless and around 300,000 people are living below the OECD poverty line and depend on food banks (Stop Spild Af Mad, 2015).

Our current unsustainable food waste regime encompasses institutions and conventions that influence the production and distributions of food waste as well as its understanding (Gille, 2013). To transform it and reduce the environmental, social and economic impacts, avoidable food waste needs first and foremost to be prevented and unavoidable food waste needs to be re-used or recycled before incinerated or landfilled. Avoidable food waste includes food, which could have been eaten but was instead discarded. Unavoidable food waste accounts for food that is not, and has not been edible under normal circumstances, like egg shells or meat bones (Petersen et al., 2014).

An implementation of sustainable solutions and innovations preventing food waste at regional, national and global levels would therefore considerably increase the efficiency of the whole food chain with positive effects on the environment as well as our social and economic system. Since Denmark has a high potential to reduce food waste and Denmark's own key goal is to create a green and sustainable society (Ministry of Foreign Affairs of Denmark, 2015), it can "serve as an exemplary test-site for innovation, evaluating what innovative elements in food waste prevention can be transferred to the EU and global context" (Halloran, Clement, Kornum, Bucatariu, & Magid, 2014, p. 294). A practical example of those food waste prevention innovations has been already developed and implemented in some day-care kitchens in the Danish capital. In Denmark, institutions like day-care centres, schools or nursing homes are responsible for the generation of around 26,100tons ( $\pm 50\%$ ) of food waste every year and account therefore for 10% of the total food waste produced by the Danish service sector (Petersen et al., 2014). Food waste prevention in those public institutions could contribute to an overall reduction of food waste. Public institutions can consequently function as facilitators and role models for a transformation towards less food waste and thus a more sustainable food waste regime. Therefore, waste prevention measures in public institutions will be the scope of this thesis.

## **1.2 KNOWLEDGE GAP**

To reduce the immense amount of food waste and all its negative consequences, preventing avoidable food waste is the most preferred and sustainable option (European Commission, 1989). However, many initiatives as well as research are mainly focusing either on exact food waste measurement processes or on the re-usage, re-cycling or recovery of food surpluses, which are all less favourable options. Research on food waste prevention is yet lacking and has a huge potential to lead to a more sustainable food waste regime.

Furthermore, scattered local food waste prevention measures do not necessarily lead to a reduction of food waste at a global level. More attention needs to be given to how those small individual measures can be scaled up as well as influence and transform our current practices and lead to a more sustainable food waste regime.

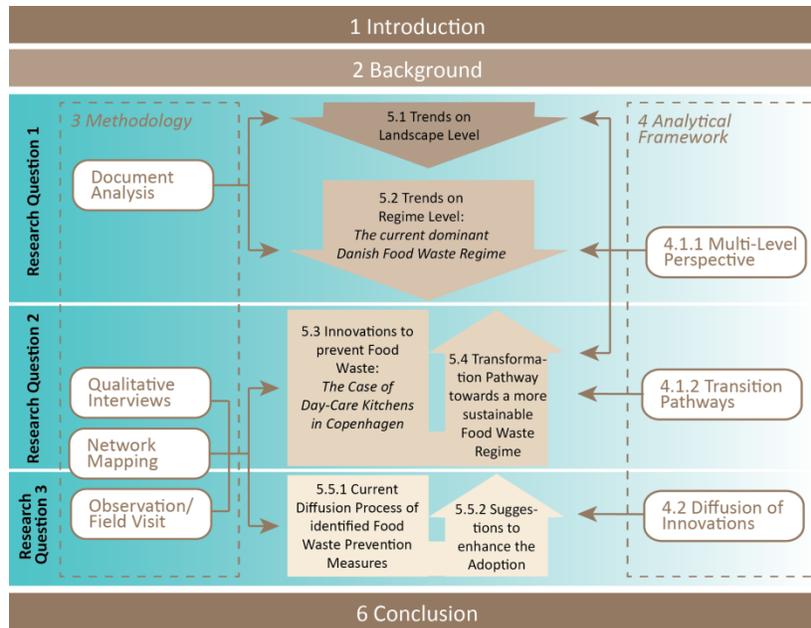
### **1.3 AIM & RESEARCH QUESTION**

To address this knowledge gap, the aim of my research is to illustrate how innovations of food waste prevention measures at a local level can contribute to a transformation towards a more sustainable food waste regime. Public institutions such as day-care centres, schools and hospitals could play an important role in facilitating a change and functioning as role models. I have chosen the transition theory and the theory of the diffusion of innovations to address the issue of food waste from a solution-oriented perspective and answer the following research questions:

1. What are the current trends at different spatial levels influencing the generation of food waste?
2. How do day-care kitchens in Copenhagen contribute to the reduction of food waste and how could such innovations support the transformation towards a more sustainable food waste regime?
3. How are those innovations adopted by other public institutions? And how could the adoption be further enhanced?

### **1.4 OUTLINE**

To achieve my aim and answer the research questions, I introduce the concept of food waste regimes as well as the waste hierarchy in chapter 2 before I outline my methodological choices in chapter 3 (see Figure 1). Following this, I present the transition theory (chapter 4.1) including the multi-level perspective and the concept of transition pathways as well as the theory of the diffusion of innovations (chapter 4.2). Based on the transition theory, I analyse in chapter 5.1 and 5.2 the current trends at different spatial levels to put food waste prevention measures into the broader context of food waste. I give then an in-depth picture of food waste prevention measures in day-care kitchens in Copenhagen (chapter 5.3). With the help of the concept of transition pathways, I identify in chapter 5.4 how innovations to prevent food waste can lead to a transformation of the current unsustainable food waste regime. Based on that, I analyse the current diffusion process of the identified food waste prevention measures (chapter 5.5.1) and give recommendations of how to enhance the adoption and diffusion of those innovations (chapter 5.5.2).



**Figure 1:** Graphical illustration of outline including the respective research questions, the chosen methodology as well as the theoretical framework. Following the introduction (chapter 1) and background chapter (chapter 2), the methodological choices are presented in chapter 3 (box on the left side). The analytical framework is illustrated in chapter 4 (box on the right side). Based on both the chosen methods and the respective theories, research question one is answered in chapter 5.1 and 5.2; research question two in chapter 5.3 and 5.4 and research question three in chapter 5.5. (Own Illustration)

## 1.5 CONTRIBUTION TO SUSTAINABILITY SCIENCE

With my research, I am contributing to one of the core objectives of sustainability science: “to guide [nature-society] interactions along more sustainable trajectories” (Kates et al., 2001, p. 641). I additionally “span the range of spatial scales between diverse phenomena” (Kates et al., 2001, p. 641) such as the global food waste generation and local food waste prevention measures. Miller et al. (2014) argue furthermore for a more solution-oriented approach within sustainability science to move beyond the analysis of problems and contribute to transitions towards sustainability. Next to the analysis of the problem of food waste and its broader context, I also illustrate local solutions to prevent food waste. I consequently fulfil the objective of sustainability science to “link research on problem structures with a solutions-oriented approach that seeks to understand, conceptualize and foster experiments for how socio-technical innovations for sustainability develop, diffuse and scale up” (Miller et al., 2014, p. 240). With the help of transition theory and the theory of the diffusion of innovations, I illustrate a possible way of how society might be able to facilitate a shift towards a reduction of food waste. At the same time, I interrogate the mainstream understanding of food waste, which allows me to criticise “details of regimes and propose alternative courses of action” (Geels & Schot, 2007, p. 406). Overall, as sustainability scientist, I contribute to the implementation of more sustainable solutions to the food waste challenge by focusing on local innovations to a global problem.

## 2 BACKGROUND

### 2.1 FOOD WASTE REGIMES

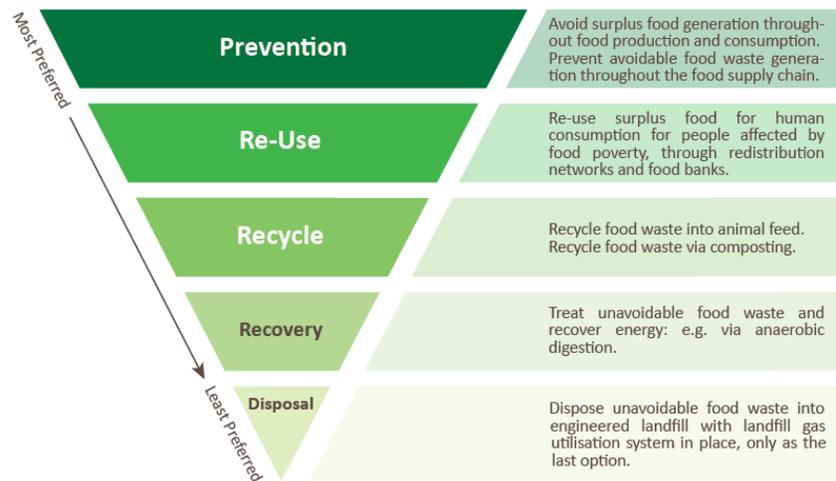
Throughout my thesis, I follow Gille's (2007) understanding of food waste regimes. Waste regimes are dynamic and include a particular set of institutions and conventions, built upon rights and rules, which decides the ways in which waste is valued, produced and distributed. The concept of waste regimes is based on Young's (1982) resource regimes and used for "'bottom-up' analysis of different regions and actors' roles in any particular food waste regime" (Gille, 2013, p. 29). Waste regimes are characterized through the (1) production, (2) representation and (3) politics of waste and vary across space and time as does the definition of waste itself (Evans, Campbell, & Murcott, 2013; Gille, 2013). The *production* of waste incorporates the social relations, which lead to waste generation as well as to the composition of waste. The *politics* of waste refers to the public discourse, policy tools as well as institutions mobilised to address the waste issues. Finally, the *representation* of waste includes the current understanding of waste and the "key bodies of knowledge and expertise mobilized in dealing with wastes" (Gille, 2013, p. 29). By including the representation of waste, the most accepted constructions of food waste are seen as part of the dominant food waste regime.

Within the framework, waste is understood as materially and conceptually produced by social relations. Thus, Gille (2007) acknowledges that waste is generated in various situations and that waste can be understood in different ways. Evans (2014) summarizes today's common assumptions about waste: waste is a classification or status description of certain things. Things classified as waste are seen as either worthless or harmful. Waste needs therefore to be separated and distanced from the society that generates it through waste management (Evans, 2014). Additionally, "waste is located at the end-of-pipe and so is uncomplicatedly viewed as that which is leftover, the redundant and final by-products of cultural and economic organization" (Evans, 2014, p. 1). O'Brien argues to overcome those understandings and to acknowledge that what we call waste has various values and qualities (O'Brien, 2008). To reduce or eliminate useless waste, it needs to be openly acknowledged that a "network of institutional, political and economic structures and practices [exists] whose cumulative effect is the production and reproduction of a paradox of modern society: useful waste" (O'Brien, 2008, p. 4). The focus should be also on improving the process of throwing away to make it at least as beneficial as it is harmful (O'Brien, 2008).

## 2.2 THE WASTE HIERARCHY

The environmentally most preferable option to reduce the resource consumption and the impact of waste is the waste prevention in the first place. In the current food waste regime however, there is a “continued dependence of modern industry on waste products of all kinds and [a] striking inventiveness that accompanies the generation and use of such products” (O'Brien, 2008, p. 7). Following the landfill ban in the EU, an industry is growing, benefitting from and depending on food waste: “The possibility of composting food or converting it to energy through anaerobic digestion signals the hope of transforming ‘waste’ into ‘value’ and so making an economic virtue out of ecological challenges” (Evans et al., 2013, p. 22). However, this approach is not accounting for the fact that those options are less environmentally preferable and located on the lower part of the waste hierarchy (Figure 2).

