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### Organizing Waste Reduction in the Dutch Waste Sector

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## 6. THE STRUCTURE OF THE WASTE SECTOR IN DENMARK

### 6.1 Introduction

The main reasons for selecting the Danish waste sector as a case concerned the position of public authorities in the solid waste market, and the fact that some interesting, transaction-based policy instruments were introduced.

The purpose of this chapter is to describe the Danish waste sector in order to examine the effect of its structure on waste reduction. Various aspects of the waste market will be analyzed including: the participants, ownership, transactions and tariffs. After this, some attention will be paid to the way solid waste figures are registered and about waste reduction in the Danish waste sector. The final section presents conclusions about the influence of five basic elements in the organizational structure: the division of functions in the market, the conditions for transactions in the waste market, the role of public authorities, the scale of planning, and the responsibility for waste reduction in the waste market.

### 6.2 The Waste Market in Denmark: Participants and Transactions

The participants in the waste market can be divided into four groups of actors: waste generators, collectors, processors and disposers. In principle, the tasks and activities of collectors, processors and disposers remain separated in Denmark: vertical integration of functions rarely takes place.

#### 6.2.1 *Waste generators*

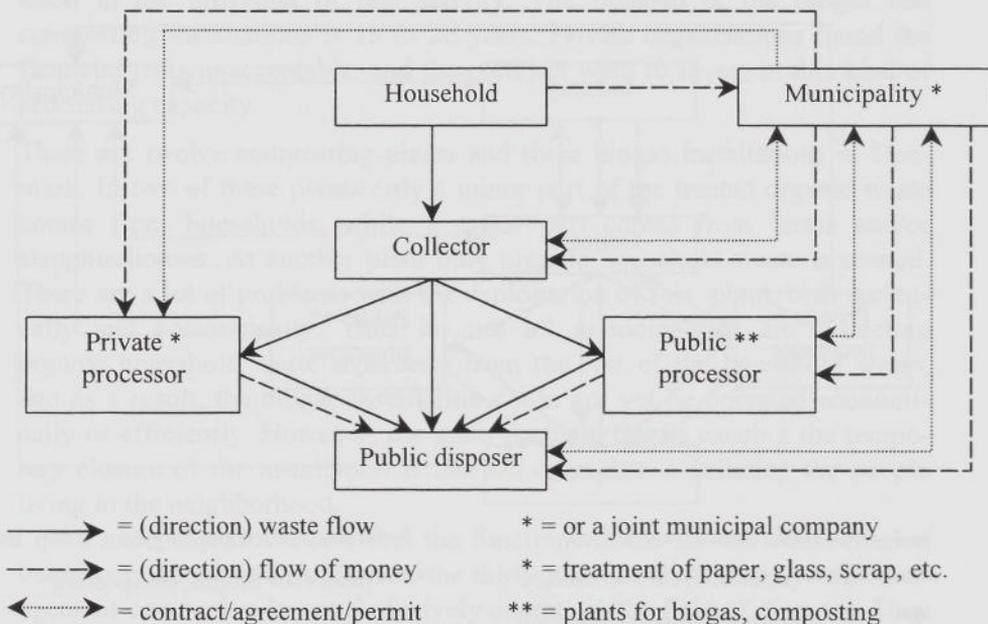
Municipalities are responsible for the collection, treatment and disposal of waste coming from households, landowners and enterprises (Ministry of Environment and Energy, 1991). Households have a duty to follow local authority waste disposal directives and use local authority collection schemes. Small enterprises may choose to make use of the municipal collection schemes or to hire the services of private collectors. Households usually pay a standard rate to municipalities (Ministry of Environment and Energy, 1995), and this is not related to the amount of waste they produce. The standard rate reflects costs made for the collection, processing (handling of curbside-collected organic household waste, as well as drop off centers for several recyclable fractions) and disposal of waste.

### 6.2.2 Private collectors

The municipalities have the responsibility for all waste, and they have two sorts of waste handling systems. The first one, the 'indsamlingsordning' is the standard one used for household waste. The municipalities remain responsible for the waste, but the collection service itself is put in the hands of private organizations on the basis of a tender.

