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**Environmental Protection  
Expenditures in Norway**

Notater

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## **1. Introduction**

The concept of environmental protection expenditure is an elusive one despite the rather long period of familiarization with this concept in many European countries. Statistics Norway's (SSB) work on environmental protection expenditure dates back to the middle of the 1980's. In Norway, studies have been conducted on environmental expenditures in both industry and the public sector. With regards to the industrial sector, SSB carried out a sample study already in 1980. In 1986, another study was carried out in this area. Many a problem were encountered in this study culminating in an unwillingness to conduct a similar study in the near future. In the last half decade, SSB has concentrated its work on two domains in the public sector; namely waste water treatment and waste management. Work related to these two domains have been limited to the municipal level.

The aim of this report is two-fold. We intend to focus on some pertinent issues in the area of environmental expenditures. This will entail discussions pivoting around some of the problems encountered in this area, both generally and with specific reference to Norway. These problems or challenges range from definitions to the delimitation of concepts with regard to both collection of data and production of statistics. The second major objective is to present work done in Norway in this area. This part of the report would cover both methodology used and more important results of the latest studies in this area.

## **2. Definitions and Classifications**

### **2.1 General**

It is no big task to give a general definition of environmental protection expenditures. On the contrary, it is to say the least, an uphill task to give very precise definitions which can function as guidelines in statistical work. This is partly due to the very nature of environmental problems. To elucidate further on this issue, one can point to the fact that, whereas environmental issues can essentially be described as global, they always possess features which have a "colouring" akin to national peculiarities or differences. There are differences in environmental policies across countries. Moreover, differences in accounting practices pose difficulties in producing statistics with a high degree of comparability. Another serious challenge is the use of environmental expenditures as a publicity stunt by both individuals and countries. The risk of overestimation of such expenditures is therefore quite high.

Due to the above-mentioned problems and many more, some of which we will attempt to deal with in later paragraphs, the concept of environmental expenditures, many a time assumes the form of the elephant and the three blind men in the age-old adage. The one holding the tail says it is a rope, the one holding the leg says it is a tree and the one leaning on it says it is a mountain. Despite problems linked to defining or delimiting this concept, we will in the following paragraphs attempt to give a few definitions of environmental protection expenditures.

### **2.2 Definitions**

Environmental protection can generally be defined as efforts or activities which aim at the prevention, protection, mitigation or repair of damage to the outer environment. Environmental protection expenditures refer to expenditures which stem from these activities.

It need not be pointed out that, with the above definition for example, different attempts at calculating environmental protection expenditures in a country might give different results dependent on whether one uses a broad or narrow interpretation.

The European System for the Collection of Economic information on the environment (SERIEE) defines environmental protection as: all actions that are aimed at the prevention, reduction and elimination of pollution as well as any other degradation of the environment.

Environmental protection expenditure can also be defined as capital and operating or current expenditures which have been incurred because of, and can be attributed directly to the pursuit of an environmental objective. It should be noted that environmental protection expenditure includes net transfer payments (taxes - subsidies).

Delimitation of environmental protection activities is by no means an easy matter. One way of delimitation of environmental protection expenditures is by using the the motive behind the activity as a criterium. In this regard, different definitions are used:

- An environmental protection activity is an activity which is set in action exclusively due to environmental considerations.

- An activity carried out primarily due to environmental considerations.
- An activity which results in an improvement of the environment irrespective of whether the environmental objectives are primary or secondary.
- An activity carried out to meet the legal requirements of the authorities ie. laws, ordinances or other obligatory instruments on the environment.

In the four definitions above, we have a range of strict to mild definitions of the same concept. Eurostat recommends quite a strict definition. This is evident from the requirement that, even if the activity has positive effects on the environment, the activity cannot be classified as environmental protection if,

- the activity primarily has other objectives (technical or economic)
- the activity can be regarded as resource utilization, including energy saving and recycling
- the activity primarily aims at the improvement of the firm's or institution's hygiene and or security.

Delimitation can also be done by economic considerations. In this regard, environmental expenditures can be delimited in two ways; the surplus investment criterium and the cost criterium.

With respect to the former, the investment expenditure for an environmental investment must be higher than that of an alternative investment (reference technology) made without environmental considerations. The cost criterium identifies both the extra costs and incomes associated with the activity.

