

**Local implementation of household plastic waste recycling policies and
their role in building circular economy**

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Abstract

Enhancing recycling has become one of the most central policy goals to address the challenges related to the extensive amount of plastic waste we generate, both in EU-level and in Finland. At the same time, the challenges and objectives of waste governance are increasingly defined within the wider framework of circular economy. In Finland, one of the most important recent changes to plastic waste governance has been the start of household plastic packaging waste collection and recycling in 2016. Although based on extended producer responsibility, the organization of collection directly and indirectly involves a number of other actors. The relations between these actors together with many practical, economic and political questions shape the implementation process of plastic recycling policies.

In this study, this process of household plastic packaging waste collection is approached with the means of policy implementation research. The study has two aims: firstly, to study the factors affecting the implementation process of household plastic packaging waste policies and secondly, to discuss the relation between household packaging waste recycling and circular economy. The data was gathered by conducting 12 expert interviews. Policy documents were used to complement the picture of questions related to the implementation process. The data was content analysed to expose the main themes shaping the implementation process.

The results reveal how beginning from the need to start household plastic packaging waste recycling in the first place, expert opinions often diverge about the best solutions and courses of action. Even if extended producer responsibility was hoped to clarify the sharing of responsibilities between different actors, many contradictions still affect their relationships on the background. The opinions concerning the best collection methods, instead, are rather consistent, as increasing collection on properties is generally seen as an important part of creating a more effective collection scheme. Improving the flow of information within the whole sector and otherwise enhancing cooperation between different actors are identified as two key issues in enhancing implementation. From the circular economy point of view, enhancing the collection and recycling of plastic packaging waste are steps forward, but demand simultaneously paying attention to creating applications and demand for recycled plastic.

Key words: household plastic packaging waste, policy implementation, waste management, waste governance, plastic recycling, extended producer responsibility, circular economy

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PREFACE

When I was looking for a topic for my master's thesis, household plastic waste recycling seemed like a topical issue to study. Circular economy as well was an emerging concept that I wanted to familiarize myself with. Having practically no previous knowledge of either of these themes, I did not fully understand the complexity of the issues I got involved with. Although waste management is strongly present in our everyday lives, I believe that its whole field is quite distant and strange for many other consumers too. When it comes to plastic waste management, the amount of underlying questions and contradictions is even greater because of the characteristics of plastic as a material. Adding to this the multidimensionality of circular economy made the topic of my master's thesis both very interesting but also very challenging to get absorbed in. Luckily, I got help and support from many people.

First of all, I want to thank all the interviewees, who enabled doing this thesis by spending their valuable time to share their knowledge and thoughts with me. Many thanks also belong to my supervisors Tuula Teräväinen-Litardo and Rauno Sairinen for their advice and ideas throughout the work, which ensured I did not get badly stuck at any phase. Finally, I am grateful for the support of all friends and family, but want to address my special thanks to Taavi's patience.

1. INTRODUCTION

1.1. In the search of better circularity of plastic products

Plastic waste has seemingly fast become a global environmental problem. Plastic debris in the oceans or microplastics in our environment are increasingly featured in the media as some of the most severe current threats to the health of both humans and ecosystems. At least one major factor behind the plastic challenge is our current predominantly linear economic model, where the use of natural resources can often be described as following a “take-make-dispose” pattern. This has long been widely recognized to cause not only environmental problems but eventually also lead to depletion of natural resources.

Lately, an alternative economic model called circular economy has arisen more and more into discussion and political agendas as a possible solution to the problems posed by the linear economic practices. The basic idea of circular economy is to keep materials in circulation by repairing, re-using, remanufacturing and recycling them, which leads to waste being minimized or ideally, completely eliminated. The overall aim is to maintain the value of materials for as long as possible. For example the European Commission is now striving to promote a transition towards more circular economies with its Circular Economy Package adopted in 2015.

Even though circular economy is essentially about changing the whole life cycle of products, waste management is central in ensuring that the materials are finally returned back into circulation at the end of their life. Basically this means diverting waste from landfills and incineration by recycling or otherwise reusing or reprocessing waste materials whenever possible. Waste management is given a central role also in the Circular Economy Package of the European Commission, which comprises of four legislative proposals on waste and an Action Plan for the Circular Economy. In Finland, “Breakthrough of the circular economy” is listed as one of the key projects of the Strategic Programme of the current Government.

Plastic, unfortunately, is an example of a material especially challenging from a circular economy-point-of-view. Our current plastic consumption habits are rather an embodiment of a linear consumption pattern, as about half of all plastics are used for disposable items (Hopewell et al. 2009, 2115), while the recycling rates for plastics are still relatively low. Post-consumer plastic waste in particular is often still lacking effective recycling systems. EU-wide, a little less than one-third of all post-consumer plastic waste was recycled in 2014 (Plastics Europe 2016, 24). In Finland this rate is yet considerably lower. While plastic recycling still lags behind recycling of most other materials, the amounts of plastic waste we generate are yet

continuously growing. Therefore, developing plastic recycling can be considered an important element for strengthening the circularity of materials in the economy. For these reasons, plastic is also named as one of the priority areas that “*face specific challenges in the context of the circular economy*” in the EU Circular Economy Package.

Plastic waste governance is currently facing remarkable restructuring in Finland. Two recent major changes in our waste legislation are a ban to landfill organic waste (which by definition also includes plastics) that has been in effect since the beginning of 2016 and a transfer of the responsibility of organizing packaging waste management completely to producers. To fulfil their new responsibilities producers were obliged to create a network of collection points for household packaging wastes – for plastic packaging this meant a minimum of 500 collection points spread across the country by the beginning of 2016. These changes have substantially changed how plastic waste is treated in Finland since most of it has previously been landfilled and separate collection of household plastic packaging waste has not existed on a large scale apart from the deposit-refund system for bottles. Industrial plastic waste instead has already been effectively recycled.

Although the general direction of waste governance development is decided upon on EU and national levels, decisions made at municipal level still have a substantial role in shaping the actual waste management practices. For example, decisions about disposition of plastic waste collection points can be central in determining how much plastic is eventually collected on these points. Thus, local level decisions are also essential relative to how practices advancing circularity of materials transfer into the reality from political agendas. This is clearly not a straightforward process and includes numerous competing interests and actors.

1.2. Research task

In this thesis, I will study household plastic packaging waste collection and recycling in Finland. The focus will be on the implementation process of the Government Decree on Packaging and Packaging Waste (518/2014), which started the collection of household plastic packaging waste in Finland in 2016. With an emphasis on the perceptions of different actors in some way involved in household plastic waste management, the aim is to provide a description of the implementation process and different questions related to it especially on a local level. Another, wider aim is to study how the circular economy challenge appears from a waste

management perspective and what this particular case reveals of the challenges that strengthening circularity of materials may encounter.

These aims are framed into two main research questions accompanied with a sub-question:

- 1) How are the policies steering household plastic packaging waste management transformed into practice?
 - What are the actual factors that steer how household plastic packaging waste is treated?
- 2) How do household plastic packaging waste management practices conform to the idea of circular economy?

The focus of this thesis is on household plastic waste particularly, which means that industrial waste as well as municipal waste from other sources are excluded from this study. Whereas separate collection of industrial plastic waste is already a well-established practice, separate collection of municipal waste has only started recently. Moreover, the recent changes on legislation have been targeted especially towards recycling of household waste, which is the main reason for excluding municipal waste from other sources. At the same time, household waste comprises a majority of the total municipal waste flow. All of this makes household plastic packaging waste an interesting case for studying the formation and implementation of new waste management practices. A focus on the implementation of policies on a local level provides a perspective through which to form a diverse picture of different actors, questions and challenges related to the process.

In the next chapter, I will create an outlook on the research field of implementation studies and define some main concepts useful in studying implementation processes or governance more generally. I will also introduce some alternative approaches and tools applied in implementation studies and briefly discuss how these can be deployed to study waste governance particularly. In the subsequent chapter, I will create foundations for studying circularity in the context of local waste management by generally introducing the idea of circular economy. To be able to study local plastic waste management in detail, I will then create an overview on the different EU-level and national policies steering waste management in Finland as well as on the responsibilities of different actors involved in waste management locally. The aim is to introduce the legal and policy framework in which household plastic packaging waste management takes place nationally and locally. After the theoretical part of

the study, I will proceed from the general and national level to study the implementation of household plastic packaging waste recycling policies in practice. With interviews as a primary source of data, I will describe and analyze a variety of different factors and views shaping the course of implementation and finally discuss the relation between household plastic waste recycling and circular economy.

2. POLICY IMPLEMENTATION RESEARCH

2.1. Governance in transition

What governance actually means has provoked debate in political science (Treib et al. 2007, 1). In general, governance can be defined as “*the sum of many ways individuals and institutions, public and private, manage their common affairs*” (Commission on Global Governance 1995, 2). However, as it is evident from such a broad definition, the term leaves plenty of room for more precise interpretations about the actual content of governance and for example the institutional structures, actor constellations and policy instruments involved in it (Treib et al. 2007, 1).

One common standpoint to explain governance is to stress the dichotomy between governance and government and the ongoing transition from government to governance (Bulkeley et al. 2003, 237). In these interpretations, governance is understood as “*those means of governing that necessarily involve non-state actors, either acting in self-governing networks or in partnership with state bodies*” (Bulkeley et al. 2005, 15). Government, in contrast, is seen as representing “*a more linear, state-dominated political system*” (Bulkeley et al. 2003, 237). Another factor adding to the complexity of governance is that it is often not restricted to take place separately and independently within different levels and spheres such as local and national or private and public (Bulkeley et al. 2003, 235). The changes in governance are not only related to the actors and decision-making processes but also to the choice of policy instruments. It is often claimed that while traditional government relied on regulatory instruments, within governance, new “softer” instruments based for example on co-regulation, voluntary agreements or distribution of information are dominant (Jordan et al. 2005, 479; Zito et al. 2003, 509). However, even if the new instruments aim to less hierarchical and more flexible governance, their adoption still often requires substantially government steering, indicating that government and governance rather continue to coexist (Jordan et al. 2005, 492-493).

The changes brought about by this transition in the governance structures can be analyzed using the concept multilevel governance. The concept of multilevel governance is often used to describe and study the complex realm of governance as an interplay between different actors at different levels. First introduced in the 1990s to describe changes brought about by European integration, multilevel governance is now widely used even in contexts outside European studies (Tortola 2016, 1-2) and can also be deployed to analyze policy implementation at a

local level (Nilsson et al. 2009, 3). Another concept closely connected to multilevel governance is network governance. Governance networks refer to the new “*non-hierarchical forms of governance based on negotiated interaction between a plurality of public, semi-public and private actors*” (Sørensen & Torfing 2006, 3). Since governance networks are based on active involvement and cooperation of the actors, they are often seen to make actors more involved in implementation processes and thus to promote efficient governance (Sørensen & Torfing 2006, 13). It has in fact been claimed that in the new governing environment characterized by decentralization and multiple actors operating at multiple levels, networks are necessary for coordinating governance (Ansell 2008, 461). Yet to provide desired benefits for the governance process, governance network have to function well, which may be restrained by various factors such as conflicts or weak leadership (Sørensen & Torfing 2006, 13).

2.2. Policy implementation process

Policy-making process is often depicted as consisting of many sequential stages, through which a policy proceeds from formulation to implementation and evaluation (Hill & Hupe 2014, 6). Even though the stages model of a policy process can be criticized for over-simplifying the process, it provides an analytical tool for the policy research (Hill & Hupe 2014, 120). Drawing a distinction between the different stages has also been on the background in the development of implementation study, even though a question about whether and how implementation can actually be separated from other stages of the policy process, where policy is formulated, has been a subject of a constant debate (Hill & Hupe 2014, 46).

Implementation theory as a concept came about in the 1970s through the work of Pressman and Wildavsky (Schofield 2001, 245). Pressman and Wildavsky (1973, xiii) noted, that even though at its simplest, implementation means carrying out a policy, policies in themselves often include not only goals but also means for achieving them, which might make it difficult to distinguish a policy from its implementation. Often considered as the founding fathers of the policy implementation research, they therefore ended up defining implementation as a “*process of interaction between the setting of goals and actions geared to achieving them*” (Pressman and Wildavsky, 1973, xv). Even though Pressman and Wildavsky paid attention to the interaction between the different stages of the policy process, their early work was still above all based on a premise of policy being an object of implementation (Pressman and Wildavsky 1973, xiii). Their approach therefore represents a so-called top-down approach to

implementation study (Hill & Hupe 2014, 46-47). In a top-down model, implementation and policy are treated as separate entities and implementation follows the setting of a policy in a rather linear way (Schofield 2011, 250).

This standpoint of the top-down approach is well visible in a more detailed description of the implementation process given by Mazmanian and Sabatier (1983, 20-21), according to whom *“The process normally runs through a number of stages beginning with passage of the basic statute, followed by the policy outputs (decisions) of the implementing agencies, the compliance of target groups with those decisions, the actual impacts – both intended and unintended – of those outputs, the perceived impacts of agency decisions, and finally, important revisions (or attempted revisions) in the basic statute”*.

The top-down approach, however, has been criticized for making simplifying assumptions about the process and for not paying enough attention to the complexity of policymaking and the different actors involved in it (Schofield 2011, 251). The advocates of an alternative bottom-up approach have made a distinction to the top-down model by bringing attention to the local actors, the nature of the problem itself and to the networks wherein implementation happens (Schofield 2011, 251). As an example of the approach adopted by the bottom-up researchers, Michael Lipsky brought the focus of research on public administrators with his theory of “street-level bureaucracy” in 1980. According to Lipsky, the decisions made by these street-level bureaucrats have a central role in policy implementation because of the discretion they have. (Winter 2006, 153). Naturally, bottom-up approaches have also confronted criticism, mostly for ignoring the role of central government while focusing on local actors (Schofield 2011, 251).

Later on, the discussion has shifted from the debate between the two approaches towards synthesizing them (Hill & Hupe 2013, 58). On the other hand, the approaches have also been simply suggested to be best suited for different situations. Yet the benefit of the debate was that it highlighted the different factors effecting the process of implementation. (Winter 2006, 154). According to Hill & Hupe (2014, 60), it is also good to be aware of the distinction between the two approaches especially since top-down perspectives still continue to define many comments we hear about implementation in media. Despite the attempts to synthesize the approaches there still does not exist a single general implementation theory, but rather a range of different methodological and theoretical approaches (Winter 2006, 163).

2.3. Tools to analyze an implementation process

Whichever theoretical approach is taken regarding the nature of implementation, the aim of implementation research can be defined as “*the development of systematic knowledge regarding what emerges, or is induced, as actors deal with a policy problem*” (O’Toole 2000, 266). To achieve this systematic knowledge of implementation, different approaches regarding the use of variables have been adopted in implementation studies. While others aim to minimize the number of studied variables to bring attention to the most important ones, others strive to include all possible variables instead. (Hill & Hupe 2014, 46).

There have also been different approaches regarding the selection of dependent variables, referring to the variables that are affected as a consequence of implementation (Winter 2006, 158-159). According to Winter (2006, 159), the degree of goal-achievement has been the most popular dependent variable. Goal-achievement is often measured by the outcomes of the policy, i.e. its actual effects on the problem (Hill & Hupe 2014, 142). However, according to Winter (2006, 162) “*we will not get a full understanding of the causal links between implementation and outcomes, unless we understand how implementation structures and processes shape outputs, and how outputs shape outcomes.*” He therefore argues for focusing on studying variation in outputs, or more precisely, the performance of the implementers, as well as variation in outcomes. (Winter 2006, 157).

According to Hill and Hupe (2014, 110, 112), consistent with the shift from government to governance, the field of implementation studies has similarly shifted from the policy-implementation paradigm centred around the concept of policy process, to a governance paradigm. According to them (2014, 111), one of the main features of the new governance paradigm is the growing attention to action, which in research has meant a redirection of the interest outside the formal policy documents into various other factors influencing policy-making. Another issue central within the governance paradigm is the dependency of the roles of different actors on the context (Hill & Hupe 2014, 111). The shift to governance tends to support the involvement of more variables in implementation studies (Hill and Hupe 2014, 134). This is because studies done from the governance perspective recognize considerably more factors influencing the implementation process.

One example of the vast variety of different factors that may be deployed to study implementation process are the factors Winter (2006, 156) included in a framework he created for analyzing implementation processes: the Integrated Implementation Model. The factors

Winter regarded as most central for studying implementation include policy formulation process and policy design, organizational and interorganizational behaviors, resource-dependency among organizations, behavior of street-level bureaucrats, socio-economic context and actions of target groups of policies, in other words citizens or firms.

Different factors may act either as drivers or barriers for the implementation process, even though this role is often subject to interpretations. Policy implementation on waste sector has been studied for example by Nilsson et al. (2009), who include most of the above-mentioned factors to analyze and explain reasons behind implementation gaps existing between policy goals and local waste management decision-making in Sweden. The main finding of Nilsson et al. (2009, 12) is that “traditional” coercive forms of governance such as bans or taxes continue to have a decisive role in local-level governance, even though “new” instruments are simultaneously being applied alongside them. Nilsson et al. (2009, 13) suggest that this is at least partly due to path dependency. Path dependency refers to the theories according to which already-existing practice and earlier choices are likely to steer decision-making into direction that most resembles the predominant situation (Kirk et al. 2007, 252). In the context of Swedish waste management, Nilsson et al. (2009, 13) suggest path dependency to be caused by “*disciplinary and professional cultures*” maintaining the old forms of governance as well as resource constraints hampering the deployment of the new modes of governance. They also note how in addition to legal and policy influences, market conditions have a central influence in local waste management (Nilsson et al. 2009, 9).

Bulkeley et al. (2005), who have also studied implementation of municipal waste management policies, have similarly identified several barriers hindering realization of more sustainable waste policies in the United Kingdom. In their context, the identified barriers include institutional fragmentation of waste management, instability and uncertainty resulting from constant changes of both regulation and composition of waste stream, financial constraints referring mainly to inadequate financial resources allocated for implementation and innovation and those barriers related to the content of the policy goals, political will and public participation. (Bulkeley et al. 2005, 9).