The collection of the *solid waste of households and small companies* is, therefore, privately owned and operated. The fact that the collection services are provided by private organizations has developed over time and is not the outcome of some planning process.

Figure 6.1 Transactions in the market for household waste

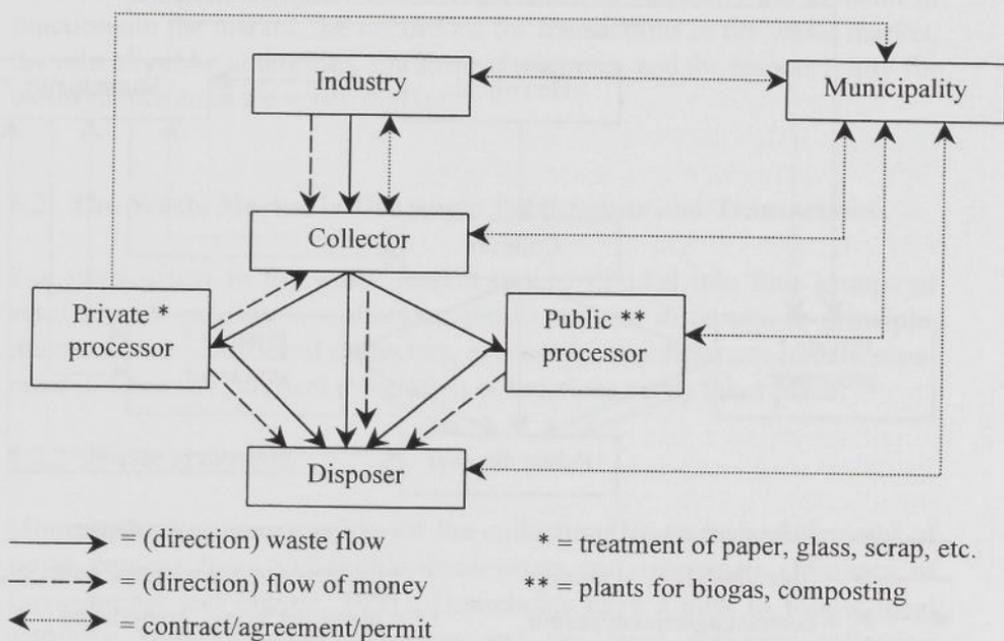


The collectors can best be seen as transporters as opposed to certain other countries where collectors collect, transport and sometimes sort waste streams or offer other services like recycling. In Denmark collectors only pick up the garbage and bring it to the places as required by the municipalities (see Figure 6.1).

The terms of the contracts between municipalities and private collectors normally range from 3 to 6 years. The collectors get paid by quantity (an estimation of the average quantity produced by a household multiplied by the number of households). Although there is little control on illegal waste transport, the interviewees do not believe that a lot of cheating takes place.

The second collection system is the 'anvisningsordning', where the municipality must specify one or more waste treatment ('anvise') plants to the waste generators. *Industrial solid waste* generators have to contract private collectors themselves (see Figure 6.2). However, they can only choose a private collector that is put on a shortlist by the municipalities. This list contains the names of those private collecting organizations that are permitted to provide their services to waste generators within a municipality.

Figure 6.2 Transactions in the market for industrial waste



So, each private collector needs a permit in which it is specified to which disposal facilities they are allowed to bring their waste. Waste collectors can be asked afterwards by local authorities to point out to whom they have provided services and where the waste has been brought to. Thus, a waste generator may choose the registered collector he wants, as well as the registered disposal plant, and must pay them directly (see Figure 6.2).

This type of system is used not only for the collection of solid, non-chemical waste flows, but also for recyclable materials. Almost all collectors transport the waste to recycling or disposal facilities themselves; however, sometimes other private organizations provide the transport service. In the contracts with municipalities they are also told where to bring the collected waste.

### 6.2.3 *Processors*

Normally the processing function is fully in the hands of private processing companies. The recycling of traditional waste components like paper, glass and scrap, especially, but also the re-use of bottles are fully privatized activities. However, facilities for the treatment of organic waste are all publicly owned and operated. No private organization was found to be interested in the provision of this activity. The lifespan of the biogas and composting installations is 15 to 20 years. Private organizations found the financial risks unacceptable, and they did not want to invest in this kind of processing capacity.