### **2.3 Classification of environmental activities**

There are different methods of classifying environmental protection activities and thus the expenditures related to these activities. The most popular method is to classify these activities with respect to which environmental medium or domain is concerned. In connection with its work in this area, Eurostat and ECE have outlined the following domains:

- Waste
- Water and waste water
- Air
- Noise
- Soil and groundwater
- Nature and landscape
- Research and other educational activities

Apart from the grouping above, environmental protection activities can be grouped according to which sector these activities occur in. Environmental protection expenditures can stem from

- the public sector, including national, county and municipal levels
- industry
- households.

It must be obvious already now that collection of data on environmental protection expenditures to cover all the domains is time-consuming, pain-staking and might involve lots of guesswork or other forms of estimation. As mentioned earlier on, one of the major uses of these data is international comparison. A comparison between countries which have employed different methods and definitions in their calculations could be quite meaningless unless efforts are well coordinated.

## **2.4 International frameworks for collection of economic data on the environment**

The importance of international frameworks for data collection can by no means be undermined. The very nature of many environmental problems presumes international comparisons. Statistics from different countries are of little value if there do not exist common definitions, classifications and to some extent methodology in these countries.

There have been a number of attempts at designing frameworks for data collection, analysis and reporting by various international organisations. The System of Integrated Economic and Environmental Accounting (SEEA) is one such attempt. This framework was designed by the Statistical office of the United Nations. SEEA is a satellite system for the environment aiming to show interdependencies between economic and the environment.

The "European System for the Collection of Economic Information on the Environment" (SERIEE) was developed by EUROSTAT. Presently SERIEE encompasses two satellite accounts; the Environmental Protection Expenditure Account (EPEA) and the Resource Use and Management Account.

The above frameworks have their own accompanying problems. The most obvious and perhaps most serious is that, some of these systems or frameworks have an extremely high level of detail. This results in lots of frustration for countries trying to employ them in their data collection work. It needs no emphasizing that, it would be better to have frameworks which have a lower level of detail and rather concentrate on the most important variables.

Statistics Norway has for strategic reasons based its work on end-of-pipe expenditures in the municipal waste water and waste management sectors. The underlying reasons for making this choice is that, statistics gathered on these aspects of environmental expenditures have been very reliable with minimal or no guesswork. Moreover, the environmental authorities (Pollution Control Authority and the Ministry of Environment) have shown lots of interests in these two areas.

## **2.5 Present work and possible areas of expansion in Norway**

As pointed out briefly in the introduction, Statistics Norway's work has focused on municipal environmental protection expenditures in the domains; waste and waste water treatment. These studies have gone on for a number of years now. This has enabled the establishment of routines which have helped in producing data of a considerably high level of reliability.

Nevertheless, these studies are under constant revision to improve aspects which might lead to among other things ambiguity.

Apart from work done in Statistics Norway, the Ministry of Environment, in co-operation with other ministries, presents data on the expenditures incurred by the central authorities on the environment in the "Green Book". This presentation has been done yearly since 1989. These figures however, are in a very aggregated form.

Eco-industry is a relatively new area of study. In Norway, a study was carried out by the consultancy firm NORVIRON under the auspices of the the Ministry of Foreign affairs. A questionnaire was sent to 120 firms, of which 91 responded. The results of the study were published in 1993. The Ministry of Energy and Industries has in 1996 employed the services of a consultancy firm to undertake a new study of this area. The project might commence in the latter part of this year and stretch over to next year.

### **3. Waste water treatment**

#### **3.1 Method**

With regards to municipal waste water treatment, data is collected in the electronic questionnaire "SSB-AVLØP". We have so far had three consecutive studies based on the same methodology. It is a comprehensive study based on the whole population. The study collects information on both physical and economic variables. The study is a result of co-operation between Statistics Norway, the Ministry of Environment and the Pollution Control Authority (SFT). The program for registration of data is installed in the offices of all 19 environmental departments. The municipalities in each county report data to their respective environmental departments. The environmental departments use different methods to collect data from the municipalities. Some do collect data by the help of questionnaires and telephone, others use registers and annual reports from the municipalities and some use a combination of both.

