

**Connecting consumption with environmental impact:
Waste prevention and Pay as You Throw, a collective case study in Sweden**

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Abstract:

Efforts to develop and enhance recycling and waste treatment facilities have improved in recent years, but still have not managed to stabilize waste levels. Increased consumption and accompanied levels of waste have led to an interest in waste prevention strategies. One such strategy for household waste is the implementation of a weight-based fee structure, or Pay As You Throw (PAYT). This policy makes households responsible for the quantity of waste discarded and thus creates an incentive for increased recycling, composting, and ideally a reduction in waste creation. This research looks at the application of PAYT in Sweden through a collective case study; eight municipalities are examined for their strategies of adapting the policy to local conditions. This project aims to further research on PAYT in the areas of illegal disposal threats, compost options, and long-term adjustments to the policy. The project also examines how PAYT fits into a larger European Union policy transition towards waste prevention. Results show that PAYT has the potential to adapt well to local conditions, encourage waste reductions, and receive high acceptance from stakeholders, however, as a waste prevention strategy only offers one piece of the puzzle, as waste levels for the sampled municipalities, after an initial decrease, have continued to follow national trends of an overall increase.

Keywords: Municipal waste management, waste prevention, weight-based fee, pay as you throw

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Abbreviations

DG – Directorate-General for the Environment
EC – European Commission
EEA – European Environment Agency
EPR – Extended Producer Responsibility
EU – European Union
FTI – Förpacknings-och tidningsinsamlingen (Packaging and Newspaper Collection)
MSW – Municipal Solid Waste
PAYT – Pay as you throw
PPP – Polluter Pays Principle
WFD – Waste Framework Directive

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Chapter 1: Introduction

Excess levels of waste can produce a host of environmental problems, including pollution to air, soil, and water. These environmental impacts, coupled with pressure on waste collection and treatment infrastructure, have fostered government interest in waste prevention strategies. As an example, for the last 30 years, waste has been at the center of the European Union's Environmental Policy (EC, 2005). During this time important progress has been made in regards to the development of waste treatment and sorting, and the pollution associated with these activities has decreased (ibid). Nevertheless, despite this progress, overall waste levels continue to increase annually (EEA, 2009).

Faced with the challenge of mounting waste quantities, government interest has grown in developing policies that encourage waste prevention. An important step in this direction involves making the environmental impacts of waste more visible to citizens. One way of addressing this step for household waste is the use of a weight-based fee structure, or Pay As You Throw (PAYT). This policy instrument provides an economic incentive for waste reductions, as opposed to the conventional flat fee. The policy has been in use both in Europe and the United States for over 20 years, but still represents a minority of municipalities. In Sweden, PAYT was first introduced in the early 1990s, and now covers 26 of the country's 290 municipalities (Dahlén & Lagerkvist, 2010:25). Research on the policy has reported a wide variety of waste reductions observed in the years following introduction of PAYT, ranging from 15 to 50 % (Tojo et al, 2008:63). Despite ample research reporting significant waste reductions in the first years following PAYT implementation, explanations for why such a wide range of waste reductions has been observed and how the policy functions in the long-term remain scarce. Most research on PAYT has focused on pilot studies or hypothetical expansions of the policy (Dahlén & Lagerkvist, 2010; Reichenbach, 2008; EUWMC, 2003). This gap in understanding warrants developing better knowledge of how municipalities adapt this policy to local conditions: particularly in light of the potential of PAYT to play an important role in helping municipalities reach national and European Union waste reduction goals.

PAYT shows potential because it addresses two important environmental challenges for waste management: making individuals responsible for the waste they create, thus fully integrating the Polluter Pays Principle (PPP), and rewarding less-wasteful behavior, as opposed to concealing it beneath the conventional flat fee. This step of clearly placing responsibility for waste and pollution, and the larger challenge of addressing increasing levels of production and consumption represent one of the ten critical global trends that affect sustainability (Kates & Harris, 2003). National governments are still in the process of designing effective policies that connect environmental impact and waste creation (EC, 2005). With the rapid growth in consumption witnessed in recent years, waste management goals have not managed to achieve a decoupling of economic growth and waste creation, despite over 30 years since the environment became a political priority (Sundberg, 2004). Connecting consumption with environmental impact will make up a critical part of addressing this challenge, and PAYT offers a potential piece of this puzzle by giving citizens an incentive to reduce waste.

1.1 Research aim

This project aims to examine how municipalities in Sweden implement and evaluate PAYT. The project explores how a selection of Swedish municipalities adapt PAYT to local conditions, and the role the municipality can play throughout the transition, as well as how the instrument fits into a larger transition towards waste prevention strategies at the national and EU level.

The project is particularly interested in how municipalities adjust to the policy in the long-term, as well as what factors or basket of measures can be put in place around PAYT to influence the policy's effectiveness, criteria for which are defined in the following section. The overall research question driving the project is:

-Does PAYT represent an effective waste prevention strategy for municipalities?

Supporting questions include:

-How do Swedish municipalities implement and evaluate PAYT?

-How have municipalities in Sweden adapted the policy in the long-term to fit local conditions?

In this context, long-term is defined to mean around a decade.

Overall, the aim of the project is to explore how municipalities in Sweden implement PAYT and what factors and strategies might impact this implementation. This project aims identify how PAYT can be implemented into an integrated waste management framework, meaning a system of waste management that sorts materials into different streams, and to evaluate the opportunity of the policy instrument for promoting waste reductions. The cases selected are meant to provide contextual examples of the use of PAYT.

1.2 Methodology

1.2.1 Research design

In 2006, the Swedish Environmental Research Institute (*IVL Svenska Miljöinstitutet*), based in Göteborg, Sweden, began work on the research programme: "Research towards sustainable waste management" (*Forskning för en mer hållbar avfallshantering*). According to the program description:

"The primary target groups for the findings of Towards Sustainable Waste Management are the Swedish Environmental Protection Agency and other policymakers in the field of waste management at European, national, regional and local levels, recycling companies, waste management companies and R&D organisations in waste management" (IVL, 2009:1).

The research programme is funded by the Swedish Environmental Protection Agency (*Naturvårdsverket*), and focuses on exploring different policy instruments that can contribute to more sustainable waste management practices, and concept that is further defined in the following section. One of these instruments is the use of a weight-based fee for waste. After a series of meetings with IVL in 2009, the researcher agreed to explore this policy instrument with the goal of contributing the project findings to the research programme.

This project uses a collective case study to explore PAYT in Sweden. PAYT is evaluated for effectiveness by analyzing local government opinions of the policy, household opinions, and finally waste data. These three sources are used to triangulate PAYT effectiveness within the context of the case study (Yin, 2009:8). Previous research on PAYT in Europe and the United States was evaluated to identify gaps in the understanding of the instrument, and these identified areas became the factors of interest that data collection focused around for the collective case study: the threat of illegal disposal, the role of composting options, and long-term adjustments to PAYT. In order to answer the research questions, the researcher analyzed data collected from

municipal waste planners, government reports, and surveys of household opinion. Primary data was collected from eight municipalities in Sweden. Secondary data—previously collected by researcher Lisa Dahlén at *Luleå tekniska Universitet*—on the same cases was also analyzed.

The focus of the research methodology is a collective case study. Silverman (2005) identifies this method as useful when “a number of cases are studied in order to investigate some general phenomenon” (ibid:127). The data collection methods include interviews and document analysis for the primary data collection as well as analysis of survey results from the secondary data. Yin (2009) points out that “case study research has the unique strength of being able to deal...with situations where many variables of interest exist, and [can] rely on multiple sources of evidence, with data needing to converge in a triangulating fashion” (ibid:8). Theory is used to define the role of the municipality during the transition to PAYT, as well as for framing the policy drivers that have led to a focus on waste prevention strategies such as PAYT at the national and EU level.

This research makes an effort to keep in mind the contextual sensitivity of the cases, which are surely shaped by the political and historical context of Sweden (Silverman, 1993). The unit of analysis is a municipality in Sweden, eight of which were selected for the sample. In order to evaluate these cases both primary and secondary data was examined: the primary data collected through contact with the waste managers at each municipality, and the secondary data by way of an earlier survey sent to these same municipalities by Lisa Dahlén. The cases selected are listed in Table 1-1 below.

Table 1-1: Swedish Municipalities selected for sample.

Municipality	Population (2009)	PAYT Implemented	Classification
Härryda	34,007	1998	Suburban
Lerum	38,301	1998	Suburban
Partille	34,382	1998	Suburban
Borgholm	10,806	1998	Small
Mönsterås	12,980	1999	Manufacturing
Emmaboda	9,223	1996	Manufacturing
Linköping	144,690	1996	Large City
Sundsvall	95,533	2003	Large City

-Classification categories: Dahlén & Lagerkvist, 2010. Population data: Statistiska centralbyrån, 2009.

Figure 1-1 below shows the locations of the selected cases in Sweden. Effort was made to cover a variety of categories or types of municipalities, thus ‘purposive theoretical sampling’ was used (Bryman, 2004:333). This strategy is identified as “strategic and entails an attempt to establish a good correspondence between research questions and sampling” (ibid:334). The cases above were thus selected to build an understanding of the use of PAYT in Sweden and answer the research aim of the project.

Primary data collection focused on gathering information related to three areas of interest that remain undeveloped in previous research on PAYT: the threat of illegal disposal, the role of composting, and long-term adjustments to the policy. The intent of the questions posed to waste planners focused around building on the data previously collected by Lisa Dahlén, as well as contributing to the research gaps identified in the literature review. The sample was selected to cover a variety of types of municipalities, and semi-structured interviews with open-ended questions were used to collect descriptive contextual data (Silverman, 2005). The questions posed to the waste planners aimed to reveal how the municipality implemented and evaluated PAYT. The base questionnaire can be found in Appendix C.

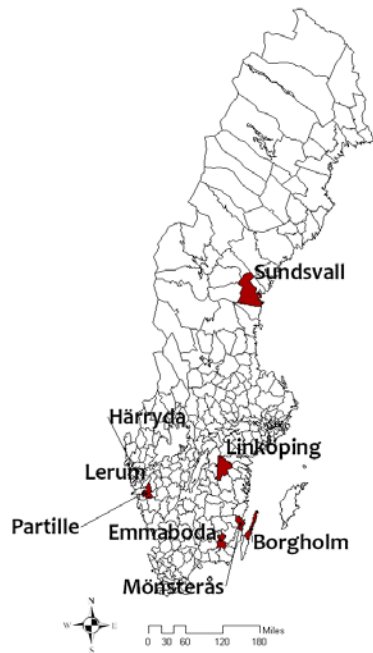


Figure 1-1: Location of PAYT Municipalities in Sweden

Primary data was collected by way of a series of open-ended questions, focused around gathering information on the factors of interest. The researcher treated the responses from waste planners as ‘actively constructed narratives,’ which depended on the perspective and context of each individual (Silverman, 2005:48). Responses to the researcher’s questions were interpreted with this framework in mind. The main results of primary and secondary analysis can be found in Appendices A and B.

The theoretical framework uses Transition Theory to evaluate the role of the municipality during the shift from conventional pricing to PAYT, but also for conceptualizing the wider policy drivers of waste prevention instruments like PAYT, e.g. recycling and waste reduction targets from national and European Union (EU) legislation (Rotmans, 2001). Recent changes to EU waste directives require member states to establish specific waste prevention strategies and reach certain goals in the near future (Versmann, 2009). This type of pressure in combination with previous national waste targets in Sweden illustrates the type of policy drivers that influence the direction of municipal waste management planning in this context.

1.2.2 Scope

This project does not aim to establish causal relationships between factors and waste outcomes, but rather to explore how municipalities can adapt the policy to local conditions, and how municipal officials and households have reacted to PAYT. The research focuses on a few particular gaps in the understanding of the policy from previous research, and tries to contribute in these areas. It is important to remember, however, that only 26 out of Sweden’s 290 municipalities have the policy in place, and while the sample tries to cover a variety of types of municipalities, this of course masks further local complexity that could make generalizing these results difficult (Dahlén & Lagerkvist, 2010:25). The wide range in waste reductions that has been observed from municipalities with PAYT illustrates this complexity. Sweden also has unique policy conditions, such as early adoption of Extended Producer Responsibility (EPR) laws, making producers responsible for packaging waste, which impacted the organization of recycling infrastructure as compared with other countries.