There are twelve composting plants and three biogas installations in Denmark. In two of these plants only a minor part of the treated organic waste comes from households, while a major part comes from farms and/or slaughterhouses. At another plant only organic household waste is treated. There are a lot of problems with the exploitation of this plant, both technically and economically. Thus far not all municipalities are collecting organic household waste separately from the rest of the household waste, and as a result, the biogas installation could not yet be operated economically or efficiently. However, the main problem that is causing the temporary closure of the installation is the bad odor that is irritating the people living in the neighborhood.

An exception to the rule that the functions in the Danish waste market being segregated is that some of the thirty joint local authority waste management companies do not exclusively operate in the field of disposal. They extended their activities by entering the field of recycling. They started, for example, presorting paper and other recyclables. This development goes back to 1986 when municipalities were obliged to have paper and cardboard collected and processed. By that time there were only two private operators in Denmark dealing with waste and paper, and municipalities had to make a choice, whether to hire the services of this monopolized private sector or build their own treatment plants. Some of the thirty joint local authority waste management companies decided to choose the latter option.

Private organizations still do not agree with this extension of tasks. They state that public processors are spoiling the market, because they do not know the market well enough to react properly. Aside from this fact, they can afford to have failures, because the tariffs that households have to pay for the collection and disposal of their waste can also easily include expenditures for other waste handling activities. However, some public organizations fear the export of 'secondary materials' by private collecting or processing organizations to countries with lower standards. Re-use and recycling are not regulated as strictly as the disposal of discarded products and materials; industries are allowed to have the recyclable waste transported to facilities within or outside Denmark. The collecting organizations do not need a permit for providing this transport service. However, the transport of recyclables must be reported to municipalities as well.

A paragraph in the Action Plan for Waste and Recycling suggests that municipalities establish at least one receiving station for recyclable materials in each municipality (Ministry of Environment and Energy, 1992a). Households can deliver paper and glass to these stations, but often 10 to 15 other fractions can be brought too. Residents do not need to pay for delivery of the discarded products and materials, because the waste levy households must pay to municipalities already includes the costs for the realization and operation of the drop-off centers. Municipalities are not required to offer the same possibilities to commercial organizations, but usually they will not stop smaller enterprises from bringing their recyclables to municipal collection schemes, especially not when small amounts are concerned. Therefore, small enterprises are often free to choose: they can bring restricted volumes of material free of charge to these communal stations, or they can try to sell the components to processors. Mostly they hire private collectors to transport their recyclables to processing industries and to sell the materials in the market (see Figure 6.2).

#### 6.2.4 *Public disposers*

There are 30 incineration plants and 108 landfill facilities in Denmark. Only 2 of the 108 landfills are privately owned and operated. Two thirds of the incinerators are owned and operated by municipalities. The other 10 incineration plants are owned and operated by energy companies. Energy companies are non-profit organizations that have a concession on providing a certain area with energy. They are owned by local authorities or by a cooperation of end-users.

The prices for disposal vary among plants. The fee varies from 120 to 400 Dkk per ton of waste. The final tariffs include a national tax. Until the

first of January 1997, the tax charged for the incineration of waste was 210 Dkk per ton, while for landfilling it was 335 Dkk per ton of waste (see 6.3.3). Disposal tariffs thus ranged from 330 Dkk to 735 Dkk per ton (expressed in Dutch guilders the range is about fl 110 to fl 245). In comparison with European countries near Denmark, these disposal tariffs are still low. Some respondents expect tariff levels to rise when a recently announced EU-directive comes into effect in a few years. This directive requests more stringent emission standards for incineration plants.

Because the realization of incineration capacity requires large investments, it takes a long period of time to write off. Normally the term of the contracts between municipalities that do not own capacity themselves and municipally-owned disposal plants are between 10 and 15 years. Such long-term contracts with waste suppliers provide the investors in incineration capacity an assurance for the income of waste streams. When such guarantees cannot be given, the risk that the capacity cannot be fully utilized each year needs to be decreased in another way. In other words, incinerator operators have to find strategies to control the level of incineration tariffs. One strategy is the raising of disposal fees in order to set aside some money for times when less waste than expected is delivered to incinerators. Another strategy is to ask waste suppliers for payments in advance.