While recognizing that identifying barriers is a tool to study key challenges related to sustainable waste management, Bulkeley et al. (2005, 9) also strongly criticize the approach, as according to them, it may sometimes serve “*to perpetuate a linear, techno-economic model of the policy process, separating the broadly ‘technical’ from the ‘social’ world in which policy*

interventions are made while its more general use implicitly divorces policy making from implementation.” That is to say that Bulkeley et al. consider using barriers as a tool to explain implementation to reassert the top-down interpretation of the process and thus lead to an incomplete picture of it.

Because of the shortcomings of the barriers approach, Bulkeley et al. (2005, 15) suggest that the focus of studies should rather be in “*the relationships between institutions, individuals, technologies and materials that together make up MWP networks, and which shape the definition, interpretation and contestation of the policy problem and solutions.*” Also challenging the focus on the transition from government to governance, Bulkeley et al. (2005, 20) suggest rather analyzing the multiple modes of governing existing and effecting response to a given issue simultaneously. In a later study, Bulkeley et al. (2007, 2739) define the modes of governing as referring to the “*set of governmental technologies deployed through particular institutional relations through which agents seek to act on the world/other people in order to attain distinctive objectives in line with particular kinds of governmental rationality*”. Within municipal waste management in the UK, they recognize four different modes: disposal, diversion, eco-efficiency and waste as resource (Bulkeley et al. 2007, 2741).

In my study, I draw from those different approaches to implementation research that share an objective to a comprehensive picture of the studied process, putting the emphasis on the actions of local actors while also recognizing the role of steering from the central government. Still, even though I recognize that household plastic packaging waste governance in Finland as well is steered through multiple modes of governing, I do not precisely define these modes. Rather I aim to draw a general picture of the different actors, objectives and policies effecting the implementation landscape simultaneously. In doing this, I study a variety of different factors affecting implementation starting from policy formulation to the actions of the consumers. Even though these factors can often be seen as either barriers or drivers to the process, I do not label them as either, as the materials I use rather highlight how these functions are open to interpretations. Instead of trying to measure the effectiveness of the implementation process primarily by its goal-achievement, I focus on the performance of implementers and how it influences the impacts of implementation as suggested by Winter (2006, 162).

Nilsson et al. (2009, 2) note how waste management is characterized by both horizontal and vertical interactions with other sectors and different levels of governance, which may cause many coordination problems (Nilsson et al. 2009, 2). Because of the fact that complex networks

of organizations, connected both horizontally and vertically, can often be found behind implementation processes, the concepts of multilevel governance and governance networks are useful in studying implementation processes as well (Hill & Hupe 2014, 69).

A central starting point for the study of household plastic packaging waste governance is indeed a notion that it is essentially a question of multilevel governance. As explained in the forthcoming chapters in detail, plastic waste governance is steered from both EU, national and local levels and involves many different actors, from private and public sectors alike. The legislation creates premises for these actors to form governance networks to enhance packaging waste collection, even though the quality of this cooperation questionable, as will be discussed. In line with the interpretation of the government and governance rather coexisting than competing, both “old” and “new” governance instruments are deployed in waste governance, since the array of instruments used includes for example bans, fees, taxes, permission procedures, guidance and other information steering. Understanding this legal and policy framework on different levels and recognizing the multiple actors involved in waste governance is a prerequisite for studying local implementation of waste policies.

3. CIRCULAR ECONOMY IN PRINCIPLE AND PRACTICE

Humanity is constantly using more natural resources than the earth is able to renew each year. This means that our current standard of living and economic development come at a price of environmental degradation. Worst of all, the problem of overconsumption is becoming just more and more severe as the global population continues growing and the world economy expanding. In addition to environmental challenges, overconsumption of natural resources links to increasing economic volatility (Dobbs et al. 2013, 5). To tackle these challenges, we need economic development not so heavily dependent on consuming natural resources, development that decouples economic growth and natural resource use.

The idea of circular economy is currently widely discussed as the direction our societies should be heading towards to solve the problems caused by the current predominantly linear economic model. In circular economy, the materials are kept in circulation by repairing, re-using, remanufacturing and recycling them and waste is minimized or completely eliminated (Sitra 2015, 3-4). Altogether, this is not only beneficial for the environment but also for the economy. For example, according to Ellen MacArthur Foundation, 95 % of the material value of plastic packaging is currently lost after its first use. This equals to a loss of about 90-120 billion USD each year. (Ellen MacArthur Foundation 2016, 17).

Even if the focus of this study is on plastic packages consumed in households, the idea of circular economy can be applied to all materials we use, biological as well as technical regardless of whether they are used in private consumption, industry or the public sector. For example in Finland, Sitra has identified food systems, forestry sector, technical loops and transport as some of the focus areas of promoting circular economy (Sitra 2016, 12). Yet the worsening challenges caused by our linear plastic consumption habits and the resultant growing awareness about the urgent need for changes at different stages of a plastic product life cycle make plastics an interesting and topical research subject.

In the following chapters, circular economy is first introduced as a theoretical concept and a guideline for reorganizing the economy in a way based on maintaining the value of materials for as long as possible. After that, circular economy will be discussed as a policy goal and circular economy policies of EU and Finland will be briefly outlined.

3.1. The early roots of circular economy: concerns about the limits to growth

Circular economy model aims to challenge our current economic systems which are heavily dependent on new raw materials and energy as the life cycle of products goes linearly from production to use to disposal, also called the “take-make-dispose” pattern (e.g. Ellen MacArthur Foundation 2013, 6). The history of the idea of circular economy goes back to the concerns emerged in the 1960s about the limits of our Earth and limits to growth, which brought about environmental and later ecological economics (Gregson et al. 2015, 219). Both environmental and ecological economics aim to explain the interactions between humans, economics and the environment and thus develop our economies to be more sustainable (Venkatachalam 2007, 556). However, while environmental economics focuses on interactions between people and sees environmental degradation as a negative externality to the economic system, ecological economics instead views the whole economy as a subsystem of the ecosystem (van den Bergh 2001, 13,15), emphasizing thus the fundamental interdependence of these systems.

A similar holistic view to the relationship between economy and the environment is taken in industrial ecology. It was especially the school of thought of industrial ecology that introduced the idea of changing the material flows in our economic systems from a linear to a circular model (Gregson et al. 2015, 219-220). Industrial ecology questions seeing industry and natural ecosystems as separate; instead it compares industry with an ecosystem and emphasizes the industry’s dependency on the resources and services produced by the biosphere. Industrial ecology argues that industrial systems should be reformed to respond to this connectivity with the ecosystems. (Erkman 1997, 1).

The concept of circular economy itself was introduced by Pearce and Turner in 1990 as they pointed out the problems related to the linear system (Su et al. 2013, 215). According to Pearce and Turner (1990, 37), it follows from the first law of thermodynamics, stating that the amount of energy and matter always stays the same, that a linear system will only have a limited lifetime as it will eventually run out of the exhaustible resources it uses. Another threat that might occur even faster than running out of resources is exceeding the nature’s capacity to assimilate our waste. As a solution to these limitations, Pearce and Turner sketched how open-ended linear economic system can be converted into a closed one, the circular economy. In circular economy, no resources would be wasted but they would be in a constant circuit around the system.

3.2. Bringing circular economy into practice

Circular economy practices are often described by an expression “cradle-to-cradle” that illustrates how the products discarded from use return to the beginning of the production chain instead of ending up as waste as in the conventional “cradle-to-grave”-thinking. The term “cradle-to-cradle” was introduced by Braungart and McDonough in 1998, as they criticized the popular concept of eco-efficiency for being insufficient to bring about real sustainability as it just offers improvements to the predominant economic model instead of bringing about the fundamental changes needed (Mathews 2015, 16; Braungart & McDonough 1998). In cradle-to-cradle thinking, all industrial materials are seen as either technical or biological nutrients, that should all be recirculated back to industrial processes, imitating natural biological cycles (Mathews 2015, 117; Ellen MacArthur Foundation 2013, 27).

Put another way, the ultimate idea in circular economy is to replace the concept of end-of-life with restoration (Ellen MacArthur Foundation 2013, 7). This means that circular economy puts the emphasis on the recirculation of materials (Singh & Ordoñez 2016, 344), instead of focusing on minimizing the amount of material flow through the system (Ellen MacArthur Foundation 2013, 23). Considering the current amount of waste we generate that is either incinerated or landfilled, this would evidently mean significant changes to our material use. So what kind of means do theorizations of circular economy suggest to turn the economic model from a linear to a circular one in practice?

Discarding a product means that both the raw materials it is made of and most of the energy used to produce it are wasted. The main aim is therefore to re-use the material in some way. However, enforcing circular economy is not only based on effective recycling of waste, even though it is often identified with it (Ghisellini et al. 2016, 16). Instead, recycling is only the last option to keep the materials in circulation. Above all, circular economy encourages to maintain the value of the products for as long as possible by maintaining, repairing, re-using and remanufacturing them. (Sitra 2015, 3). Ellen MacArthur Foundation (2013, 7) explains the benefits of this by talking about the “power of inner circle” and states that: *“the less a product has to be changed in reuse, refurbishment and remanufacturing and the faster it returns to use, the higher the potential savings on the shares of material, labour, energy, and capital embedded in the product and on the associated rucksack of externalities (such as greenhouse gas (GHG) emissions, water, toxicity).”* Since recycling means extracting the raw materials of a product and converting them to a completely new product, it is thus generally a less

productive way of reprocessing materials. The priority order between different ways of maintaining materials in circulation is often described as the 3Rs principle, the 3Rs referring to reducing, reusing and recycling (Ren 2007, 126). Ellen MacArthur Foundation (2013, 30) though also notes that the superiority of one way of processing materials compared to other also always depends on the product, types of materials and other circumstances of the case in question.

In general, reprocessing activities should preferably happen locally or regionally since this requires less transportation and packaging and is therefore more energy- and cost-effective (Stahel 2013, 4). In addition to recycling being less energy-efficient, it is also “*a global business based on the principles of industrial production*” making it yet less preferable compared to other ways of material reprocessing (Stahel 2013, 4). Despite this, recycling is vital in enacting circularity, as it can turn wastes not usable in other ways into resources therefore acting “*as a connection bridging the production and consumption arenas*” (Ren 2007, 126).

Enabling the re-use of a product in a way as efficient as possible starts from the design of the products and their materials. This can mean for example that the components of products are standardized to make repairing them easier. (Ellen MacArthur Foundation 2013, 9). In addition to taking a stand on the re-use of materials, circular economy also challenges the way we are used to possess the goods we use in the first place and encourages more circulation of the goods between people. This means sharing, leaning, leasing or hiring commodities instead of buying them (Ellen MacArthur Foundation 2013, 7, 59).

Even if the ultimate aim of circular economy is to keep materials away from the waste flows for as long as possible, waste management is still a crucial part of circular economy as it can keep the materials that cannot otherwise be re-used in circulation. As described, the most important difference between circular economy and conventional waste management practices, such as those based on EU waste hierarchy, is that they see the discarded materials differently (Singh & Ordoñez 2016, 343). In circular economy waste management is seen as recovery of materials instead of merely getting rid of them as it has been viewed in the past (Ghisellini et al. 2016, 19).

Although effective recycling or re-using of waste as such is desirable in circular economy, there might also be a risk associated with them. It has been suggested that if it would be possible to recycle all waste, companies or the society might no more have an interest to reduce the

amount of waste (Gwehenberger et al. 2003, according to Ghisellini et al. 2006). This is also referred to as a “rebound effect”, meaning that improving eco-efficiency might result in a behavioral or other systemic change that weakens or undoes the positive environmental impacts that would otherwise have been achieved (Hertwich 2005, 86). Even though in an “ideal” circular economy, the resources would be constantly circling around the system, this is not possible in practice. It is not possible to create a real circular economy by just recycling more. This follows from the second law of thermodynamics, according to which the entropy of resources increases as they are circulating in the economy (Andersen 2006, 134). This means that resources gradually become less and less valuable for humans and cannot therefore be endlessly circulated. Therefore, no matter how effective recycling system we create, it alone can never be enough to create a functioning circular economy. Attention also need to be paid to minimizing material usage, design of products and using renewable raw materials.

3.3. The economic logic of keeping materials in circulation

At its core, circular economy is a market-based approach, that “*operates around the neoclassical economy framework even if [it] threatens some of its key pillars*” (Ghisellini et al. 2016, 16). Stahel (2013, 7) further describes the underlying economic rationale of circular economy by explaining that “*maintaining value and performance of stock replaces value added of flow, and utilization value replaces exchange value as a central notion of economic value*”. Through its different means of value creation, circular economy can offer economic benefits for both companies and the economy as a whole.

In addition to the aforementioned “power of inner circle”, where value is created when returning the product means saves on costs compared to using new raw materials, Ellen MacArthur Foundation (2013) describes three other ways of improving productivity of materials and thus creating value in circular economy. More value creation potential compared to linear economy is also involved in keeping products in circulation longer, cascading products to substitute for more expensive virgin materials and using purer, non-toxic or easier separable materials (Ellen MacArthur Foundation 2013, 30-31).

What makes circular economy especially appealing in an economic sense it that since the beginning of the 21th century, the resource prices have both come up and become considerably more volatile (Dobbs et al. 2013, 5). One of the main reasons for this is that many natural

resources have become scarcer or their sources harder to access due to a rising demand (Dobbs et al. 2013, 5-6). Therefore, minimizing the need for virgin raw materials provides the main economic incentive for a shift towards circular economy. Circular economy would not only provide material cost savings for businesses but it could also counteract volatility by providing resilience and stability through smaller dependency on virgin resources (Ellen MacArthur Foundation 2013, 9, 12, 64). In a situation of growing scarcity of natural resources, the fact that circular economy increases material productivity means competitive advantages for companies (Ellen MacArthur Foundation 2013, 83).

What is remarkable from the state economy point of view is that since circular economy practices like reuse, remanufacturing and refurbishment require labour force, circular economy can offer new job opportunities especially at the service sector (Ellen MacArthur Foundation 2013, 68). In addition to reprocessing activities being labour-intensive, they also most often take place locally or regionally, meaning that especially regional economies would benefit from job creation (Stahel 2013, 9). The exact effects on employment are however hard to estimate and will differ from sector to sector. Circular economy could also spur innovation when production and consumption models need to be redesigned. (Ellen MacArthur Foundation 2013, 68, 75).

Even though more effective use of materials generally provides economic benefits, there are certain limits to this. Whereas the initial re-use or recycling of materials often offers net benefits for business, there will eventually be a cut-off point where recycling becomes so difficult it no longer offers net benefit and where there is thus no more incentive for the companies to recycle (Andersen 2007, 133-134). There also often exist non-financial barriers, related to for example regulations, taxes or insufficient knowledge that may impede the transition towards circularity (Ellen MacArthur Foundation 2015, 32-33). Therefore, enacting circular economy practices cannot just be left relying on markets, but enforcing them also requires public policies.

3.4. Circular economy policies

In practice, circular economy is a series of actions on a level of companies or consumers. However, as described, markets alone do not always provide companies enough incentive to put practices enforcing circularity into operation. Public policies should ensure that circular practices are promoted when it is beneficial for the society as a whole. This can mean for

example that re-using or recycling are arranged not only when it provides direct economic benefits, but always when it is socially desirable and efficient (Andersen 2007, 134).

Circular economy can be promoted by a number of different policy measures. Environmental taxes, laws or certificates are examples of common environmental policy instruments that are often used to support a shift towards circular practices. Informing consumers and public procurements are examples of potential measures to strengthen the demand for more sustainable products (Ghisellini et al. 2016, 19), while innovations and investments are needed to revise production practices (COM/2015/0614). However, the used instruments vary depending on the general approach adopted towards circular economy in a certain country or region.

China has been a forerunner to adopt circular economy as a policy goal. Circular economy policies have also been adopted for example in USA, EU or Japan, but the approach is very different (Ghisellini et al. 2016, 11). In China, fostering circular economy is an integral part of the national policy strategy meaning the approach is top-down (Feng & Yan 2007, 95 & Ghisellini et al. 2016, 18). In Chinese approach, circular economy is seen as an alternative development model instead of an environmental management policy (Dajian 2014, 11). Elsewhere, circular economy is mainly used as *“a tool to design bottom-up environmental and waste management policies.”* (Ghisellini et al. 2016, 11). The difference in approach is also reflected in the instruments used to enforce circular economy; while in China these are mostly command-and-control, in other countries market-based have been applied (Dajian 2014, 11).

The differences can be explained by circular economy practices being implemented in very different stages of economic development. In China, the concept has been adopted at the stage of continuing industrialization, where it is seen as a possible solution to the problems related both to scarcity of natural resources and worsening environmental pollution (Ren 2007, 125). In EU, Japan and USA instead, circular economy is implemented to solve the problems related especially to growing amounts of waste in a developed, post-industrial society (Ren 2007, 125).

Designing suitable public policies requires a comprehensive analysis and understanding of the socio-economic benefits of circular economy (Andersen 2007, 134). As Ellen MacArthur Foundation (2013, 23) puts it, thinking in systems is one of the principles circular economy is based on. This means that it is important to *“understand how parts influence one another within a whole, and the relationship of the whole to the parts”* (Ellen MacArthur Foundation 2013, 23). This should be taken in consideration if circular economy is expected to be more than an

environmental management tool. Understanding the whole system is a prerequisite for bringing about a systemic change that circular economy is all about. This is noteworthy taking into consideration that even though circularity has been enacted in a multitude of different ways in different countries and regions, a complete circular economy still remains an ideal (Gregson et al. 2015, 235).

On the EU-level, striving a circular economy is part of the long-term vision of the 7th Environmental Action Programme. According to the vision, in 2050 we would have decoupled growth from resource use and would live within the ecological limits of Earth. If the vision were to be realized, in 2050 *“our prosperity and healthy environment stem from an innovative, circular economy where nothing is wasted and where natural resources are managed sustainably”* (EU 2013). Turning waste into a resource is also addressed in the Roadmap to a Resource Efficient Europe (COM/2011/0571). The Roadmap calls for enhancing the possibilities and effectiveness of recycling and reuse through various different policy measures.