This project focuses on household municipal waste, despite this area only representing a portion of a country’s overall waste stream. It is also important to remember that although PAYT has been around since 1995, it has only spread to a minority of Swedish municipalities (ibid). While the question of why the policy has not spread further or faster is an important one, data collection is not focused around this issue. From the findings observed, however, some ideas and recommendations on this issue will be shared.

The goal of the project is to develop ‘policy relevant evidence’ (Cox et al, 2010:195). Evidence used to support policy is defined as having three components: “hard data, reasoning that puts that data in context, and an

evidence base with stakeholder opinion” (ibid:195-196). The project aims to do so by using waste data as a baseline, examining each case in context, and evaluating the outcome by way of government and customer opinions of the policy.

Finally, a limitation that arose for the researcher was the reality that it was not always possible to access specific information about the PAYT implementation process, since the transition happened a decade ago for some cases. Further, not all cases collected data from household opinion specifically about PAYT (See Appendices A and B).

1.2.3 Thesis structure

This report will build a background framework in Chapter two on waste management policy in the European Union and more specifically within Sweden, to illustrate how the problem area of waste management has developed and changed over the past few decades. The focus will then turn to the particular policy instrument of PAYT, and provide a survey of previous research from other parts of Europe, the United States, and within Sweden. The background section will set the stage for the findings of the collective case study in Chapter three. Within this next chapter the implementation process for three municipalities will be described to illustrate the use of the policy in the Swedish context. The three cases presented are all located on the outskirts of Göteborg and implemented PAYT the same year, in 1998. The findings from the other five cases are integrated in the following section which presents the findings on the main factors of interest: the threat of illegal waste disposal, the role of composting, and long-term adjustments to the policy. This section is followed by an overall identification of the economic, social and environmental factors that impact the policy. Finally, the discussion section in Chapter four looks at the role that municipal government can play during the transition to PAYT, analyzes the economic, social, and environmental factors impacting the policy, and examines the potential of the policy in relation to future waste prevention goals. The report will finish with some final conclusions and recommendations for further research to clarify gaps remaining in the understanding of PAYT and the development of waste prevention strategies.

1.3 Use of Theory

According to the Swedish Environmental Institute (2006): “A more sustainable waste management system is a system that contributes to increasing efficiency in the use of natural resources, and to decreasing environmental burdens” (TSWM, 2006:2). This definition is considered for this project as the basis of improving waste systems. The researcher further recognizes the importance of fully integrating the Polluter Pays Principle (PPP) as part of this strategy, which means making both producers and consumers responsible for the waste they create. This can be done through policy instruments such as Extended Producer Responsibility (EPR) and Pay As You Throw (PAYT), both of which are further defined in the following sections.

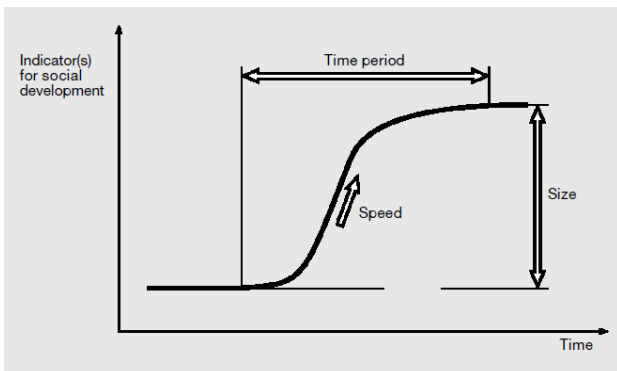
This project focuses on the role of the municipality in implementing the policy instrument, as Rotmans (2001) identifies that: “government can play a role in bringing about structural change in a step-wise manner” (ibid:16). Tojo et al (2008) also underline that local government has an important role to play in maximizing the potential of a policy instrument like PAYT.

The use of Transition Theory aids in exploring the process of change, or manner of steps taken throughout the process. As PAYT represents a step towards institutionalizing waste prevention, the use of theory allows for

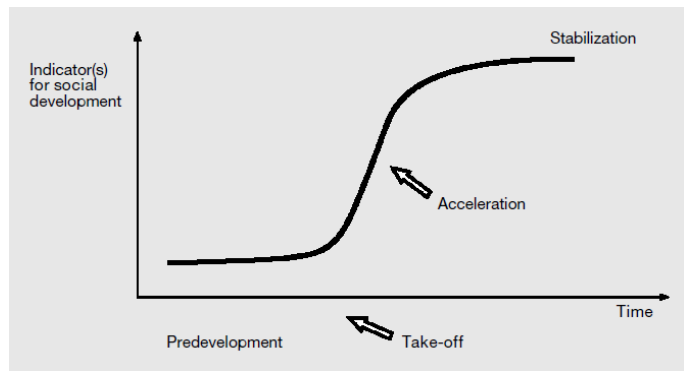
analysis of the transition to PAYT from a flat waste fee, but also identification of the larger ‘driving forces’ from the National and EU level to encourage such a direction (Rotmans, 2001:16).

This project aims to explore the different policy drivers that can impact the direction and development of waste policy. For this analysis, Transition Theory offers a framework for analyzing this evolution, as it identifies three different levels of social organization for describing the dynamics of transitions to new systems (Rotmans, 2001). The three levels are defined as micro, meso, and macro, or by Rips and Kemp (1998) as niche, regime, and socio-technical landscape (Rotmans, 2001:19). For the context of this project, the three levels of social organization are defined as municipality, nation, and European Union.

Transition Theory also defines four different transition phases: *pre-development*, “where the status quo does not visibly change,” *take-off*, when “the process of change gets under way [as] the state of the system begins to shift,” *acceleration*, when “visible structural changes take place,” and *stabilization*, when “the speed of social change finally decreases and a new dynamic equilibrium is reached” (See Figure 2-1; Rotmans, 2001:17). In the ideal transition: the “system adjusts itself successfully to the changing internal and external circumstances, while achieving a higher order of organization and complexity” (Rotmans, 2005:24). The role government can play changes throughout each phase of the transition process: during *pre-development* it can assist as a catalyst and director of change, during *take-off* as a mobilizer of actors towards the objective, during *acceleration* as a stimulator of learning objectives, and finally during *stabilization* as a guide to preventing negative backlash (Rotmans, 2001:17).



The three system dimensions of a transition.



The four phases of a transition.

Figure 1-2: Transition dimensions and phases. Source: Rotmans, 2001:17-18.

There are some important limitations, however, to the role of government in this context: “transitions involve a range of possible pathways...[that] government policy can influence, but never entirely control” (Rotmans, 2001:16). Further, there are a “number of external factors (landscape factors), such as the development of energy prices and cultural values, over which government has only limited influence” (Rotmans, 2001:26). Part of acknowledging this complexity involves integrating the perspectives of different disciplines to analyze the transition. Rotmans (2005) identifies that “research into transitions is by definition multi-disciplinary and interdisciplinary” (ibid:4). As, “transitions and system innovations are complex phenomena that cannot be entirely investigated from one scientific discipline” (ibid:19). As underlined by Max-Neef (2005) the “major challenges of our time cannot be tackled by one discipline.” In this way, this paper will aim to evaluate PAYT using a multi-disciplinary framework, by way of addressing the economic, social, and environmental factors related to the policy’s use.

Finally, according to Rotmans (2005): “a transition is a structural societal change that is the result of economic, cultural, technological, institutional as well as environmental developments, which both influence and strengthen each other” (ibid:10). Meaning, without consideration of the role of transitions taking place in other parts of society, understanding of the potential of government’s role will remain limited. For this research project, Transition Theory aids in visualizing the problem area of waste management, the evolution of the use of the policy, as well as to identify where barriers might be impeding process, or slowing the speed of the transition.

Chapter 2: Background on waste management policy and PAYT

This section examines how waste policy has developed in the European Union (EU) and in Sweden over the past few decades. The development and use of PAYT will also be examined, as well as the evolving nature of the waste policy context.

2.1 Waste management policy setting

2.1.1 Waste prevention developments in the European Union

“The unsustainable trends in waste generation and the [related] policy issues are cause for concern because the generation of waste can be a symptom of environmentally inefficient use of resources. Furthermore, waste management generates emissions to air, water, and soil as well as noise and other nuisances which contribute to environmental problems and cause economic costs” (ECCOM, 2005:3).

This passage comes from the European Commission communication launching the Thematic Strategy on Waste Prevention and Recycling in 2005. It underlines the justification for why waste has played such a central role in European Environmental Policy, as well as how this policy area will continue to do so in the future.

According to Andreas Versmann (2009) of the European Commission’s Directorate-General for the Environment, the current objectives of European Union (EU) waste policy are “decoupling economic growth from environmental impacts, prevention of waste, moving towards a recycling society, promoting the use of waste to produce energy, [and] better implementation of waste legislation” (ibid:6).

To achieve these objectives, EU legislation has several core principles guiding waste management policy (Williams, 2005:9; Tojo et al, 2008:10):

The Principle of Prevention – advocates preventive measures as a better strategy than attempting to repair damage already inflicted on the environment.

The Precautionary Principle – refers to the possibility of irreversible damages, and advises that a lack of scientific consensus does not warrant inaction.

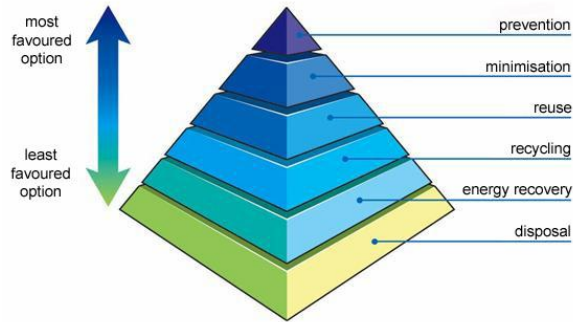
The Polluter Pays Principle – recommends that the party that pollutes be responsible for paying for the damage done.

Extended Producer Responsibility – allocates responsibility to the manufacturers of products for the environmental impacts related to the disposal or afterlife of their products.

The Proximity Principle – recommends that waste be dealt with and disposed of as close as possible to the site of creation.

Self-Sufficiency Principle – urges that waste be dealt with inside the country of origin and not shipped elsewhere.

These guiding principles have played an important role in shaping the evolution of Waste Policy in the EU. Within this list the theme of prevention, or acting before the waste or pollution has been created, as well as making those responsible for waste creation in charge of treatment can be clearly seen. Legislation along the



lines of these principles has shown up nationally in many member states, and reflects the journey that waste management policy has taken over the last decade, starting with an end-of-the-pipe focus in the 1970s and 80s and evolving in the 1990s towards an interest in pollution prevention (Williams, 2005). This current priority for prevention and precaution is further echoed in the EU Waste Hierarchy seen in Figure 2-1. Current EU waste policy is based on the hierarchy, with the overall aim of moving towards a “recycling and recovery society” (ECCOM, 2005:6).

Figure 2-1: EU Waste Hierarchy. Source: ES, 2010.

The waste hierarchy is not meant to be interpreted as a “hard and fast rule,” as each member state has varied local conditions which may determine the suitability of some methods (ECCOM, 2005:4). Still, the goal is to encourage efforts to “move up the hierarchy towards a recycling society,” meaning minimizing landfill and incineration activities, and moving towards a system focused on prevention, reuse, and recycling (DG, 2009:8).

Figure 2-2 below shows the relevant portions of EU waste law referred to in this paper. According to Eberl (2010) EU waste legislation can be organized into three categories: 1) framework legislation, 2) legislation on waste treatment pathways, and 3) legislation on specific waste streams (ibid:3).

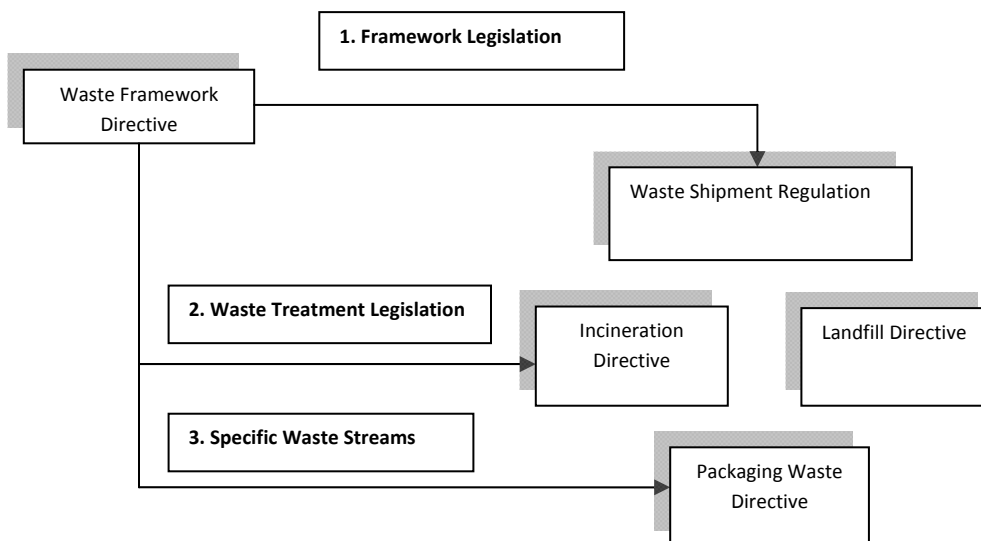


Figure 2-2: Structure of Relevant EU waste law. Adapted from Eberl, 2010:3.