##### *Variables included in the study*

- Number of households and industrial or business units connected to the municipal pipe network system
- Rates for waste water treatment charges for the present year
- Total income from charges
- Operational expenditures
- Investments (including past and planned)

Operational expenditures were supposed to be apportioned among:

- administration
- operation and maintenance
- inter-municipal co-operation

Investments are categorized into 5 groups:

- Laying of new sewer pipes
- Renovation of sewer pipeline systems
- Plants without nitrogen removal facilities
- Sludge treatment plants
- Nitrogen removal facilities

#### **3.2 Evaluation of data**

The collection of data on environmental protection costs posed many challenges, even though waste water treatment is a relatively demarcated environmental area. Before the data is sent to Statistics Norway from the environmental departments, a quality check is conducted. At SSB, the data goes through another stage of quality control. Figures which appear doubtful and missing data are taken up with the environmental departments. This stage is conducted normally by telephone and / or telefax. This is to ensure that data collected is of an appreciably high quality.

The quality of the data gathered in the study can be described as reasonably high. Due to the fact that the study has been carried on for some years now, the municipalities have very little problem as regards reporting of data for the majority of variables. There are a few variables which have posed some problems for some municipalities.

A case in hand is investments. The municipalities are asked to report both investments inclusive subsidies and investments without subsidies. A number of municipalities did not have a good overview of whether the figures they reported included subsidies and other transfer payments.

The municipalities accounts formed the basis of the questions on the municipality's costs in the waste water treatment sector. The municipalities are given a good deal of freedom as regards the preparation of accounts. Many municipalities do not possess routines for the calculation of the proportion of administration costs which should be apportioned the waste water sector. Consequently these costs are excluded for some municipalities.

Despite the above-mentioned problems, on the whole, we can assert that the study has come out with satisfactory results. Compared with studies from earlier years, this year's study shows a marked improvement in the quality of data. The amount of missing data for example is minimal.

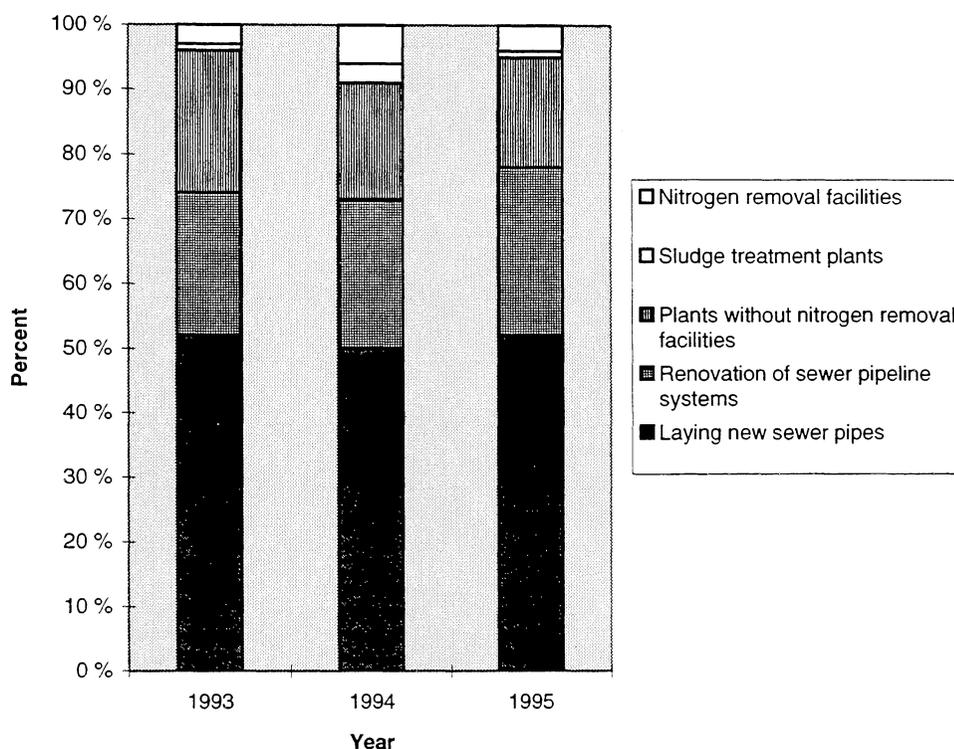
### **3.3 Results**

#### *Capital expenditures*

In 1995, capital investments in the municipal waste water treatment sector totalled 1.43 billion kroner which rounds up to about 993 kroner pr. subscriber. The municipalities plan to continue with the high level of investments in the forthcoming years.