In December 2015, EU adopted a Circular Economy Package to boost the area’s development towards a circular economy. The Circular Economy Package consists of an EU Action Plan for the Circular Economy and four legislative proposals on waste. The actions proposed by the Circular Economy package concern the whole lifecycle of products from production to waste management and creating markets for secondary raw materials. Strengthening circular economy is considered beneficial not only for the environment but also for the economy. This is because circular economy is believed to strengthen EU’s competitiveness by making businesses less dependent on scarce resources and less sensitive to volatile prices and by creating new business opportunities. Overall, circular economy is seen as going well together with the main political priorities of EU such as job creation, growth and boosting investments and innovations, climate actions and energy, social agenda and sustainable development. (COM/2015/0614).

In Finland, the Finnish Innovation Fund Sitra has estimated that the value of new business opportunities created by circular economy in the country would be 1,5-2,5 billion euros. According to Sitra (2015, 9), some ideas of circular economy have already been applied in Finland especially by improving resource and energy-efficiency. Other aspects instead, such as utilizing production side streams or re-using products have gained less attention (Sitra 2015, 9).

“Breakthrough of a circular economy” is listed as one of the key projects of the Strategic Programme of current prime Minister Juha Sipilä’s Government. The objectives related to the key project include an aim to have a recycling rate of at least 50 percent of the municipal waste. The ten-year objective of the strategic programme is that Finland is a pioneer in circular economy.

4. PLASTIC AS A MATERIAL AND A SUBJECT OF GOVERNANCE

Since the start of the mass production of plastic goods in the 1940s and 1950s, plastics have come to play a central role in our contemporary societies (Thompson et al. 2009a, 1973). It is the combination of many incomparable characteristics that has made plastics so widely used. Plastics are very versatile as different types of plastics can be used for very varying purposes, they are strong yet light, they can be used in different temperatures and above all, they are low-cost (Andrady & Neal 2009, 1977). Consequently, global plastic production volumes have now increased continuously for 50 years (Plastics Europe 2015). In 2015, 322 million tonnes of plastics were produced in the world (Plastics Europe 2016). Global plastic production is anticipated to still keep growing, according to estimations nearly quadrupling by 2050 (Ellen MacArthur Foundation 2016, 24).

Plastics are beneficial to us in countless different ways. To mention some examples, they reduce food wastage by providing protection for food, they keep drinking water clean, they are used to make many medical devices and they reduce emissions from transportation as plastic can substitute for heavier materials in transportation vehicles (Andrady & Neal 2009, 1980). Packaging is the most common use of plastics, accounting for 26% of total plastic usage globally (Ellen MacArthur Foundation 2016, 17).

Plastics are currently mainly made from fossil fuels but can in principle be made of any feedstock that contains carbon and hydrogen (Plastics Europe 2008, 12). Making plastics from oil and gas requires a process called polymerization. In polymerization monomers separated from oil or gas are linked together which forms polymer chains. (Thompson et al. 2009a, 1973; Plastics Europe website). Different chemical additives are then mixed to the polymer resin to better certain qualities of the plastic (Thompson et al. 2009b, 2154).

The flip side of the great benefits the extensive use of plastics has brought to our economies are the vast environmental challenges plastics contribute to. The major challenge related to plastics is that since most of them are very durable, they might remain for centuries, possibly even for a millennium (Hopewell et al. 2009, 2116). At the same time about half of the plastics are used for disposable items and therefore end up as waste after a very short use (Hopewell et al. 2009, 2115). Furthermore, according to Ellen MacArthur Foundation (2016, 26), globally as much as 32 % of plastic packaging is not treated within a collection system. Many concerns have also been raised about the possible health risks different chemicals in plastic materials might cause. Even though there is evidence of some materials being harmful, there is still a lot

uncertainty around the issue and more research is needed especially on the effects of long-term exposure. (Thompson et al. 2009b, 2158).

Since plastics are mainly made from fossil oil and gas and their manufacturing also takes energy, plastic production accounts for about 8 % of the world petroleum production annually (Hopewell et al. 2009, 2115). Therefore, plastic production also notably contributes to climate change and natural resource depletion. However, as plastic usage also has potential to reduce greenhouse gas emissions, the total impact of plastics on emissions is not so straightforward. A report commissioned by Plastics Europe (Association of Plastics Manufacturers in Europe) has estimated that plastic markets in Europe actually have a negative carbon balance, meaning that plastic usage can in fact prevent more greenhouse gas emissions than it emits (Pilz et al. 2010, 19). However, the issue being very complex, the accuracy of this claim is hard to confirm and the carbon balance strongly depends on the applications plastic is used for.

In 2015, 49 million tonnes of plastics were used in Europe. Also in Europe, most of plastic is used for packaging accounting for about 40 % of the total plastic demand. The second largest segment in Europe is building and construction, which accounts for about 20 % of plastic use. Automotive, electrical & electronic and agriculture sectors together account for about 18 % of the plastic demand while other uses such as consumer and household goods account for 22,5 %. (Plastics Europe 2016, 17).

4.1. An overview on the extent and possible solutions to the issue

4.1.1. Defining the plastic waste challenge

Waste is commonly divided into municipal and industrial or correspondingly post-consumer and pre-consumer waste. Statistics Finland defines municipal waste as “*waste generated in households and waste comparable to household waste generated in production, especially in the service industries*”. Statistics Finland further describes that “*the general common feature of municipal waste is that it is generated in the consumption of final products in communities*”. Industrial waste, on the other hand, according to the definition of Statistics Finland, is “*production waste generated in manufacturing industries*”. Post-consumer and pre-consumer waste are defined similarly, pre-consumer waste as waste generated during the manufacturing process of the products and post-consumer waste as waste generated by the end-users of the product (ISO 15270:2008). Municipal or post-consumer waste can be further divided into

household waste, that is waste generated in dwellings, and waste generated in administration, services, business and commercial activities (Salmenperä et al. 2016, 8).

The amount of post-consumer plastic waste generated in our societies is considerably bigger than that of pre-consumer plastic waste. For example, Patel (2000, 66) in his research about plastic recycling in Germany, has estimated post-consumer plastic waste volumes to be 3,5-5 times higher than volumes of pre-consumer plastic waste. In EU, 25,8 million tons of post-consumer plastic waste was generated in 2014 (Plastics Europe 2016, 24). The exact amount of pre-consumer waste is harder to estimate, because industries often manage their waste streams themselves either by reusing waste or by selling it directly to reprocessors (European Commission DG ENV 2011, 89)

Roughly speaking, plastics account for about 10 % of total waste flows (Thompson et al. 2009a, 1975). However, if measured by volume, the share of plastics is considerably bigger than when measured by weight (Thompson et al. 2009b, 2159). It has been estimated that in Europe, 63% of all plastic waste is packaging waste (Merta et al. 2012, according to Salmenperä et al. 2015, 34).

At the moment pre-consumer plastic waste is more efficiently recycled than post-consumer plastic waste. This is because it only arises from a limited number of sources in higher quantities, which makes it easier to collect than small amounts of plastic waste generated in each household. Another, and maybe the main challenge in plastic recycling present especially in the case of post-consumer waste is that our plastic waste is far from homogenous. We use a number of different polymers which are combined with different additives and other materials in plastic products. This kind of mixed plastic waste is harder to recycle as different plastic types need to be separated from each other. (Hopewell et al. 2009, 2118). One more challenge related to recycling post-consumer plastic waste is that it is often dirty and does therefore require cleaning before it can be recycled.

In Finland, the total amount of municipal waste was about 2,6 million tons in 2014 (SVT 2014). Salmenperä et al. (2016, 8) have modelled the generation of municipal waste in Finland in 2014, estimating that 65 % of municipal waste was generated in households and 35 % in other activities. The total amount of municipal plastic waste is not simple to estimate and accurate data seems non-existent. Statistics show that in 2015, 41 791 tons of municipal plastic waste was collected in separate collection (Tilastokeskus 2016). Yet also a significant share of the 1 268 000 tons of municipal mixed waste generated in 2015 is plastic waste (Tilastokeskus

2016). Therefore the estimates about the total amount of municipal plastic waste generated yearly have varied from about 160 000 tons to roughly 350 000 tons (Eskelinen et al. 2016, 12). Salmenperä et al. (2015, 26) have estimated that in 2012 13 % of all municipal waste was plastic, which equals 356 000 tons of plastic waste generated that year. Even though the estimates about the total amount vary greatly, it is clear that the share of plastics in municipal waste has been steadily growing during the last decades in Finland. The amount of plastic waste generated in Finland is anticipated to further grow during the next decade. (Salmenperä et al. 2015, 28-32).

According to statistics, the total amount of packaging waste generated in Finland in 2012 was about 715 000 tons, of which 117 000 tons were plastics (Jokinen et al. 2015, 19). These numbers are based solely on the amounts of packaging placed on market, and therefore Jokinen et al. (2015, 42) have estimated that in reality, the total amount of packaging waste might be considerably higher, as much as 840 000 tons in 2012, all streams of packaging included. Pursula et al. (2015, 8) have presented an estimation, according to which 69% of all plastic packaging waste would be generated in households, 30% in business, commercial activities and services and 1 % in industries.

4.1.2. Plastic waste treatment options

The first, as well as the most effective steps in plastic waste management can be considered as being reducing the material used in the products and making products more durable and repairable to minimize the amount of plastic ending up as waste in the first place. However, most of the post-consumer plastic waste is packaging, the usage of which is often already minimized by manufacturers because of economic reasons (Hopewell et al. 2009, 2116). As it is not likely that notable reductions in post-consumer plastic waste volumes would be achieved at least in near future, the questions about its treatment methods remain topical.

There are basically two different options to treat plastic waste; it can either be landfilled or recovered. Recovery can mean either material recovery through recycling or re-use or energy recovery i.e. incineration. (Hopewell et al. 2009, 2116). In the case of post-consumer plastic waste, that is mostly packaging, the opportunities for re-use are however limited. For the time being, the possibilities to for example refill a used plastic package in a shop are very rare. Similarly, developing re-use systems by producers seems hard because of logistical challenges as well as a wide variety of different packages used. (Hopewell et al. 2009, 2117-2118).

Therefore landfilling, incineration and recycling remain the waste treatment options actually feasible on a large scale.

Landfilling has formerly been the most common way to treat plastic waste but is now losing its popularity at least in Europe. One of the main reasons for this is that since landfills take a lot of space, finding new areas for landfills has become more challenging (Thompson et al. 2009b, 2159). Nor does landfilling enable utilizing the value of discarded materials. Moreover, landfilling plastics has been criticized because of their durability and the risk of them spreading to environment as debris unless properly buried at the landfill (Barnes et al. 2009, 1986).

EU-wide, the amount of post-consumer plastic waste landfilled decreased 38 % between 2006 and 2014. Instead, energy recovery has now become the most common way to treat post-consumer plastic waste, accounting for 39,5% of its treatment in 2014 while 30,8% was landfilled. The remaining 29,7% was recycled. (Plastics Europe 2016, 24). The changes reflect EU policies now setting landfilling as the least preferable waste treatment option.

From a circularity of materials point of view, incineration is barely a better waste management option than landfilling. Even though the energy stored in plastic products is utilized through incineration, it still destroys the valuable materials and removes them from circulation.

Ideally, applying the principles of circular economy to our plastic consumption habits would mean reducing the amounts of plastic we use, reusing the materials whenever possible and then finally recycling them. However, given the fact that most of our plastic waste is packaging materials with limited possibilities for reuse and the fact that the amounts of plastic waste are just anticipated to grow in the future, it seems like recycling is in a central role in bringing circularity to our plastic consumption.

4.2. Plastic waste governance on different levels

4.2.1. EU policies steering plastic waste management

All EU waste management should be based on a five-ladder hierarchy established in the Directive 2008/98/EC on waste (Waste Framework Directive). These five steps are prevention, preparing for re-use, recycling, other recovery such as energy recovery and disposal. The Waste Framework Directive also sets the principles guiding waste management in the EU. In addition to the general principles of EU environmental law: polluter pays, preventive and precautionary principles, these principles include the proximity principle and the self-sufficiency principle.

These mean that waste should be treated near its source and that EU and its member states should become self-sufficient in their waste disposal and recovery (Environmental Administration of Finland). The Waste Framework Directive also incorporates the principle of extended producer responsibility into EU waste management. OECD (2001, 18) has defined extended producer responsibility as “*an environmental policy approach in which a producer’s responsibility, physical and/or financial, for a product is extended to the post-consumer stage of a product’s life cycle*”. In practice, in the case of plastic waste, extended producer responsibility usually means that the producer has to pay for the treatment of waste. This should create an incentive to firstly, minimize the amounts of waste generated, and secondly, to minimize the costs of waste treatment (Jans & Vedder 2012, 480). Producers would therefore also have an incentive to design both cost-efficient recycling processes and easily recyclable products (OECD 2014, 8).

In addition to the general rules also applicable to plastic waste management, the Waste Framework Directive established a specific obligation for separate collection of plastic waste by 2015. The Waste Framework Directive also requires that by 2020, at least 50% of household waste (and of waste from other origins similar to household waste) must be recycled or “prepared for re-use”. Another piece of EU legislation central to plastic waste management is the Packaging and Packaging Waste Directive 94/62/EC. Its aim is to minimize the amount of packaging materials used and to promote reuse, recovery and recycling of packaging materials. The directive set recycling targets to be reached by 2008, including a plastic recycling target. Reviewing and renewing work of the directive and its targets is currently ongoing.

In addition to Waste Framework Directive and the Packaging and Packaging Waste Directive, there is plenty of other EU legislation related to plastic waste management such as landfill directive, incineration directive, waste shipment regulation or Waste Electrical and Electronic Equipment Directive, just to mention a few (Municipal Waste Europe). In fact, the plastic waste management legislation in EU is very fragmented and does not provide a comprehensive solution to the challenges related to plastic waste (European Commission 2017). The need to reform the plastic waste management policies has been recognized by the commission and plastic is now given a central role in the Circular Economy Package. In the Action plan for circular economy, plastics are defined as one of the priority areas. As a part of the Circular Economy Package, EU is now preparing a plastics strategy to specifically address the problems related to plastic waste (European Commission 2017). The four revised legislative proposals on waste adopted as part of the circular economy package are likely to bring considerable

changes to plastic waste management, too. The revised legislative proposal on packaging waste suggests that by 2025, 55% of plastic packaging should be prepared for reuse or recycled in each EU member country. If the proposed Directive will be accepted as such, major changes to plastic waste management systems across the EU can therefore be expected during the forthcoming years.

4.2.2. Plastic waste governance in Finland

Waste Act (646/2011) and Waste Decree (179/2012) form the basis of general waste legislation in Finland. In addition to those, there are provisions on reducing the negative impacts of waste on Environmental Protection Act (527/2014) and Environmental Protection Degree (713/2014). Finnish waste legislation is based on EU waste legislation, although stricter at some issues. The order of priority defined in EU's waste hierarchy forms the foundations also for the Finnish waste management. (Ympäristöministeriö 2016).

The EU Waste Framework Directive and the Waste Act also require that the Ministry of Environment draws up a national waste plan. The national waste plan outlines the general aims of waste management development in Finland, but is not a legally binding document. The latest plan - Towards a recycling society – The National Waste Plan for 2016 - has been in effect since 2008, but a new plan is currently under preparation. Based on the national waste plan, the centres for economic development, transport and the environment prepare regional waste plans to promote the objectives of the national waste plan on a regional level, taking into account the regional special characteristics.

According to the Waste Act, the holder of waste has the responsibility to organize waste management. However, there are exceptions to this rule. First of all, municipalities are responsible for organizing waste management for municipal waste from households, public governance and services. Yet, municipality is not responsible for organizing management for waste under the producer responsibility. Producer responsibility obligates the importer or manufacturer of certain products listed in the Waste Act to take care of waste management when the products are discarded.

Finnish waste legislation was reformed between 2012 and 2014 to update it to respond to changes happened in the field and, importantly, changes in EU waste legislation. One of the aims of the reform was to clarify the sharing of responsibilities in waste management. (HE

199/2010 vp, 1). As a part of the reform, coming into force of the current Waste Act in 2012 brought significant changes to plastic waste management. Until the reform of the Waste Act, the producers had only had a partial responsibility for the packaging waste. In the Waste Act reform, the responsibility of organizing packaging waste management was transferred completely to producers. (Moliis et al. 2014, 7). Considering that a clear majority of plastic waste is packaging, this is a significant change in plastic waste management.

The Government Decree on Packaging and Packaging Waste (518/2014) adopted in 2014 under the Waste Act sets more specific targets for collection and recycling of packaging. The decree implements the Packaging and Packaging Waste Directive 94/62/EC into the national legislation. According to the decree, producers have to create a network of collection points for packaging waste generated in households. This network has to cover the whole country. The collection points must be located next to grocery stores or other often-used services or along commonly used routes. The requirements considering the number and disposition of collection points are set separately for other packaging waste and for plastic, as the network demanded for plastic is narrower. For plastic packaging waste, the decree sets a requirement to create a network of at least 500 take-back points. Each population center of at least 10 000 inhabitants must have at least one take-back point for plastic waste. Producers also have to arrange at least 30 terminals for other than household packaging waste and for packaging waste collected by other actors in supplementary collection. The costs of creating and operating the network of take-back points are covered by producers.

In the case of packaging, it is not exactly the producer, but the packer of the product or importer of a packaged product that is hold as the “producer” and thus responsible. The new regulations concerning producer responsibility were first set to come into force from 1.5.2014 onwards, but with an amendment to the law, a transition period continuing until the first of January 2016 was given for producers to fulfil their responsibilities considering organizing the reception and transportation of packaging (Moliis et al. 2014, 7). This means that the whole network of packaging waste collection points has had to be complete and in operation from 1.1.2016 onwards. The reason for prolonging the transition period was to give the producers as well as municipalities and other actors sufficiently time to develop their operations to correspond to the new requirements (HE 201/2013, 2). However, the take-back network was not completed on time, mainly because the negotiations about the placement of take-back points with the grocery stores took more time than expected (Yle Uutiset 2016a).