When it comes to implementing waste policy, Tojo et al (2008) explains: “some EU legislation, especially those governing specific waste streams, contains examples of policy instruments...Some set standards for all member states, while fulfillment of the requirements is left to member states” (ibid:24). It is important to acknowledge that most enforcement is devolved to member states, as this can represent a significant challenge to uniform progress. The European Commission (2005) reports that “legislation is sometimes poorly implemented and there are significant differences between national approaches” (ECCOM:3). The following sections will further identify the three categories of EU waste law identified in Figure 2-2.

2.1.1.1 Framework Legislation

The core of EU waste legislation is the Waste Framework Directive (WFD), first established in 1975, which built the foundation for EU Waste Policy, and has now been amended several times (Tojo et al, 2008). An important amendment to the WFD in 1991 introduced the Polluter Pays Principle (PPP) and encouraged recycling targets (Williams, 2005). The PPP advocates that producers should bear the cost of waste disposal. A further extension of this idea was realized with the passage of EPR laws on packaging waste in 1994, making producers financially responsible for the waste created by a product’s afterlife. Amendments to the WFD in 2006, Directive 2006/12/EC, required member states to develop a waste management plan (Tojo et al, 2008). This plan had to incorporate some of the policy instruments identified by the directive, as well as create a strategy for packaging waste and the reduction of bio-waste heading to landfill (ibid). The most recent revisions to the Waste Framework Directive, 2008/98/EC, oblige member states to establish waste prevention programmes by 2013, including: setting prevention objectives, determining qualitative and quantitative targets for waste prevention, and describing prevention measures (Versmann, 2009:9).

The European Council adopted these latest Waste Framework Directive (WFD) revisions in October, 2008 (Burgess Salmon, 2009). The changes were aimed at encouraging greater reuse and recycling of waste and streamlining the “fragmented legal framework” that regulates the waste sector (Burgess Salmon, 2009:1). These newest WFD changes introduce the first concrete EU recycling targets (ibid). By 2020, member states should reuse or recycle 50% by weight of certain categories of household waste (paper, metal, plastic, and glass) and reuse, recycle, or recover 70% by weight of non-hazardous construction and demolition waste (Versmann, 2009:11). Future plans include a report in 2011 on progress towards waste generation and prevention, and a review in 2014 of the targets in the new WFD, after which the Commission will also decide whether to formulate waste prevention and decoupling objectives for 2020 (ibid:10).

2.1.1.2 Waste Treatment Legislation: Landfills, Incineration, and Bio-waste

Figure 2-3 below shows the breakdown of landfilling, incineration, and recycling activities in Europe.

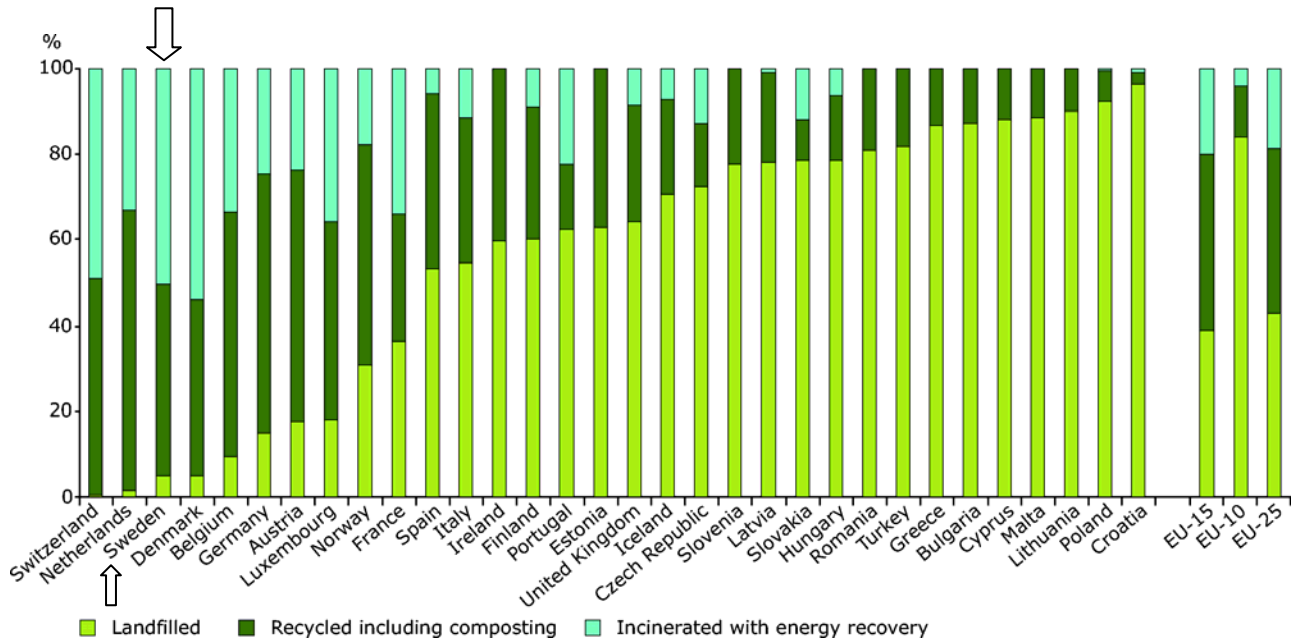


Figure 2-3: Waste Landfilled, Recycled, & Incinerated, overall trends in Europe. Source: EEA, 2007.

Figure 2-3 illustrates the wide variety of waste management systems present in Europe. While many EU member states still rely heavily on landfilling as the primary method of waste treatment, some countries in Western and Northern Europe have evolved to focus primarily on recycling and incineration. Many studies support the EU waste hierarchy showing that landfilling is the worst method for the environment (Fredriksson, 2004:30). EU waste policy illustrates these findings by placing this waste treatment method at the bottom of the Waste Hierarchy (See Figure 2-1). This status relates to the serious environmental impacts posed from landfilling, which include climate change impacts and groundwater contamination (Sahlin & Wikström, 2004). The EU Landfill Directive (1999) addressed these concerns and established specific standards for the maintenance of these sites and goals for reducing the amount of waste treated in this method in the long-term.

An important part of dealing with the quantity of waste heading to landfill in Europe involves addressing the issue of food waste, or bio-waste, as it is referred to in EU documents. In the EU, bio-waste accounts for 30 to 40% of the municipal solid waste stream, and thus far is mostly treated by methods low on the waste hierarchy (DG, 2009:4). As an example, currently half the countries in the EU are sending more than 50% of bio-waste to landfill (Tojo et al, 2008:18). At the moment, vast differences exist in how this waste stream is treated among member states (ibid). With these concerns in mind, in 2009, the European Commission’s Directorate-General for the Environment held a conference in Brussels titled “Bio-waste – Need for EU legislation?” The conference addressed a green paper from 2008 on the subject and talked to stakeholders about the implications of possibly developing EU legislation to address this waste stream, and about the progress of an Impact Assessment taking place on the subject (DG, 2009).

Many important justifications exist for addressing bio-waste, among them the protection of soil, addressing related climate change impacts, and reaching diversion and renewable energy targets (DG, 2009). Previous research on waste management has also shown that composting related activities often exert the largest impact on waste levels (Bartelings & Sterner, 1999). In December 2008, the green paper on bio-waste was issued, and as of now the European Commission is in the process of an impact assessment on the subject (Versmann, 2009; DG, 2009). Part of the impact assessment involves examining implications for existing EU

legislation that already refers to bio-waste. As an example, the Landfill Directive (1999), in order to encourage waste prevention, has already set bio-waste reduction targets for member states, which can be seen in Table 2-1 (Tojo et al, 2008:17).

Table 2-1: Reductions requirements for Bio-Waste in EU Landfill directive. Source: Directive 1999/31/EC.

Reduction Target (by weight)	Deadline	Optional Deadline (for countries with 80% waste land filled in 1995)
75% of 1995 levels	2006	2010
50% of 1995 levels	2009	2013
35% of 1995 levels	2016	2020

In order to reach these targets, member states will have to make specific efforts to divert and treat this portion of the waste stream, which at the moment usually heads to incineration or landfill.

Finally, the incineration of waste has evolved to play an increasingly prominent role in EU waste treatment. In 2000, the EU Incineration Directive addressed this evolution (Eberl, 2010). According to Tojo et al (2008) “the goal of the Incineration Directive 2000/76/EC is to prevent or limit negative effects on the environment and resulting risks to human health” (ibid:19). The Directive also acknowledges the “growing acceptance of incineration with energy recovery as a way to avoid landfilling” (ibid:13). This Directive, which has played a role in supporting a trend towards a dependency on incineration in some countries, has prompted some concerns that increased use of this treatment method may undermine efforts to divert materials for recycling (ibid). While recycling efforts and treatment capacities have improved, current waste trends will demand extensive incineration capacity if landfilling is to decrease as advocated by the EU. Figure 2-4 illustrates this growth in waste volumes in recent years.

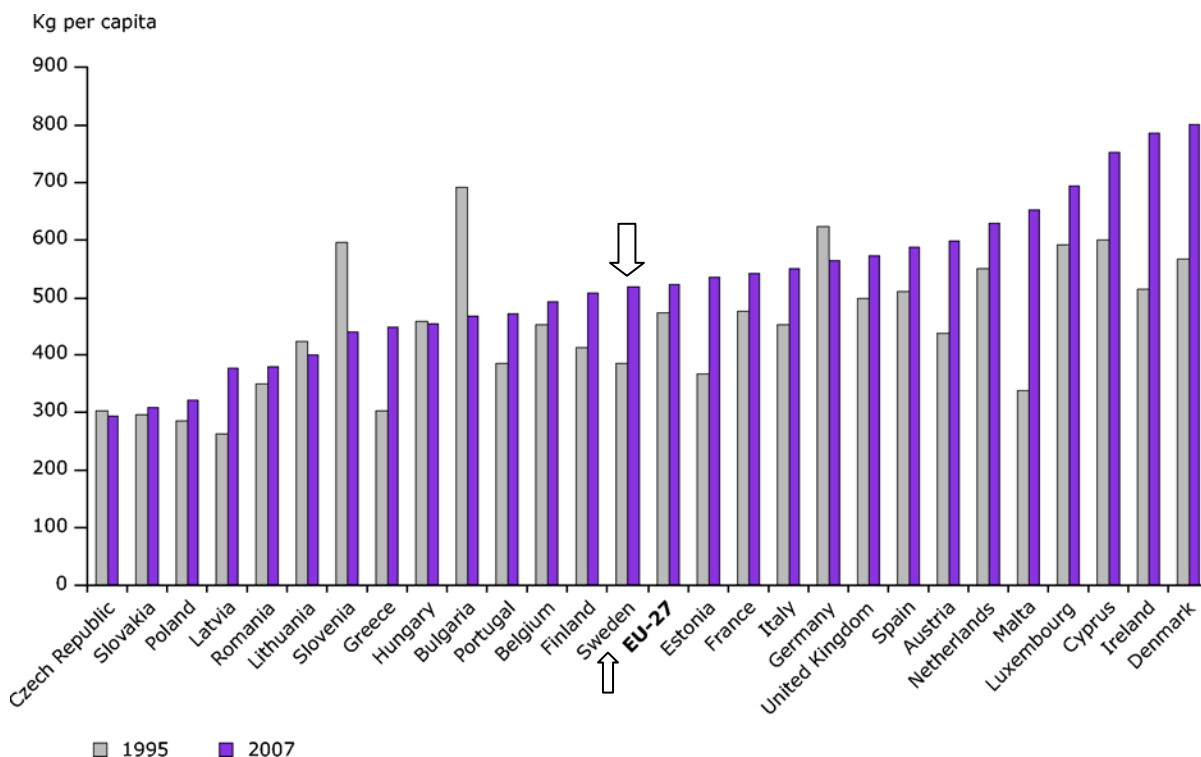


Figure 2-4: Generation of Municipal Waste in EU-27, 1995 & 2007. Source: EEA, 2009.