The situation for incineration plants owned by electricity companies differs from the above described situation. According to some respondents, the tariffs of incineration plants owned by electricity companies are significantly lower than those of municipally-owned incineration plants. Here, three different explanations for differences in price levels are given by the respondents. First, it may be that electricity companies do not need to include the expenses for building a plant into incineration tariffs, because they can also decide to add these costs to the electricity tariffs that their consumers have to pay. Therefore, there would not be a need for electricity companies to enter into long-term contracts with their customers, but simply to 'accept waste at the gate'. Secondly, the tariffs may be lower because of miscalculations, which will be adjusted in the near future[1]. Thirdly, electricity companies may use a longer time span than municipalities do for writing off investments (20 years instead of 15 years).

One important factor determining the costs of incineration is the price that incinerator operators can get for the heat and the electricity they deliver. All thirty incineration plants produce heat and they all function as district heating systems. Sixteen of them produce electricity. Due to their functioning as district heating systems, the costs incineration plants have to charge not only include incineration technology, but also costs for the heat transportation system.

Although most respondents do not fear a situation of overcapacity, all respondents agree that conflicts of interest are a threat to waste reduction. Some examples have been given of recyclable materials that were sent to incineration plants because of economic interests. Paper, for example, has a low calorific value, and adding it to the incineration process means that more tons can be burned. Since profits are based on the total amount of tons incinerated, this means an economic advantage for incinerators. Apart from the link between ownership of incineration plants and the incineration of paper, another reason for incinerating paper can be found in low prices for post-consumer paper, and the fact that the Danish paper market has been disturbed by the import (dumping) of paper from Germany. Respondents point out that besides paper, organic household waste is also sometimes not sent to composting or biogas plants owned by municipalities, but rather to incinerators owned by exactly the same municipalities.

Especially for joint local authority waste management companies that extended their incinerating activities in the past with sorting and processing activities, the temptation of putting materials that could also be processed into incineration plants is sometimes too great. One of the respondents put this kind of conflict of interest, due to the ownership of both incineration and processing capacity, into the following words: "As soon as they (joint ventures) are told to deliver heat and electricity each year, they have a need for the garbage and they will not be interested in recycling much anymore. It's like an oil tanker in the sea: it's very difficult to change its direction. Those who make decisions about the way waste is going to be dealt with are the very same people who actually paid for the incineration plants."

The respondents reject the necessity to alter the structure of the waste sector to avoid this kind of conflict of interests. They believe that the connection between the energy sector and the waste sector results in a positive relationship: it causes a restraining effect on the extension of investments in expensive, large-scaled disposal technologies. The point is that in Denmark the planning process for the use of energy starts with the inventorization of energy resources. The Ministry of Environment and Energy first requires an inventory to be made of the need for heat (households), then for steam (industry) and then for electricity. Waste is seen as an inflexible energy resource. Besides, incineration plants can only be applied as district heating systems on a large scale (about 70% of the energy a plant can provide is heat; 30% is electricity). It is difficult to find locations where heat can be applied usefully throughout the year and on such a large scale. The amount of waste that may be used for generating the maximum amount of energy needed for this planned district heating capacity is then calculated. Therefore, it is not easy to establish new incineration capacity or extend the

existing one. The initiative to reconsider the existing capacity usually comes from one or more municipalities or an electricity company. The motive normally lies either in an increased need for disposal capacity, or new possibilities for the application of heat or steam. To establish new capacity an approval from the Ministry of Environment and Energy is needed and adoption of the National Energy Plan is required.