The waste hierarchy was first introduced in the EU’s Waste Framework Directive (1975/442/EEC) and can be seen as a useful tool to develop waste management strategies, which aim at limiting resource consumption and protecting the environment (ISWA, 2009). As shown in Figure 2, the hierarchy ranks the different waste management strategies according to their environmental preference. The most favourable option are methods which prevent the generation of food waste in the first place, followed by the distribution of food surplus for human consumption (Re-Use) and the option of converting food waste to animal feed or compost (Recycle). Less favourable are recovery measures and the disposal into landfills (European Commission, 1989; Leal Filho & Kovaleva, 2015; Papargyropoulou et al., 2014).



**Figure 2:** The food waste hierarchy. Ranking prevention, re-use, recycle, recovery and disposal from the most favourable to the least favourable option. Adapted from “The food waste hierarchy as a framework for the management of food surplus and food waste” by Papargyropoulou, E., Lozano, R., Steinberger, J.K., Wright, N. & Ujang, Z., 2014, *Journal of Cleaner Production*, Vol. 76, p.113.

### **3 METHODOLOGY**

#### **3.1 EPISTEMOLOGICAL & ONTOLOGICAL CONSIDERATIONS**

Throughout my work, I adopt a critical realist approach to ontological and epistemological issues. According to that “there exists a reality ‘out there’ independent of observers” (Easton, 2010, p. 120). This approach also allows me to be critical about the mainstream understanding of food waste as worthless by-product in order to explain and understand social phenomena. With the help of my theoretical framework, I analyse the reality of food waste in Denmark and the involved entities, their structures as well as necessary and contingent relations to achieve the fundamental aim of critical realism: to understand and explain the social phenomena of...

- (a) ... the current visibility of food waste and the adjustment of regime actors (Research Question 1)
- (b) ... the prevention of food waste in day-care centres in Copenhagen (Research Question 2)
- (c) ... a future transformation of current unsustainable food waste practices (Research Question 3).

Following the critical realism approach, the final result of my research is to identify “one or more mechanisms that can be regarded as having caused [those phenomena]” (Easton, 2010, p. 128) and to introduce changes “that can transform the status quo” (Bryman, 2012, p. 29).

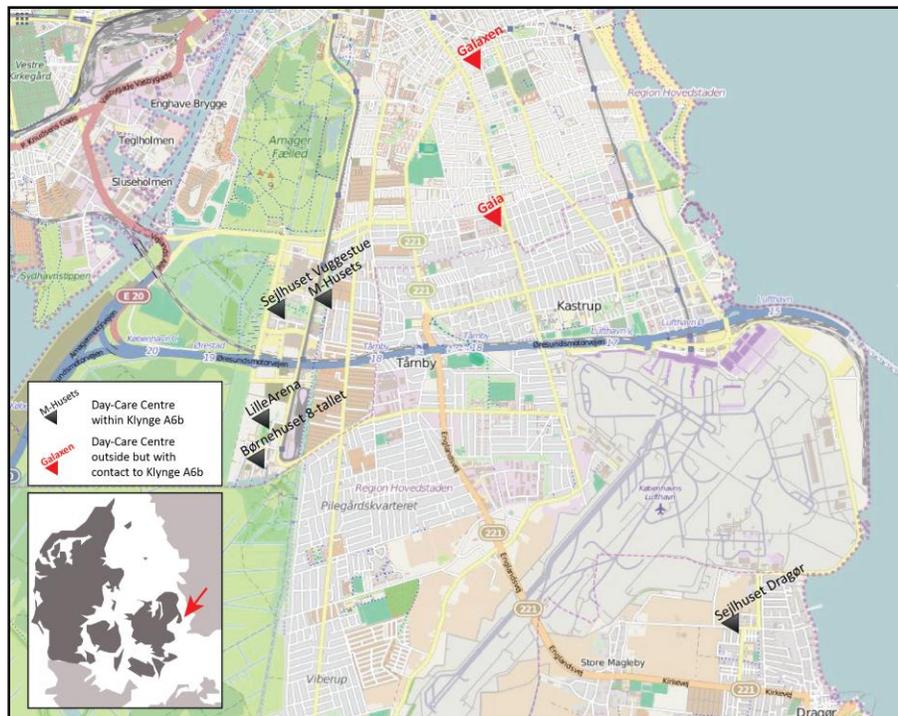
#### **3.2 RESEARCH METHOD: CASE STUDY**

To explore food waste prevention innovations as “a contemporary phenomenon in depth and within [their] real-life context” (Yin, 2009, p. 18), a case study was chosen as research method. I aim at providing an in-depth illustration of the unique features of food waste prevention measures in day-care kitchens in Copenhagen. Therefore, I apply a single case design, with day-care kitchens as my unit of analysis. According to Yin (2009) the unit of analysis strongly depends on certain contextual conditions. Therefore I chose to strategically analyse those conditions with the transition theory's multi-level framework to answer my first research question. Following Yin's case study types, my case of food waste prevention in day-care centres in Copenhagen exemplifies the broader category of food waste prevention innovations currently arising all over Europe (Yin, 2009). One of the objectives of my research is therefore to “capture the circumstances and conditions of [the] everyday and common place situation” within those food waste prevention initiatives (Yin, 2009, p. 48).

### 3.3 THE CASE OF KLYNGE A6B

Based on my research questions, I chose a case of potential food waste prevention in day-care centres with sufficient access to data through interviews and observations during the given time frame. All chosen day-care kitchens are publically owned and operate in the capital region of Denmark. The region is located at the most eastern part of Denmark and comprises next to the city of Copenhagen, 28 municipalities. In 2014, 71,547 children between 1-6years were registered in public day-care centres<sup>2</sup> within the capital region of Denmark (here after referred to as Copenhagen) (Statistics Denmark, 2015).

I examined the cluster of five day-care kitchens within the Klynge A6b<sup>3</sup> and additionally investigated two kitchens outside but with contact to the above mentioned Klynge (Figure 3). In total, 525 children between 1-6years are registered in the institutions of Klynge A6b (Table 1). The kitchens within the Klynge are connected via the management and the executive chef (Figure 4). The management has contacts to other Klynger and the parents. The executive chef has also connections to external kitchens.



**Figure 3:** Geographical location of the day-care centres Børnehuset 8-tallet, LilleArena, M-Husets, Sejlhuset Dragør and Sejlhuset Vuggestue within Klynge A6b (Black triangles) as well as the two day-care centres Gaia and Galaxen which are not part of but in contact with Klynge A6b (Red triangles). Adapted from OpenStreetMap, 2015, *Section of the capital region of Denmark*, Retrieved from <http://osm.org/go/0NWrTG0>.

<sup>2</sup> This number includes all public institutions such as Dagpleje (day-care centres), Vuggestuer (nurseries) and Børnehaver (kindergartens).

<sup>3</sup> Klynge = Danish for “cluster”; in this context a compound of usually 3-6 day-care centres within the municipality capital region of Denmark.

Name of Day-Care Centre	Børnehuset 8-tallet	LilleArena	M-Husets	Sejlhuset Dragør	Sejlhuset Vuggestue
Management	Carsten	Anja T.	Charlotte	Hanne	
Number of Children	170	160	78	56	60
Age of Children	1-6	1-6	1-3	1-6	1-3
Number of Kitchen Staff	3	1	1	1	1
Chef	Rasmus & Emil		Josephine	Lars	Anja S.M.

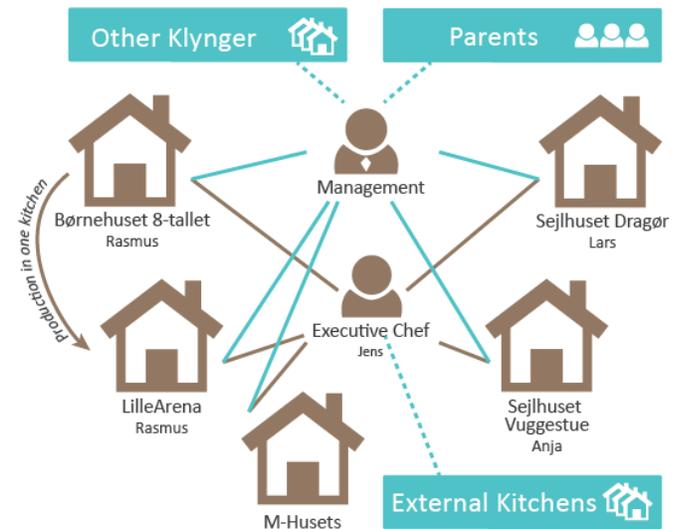
**Table 1:** Information about the five day-care centres Børnehuset 8-tallet, LilleArena, M-Husets, Sejlhuset Dragør and Sejlhuset Vuggestue within Klynge A6b; including names of managers, number and age of children, number of kitchen staff as well as the names of the chefs.

### 3.4 DATA COLLECTION

The collection and analysis of data was conducted in an iterative approach. I collected and analysed the first data set then used that analysis to inform subsequent data collection. In a methodological triangulation approach, I based my data collection on the following multiple sources: document analysis, qualitative interviews, a network map, observations/field visits and email correspondences. This procedure ensures the internal validity of my research (Bryman, 2012).

#### *Document Analysis*

I based my analysis of the broader food waste context and of the current trends at different spatial levels on secondary and grey literature as well as on policy documents. To gain information about landscape changes, I used for example EU policy documents such as the “Roadmap to a Resource Efficient Europe” or EU regulations such as the Waste Framework Directive. To obtain an understanding of the Danish food waste regime and the current Danish food waste generation, I reviewed reports by Danish and European institutions such as Miljøstyrelsen – the Danish Environmental Protection Agency or the Fødevareøkonomisk Institut – the Institute for Food Economics. I furthermore analysed policy documents such as the Danish resource strategy or Copenhagen’s resource and waste management plan to gain information about the policy tools as well as institutions mobilised to address the food waste issue. All documents were chosen with regard to their importance for the Danish food waste regime.



**Figure 4:** Structure within Klynge A6b including the five day-care centres which are connected with the management and the executive chef. The management has contact to other Klynger and the parents. The executive chef has also connections to external kitchens. Børnehuset 8-tallet delivers food to LilleArena. The names of interviewed actors are included as well (interviews a, b, f & g). The figure is based on the network map (Appendix C). (Own Illustration)

### *Qualitative Interviews*

In order to gain a first impression of the case, I conducted an unstructured exploratory interview, based on a list of possible topics obtained through a literature review, with the executive chef as well as a head chef from Klynge A6b in October 2014. This gave me the possibility to obtain an understanding for what the interviewees perceived as relevant and important (Bryman, 2012). A second semi-structured interview with the executive chef of Klynge A6b followed in January 2015. Because of recommendations and time arrangements through the executive chef, the following interviews were based on a snowball sampling. I conducted semi-structured individual interviews with two chefs working in kitchens within the same Klynge. Additionally, semi-structured individual interviews with two chefs and one kitchen employee from two day-care centres outside of Klynge A6b were conducted during February 2015.<sup>4</sup> Before each of the partially retrospective interviews, I developed an interview guide with interview questions based on my research questions.<sup>5</sup> The semi-structure of the interviews allowed me a certain degree of flexibility and made it possible to follow the direction of the interviewee as well as to adjust my research. I transcribed all conducted interviews and coded and analysed them with the help of qualitative data analysis software (QDA Miner). The interview guide as well as the transcripts and audio records are kept to ensure the reliability of my research.