Figure 2-5 below, shows the percentage of municipal waste incinerated by EU member states. As of now, for most of the countries focusing on incineration, this method of treatment continues to expand, particularly because of its linkages with energy recovery (Dijkgraaf & Volleberg, 2003). As an example, Sweden has developed plans to double its waste incineration capacity between 2000 and 2010 (Sundberg, 2008:6).

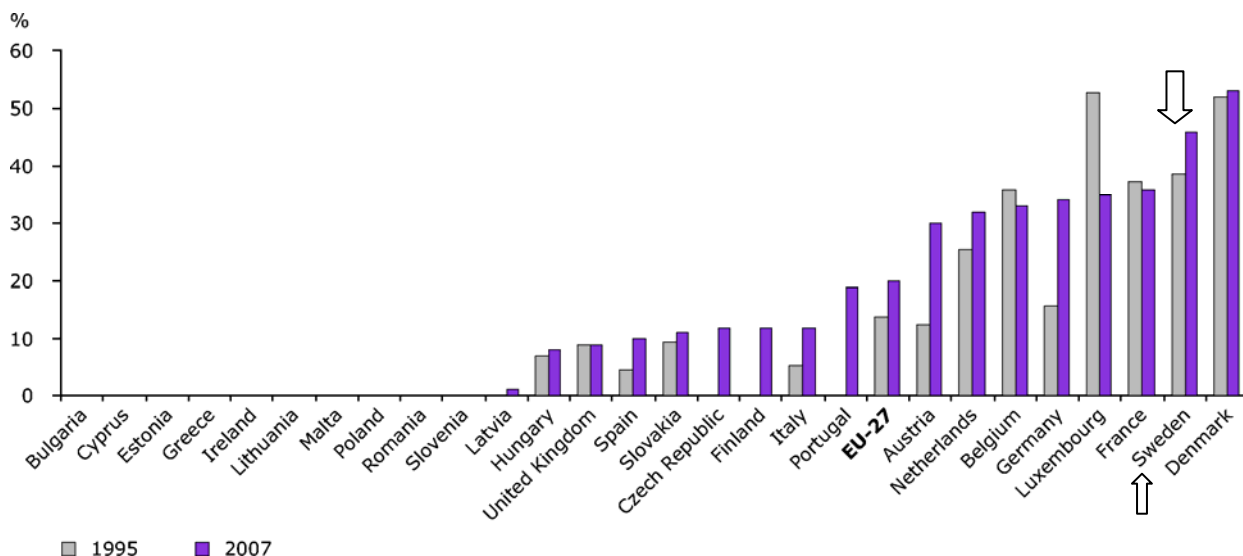


Figure 2-5: Percentage of municipal waste that is incinerated in the EU-27, 1995 & 2007. Source: Eurostat, 2007.

In order to address the pressure on waste treatment facilities from growing levels of packaging waste, the EU decided to apply the Polluter Pays Principle to producers, with the application of Extended Producer Responsibility (EPR) in 1994, which makes producers financially and physically responsible for the waste their products create (Williams, 2005).

2.1.1.3 Specific Waste Streams: Extended Producer Responsibility and Packaging Waste

EPR allocates responsibility to the manufacturers of products for the environmental impacts related to the disposal or afterlife of their products. This means making companies physically and financially responsible for collecting the packaging waste left behind by a product (Jansson & Peterson, 2004). The EU adopted EPR with their Packaging Directive in 1994. An important aspect of the principle lies in its potential to address the volume of packaging waste: producers have the most potential to design products that consume less material and are easier to reuse or recycle. When applied to member states, EPR has usually caused industry to get together to form an organization to comply with the collection obligations (Tojo et al, 2008).

2.1.1.4 Future waste policy developments

The report launching the EU Thematic Strategy on Waste Prevention and Recycling (2005) warns that “emerging knowledge about the environmental impact of resource use is not fully reflected in waste policy” (ECCOM, 2005:3). Although previous EU Waste Policy documents proclaim a goal of decoupling growth with waste levels, data shows that despite some progress in Germany, overall this transition has yet to happen (See

Figure 2-4; Sundberg, 2004). Despite advances in waste sorting and treatment infrastructure, municipal waste levels continue to increase (EC, 2003). The amount of waste heading to landfill also continues to increase, despite improvements in recovery and recycling (ECCOM, 2005).

The EU Thematic Strategy on Waste Prevention and Recycling (2005) reported that “although waste prevention has been the paramount objective of both national and EU waste management policies for many years, limited progress has been made so far in transforming this objective into practical action” (ECCOM, 2005:5). And further, Tojo et al (2008) echo that “it has been recognized that waste prevention, the highest [step] in the waste hierarchy, has not been making much progress. Indeed, the generation of waste per capita has been constantly increasing despite various efforts” (ibid:14).

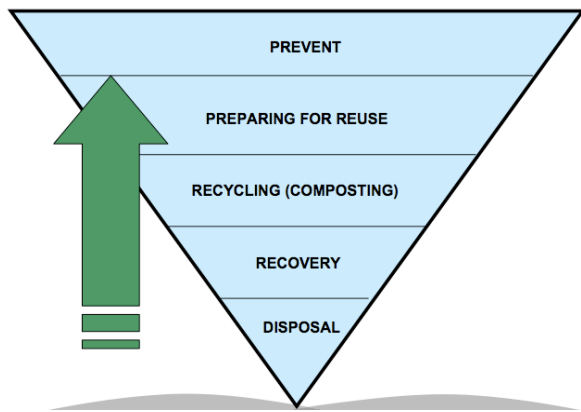


Figure 2-6: Flipped Waste Pyramid.

Source: Versmann, 2009: 18

Andreas Versmann (2009), of the European Commission’s Directorate-General for the Environment, points out that the future of EU Waste Policy should organize around a flipped version of the Waste Hierarchy (See Figure 2-6). Meaning, the most activity should revolve around prevention efforts, then re-use and recycling, with the last two steps just addressing the residual waste left over by way of incineration and disposal. This sets a strong image for future European Waste policy trends, particularly in relation to plans to potentially draft decoupling goals in 2020 (See Section 2.1.1.1). Nevertheless, the reality of waste numbers is that they continue to increase, thus waste prevention efforts will need to be further operationalized and implemented to truly make progress towards these objectives. The policy instrument of PAYT aims to offer a step in this direction.

2.1.2 Waste policy evolution in Sweden

At the basis of Swedish environmental law are 16 specific national environmental quality goals. The country has very carefully framed the issue of environmental protection through a system of environmental objectives, which include 70 sub-goals, all adopted by the Swedish government in the 1990s (Edvarsson, 2007:298). This systematic plan for the future attempts to ensure the inclusion of environmental factors in almost all decision-making processes. The main environmental quality goals related to waste stem from Goal 4, “a poison free environment,” (*Giftfri miljö*) and Goal 15, “a well-built environment,” (*God bebyggd miljö*) (Bertilsson et al, 2008:5). The overriding themes advocated by these goals involve reducing waste quantities, increasing recycling, and proper handling of hazardous materials (ibid).

While Sweden lies close to the average annual waste generation of member states in the EU (See Figure 2-4 above), the country has made some of the earliest efforts to address waste problems and encourage waste prevention. This is shown by Sweden’s strong recycling performance (See Figure 2-3). These efforts have included early adoption of national EPR legislation, bans on landfills, landfill taxes, and strong goals for recycling and diversion of organic waste. For these efforts, the country is considered internationally as one of

Europe’s environmental pioneers (Skou & Liefverink, 1997). Table 2-2 illustrates a timeline of Sweden’s waste management legislative efforts.

Table 2-2: Waste Policy Developments in Sweden.

1994 – Producer Responsibility introduced for packaging.
2000 – Landfill tax introduced.
2001 – Producer Responsibility extended to electronic waste.
2002 – Ban on landfilling burnable waste.
2003 – National goal to divert 35% organic waste by 2010. Landfill tax increased.
2005 – Ban on landfilling organic waste.
2006 – Tax on waste to incineration. Landfill tax increased.

-Source: Adapted from Fredriksson, 2004:33; Bertilsson et al, 2008:14.

The introduction of EPR in 1994 had a marked effect on recycling rates in Sweden: between 1994 and 2004 sorting increased by 140% (Bertilsson et al, 2008:29). Beyond increased diversion, the law is also credited with helping reduce packaging volume (ibid). During this time, household waste heading to landfill also dropped from 20 to 5%, and incineration increased from 40 to 50% (ibid:29).

Since the implementation of EPR, the responsibility for the collection of household waste is divided between the municipality and the producers. Table 2-3 below explains this division:

Table 2-3: Division of Responsibility for Household Waste Collection in Sweden.

Municipality	Producer
Collecting waste bins	Newspapers and other recycled paper
Bulky waste	Packaging made of paper, metal, plastic, and glass
Garden waste	Electronic waste (shared with municipality)
Hazardous waste	
Electronic waste (shared with producers)	

-Adapted from Peterson, 2004:117.

In response to EPR passage, five material collection companies—plastic, metal, corrugated cardboard, paper, and glass—were formed in Sweden, under the title of “Packaging and Newspaper Collection” (*Förpacknings-och tidningsinsamlingen*)(FTI), which took financial responsibility for recycling packaging and newspapers (Bertilsson et al, 2008). As of November 1st, 2008, soft plastics can now also be recycled in the same bin as other plastics as an extension of EPR (Meyer, 2010). FTI has the goal of providing recycling centers at the ratio of 1 per 1000 inhabitants, and thus far has responsibility for more than 6,000 recycling centers in Sweden (Bertilsson et al, 2008:39; Meyer, 2010). The REPA-registret, or “register for producer responsibility” (*Register för Producentansvar*) handles the fees from producers that choose to join in the FTI system (Jansson, & Peterson, 2004:148). Thus far, 90% of packaging volume is covered under the EPR collection system in Sweden (ibid:148).

Landfill bans and taxes have moved Sweden away from this treatment method and towards recycling, composting, and incineration. In 2002, it became illegal to landfill burnable waste, and in 2005 the government banned depositing organic waste in landfills (See Table 2-2). Landfill taxes from the government were meant to

make this form of waste treatment less economically viable (Fredriksson, 2004). It has thus gradually become economically inefficient to landfill from both national government and EU requirements (ibid). In order to prevent a spike in waste heading to incineration, after passing strict laws on landfills, the Swedish government also passed specific recycling goals in 2003: including that 35% of organic waste should be diverted by 2010 (ibid:33). Nevertheless, even with improvements in sorting capacity, waste quantities still continue to grow (See Figure 2-4). Household waste in Sweden has grown at 2 to 3% annually for the last decade (Sundberg, 2004:15). This continual increase has put pressure on and caused problems for the waste treatment capacity of some communities (ibid). This pace anticipates a doubling of waste levels in 30 years, which means treatment facilities would have to expand in the next 15 to 20 years to meet the demand (ibid:16). Waste levels from 1985 are predicted to double by 2014 (ibid:21).

As seen in Figure 2-4, Sweden relies on incineration for a large part of the country's waste treatment, often coupled with energy recovery. While recycling rates are high, increasing waste totals have placed pressure on both incineration capacity and material diversion efforts. This direction in waste planning has also unearthed the debate mentioned previously, concerning EU policies, which argues that focusing on incineration may hinder improvements in diversion. As an example, in March, 2010, the board of directors at SYSAV, a waste to energy recovery incinerator owned by several municipalities in Southern Sweden, decided to import 30,000 tons of waste from Norway (Löfqvist & Ivarsson, 2010). SYSAV may need to import an additional 100,000 tons of foreign waste before the end of the year (ibid:A5). SYSAV increased its capacity despite disapproval from some municipalities that felt they could make improvements in waste diversion instead. The board director argues that the current drop in waste that has required importing waste has been caused by the financial crisis, and that waste totals will eventually increase and demand that extra capacity (ibid). This situation exemplifies the debate, in which some critics view increased incineration capacity as taking away the incentive to focus on waste prevention and recycling to address future waste quantities.

