

# Factors influencing municipal recycling rates of household waste in Norway\*

Julie L. Hass

*Waste reduction is one of the key components in Norwegian waste policy along with increased recycling rates. The government has set ambitious, mandated recycling levels but the policies for reaching these goals are still under development. Identifying factors that influence municipal recycling rates of household waste can be important in this process. A number of studies in other countries indicate that fee structures are important influencing factors, but in Norway marginal cost pricing is almost absent. In this study, it was found that the age of the curbside collection program and the closeness of the municipality to major cities (centrality) were important for municipal recycling rates. Moreover, municipalities that have particularly high recycling rates seem to have benefited from special support from the Norwegian government for development of infrastructure or from regional approaches to developing recycling systems.*

The Norwegian Government's strategic objective regarding waste and recycling states that, "Waste problems shall be solved in a way that minimizes damage and nuisance to people and the environment and at the same time minimizes the resources used in waste management." (Report No. 8 to the Storting 1999-2000, Ministry of the Environment 1999-2000: 27). In addition to this strategic objective, specific national targets have also been made. One of the national goals is that the growth in the quantity of waste generated shall be considerably lower than the rate of economic growth. Inherent in this goal is the concept of source reduction, which encompasses the view that preventing the generation of waste is better than having to treat the waste once it has already been produced.

In Norway there is an increasing trend for amounts of household waste produced. From 1992 to 1998 the amount of household waste generated increased from 235 to 308 kilograms per capita (Statistics Norway 2000). In addition, the projections made by Statistics Norway (Bruvoll and Ibenholt 1999) indicate that there will be a 33 percent increase from 1996 to 2010 in the production of household waste. But at the same time as there has been an increase in the total amount of household solid waste produced, there has also been an increase in the amount of material collected from households for recycling (Statistics Norway 2000). There have been an increasing number of

source separation and collection centers and curbside collection programs available to the Norwegian population with the result of increasing amounts of material being collected for recycling. This increase in availability in recycling programs will contribute to achieving the national target of having only 25 percent of the total quantity of waste generated to be delivered for final treatment in 2010 (Ministry of the Environment 1999-2000).

## **Economic incentives and recycling rates**

Most of the research concerning increasing recycling rates focuses on economic incentives (see for example, Chilton 1993, Scarlett 1993, Skumatz 1993, 1996). Often the focus has been on the results produced when different types of variable fee rate schemes are introduced in a community. Most of the analyses are based on data from North America, and specifically the United States, since there are such a variety of different programs and unit fee structures that can be studied.

Skumatz (1996) studied recycling and waste diversion in 500 communities across North America and concluded that variable fee rate programs lead to significantly more recycling. In another study, Skumatz (1993) reports that communities that implement variable fee rates in conjunction with recycling programs have experienced between 25 and 45 percent reduction in tonnage going to disposal facilities. Also reported are results from consumer surveys in the municipalities with variable rates that indicate that the variable rates do influence purchasing behavior and provides an incentive to reduce household

**Julie L. Hass** is Research Fellow in the Division for Environmental Statistics. E-mail: Julie.Hass@ssb.no

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garbage. The results of Repetto, et al. (1992) suggest that an additional charge of \$1.50 per 32-gallon container (approximately 9.5 kilograms) induce households to cut their solid waste by 18 percent per capita. Chilton (1993) reports that the unit pricing system in Seattle, Washington led to a fall in landfill tonnage of 22 percent and recycling grew from 24 to 36 percent of the waste stream. Scarlett (1993) reports similar findings in a study of ten volume-based pricing programs in the United States. It was reported that there was an increase in recycled material of between 60 and 150 percent, while the amount of waste sent to landfill was reduced by 20 to 65 percent.

The most common approach to variable rate pricing is based on volume or on "per bag" fees. In some cases stickers for bags are used to implement the variable rate pricing. Each bag to be collected must have a sticker attached. In this way, the household pays only for the amount of waste collected and if the household has a sudden increase in waste one week, they can simply use additional stickers to apply to the extra bags. If there are no bags collected, then there is no fee charged. Another option is weight-based systems but there are not many of these since the increased expense of the weighing scales and record keeping (Ackerman, et al. 1992) can make the system too expensive. The advantage of variable rate pricing is that the households pay for the waste that they produce. With this type of system there is also an economic incentive to reduce the amount of waste with this type of "pay-as-you-throw" pricing since each unit of waste produced is more costly to have collected.