In 1995 laying of new sewer pipelines and renovation of pipe networks accounted for about 78% of the total investments in municipal waste water treatment. This constitutes a five-percent-point increase over corresponding categories in 1994. Investments in cleansing plants without nitrogen removal and sludge treatment facilities was responsible for 17 percent of the total capital investments in 1995. Nitrogen removal facilities and sludge treatment plants accounted for 4 and 1 percent respectively of total investments.

**Figure 3.1 Capital expenditure distributed according to type of activity. 1993-1995. Percent**

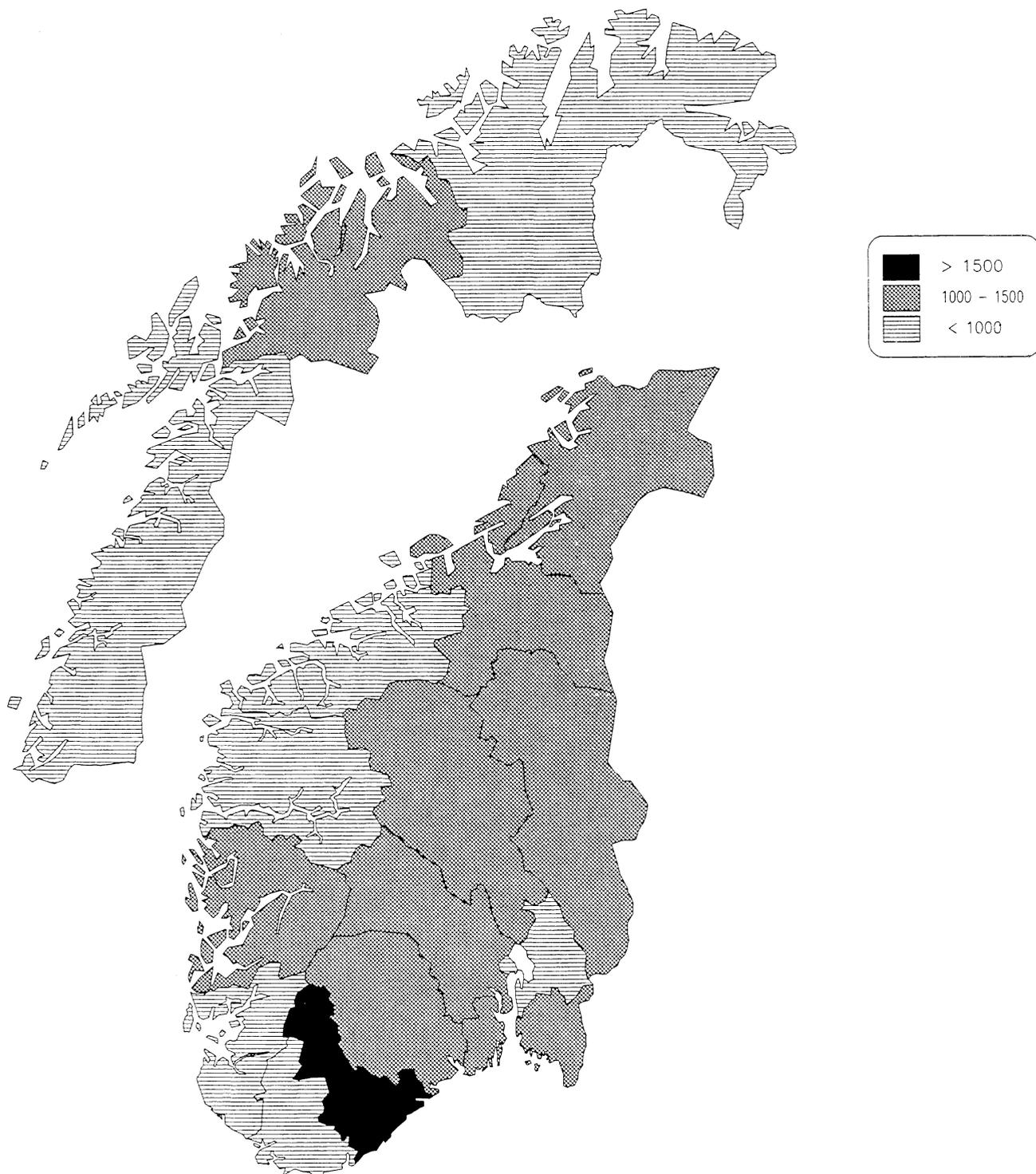


The distribution of the volume of investments among the counties showed a considerable amount of variation which was dependent on 'inter alia' the size of the county and geographical location of the county. With respect to the latter, the study showed that, the North Sea counties<sup>1</sup> generally had higher levels of investment than the other counties.

However, when we take a look at the amount of investment per subscriber this line of demarcation becomes somehow blurred. Investment per subscriber varied from around 500 kroner to over 2000 kroner among the counties.

<sup>1</sup> The North Sea Counties refers to the counties which are covered by the North Sea declaration. These counties have drainage into the North Sea.

Figure 3.2 Capital expenditure per subscriber. County. 1995. Kroner



### *Current/operational expenditures*

In 1995 current expenditure by the municipalities on waste water treatment totalled over 1.7 billion kroner. This is about the same level as in 1994. Generally the municipalities with high levels of capital expenditures also had high levels of current expenditure.

### *Costs of capital*

Costs of capital include both interest payments on loans and depreciation expenses. The municipalities have different methods of calculating the latter. Moreover, in cases where municipalities have used their own funds to finance its investments, municipalities could employ different methods in their calculations. In order to achieve a high level of comparability among the municipalities, we decided to use the following assumptions:

- The economic life span of all investments in the municipal waste water sector is set at 20 years.
- Interest rate for the year is an average figure obtained from the municipal bank.
- The capital costs are calculated as an annuity based on capital expenditures or investments the last twenty years.

The total costs of capital for all the municipalities in Norway was estimated at 1.5 billion kroner in 1995. It is worthy of note that there was very little difference between the costs of capital for 1994 and 1995.

### *Subsidies*

The Ministry of environment in Norway has paid out subsidies or reimbursed the municipalities for part of their investments in the municipal waste water sector. These reimbursements are based on among other things, the volume of investments, the cost structure in each municipality and the income from fees in each municipality. The total amount of subsidies to the municipalities has varied from about 100 million 1993-kroner<sup>2</sup> to about 470 million 1993-kroner in the period 1975-1995. In 1995, subsidies paid by the Ministry of environment to the municipalities totalled over 357 million kroner in current prices. This is more than double the amount paid in 1994.

### *Fees*

The Ministry of environment in its directives wishes to operate by the principle that, the polluter pays the costs of cleansing. In this regard the municipalities are encouraged to set waste water treatment fees in such a manner that, all costs which without any doubt can be ascribed to the municipal waste water sector are included.

In 1995, a total of 2.96 billion kroner which represents 92 percent of the total costs of the municipal waste water costs was collected as fees from subscribers. In 1994, a total of 2.75 billion kroner was collected in form of fees.