2.2 PAYT as a waste prevention policy instrument

2.2.1 Past research on PAYT in Europe and the U.S.

PAYT, or Pay As You Throw, is a policy instrument often implemented with the intention of reducing waste quantities and increasing diversion for recycling or composting. It typically involves a fee structure divided in two parts: a fixed portion and a variable or weight-based portion. The fixed portion aims to cover basic waste infrastructure and the variable portion to incentivize reductions, as users pay by unit of waste discarded. The ratio of fixed to variable parts is up to the local municipality and can be adjusted. Most municipalities start with a 50:50 balance and adjust it depending on waste and revenue outcomes.

In an EU joint research initiative in 2003, meant to explore the use of PAYT in member states, the final report describes the instrument in this way: "the approach of PAYT is to realize the Polluter Pays Principle in a fair manner by charging people in accordance to the amount of waste they actually generate" (EUWMC, 2003:1). This research initiative took place with funding under the EU's 5th Environmental Programme (1992), and with the result of positive findings, the 6th Environmental Action Programme (2002) specifically refers to PAYT as an example of a policy "that supports EU policy making and implementation" (EUWMC, 2003:1).

There is a 20-year history of the use of PAYT in Europe (Reichenbach, 2008). The policy now exists in a wide range of European countries in varying forms. Germany and the Netherlands are viewed as the European leaders thus far, but wider interest is now growing in many other member states. The majority of the countries that joined the EU between 2004 and 2007 included some form of PAYT in their environmental legislation

(ibid). Along with Germany and the Netherlands, Sweden, Austria, Finland and the Netherlands have been experimenting with PAYT for the longest (USEPA, 2003). Switzerland and Luxembourg have now integrated the policy into national legislation, and interest in the policy is reportedly spreading to Belgium, Poland, Denmark, France, Ireland, Italy, Czech Republic, and Spain (ibid; Reichenbach, 2008).

The introduction of PAYT can either be driven by national legislation or from the bottom up through municipal initiation. Reichenbach (2008) cites integration of the Polluter Pays Principle (PPP) into national legislation as one of the main drivers for pilot PAYT projects in Europe. As mentioned, however, PAYT can also be initiated from the ground up by municipal governments interested in promoting waste reduction and increased recycling (Dijkgraaf & Gradus, 2004). Dijkgraaf & Gradus (2004) point out that municipalities that introduced the policy often already producing less waste, and are thus perhaps more proactive about improving waste policy goals. Thorgersen (2003) cites a number of changes that usually come with PAYT implementation, such as intensive information campaigns, expanded recycling services, and improvements in waste data.

A combination of stricter recycling targets from the EU and shared positive experiences from countries with PAYT have helped to convince some formally landfill dependent countries to consider implementing the policy, such as France and Ireland (Reichenbach, 2008; Scott & Watson, 2006). Though both of these countries have long relied on landfills for waste disposal, they each have recently updated national legislation to encourage the use of PAYT at the municipal level. In 2005, France developed national environmental legislation incorporating the 'principle of prevention' and the 'polluter pays principle' (ibid:2810). Since widespread implementation of PAYT in Ireland in 2004, the country has witnessed significant reductions in waste, despite some reports of problems with illegal dumping: reductions as high as 45% were recorded in some municipalities after the first year of implementation (Scott & Watson, 2006:39).

If backed by sufficient recycling infrastructure, Reichenbach (2008) sees PAYT as having strong potential to reduce waste and increase recycling. The design of the fee structure, or mix of fixed and weight-based parts, however, is critical to fully incentivize changes in waste behavior, and is connected with a reported high risk of illegal dumping (ibid). Fuller and Kinnaman (1995) also warn that poor design of the fee structure can lead to illegal dumping. The fee structure should correctly reflect the costs of the waste services for the municipality, but also hold the proper balance of fixed and variable parts to encourage reductions (Tojo et al, 2008). This means municipalities need to have a solid understanding of the costs involved with their waste collection infrastructure. Additionally, the largest reductions in waste appear to come from the diversion of food waste, meriting adequate attention to this waste stream (Bartelings & Sterner, 1999; Scott & Watson, 2006). Further, it is often recommended to launch PAYT with curbside collection schemes to maximize the accessibility of diversion (Reichenbach, 2008).

Though it represents a different policy context, it's worth noting that the use of PAYT has also been growing in the United States (U.S.). PAYT has a history reaching back a few decades in the U.S., but has seen its most rapid growth during recent years. PAYT programs have expanded from 100 in the late 1980s to over 7,000 in 2006 (Skumatz & Freeman, 2006:2779). This translates to a 70% growth in the use of PAYT over the last decade, with the policy now in use in 26% of municipalities, and 30% of large cities (ibid:2779). PAYT is reported to provide on average a 17% reduction in waste in U.S municipalities (ibid:2782) and is cited as "the most effective single action towards increasing recycling and diversion" (ibid:1). This echoes the research of Scott & Watson (2006), in Ireland, who found that an increase in a weight-based fee elicited higher waste reductions than the same change in a volume based fee.

The main advantages of PAYT in the U.S. are viewed as reducing the burden on disposal infrastructure, encouraging more efficient resource use, reducing environmental impacts, and lowering costs (EPA, 2009). The

policy is also associated with stronger job creation potential than landfilling infrastructure (ibid). Potential barriers to success are viewed as lack of diversion goals, lack of corresponding recycling infrastructure expansions, limited outreach to customers about how to change purchasing habits, and charging a separate fee for recycling (Skumatz & Freeman, 2006). Though some communities in the U.S. express concern for the potential high cost of PAYT, research by Skumatz & Freeman (2006) show that 2/3 of PAYT municipalities report similar or even decreased waste costs as compared with non-PAYT municipalities (ibid:12).

The biggest concern for municipalities in the U.S. potentially interested in the policy is illegal dumping (ibid). Research shows that 20% of municipalities with PAYT did report problems with illegal disposal, however, these problems tended to last three months or less, as strong enforcement of illegal dumping ordinances was usually sufficient solve the problem (EPA, 2009:1). When surveyed after implementation, 95% of households preferred the new system (Skumatz & Freeman, 2006:15).

In a wide-ranging assessment of PAYT in Europe, Tojo et al (2008) concluded that the instrument is effective and easy to implement. The most important factors when implementing PAYT are outlined as taking precautions against illegal dumping, making sure that full financing of waste infrastructure takes place through appropriate designing of the fee structure, and raising awareness of stakeholders involved in the waste management system (ibid). Reichenbach (2008) sees recent success with PAYT as contributing to new interest and potential growth in the use of the policy to meet national and EU environmental goals for waste prevention.

While previous research has reported positive experiences with the instrument, some factors related to its effectiveness remain unclear. As an example, research indicates that economic instruments may not represent the most important factor when it comes to shifting waste behavior. For instance, Bartelings & Sterner (1999) report that households actually ranked the amount of time and effort needed to sort waste as more important than the savings on their bill. Sörbom (2004) also echoes that accessibility appears equally or more important than economic incentives or informational campaigns.

Finally, though some of the factors aimed at influencing successful use of PAYT are well researched, according to Scott & Watson (2006), gaps still exist in how information campaigns are used as well as the effects of long-term adjustments to the policy. An EU survey of research on PAYT found that only 5% of past studies on the subject of PAYT look at the implementation and long-term effects of the policy, and that overall, research on the actual effects of the policy are lacking (EUWMC, 2003). The threat of illegal disposal also remains an important concern for municipalities. Three different pathways for illegal dumping are identified: waste tourism, or placing waste in someone else's bin, burning it at home, and dumping it in nature areas (Dijkgraaf & Gradus, 2004). Scott & Watson (2006) reported that Ireland has experienced some serious problems with the burning of waste since introducing PAYT. Finally, Bartelings & Sterner (1999) find that plenty of research exists illustrating the link between PAYT and reduced waste and increased recycling, however a lack of understanding still exists on the best way to design the fee structure and the limits to behavioral change.

2.2.2 Past research on PAYT in Sweden

PAYT has existed in Sweden for over a decade, and is currently used in 26 of the country's 290 municipalities (Dahlén & Lagerkvist, 2010:24). These select municipalities represent about 10 percent of the Swedish population. Bartelings & Sterner (1999) analyzed the first municipality to implement the policy, Varberg, which tested PAYT in 1994. The municipality used a phased implementation, with a pilot project of implementing the policy in one neighborhood, Tvååker, of 725 inhabitants for the 1993-1994 year (ibid). During this time the

neighborhood witnessed a significant drop in waste, and a positive response from households (Nilsson, 2004). With this satisfactory outcome, Varberg decided to scale up the policy to cover the entire municipality in 1995, consisting of 55,000 inhabitants (ibid). Following the full-scale implementation, the municipality witnessed a 27% reduction in waste (ibid:21). At the time Varberg also launched a “green shopping” campaign aimed at making residents aware of the waste footprint of their shopping habits, as well as expanded recycling services (Bartelings & Sterner, 1999:476). The policy is regarded to have led to significant waste reductions and increased recycling. As an example, the average waste per household declined by 35%, however, research also shows that some illegal disposal of waste has occurred (ibid:476).

Most PAYT schemes (82%) in Sweden were introduced between the years of 1995 and 1999, while the rest (18%) began between 2000 and 2005 (Dahlén & Lagerkvist, 2010:25). Overall, research has shown that PAYT has the potential to reduce waste 30%-50% in Swedish municipalities (Dahlén et al, 2007:1302). On average, municipalities with PAYT reduced waste levels by 20% in the first few years following implementation (Dahlén & Lagerkvist, 2010:26).

Dahlén & Lagerkvist (2010) looked at all 26 municipalities with PAYT and found that the recycling differences observed after PAYT implementations cannot entirely explain the waste reductions witnessed. The three main pathways anticipated to account for the reductions in waste are increased recycling and composting, illegal disposal of waste, or changes in waste behavior (Ekvall, 2006). 95% of municipal governments with PAYT in Sweden showed a positive attitude towards PAYT (Dahlén & Lagerkvist, 2010:27).

A wide variety of fee structures for waste exist in Sweden, though bills based on volume are the most common (Dahlén et al, 2007). This variety most likely owes to the local government preference for designing a waste system that best meets local needs. The general goals of municipalities that choose PAYT usually include a desire to encourage households to minimize waste and recycle more, as well as to put the municipality in line with national waste legislation. Finally, Dahlén & Lagerkvist (2010) report that PAYT as a policy instrument has not been fully evaluated; in particular the extent to which illegal dumping is a problem.

2.3 The evolving Waste Management policy context

The OECD, in 2002, defined waste prevention as “strict avoidance, reduction at the source (e.g. home composting) and reuse” (Cox et al, 2010:195). Recycling is excluded from this definition, though research shows that stakeholders involved with waste prevention efforts often categorize it as part of the definition, or include it as a “waste minimization activity” (ibid:195). While the definition is evolving, and needs further operationalization, efforts in this direction show how waste policy strategies now focus on the earliest stages of production and consumption. Given that policy efforts thus far have failed to stabilize waste levels, many countries now look to make an effort to limit the production of waste as early as possible, as simply focusing on sorting activities at the end of the production-consumption chain has proved insufficient. Cox et al (2010), after an international review of these types of strategies, suggests that waste prevention benefits are best derived from a ‘package’ of measures, including prevention targets, EPR, household charging, funding for pilot projects, collaboration between sectors, and public information campaigns (ibid:216). Understanding the role that different policy instruments can contribute will help strengthen these recommendations, which justifies the need to further research the potential of policies like PAYT.

Chapter 3: A collective case study in Sweden

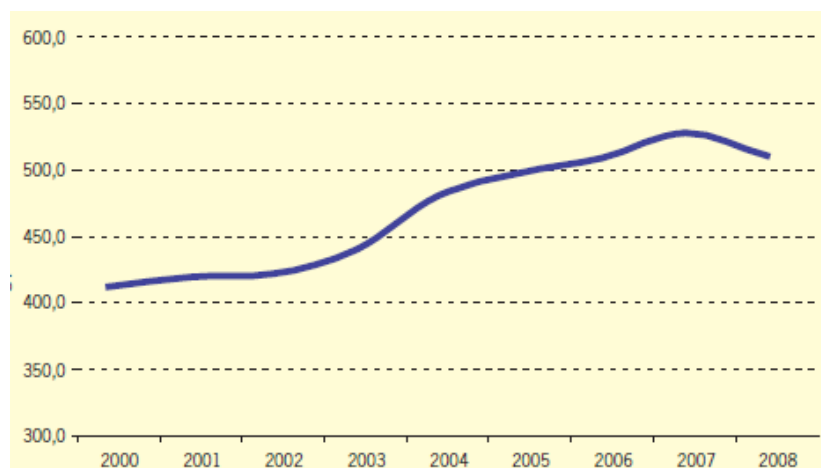
This section will outline the setting for municipal waste planning, and describe the implementation process for PAYT in three municipalities near Göteborg: Härryda, Lerum, and Partille.