### *Network Mapping*

A toolbox, similar to NetMap, introduced by Schiffer and Peakes (2009), was used during the second interview with the executive chef of Klynge A6b.<sup>6</sup> This tool helped me to understand the complex network of day-care kitchens within and around the Klynge A6b as well as to grasp the roles of different actors. The map has proven very useful since the following interviewees also referred to these identified actors. For the map creation, symbols representing the different day-care centres, actors and actor groups like parents, suppliers or authority levels were provided. Those symbols were arranged and connected by the interviewee with lines according to responsibilities and information flows. Furthermore specific details about the different day-care centres, e.g. number and age of children, number of kitchen staff as well as the names of the chefs, were filled in. The map was also verbally described by the interviewee.

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<sup>4</sup> See Appendix A for a detailed interview list.

<sup>5</sup> See Appendix B for the interview guides.

<sup>6</sup> See Appendix C for pictures of the symbols and the final map.

### *Observations/Field Visits*

I carried out most interviews in the respective kitchens, to minimize the distraction as well as to conduct the interviews in an environment familiar to the interviewee. To combine interviews with field visits of the kitchens gave me also the opportunity to get an impression of the working environments as well as the implemented practices.

### **3.5 LIMITATIONS**

In my research, I adopt to the normative statement that sustainability is the goal we should strive for and that a reduction of food waste is one way to reach that goal. This means that my research scope excludes the analysis of those who benefit from waste such as waste incinerators companies or dumpster divers.

My study was conducted in Denmark, which may serve as a test-site of food waste prevention measures. However, when transferred to other countries, local contextual settings and differences need to be acknowledged. Additionally, I focused only on the amount/weight of food waste but did not include other aspects as for example the nutrition value. I furthermore did not carry out any measurements of food waste. Case specific data is exclusively based on the subject view of my interviewees and observations. The same applies for the assumption that the identified measures are not yet widely implemented in public institutions in Copenhagen.

According to the critical realist approach, my observation of the real world might be fallible. "It is unlikely to reveal completely and lead to a full understanding of any social situation" (Easton, 2010, p. 123). I also might have made "causal misattributions given the complexities of the systems we study and the possibility that different mechanisms can cause the same events" or "one or more mechanisms [might be] at work" (Easton, 2010, p. 124). I tried to prevent those misattributions through the application of an iterative research design.

One might say that a disadvantage of a single case study as research method is the low statistical representativeness. However, since I apply qualitative interviews, I do not claim quantitative representativeness but rather aim at illustrating the unique practices within day-care centres in Copenhagen.

Various drawbacks of my data collection methods need to be acknowledged: The used documents for the landscape and regime developments might be incomplete due to language barriers and

inaccessibility. If not available in English, documents were translated with the help of a translation program. It was furthermore not possible to get to know the perspective of all niche actors. Others might also work towards a reduction of food waste, but I chose Klynge A6b because their practices relate most closely to the food prevention focus of this thesis. The number of interviews was constrained by the availability of the interviewees as well as the available time frame. The interviews were conducted in English, which is neither mine nor the interviewee's native language. Since some of the interviews were conducted in the kitchens, distractions might have influenced the interviewees. The interviewees might have been additionally influenced by leading questions, which I tried to prevent as best as possible when developing the questions. The interviewees were also aware of my personal position towards food waste.

## 4 ANALYTICAL FRAMEWORK

### 4.1 TRANSITION THEORY

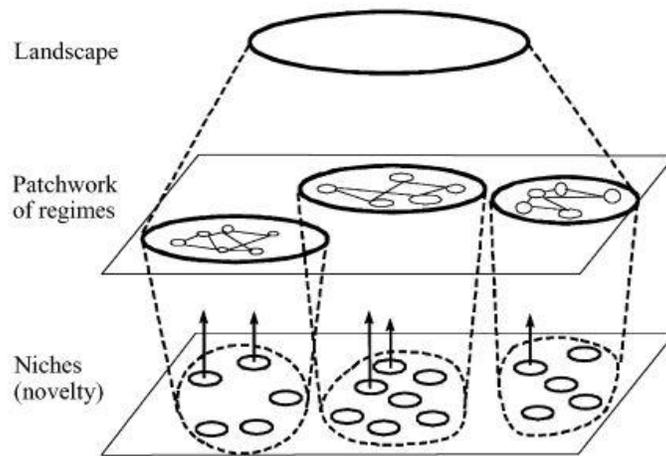
I apply the transition theory to analyse the broader context of food waste and answer my first research question: *“What are the current trends at different spatial levels influencing the generation of food waste?”*. The tools of transition theory are useful to analyse current societal developments as well as to explore transition pathways and underlying mechanisms to be able to identify possible leverage points. The theory therefore allows me to achieve one objective of sustainability science by linking the current trends influencing the generation of food waste at different spatial levels and by guiding nature-society interactions along more sustainable pathways. With the help of the multi-level perspective I structure and illustrate the current developments affecting food waste at different spatial levels. Based on the relationship between those levels, the theory of transition pathways allows me to move beyond the analysis of problems and illustrate how a transformation towards a more sustainable food waste regime might be achieved. This answers the last part of my second research question: *“How do day-care kitchens in Copenhagen contribute to the reduction of food waste and how could such innovations support the transformation towards a more sustainable food waste regime?”*

Rotmans, Kemp, and Van Asselt (2001) define a transition as a “set of connected changes, which reinforce each other but take place in several different areas, such as technology, the economy, institutions, behaviour, culture, ecology and belief systems” (Rotmans et al., 2001, p. 16). Transitions gradually change society in a fundamental way over a generation or more (Grin, Rotmans, & Schot, 2010). The concept of transition is used to “structure diverse societal phenomena in a simplified yet communicative manner” and “unravel societal [...] transitions in different development stages, using knowledge from a variety of disciplines” (Grin et al., 2010, p. 127). From a systems perspective, transitions are characterized through a strong and non-linear behaviour as well as through the systems dimensions: speed, size and time period of change (Grin et al., 2010; Rotmans et al., 2001).

Within transitions theory various concepts and “tools of analysis” are proposed, as for example the multi-level perspective as well as transition pathways. I illustrate the multi-level perspective in the following paragraphs to analyse in chapter 5.1 and 5.2 the current trends at different spatial levels influencing the generation of food waste. I also introduce the concept of transition pathways to identify in chapter 5.4 how innovations to prevent food waste can lead to a transformation of the current unsustainable food waste regime.

### 4.1.1 THE MULTI-LEVEL PERSPECTIVE

The multi-level perspective reveals the dynamics of transitions and describes “interactions between three different functional scale levels”: micro/niche level, meso/regime level and macro/landscape level (Grin et al., 2010, p. 131; Rotmans et al., 2001). As shown in Figure 5, these levels form a nested hierarchy where niches are embedded within regimes, which are in turn embedded within landscapes. The three levels are characterized by different degrees of stability and sizes, coordinating and structuring local activities in various ways. The theory is used to explain where and how transitions arise: “(a) niche-innovations build up internal momentum [...], (b) changes at the landscape level create pressure on the regime and (c) destabilisation of the regime creates windows of opportunity for niche-innovations. The alignment of these processes enables the breakthrough of novelties in mainstream markets where they compete with the existing regime” (Geels & Schot, 2007, p. 400). Subsequently, I will present the three levels more detailed.



**Figure 5:** Multiple levels as a nested hierarchy. Reprinted from “Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study” by Geels, F.W., 2002, *Research policy*, p.1261.

The **landscape level** encompasses institutions and organizations and provides the broad background settings in which actions take place. Structures within the landscape cannot be influenced directly by regime or niche actors. Van Driel and Schot (2005) define three kinds of landscape changes: (1) rapid external shocks, (2) long-term changes and (3) factors that change only slowly or hardly ever. Those developments can lead to two kinds of relationships between the landscape and the underlying regime level: On the one hand, landscape changes can be reinforcing, which leads to a stabilization of the current regime and creates no incentives for transitions (Geels & Schot, 2007). On the other hand,

landscape changes can be disruptive. Those disruptive changes put pressure on the regime and create “impulses for change” (Geels & Schot, 2007, p. 406).

Within the landscape level, various **regimes** operate as "systems of dominant structures, cultures and practices that are shared by groups of actors" (Grin et al., 2010, p. 131). The status quo of a regime is maintained by the existing institutions, networks and organizations which resist transformative change and innovations.

Individual actors and technologies as well as local practices are located at the **niche level**. The niche level provides the ground for “the generation and development of radical innovations” (Geels, 2002, p. 1261). Niches function as a kind of protected area, in which novelties, like “new initiatives, new techniques and new forms of culture and management” may develop (Grin et al., 2010, p. 132). Developments at the regime and landscape level may support or constrain the formation of niches. In the end, “it is the alignment of developments – successful processes within the niche reinforced by changes at regime level and at the level of the sociotechnical landscape – which determine if a regime shift will occur” (Kemp, Rip, & Schot, 2001, p. 276).

**Novelties** or niche-innovations occur “in niches in the context of existing regimes and landscapes with its specific problems, rules and capabilities [and are] geared to the problems of existing regimes” (Geels, 2002, p. 1261). Two kinds of relationships between the innovation and the regime are possible: on the one hand, the niche-innovation can be competitive, aiming at replacing the regime. On the other hand, it can be a symbiotic relationship where the niche-innovation “can be adopted as competence-enhancing add-on in existing regime to solve problems and improve performance” (Geels & Schot, 2007, p. 406). As soon as the ongoing developments at the landscape level put pressure on the regime or tensions in the regime itself exist, ‘windows of opportunities’ are created. It is then possible for innovations, which are already diffused to a certain extent, to break out of the niche level (Geels, 2002).

#### **4.1.2 TRANSITION PATHWAYS**

The multi-level perspective however does not show dynamic patterns of transitions. Because of that, I chose to accompany the multi-level perspective with the theory of transition pathways to illustrate how a transformation towards a more sustainable food waste regime might be achieved and to answer part of my second research question.

Each transition is distinctive and can proceed in various different pathways. The transition pathway depends according to Geels and Schot (2007) on the combination of (1) the nature of multi-level

interactions and (2) timing. As described in 4.1.1, the *nature of interactions* between the landscape and the regime can be either reinforcing or disrupting. The relationship between the niche-innovations and the regime can be either of competitive or symbiotic nature. The *timing* of multi-level interactions is of importance since different timings can have different outcomes (Geels & Schot, 2007). Especially essential is the “timing of landscape pressure on regimes with regard to the state of niche-developments” (Geels & Schot, 2007, p. 405). For example, if the landscape exerts pressure when the niche-innovation is not yet fully developed, the “niche cannot take advantage of this window [of opportunities], which may subsequently close” (Geels & Schot, 2007, p. 406).

Based on the combination of the nature of multi-level interactions and timing, Geels and Schot (2007) suggest four ideal transition pathways: technological substitution, the de-alignment and re-alignment path as well as the transformation and reconfiguration paths. In this thesis the two latter pathways are applied.

#### *Transformation Pathway*

Within the transformation pathway, old regimes transform into new regimes through cumulative adjustments and reorientation (Geels & Schot, 2007). Under the pressure of landscape changes, the regime actors try to modify “the direction of [the] development paths and innovation activities” and therefore cause reorientations (Geels & Schot, 2007, p. 406). Outsiders, like societal pressure groups, social movements, scientists and outsider firms, entrepreneurs or activities are of importance since they show alternatives and therefore eventually “change perceptions of regime insiders and lead to reorientations of (innovation) activities” (Geels & Schot, 2007, p. 406). If the niche-innovations have a symbiotic relationship with the regime, they might be adopted by regime actors “as add-on or component replacement” (Geels & Schot, 2007, p. 411). Those adoptions are among others triggered by economic considerations and do not disturb the basic regime architecture.