The municipalities thus no more bear responsibility to collect any packaging or other products under full producer responsibility. However, according to 35§ of Waste Act, municipalities can complete the collection of packaging waste by organizing the transport of separately collected packaging waste from properties to the waste management organized by producer. The costs of this as well as other waste management organized by a municipality are covered by collecting a waste fee.

The Decree on Packaging and Packaging Waste also defines the recycling targets to be reached by the producers. For plastic packaging waste excluding bottles, the targets are 16 percent of weight by 2016 and 22 percent of weight by 2020. These targets concern packaging waste from all sources, not just post-consumer or household waste. This means that in principle, producers are not obliged to collect any household plastic packaging waste if they can reach the recycling targets by enhancing the recycling of plastic packaging waste from other sources. The law only obligates them to create a network of take-back points for post-consumer waste but does not set any specific targets for the amounts of household waste collected within this network. If we rely on Pursula et al.'s (2015, 8) estimation, according to which 30% of plastic packaging waste is generated in industry, commerce, business and services, it would at least in principle be possible to reach the 22% recycling target without recycling any household waste.

According to unofficial national recycling rates reported by PYR (The Environmental Register of Packaging, now replaced with RINKI), in 2012 the recycling rate for plastic packaging waste excluding bottles was 12 %, while the total recycling rate including bottles was 25 % (Moliis et al. 2014, 12). By comparison, the same year the total recycling rate for packaging materials was 59%, only wood packaging waste having lower recycling rate than plastic (Jokinen et al. 2015, 19). Therefore, even if the recycling target set for 2020 would be reached, recycling of plastic packaging waste would still lag considerably behind recycling rates of most other packaging materials.

Another major change to plastic waste management in Finland that also came into effect in the beginning of 2016 is a ban to landfill organic waste. As the definition of organic waste also includes plastics, plastic waste is currently in practice either incinerated or recycled. Before the changes in legislation, in 2012, recycling rate for all plastic waste has been calculated to be less than 1 % (Salmenperä et al. 2015, 27). The majority of plastic waste is currently incinerated.

4.2.3. Plastic waste management in a local context

The responsibilities related to waste management can be divided into three categories: administrative functions, supervisory functions and service functions. The different actors responsible for these functions in packaging waste management and their main tasks are also presented in figure 1. The administrative functions of waste management are taken care of by a municipal waste management authority, or a joint organ between municipalities if they have agreed to arrange the service functions jointly. (Kuntaliitto 2016, 7-8). In practice, the municipal waste management authority is usually a waste management committee. A waste management committee can for example decide where the waste is collected, give waste management regulations or decide on the waste tariff (Joensuun kaupunki 2016). The responsibility for supervising waste management is held by centers for economic development, transport and the environment (ELY Centres) and the municipal environmental protection committee.

Waste management services mean organizing the reception, transport and treatment of waste in practice. Municipalities often take care of their waste management service responsibilities through waste management companies, which are commonly owned by several municipalities from the region. Waste management companies usually buy services such as waste transport from private companies by inviting them to tender. (Ympäristöhallinto: Jätehuollon vastuut ja järjestäminen). Private waste management companies can also offer waste management services complementing those offered by the municipality directly to the customers, provided that this is possible within the limits of legislation.

The producers, or in other words those companies packing products or importing packaged products and therefore obliged to provide waste management services based on producer responsibility, usually take care of their responsibilities by joining a producer organization. The producer organization then takes care of the responsibilities the Waste Act delivers on producers on behalf of them. In the case of packaging waste, there are six different packaging producer organizations for different packaging materials in Finland. The producer organization for plastic packaging waste is called Suomen Uusiomuovi Oy (The Finnish Plastics Recycling Ltd.). In practice, the companies join the producer organizations by joining a service company called Finnish Packaging Recycling RINKI Ltd. (Ympäristöhallinto: Pakkausten tuottajavastuu). RINKI operates the network of take-back points and thus carries out the actual collection of consumer packaging waste on these points. Producers are obliged to pay recycling

fees for RINKI according to the tons of packaging they place on market. The recycling fees for different materials are decided upon by the producer organizations.

To ensure that waste management is organized properly according to the Waste Law, municipalities give municipal waste management provisions that take into account the local circumstances. Waste management provisions can apply to the whole municipality or just a part of it. The provisions can regulate practicalities of waste management such as how waste collection or sorting should be organized. In practice waste management provisions order for example how and what different waste materials must be collected on different kinds of properties. For instance, by issuing waste management provisions, municipalities can demand completing the collection of packaging materials under producer responsibility on the properties. The orders imposed by the waste management provisions set the minimum level for required sorting possibilities at the properties, but housing cooperatives or dwellers of a property can yet decide to have more waste receivers for different types of waste on the property.

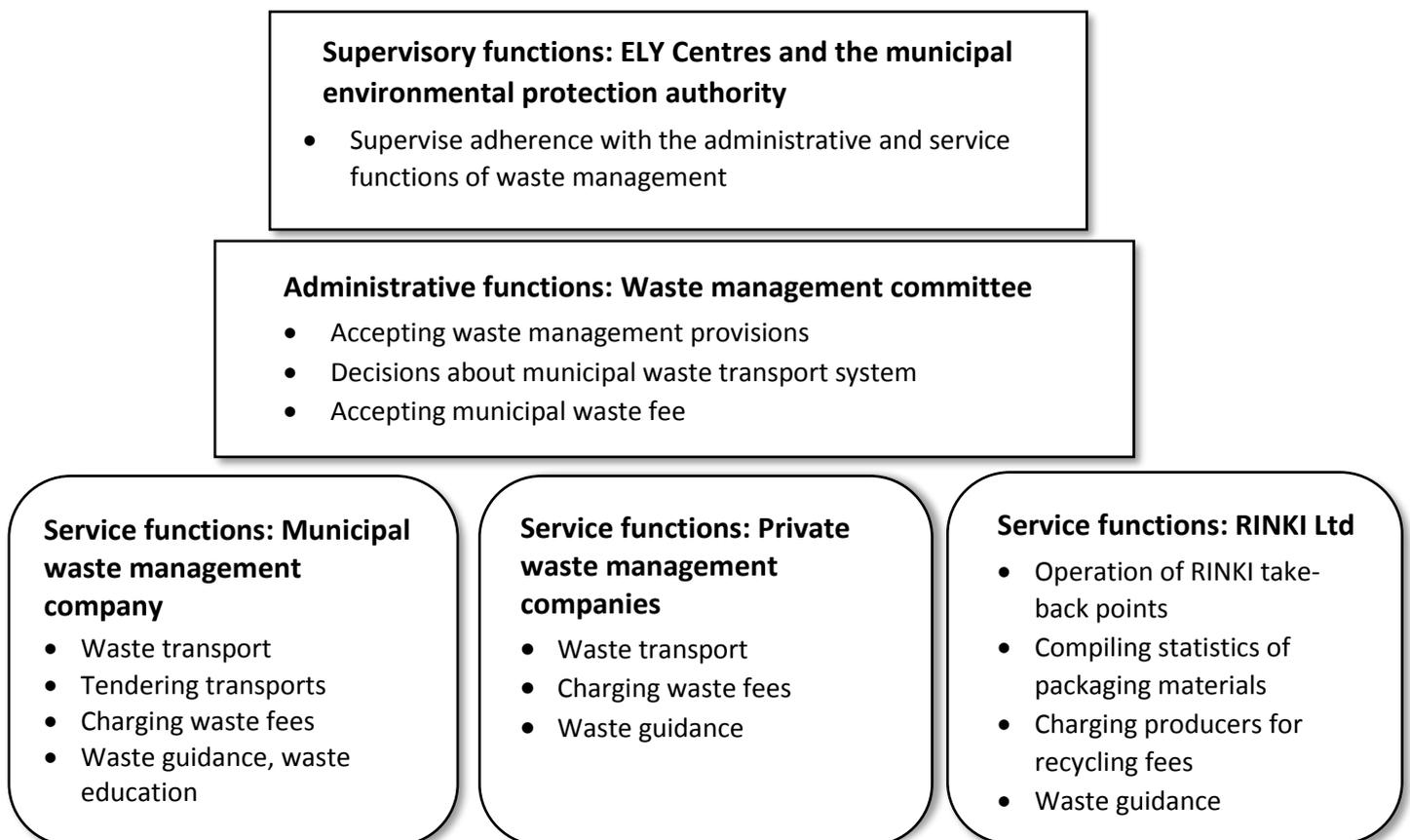


Figure 1. Packaging waste management actors, modified from a chart at Puhas Ltd website: <http://www.puhas.fi/yhtio/jatehuollon-tyonjako.html> (22.11.2017)

5. MATERIALS AND METHODS

5.1. Selecting the experts to be interviewed

To gain more information about practical issues related to plastic waste management I conducted 12 expert interviews. In expert interviews, the interviewees are selected based on the knowledge they have because of their institutional status or other reason that makes them involved in the studied phenomenon or process (Alastalo & Åkerman 2010, 373-374). In this thesis, ten of the interviewees represent different actors somehow in touch with plastic packaging waste management in their work and two are experts otherwise knowledgeable of plastic and circular economy questions. Actors in touch with plastic packaging waste in their work include seven actors working within the waste sector and three actors representing plastic producers, plastic industry or commerce. The interviewees working within the waste sector include actors from both RINKI as the organizer of the nationwide collection network, municipal and private waste management actors, that may supplement the plastic waste collection organized by RINKI and the plastic refinery, where plastic packaging waste is eventually processed. My intention was to include actors viewing the plastic recycling issue from different angles and from different stages of the life cycle of a plastic product to ensure a broad perspective on the issue.

The interview data was complemented with document data comprising of policy documents as well as information found on the websites of different organizations. The document data served two purposes: it was used both to help prepare for the interviews and later in the analysis phase to cross-read it with the interview data.

My initial plan was to study local implementation in my hometown Joensuu specifically, but as the work proceeded, a more general approach proved to be more practicable and fruitful for various reasons. First of all, the number of actors involved in household plastic waste management in the city is very limited, which is why interviewing only them would have made it very hard to properly analyze the results while also keeping the actors unidentifiable, which was an approach I ended up using. Moreover, as plastic packaging waste management is initially based on producer responsibility, I considered it necessary to include actors representing producers and RINKI as they are responsible for organizing the nationwide collection of packaging waste. These actors, however, are better knowledgeable about issues concerning the whole country and not familiar with Joensuu specifically. I therefore eventually decided on broadening the scope of the study to concern local implementation generally and

included municipal actors from a couple of different cities as well to draw a more diverse picture about local implementation and to enable some comparisons between the practices adopted in different municipalities. The interviewed municipal waste management actors include both municipal waste management officials and representatives of municipal waste management companies and are from three different municipalities located in eastern or southeastern Finland. I purposely selected actors from municipalities that had adopted different approaches regarding household plastic packaging waste management to get a more diverse picture of possible views and practices.

The interviewees were partly selected using snowball sampling. The idea of snowball sampling is to first identify and interview a few key actors and then ask them to propose other informants that could provide more information on the studied issue. These next interviewees are then asked to suggest further informants and so on, until no new informants are proposed by the interviewees or until the researcher has no more resources to carry on doing interviews. (Hirsjärvi, Hurme 2010, 59-60). I asked my interviewees to propose new informants but then just selected the most suitable ones for my study instead of continuing doing interviews until no new names would come up. Considering the vast field of my study this was the best suitable approach, as so many possible names came up that it would not have been either useful or possible to interview all the proposed informants. Moreover, it was rather easy to identify the most relevant informants, also because these names usually came up more than once.

As I proceeded with the interviews, I also contacted new informants that had not been proposed by previous interviewees based on my own estimations of them being relevant for the study. By this, I wanted to ensure that different kinds of actors within the field would be represented. Overall, about half of my interviewees were selected following them being proposed by other informants and half were either initial key actors or selected later based on my own idea of them being useful informants. I believe 12 interviews was enough to draw a picture of the main questions related to the implementation process and to shed light on the points about which opinions commonly diverge.

11 interviews were conducted between April and June and last one in September. Four of them were conducted in-person and the rest in phone since the interviewees were not located in Joensuu. The duration of the interviews varied between half an hour and an hour. I recorded all the interviews and then transcribed them. The accuracy demanded of transcribing depends on whether the subject of the study is the interaction in itself or the factual content of the interview

(Ruusuvuori & Tiittula 2005a, 14). In outline, I transcribed all the interviews word for word, even though my interest being in the factual content, I did not transcribe all filler words or details such as breaks. The interviews were transcribed in Finnish. The quotes used in the results are therefore my translations of the original quotes.

5.2. Semi-structured thematic interviewing

The approach I used in doing the interviews can best be described as thematic semi-structured interviewing. Even though there does not exist any unambiguous definition for a semi-structured interview, it is often described as something between a structured survey and an unstructured interview (Hirsjärvi & Hurme 2010, 47). There are varying opinions considering how consistent the semi-structured interviews should be in terms of the questions asked or their order and wording. The taken approach varies between different studies. (Hirsjärvi & Hurme 2010, 47; Tuomi & Sarajärvi 2013, 75). I take an approach described by for example Ruusuvuori & Tiittula (2005a, 11), according to which the idea of a thematic semi-structured interviews is rather just to predetermine the covered themes, whereas the exact phrasing and order of questions can vary. The lack of detailed questions should leave space for the interviewees' own interpretations and for the meanings they give on the covered issues as well as creating these meanings in an interaction (Hirsjärvi & Hurme 2010, 47-48).

According to Wengraf (2001, 5), in a semi-structured interview, the initial questions are prepared in advance, but since they are open, the interviewer cannot fully foresee the course of the interview in advance, and must therefore be prepared to improvise a significant share of the questions based on the answers of the interviewee. For the same reasons, as Hirsjärvi and Hurme (2010, 103) note, it might be more important that the interviewee listens carefully than that they ask certain questions. This kind of description of the course of a semi-structured interview comes closer to how my interviews proceeded in practice. Even though I had prepared a list of questions for each interview, I often did not move on strictly according to this list but tried instead to ask defining questions based on the interviewee's answers. In a way, I strived towards a more unstructured, reflective interview and used the carefully pre-created list of questions not only as a framework for the interview but also as a backup if I felt like I needed it to proceed with the interview.

On the other hand, in the case of my topic, it was also only reasonable to prepare and proceed with rather many complete questions, as the topic is not so much about the personal experiences

of the interviewees but about the practicalities around plastic recycling. The prepared questions therefore ensured I got answers to those particular issues I was interested in and the conversations did not get too much side-tracked. Secondly, good preparation helps bringing the conversation from the general level to those exact questions not documented in other data (Alastalo & Åkerman 2010, 379).

It is common in expert interviews to frame the interview questions differently for different interviewees. Preparing for each expert interview therefore requires background work in the form of studying either other materials or previous interviews. (Alastalo & Åkerman 2010, 378). Since conducting the interviews and asking defining questions requires the interviewer to already have a certain understanding about the studied process, data collection and analysis phases often strongly overlap in studies based on expert interviews (Alastalo and Åkerman 2010, 317-319).

The thematic areas my questions generally touched upon included practicalities of organizing plastic waste collection, the distribution of work between the different actors in waste management, general views of the interviewees about plastic recycling and the policy instruments, challenges and goals related to it as well as their perceptions about the role of waste management in enforcing circular economy.

I decided to keep all the interviewees anonymous as some of them were requiring it and it therefore seemed simpler to keep all of them anonymous. Anonymity, however, has twofold consequences. As Alastalo and Åkerman (2010, 384) note, office-holders are especially challenging as informants as what they say may be restricted by strong codes of practice or professional ethics. Therefore, by telling the interviewees that the answers will be held anonymous, I might have got more honest answers as the interviewees knew they would not be met with any consequences would they for example express opinions not in line with the official position of the organization they represent.

Even if anonymity may help to get more honest answers during the interviews, it has its downsides in the analysis phase. Like Alastalo and Åkerman (2010, 383) point out, it is often not possible within a limited field of actors to anonymize the interviewees without consequently losing something essential about the content. This is an issue in my study as well, as the answers might partly be strongly connected to the professional positions of the informants and therefore exposing those positions might enable a deeper analysis of their viewpoints. Within the limits of not enabling identifying the identities of the actors, I have

referred to actors representing producers, local actors, actors representing commerce or other experts when this is of relevance in regard to the presented views and brings something more to the analysis. When it is needed to study local implementation in more detail, I define the local actors more precisely as municipal and private company actors, in some cases also making a difference between municipal officials and municipal waste company actors.

5.3. Analyzing and comparing interview and document data

The aim of analyzing expert interviews is not to study the personal experiences of the interviewees and cultural meanings related to them but to gain factual information about the process (Alastalo & Åkerman 2010, 374, 389). In this study too, the main interest is on the description the interviews provided about the implementation process. After transcribing the interview data, I therefore continued processing it with content analysis, in which the interest is on discovering meanings from the data while the aim is to create a general, compact description of the studied phenomenon (Tuomi & Sarajärvi 2012, 103-104).

In simplified terms, the analysis of transcribed interview data can be depicted as proceeding through three main phases: classification, analysis and interpretation. Classification means systematical organization of the data into different categories to create a foundation for later analysis and interpretation (Ruusuvaori et al. 2011, 18; Hirsjärvi & Hurme 2010, 147). In the analysis phase, these categories are reorganized to expose connections, conformity or variation between them (Hirsjärvi & Hurme 2010, 149). The last phase is about discussion with the results: a researcher presents their interpretations about the results of analysis, connects them with earlier research and theoretical approaches and opens the topic for the reader's own interpretations and possible further research (Ruusuvaori et al. 2011, 29). In reality, the analysis does not proceed straightforwardly through these phases, but they overlap and interact (Ruusuvaori et al. 2011, 10).