3.1 Municipal waste policy setting

Since the beginning of the 1990s, environmental law in Sweden has required a specific waste plan from municipalities (Bertilsson et al, 2008). The direction of waste planning is driven primarily by regional and national environmental quality goals related to waste. The three cases below have been involved in developing a regional waste plan (2010) with 13 other municipalities near Göteborg, which represents an effort to collaborate on waste goals and work to bring the municipalities collectively in line with national and EU waste legislation. The report aims ambitiously for “world-leading standards” (A2020, 2008: 11). The goal of such organization is to create a more integrated system that can work together to meet waste goals, and better operationalize efforts towards national environmental goals.

The individual municipal waste plans make a direct reference to national environmental goals related to waste, and the EU waste hierarchy, and how the municipality is aiming to work towards/enforce them (Bertilsson et al, 2008). The most recent waste directive passed by the EU in 2008 is also mentioned in the regional waste plan (A2020, 2008). Thus, the construction of waste policy is driven both by local conditions and regional waste goals, as well as national targets and EU requirements.

Figure 3-1 shows the collective waste trends for the 13 municipalities that participated in organizing the regional waste plan.



Despite previous efforts to address waste levels, totals in the region continued to gradually increase (the dip in recent years is attributed to the financial crisis and expected to reverse). The regional waste plan aims to address this growth with stepped plans for improvement towards 2020, including recommending the use of PAYT as a possible instrument to help municipalities meet the goals (A2020, 2010:25).

Figure 3-1: Waste Generation in the Göteborg Region (kg per user/ year).

Source: A2020, 2010:13.

3.2 The implementation process: Härryda, Lerum, & Partille

This section describes the PAYT implementation process of three municipalities to the east of Göteborg that implemented PAYT in 1998. Findings come from a combination of municipal government reports and contact with waste planners, as well as analysis of secondary data collected on the cases, both of which can be found in more detail in Appendices A and B. The same level of information was not always available for each municipality, but the descriptions together give an idea of the implementation process in this context.

Table 3-1: Select municipalities.

Municipality	Population (2009)	PAYT Implemented	Classification
Härryda	34,007	1998	Suburban
Lerum	38,301	1998	Suburban
Partille	34,382	1998	Suburban

-Classification categories: Dahlén & Lagerkvist, 2010. Population data: Statistiska centralbyrån, 2009.

The municipalities of Härryda, Lerum, and Partille are located to the east of Göteborg. Each house around 30,000 inhabitants, and chose to implement PAYT in 1998. All three municipalities report that their main reasons for choosing to implement PAYT were a desire to reduce waste quantities and encourage sorting. Partille also reported expecting the policy to help encourage more home composting. All three municipalities have 20 to 30 FTI packaging recycling drop-off locations—provided by producers in line with EPR law—available in the region for the recycling of newspapers, glass, plastic, metal, glass, and cartons, as well as one or two large recycling centers available for bulkier items and yard and construction waste, which are run by the municipalities. Together with 11 other municipalities in the region, these three own a stake in a nearby waste incineration plant with energy recovery, called Renova, which was built in 1998. Waste that is not diverted for recycling or compost is collected by Renova for incineration. While compost collection is not currently offered, all three are considering adding curbside collection of this stream to their waste services in 2011. Härryda reports that 50% of its households in the municipality already home compost, and offers these households the option of selecting less frequent waste collection at a lower price. All three municipalities charge a waste fee with a fixed portion and a variable portion. The size of the fixed portion depends on the size of the container selected and the frequency of collection. The variable portion depends on the amount of kilograms of waste discarded by the user. Though all three municipalities started with a 50:50 balance of the two parts of the bill, with a fee of 1 krona per kilogram, all have adjusted the fee structure since first implementing the policy. Härryda reports that the variable portion of the bill now represents about 40% of the bill, as the fixed portion has increased to protect against economic vulnerabilities and waste infrastructure maintenance. Lerum reports that the variable portion of the fee has increased to 2 Swedish kroner per kilogram of waste and that the fixed portion of the fee has increased 104%. As a yearly example, Partille cited that the average customer now pays 425 kroner for the variable charge, and 827 for the fixed portion of the bill. Partille reported changing the fee balance quite often, always with the goal of finding a balance between expenditure and revenue. All three make the decision locally each year about the structure of the fee. On the question of illegal dumping, none of the three reported serious problems with illicit disposal of waste. Härryda did remark about receiving some reports of extra waste in the dumpsters at rest stops, but did not see it as a significant or lasting problem. None of the three reported problems with dumping in nature areas, and Partille in particular expressed the opinion that the risk of illegal dumping associated with PAYT appears exaggerated, and that no noticeable change in this type of activity occurred in association with the policy.

Education efforts during the transition were centered around mailings to users and some evening informational meetings before implementation of the policy. Partille also cited media interest as helping spread information about PAYT; as their municipality was among the first in the region to implement the policy, they found that the local media were quite interested to write about PAYT. Partille has a municipal goal of making at least five announcements related to waste management awareness to the media per year. Though the municipalities did not report measuring public opinion right after the shift, general waste surveys show satisfaction with the system, and the waste planners reported that users have a perceived high level of acceptance for the waste services and billing system. This relates to the fact that PAYT is viewed as an extension of the same billing process used by other utility services, such as water and electricity, which also charge by unit. The general advantages for the policy listed by the municipalities are that it is “fair,” offers a

strong incentive for waste reductions and increased sorting, and that it delivers high quality waste data. Härryda in particular reported that an unanticipated benefit of PAYT was the high level of control it gave them over the waste system. Coupled with a GIS system, the municipality can now easily track the number and location of bins, and how much waste is collected and at what time each day. This makes it easy to address customer service questions and also allows the municipality to ensure that extra waste is not collected. With the previous system of bag collection, waste haulers could collect extra bags without reporting it into the system. With PAYT, each container is connected with an ID and the weight is checked at collection and upon delivery to the treatment center. This highly technical nature can also be a potential disadvantage, as all three municipalities reported that the system requires the storage of large amounts of data, and that the highly technical nature can make the system vulnerable, and in need of careful handling.

In terms of waste trends, all three municipalities reported waste reductions after implementing PAYT, followed by a period of stabilization, but with slight increases in recent years. Partille reported that waste totals for the first year following implementation decreased from 6,000 to 5,000 tons annually, and that the quantity of diverted materials increased for the first 6 years after the implementation of the policy, but has now leveled off. Waste quantity trends for the three municipalities are shown in Figure 3-2. A comparison with Figure 3-1 does show more success for these cases at stabilizing waste levels than overall regional trends. For this reason, Härryda reports that that PAYT may spread to most of the municipalities in the region in the coming years.

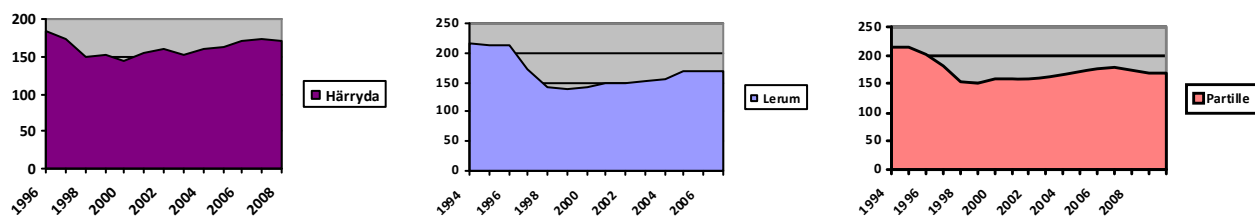


Figure 3-2: Long-term Waste Quantities per customer (kg per user/ year): Härryda, Lerum, Partille.

3.3 Findings on factors of interest: illegal disposal, compost options, long-term adjustments

This section draws upon the findings of from all 8 cases listed in Table 1-1. Appendices A and B list the main findings for all cases from primary and secondary data analysis. All municipalities cited PAYT as having an influence on waste levels and all except one, Borgholm, reported a positive attitude towards the policy. In the long-term, after witnessing reductions in the first few years after implementation and increased sorting, some municipalities reported stabilization and then an eventual increase in waste levels. As an example, Sundsvall reported a 5 to 10 % decrease in waste for the first few years following implementation, and Borgholm that waste levels had now increased to return to levels when the policy was first implemented.

Table 3-2: Additional Cases.

Municipality	Population (2009)	PAYT Implemented	Classification
Borgholm	10,806	1998	Small
Mönsterås	12,980	1999	Manufacturing
Emmaboda	9,223	1996	Manufacturing
Linköping	144,690	1996	Large City
Sundsvall	95,533	2003	Large City

-Classification categories: Dahlén & Lagerkvist, 2010. Population data: Statistiska centralbyrån, 2009.

3.3.1 Reactions to illegal dumping

Three pathways for illegal dumping are identified: waste tourism, meaning, depositing waste in another's bin, burning waste at home, and disposal in nature. The risk of illegal disposal is identified in previous research as the biggest concern of municipalities considering PAYT (Skumatz & Freeman, 2010). In the context of this case study, however, all municipalities except for one, Borgholm, reported no serious problems with illegal disposal. Some of the waste planners, such as Emmaboda and Partille, even offered rather pointed opinions that the threat of illegal disposal in association with PAYT is over-exaggerated. The one municipality that did report problems, Borgholm, has the unique characteristic of experiencing a large tourist influx for part of the year, and the waste planner commented that it is difficult to change behavior with residents that only live in the municipality part-time. In terms of the issue of waste tourism, while Härryda did report that some rest stops had seen an increase in waste, this situation was not viewed as a lasting problem. While these findings may not apply to the unique contexts of other municipalities in Sweden, they at least show that these seven cases do not report serious illegal disposal issues after over a decade of use of the policy.

3.3.2 Compost options

Composting represents an important opportunity for cutting municipal waste streams and offers a host of advantages to municipalities: with home diversion of food waste no extra collection or treatment facilities are required and environmental impacts, such as bacteria and air quality issues, are lessened with the decentralized nature of household treatment (Vinnerås, 2004). The reality of the situation, however, is that not all households have the potential outdoor space to home compost, making this option limited in urban areas. In these contexts, curbside collection is the primary option for diverting this waste stream. Curbside collection of bio-waste can be treated in central composting facilities to be made into fertilizer, or treated in biogas plants to become energy or fuel. Home composting offers a direct way to lower the weight-based portion of the bill, while curbside collection allows for separation of the waste stream for fertilizer or biogas.

Though the Swedish government passed a goal urging 35% diversion of this stream by 2010, this goal has proved difficult for municipalities to reach (ibid:164). The original aim was to have half of the Swedish population sorting their organic waste, yet by 2005 only 1/6 reported to do so (ibid). While Härryda reported that as many as half of its households compost, the municipality still plans to add compost collection at the curbside next year. In order to not discourage home composting, Härryda reports most likely including the cost of the collected compost stream in the variable portion of the fee.

Two municipalities, Sundsvall and Partille, cited "to increase home-composting" as part of the reason for implementing PAYT (see Appendix B). Both Mönsterås and Sundsvall also reported noticing increases in composting activities after the start of PAYT. Most municipalities examined planned to add curbside collection of compost in 2011, with the exception of Sundsvall, which already began the service in 2009. This shift will help the municipalities get in line with national diversion goals for organic waste.

3.3.3 Long-term adjustments to the policy

All municipalities except one, Mönsterås, reported to have changed the fee balance and pricing since first introducing PAYT. Most cases start out with a 50:50 balance and adjust the fixed and variable portions according to waste outcomes each year. Some municipalities did report increasing the fixed portion to protect against the costs needed for repairs and maintenance of waste related infrastructure. PAYT does, however, appear easily adjustable, as this can be done on a yearly basis, and given that the policy tends to offer high

quality data, waste trends can be easily tracked. Linköping cited changing the fee to raise revenues to fund recycling centers, better hazardous waste collection, and to cover increased collection costs.