#### *Reconfiguration Pathway*

Continuing the transformation path, adopted innovations may also “lead to further adjustments [of the regime architecture] as regime actors explore new combinations between old and new elements and learn more about the novelties” (Geels & Schot, 2007, p. 411). This may cause technical changes, changes in user practices or perceptions and “create space for new adoptions of niche-innovations. Sequences of component innovations can thus, over time and under influence of landscape pressures, add up to major reconfigurations and regime changes” (Geels & Schot, 2007, p. 411).

## 4.2 THEORY OF THE DIFFUSION OF INNOVATIONS

With a solution-oriented approach, I seek to understand how innovations to prevent food waste diffuse and scale up. I therefore apply the theory of the diffusion of innovations developed by Rogers (2003) to answer my third research question. Especially the innovation-decision process contributes to the explanation of how those innovations to prevent food waste are adopted by other public institutions and how their adoption could be further enhanced.

Rogers (2003, p. 5) defines diffusion as “process in which an innovation is communicated through certain channels over time among the members of a social system”. The innovation can be an idea, practice or object, which is perceived as new by the unit of adoption. The innovation will be adopted faster than others if it is perceived by individuals as having the following characteristics (Rogers, 2003): *Greater perceived relative advantage*, based on economic benefits, social prestige factors as well as convenience and satisfaction. *Greater compatibility* with the existing values, past experiences, and needs. *Greater triability*, which means the degree to which an individual is able to try the innovation on a small scale. If the results of an innovation are visible to others, which leads to a *greater observability* as well as *less complexity*, which means that an innovation is perceived as easy to understand and use.

### *The Diffusion Process*

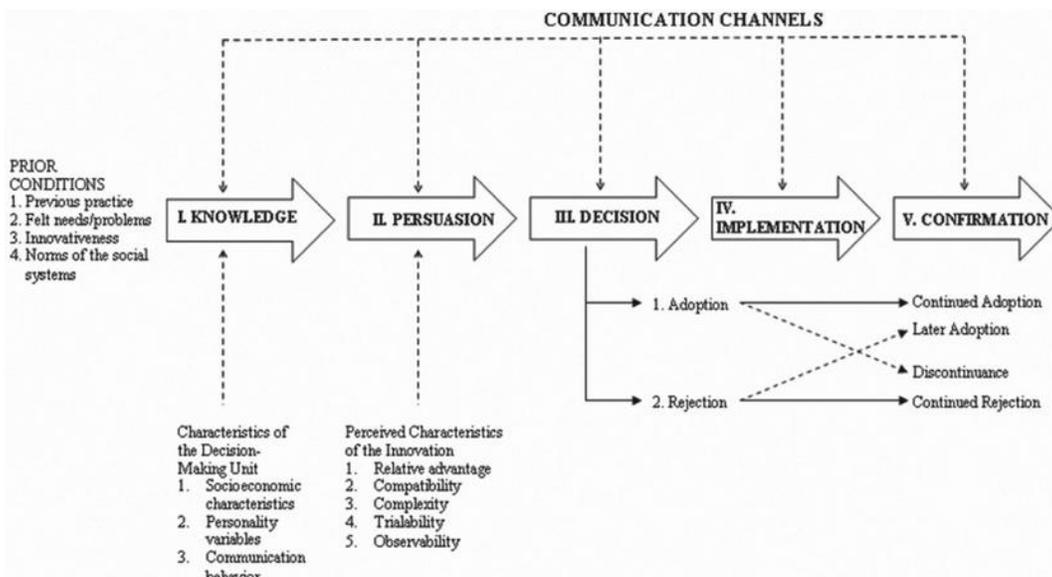
During the diffusion process, one individual communicates the new idea to others and exchanges information. This process is of importance since individuals are more likely to adopt an innovation if it is used and evaluated by another individual like themselves (Rogers, 2003). The communication process involves the innovation itself, the individual that has knowledge and/or experience using the innovation and the adopter that does not yet have knowledge of or experience with the innovation. The adopter as well as the individual which possesses knowledge about the innovation are connected through communication channels such as mass media, interpersonal or interactive communication (Rogers, 2003). Mass media channels are usually the most rapid and efficient in informing potential adopters about the existence of innovations. However, interpersonal channels are crucial when it comes to convince individuals to accept new ideas, especially if the involved actors are homophilous<sup>7</sup> (Rogers, 2003).

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<sup>7</sup> Homophily is the “degree to which two or more individuals who interact are similar in certain attributes, such as beliefs, education, socioeconomic status” (Rogers, 2003, p. 19).

### The Innovation-Decision Process

Figure 6 shows the five stages of the innovation-decision process identified by Rogers (2003). At the *knowledge* stage, the individual learns of the innovation’s existence and gains an understanding of its functions and capacity to solve a problem. Different characteristics of the individual, such as the socioeconomic background, personality variables or communication behaviour are influencing this step. The individual’s attitude towards the innovation is formed at the *persuasion* stage where the question “Will the innovation be beneficial to me in my particular situation?” is answered (Rogers, 2003, p. 21). Innovation-evaluation information helps to address this question and to reduce the uncertainty about the consequences of an innovation. Those specific evaluative information include the innovation’s advantages and disadvantages for a particular situation, and are likely conveyed through “interpersonal communication networks with near peers” (Rogers, 2003, p. 21). In the next step, the individual decides to either adopt and consequently fully use the innovation or to reject the innovation. At this *decision* stage, the individual is likely to be influenced by the subjective opinions of others. During the *implementation* stage, the individual “puts an innovation into use” (Rogers, 2003, p. 20). This step is followed by the *confirmation* where the “individual seeks reinforcement of an innovation decision that has already been made” (Rogers, 2003, p. 20). If the individual is dissatisfied with the innovation or a better innovation is available, the decision can be reversed. The whole innovation decision process is affected by previous practices, the felt needs and problems as well as the innovativeness of the adopting unit and the general norms of the social system.



**Figure 6:** A model of the five stages in the innovation-decision process. Reprinted from “*Diffusion of innovations - Fifth Edition*”, by Rogers, E.M., 2002, New York: Simon and Schuster, p.170.

### *The Role of Opinion Leaders & Change Agents*

The diffusion process is influenced by opinion leaders and change agents. As a member of the social system, opinion leaders function as social models within their interpersonal networks. Their innovative behaviour is often imitated by other members of the system (Rogers, 2003). Most systems encompass innovative opinion leader as well as leaders who oppose change. The change agent on the other hand is external to the system and “influences clients' innovation-decisions in a direction deemed desirable by a change agency” (Rogers, 2003, p. 38). The goal might be to convince individuals to adopt or to slow down or prevent diffusion. Change agents often use opinion leaders in social system as their “lieutenants in diffusion activities” (Rogers, 2003, p. 95).

## 5 RESULTS & ANALYSIS

In the following chapters, I answer my research questions with the help of the introduced analytical framework and illustrate how innovations of food waste prevention measures can contribute to a transformation towards a more sustainable food waste regime. Based on the transition theory's multi-level perspective, I illustrate in chapter 5.1 and 5.2 the current trends influencing the generation of food waste at the landscape and regime level (Research Question 1). This is followed by an in-depth picture of food waste prevention measures in day-care kitchens in Copenhagen in chapter 5.3 (Research Question 2). Based on the concept of transition pathways, I analyse in chapter 5.4 how those innovations to prevent food waste can lead to a transformation of the current unsustainable food waste regime (Research Question 2). In chapter 5.5, I finally analyse the current diffusion process of the identified food waste prevention measures with the help of the theory of the diffusion of innovations and give recommendations of how to enhance the adoption of those innovations (Research Question 3).

### 5.1 LANDSCAPE LEVEL: INCREASING PRESSURE

Various destructive landscape trends on the global as well as European level cause an emerging visibility of food waste and exert immense pressure on the underlying regime level. I elaborate on those tendencies and structure them according to the landscape changes proposed by Van Driel and Schot (2005): rapid external shocks and long-term changes.<sup>8</sup> Certain rapid shocks such as the outbreak of the foot and mouth disease in 2001 as well as long-term changes, like urbanization and dietary transitions lead to an increase of food waste. On the other hand, other rapid shocks, like the financial crisis and further long-term changes such as the global population growth as well as climate change cause the current emerging visibility of food waste in all areas of society. Overall, the importance and urgency of the issue of food waste has been recognised at the landscape level and the topic is now high on the political agenda in many industrialized countries as well as rapidly gaining attention in policy and regulation and societal and environmental debates.

#### *Rapid External Shocks*

In 2008, the global food crisis led to an abrupt increase in food prices, creating an economic necessity to pay attention to food waste. Evans et al. (2013) suggest that this global food crisis in combination with an increased trade of food commodities due to the global financial crisis, created an "environment

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<sup>8</sup> As shown in 4.1.1, Van Driel and Schot (2005) also propose a third category of landscape developments: factors that change only slowly or hardly ever. Since those developments have a long timeframe, I refrained from including them in my analysis.

where it is both less desirable, and harder to afford, to waste food” (Evans et al., 2013, p. 17). In contrast, the sudden outbreak of the foot and mouth disease in the EU in 2001 led to policy regulations which prohibit “the feeding of all processed animal proteins to all farmed animals” (European Commission, 2012). This has made recycling and the usage of food for animal feed nearly impossible and increased the amount of incinerated or landfilled food waste in the EU.

### *Long-term Changes*

In the future, the generation of food waste will likely increase, driven in part by urbanization, dietary transition, the globalization of trade in developing countries as well as an ageing population and the growth of single person households in industrialized countries (Parfitt, Barthel, & Macnaughton, 2010). The generation of food waste will also be strongly influenced by the following ongoing global processes of change: global population growth, which will lead to a 60% increase in global demand for food by 2050 which consequently exacerbates the problem of food security. Also a 25% reduction of the world food production “during this century as a result of climate change, water scarcity, invasive pests and land degradation” puts pressure on the regime level (Papargyropoulou et al., 2014, p. 5). The most current IPCC report emphasized the potential to substantially lower emissions through a reduction of food waste (Pachauri et al., 2014). Evans et al. (2013) also list the development of information and communications technology as an additional long-term change. Those technologies support a wide knowledge exchange, making the issue of food waste more visible to the wider public and therefore opening new windows of opportunities. As a consequence, international governance and policy is slowly shifting, putting food waste “on the agenda at a variety of geographic scales” (Evans et al., 2013, p. 19).

At the global level for instance, the FAO, IFAD and WFP propose “[m]ore efficient post-production food systems [...] that reduce the global rate of food loss and waste by 50 percent” as part of their Post 2015 Development Agenda (FAO, IFAD, & WFP, 2014, p. 5). Furthermore, the initiative ‘SAVE FOOD’ by the FAO as well as the ‘Think • Eat • Save’ campaign by the UNEP aim at reducing the amount of food waste through awareness raising, collaboration as well as policy, strategy and programme development (FAO, 2015; Think.Eat.Save., 2014). In doing so, those global actors put pressure on the current regime.