### 6.3 Waste Reduction

#### 6.3.1 *Source Reduction and Recycling*

The emphasis of Danish waste policy lies on recycling. The overall recycling objective for the year 2000 is 54%. Remarkably, there is no specified goal set on source reduction in the national policy program covering solid waste, the Action Plan for Waste and Recycling 1993-1997 (Ministry of Environment and Energy 1992a). This action plan only sets goals for recycling, incineration and landfilling. For preventive efforts in the field of waste it refers to another policy program, which describes policy goals for industrial waste, namely the Cleaner Technology Action Plan 1993-1997. This plan defines cleaner technology as: "pollution and waste related to the production, use and disposal of products are minimized to the extent possible as close to the source as possible. This implies changing the product or the production process so that the overall environmental pressure from the circulation of materials and substances in the society is minimized.(...) Cleaner technology ranges from the simple raw materials husbandry to the use of sophisticated techniques and design." (Ministry of Environment and Energy, 1992b). Although attention is being paid to the necessity to reduce the environmental impact of production processes and products, any concrete goal per type of waste or type of industry is lacking.

#### 6.3.2 *Registration system*

Since 1993 there has been a registration system in use: the Danish Information System for Waste and Recycling or 'the ISAG system'. The ISAG system uses data from recycling and disposal plants, such as landfilling sites, incineration plants, composting and biogas facilities, and processing plants. The system contains figures based on weighed quantities at plants. The figures from the ISAG system which are presented below are related to 1993, 1994 and 1995 (Danish Environmental Protection Agency, 1996b and c). Before the ISAG system was functioning, figures were based on estimates made by municipalities (this was the case in 1985). Figures for the total waste stream

were: 9 million tons in 1985; 10,133 million tons in 1993; 10,935 million tons in 1994, and 11,234 million tons in 1995.

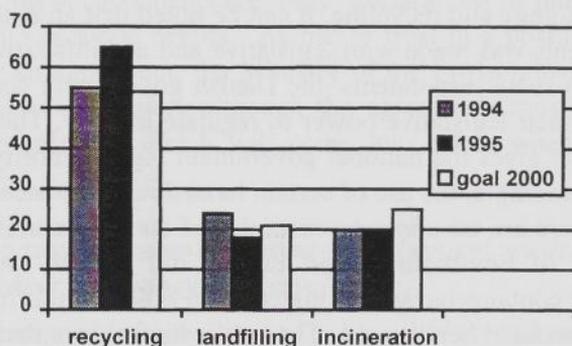
The production of waste rose by 8% in 1994 in relation to 1993. The Danish Environmental Protection Agency (1996b) gives two reasons for this increase in total waste production, namely:

1. The report to the ISAG for 1994 included 454 plants among 306 enterprises, whereas the report for 1993 included only 401 plants among 257 enterprises. In 1993 ISAG lacked data from a number of firms engaged in the recycling of waste.
2. Economic recovery in the community brought about a growth in employment and in consumption and, with that, also a growth in the volume of waste.

In 1995 the total waste stream came from the following sources: households (23%); institutions, trade and offices (7%); industry (23%); building and construction sector (23%); sewage treatment plants (9%); coal-fired power stations (15%).

Comparison of the figures for the total waste stream for 1994 and 1995 shows that compared with 1994 there was an increase in the recycling of waste from 55% to 65%. The percentage for landfilling dropped slightly from 24% to 18%, and incineration remained the same at 20%. The current Action Plan for Waste and Recycling gives total objectives for the year 2000, namely: recycling 54%, landfilling 21% and incineration 25%. Figure 6.3 shows that these targets for landfilling and incineration have almost been reached, and that the target for recycling has been reached several years in advance.

Figure 6.3 Percentage of total waste streams recycled, landfilled and incinerated in 1994 and 1995, and the policy goals in 2000.



However, the figures from 1995 in Figure 6.4 below, specified per type of waste, demonstrate that the total recycling figure has to be attributed mainly to the considerable recycling of building and construction waste (85%), coal-fired power stations (92%) and sewage treatment plants (about 70%) (Danish Environmental Protection Agency 1996c).

Figure 6.4 Percentage recycling per type of waste in 1995



Figure 6.4 indicates that there still is a long way to go to reach the objectives for other types of waste. For example, the objective of 40-50% recycling of domestic waste that ought to be reached in 2000 was far lower in 1994: 74% of it was incinerated, 12% landfilled and only 14% recycled.