### **Not a simple relationship – other factors are important**

Kinnaman and Fullerton (1994, 1997) and Fullerton and Kinnaman (1994, 1995) have analyzed recycling rates and unit fees under a number of different conditions including the option of illegal dumping. They conclude that variable unit fees do influence recycling rates but the relationship is not a simple one. Other factors influencing recycling rates included household preferences for recycling, income distribution in the community, the price of recyclable materials, the presence of curbside collection for recycled materials and the fixed costs associated with dumping. The studies of Kinnaman and Fullerton include the options of illegal dumping in their evaluations and conclude that there is a negligible change in the amount of illegal dumping when variable rate fees are used. Ackerman, et al. (1992) also claim that there is no simple or clear relationship between volume-based rates and recycling. They state that studies of volume-based unit fees provide a variety of conclusions. Their results range from variable volume unit fees having no recognizable impact on recycling rates to that these types of fees having sizable impacts on recycling rates. They claim that much of the registered volume drop is due to compressing of the waste (stompaging)

by households and not due to an actual reduction in the weight of waste.

### **The Norwegian situation**

In the United States, twenty percent of states have legislation that promotes or even mandates variable rate pricing (Skumatz and Zach 1992). The increase in variable rate systems has been driven to a large degree by state legislative requirements (Skumatz 1993). In contrast, in Norway, the only legislation regarding waste fees is that the municipalities are required to charge fees which result in revenues which must be equal to expenditures for waste collection and treatment (SFT 1994), i.e. no marginal pricing. The current approach of the Norwegian government is to simply recommend that municipalities use variable rate pricing. So far legislation is not used although it is being considered (Ministry of the Environment 1999-2000).

In Norway, variable fee rates are still not yet widely used. Most municipalities have a single rate for a standard-sized container for household solid waste collection and treatment. Generally speaking, a household pays for one container to be picked up weekly or every other week. The fee structure in most municipalities is related to the number of containers, with each container having the same rate or a reduced rate for larger containers or two containers. Whether the container is full or empty does not influence the amount the household is charged, and sometimes, larger volumes of garbage actually are less expensive per container than smaller volumes. This rigid type of flat or decreasing volume-based fee system does not provide economic incentives for solid waste reduction. This pattern is, however, slowly changing since the Government is strongly encouraging municipalities to use differentiated fee structures.

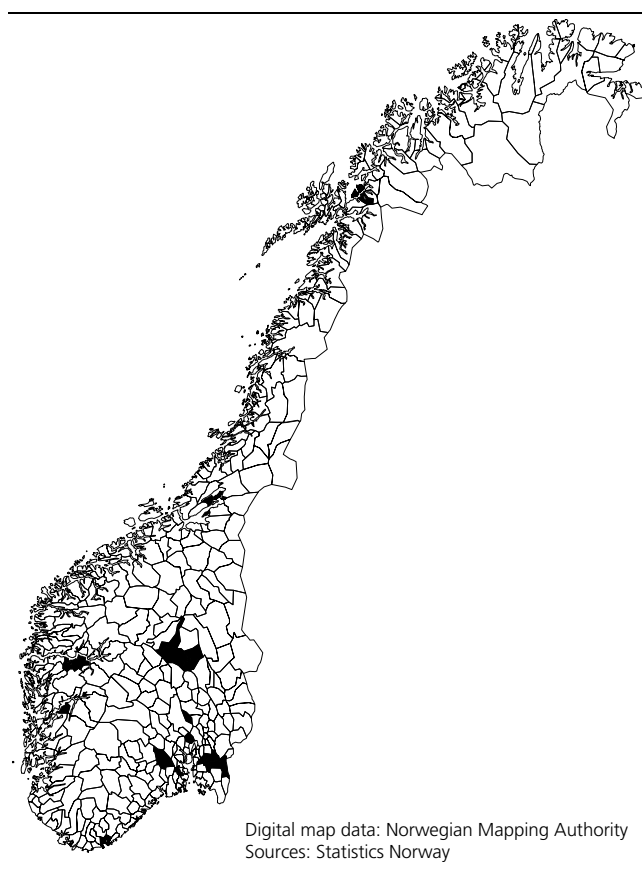
### **Testing possible explanatory variables**

Regression analyses were used to search for factors that may influence the municipal recycling rates of household waste (Hass 1997). Both policy-related and infrastructure-related variables were examined.