Also at the EU level, the first steps to tackle food waste have been made. In their “Roadmap to a Resource Efficient Europe”, the European commission in 2011 already called for a 50% reduction of all edible food waste by 2020 (European Commission, 2011). However, as part of the communication “Towards a circular economy: a zero waste programme for Europe”, the European Commission proposed in 2014 a 30% food waste reduction by all member states by 2025 (European Commission, 2014).

Currently, this proposal is part of the Commissions 2015 work programme and a “more ambitious proposal to promote [a] circular economy” will follow in the end of 2015 (European Commission, 2015). In addition, the waste hierarchy, first introduced in the EU’s Waste Framework Directive (1975/442/EEC) categorizes and prioritizes the most appropriate options for the prevention and management of food waste (see also chapter 2.2 and Figure 2).

Through both the ambitious future food waste reduction targets of the EU as well as the food waste hierarchy, the EU is exerting pressure on the nation states at the regime level to reduce food waste while taking into account the preference for waste prevention.

## **5.2 THE CURRENT DOMINANT DANISH FOOD WASTE REGIME**

The food discarded in Denmark contributes to the unsustainable usage of the planet’s limited resources and has also significant impacts on our environmental, social and economic systems. Danish regime actors have started to react and adjust to the described destructive landscape pressures. Private households as well as food processing, retail and food service institutions such as day-care kitchens are the main responsible food waste generators.

The food wasted in Denmark has a financial value of approximately €1.1billion annually (Jensen, 2011). This number accounts for grain and grain products, fruit and vegetables, milk, dairy and meat products as well as other categories of food, like seafood, sugar, spices and the hidden food waste<sup>9</sup>. “Meat and fruit/vegetables each constitute about one third of this loss, and dairy products constitute around one fifth of the total value. The majority of the economic loss can be attributed to the household sector, which represents around two thirds of the total value. However, food processing, retail and professional kitchens (canteens, hospitals, day-care centres, restaurants etc.) also contribute substantially to the economic value of the food loss” (Jensen, 2011, p. 3). In Denmark, institutions like day-care centres, schools or nursing homes generate around 26,100tons (±50%) of food waste per year and account therefore for 10% of the total food waste produced by the Danish service sector (Petersen et al., 2014). The food service sector includes every organization “involved in the preparation of ready-to-eat food for sale to individuals and communities” such as the hospitality sector, schools or hospitals (BIO Intelligence Service, 2010, p. 25). About 80% (21,000tons) of it can be characterized as avoidable food waste. According to Petersen et al. (2014), Danish day-care centres in particular, generate 5,500tons of

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<sup>9</sup> Hidden food waste includes “raw materials, ingredients etc. that are never used for final consumption (for instance, animals that have died prior to slaughtering)” (Jensen, 2011, p. 3).

avoidable and 3,300tons of unavoidable food waste per year. This breaks down to around 28kg food waste per child and year in day-care centres. 40% of the food waste in day-care centres is produced in the kitchens, while around 60% arise after direct contact with the children and the teachers (Petersen et al., 2014).

The Danish waste management is characterized by a low degree of landfill (< 3%). Even though the total Danish recycling rate which includes recycling of material and composting, increased from 25% (1995) to 45% (2012) (Eurostat, 2014b), the recycling of bio-waste only increased from 11% (1995) to 13% (2012) (Eurostat, 2014a). In 2012, Denmark had one of the highest incineration rates (with energy recovery) in Europe (52%). Incineration however, is an environmentally less preferable option and located on the lower part of the waste hierarchy (see also Figure 2). This is a clear indicator that a stronger focus on prevention, the most preferable option according to the waste hierarchy, is needed.

Based on changes at the landscape level (see 5.1), the issue of food waste became of public interest and visible again thus regime actors are under pressure to adjust to those developments. As an EU member, Denmark will be affected by the ambitious future food waste reduction targets of the EU. Several Danish ministries, such as the Ministry of the Environment, the Ministry of Food as well as the Ministry of Economic and Business Affairs, are already mobilized to reduce food waste (Miljøstyrelsen, n.d.-b). In 2013, the Danish government passed the first part of the Danish resource strategy “Denmark without waste: Recycle more– incinerate less”. The draft of the second part “Denmark without waste II: Strategy on Waste Prevention” is currently in consultation.<sup>10</sup> It states among others that the Danish government’s goal is to reduce food waste in all stages of the food chain. Therefore, the draft proposes for example a team of “madspildsjægere” - food waste hunters - which will offer help to public and private commercial kitchens to reduce food waste (Regeringen, 2015). Those policy documents go hand in hand with the waste hierarchy’s preferences. Furthermore, they demonstrate a “change in course for Danish waste policy” (Regeringen, 2013, p. 11) and illustrate a wider shift away from the less favourable incineration and from considering waste as a waste product towards seeing waste as a resource which can be reused and recycled (Miljøstyrelsen, 2014). In addition to the governmental efforts to reduce food waste, private initiatives have addressed this subject in Denmark. “Stop Spild af Mad” - Stop Wasting Food - has for example the aim to inform about and combat food waste (Stop Spild Af Mad, 2015).

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<sup>10</sup> Current Status (05/03/15): the draft is in consultation until 7 April 2015 (Miljøstyrelsen, n.d.-a).

The Danish capital has the following ambitious goal: Vision Copenhagen 2050 - A zero waste city (City of Copenhagen, 2014). As all Danish municipalities, Copenhagen's waste management plan must be in line with the national resource strategies. Based on the waste hierarchy, the plan focuses mainly on recycling as a more preferable alternative to incineration and landfill. Among other things, Copenhagen and the 800 institutions owned by the city, aim on taking the lead when it comes to waste separation (City of Copenhagen, 2014). According to this plan, the city of Copenhagen also aims at a generation of less food waste. However, so far only projects with retailers and households, but not with Copenhagen's public institutions are emphasized.

### **5.3 NICHE LEVEL: FOOD WASTE PREVENTION MEASURES**

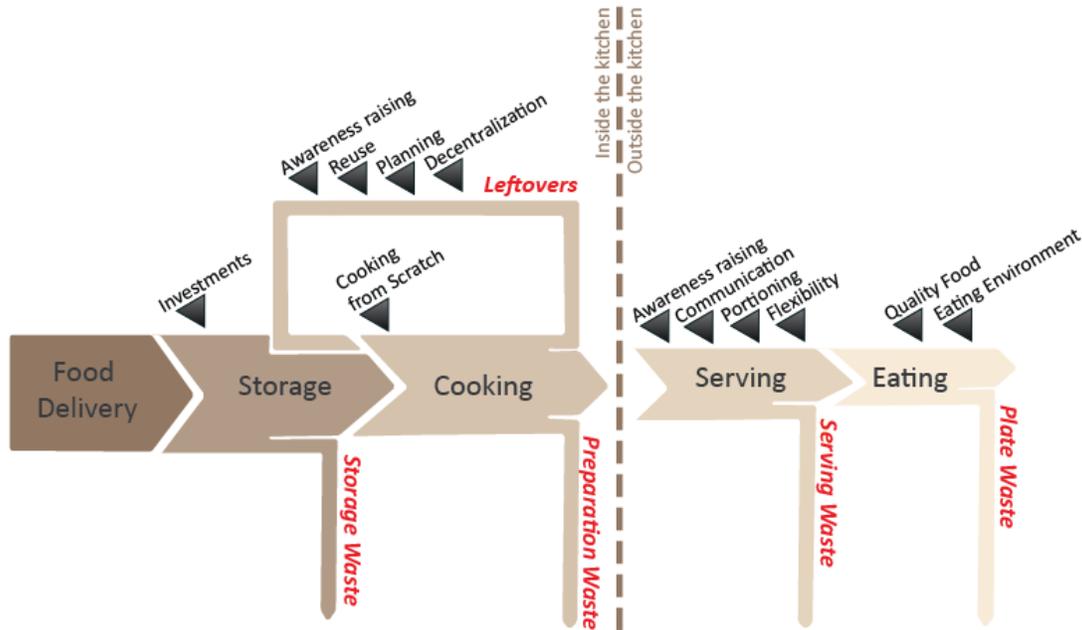
To answer my research question: "*How do day-care kitchens in Copenhagen contribute to the reduction of food waste?*", I identified Klynge A6b in Copenhagen as a 'niche' as well as ten food waste prevention measures that have been implemented by the day-care centres within the Klynge. The measures tackle all main causes of food waste in the food service sector.

Within the food service sector, which also includes public institutions like day-care centres, portion sizes, logistics, attitudes, awareness and preferences are among the key causes of food waste (BIO Intelligence Service, 2010). The *portion size* is a major cause of food waste as soon as a default size is delivered or the size of the served meal is imposed (BIO Intelligence Service, 2010). From the *logistic* point of view, food waste is generated through overstocking. This occurs, if the number of needed meals is only estimated. One reason for inaccurate forecasting could be that the served food is made in centralized kitchens, which "causes food waste because these kitchens are unaware of the amount to make" (Halloran et al., 2014, p. 299). Furthermore, "[m]ixing of ingredients in large quantities before serving can exacerbate food waste, because mixed products often last less long than products that are stored separately" (BIO Intelligence Service, 2010, p. 40). Food hygiene regulations and standards have additional consequences for logistics of food production, serving and storing. To store already cooked food for instance, it needs to be cooled down in a certain time and the cold chain must be guaranteed (European Parliament & Council, 2004). *Attitudes* towards food are another key cause of food waste: food might be considered less valuable among children because it is available in abundance and since the parents pay in advance, the food is experienced as free of charge (BIO Intelligence Service, 2010). Missing *awareness* additionally contributes to the generation of food waste. Studies have shown that when children are made aware of the amount and consequences of food waste, plate waste can be reduced by 35% (Stuart, 2009). Especially day-care centres and school canteens experience difficulties

meeting *preferences* of children (BIO Intelligence Service, 2010). Restricted budgets, low motivation of the kitchen staff or missing knowledge about preventing food waste and planning in general may also contribute to those difficulties and ultimately food waste.

In Copenhagen, Klynge A6b serves as a niche and provides a protected area and therefore the basis for the development of innovations, which prevent food waste. Different external and internal historical developments contributed to the creation of Klynge A6b as niche. First of all, public institutions like day-care centres, schools or hospitals have compared to the private service sectors the advantage of having a limited menu selection for a rather constant number of children. Furthermore, in 2011, parents in Copenhagen were granted the right to vote every other year for either a common lunch in their day-care centre or packed lunch from home (Københavns Kommune, 2014). 95% of the institutions that have the common lunch plan produce the food in-house within the day-care facilities (M. Stampe, personal communication, February 20, 2015). Within those external settings, certain internal developments within Klynge A6b itself lead furthermore to the creation of a protected area. Whereas other day-care kitchens work mainly independently from each other (Interview b, 2015), the five kitchens within Klynge A6b have worked closely together since 2010 (Klynge A6b, n.d.). They are connected through an executive chef (see also Figure 4) and provide food for more than 500 children at the age of 1-6 on a daily basis (see also Table 1).

Through the conducted qualitative interviews it became apparent that within the described protected area, various food waste prevention measures have been developed and implemented throughout the whole production chain within the day-care centres of Klynge A6b. The following food waste prevention measures were identified: (a) reuse, (b) cooking from scratch, (c) planning, (d) portioning, (e) communication, (f) awareness raising, (g) decentralization as well as (h) investments, (i) quality food and (j) eating environment (Figure 7). Through those prevention measures which I describe in the following paragraphs, the food waste generation in Klynge A6b is reduced to “somewhere between 5-10%” (Interview a, 2014).