### 6.3.3 *Waste reduction incentives*

#### *Instrument of coercion: prohibition on landfilling of combustible waste*

Exploring the instruments the national government has chosen to stimulate cleaner technology and recycling, it can be noted that an extension of financial instruments was made with legislative and administrative instruments. According to some respondents, the Danish government could make much more use of their legislative power to regulate directly. The Environmental Protection Act gives the national government legal authority to set rules or prohibit, for example, the use of certain hazardous substances, materials and products. There are no concrete examples of such measures yet. However, the Ministry of Environment and Energy did recently publish a list of products that contains hazardous materials in order to inform the consumers about the associated health risks. The publication shows that the Ministry is expecting a lot from bottom-up initiatives.

One specific example of a new legislative instrument that only has an indirect effect on waste reduction is the prohibition on the landfilling of combustible waste. Since January 1, 1997, landfilling of combustible waste has been prohibited. This measure was already announced in 1994. Whether the announcement actually resulted in an increase or decrease of demand for incineration is unknown, because of a lack of data being registered. It is assumed that the prohibition gave a strong incentive to the recycling of building and construction waste. Some respondents suggest that since the prohibition on landfilling, the amount of requests for permitting the realization of new biogas installations has increased as well.

#### *Instrument of communication: environmental agreements*

The national government has high hopes for the use of administrative instruments to stimulate cleaner technology and recycling. In the period between 1987 and 1995, the Danish Environmental Protection Agency administered sixteen environmental agreements. Agreements have been established on the following: CFCS & HCFCs, Halon bank, rechargeable batteries, lead accumulators (storage batteries), PET-bottles, transport packaging, combustible waste, tires, organic solvents, VOC-emissions, PVC, NPEO in detergents, surfactants in detergents and softeners, diesel, impregnation of timber, and clean-up of sites. These voluntary environmental agreements between national and sometimes municipal authorities, and (parts of) the different sectors of industry, are seen as "a supplementary dynamic tool for regulating emissions, waste and the preservation of resources amongst other things." (Danish Environmental Protection Agency 1996a) According to most respondents, too little progress has been made. They point out that the

realization of agreements thus far has been due to there already being international obligations, or that the environmental principles are already implemented, or that the product is easy to access and regulate. A common complaint is that establishing an agreement is a time-consuming activity. Furthermore, these agreements are 'only' declarations of intent, and as long as there are no concrete results, one has to trust in a positive outcome. In exchange for an agreement, the Ministry of the Environment refrains from direct legislative regulation, although the agreements mostly contain supplementary regulations which will come into effect when goals are not achieved.

*Transaction-based instruments: deposit-refund system, waste charge system, grants for cleaner technology and recycling*

Denmark has deposit-refund systems for beverage containers used for beer, wine and soft drinks. The systems are economic instruments to promote the re-use, recycling and proper disposal of waste bottles. The Can Act of 1971 provided the framework for this kind of economic instrument and for recycling activities. In 1984, this act was replaced by the Recycling and Reduction Waste Act. In 1992, it was adopted in the Environmental Protection Act, which incorporated the regulation of re-use and cleaner technology. The aim of these acts is to provide a control for pollution, by banning certain types of non-returnable packaging, and prohibiting the use of particular substances and materials which may pose special waste disposal problems. (Basse, 1994) For example, aluminum and steel cans are not allowed as containers for soft drinks and beer.

The waste charge system was originally initiated by the Ministry of the Environment in 1986. As the waste charge is a tax, it could only be levied through legislation. The waste charge act has been altered in 1989, 1992 and 1993.

The primary purpose of the tax is to give an economical incentive to reduce (the growth in) waste production, and increase recycling and reuse by stimulating consumers to recycle more and waste less. Secondly, the tax is used to supply a fund for the promotion and stimulation of recycling and cleaner technology. The national disposal tax is not meant for providing funds used only for environmentally sound initiatives. Technically, there is not even a connection between the size of the fund and the increase or decrease in tax revenues. Most of the revenues from the waste charge, which totalled 121 million Dkk in 1987 and 550 million Dkk in 1994, is treated as an ordinary state income, financing government expenditure in general. From 1993 onward, it was also seen as a part of the decrease in the direct taxation of income (Miljostyrelsen, 1996). Achieving the primary goal [of

increased waste reduction and recycling?] with this kind of tax seems very indirect. Disposal costs are only one component of the tariffs consumers pay, and besides that, the percentage of the tariff depends on political choices made by the municipal authorities.