After transcribing the interviews, I divided the data into a few main themes and then further into a few subthemes. These themes partly resemble the thematic areas covered in the interviews, yet the subthemes especially were also shaped based on the issues that arose from the interviews. Under the subthemes, I continued processing the data by dividing it into smaller topics and by organizing the data according to the different views concerning some topic, meaning I searched for similarities and differences in the data.

There are five main themes, under which the results were finally divided and discussed. The first three themes concern household plastic packaging waste management generally and locally and discuss the general premises for plastic collection and recycling, the roles of different actors in implementation and the collection methods. The fourth theme describes the local circumstances for implementation in Joensuu as a case example. Even if I changed the focus from Joensuu into implementation more generally, I decided to discuss Joensuu as an example to describe possible factors shaping the local implementation processes more concretely. The fifth theme discusses the relationship between waste management and circular economy.

When it comes to the role of theory in the analysis, my approach to analyzing the materials was theory-guided. A theory-guided analysis is not directly based on a theory, but has connections to it. The analysis is primarily founded on the data, but the theory is used to help bring out new aspects from the data. (Tuomi & Sarajärvi 2012, 96-97). In studies utilizing theory-guided content analysis, rather than being based on one single all-embracing theory, theoretical foundations often comprise of many theories, references on earlier research and concepts (Eskola 2007, 163). It is therefore common for a theory-guided and data-driven content analysis, that data collection and conceptual definition of the studied phenomenon are not based on a theory (Tuomi & Sarajärvi 2012, 98). Yet whereas in data-driven analysis, theoretical concepts are derived from the data, in a theory-guided analysis they are brought to the analysis from outside, as something already known about the phenomenon (Tuomi & Sarajärvi 2012, 117).

Like Ruusuvuori and Tiittula (2005b, 24) highlight, all data generated by any interview is produced in an interaction between the interviewer and the interviewee. As the facts too are co-produced by the interviewer and the interviewee, they cannot be straightly derived from expert interviews, but require constant cross-reading of information from different sources throughout the whole study (Alastalo & Åkerman 2010, 390). Using other materials such as different documents to complete the picture of a process is therefore often useful not only when preparing to conduct the interviews but also when analyzing the interview data (Alastalo & Åkerman 2010, 386-387).

I also used various policy documents in addition to the interviews to support forming a comprehensive picture of the policy implementation process, both when preparing for the interviews, but especially later when analyzing the results. The documents used to support the

analysis include mainly law drafting materials, such as reports commissioned by the Ministry of the Environment to study the effects of different waste collection options, environmental committee reports or government proposals as well as other reports considering waste management. My aim of using these materials was to open up the background of regulations to enable a dialogue between the goals of legislation and the experiences actors had of implementing the policies or to otherwise bring the encountered challenges into a larger context.

6. VIEWS AND EXPERINCES OF HOUSEHOLD PLASTIC WASTE RECYCLING

6.1. The premises for plastic collection and recycling

Even though in principle, all waste management in EU should follow the waste hierarchy established in the Waste Framework Directive, given the statistics about plastic waste treatment methods, it seems evident, that in the case of plastic, the implementation of waste hierarchy has not succeeded very effectively, neither EU-wide nor in Finland. Because of the low recycling rates and the special challenges connected to plastic waste, plastics are now defined as one of the priority areas in the EU Action plan for the Circular Economy. According to the Action plan, *“Increasing plastic recycling is essential for the transition to a circular economy”*, while this is considered to demand better separate collection and certification schemes for both collectors and sorters. (COM/2015/0614, 13). Yet as the following subchapters demonstrate, beginning from the premises such as the attitudes towards recycling and legislation or the economic incentives for collection and recycling, implementing plastic recycling policies in Finland takes place in circumstances characterized by many challenges and controversies.

6.1.1. Varying viewpoints about the need and rationality of plastic recycling

Many of the interviewed actors shared a view that recycling as such is not a panacea to the challenge of plastic waste but that attention should instead be paid to the question of our plastic consumption on a larger scale. Even though many considered recycling important, they also highlighted the role of diminishing the amounts of plastic waste through product design or by replacing plastic with other materials. Growing use of bioplastics was also suggested as a likely development in the future.

Some interviewees were more skeptical towards the rationality of collecting and recycling household plastic waste in the first place. Even if they did not directly condemn recycling pointless or even thought it is good as such they doubted whether the environmental effects of collecting plastic waste from around Finland had ever actually been calculated. In a Ministry of the Environment report about the estimated effects of separate collection of different packaging wastes, plastic waste was estimated to have a “potentially best climate balance” given that plastic packaging waste would be used to replace virgin plastic (Moliis et al. 2014, 39). Simultaneously, the climate balance of plastic was though noted to be connected to biggest

uncertainties. According to the report, dirtiness and heterogeneity of the waste stream might in fact possibly turn the climate balance into negative, which would make energy recovery a better option from a climate-point-of-view. (Moliis et al. 2014, 39).

There also seems to be a lot of ambiguity about the actual recycling process among the actors I interviewed. Five of the interviewees referred to insufficient information about the recycling process at the plastic refinery to estimate the total benefits of recycling. The rather mixed feelings and uncertainties related to the issue are reflected in a comment:

“But a good thing is that we now have the recycling points here, and we get the plastic separately collected, but then what this plastic is like and whether it is possible to use it as a raw material to substitute for virgin materials, I’m just afraid that as it is mixed plastic its separation is awfully difficult.”

More accurate information about the effects of the whole recycling chain from transportation to processing plastic at the refinery was considered important also for waste management planning, both at national and local levels. Especially some municipal waste management actors thought that having information about the regional or local effects of separate collection of plastic packaging waste would be useful when planning supplementary collection. One municipality had in fact assigned a consult to make a report about the environmental effects of different plastic waste collection options in the municipality.

In a way, ambiguity and complexity around waste statistics and estimations about quantities of different plastic waste streams especially were also reflected in somewhat contradictory views some of my interviewees presented about the significance of recycling household plastic waste. While according to one view household plastic packaging waste forms such a small section of the total material flow that its recycling is basically irrelevant and will likely stay such even if the recycled volumes would continue growing, according to another view this exactly is the waste section with potential to raise the total recycling rates.

The contradictions between different comments probably stem from the fact that different actors based their claims on different premises. Whereas Jokinen et al. (2015, 19) estimated the amount of plastic packaging waste generated in 2012 to be about 117 000 tons, they also estimated that roughly 264 000 tons of plastic packaging was reused the same year, thereby counting the total usage of plastic packaging to be 381 000 tons. Therefore, analyzing the total amount of plastic packaging used and proportioning the amount of household packaging waste

to it instead of packaging waste only can lead to a rather different interpretation of the significance of recycling household packaging waste.

However, if we focus solely on the amount of plastic waste generated, based on which the current recycling targets are counted, other sources of information seem to support the interpretation that household plastic packaging waste indeed forms a significant part of the total waste stream. First of all, as mentioned, Pursula et al. (2015, 8) estimated that 69% of all plastic packaging waste in Finland would be household waste. If we also assume 63 % of all plastic waste to be packaging waste, as has been estimated to be in Europe (Merta et al. 2012, according to Salmenperä et al. 2015, 34), this would mean that roughly 43 % of all plastic waste would be household packaging waste. Yet it has to be noted that as the percentages this calculation is based on are in themselves based on estimations and assumptions, this estimation too is only very approximate. However, in the light of other studies, it seems that household plastic packaging waste forms a significant part of the total plastic waste stream.

6.1.2. The prospects of plastic as a recycling material

Dirtiness and heterogeneity are not the only challenges related to recycling household plastic waste. Moliis et al. (2014, 23) also mention a lack of commercial recycling technologies in Finland, a lack of demand for recycled plastic and uncertainty regarding what happens to the plastic waste sent abroad as factors causing uncertainty about sufficient recycling opportunities for the collected plastic.

As the variety of different types of plastic is a challenge for the recycling process, many interviewees emphasized that improving the recyclability of the plastic products should start from the product design. At best, this could mean homogenizing the packaging materials or otherwise making them easily recyclable and at least improving the package markings to make separation of waste easier for consumers. Yet, combining improved recyclability with other policy goals such as reducing food waste or even reducing the amount of packaging materials is not always simple. One interviewee described, how for example vacuum packing or multilayer films used to improve preservability of groceries are problematic from a recycling-point-of-view. This actor mentioned an example of one new plastic package that recently came to the market and is advertised to reduce the amount of packaging materials used, but at the same time encompasses many features that make it hard to recycle: multilayer films, the use of vacuum, the color and the softness of the material.

Influencing packaging design is also not simple in practice as it often takes place outside Finland. A couple of interviewees had, however, noted positive signs of big brands in Europe starting to pay more attention to recycling issues and believed this could indicate a change in the plastic industry.

The reason plastic waste collection only concerns packaging is that producers are only obliged to pay for the collection of packaging waste and collecting other types of plastic waste would thus mean extra expenses for them. As for the recycling process, it does not make a difference if a product of suitable type of plastic is a package or not. One interviewee therefore brought out how the system could be improved by including other light plastic products into the collection.

At the moment, all household plastic packaging waste separately collected in Finland is taken to Fortum's Plastic Refinery in Riihimäki, where it is processed. Overall, the plastic waste delivered to the Fortum plastic refinery has been of good enough quality to be utilized through recycling. The challenge with producing recycled plastic, however, lies in the fact that compared to the value of the recycled plastic, the recycling process is rather expensive. Because of this, a gate fee is collected for every ton of plastic waste brought to the plastic refinery as is the case with many other recyclates too.

The interviewees had differing estimations about the prospects for the value of recycled plastic. While a couple of interviewees believed that the value of recycled plastic is about to grow in the future, other three were more pessimistic, referring to the high costs of operating the collection system and of processing the waste at the refinery. Two interviewees shared a view that it could be possible that some day the refinery would not have to collect a gate fee or would only need to collect a very small one, but that as a whole the costs of collection will continue to outweigh the value of the recycled plastic.

According to two interviewees in touch with the plastics market, there is demand for the recycled plastic. They both however mentioned a challenge related to the rules guiding the use of recycled plastic as there are certain regulations prohibiting the use of other than virgin plastic in particular applications. The supervisory authority was seen to prohibit everything "just in case" when it is not familiar with the issue such as using recycled plastic as a backing material in products. Another interviewee noted, that loosening regulations is an issue of big societal discussion about human safety and risk management, but already saw small signs of the regulations gradually changing.

Another challenge was identified in the authorities not striving to advance the use of recycled materials for example through public procurements. In order for the recycling industry in Finland to grow, many interviewees also thought that we would need more recycling facilities. Investment aids for building new facilities were suggested as a means to support their foundation. Also creating financial incentives for the use of secondary materials, for example through lower taxation for products made of recycled plastic, was seen as a possibility to support the recycling industry. One interviewee underlined the importance of recycling taking place in Finland as this will create work and improve Finnish purchasing power.

Some interviewees brought out the role of consumers in demanding shops to take products made of recycled plastics into their selection. An interviewee in touch with the consumers, however, felt that recycled plastic had not yet reached such a value as a production material that the consumers would have much interest for it and be looking for products made of it. Apart from plastic bags, products made of recycled plastic have not yet reached notable volumes in the selections of shops.

6.1.3. Waste incineration - a rival or a supplement of the plastic recycling system?

The role of waste incineration in modern waste management has provoked much debate. Even though according to the waste hierarchy, energy recovery is the second-least favored option in waste management only preferable to landfilling, the waste hierarchy as such is not legally binding for the member states unless its goals are implemented through other legislation (Turunen 2017, 9). This has enabled for example the energy recovery rates for plastic waste to stay at their current high level.

One typical source of controversies around the issue is the alleged risk that waste incineration would reduce incentives to develop recycling. Nevertheless, most of the interviewees did not consider waste incineration as a significant threat to the development of plastic recycling but rather saw that the two waste treatment methods can be complementary to each other. Many interviewees emphasized that waste incineration has above all replaced landfilling and is therefore an essential part of the waste management system. Interviewees also noted that after all our overall waste streams are so large that it is not likely we would run out of combustible waste no matter how effectively we recycle and that there will also always be non-recyclable waste that we need to burn. Waste incineration was also seen to have a role in the treatment of

plastic packaging waste particularly, where it is generally considered the best treatment method when the waste is so dirty that washing it would consume a lot of water.

This waste stream specific approach is also taken into account in the Waste Framework Directive as its article 4(2) leaves a possibility for exceptions of the hierarchy, when departing specific waste streams from it leads to the best overall environmental outcome considered from the life-cycle perspective. Yet primarily, realizing the waste hierarchy should start from the premise that life cycle perspective has already been taken into account in creating the hierarchy and that following it should therefore lead to the best environmental outcomes (European Commission 2012, 49).

One interviewee more critical of considering recycling to have a priority as the best waste treatment option for plastic waste suggested that the choice of the best treatment method should be considered regionally:

“...recycling should not be considered to have an absolute value there. That it will be done at any price. So it must be considered reasonably how and where it is worth recycling certain materials and where should they possibly be burnt.”

The biggest disagreement seems to surround the actions and interests of the municipal waste management companies in relation to the issue. This stems from the fact that municipal companies have often invested in the waste incineration plants and committed in a contract to deliver a certain amount of waste to these plants. Therefore many interviewed actors shared a doubt whether the municipal waste management companies will eventually have an interest to develop plastic waste collection.

“What I am a little concerned about here is the real will of some municipal actors to advance plastic packaging recycling. Because there has been that kind of commitments made with the incineration solutions that there are municipal actors, that will get contract-wise and economically into a bit difficult situation, if all the plastic packages would be taken away from the fuel. That raises a question whether there really exists a genuine will to enhance recycling.”

“Well they [municipal waste management company] could start collecting it in principle, if they wanted, but in a way they would eat their own bread then. As now combustible waste is kind of better business for them, they get more money out of it.”

At the same time other interviewees did not see that waste incineration plants would actually effect the willingness of municipal waste management companies to promote recycling. They

noted that some municipal waste management companies have in fact been actively bringing supplementing collection to the properties and that plastic is so light that it does not make a big difference in regard to the tons delivered to the waste incineration plant if it is taken away from the load. One interviewee suspected that it is private waste companies that make these kind of untrue claims about municipal companies, even though private companies themselves would be guilty of what they accuse the municipal companies of.

“It is not our primary purpose or will to get as much waste as possible to be incinerated, that is in the hands of the owners of the waste plants to plan, with what kind of waste streams they are able to run the facility. I believe that even though there are many facilities, where the municipal waste management companies are co-owners, they certainly have not counted it on their own solid waste quantities, but they sell their surplus capacity for these private companies that are moaning about these waste incineration plants.”

6.1.4. Contradictory interpretations of the role of legislation and recycling targets

Generally, views on waste legislation were rather twofold. On the one hand, many actors saw binding rules as the most important and most effective way to steer waste management, on the other legislation was often considered incoherent, excessive or otherwise impractical steering instrument.

“Well actually the waste industry is such that it is strongly steered with legislation. Nothing really moves forward until the legislation obliges. And it has helped recycling, for example, a lot, that obligations have been given through legislation. --- but we do not see that the right way would be to start raising the recycling rate with legislation, for instance.”

Another actor described how confusing formulation of the legislation makes it hard to implement. According to this actor, the fact that packaging waste collection is simultaneously regulated by many different articles from different paragraphs and that the regulations concern all waste under producer responsibility generally have meant that the implementation practices and guidelines have been formed in a situation characterized by a practical necessity.

One actor also brought out how complexity of waste legislation for its part complicates decision-making in local governments as being able to make decisions on waste issues would require a lot of studying about the whole field.

EU-legislation regardless of its subject matter is often criticized for not paying enough attention to regional differences and special characteristics of different areas. The same holds true for recycling targets set from EU. Many interviewees felt that the recycling targets are decided upon without paying enough attention to the special circumstances in Finland, such as sparse population and its effects on the environmental impact of collecting large quantities of plastic waste. On the other hand, one interviewee pointed out how Finland usually in fact does well in terms of implementing EU targets, which is why common initial opposition towards stricter targets may be viewed critically. Yet, by one critic, “Finland being EU’s model student” that is the first to immediately drive its own legislation when something is decided upon in Brussels, is exactly the biggest problem in relation to legislation.

Many local actors emphasized how a regional perspective should be taken into account when issuing both EU and national recycling targets or other regulations. One actor claimed that both national and EU plastic recycling targets are primarily politically determined, which means that they do not necessarily even conform to the overall recycling targets of municipal waste. Another actor commented on the unclarity related to calculating recycling rates. According to this actor, harmonizing the calculation methods for the recycling rate in the EU would be a prerequisite for a possibility to even have a discussion about these rates.

Jokinen et al (2015, 18) list several factors that make comparisons between the recycling rates of packaging waste between different EU member states difficult: differences in the used sources of information, differences considering what is counted as recycling and differences regarding materials counted as packages. One more thing is the aforementioned difference between taking into account only recycling versus both recycling and reuse, which at least in Finland makes a significant difference in terms of material efficiency. While in 2012, recycling rate for plastic packaging waste was 25 %, the corresponding rate for reuse and recycling of plastic packaging was 77 %. Even though waste prevention, into which reuse is by definition counted, is given the highest priority in the EU Waste hierarchy, EU has not yet set reuse targets for packaging waste (Jokinen et al. 2015, 19).

Many shortcomings of EU waste legislation, such as the need for simplification and harmonization of definitions and calculation methods have been recognized on EU-level and are now taken into account in the goals set in the EU circular economy package (COM/2015/0614, 10). The legislative proposal on packaging waste adopted as a part of the circular economy package also suggests adding preparing for re-use to be taken into

consideration alongside the recycling rate. It is however noteworthy that “preparing for reuse” refers to an essentially different thing than mere reuse of a product. Preparing for re-use requires a product first to become waste, before it is reused after needed preparations (WFD 2000/60/EC). The exact interpretations about the issue vary between different countries which is why the definitions are currently under discussion as the preparatory work on circular economy package continues. The adopted definitions will eventually considerably affect how ambitious the recycling and reuse target will be for example from Finland’s perspective. (Koskinen 2017).