**Figure 7:** Flow chart of food and food waste including the ten identified measures to prevent food waste in Klynge A6b: reuse, cooking from scratch, planning, portioning, communication, awareness raising, decentralization as well as investments, quality food and eating environment. Adapted from “Food losses in food service institutions examples from Sweden” by Engström, R., & Carlsson-Kanyama, A.<sup>11</sup>, 2004, *Food Policy*, Vol. 29(3), p.206.

**(a) Reuse:** To minimize the preparation waste, the kitchens in Klynge A6b process as much of the ingredients as possible and reuse leftovers whenever feasible. During the interviews it was repeatedly emphasised that for instance entire chickens are bought and nothing goes to waste since even the bones are used to produce chicken broths. The same applies for vegetable parts like celery leaves or herb stems (Interview a, 2014). Next to processing every part of the ingredients, the interviews also showed that leftovers are reused whenever it is possible: “I’ll always use it for something. In another context.” (Interview f, 2015). Different concrete examples were given: “[...] when we had that Thai stew, there were some leftovers, which we used as a spread yesterday – this tasted really nice” (Interview a, 2014). “Bread is very good to reduce food waste [...] sometimes there’re leftovers and the porridge can go into the dough next day. And when we make carrot salad, we can put the rest of the salad in the dough” (Interview g, 2015). Also fieldtrips of a children seem to be good opportunities to reuse smaller amounts of

<sup>11</sup> Engström and Carlsson-Kanyama (2004) studied food losses in schools and restaurants in Sweden and developed a flow chart of average food losses in those institutions. For more clarity and a higher degree of detail, I separated the storage and cooking processes. Engström and Carlsson-Kanyama (2004) identified storage losses, “which occur because of improper storage”; preparation losses, “which are mostly seeds, peel, etc. from fruits and vegetables”; serving losses, “which are what are left on serving dishes, and in canteens and bowls”; leftovers, which are never served prepared food as well as plate waste, which is left on the plate (Engström & Carlsson-Kanyama, 2004, p. 206).

leftovers (Interview a, 2014; Interview f, 2015). In the case, the kitchen cannot make any use of the leftovers, the staff “has the possibility to bring it home” (Interview a, 2014).

- (b) Cooking from scratch:** The strategy of reusing leftovers is mainly possible because all kitchens within Klynge A6b are cooking from scratch. All interviewees as well as the statements on the webpage of Klynge A6b confirm this (Klynge A6b, n.d.). This approach is, according to one head chef of Klynge A6b, not common in Copenhagen (Interview f, 2015). All kitchens within Klynge A6b bake bread from scratch, which, as illustrated above, makes it possible to reuse leftovers, such as porridge. This approach also supports the idea of using as much of the ingredients as possible. For example, broths are made from scratch, which offers the opportunity to process even the chicken and fish bones (Interview a, 2014; Interview g, 2015). This prevents food waste, which would have been generated on other places of the supply chain. As motivation to prepare the food from scratch, the interviewees listed attractiveness of food as well as to maintain the budget (Interview b, 2015; Interview f, 2015). Reasons against cooking from scratch may be that “it’s easier and it’s faster not to do everything on your own from scratch [...] people [which] were hired with less hours, need to do fast food” (Interview f, 2015).
- (c) Planning:** To be able to cook from scratch and reuse as much of the leftovers as possible, planning is essential. Therefore, knowledge about existing leftovers and the freezer content is necessary. In Klynge A6b, the planning process is also supported by an early central menu planning four to six weeks in advance. The individual kitchens are then able to plan their ingredients and leftovers accordingly (Interview a, 2014). Ordering the ingredients from the suppliers is possible at short notice and generally takes mainly place a couple of days in advance. Planning beforehand also offers the possibility to benefit from sales offers of short-dated food which can be stored in the freezer and incorporated into the menus. This approach makes it possible to reduce food waste, which would have been generated at the supplier’s site. Despite the possibility of reusing surplus food, the kitchens aim at not having any leftovers, which is only possible if they calculate and plan correctly (Interview a, 2014).
- (d) Portioning:** Because of food safety and hygiene reasons (European Parliament & Council, 2004), the kitchens do not reuse food that has left the kitchen at any point. The teachers receive serving bowls from the kitchens, which they take to the children. The kitchen staff is aiming to reduce the serving waste through correct portioning of those serving bowls. In doing so, it is important to find a “balance of too much and too little” (Interview a, 2014). The kitchens in Klynge A6b apply the principle of prudence: “Not putting so much food in the serving bowls, to

start with. So they [the teachers] are able to come back and refill the bowls” (Interview g, 2015). This approach might result in additional work for the teachers. Milk used to be served in the milk carton, resulting in food waste when the children did not empty it. To reduce this waste, the kitchens now serve the milk in pitchers where the amount of served milk can be adjusted (Interview b, 2015).

- (e) Communication:** The illustrated measures concerning portioning are possible because of a close communication between kitchen and teachers and in general because of staff that is aware of the importance of food waste prevention. The tight cooperation between the day-care centres in Klynge A6b makes it possible to take advantage of synergy effects. For example, for the smaller kitchens it is not worthwhile to cook broth out of a small amount of chicken bones. However, they might send them to the bigger kitchens which can use them instead (Interview a, 2014). In addition to the communication between the kitchens, a close communication between the kitchens and the teachers has been established. To reduce the serving waste, the teachers are asked to inform the kitchen about the group size and cases of illness. This happens either in the morning or latest when they pick up the serving bowls (Interview a, 2014; Interview f, 2015). The teachers are also informed that a refill of serving bowls is always possible. Since the kitchens are within the buildings, it is easy for the teachers to ask for a refill.
- (f) Awareness Raising:** Within Klynge A6b, measures to raise awareness about food waste are carried out both among the kitchen staff and among the teachers. The executive chef, for example, regularly controls the garbage bins: “I always look into the garbage. It doesn’t matter which kitchen I go into. If I can see the leaves from celery: Why do you throw out the celery? You can use it!” (Interview a, 2014). Further measures aim at making food waste visible and at convincing the teachers of the importance to come back and refill the bowls. In the past, for instance, the food of all returned serving bowls has been collected and shown to the teachers. Furthermore, pictures of returned fruits and milk have been taken and in connection with the price presented to the teachers. According to the interviewee, “that was an eye opener for the staff. [...] They started to look at food waste in a different way” (Interview b, 2015). Because of the employee fluctuation, the interviewee emphasized that those measures need to be regularly repeated (Interview b, 2015). The communicated main motivation behind those awareness raising measures is “to show the staff that [wasting food] is too expensive” (Interview a, 2014).
- (g) Decentralization:** All the illustrated measures are based on a close geographical distance between food production and consumption. During the interviews, the advantages of such a

decentralization have been put as following: “If you’re decentralized, you’re much more flexible and it is much easier to adapt on a daily basis to the exact amount of kids to prevent food waste and to prevent cooking too much” (Interview b, 2015). Bringing the production closer to consumers in forms of decentralized kitchens helps to adjust the cooking and to reduce the waste (Kjær & Werge, 2010). The connection between kitchens and day-care centres has also educational advantages, which could lead to a long-term reduction of food waste. One head chef of Klynge A6b is for instance planning to take children into the kitchen to teach them (Interview g, 2015). This may influence how children appreciate food

- (h) Investment:** To reuse leftovers, certain investments into the kitchen facilities in Klynge A6b were necessary. Because of food safety regulations, cooked food has to be cooled down within a certain time (European Parliament & Council, 2004). Therefore, a quick freezer was bought (Interview a, 2014). To convince the city of Copenhagen of the investment was mentioned by the interviewee as one obstacle they had to face (Interview a, 2014). Furthermore, kitchen appliances such as professional ovens are available for cooking as well as freezers and cooling rooms to properly store leftovers.
- (i) Quality Food:** To reduce the plate waste, the kitchens in Klynge A6b put great emphasis on the quality of the food they serve (Klynge A6b, n.d.). This influences the attitudes of the children towards food, which is one main cause of food waste: “work to improve quality would reinforce signals to [...] children about the value of food” (BIO Intelligence Service, 2010, p. 11). Two factors are important when it comes to quality food: the taste as well as the presentation of the food. A former kitchen helper of Klynge A6b summarizes it as follows: “They make really nice food. The food is not tasteless; it’s tasteful so they [the children] eat a lot [...] Quality food is all I can say. Then not much is wasted” (Interview e, 2015). The chef of Børnehuset 8tallet in Klynge A6b highlights the relevance of how the food is displayed: “It’s also the presentation. Make sure the food is nice” (Interview a, 2014). In general they are convinced that if you “make the right food and food that kids can enjoy, you will not get anything back” (Interview e, 2015).
- (j) Eating Environment:** The day-care centres of Klynge A6b also pay attention to the eating environment of the children (Klynge A6b, n.d.). A calm and pleasant environment where children are not distracted and have enough time is favored. This helps to minimize food waste but it may conflict with the refilling procedure, since the teachers have to leave the room for that.

#### **5.4 TAKING THE TRANSFORMATION PATHWAY TOWARDS A MORE SUSTAINABLE FOOD WASTE REGIME**

Looking at the unsustainable usage of the planet's limited resources and the environmental, social and economic impacts of the global food waste regime, it becomes obvious that a transition towards a more sustainable food waste regime is urgently needed. Day-care centres as well as other public institutions can function as role models and provide test-sites for innovations of food waste prevention measures. Those innovations can lead to a change of practices, an overall reduction of food waste and consequently to a transformation of the current food waste regime. As suggested by the theory of transition pathways, regime actors adjust under the pressure of landscape changes and adopt the identified food waste prevention measures as an add-on. This is how such innovations could support the transformation towards a more sustainable food waste regime, which answers my second research question.

The identified food waste prevention measures implemented in the day-care kitchens of Klynge A6b are all aiming at avoiding surplus food generation and prevent food waste generation throughout the food production and consumption. The innovation is therefore a practical example of food waste prevention, which is according to the food waste hierarchy (see also Figure 2) the most preferable and sustainable option to reduce food waste. The food waste prevention measures have been developed at the niche level. They have a symbiotic relationship to the regime, which means they can be adopted as add-ons by existing regime actors as for example by other day-care centres to solve local problems and improve performance.

Additionally, various landscape changes put increasing pressure on the Danish food waste regime (see also 5.1). As a member of the European Union, Denmark needs to implement the ambitious future food waste reduction targets of the EU. Also other regime actors, such as the city of Copenhagen have started to adjust to the landscape changes (as analyzed in 5.2) and published the ambitious "Vision Copenhagen 2050 - A zero waste city". To use those windows of opportunities created through the landscape pressure and break out of the niche level, innovations need to be stable and diffused to a certain extend (Geels & Schot, 2007). In the following chapter, I illustrate that other day-care kitchens have already started to adopt the identified measures. Regime actors might even consider actively supporting a diffusion of the identified food waste prevention measures, since it can be a possible way to achieve their ambitious goals.