The two variables that were found to influence recycling rates at a statistically significant level were the closeness of the municipality to major cities (centrality) and the time when the municipality had implemented curbside collection of recyclable waste fractions. It was found that municipalities that are closer to major cities generally have higher recycling rates. In other words, there appears to be advantages for recycling in more densely populated areas.

The other factor that significantly influences recycling rates in municipalities is time. The longer the municipality has had a curbside collection system, the greater the amount of material collected for recycling. This factor can be understood from an innovation

**Figure 1. Map of Norway showing the 24 municipalities with the highest recycling rates in 1995**



adoption perspective, which would predict that new behaviors and innovations require time to be accepted, understood and utilized (Rogers 1995).

These results indicate that extra encouragement to the municipalities to start curbside recycling programs as soon as possible may influence the possibilities to reach the recycling goals set by the Norwegian government (Ministry of the Environment 1999-2000). This would apply particularly to municipalities that are closer to major cities since these municipalities tend to have higher recycling rates than rural municipalities. Geographic location and age of the recycling program were also identified by Skumatz (1996) as key factors impacting waste diversion to recycling programs in North America.

Although municipalities with curbside collection systems have higher rates of recycling, this type of system can be very costly. For this reason, some municipalities have chosen to not establish curbside collection systems but have focused on the development of systems of drop-off centers for recycling. At these recycling centers, households deliver separated waste fractions to a central location. These types of systems are most often established in rural municipalities where it is not cost effective for a curbside collection type of system. These recycling centers encourage and increase the recycling rates in municipalities

but they are often not as effective as curbside collection since it requires additional effort and cost to the households.

### Investigating municipalities with very high recycling rates

It was interesting to note that some of the municipalities have recycling rates that are much higher than the average (Hass 1997). These high recycling rate municipalities were examined in more detail to try to determine additional factors that can be important for obtaining high levels of municipal recycling of household waste.

The municipalities which have markedly higher levels of household recycling rates, defined as rates greater than the mean plus two standard deviations, were identified on a map of Norway (Figure 1). These 24 municipalities (5.5 percent of the total) had recycling rates of more than 37 percent. It is interesting to note that there appears to be three main clusters of neighboring municipalities with high recycling rates. There is a cluster of municipalities in Oppland with Lillehammer, Gausdal and Øyer. Another cluster is located in Østfold including Eidsberg, Skiptvet, Trøgstand, Marker, Spydeberg, Askim and Hobøl. And a third cluster is found in Nord-Trøndelag with Mosvik, Frosta and Inderøy. There are also a number of isolated municipalities, such as the city of Kristiansand.

### Special focus and inter-municipal solutions

Two main factors were identified in the municipalities with very high recycling rates. Either the municipalities have received special government support for establishing an infrastructure for recycling materials or they are part of a regional, inter-municipal cooperation with regards to recycling.

The cluster in Oppland includes the towns of Lillehammer and Gjøvik that were major sites for the 1994 Winter Olympics. In connection with the Olympics an extensive infrastructure for recycling was developed in that region. This can be one explanation for the high levels of recycling from this area.

The city of Kristiansand on the south coast has also received substantial support from the Ministry of the Environment to develop and promote recycling. This support has been provided not just for one year but over a number of years. This consistent development and promotion of recycling in the city of Kristiansand has led to these high levels of recycling.

The clusters of municipalities in Østfold and in Nord-Trøndelag have inter-municipal organization of solid waste treatment that includes recycling. These regional approaches to recycling appear to increase the amounts of materials collected and potentially increase the cost effectiveness of the systems. There appears to be efficiencies of scale in these cases.

## Conclusion

According to the literature economic instruments may be important when dealing with waste handling and recycling. In the Norwegian economy, marginal cost pricing in waste treatment is almost absent.

Two general identifying factors that seem to be important when studying municipal recycling rates of household waste in Norway in the early and mid-1990s are the age of the curbside collection program and the closeness of the municipality to major cities (centrality). Higher recycling rates are observed in municipalities with older, established curbside collection programs that are close to (or located in) major cities.

Two additional factors that are particular to municipalities with very high recycling rates were also identified. These factors are special support from the Norwegian government for development of infrastructure, for example the municipalities hosting the 1994 Winter Olympics and the city of Kristiansand, and regional approaches to developing recycling systems. The regional approaches tend to indicate that efficiencies of scale appear to be possible in recycling programs.

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