6.2. The sharing of responsibilities between waste management actors

The contradictions between different waste management actors are common. The conflicts partly stem from the fact that even though waste management is a large business area, competition on the field is very regulated. In the preparatory documents for the new Waste Act, these restrictions on competition are considered necessary to guarantee the functionality of waste management (HE 199/2010 vp, 43). Yet, restrictions can lead to unfair situations from different actors’ points of view. Another factor contributing to the possibility of conflicts is that the distribution of responsibilities in legislation is often considered unclear as the Waste Act leaves possibilities for divergent interpretations considering the responsibilities of different actors (Ympäristöministeriö 2015, 10). What further complicates the issue is that because of a growing awareness about scarcity of natural resources, technological developments enhancing waste utilization possibilities and developments in waste regulation, waste treatment and utilization is more and more often a profitable business (HE 199/2010 vp, 31-32). In the light of the interviews I conducted, it seems that sharing of responsibilities between waste management actors raises a lot of contradictions in organizing household plastic packaging waste collection, too.

6.2.1. Incentives and challenges created by extended producer responsibility

Before the extended producer responsibility came into force, so-called partial producer responsibility was applied to packaging waste. This meant that producers only had a responsibility to guarantee that altogether 61 % of all packaging waste was utilized. In practice they were able to fulfill this requirement by managing the waste from industrial and

commercial activities. Implementation of partial responsibility was considered to cause unclarity and contradictions in terms of sharing of responsibilities between the waste management actors and this in turn to lead to problems in the legal security of the citizens. The shift into extended producer responsibility was therefore considered to clarify the rules concerning the sharing of responsibilities. (HE 199/2010 vp, 37, 95). According to the government proposal for the waste act (HE 199/2010 vp, 37) the overall aim of the changes to rules considering producer responsibility was to improve the standard of service. Even though most of the actors I interviewed seemed to approve the idea of extended producer responsibility as a guiding principle in waste management, many were critical of the way it was in practice implemented in Finland.

The general idea behind producer responsibility policies is that as they can encourage to both minimize the amounts of waste and to utilize the material value of wastes, they may contribute to the implementation of the waste hierarchy (YmVM 4/2004 vp, 3). The potential benefits of a waste management system based on producer responsibility were recognized also by those interviewed actors that were otherwise more critical of the way of implementation:

“I do not necessarily see a problem at it [plastic waste] going to the producers particularly, in them receiving it and maybe they specifically could better influence to the production end, too.”

However, whether a shift to extended producer responsibility actually created any incentives to decrease the use of packaging materials or to take recyclability better into account in production has been questioned. This is because products are usually not designed primarily for the Finnish market nor from the perspective of waste management. Packers and producers also already have an economic incentive to minimize the use of packaging materials for logistic reasons and after all, in the price of a product, the share of packaging is very small. (Kautto et al. 2010, 26-27). The actual effects of waste collection on the price of one plastic package have been estimated to be only about 0,0001-0,0004 euro per an average food package (FCG 2010, 25). Moreover, different goals such as reducing the amount of packaging materials and enhancing recyclability are not always consistent, as discussed. When producers pay recycling fees according to the amount of packaging materials placed on market and the recycling targets the legislation obliges them to meet are rather easily achieved, the emphasis of incentives created by legislation may be rather on reducing the amount on materials than enhancing recyclability. Although favorable as such, this however is not self-evidently the best solution considering material use as a whole. Also, even if producers in principle bear the costs of

collection and treatment of packaging waste, it is eventually customers that pay for the waste management organized by producers, since producers at least partly transfer the expenses incurred on them to the prices of the products. It is though in producers' interest to keep the prices low (Fråne et al. 2014, 108).

Whether or not extended producer responsibility actually has any effects on packaging design, it has significantly changed the organization of packaging waste collection. Some of the interviewed actors generally critical towards the implementation of extended producer responsibility considered its potential advantage to be creating a uniform collection network for the consumers throughout the country. As far as household plastic packaging waste is concerned, the shift into extended producer responsibility can in fact be considered pivotal as it started the collection and recycling in the first place. As an actor otherwise rather critical of the implementation of extended producer responsibility admitted:

“...probably at least we would not have separate plastic collection now, had the producers not started it.”

The Waste Act guarantees the producers the right of precedence in organizing collection of waste under producer responsibility. The idea is that it is fair to ensure that producers have a primary right above all to waste with positive value as they bear the main responsibility for organizing waste management and pay the costs related to it. Moreover, collecting together higher amounts of waste can create more demand for these waste materials, since profitable reprocessing of waste usually requires waste volumes big enough. (YmVM 23/2010 vp, 13). Being able to gain profits from recyclable waste could in turn encourage producers to enhance their waste collection systems and aspire to reach higher recycling rates. As for household plastic packaging waste, the challenge however is the negative value of its recycling.

When collecting wastes barely means costs for producers, they may not have an incentive to aim at collecting more than the minimum required amount. Therefore, even if the interviewed actors considered extended producer responsibility and the fact that it brought household plastic packaging waste collection to Finland as favourable developments as such, many interviewees shared a belief that the current legislation on extended producer responsibility does not create any incentives for the producers to develop the collection system any further than the minimum demands.

“They see that they go exactly to the point that the packaging waste decree demands. And if it’s reached, then perhaps it is pointless to even think that the system would be developed further, and that the producers would invest more in it. I don’t believe in it.”

Another actor did not consider the shift into extended producer responsibility to have overall brought any significant changes into the circulation of materials in Finland:

“I mean materials have circulated in Finland already earlier. So in reality, this full producer responsibility didn’t change anything else in this matter than the payer, in my opinion. I mean in any case, be it municipal waste management or waste management organized by producers, the payer is eventually a consumer.”

The actual effects of the extended producer responsibility on the amounts of collected materials are still hard to estimate as the system has been in operation for a rather short time.

6.2.2. The supplementary role of other actors

One challenge with the former legislation was that other actors could collect valuable waste and earn profits from it, while producers were left the responsibility to take care of waste management for wastes with negative value (HE 199/2010 vp, 42). This was a reason behind limiting the rights of other actors and giving the producers the precedence to collection in the current Waste Act. According to §47 of the Waste Act, other actors may only organize parallel collection or reception systems when this is done in cooperation with the producer. Municipalities have the secondary right to organize supplementary collection, and if a municipality has not arranged it, private companies can offer their services for the consumers, in practice often represented by property managers.

Plastic, in a sense, is a special case since its separate collection on a larger scale only started simultaneously with coming into force of the extended producer responsibility. Plastic packaging waste currently does not have a positive value and all the collected plastic packages eventually have to be delivered to terminals of the producers. The producers have also decided not to extend their collection network to the properties and have no interest to aspire to limit the actions of municipal or private companies if they want to organize supplementary collection. For these reasons, plastic packaging waste collection is not so liable to cause conflicts of interests between producers and other waste management actors now that the collection network is created and in operation. Neither did my interviewees raise actual

conflicts that would have taken place between the local waste actors and the producers since the collection of household plastic packaging waste started. Instead, critique often presented by municipal companies concerns the creation of the collection network and how the responsibilities between the actors were shared in the first place.

Municipal actors are often very critical of the fact that when the extended producer responsibility came into force, RINKI created a new collection network taking only limited advantage of the already existing collection network of the municipalities. Many see that it is not effective or coherent for customers that there now exists two parallel collection systems as municipalities continue to upkeep many of their own collection points. This, however, does not directly concern plastic packaging waste as its collection only started along with RINKI creating the collection network. When municipalities decide to organize supplementing collection, they also usually do it on properties, not on take-back points.

What concerns plastic waste too, however, is that many municipal actors are also of the opinion that it would have been a better solution to assign producer organizations the responsibility to cover the costs of the collection network but to give the municipal waste management companies the task of actually operating that network. One municipal actor described the process of implementing extended producer responsibility:

“Well it is good of course, that producer responsibility has been increased, if you could say so. But this way of implementing was totally foolish, totally irrational. A devastating amount of money was wasted, but the problem was that there was no willingness to cooperate with municipal companies in a sense that the existing network would have been utilized. So we would have been given the operative task.”

Another municipal actor criticized RINKI as the operator of the collection network:

“...as RINKI is a nationwide actor, it is not much bothered by a collection point of some single area, whereas in this area they may be very important, and for these customers of ours they are important.”

On the other hand, an actor representing the interest of producers saw that many incentives created for the producers by a system where they have an opportunity to influence the means to reach the recycling targets would disappear if they were only to pay a bill for recycling organized by municipal companies. According to the actor, in the long run these incentives contribute to creating recyclable products.

The incentives of the municipal companies to organize supplementing collection are another contradictory and divisive issue. Generally speaking recycling plastics is currently not economically attractive compared to other waste management options at least in the Nordic countries (Fråne et al. 2014, 108). If incineration of plastics within mixed waste is a cheaper waste treatment option than organizing separate collection and the municipal companies have also invested in waste incineration plants, their incentives to organize supplementary collection are not self-evident, as discussed within the paragraph about waste incineration. Again, the views of the interviewed actors considering the incentives of the municipal actors to organize supplementing collection were polarized. Some actors emphasized the non-existence of any incentives and that organizing supplementing collection means *“only expenses for the municipalities”* or *“doing free work for the producer organization”*. Others referred to *“public spirit”* as a driver of municipal waste companies in advancing the recycling of materials or to their commitment to act according to the principles set in the Waste Act.

Even though the Waste Act ostensibly requires producers and other actors to cooperate when parallel collection systems are established, in practice this cooperation seems to be rather official, meaning primarily that the producer organization gives a municipality a permission to collect plastic waste and instructs on practical and technical issues concerning collection. Therefore, a couple of municipal actors were hoping for more and better cooperation that would reach further than just agreeing about supplementary collection.

“In my opinion somehow municipal waste management companies and producer organizations should be obligated to cooperate, so that the best possible solutions would always be considered together. And not only staring at the recycling. We should see where it is most reasonable, or easiest to develop it so that we would get a material gain as large as possible.”

The interviewees presented differing estimations about the direction of cooperation between different actors of the waste sector. An actor primarily familiar with nationwide issues was able to see willingness to cooperation on the field and felt that disputes had decreased from previous years. On the other hand, an actor involved in local waste management felt that in the past, cooperation used to be of better quality and that since then, communication through discussions has nearly vanished.

6.2.3. The long-standing disputes between municipal and private companies

A certain kind of juxtaposition commonly exists between municipal and private waste management companies and many of these contradictions are also present concerning the organization of waste management of materials under producer responsibility. One of the main themes of the disagreements is related to the position municipal companies have in organizing municipal waste management, which private companies often claim to cause unfair competitive advantage. Private waste companies have therefore demanded that the holder of waste should be able to freely choose the provider of waste management services. (Valtakari et al. 2014, 60).

Another example of the disagreements already mentioned is related to waste incineration. The substance of the dispute is that private companies claim that by striving to deliver enough mixed waste to the incineration plants, municipal waste companies prevent the development of recycling or parallel combustion of energy waste. On the contrary, municipal waste management companies accuse private companies of burning recyclable waste in parallel combustion and therefore hindering the realization of the waste hierarchy. (Valtakari et al. 2014, 60). The contradictions are reflected in a comment made by one interviewee representing a private waste management company, who doubted that their willingness to recycle may not appear in a very positive light from the municipal company point of view, since it is away from the revenues municipal company earns from waste incineration.

Overall, it became apparent from the interviews that there indeed is a lot of mistrust between municipal and private companies. Both sides seem to believe that they do the work better than the other. While a municipal company actor claimed that the private companies only think about business, unlike municipal company, that aims to make separation of waste easy for customers, an actor from a private company similarly suggested that they indeed do waste management better and are more committed to enhancing recycling than the municipal company.

One of the biggest arguments is related to tendering waste transportation services. Many small companies have felt that they no more have possibilities and resources to win competitive biddings organized by municipal waste management companies, as they increasingly favor big companies (Valtakari et al. 2014, 48). An interviewed private company actor was very critical and worried about the tendency to move to larger tenderings in municipal waste management, which the actor saw as eventually leading to the vanishing of smaller, local private companies. According to this actor's point of view, smaller companies are both more beneficial to the local economy as a whole and do the work with better quality and commitment than large, possibly

foreign-owned companies that tend to win the tenderings. Then again, according to a municipal actor, before the tenderings the local companies could collect excessive gains from the customers and then burned their bridges to the municipal companies during the fights about tenderings.

What actors from both sides agreed on is that more and better cooperation is needed and that before anything, it would require a common change of attitude.

6.2.4. The role of consumers

According to the interviewed actors, consumers have mostly welcomed plastic packaging waste collection with enthusiasm. On the other hand, as one interviewee pointed out, the excited feedback different waste management actors get may not reveal the whole truth:

“...there are a lot of those active recycler citizens, who are in contact, as that they are so effective, then there is a big mass that has not yet started and for the majority, carrying the plastics there, say you have to take it many kilometers away, may be a little bit too laborious.”

Most of the interviewed actors were of the opinion that consumers still need more information about plastic waste collection and the practical issues related to it and that guidance should therefore be enhanced.

Recycling plastics does indeed require both knowledge and effort from consumers, even compared to other recyclable packaging materials. First of all, consumers are supposed to know which types of plastic are recyclable. Since recycled plastics have to be clean, used packages often need to be rinsed and dried before bringing them to the take-back point. Consumers should also be aware of other rules considering recycling such as that different types of plastics should be separated from each other and that packages of different materials should not be put inside each other. As it is still rather rare to find plastic waste collection on properties, consumers wishing to recycle plastics often also have to carry the packages to the take-back point.

Some interviewees noted that in addition to delivering more information about practical issues related to waste collection, consumers should be better informed about the actual effects and benefits of recycling and for example applications of recycled plastic. More information could

motivate them to separate their wastes, or as one actor suggested, to question the rationality of separate collection of household plastic waste.

In principle, packaging waste collection under producer responsibility should create incentives for the consumers to decrease the amount of packaging waste they generate. This is because they eventually pay for the costs of waste management in the prices of the products. (Moliis et al. 2014, 27). In a way, this strengthens the application of polluter pays principle in waste management, as those customers creating the greatest volumes of packaging waste also pay the most (Moliis et al. 2014, 33). As Moliis et al. (2014, 27) note, the challenge, however, is that consumers are usually not aware of all the factors affecting the price of a product or its packaging and the price of packaging will unlikely effect their purchase decisions. Actual realization of polluter pays principle is questionable as well, at least when it comes to plastic packaging, as the price of packaging is usually very low.

One interviewed actor as well was especially concerned about consumers' unawareness of the costs of waste management being included in the price of every package they buy. This actor suggested, that the share of waste management costs in the price of a product should be clearly indicated in packaging as this would give the consumers an opportunity to question whether they want to pay such costs.

Raising consumer awareness may not be a straightforward task. Many interviewees identified a challenge related to getting the message through to consumers; even though information is available and delivered through different channels, it does not always reach the customers. An example of one particular practical challenge still prevalent is that not all the consumers have assimilated that the collection only concerns packaging waste. One municipal waste management actor perceived it a challenge that RINKI has the responsibility to deliver information nationwide while waste management companies simultaneously have to deliver information in their communications, even though the actor recognized the benefits of both nationwide and local informing. At the same time an actor representing the producers told that they have noticed a need to deliver information on a regional level in addition to national communication channels to bring the issue closer to consumers. Both actors mentioned a possibility to some kind of partnerships in communications, yet neither knew exactly how this could be realized.

6.3. Collection methods

According to the 49§ of the Waste Act, the producer has to organize collection points for discarded products so that they can be disposed of free-of-charge and easily. The aim is to guarantee a minimum standard of service for the owner of a product (Moliis et al. 2014, 21).

Before the Packaging and Packaging Waste Decree came into force, other household plastic waste than bottles had not been separately collected in Finland on a large scale. At some areas, plastic waste has been collected for waste-to-energy purposes or as trials for plastic recycling. Therefore, even though the accessibility of plastic waste take-back points is not as good as for other packaging wastes, the new network of collection points has still considerably improved the national standard of service (Moliis et al. 2014, 23). Moliis et al. (2014, 23) see the uncertainties related to sufficient possibilities to recycle packaging waste as a justifiable reason for fewer take-back points compared to other packaging wastes.

The standard of service, however, is not the only criteria that the sufficiency and functionality of the collection network can be weighed against. Environmental impacts and costs of collection are other often-mentioned factors used to evaluate collection methods. The different criteria are not easily commensurable (Moliis et al. 2014, 42). As one interviewed actor pointed out, this leads to the impossibility of unambiguously establishing a hierarchy among for example standard of service and environmental effects. This poses a challenge for waste management planning. A local actor described weighing between the different perspectives:

“Well it is kind of balancing, partly in some places the standard of service may be given more weight, sure in other places not. But the environmental effects surely do in some way set limits to what services are provided”

Separate collection is not the only possible way to arrange the separation of plastics from other waste. At the moment, a small fraction of mixed waste ends up in a waste separation facility in Riihimäki, where recyclable plastics are extracted from other waste. Another waste separation facility extracting amongst other things plastics from the waste stream is located in Lahti and one is being planned to be built in Oulu. Even though some interviewed experts saw potential in mechanical separation, it seems overall unlikely in the light of expert comments, that separation in a facility would become a solution on a larger scale. Instead, separate collection will probably continue to have a key role in waste separation.

Even though household plastic waste collection has only just started and is currently shaping up in Finland, significant changes may already be on their way in the form of recycling targets set in the EU circular economy package. The proposed 55% recycling or preparing for reuse target for the year 2025 was generally considered very strict by the interviewed actors. According to them, imposing a target this high would demand major changes to plastic collection and recycling in Finland. Many emphasized the role of substantially extending collection on properties, but reaching the target was also believed to require building new recycling facilities, facilities for mechanical separation and chemical recycling.