All respondents say that there never were serious objections from industry, organizations or other interested parties against the introduction or adoption of the tax. The disposal tax was: 40 Dkk per ton in January 1987, 130 Dkk per ton on both incineration and landfilling in January 1990, and 160 Dkk per ton for incineration and 195 Dkk per ton for landfilling in January 1992. Since January 1, 1997, the rates are 210 Dkk per ton when incinerated in a plant producing both heat and electric power, 260 Dkk per ton when incinerated elsewhere and 335 Dkk per ton when landfilled. This new aspect reflects the wish to reduce the consumption of energy derived from fossil fuels (Miljostyrelsen 1996).

Although the effect of the implementation of a national tax on disposal since 1987 could not be demonstrated, because of a lack of data, all respondents say that this has led to a reduction of construction waste in particular ( $\pm 80\%$  recycling now), as well as wet components (like sludge).

Results given by a report of the Danish Environmental Protection Agency (1996c) are as follows:

- Due to the charge, relative prices have changed, and, as a result, it is now more profitable to establish waste reducing and recycling schemes.
- Recycling/reuse has increased from 21% in 1985 to 61% in 1995, whereas landfill use has fallen from 57% to 18%. The fraction being incinerated remained unchanged at 20%. Notably, in this report different figures than those given in sub-section 6.3.2 are used for 1985 (total waste stream 9.3 million tons) and 1993 (9.5 million tons).
- The waste charge has been the main cause for the increase of re-use in the construction sector from 12% in 1985 to 85% in 1995.

Grants are awarded for activities which promote the use of cleaner technology or the recycling of products, materials and waste products. These activities may include tests, or demonstration or information projects, but capital investment in plant and machinery is not eligible. The grants provide a special fund for the promotion and stimulation of recycling and cleaner technology. Grants are awarded by the Council for Recycling and Cleaner Technology, which is comprised of representatives of the key players in the waste and recycling field (Ministry of Environment and Energy 1995).

## 6.4 Conclusions: Structural Elements and Waste Reduction in Denmark

### 6.4.1 *Separation/Integration of functions*

In principle, the functions in the waste market are segregated in Denmark. Some of the respondents are against vertical integration of functions. They think that the separation of functions assures real competition within segments of the waste market. For example, competition exists in the field of collection of industrial waste, but since the collection of household waste is subject to public tendering, some competition was introduced in this field too (Ministry of Environment and Energy 1992a). Still, the introduction of competition does not assure a huge incentive for source reduction, because collectors get paid per unit of waste collected. So for them the more units of waste collected the better. An argument that favors separation of functions is given by the example of the problem of conflicting interests, which may lead to disposal installations attracting waste that could have been recycled, and which is particularly manifest when cooperating municipalities have extended their waste disposal activities by including processing activities.

Separation of the collection function from other market functions alone thus does not assure the prevention of an entanglement of interests. It appears to be very likely that conflicts of interest will stay manifest as long as municipalities have the ability to own and operate disposal facilities, while at the same time they are able to regulate the flow of waste streams in their role of administrator. As long as the investments in incineration capacity are high, and the ownership is in the hands of the same municipalities that can decide where the waste is transported to, it is often more financially attractive to have recyclable waste brought to incineration plants.

### 6.4.2 *Conditions for transactions*

Each collector or transporter needs a permit for transporting waste. This permit prescribes to which processing or disposal sites the materials or substances might be brought to. In essence, these kind of flow control ordinances have neither a positive nor a negative effect on waste reduction. But as soon as the ordinances are used by local authorities to regulate the flow of waste towards specific capacity in order to protect the risks of investors, these conditions for transactions result in an impediment to waste reduction—certainly in the short term.

### 6.4.3 *Roles of governmental bodies*

The main reason for selecting Denmark as a case was the belief that public authorities are withdrawing from the waste market in order to introduce more policy instruments based on transactions. In practice the market for waste is still dominated by public authorities.

Local authorities have great influence on the way in which waste is handled. Although they normally put the collection, transport and most of the processing activities in the hands of private organizations, they themselves own and operate disposal facilities and plants for the treatment of organic waste. Therefore, Danish municipalities did not withdraw as participants from the waste market.