### *Future Outlook: Reconfiguration Pathway*

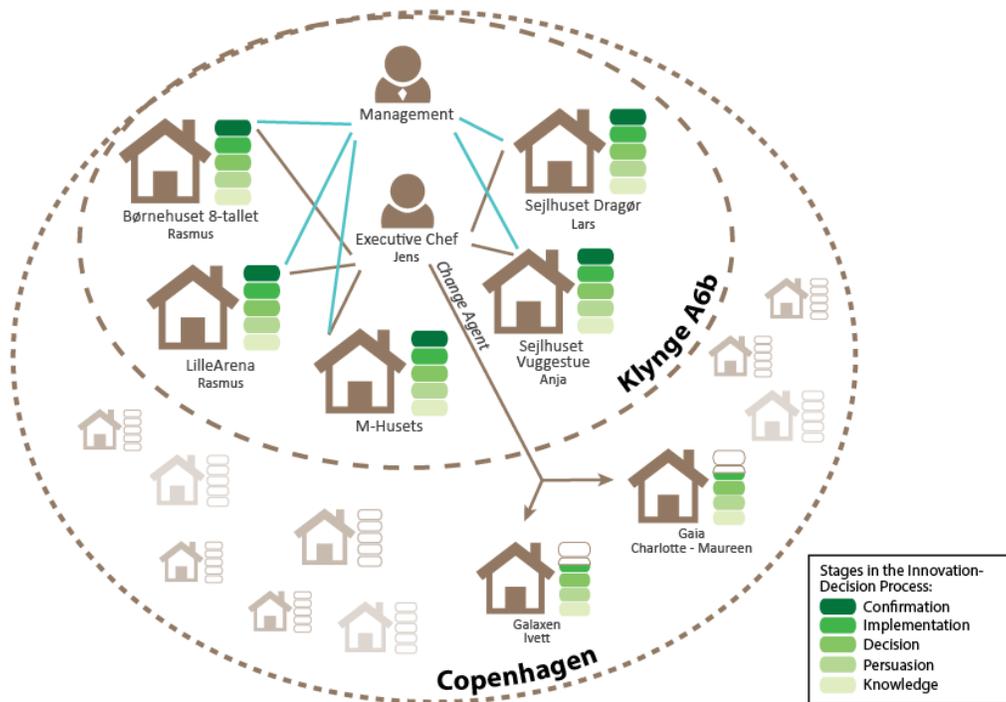
Continuing the transformation pathway, the adopted food waste prevention innovation might also lead to further adjustments of the whole regime architecture. When regime actors learn more about the innovation and explore new combinations between the old and the new elements, it might cause technical changes, changes in user practices or perceptions and “create space for new adoptions of niche-innovations. [This might,] over time and under influence of landscape pressures, add up to major reconfigurations and regime changes” (Geels & Schot, 2007, p. 411).

## **5.5 DIFFUSION OF FOOD WASTE PREVENTION MEASURES**

I apply the theory of the diffusion of innovations developed by Rogers (2003) to answer my third research question. I therefore analyse with the help of the innovation-decision process how the identified food waste prevention measures are adopted by other public institutions and how this adoption could be further enhanced. So far, the identified measures are routinized within the kitchens of Klynge A6b; the diffusion process was therefore successful. With the support of the executive chef of Klynge A6b who is functioning as change agent, day-care kitchens outside of Klynge A6b have also started to adopt the food waste prevention measures (Figure 8).

### **5.5.1 THE CURRENT DIFFUSION PROCESS**

As shown in Figure 6, the individual innovation-decision process consists of five stages: knowledge, persuasion, decision, implementation and confirmation. The decision to adopt or reject the implementation of the identified food waste prevention measures is mainly taken by the respective individual chef. I therefore analyse the current diffusion status of the identified food waste prevention measures based on those five stages (Figure 8).



**Figure 8:** Diffusion process of the identified food waste prevention measures within Klynge A6b and Copenhagen as well as involved actors and interviewees. The green scale illustrates the stages in the Innovation-Decision Process: Knowledge, Persuasion, Decision, Implementation and Confirmation. The five day-care centres of Klynge A6b: Børnehuset 8-tallet, LilleArena, M-Husets, Sejllhuset Dragør and Sejllhuset Vuggestue completed the diffusion process. The two interviewed external kitchens Gaia and Galaxen are currently within the implementation stage. (Own Illustration)

### *Knowledge Stage*

According to the diffusion theory, socioeconomic, personality and communication characteristics of the decision making unit influence the first step of the diffusion process. In the case of day-care centres in Copenhagen, the involved individuals are homophilous with similar education, occupation and socioeconomic status. This leads to a more effective communication of new ideas regarding knowledge gain, attitude formation as well as behaviour change.

Within Klynge A6b, the diffusion of the identified food waste prevention measures was promoted by the executive chef who functions as the innovator. He became aware of the importance of food waste during his previous work in the private hospitality sector. His motivations are monetary as well as environmental reasons. The innovator is connected with the chefs via interpersonal communication channels. The interviewees named him as the person to contact in case of questions and uncertainties.

The two interviewed external day-care kitchens Gaia and Galaxen got to know about the measures implemented in Klynge A6b through interpersonal communication channels via the management, the executive chef and the chefs. The two external chefs have just started their work and therefore asked

Klynge A6b for support. Additionally, further kitchens got in contact and asked for help to maintain their budgets (J. Mod er, personal communication, January 29, 2015).

### *Persuasion Stage*

So far, the individuals learned about Klynge A6b's measures through interpersonal communication channels which are an effective way of persuading individuals to accept new ideas (Rogers, 2003). The executive chef of Klynge A6b functioned within the Klynge as opinion leader, where he is able to influence other individuals' attitudes. He therefore provided information and advice about the innovation to other individuals in the system and served as a social model whose innovative behaviour was imitated by other system members. As an external to the system, the executive chef of Klynge A6b also impacted kitchens outside of Klynge A6b as change agent (Figure 8). Through his flexible position he was able to function as an innovator and to diffuse the food waste prevention measures. The chefs of Klynge A6b can be categorized as early adopters, which are a more integrated part of the local social system than innovators and role models for many other members of the social system.

According to the diffusion theory, the measures are adopted faster than others if they are perceived as having a greater relative advantage and compatibility (Rogers, 2003). Internal as well as external adopters perceived the economic benefits as the biggest overall advantage. The measures to prevent food waste allow them to save money and stay within their tight budgets. The particular measure of cooking from scratch is also seen as good advertisement for the whole day-care centre. All interviewees see the current amount of food waste in the society as problematic. Food waste prevention measures are therefore consistent with the existing values, past experiences, and needs of potential adopters and consequently are highly compatible.

### *Decision Stage*

The decision was an optional innovation-decision where the choice to adopt or reject the food waste prevention measures has been mainly taken by the independent chef. The individuals sought additional information about the measures and were strongly influenced by the experience of others. The perceived low complexity and high triability led to the adoption of the food waste prevention measures by all contacted kitchens. The interviewees confirmed that the measures were easy to try and to implement. During site visits in kitchens of Klynge A6b, the measures have been presented and tested.

### *Implementation Stage*

Even though the interviewees perceived the measures as easy to implement, some challenges were faced as well. On the one hand, knowledge about leftover recipes, right serving amounts, exact planning and ordering and as well as about nutrition with focus on children was necessary (Interview c, 2015; Interview d, 2015). On the other hand, old habits needed to be changed. That included personal habits as for example old ways of cooking as well to convince the teachers of the importance of food waste prevention (Interview b, 2015; Interview d, 2015). The two interviewed external kitchens Gaia and Galaxen are currently within the implementation stage (Figure 8). Throughout the whole process, on-site support through Klynge A6b's executive chef is available. The results of the measures are visible in the budget as well as through direct feedback from the children with regard to taste and serving amounts. The measures have consequently a high perceived observability.

### *Confirmation Stage*

The diffusion process within Klynge A6b is completed and the chefs routinized the food waste prevention measures (Figure 8). According to Klynge A6b's executive chef, no more work is needed except for "keeping the teachers and the [new] staff up to date" (Interview b, 2015).

## **5.5.2 SUGGESTIONS TO ENHANCE THE DIFFUSION**

To achieve an adoption of the food waste prevention measures by other day-care centres and consequently a transformation towards a more sustainable food waste regime, recommendations of how to enhance the diffusion process are given based on the diffusion theory.

Firstly, a combination of a centralized and decentralized diffusion system could enhance the process. As shown, various pressures through the landscape level create the need for regime actors to react and adjust. To fulfil the ambitious future food waste reduction targets of the EU and Copenhagen's vision of "A zero waste city", regime actors, as for example the government of Denmark or the city of Copenhagen, could take the lead as change agency. The change agency could send out change agents to the different Klynger to achieve an adoption of the identified food waste prevention measures. This approach would go hand in hand with the government's idea of "madspildsjægere" - food waste hunters - which shall offer help to public and private commercial kitchens to reduce food waste. The idea of madspildsjægere is included in the draft of "Denmark without waste II: Strategy on Waste Prevention", which is currently in consultation. However, since a high degree of expertise regarding food waste prevention measures exists already within the municipalities (as seen in Klynge A6b) and change agents

are most effective when they and the involved actors are homophilous, the change agency could consider using chefs from the municipalities as change agents. They would therefore make sure that the change agents understand the needs of the other day-cares and are perceived as credible, competent and trustworthy.

#### *Enhancement of the Knowledge Stage*

Since individuals tend to expose themselves to ideas that are in accordance with their own interest and needs (Rogers, 2003), the change agency could first of all diagnose problems and needs which day-care kitchens perceive, such as the need to stay within a tight budget. They could then create awareness-knowledge that food waste prevention measures exist and could solve the identified problems. Alternatively, the need for food waste prevention measures could be also created by raising for example public awareness. Mass-media channels represent the most effective communication channel to transmit or create awareness-knowledge. The respective change agency could therefore initiate a communication campaign targeted on different actors within day-care centres.

#### *Enhancement of the Persuasion Stage*

If day-care centres are aware of the existence of food waste prevention measures, attitudes towards those measures can be influenced. The change agents could therefore promote the perceived relative advantages of the measures, such as the economic profitability and low initial costs as well as the social prestige that comes with a food waste prevention and the immediacy of rewards. Furthermore, incentives might be given to increase the degree of the relative advantages. Those incentives could be directed to the innovation diffuser, e.g. change agents or adopter; they might be direct or indirect; monetary or nonmonetary; immediate or delayed and could favour either the continuance or discontinuance of certain actions. The change agency could for example base their waste disposal fees on weight to incentivize a waste reduction. Next to the promotion of the relative advantages of food waste prevention measures, change agents could also emphasize the compatibility and consistency with existing values and felt needs. Otherwise, the measures might be blocked. To reduce the perceived complexity as well as to prevent innovation negativism<sup>12</sup>, the change agents could break down the measures and build upon small successes. Overall, mass-media channels are too general to convey the necessary information since the individuals seek answers to their specific situation. Instead,

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<sup>12</sup> Innovation negativism is the “degree to which an innovation’s failure conditions a potential adopter to reject future innovations” (Rogers, 2003, p. 245).

interpersonal and localized channels, such as near-peers and the subjective opinion of innovators are most influential and convincing. This can be another reason to choose day-care chefs as change agents.

#### *Enhancement of the Decision Stage*

To facilitate the phase where the individuals engage in activities that lead to either adoption or rejection of the innovation, change agents should transmit knowledge about how to apply and use the measures. They could encourage trials through such things as the distribution of leftover recipes. This could reduce the uncertainty and determine the usefulness of the measures. Since trials of new ideas by peers can substitute partly for own trials, demonstrations of the food waste prevention measures on test sides can lead to a more rapid adoption and are especially important for early adopters. In general, “subjective evaluations of a new idea by other individuals are especially likely to influence an individual” at the decision stage (Rogers, 2003, p. 21). All interviewed chefs of Klynge A6b would be willing to demonstrate the food waste prevention measures in their kitchens for example. Also the new food waste prevention courses given by Københavns Madhus and Copenhagen Hospitality College can be supportive at this stage (A. Rossing, personal communication, February 06, 2015 & M. Præstegaard , personal communication, February 02, 2015).