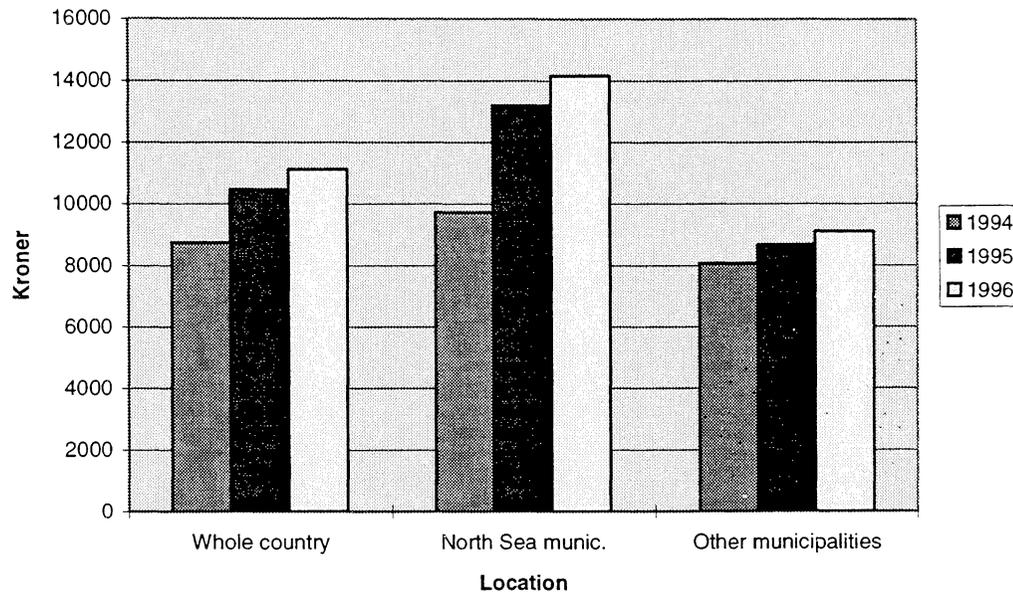
There are two types of fees in this sector. Connection fees, as the name implies are one-time payments which the subscriber makes when connected to the municipal system. In addition, we have yearly fees which are annual payments by subscribers. Annual fees are calculated either by the size of the building or by the volume of water used. The mean value of the connection

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<sup>2</sup> Calculations with 1993 as the base year are carried out by help of the cost-of-building index.

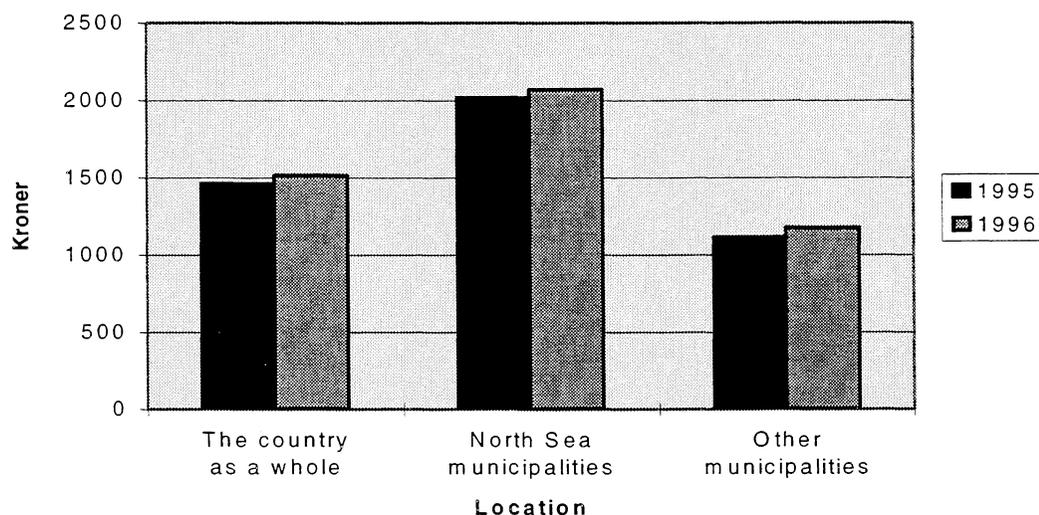
fees in the municipalities in 1996 is about 11000 kroner for an average residence of between 100-140 m<sup>2</sup>. There is however a strict line of demarcation between the municipalities in the North Sea counties and the other municipalities. The municipalities in the North Sea counties have a mean connection fee of 14000 kroner compared to around 9000 kroner for the other municipalities.

**Figure 3.3 Mean value of connection fees in the municipal waste water sector. 1993, 1994, 1995. Kroner**



The mean value of annual municipal fees for a residence of about 140 m<sup>2</sup> in 1996 is a little over 1500 kroner. For the municipalities in the North Sea counties, the mean annual fee is about 2100 kroner while the corresponding amount for the other municipalities is about 1200 kroner.

**Figure 3.4 Mean value of yearly fees for an average subscriber. 1995. Kroner**



## 4. Waste management

### 4.1 Method

A paper questionnaire is used for data collection for the annual study on Municipal waste. The questionnaire has questions on both physical data and economic data. Originally the questionnaire tackled only physical aspects of the environment. Economic aspects were introduced for the first time in the study carried out for 1993. Sample studies were carried out in both 1993 and 1994. The study in 1995 comprises all the municipalities in the country. This is to enable us obtain more accurate figures on municipal level. In addition, this would create a better basis for comparison with future sample studies.