6.3.1. The adequate extent of the collection network?

A question whether the current requirement of 500 take-back points throughout the country is reasonable and adequate divided opinions among the interviewed actors. Some directly condemned it as insufficient, or saw that even though a smaller network may have been a good starting point, it should already be expanded.

“...if we particularly consider that we had to start somewhere and see if this works, so it probably may have been a controllable number. But now it is already directly beginning to seem too small, as we have got the experiences of it working.”

Some, on the other hand, were very critical towards any expansion to the requirements considering the extent of the network or even towards the current requirements. The requirements were seen as environmentally unsound, uneconomic or otherwise impractical.

“I would completely consider, why these kind of 500 or 1850 points are scaled and put into decrees. It is by no means a reasonable or flexible model in the long run.”

A couple of interviewees brought out their doubts that decision-making on the requirements of the collection network may have been based on coincidental or political factors rather than analyses about the effects. One interviewee described how the number of take-back points started declining as a consequence of lobbying from interest groups and doubted whether the eventual, reduced requirement of 500 points was actually considered satisfying in the Ministry of the Environment. Another interviewee described how the packaging industry had an ambition to set the extent of the collection network yet considerably smaller than it is currently. As for the requirement to establish a plastic packaging waste take-back point to every population centre of at least 10 000 inhabitants, one interviewee wondered whether this was

more of a coincidental than a considered decision made primarily to get started with the collection in the first place.

Whether the requirements considering the extent of the network are considered adequate or not, the number of points alone does not determine the sufficiency of the network. In fact accessibility, central location and information delivered to consumers may be even more important in regard to the gain of collected materials than the total number of take-back points (Moliis et al. 2014, 24).

For the time being, RINKI is not about to expand the collection network of plastic packaging waste now that it has reached and slightly exceeded the required 500 points. Yet it is possible to use the existing network more effectively. One interviewee stressed how it is possible to collect multiple times the amount of plastic collected with the collection network last year, which was 2600 tons. According to this actor, the aim this year is to collect 6000 tons, while the capacity of the network would still enable doubling this amount. According to another actor, RINKI is also likely to be relocating some take-back points if it turns out that the collected amount might be bigger elsewhere.

6.3.2. Where should the collection take place?

The majority of RINKI take-back points are located within grocery stores. Establishing a take-back point requires negotiations between RINKI and the grocery store as well as a permission from the landowner, when it is not the store. Depending on the size of the take-back point, it may also require a construction permit or a planning permission from the municipality.

Interviewees generally considered the disposition of RINKI take-back points within grocery shops as a good, practical solution. A take-back point is usually also a favorable facility from a grocery store perspective, since it can be one pull factor adding to the overall attraction of the shop, as described by an interviewee representing commerce. Yet even if take-back points within grocery stores were regarded beneficial for different actors, many interviewees did not consider them alone as an adequate solution for household plastic waste collection, at least in the current extent. Even though some interviewee also suggested that expanding RINKI's network to significantly more grocery stores might be needed in order to reach higher recycling rates, most interviewees emphasized the importance of other collection methods. Collection on properties especially provoked discussion, most interviewees seeing it as an important part of

a more effective collection scheme. The advocates of collection on properties included actors representing producers and industry, municipal waste management, private waste management company and other experts alike.

Even though according to the law the producers have the primary right to the collection on properties as well, the producer organization has made a decision not to start collection on properties and it seems likely that they will have no interest to change their approach in the future either. Collection on properties can thus be based either on waste management provisions given by a municipality or on the voluntary will of consumers to buy plastic collection services provided either by a municipal waste management company or a private company. Voluntary collection service is usually only provided to the customers of a certain region or living in a housing cooperative of a certain size. In practice, collection on properties is still most often based on a voluntary contract. According to an interviewee, collection on properties is already starting in 20 subregions covering about 100 municipalities. A couple of interviewees suggested that national regulations or guidelines might be needed to encourage into collection on properties, provided however that collection would always be based on an assessment of its effects on each area.

The interviewed local actors had rather varying views and had adopted differing approaches regarding collection on properties. The high variation between the answers is however also because of the fact that I intentionally selected interviewees from municipalities with differing practices to enable comparing these differences in approaches. The opinions between the interviewed local actors varied from seeing waste management provisions as a good way to guide and encourage to collection on properties into being rather skeptical towards all collection on properties.

In one municipality it had been considered better to wait for more experience and information about collection through the take-back network before issuing binding waste management provisions. In another municipality the authorities had eventually decided on obligating properties with a high number of flats to collection as this was seen to ease the start of collection in practice compared to properties joining in voluntarily. This was because giving provisions, for example, enabled planning effective routes for the waste collection vehicles and cooperating with the property managers to get experience of collection.

Approaches towards a voluntary collection service provided by municipal waste management company were similarly varying. In one municipality the waste management company had no

interest to start offering voluntary collection service, in another voluntary collection service was provided for the interested and in a third municipality, voluntary collection supplemented collection based on waste management provisions. All municipal and private company actors offering voluntary collection service were for the time being only providing it for the most central areas, while an expansion of the covered area was regarded possible in the future. Collection based only on voluntariness was mentioned to offer the benefit of leading to a better quality of the collected material, as only the most motivated were now involved in it.

According to the local actors, fitting plastic waste bins on properties may in some cases cause a practical challenge for the collection. In fact two local actors regarded this as a significant limiting factor for the collection on properties or a reason not to give waste management provisions about plastic waste. Yet two other actors did not consider this as a major issue at least for now as the collection has not yet expanded into smaller properties. In fact, collection can in many cases be started by simply replacing one mixed waste bin with a plastic waste bin, meaning also that the costs of customers should stay nearly the same if not decrease.

A couple of interviewees mentioned a possibility that if waste collection vehicles with two or more compartments for different types of waste become more common, collection of plastic waste even from detached houses could be possible in future.

Perhaps one of the main practical challenges of plastic packaging waste collection is caused by a feature of plastic that for one reason makes it so widely used – lightness. This is because lightness also causes plastic waste to take up a lot of space when gathered together. Even though this challenge can be rather easily solved at the take-back points by installing a press to the container, at homes this may pose a real challenge or even an obstacle for its collection. Collection on properties may offer a partial solution to this challenge, as for many, it could reduce the need to store plastic waste at home for a long time.

6.4. An example of local implementation: Joensuu

I will discuss the organization of household plastic waste collection in Joensuu to illustrate the local implementation process more concretely. However, as I intend to keep the actors anonymous, I have had to exclude issues related to acts of certain actors and to the relationships between the different actors from this section. Those results are covered as part of previous

sections. This chapter merely draws a rather general picture of the operational environment in which household plastic packaging waste policies are implemented in one city.

Joensuu is a city with nearly 76 000 inhabitants located in Eastern Finland (Joensuun kaupunki 2017). In Joensuu, the waste management service responsibilities belonging to the municipality are taken care of by a waste management company called Puhas Ltd, which is commonly owned by five municipalities from the region. The administrative functions of waste management are taken care of by a regional waste management committee operating at the area of the same five municipalities that jointly own Puhas Ltd. The supervisory functions of waste management in the region belong to the ELY Centre of North Karelia and the environmental protection authority of the municipality. (Puhas Ltd 2017).

The basic guidelines of waste management in North Karelia are outlined in a waste plan for Eastern Finland for 2016. The plan describes the current situation of waste management in the region and presents the objectives of waste management development as well as the actions that need to be taken to realize these objectives. The waste plan was in principle drawn for years 2010-2016, but it continues to be in force until the new regional waste plan will take effect. (Pohjois-Karjalan ympäristökeskus 2009).

As far as the legal obligations of establishing plastic packaging waste collection points are considered, the producers would be obliged to only establish one collection point in the city. This is because Joensuu downtown forms the only population centre of at least 10 000 inhabitants within the area of the city (Pohjois-Karjalan Maakuntaliitto 2015, 18). However, at the moment there are three RINKI collection points for post-consumer plastic packaging waste in Joensuu. Two of them are located within hypermarkets situated on the outskirts of the city center while one is located next to a grocery store a couple of kilometers from the center. Especially the collection point located within Prisma Joensuu has been outstandingly popular – between January and June 2017 it collected the highest amount of household packaging waste of all RINKI collection points in Finland (Rinki 2017).

Waste management provisions of the city of Joensuu do not require completing the collection of plastic packaging organized by producers on properties. Neither is the municipal waste management company Puhas Ltd currently offering voluntary collection services. Instead, there is at least one private waste management company collecting household plastic waste on properties.

Mixed household waste from Joensuu is taken to Riikinvoima Eco Power Plant, which is located about 130 kilometers from Joensuu in Varkaus. The power plant has been in productional operation since February 2017. It is owned by Varkauden Aluelämpö Oy and eight municipal waste management companies, including Puhas Ltd. (Riikinvoima Oy 2017).

The remote location of Joensuu on the Eastern border of Finland and the sparse population of the area are perhaps the two most central issues defining the premises for all waste management in the city. At the same time, these same characteristics could describe the circumstances in most parts of the whole country. Therefore, the worry and wish of local actors considering taking the special circumstances of remote areas into consideration in national policy-making is probably shared around Finland:

“Things cannot necessarily be done the same way in Joensuu as they are done in Helsinki.”

One actor pointed out how regional differences reach further than just the question about the reasonable number of collection points. According to the actor, for example the collection vehicles may need to be different in different areas having for instance different snowfall during wintertime.

Based on the comments of the local interviewees, it seems that the waste plan for Eastern Finland has not had a strong steering influence on waste management. In fact, the actors did not seem to be very familiar with the plan in the first place. One actor considered the challenge with the plan to be it covering too large an area both geographically and content-wise and the fact that within the time of the plan being in operation, changes happened in both legislation and the operational environment have caused the plan to appear outdated today. According to this interviewee, it is likely that in future drawing regional plans will be replaced with regional operational programmes for the new national waste plan.

The controversy discussion related to waste incineration is perhaps especially topical in Joensuu, as Riikinvoima Eco Power Plant has only been opened recently. Joensuu being located 130 kilometers from Riikinvoima as compared to 400 kilometers from Riihimäki is one obvious fact that can be used to argument against carrying household plastic packaging waste into the recycling facility. Another issue that was raised during the interviews as an argument against separate collection of household plastic waste is the sparse population and the following long distances within Eastern Finland.

The popularity of the take-back point located at Prisma is explained by Prisma Joensuu being the biggest Prisma in Finland and very popular among consumers. As Prisma Joensuu is located on the outskirts of the city, some three kilometers from the center, it is most often visited by car. This therefore entails the question about the environmental effects of bringing plastic waste into the collection point by car. Yet this was not considered problematic by the interviewees when the consumers would have visited the market in any case and not just to bring plastic waste there. The interviewees described a “positive challenge” that occurred when the plastic collection first started at Prisma, as the amount of plastic waste brought to the point was higher than expected, which in the beginning caused problems with the collection capacity. These could however be rather easily solved with practical adjustments. It seems like starting the collection of plastic packaging waste has also clearly raised the amounts of the other packaging wastes collected at the point.

Sometimes the attempts to effect consumer behavior are rather small and practical. During the summer, the collection point was reformed to make it look greener. According to an interviewee the landscaping is hoped to not only make the collection point look more attractive for consumers but also to create associations with greenness and environmental values. At best, this could not only encourage people to recycle but also to keep the collection point clean.

One local actor estimated the future prospects for collection on properties in Joensuu to be good not only because plastic waste collection is affordable for the consumers, but also because “*North-Karelian people like to recycle*”.

6.5. Perceptions on the role of waste management in circular economy

As described earlier, waste management is only one of the many sectors playing a part in realizing circular economy. Yet it has become a central concept in waste governance both EU-wide and nationally. According to the EU circular economy package, waste management “*plays a central role in the circular economy*” as it “*determines how the EU waste hierarchy is put into practice*” (COM/2015/0614, 8). In Finland, circular economy seems to be given an essential role in the new national waste plan, the current draft version being named “From recycling to circular economy”. The first of the plan’s seven objectives for the year 2030 is that “*Waste management is part of Finnish circular economy*”. (Ympäristöministeriö 2017, 4).

The concept of circular economy is gaining more and more prominence in municipal waste management as well. Many cities or regions have waste management goals or projects related to circular economy. For example Savo-Pielinen waste management committee, the operation area of which neighbors that of Joensuu waste management committee, has raised circular economy to a central role on its waste policy programme for 2022 (Savo-Pielinen jätelautakunta 2017, 11).

Even if in principle, the EU waste hierarchy creating a framework for all waste management in the EU, seems to promote mainly the same priority order of waste management practices as circular economy, the correspondence of the EU waste hierarchy and circular economy has been questioned. According to Gharfalkar et al. (2015, 306, 312) “*the WFD2008 supports ‘circular thinking’ to some extent*”, but they criticize it for being unclear and for overlaps between its measures and for absence of recovery and reuse in its measures.

Similarly, if not even more, open to interpretations is the relationship between circular economy and actual local waste management practices. This became apparent from the interviews, as the interviewed actors had rather varying interpretations about the role of waste management and recycling as well as their own role in enforcing circular economy. Again, contrary interpretations were presented, especially to a question concerning the role of recycling in relation to circular economy. On the other extreme recycling was seen as representing such a small part of the whole circular economy, that the concepts should not even be connected:

“I have never seen recycling being circular economy. In my opinion circular economy is a part of so much more that includes lending and reuse and others and recycling in such a small part of it that I would keep it almost completely separated from circular economy thinking.”

On the other hand, a more common view was to see recycling as self-evidently promoting circular economy, even if the interviewees also recognized that it is just a part of a whole.

“Of course we have to remember, that in the circular economy this recycling of waste, it is quite a small part of the whole framework. We easily here at the waste sector too start from it being only what we do, but. But without question, this is activity in accordance with circular economy thinking.”

When asked about the perceptions of local waste management actors regarding their own role in enforcing circular economy, municipal company actors and municipal waste management

officials presented slightly differing views. The municipal company actors perceived themselves to have a central role in relation to circular economy as they can use the companies' profits to develop waste management and therefore even act as a "development platform" for circular economy practices. At the same time, municipal waste management officials highlighted the role of intervening already during earlier stages of a product life cycles, in a municipality for example through procurement choices, as this was seen as a more influential way to enforce circularity than mere waste management. As one interviewee noted, even if waste management has an important role in turning the materials back into circulation, it can only work within the limits of recyclability of these materials. On the other hand, not all local actors were enough familiar with the idea of circular economy to take any stand on the issue in the first place.

7. CONCLUSION

7.1. Divergences and consistency in expert opinions

Plastic waste has become a global problem demanding policy solutions sought in international as well as local arenas. Recycling household plastic packaging waste is one measure among countless others needed to address the problem. With the range of EU instruments being adopted to address the plastic waste challenge, plastic recycling is given a strong and growing emphasis in the union. This is tightly connected to the overall goal of the EU to move towards a circular economy. Yet as the still low plastic recycling rates across the EU suggest, implementing plastic recycling policies on national and local levels is not a simple process. The results of this study illustrate how at the local level, the plastic waste challenge appears in a very different light, as it encounters the local political, social and economic reality as well as the geographically different circumstances of each area. Also the decisions of both consumers and local actors involved in organizing household plastic waste collection seem to have a determining role in local implementation of national recycling policies. The different factors having an influence on local plastic waste management practices are illustrated in figure 2. Another main finding of this study concerns the relationship between circular economy and waste management, which seems to be way less straightforward in the local context than it appears to be on EU policy papers.

In this thesis, the different factors having an influence on the local implementation process of household plastic packaging waste recycling policies were studied primarily through expert interviews. The aim was to gain information about the different factors and questions that actually shape the implementation of plastic recycling policies. The expert interviews drew a picture of a rather contradictory, complex implementation process. The interviews revealed how experts often have diverging points of view especially about questions related to the roles of different actors in organizing the collection and the premises for plastic recycling in the first place. On the other hand, views considering the best collection methods and the future development needs were rather convergent.

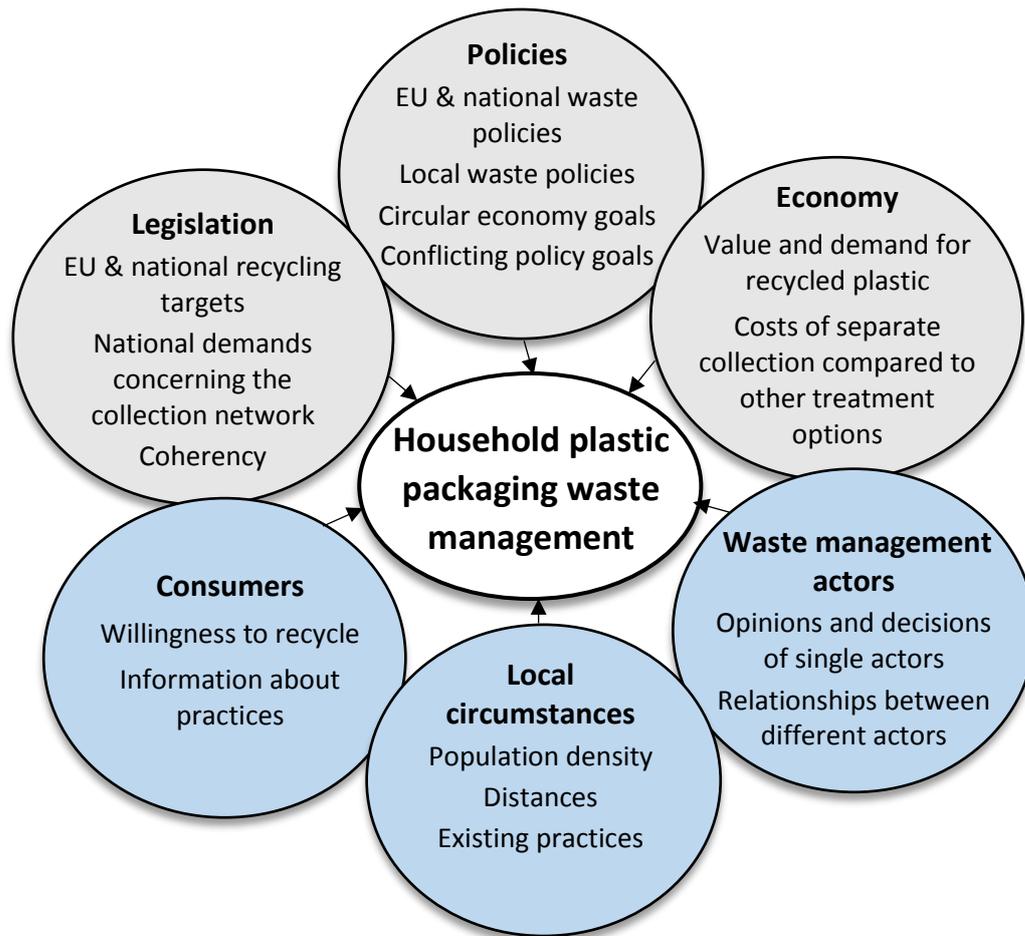


Figure 2. A chart of different factors shaping household plastic packaging waste management locally. Modified from a figure by Schott et al. 2013, p. 11.