Besides ownership of disposal and recycling facilities, municipal authorities also have the responsibility to draw up waste plans, which are used by the Ministry of Environment and Energy to plan the collection and disposal of waste on a national scale, and furthermore, they administer the Environmental Protection Act (1991) and related orders. They are able to use regulatory power in order to control waste flows. The market for discarded materials and products that can be re-used or recycled is not regulated as strictly as is the disposal of discarded products and materials. Industries are allowed to have the recyclable waste transported to facilities within or outside Denmark, as long as they order collectors to report it to. When public authorities are not involved in market functions they cannot be accused of abusing their regulatory power.

### 6.4.4 *Scale*

In Denmark, waste management is planned on a national scale. The principle of self-sufficiency is a top priority, and so the waste market is strongly regulated. But because disposal prices in surrounding countries are higher rather than lower, it seems that the export of waste is not profitable. However, at least in theory, large-scale disposal capacity attracts waste: conditions for transactions more or less guarantee the input of disposal capacity.

The link between the waste and energy sectors is remarkable. On the one hand, electricity companies are involved in the waste sector in two different ways: as owners of incineration plants (sometimes called 'energy-recovery-plants'); or as contractors buying the 'recovered' electricity from municipal incineration plants. On the other hand, there is encroachment from the waste sector into the energy sector: incineration plants are counted as district heating systems. In the National Energy Plan (NEP) the choice for energy resources depends primarily on the supply of heat, then steam and finally electricity. Because of the inflexibility of the energy resource (due to the

large scale of disposal facilities), waste is one of the first energy resources that has to be considered in the NEP. Central district heating systems are given priority above decentralized applications like Combined Heat and Power systems (CHP). As a result, in Denmark it is somewhat more difficult to extend disposal capacity. The linkage to electricity, within the NEP, has a restraining effect on the extension of incineration capacity. The sharp tuning of supply and demand creates a climate in which overcapacity can be avoided.

#### **6.4.5 *Responsibility for Waste Reduction***

The emphasis of Denmark's waste reduction policy is on recycling. There is no qualitative or quantitative policy goal for source reduction; there is only one for recycling. There is no specific organization or entity held responsible for the realization of waste reduction. Local authorities can regulate the waste market as participants in the market, but also as legislators that can order private collectors to disclose the amount of waste they collect, where it originates and its destinations. The national government supplements municipal policies in trying to influence the recycling market by stimulating activities in the field of recycling and cleaner technology.

#### **6.4.6 *Conclusions***

The arguments for choosing Denmark as a case-study were the belief that local authorities had withdrawn themselves as participants from the waste market, and that market-based policy instruments had been introduced. The first belief appeared not to be true. While there are no public authorities active in the field of waste collection, disposal facilities are usually owned by local municipalities or by municipalities cooperating in a joint municipal company. In Denmark the division of market functions has been a deliberate choice, yet separation of the collection function from other market functions alone does not assure the prevention of conflicts of interest. It appears to be very likely that the entanglement of interests will stay manifest as long as municipalities simultaneously own and operate disposal facilities, and are able to regulate the flow of waste streams in their role of administrator. Therefore, the example of the Danish waste sector cannot demonstrate whether functional separation stimulates waste reduction when public authorities are not (directly or indirectly) involved with waste market activities.

Concerning the second argument for choosing Denmark as a case study, only a small number of transaction-based instruments have been introduced

in Denmark. The responsibility for waste reduction is not attributed to a specific market actor (like producer responsibility), but is something that has to be attained by the application of a national policy. And the Danish national environmental policy does not (yet?) contain any source reduction goals; only a recycling goal has been formulated. A restricted amount of instruments have been applied. Although the effects are difficult to measure, because the registration system has only been functioning for a few years, it seems that prohibition on the landfilling of combustible waste, as well as the implementation of a national tax on disposal have both resulted in a stimulation of the recycling of construction waste. Also the introduction of some other financial incentives, a deposit refund system and a fund for recycling and cleaner technology, seem to have had little effect on household waste thus far. The scarce figures that are available show that the percentage of recycled household waste is still low. Probably new efforts will have to be made in order to reduce the flow of household and other types of waste.