For 1995 the questionnaire, with guidelines, was sent to all 435 municipalities. The municipalities sent the completed questionnaires to their respective county environmental protection departments. The environmental protection departments sent out the first set of reminders to the municipalities while SSB sent out the second if there was need to do so. The completed questionnaires were then manually controlled and revised at SSB. In case of inadequate answers or if there was the need for elucidation with respect to possible misunderstandings or mistakes, the contact person in the municipality was given a phone call.

#### *Contents of the questionnaire*

The following economic data were supposed to be reported for each municipality for the previous accounting year.

- Investments categorized according to purpose
- Expenditures related to the building up of an investment fund
- Capital costs and income from the sale of capital equipment
- Operational expenditures
- Operational income (excluding waste management treatment charges)
- Waste management charges
- Total income from waste management treatment charges.

### 4.2 Evaluation of data

Before the data is sent to Statistics Norway from the environmental protection departments, a preliminary quality check is conducted. At SSB, the data goes through another stage of quality control. Figures which appear to be wrong and missing data are taken up with the municipalities. This process takes place by telephone and or telefax. This is to ensure that data collected is of an appreciably high quality.

The quality of the data gathered in this study can be described as reasonably high. Generally, the municipalities have very little problem as regards reporting of data for the majority of variables. There are a few variables which have posed some problems for some municipalities. On the whole, we can assert that the 1995 study has come out with satisfactory results. The 1995 study also revealed some weak aspects of the two sample studies carried out in the two previous years. It became evident that a few variables could have been overestimated from the sample surveys.

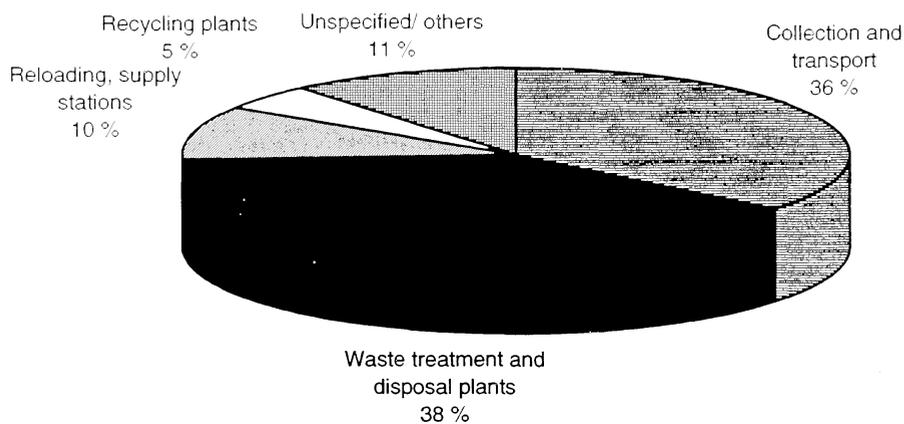
### 4.3 Results

#### *Capital expenditures*

In 1995, the municipalities invested a total of 196 million kroner in the municipal waste management sector. It is worthy of note that this amount forms only a fraction of the total amount invested in the municipal waste management sector. There is a growing number of companies (both private and joint) in this sector which are not included. We have concentrated on the activities of the municipalities themselves.

Waste treatment and disposal plants were responsible for the biggest portion of investments; 38 percent. Collection and transport followed closely with 36 percent. Not surprisingly, recycling plants were responsible for the smallest portion of the investments, 5 percent. Several of the recycling plants are owned by companies formed initially through inter-municipal cooperation, but which are now run independently of the municipalities. Their investments are not included here. The total costs of capital of the municipalities in 1995 was 173 million kroner. This includes both depreciation and interest payments.