Even if the interviewees generally admitted the benefits behind the idea of extended producer responsibility, opinions diverged about the success of its actual implementation. Municipal actors especially often express their dissatisfaction about the fact that municipalities only have a supplementing role in the collection of household plastic packaging waste. At the same time, old disagreements about issues such as tendering transports or waste incineration still gnaw at the relations between municipal and private waste management companies. Overall, it appears that even if extended producer responsibility was hoped to clarify the sharing of responsibilities between different actors, many old and new contradictions are still present, causing tensions and hampering possibilities for effective cooperation between the actors. Therefore, contradictions related to plastic packaging waste recycling can be partly regarded as above all reflecting these wider contradictions overall common on the waste sector.

As compared to the recently growing emphasis given to developing plastic recycling on the EU level or the seemingly great enthusiasm of the consumers to recycle their plastic waste, the fact that the lack of common ground among experts reaches to the premises for plastic recycling seems slightly surprising. After all, not all interviewees were even convinced about the rationality of recycling household plastic packaging waste in the first place or they had differing estimations about the future development of the value of recycled plastic, the influence of waste incineration or the functionality of legislation. One possible explanation behind the different interpretations is that the aforementioned unclarity and contradictions related to the share of responsibilities are also reflected in the varying attitudes towards the questions related to the premises for plastic recycling. In the lack of functioning cooperation, the contradictions and partly unclear share of responsibilities mean that different actors may still have different incentives influencing their opinions and guiding their decisions. The different positions actors answered from might therefore have an effect on their views starting from the premises. The decision to keep the interviewees of this study anonymous, however, does not enable a deeper analysis about the possible motives and influences behind differing views. What seems clear based on the results of this study, instead, is that at least the lack of information plays a central role in creating doubts related to the premises for household plastic packaging waste recycling.

At the same time, expert opinions considering the most suitable collection methods as well as the development needs were fairly consistent. More extensive collection on properties is generally considered as a necessary part of a more effective collection scheme, regardless of whether the current collection network is considered adequate or not and even if the views considering the practical organization of collection on properties do diverge. Another development need in terms of more effective collection that the experts agreed on is the need to inform consumers better.

Municipal and private waste management actors shared an opinion that there is a need for better cooperation between the different actors working within waste management. Enhancing cooperation and the flow of information therefore raised as two main issues that should be developed in order to improve implementation of recycling policies.

It needs to be noted, however, that the interview data gathered in this study has its limitations. As there are often only one or a couple of interviewees representing some type of actor, the opinions of single actors may become too emphasized in order to draw exact conclusions about

the views of different actors more generally. This especially concerns those results where the views of different actors such as municipal or private company actors are compared and contrasted. A more extensive, deeper analysis would therefore require more interviewees. Having a larger number of interviewees would also enable a more exact analysis about the possible reasons behind the differences in opinions.

7.2. Factors shaping the local implementation of recycling policies

The results demonstrate how measuring the effectiveness of implementation by focusing merely on goal-achievement measured by the effects on the problem would give a rather one-sided picture of the success of implementation. For example in this case, goal-achievement measured by outcomes is tightly connected to the achieved recycling rate. Yet, the current 16 % recycling target for plastic packaging waste could be fulfilled without collecting any household waste. Studying implementation through the actions of different actors and the processes of interaction between different actors and goals is therefore essential in providing information about the causal connections between different factors, as Winter (2006) suggested.

All in all, consistent with the findings of Bulkeley et al. (2005, 19), EU legislation seems to be the most important driver of changes in municipal waste policies also in Finland. The multilevel nature of waste governance has twofold consequences for the implementation process though. The biggest challenge of plastic recycling being creating more value and demand for recycled plastic, one of the biggest benefits of EU-wide steering is that it creates premises for strengthening the market situation. In a same way nationwide requirements that demand extending the collection network into the whole country create better premises for development of recycling business in Finland. Yet, from the local actors' perspective and in their day-to-day work on the field, demands given from Brussels or from Helsinki may seem to make not much sense or at worst, to make their work more difficult. Because of these challenges, many local actors are hoping for policies that would take better account of the regional differences.

In line with the findings of Nilsson et al. (2009), "traditional" or "hard" forms of governing such as bans and binding targets seem to have maintained their central role as steering instruments also in the context of Finnish waste management. Household plastic packaging waste collection is a good example, as it lacking a positive value as a recycling material means that the start of its collection was solely based on binding legislation. Yet at the same time,

starting collection based on producer responsibility has created incentives for the municipal waste management companies and private sector companies to organize supplementing collection, which exceeds the obligations created by law. Thus, even if the binding forms of governing were the ones to first initiate expanding packaging waste collection into plastics, the legislative requirements entailed other instruments based on voluntary or market-driven actions of multiple actors. At the same time, distribution of information has a central role in steering consumer behavior. Household plastic waste governance is therefore a combination of different instruments targeted to influence the actions of different actors.

It must be noted, however, that the effectiveness of the “soft” instruments is much more uncertain. The responses between different waste management companies let alone different consumers towards the voluntary-based opportunities for plastic waste collection vary considerably. As Nilsson et al. (2009, 13) suggest, a partial explanation to traditional instruments continuing to maintain a more decisive role in waste governance might be offered by path dependency. Professional cultures and resource constraints causing lack of support to new instruments are also applicable to some extent in this case. Most clearly, path dependency appears in the case of the practical challenges related to local organization of plastic collection. Issues such as insufficient space for new waste bins on properties or insufficient knowledge of consumers about the collected materials may seem rather easily solvable, but combined with limited resources, they can be enough to considerably hamper the development of collection practices.

Yet, as the results show, the responses of different actors to the challenges as well as new opportunities created by changed legislation vary considerably between different municipalities and areas. This has increased the local and regional differences in the standard of service of plastic packaging waste collection. As it is unlikely that different areas would have significantly different professional cultures or resource constraints, it seems like the differences could be rather explained with Lipsky’s theory of street-level bureaucrats playing a central role in policy implementation. Based on the interviews with the waste management actors, it appears that opinions and actions of single actors can often have a determining influence on the practices adopted in a certain locality.

The pronounced relevance of the decisions of single actors is connected to one central challenge present on the whole waste sector: the poor quality or complete lack of cooperation, which at worst can rouse mistrust or even conflicts between the actors. These challenges are

inevitably present also within the implementation of plastic packaging waste collection, being after all reliant on functioning governance networks. These governance networks include not only RINKI, municipal companies and private sector companies, but also the commercial enterprises, municipalities and property owners involved in negotiations about RINKI take-back points as well as property managers that make contracts about collection on properties. Whereas poor relationships are most evident between municipal and private sector companies, there is also room for improvement in the cooperation between other actors, especially between RINKI and municipal companies. As noted by Sørensen & Torfing (2006, 13), only well-functioning networks have potential to make governance more effective.

Instability and uncertainty of the waste sector identified by Bulkeley et al. (2005, 11) as one of the barriers to development also describe the circumstances wherein plastic packaging waste management takes place in Finland. Uncertainties are related both to the development of the market situation of recycled plastic as well as to the upcoming changes to recycling requirements from EU. Yet in the light of the interviews, it seems like the strongest uncertainties are caused by insufficient knowledge of the actors. The interviews revealed how many actors felt they had inadequate information about the actual recycling process of the collected plastic or the benefits of recycling, which clearly complicates their decision-making. Improving distribution of information is in fact a challenge, which seems to concern the whole sector. Not only could local actors benefit from better information from the plastic refinery, but more information from the refinery could also help producers to make better recyclable products. On the other end of the chain, consumers still need more information about collection practicalities. When it comes to information distribution, the need to strengthen cooperation concerns therefore not only actors involved in organizing collection, but all actors along the life cycle of a plastic package. What further complicates information distribution, however, are the overall ambiguities related to waste statistic and recycling targets. Uncertainties related to insufficient information therefore partly derive from challenges outside the scope of actions of single actors.

Moreover, not all need for more information can be solved by just strengthening its distribution through cooperation. Regional or local information about the effects of separate collection that municipal actors thought would be helpful in their work, would need to be produced by someone. Even though municipalities could take their own initiative to produce such information, the limited resources are likely to restrict the possibilities for this in many cases.

One more finding of this study consistent with the findings of Nilsson et al. (2009, 9) is that in addition to legislation, market conditions are a central decisive factor in waste management decision making. Most importantly, the low value of recycled plastic as compared to the expenses of collection means that from the outset, the premises for plastic collection are very different compared to other packaging materials. In the local implementation, the most contradictory issue in terms of the effects of market conditions seems to be waste incineration and the incentives of municipal waste management companies to offer supplementing collection services. Regardless of whether or not waste incineration creates economic incentives that would in some way hinder the development of recycling practices, the controversy issue seems to create uncertainty to the field and add to the mistrust between the different actors.

Nilsson et al. (2009, 10) connect marketization together with a strengthening tendency of local waste management “*becoming either privatized or incorporated as publicly owned companies*” into the weakening role of traditional waste planning. The interviews conducted in this study indicated towards a same kind of development, at least as far as regional waste plans are concerned, as they seemed to have a rather minor role in local waste management. Yet, by such a limited data, it is not possible draw any exact conclusions about the extent of this trend or the reasons behind it.

Although consumers were not in the centre of this study, their choices obviously have a decisive role with regard to the success of the collection network for household plastic packaging waste. Consumer perceptions about the organization of collection and the factors affecting their activity is therefore one possible topic for further study.

7.3. The relationship between plastic recycling and a circular economy

As proved by the varying answers of the interviewed actors, the relationship between waste management and circular economy is very open to interpretations. Even if in policy papers at all levels of governance, waste management is increasingly framed within the larger idea of circular economy, in local context the connection between the two seems still rather vague.

In a sense, household plastic packaging waste is not an ideal material for studying circularity. The possibilities to keep plastic packaging in circulation are very much limited on recycling, which from a circular economy-point-of-view is only the last possibility to maintain the

material value of a product, if there are no other ways to keep it in circulation. Plastic packaging waste also quickly dashes the ideal thought of keeping materials in an endless circulation as the number of times it is possible to recycle a package into a new product is very limited. Moreover, at least at the moment, plastic packages are not reprocessed back into corresponding packages, but for example pipes and plastic bags.

Still, given the extent of the amount of plastic waste we generate, finding solutions on how to more effectively utilize the raw material and to minimize the need for using virgin plastics is an essential question in terms of strengthening circular economy. Finding ways to replace plastic with other materials and developing bioplastics seem necessary to answer the challenges posed by plastic waste on a long term. In fact, new solutions on replacing plastic with other materials, or at least minimizing its amount on packaging, have recently been developed on an accelerating pace. Technically, replacing a substantial amount of plastics used in for example food packaging may not be so far-off. (Yle Uutiset 2016b). Yet in practice, extensive replacement of plastic as a packaging material does not seem likely at least in the near future due to plastic's many superior characteristics as packaging material and its low price. For this reason, developing plastic recycling is essential also with regard to circular economy.

Moreover, due to the benefits of using plastic as a packaging material, replacing it with other materials does not automatically lead to the environmentally best solutions as a whole. For instance, as some of the interviewees of this study pointed out, a substantial reduction of the amount of plastic packaging materials used may not necessarily be possible nor desirable as it would be likely to lead to the amount of food waste correspondingly growing. This is but one example of a possible solution to the plastic waste challenge colliding with other policy goals also in line with promoting circular economy. As regards to household plastic waste recycling, organizing packaging waste collection for example inevitably produces greenhouse gas emissions, which makes some question the overall rationality of collection in the first place. Aside from other environmental objectives, circular economy goals may also be contradictory to other policy goals such as energy production or economic efficiency, at least on a short term. Realizing circular economy is therefore balancing between different goals, that requires both long-term vision and practical, binding short-term targets to ensure the policies are put into practice despite the competing and contradictory goals.

Another major challenge related to strengthening circular economy through household plastic packaging recycling concerns the economic aspects of plastic recycling. A basic assumption

behind the idea of circular economy is that while benefiting the environment, it would also benefit the economy. Moreover, in a situation of diminishing natural resources, strengthening material circulation should provide competitive advantage for companies (Ellen MacArthur Foundation 2013, 83).

When it comes to the economy as a whole, plastic recycling and reprocessing activities can certainly create jobs in Finland, yet estimating the total effects of household plastic packaging recycling is a complex task reaching outside the scope of this study. Instead, perhaps the biggest challenge in terms of the relation between household plastic packaging waste recycling and circular economy is that the potential of household plastic recycling to provide any considerable benefits to a single plastic producer company seems to be very limited, at least on a short-term. For the producers, their responsibility of organizing plastic packaging waste collection means mainly rising expenses, even if these costs are eventually transferred into the prices of products. The challenge is that the price of recycled plastic is not competitive compared to the price of virgin plastic, which means they do not have strong incentives to develop its use in production. In addition to this, most of the producers obliged to pay for plastic packaging waste management because of producer responsibility are not themselves using recycled plastic in their production. This means that the idea of producers benefiting from material circulation is not really materialized.

For these reasons, public policies are essential in enhancing circulation of household plastic waste. It is clear that in terms of circulation, the current instruments and obligations may not be the most effective ones. Extended producer responsibility does not necessarily encourage the producers to develop the practices much further than the minimum demands nor does it seem to have considerable effects on production, which would be essential for strengthening circular economy comprehensively. Despite this, the policies can be regarded as a good starting point for changing the linear pattern of our plastic consumption habits. Reaching a situation where recycling household plastic packaging waste would be an overall economically attractive option for the producers, that would be a decisive turn in household plastic packaging waste management, will surely happen faster with a help of steering policies that demand organizing separate collection. However, even if the focus of this study was on waste management, reaching this situation also requires effective recycling processes and having applications and demand for recycled plastic. It seems like at the moment many factors such as prohibiting regulations and insufficient knowledge limit both the development of recycling and the use of recycled plastic and thus hamper creating more demand for recycled plastic. Directing our

plastic consumption habits towards a more circular pattern therefore requires actions and steering at many fronts simultaneously. Regardless of the challenges related to recycling household plastic packaging waste, it can be considered one step among countless others needed to advance circulation of plastic.

One of the challenges related to implementation of household plastic packaging waste recycling policies may therefore be especially representative of an overall challenge related to making circular economy a reality. As circular economy requires rethinking the whole life cycles of products, its effective realization would often require close cooperation between the different actors along the different stages of these cycles. Yet as the case of organizing packaging waste collection showed, the cooperation between actors working among the same issue but within different fields of operation or just otherwise different premises is often not seamless. Strengthening cooperation would therefore be in a key role not only for better implementation, but also for reinforcing circularity of plastic on a larger scale. The same applies to the need to enhance the flow of information between different actors.

This study has drawn a picture of household plastic packaging waste recycling on its early stages in Finland. Technical developments, changes in market situation or changing legislation can quickly considerably change the circumstances of plastic waste management. It remains to be seen, for instance, whether household plastic packaging waste recycling is just a transitional period before technical developments enable largely replacing plastic with other materials or whether it will be possible in the future to buy groceries in packaging entirely made of recycled household plastic waste. As for the relation between circular economy and plastic waste management, this study has mainly opened possibilities for further discussion and research, which are needed to steer our material consumption habits towards a more circular pattern.

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APPENDIX I: AN OUTLINE OF THE INTERVIEW STRUCTURE

The exact questions and their wording varied between the interviews.

Background

-Your own/your organizations tasks

-What has the start of household plastic packaging waste collection meant for your organization's point of view?

About the sharing of responsibilities between the actors

-Do you consider it a good thing that household plastic packaging recycling is developed based on extended producer responsibility particularly?

- Has the new share of responsibilities between waste management actors proved to be practical and clear?
- Do you think that cooperation between different actors has worked well?

-If we presume that the demand considering the development of recycling are going to become yet significantly tighter as part of the EU circular economy package, do you believe it would be possible to reach this targets with the current system or how should the collection be organized to meet these demands?

About arrangements and demands considering plastic waste collection

-How do you see the current demands of establishing at least 500 take-back points for household plastic packaging waste in the whole country, one in each population center of at least 10 000 inhabitants?

-Do you believe that the current recycling target (22% by the year 2020) is an appropriate and ambitious enough goal?

-Discussion related to waste incineration: do you believe that there exists a contradiction between these waste management options being simultaneously developed or is it possible to develop them as mutually supporting waste treatment methods?

-Do you feel like the consumers are well enough informed about plastic recycling issues?

-What do you consider to be the biggest challenges for plastic recycling?

-How could plastic recycling be enhanced? Would it require steering?

-How do you believe that plastic waste management is going to develop in the future?

About circular economy

- How do you see the role of waste management in enforcing circular economy?
- How do you consider the role of plastic waste recycling in relation to circular economy?
 - Do you think that starting the recycling of household plastic packaging waste has contributed to strengthening circular economy?
- Do you believe that a system based on extended producer responsibility has created better premises for circular economy?