Despite previous research underlining the importance of recycling convenience (Sörbom, 2004), none of the case studies selected here reported having curbside collection of recyclables, despite most likely adding it for food waste in the future. Härryda said explicitly that it would not be adding curbside recycling collection anytime soon because it would be too expensive when producers are already required to pay for FTI stations under EPR. On the other hand, some frustration was also expressed from municipalities about a lack of sufficient funding for expanding recycling facilities from FTI over the past few years.

3.4 Policy assessment

This section introduces the economic, social, and environmental factors that appear to factor in at the municipal level with the use of PAYT.

3.4.1 Economic factors

While introducing PAYT has the possibility of creating some uncertainty with costs and revenues, this reality is recognized by the municipalities, but not reported as a serious problem, as the policy has the flexibility of being adjusted each year if needed, in response to waste trends and revenue. Further, changes in waste infrastructure costs can often have more to do with the shifting costs of dealing with waste and recycling infrastructure than PAYT itself. Still, with the high levels of material diverted for recycling, keeping up this infrastructure has become very expensive. As an example, Linköping specifically reported having to increase the fee to cover increasing recycling costs. Seven of the municipalities reported to often adjusting the different parts of the fee (only one municipality, Mönsterås, has left the fee structure the same since implementation). As the variable portion of the fee is the part that offers the waste prevention incentive, excessively altering the ratio with the fixed portion could potentially undermine this incentive. The policy could thus end up weakened if basic infrastructure and repair costs cannot be covered by the fee. While PAYT appears to lower waste quantities, and thus lessen stress on waste collection infrastructure, pressure on recycling facilities can increase.

3.4.2 Social implications

The most common word listed by waste planners in reference to the policy is “fair,” both in their assessment from the government perspective and from feedback from households (See Appendix A and B). In fact, most municipalities listed the words ‘fair’ or ‘just’ as one of the policy’s main advantages. Thus, a fairly high level of acceptance for the policy is reported. Only one municipality, Borgholm, reported dissatisfaction, and is in the process of lowering the variable, or weight-based portion, of the fee to satisfy customers. While the introduction of the fee can raise concern over a perceived unfair burden to lower income households, or as one waste planner brought up, for families with young children, the conventional fee structure essentially implies that all users have to subsidize heavy wasters. High levels of waste put stress on collection and treatment infrastructure, and costs for expansion are then shouldered by all users. One municipality, Mönsterås, even commented that their waste fees had not increased as fast as neighboring municipalities without PAYT. Finally, Härryda pointed out that the high quality of data collected with the policy also allows for a high level of customer service.

3.4.3 Environmental impacts

While most municipalities report reduced waste quantities for the years following implementation, assessing environmental impacts can be quite complex. Certainly decreased waste production means less waste incinerated or landfilled, and thus decreases the pollution and energy costs associated with these pathways. However, the real savings lies in the actual waste prevention, or citizens deciding to change their behavior to produce less waste. This project cannot report for sure how much of the reductions relate to this factor, but it can at least say that seven of the municipalities do not cite illegal disposal as a major factor. In this way, the odds are strong that a combination of increased sorting, home-composting and prevention account for the change. While waste reductions are reported, the policy has not been enough to permanently stabilize waste levels, and quantities have begun to increase again. The numbers do show strong initial reductions in waste levels, however, and this does mean a positive for the environment.

Chapter 4: Discussion

This section will begin with an analysis of the role of the municipality during PAYT implementation, within a Transition Theory framework, and then move onto a multi-disciplinary discussion of the different factors related to the use of the policy and its potential future as a waste prevention strategy.

4.1 The role of the municipality during the policy transition

Rotmans (2001) identifies three dimensions of a system transition—time period, speed, and size—to help describe the dynamics of the changes taking place (See Figure 1-2). For the transition to PAYT, in relation to *time period*, most municipalities have had the policy in place for over a decade, with the earliest implementation in 1996 (a range of 1996 to 2003 for the starting year). The most dramatic changes in waste quantities appear to take place in the first three to five years after implementation. This can be seen in the three graphs in Figure 3-2 of the findings section, and was reported by the municipalities as the range for the biggest observed changes. Most municipalities then reported a levelling off of waste quantities over the next few years, followed by a slight increase again after about a decade of use. While most municipalities appear to follow this pattern, the scale or size of the reductions, and whether the municipality is able to sustain stabilized waste level most likely depends on a multitude of factors, such as accessibility of recycling infrastructure, or whether households have the possibility to home-compost.

In Transition Theory, Rotmans (2001) also identifies the different role that government can play throughout the different phases of a transition to assist the process (See Figure 1-2; Section 1.3). Whether the government maximize its influence and encourages the transition may have an impact on the range of results, such as how well the fee structure is designed to gain acceptance from users. During the *pre-development* phase, the municipality can carefully design the structure of the fee to adequately reflect waste infrastructure costs, and select a variable or unit-based portion that won't place an unbearable economic burden, but can still encourage users to reduce waste. Plans can also be made to expand diversion infrastructure to provide accessible sorting. Educational efforts early on can also insure that users know about the options available to sort waste or home compost to reduce the fee. During the *take-off* and *acceleration* phases, when the policy is first implemented, and users are adjusting to the fee, the municipality can work to stay in good contact through educational materials, and carefully monitor waste outcomes and revenue to adjust the fee accordingly. In the long run, if the government has managed these first stages carefully, there may be potential to stabilize waste levels, but if not, waste levels may start to increase again, or users to illegally dispose of

waste. Nevertheless, factors out of the municipality's control, such as increasing levels of consumption, may ultimately cause barriers to reaching stabilization in the long-term.

As Rotmans (2001) explains: "the multi-level aspect of transitions implies that change only breaks through if developments at one level gel with developments in other domains" (ibid:20). Thus, without addressing larger drivers of consumption, local government waste policies may not be enough to stabilize waste levels. As Rotmans (2001) points out: "while culture changes slowly, economic changes can arrive quickly, and finally institutional and technical changes in between" (ibid:19). While current efforts at the micro, meso, and macro levels are helping move towards institutionalizing waste prevention strategies like PAYT, without a larger cultural change addressing the issue of consumption, such policy instruments may remain limited in their ability to stabilize waste levels. Further, Sweden's increasing dependency on waste incineration with energy recovery, may build in a minimum level of waste needed, and therefore a limit to the need for waste prevention efforts. While Sweden has already begun importing waste for some its incinerators, both national and EU waste law may make this more difficult in the future, thus not meeting the waste needs of these incinerators may conflict with waste reduction goals, and therefore clash with a potential spread of PAYT.

4.2 Assessing PAYT: A multi-disciplinary view

The design of the fee structure represents a critical component of PAYT, both for the need to connect the fixed portion of the fee correctly to cover the cost of waste services, but also to find the appropriate balance with the variable or weight-based portion to incentivize waste prevention. Linköping argued that their best defense against illegal disposal was actually to provide good service at a fair price. This means not only carefully balancing the variable fee to encourage reductions, but also investing the fixed portion in providing recycling and composting education so that users have opportunities to reduce their bill. Though Borgholm experienced dissatisfaction from some customers, and problems with the burning of the waste at home, their waste planner felt that free recycling drop-off points at least prevented customers from dumping elsewhere.

Nevertheless, municipalities have to cover basic costs, and some municipalities did report increasing the fixed portion of the fee to deal with economic uncertainties and to cover infrastructure repairs. Some of these adjustments are to be expected, given the increasing cost of waste treatment infrastructure. However, not giving the variable part of the bill adequate weight could undermine the impact of the incentive for households to reduce. In this way, the goals of PAYT can be weakened if the bill cannot cover the basic infrastructure and repair costs of the municipality. Findings from this project do show that a number of municipalities reported adjusting the fee to meet waste infrastructure needs. Though this is an important reality of PAYT, the policy can also offer potential to address it: flexibility. As most municipalities reported having better quality waste data after implementing the new system, the local government can then use this data to make a decision each year on whether to adjust or change the fee. Thus, while PAYT may appear to initially cause uncertainty in revenue, and require some adjusting of the bill, the policy can provide the data needed to help make this decision and be easily adjusted each year.

While the economic factors will certainly play an important role for municipalities, the social aspects, or the reaction of households also represents a critical component for a successful outcome. Households must be educated about the transition to PAYT, and continually informed about how to best dispose of waste. Within the selected cases, government officials most often described the policy as "fair" and report that households view it as such as well. In this context, PAYT was viewed as making users responsible for how much waste they throw away, in the same manner as water or energy bills, a process that is already well-accepted.

As raised by Linköping, an important reality of the conventional flat fee is the fact that households feel as if they pay for the service of full container. Thus, to get the most for their money, customers may have the urge to throw out as much as possible each week to fill the container. PAYT takes away the possibility of this line of thinking, because more waste will always mean a higher bill. Of course, the size of the fee and the balance of the fixed and unit-based portions has to be accepted by users as well, which is the problem Borgholm faces, and is currently trying to correct.

The threat of unusually high waste costs can also raise questions of how much this burden might fall on large families or low-income households. However, the reality of the conventional system must be acknowledged as well: with a flat fee the impacts of heavy wasters on the system are hidden. More waste means more wear on waste treatment infrastructure and pressure on capacity. If waste bills have to increase to cover this pressure on infrastructure, everyone pays more. PAYT does address this, and as Mönsterås pointed out, their waste fees have actually not risen as fast as in neighboring municipalities.

Additionally, environmental factors are implicated within both the economic and social choices. While a municipality may have fears about the possible revenue uncertainties or technology transitions required by PAYT, the policy can offer a way to meet national waste targets through increased sorting and reduced waste quantities. These last two factors were the most common listed for why municipalities chose the policy. Strong environmental goals from European Union (EU) waste directives and the Swedish national government act as policy drivers for municipal waste planning choices. As an example, some of the municipalities specifically mentioned the EU waste hierarchy in relation to local waste goals in their waste plans, showing that macro level policy goals are reaching all the way down to the micro level.

Occasionally, however, the speed of the transition for some waste goals from higher levels can lag behind, such as the decision by the Swedish government to ban the incineration of organic waste in 2005. This policy has taken some time to implement: most likely given that not all household have the space to home compost, and the fact that adding collection of organic waste requires specific infrastructure improvements. As urban dwellers may not have access to yard space to home compost, for these residents, curbside collection is the main option for diverting this waste stream. This can be observed in the finding that many of the municipalities in the sample reported to start collecting compost at the curbside by next year. The European Union and National waste goals of Sweden are ambitious for the coming decades to encourage these diversion trends: yet this ambition is balanced with the reality of yearly increases in waste quantities. Thus, for municipalities that need to reach these targets PAYT could be a powerful tool. It gives the municipality high quality data on waste quantities and some leverage to incentivize users to reduce waste.

While the sorting of waste is important, it must also be recognized that this step costs resources as well. Recycling and the transportation of waste to facilities for reuse or re-processing consumes energy and causes pollution. The real savings for the environment comes from reduced waste creation. Research on PAYT cannot thus far explain how much of the waste reductions reported actually come from changes in consumption patterns. Waste quantities have decreased, and recycling and composting most likely represent part of this shift. Findings from this project can at least illustrate that illegal disposal has not played a serious role for the selected cases, excluding one. Still, the implications of increased diversion of recycling are important to consider. While diverting more materials for recycling represents a positive step, those facilities cost money and resources to run and maintain and can only handle a certain capacity of materials, thus, the ability of the municipality to educate and offer opportunities for waste prevention, such as home composting, remains a critical aspect of the policy.

In the long-term, most of the municipalities appear to follow the trend of a gradual increase in waste found overall in Sweden and the EU. While the first three to five years after introduction of PAYT offered reductions, after a decade these municipalities are again experiencing increases in waste totals. This reveals the need to address the drivers of this increased consumption if waste levels are to truly be stabilized. As the EU reports: "emerging knowledge about the environmental impact of resource use is not yet fully reflected in waste policy" (EC, 2005:3). Thus it remains critical to continue to work to operationalize how to connect environmental impact with consumption, and make producers and consumers fully responsible for the waste they create.

4.3 PAYT as a Waste Prevention Strategy

As of November 1st, 2008, soft plastics can also be recycled as an extension of the EPR legislation in Sweden (Meyer, 2010). This shift may have important implications for waste heading to incinerators and impact the spread of PAYT. This type of packaging represents one of the last parts of the waste stream that could not be diverted in Sweden and an important high energy part of the waste stream heading to incinerators. With this shift, waste totals could potentially decrease in terms of burnable waste, and threaten the minimum capacity needed for the many incinerators used in Sweden for energy recovery.