**Figure 4.1 Municipal capital expenditures in the waste sector in 1995 by type.**



#### *Current/operating expenditures*

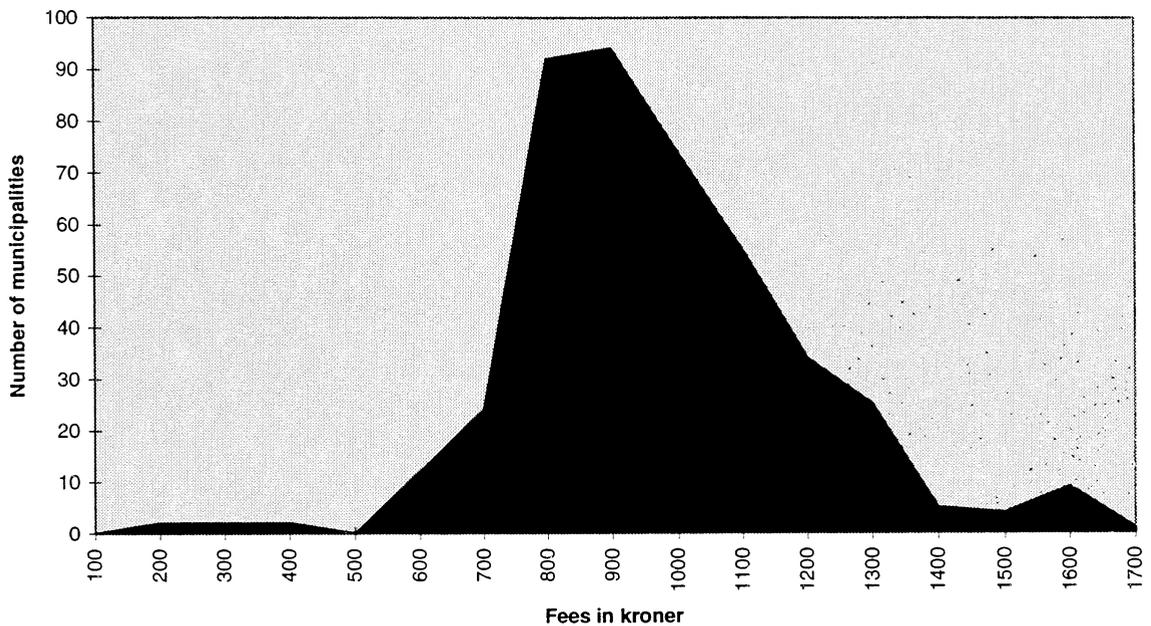
Current expenditures of the municipalities in 1995 totalled 1.97 billion kroner. This constitutes a 4 percent increase over that of 1994. Per capita, this amount averages to 454 kroner.

#### *Fees*

The municipalities are obliged by Parliament Act 44 (1991, 1992) to cover through fees paid by the subscribers all costs which can be connected either directly or indirectly related to the treatment of their waste. This is in consonance with the principle that, the polluter must pay for the full costs of cleansing. In 1995, a total of 1.87 billion kroner was collected from the subscribers in the municipalities.

The municipalities are encouraged to practice differentiation of fees to reflect the true costs of waste treatment of different categories of subscribers. 40 percent of the municipalities had in operation a differentiated fee system. The mean value of these fees in the municipalities was 923 kroner i 1995. It is important to note that there was a relatively big amount of variation in these fees. The minimum charge was 110 kroner while the maximum amount was 1672 kroner.

**Figure 4.2 Frequency distribution of fees in the municipalities**



## 5. Conclusion

Environmental protection expenditures is a relatively broad area of study. The ideal situation is to present statistics which cover the area as a whole. A prerequisite to achieve this objective is that a substantial amount of resources would have to be set aside. It is a well accepted fact that, resources for statistics are scarce and these scarce resources have competing uses.

Due to the above-mentioned fact and others, Statistics Norway has concentrated on a rather limited portion of this area. The strategy has been a gradual development. In implementing this strategy, we have identified the areas which are clearly demarcated as environmental expenditures. In Norway, the municipal waste and waste water sectors have clearly stood out as the sectors which are well defined and therefore are suitable for presentation of very statistics. Our yearly studies in these two sectors have produced results of appreciably high quality. However, this does not mean that we have to rest on our oars. Statistics on environmental protection expenditures is an area under constant renovation. In addition, lots of international work as regards definitions and classifications have come a long way.

Paying heed to the above-mentioned developments, we hope to achieve an extension of the breadth of our studies in the forthcoming years. This would enable us to present a more complete picture of this area.

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