#### *Enhancement of the Implementations & Confirmation Stage*

When the day-care kitchens put the food waste prevention measures for the first time into use, change agents could provide technical assistance, as done in Klynge A6b. At this stage, the adopter kitchen might modify or re-invent the original measures. The implementation is completed when the food waste prevention measures become routinized and a regularized part of the kitchen’s ongoing operations. However, even after the routinization, change agents should provide supportive messages that reinforce the innovation decision, stabilize the adoption and prevent dissonances. Further effort could be made to develop the adopter kitchens’ ability to be future change agents. During both stages, the perceived observability can be promoted by making the results of the food waste prevention measures visible to others. The day-care centres could for example use them as advertisement and promote food waste prevention on their websites. Furthermore, the change agency could think about a certification scheme for institutions that prevent food waste.

## 6 CONCLUSION

Food waste represents a sustainability challenge with significant impacts on our environmental, social and economic systems. Around one-third of all food produced for human consumption is wasted each year, which has immense environmental, social and economic consequences. Even though ranked as one of the most sustainable countries in the world, Denmark still wastes food worth €1.1 billion annually.

In my thesis, I have applied a solution-oriented approach and focused on food waste prevention, the most preferable and sustainable option. I have illustrated how innovations of food waste prevention measures in day-care kitchens in Copenhagen can lead to an overall reduction of food waste and consequently to a more sustainable food waste regime.

Using the multi-level perspective of transition theory, I have illustrated trends at landscape and regime level with regard to food waste. Destructive landscape changes, such as the financial crisis, global population growth, climate change and the ambitious future food waste reduction targets of the EU, cause an emerging visibility of food waste in all areas of society and put immense pressure on the underlying regime level. As suggested by the theory of transition pathways, regime actors such as the government of Denmark and the city of Copenhagen, have started to react and adjust to the described landscape pressures. The identified innovation of food waste prevention measures in the case of day-care kitchens in Copenhagen tackles all main causes of food waste in the food service sector. If those innovations are stable and diffused to a certain extent, they might be adopted as an add-on by regime-actors. This can consequently lead to a change of practices, an overall reduction of food waste and as a result to a transformation towards a more sustainable food waste regime. To stabilize the food waste prevention measures, I have recommended the regime actors to enhance the diffusion of the measures for example through the use of homophilous change agents, the promotion of perceived characteristics of the measures and the effective use of different communication channels.

When attempting to deepen our knowledge about food waste prevention measures and to prevent causal misattributions, further research of the identified measures as well as their causal relations is necessary. In order to enhance the transition process, challenges and barriers for adopter kitchens need to be examined. To strengthen the policy recommendations, the potential of other public institutions, such as hospitals, schools or canteens should be additionally assessed and further holistic analysis of food waste regimes in various contexts need to be conducted. This study would also benefit from seeing

the same collected data through different theoretical lenses, such as behavioural studies or other theories of social change.

In the future, we need to further strengthen our focus on waste: “its prevalence throughout the entire food system and its extent are truly astonishing, its perpetuation is among the most offensive demonstrations of human irrationality, and its reduction would obviously go a long way toward improving the productivity of the modern food system while reducing its environmental impacts” (Smil, 2010, p. 2).

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## 8 APPENDICES

### APPENDIX A - CONDUCTED INTERVIEWS

	Name	Position	Day-Care Centre	Klynge	Location of Interview	Date of Interview	Lengths of interviews
a	Modéer, Jens	Executive chef		A6B	Richard Mortensens Vej 77 Copenhagen	09/10/2014	135min.
	Reckeweg, Rasmus	Head chef	Børnehuset 8tallet				
b	Modéer, Jens	Executive chef		A6B	Biskopsgatan 5 Lund	28/01/2015	97min.
c	Nahoczky, Ivett	Head chef	Galaxen	A1	Øresundsvej 10A Copenhagen	02/02/2015	34min.
d	Holm, Charlotte	Head chef	Gaia	A10	Amagerbrogade 262 Copenhagen	02/02/2015	17min.
e	Wanjaru Bertelsen, Maureen	Temporary kitchen helper	Gaia	A10	Amagerbrogade 262 Copenhagen	02/02/2015	11min.
f	Skjellerup-Munkholm, Anja	Head chef	Sejlhusets Vuggestue	A6b	Edvard Thomsens Vej 37 Copenhagen	09/02/2015	25min.
g	Ellegaard, Lars	Head chef	Sejlhusets Børnehavn/Dragør	A6b	Nordre Dragørvej 120 Dragør	09/02/2015	20min.

## APPENDIX B – INTERVIEW GUIDES

### Interview Guide for Interview b (28/01/2015)

RQ	Interview Question	Order	Objective
General	What is food waste for you?	1	To establish a mutual understanding of food waste
	What does your definition of food waste not include?	2	To establish a mutual understanding of food waste
	Did your definition/understanding of food waste change over time? Why?	4	To explore if something triggered a change.
How do day-care kitchens in Copenhagen contribute to a reduction of food waste?	When you started working in the kitchens, what practices caused food waste?	6	To determine what processes were implemented in the kitchen that generated food waste BEFORE the change.
	What practices reduced the amount of food waste?	7	To determine what processes were implemented in the kitchen that reduced food waste BEFORE the change.
	What did you change?	9	To understand what was changed.
	What actors were involved in the change? [actors of network]	10	To explore how complex/comprehensive the changes were.
	What changes were successful?	11	Determine successful changes/results from the perspective of the interviewee.
	How did it influence the perception of [your & actors of network] towards food waste?	12	Explore the magnitude of the changes.
	How did it influence the behaviour of [your & actors of network] towards food waste?	13	Explore the magnitude of the changes.
	What practices are now implemented that reduced the amount of food waste?	16	To determine what processes were NOW implemented in the kitchen that reduced food waste.
	What behaviour generates still food waste? → Will you change them? → How?/Why not?	19	To determine what processes are STILL generating food waste. Explore possible barriers for change.
	Do you have concrete future plans/changes regarding the reduction of food waste?	23	
	Do you believe the current amount of food waste is problematic? → Why?/Why not?	5	Determine what motivates to take action against food waste.
	Can you tell me about how you got interested in FW?	3	Determine what motivates to take action against food waste.
	Why did you change the practices that led to food waste when you started working in the kitchens?	8	To explore the motivations/reasons to start to change the old practices?
	How did you motivate [you & actors of network] to change the practices?	14	To explore the motivations/reasons to keep changing the old practices?
	What problems did you encounter when you changed the practices? → How did you address those challenges?	15	Determine possible challenges and reactions/solutions
How are you motivating [yourself/other actors of network]?	17	To explore the motivations/reasons to keep changing practices?	

	What problems are you facing? [with regard to the actors of network]? → How do you address those challenges?	18	Determine possible challenges and reactions/solutions
	What would help you to reduce even more food waste in the future?	24	
How could such novelties support the transformation towards a more sustainable food waste regime?	Do you think your practices are extendable for the <i>municipality of Copenhagen</i> ? a) If yes, how? What challenges could you face? How can they be removed? b) If not, why not?	20	Determine the applicability of the performed practices from the interviewee's perspective at a regional level.
	Do you think your practices are extendable for <i>whole Denmark</i> ? a) If yes, how? What challenges could you face? How can they be removed? b) If not, why not?	21	Determine the applicability of the performed practices from the interviewee's perspective at a national level.
	Do you think your practices are extendable for <i>whole Europe</i> ? a) If yes, how? What challenges could you face? How can they be removed? b) If not, why not?	22	Determine the applicability of the performed practices from the interviewee's perspective on at international level.
	Would you consider what you're doing as a shift in the approach to food waste? Why?	25	Explore the interviewee's opinion about own practices in relation to a bigger picture.

*Interview Guide for Interview c, d, e (02/02/2015)*

General Definitions	<ul style="list-style-type: none"> <li>- What is food waste for you?</li> <li>- What does your definition of food waste not include?</li> </ul>										
INNOVATION PROCESS IN AN ORGANIZATION											
Agenda Setting	<ul style="list-style-type: none"> <li>- Do you see food waste in your kitchen as a problem? Why?</li> <li>- Just as an estimation, how much food waste do you have (in % /\$/...)?</li> <li>- How/where/when did you get to know about Jens practices to reduce food waste?</li> </ul> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2">INNOVATION</th> </tr> <tr> <td style="width: 30%;">Relative advantage</td> <td>In your opinion, what are the advantages of Jens practices/way of doing it? What could be desirable consequences?</td> </tr> <tr> <td>Compatibility</td> <td>Do you think it would be possible in own kindergarten/kitchen?</td> </tr> <tr> <td>Complexity</td> <td>How easy are the practices to understand?</td> </tr> <tr> <td>Triability</td> <td>Would it be possible to try on a small scale before implementing in whole kindergarten?</td> </tr> </table>	INNOVATION		Relative advantage	In your opinion, what are the advantages of Jens practices/way of doing it? What could be desirable consequences?	Compatibility	Do you think it would be possible in own kindergarten/kitchen?	Complexity	How easy are the practices to understand?	Triability	Would it be possible to try on a small scale before implementing in whole kindergarten?
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Compatibility	Do you think it would be possible in own kindergarten/kitchen?										
Complexity	How easy are the practices to understand?										
Triability	Would it be possible to try on a small scale before implementing in whole kindergarten?										
Matching	<ul style="list-style-type: none"> <li>- With whom do you talk about the (planned) changes? (do they know anyone else who does it?) <ul style="list-style-type: none"> <li>o Inside of own kindergarten/kitchen</li> <li>o Outside (other kindergartens?)</li> </ul> </li> <li>- Who is involved in the decision to change? /Who decides to implement new processes?</li> <li>- What are/were/could be challenges in deciding?</li> </ul>										
Redefining/ Restructuring	<ul style="list-style-type: none"> <li>- To implement the procedures, which changes are/were necessary in <ul style="list-style-type: none"> <li>o the ways of working?</li> </ul> </li> </ul>										

	<ul style="list-style-type: none"> <li>○ the organization?</li> <li>- What are/were/could be challenges in implementing?</li> </ul>
Others	<ul style="list-style-type: none"> <li>- When did/do you (want to) implement?</li> <li>- Who is especially interested in FW prevention?</li> <li>- Do you know that kbhmadhus is offering courses about food waste?</li> </ul>
	<p>Ask if interviewee would like to add/ask something</p> <p>Contact information?</p>

*Interview Guide for Interview f & g (09/02/2015)*

GENERAL DEFINITION

- What is food waste for you?
- What does your definition of food waste not include?

INNOVATION

- What are the advantages of reducing food waste in your kitchen?
- Can you give me examples of how you're reducing food waste in the kitchens? → how did/do you come up with ideas to reduce food waste?
- From whom did you hear first about food waste reduction in the kitchens? Whom do you contact nowadays for questions related to food waste?
- Are there differences between kitchens within the Klynge when it comes to food waste (amount, reduction,...) ?

DIFFUSION

- How do you motivate your staff/teachers to reduce food waste?
- How often did you get visitors in the kitchen in the last year?
  - Where are they from?
  - How do they know about you?
  - Why are they coming?
  - What do you explain?
  - How often are they coming? Are there any follow ups? Do they contact you afterwards again?
- Do you sometimes go to other kitchens? How often? Why?
- What needs to be changed to reduce food waste in all kindergarten kitchens all over Cph?
- Did you participate in courses at kbhmadhus? Do they mention food waste?

CLOSING

- Ask if interviewee would like to add/ask something
- Contact information?

# APPENDIX C – NETWORK MAP