When considering the future of PAYT and waste prevention efforts in Sweden, it is difficult to not run up against the question of incineration, and dependency on this form of waste treatment. Though waste levels continue to slowly increase, some incinerators in Sweden already lack waste, and have decided to import foreign waste to bridge the gap. While the government at all levels proclaims waste reduction goals, waste infrastructure planning, in particular incineration capacity is still preparing for increases. The case of SYSAV illustrates this reality with their decision to invest in building additional capacity in recent years, which now completed needs waste from Norway to fully function. Thus, we have two different messages happening: one pushing waste reductions with policies like PAYT and the extension of EPR to soft plastics, but another emphasizing a growing capacity to incinerate. If some incinerators already lack waste, an extension of the use of PAYT could potentially further undermine their fuel stock.

Nevertheless, as of now, the conventional flat waste fee still represents the norm. And while some European countries have taken strong steps toward nationalizing the policy, for the most part it still remains on the fringe, as within Sweden. This will require further research to identify if barriers exist, and what kind of drivers it will take to further expand the use of the policy. Research does show that local governments have a strong desire to keep control over local waste management systems, and keep them adapted to local conditions, which may make them reluctant to try a new system. This type of diversity was certainly observed during the research process, as each municipality has a slightly different interpretation about how to educate users and implement and change the policy and design their own waste treatment capacities.

While the EU waste hierarchy and legislation does favor waste incineration over landfilling, the current trend towards incineration still raises some questions for the future. While incineration with energy recovery currently represents a better alternative than landfilling, the existence of these plants still builds a minimum waste requirement into the system. As Sweden already faces the need to import waste for some of these incinerators, this critique no longer represents a hypothetical. The decision to ship waste from elsewhere to feed incinerator capacity clearly goes against the Self-Sufficiency and Proximity Principle also advised by the EU (See Section 2-1). On the other hand, the reason Sweden has ended up with so much incineration is a systematic move to make landfilling economically inefficient, supported by the fact that the EU has made clear that incineration with energy recovery represents a better environmental option. Many other EU countries are

also planning to take the path that Sweden has chosen, towards incineration, which may make this debate an important topic in the future.

Chapter 5: Conclusions

5.1 Concluding remarks

While PAYT does show potential as a waste prevention strategy it requires a proactive municipality willing to expand collection services, educate users, and deal with a large amount of data. The policy can represent an important step towards waste prevention but cannot tackle waste levels on its own. Consumption continues to grow and bring with it increasing waste quantities. Further, increased sorting does mean resource recovery, but also the use of additional energy and the creation of pollution impacts in order to recover the materials. The most important savings thus relate to preventing waste from ever entering the treatment system. PAYT does help to put municipal waste policy in line with the Polluter Pays Principle, and encourage the important environmental savings that come with prevention, such as increased composting, but it is not clear how fully effective the instrument is as a waste prevention tool in the long-term. The instrument does, however, adapt well to local conditions and show a high level of acceptance for stakeholders which gives it great potential to spread and make waste management systems more consistent with the Polluter Pays Principle and the goals of the EU Waste Directives.

5.2 Recommendations for further research

After completing this process, the researcher sees a need for further explorations of the linkages between consumption and waste prevention strategies, obstacles to the spread of PAYT, and implications of minimum waste requirements for incinerators on waste prevention efforts. Further, implications of the increased cost of recycling and the limitations of funds from EPR in Sweden warrant attention as well. Finally, as bio-waste represents an important topic in the EU at the moment, developing a better understanding of how best to address this waste stream would benefit efforts toward expanding waste prevention strategies in the future.

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Appendix A – Results of Primary Data Analysis:

Municipality	Recycling/Composting Options	Waste Trends	Fee Structure	Adjustments	Illegal Disposal	Education Efforts	Household Opinion	Main Advantages	Main Disadvantages
Härryda	-26 drop-off centers for packaging. -2 large recycling centers -50% report to home-compost. -Plan to add compost collection next year, within variable fee.	-See Figure 3-2	-Started at 50:50 (1kr/kg).	-Variable portion now 40%.	-Not reported as serious problem . -Road authorities occasionally report dumpsters at rest stops to have extra trash. -No serious problems with dumping in nature areas.	-Send out a waste newsletter each month with the bill, and as well as a packet of education materials each year. -Send packet of materials to new subscribers.	-Questions in yearly survey that relate to waste.	-GIS system allows for excellent control and tracking of waste system. -Quality waste data, ability to track changes in waste levels. -Easier for customer service -Ensures “extra” waste doesn’t end up collected.	-Extra work during transfer to the new system -Technical system
Lerum	-FTI drop-off stations for packaging. -One larger recycling station.	-See Figure 3-2	-Started with variable fee of 1 kr/kg -Fixed fee depends on size of bin and frequency of collection.	-Variable fee now at 2kr/kg -Fixed fee has increased 104%.	-No significant problems reported.	-Written information to households and evening meetings before implementation.	-None reported.	-Decrease in waste per person. -Can see how waste was collected.	-Very technical system, and thus vulnerable -Need careful training/handling
Partille	-33 drop-off stations for packaging. -Allowed to compost at home without a permit since 1997.	-Quantity of diverted materials increased for the first 6 years, but now has leveled off. See Figure 3-2	-The avg customer pays 425kr in variable charge and 827kr for the fixed portion.	-Fee mix changes all the time -Goal is always to find a balance between expenditure and revenue.	-Risk is exaggerated. -Those who have before continue but no noticeable increase.	-Many mailings to households. -Advertisements. -Newspapers were very interested to write about it, as were first in the region with the weight-based fee.	-Surveys, but not directed at PAYT.	-Fair -Encourages greater source separation	-Requires a lot of information collection -Need technical system to function well -More complex billing
Borgholm	-Recycling of packaging takes place at FTI, no curbside collection. Composting allowed for property owners. No curbside of compost collection yet. Garden waste can be left that	-Initially, waste volumes reduced sharply, but have subsequently increased. As much of the waste in the municipality	-Everyone pays a fee based on container size and retrieval frequency. The proportion of fixed rate thus depends	-Fees are indexed occasionally, but at the moment the variable portion is quite high and there are plans to reduce this portion	-It is well known that some owners burn their waste at home. There are no serious problems with the dumping of waste elsewhere,	-Not known.	-In 2009 a general customer survey that showed significant dissatisfaction with PAYT.	-Perceived as more fair, since those with a lot of waste also pay more. -The sorting increases as people become	-There are those who do not want to pay anything at all and therefore burn waste at home, or put it in public bins or in a neighbor's rubbish bins.

	the recycling center for compost.	comes from tourism, it is difficult to determine whether the policy has permanently changed behavior.	entirely on how many kg of waste you have.	instead of correcting the fixed fee.	especially since it has become free of charge for households to leave the waste at the recycling center.			more aware of how they can reduce costs.	
Mönsterås	-19 recycling stations, in central locations near municipality's 5 urban areas. -Garden waste can be dropped off at the landfill for composting.	-After start of PAYT, clear increase in the amount of recycled and composted materials.	-Fixed portion depends on size of container and frequency of collection.	-Has not changed and no changes are planned.	-No serious problems reported.	-Sent out as information packets.	-None reported.	-More fair to users -Cheaper to sort more -Encourages sorting	-Collection system more technical and can malfunction and cause downtime for repairs
Emmaboda	-One central recycling center in the urban part of town. -10 other recycling facilities.	-Recycling has increased over the years	-Variable fee 2.94kr/kg for 2009. -Fixed fee depends on size of container and frequency of collection.	-The fee has been increased gradually over the years.	-Apprehension towards illegal dumping viewed as overrated. -Very rare.	-No response.	-None reported.	-Everyone works to reduce their waste volume -Economical to minimize the quantity -Makes sure the information on the sorting of recyclable and hazardous waste is clear.	-None given
Sundsvall	-Curbside compost collection began in 2009 -FTI packaging recycling centers and central recycling locations.	-Positive trend for recycling and composting since implementation.	-Around 50:50	-Has been adjusted depending on the outcome each year.	-Problems have markedly decreased since first implementation.	-Written material to customers.	-Perceived as fair by the citizens.	-Good instrument	-No significant disadvantages except that it can be costly in terms of equipment and administration
Linköping	-FTI centers available as well as possibility to purchase collection services. -Collection of food waste for biogas production scheduled to start in 2011.	-Packaging and newspaper collection has developed a lot, though not clear if this is due to PAYT. -Data before introduction of PAYT was inferior/deficient	-For a normal house, the fixed component is 42%, and the variable 58%.	-The fees are always changing depending on outcomes. -Changes might occur to fund to recycling centers, better hazardous waste collection, or increased collection costs	-Try to discourage dumping in the forest by offering good service at a reasonable price.	-Too long ago, no knowledge of how it was handled.	-Not immediately afterwards, but the question has been posed, and it can be said that users see the system as fair.	-System seen as fair to customers -Encourages more sorting -Less garden waste in container -No motivation to discard extra waste	-None given

-Source: Personal contact with Municipal Waste Planners from March 2010 to May 2010.

Appendix B – Results of Secondary Data Analysis:

Municipality	Reasons for Implementation	Municipal Opinion of PAYTs Influence on waste totals	How has PAYT influenced household waste	Opinion of PAYT from Government perspective	Opinion of PAYT from Household's perspective	Overall Opinion of PAYT	Additional Comments
Härryda	To increase sorting, reduce waste quantities.	Yes, some influence	Mixed waste for incineration has decreased, sorted packaging and newspapers has increased, continuation of high rate of home composting (49%).	Positive	Positive	Positive	Individual ID tags keep very good track of the number of containers and subscribers for the billing system. Together with GIS, the system provides strong waste reporting and excellent customer service. It also helps minimize the risk that haulers pick up extra waste, since the weights are checked at the treatment plant.
Lerum	To reduce waste quantities and increase sorting of packaging and newspapers.	Yes, big influence	None given	Positive	Positive	Positive	None given
Partille	Reduce waste quantities and encourage subscribers to get better at sorting and to start composting.	Yes, big influence	Decreased waste totals the first year from 6,000 to 5,000 tons annually and increased quantities of sorted packaging.	Positive	Positive	Positive	PAYT is very technically demanding and also requires storing large amounts of data.
Borgholm	None given	Yes, big influence	Waste volumes fell sharply at the beginning. They have since risen again and are now close to the	No answer	No answer	No answer	To respond to the survey questions about opinions on perspectives is not possible because there are so many aspects to

			amounts present before implementation.				include in the reasoning.
Mönsterås	To increase household sorting and reduce waste volumes. The municipality already separated wet and dry waste before PAYT.	Yes, big influence	The fee has increased less than in surrounding communities without PAYT.	Very positive	Very positive	Very positive	None given
Emmaboda	To reduce waste quantities.	Yes, big influence	More waste is sorted for recycling and composting.	Positive	Positive	Positive	None given
Linköping	To minimize waste production.	Yes, some influence	Home composting provides an automatically lower fee. Households no longer put yard and driveway waste in the bin. With the volume based fee, households often want to fill up the bin since they feel like they are paying for the collection of a full container.	Very positive	Very positive	Very positive	We have not had any problems with costumers questioning the policy. We have not noticed any illegal dumping of waste to avoid the charge.
Sundsvall	To increase the sorting of packaging waste. To stimulate home composting. For better quality waste to incinerator. For reduced garbage bags and containers.	Yes, big influence	Annual reduction in waste of 5-10% in the first few years.	Very positive	Very positive	Very positive	Perceived as fair

Source: Select excerpts from secondary Data Collected by Lisa Dahlén (Luleå tekniska universitet), shared February 2010.

Appendix C – Base Questionnaire for Primary Data Collection:

Research Aim: to understand how municipalities in Sweden implement and evaluate Pay As You Throw (PAYT) billing for waste, with a focus on recycling and composting options, responses to illegal dumping, educational efforts, and long-term adjustments to the policy.

Municipality:

Respondent's Name:

Occupation Title:

Q1. What recycling and composting options are available in the municipality?

Q2. What trends in recycling and composting rates have been observed since PAYT implementation?

Q3. What does the municipality charge for the fixed and variable portions of the fee?

Q4. Has the fee been changed since it was first implemented? Any future plans for adjustments?

Q5. How has the municipality reacted to the threat of illegal dumping activities?

Q6. How did the municipality handle education efforts for customers during PAYT implementation?

Q7. Did the municipality send out surveys to measure customer opinion after the shift to PAYT?

Q8. What does the municipality see as the main advantages and disadvantages of PAYT?