

Analytical Note

for Russian-Danish Local Government Project

Gusev Municipality - Kaliningrad - Russia

&

Odense Municipality/ Odense Waste Management Company Ltd. - Denmark

September 2008



CITY OF ODENSE

 **Odense Waste**
Management Company Ltd.

Preface

The present analytical note has been elaborated in accordance with the revised Project Working Plan in order to give an overall description of the solid waste management system and experience in the Municipality of Odense.

The project partners from Odense have already been on a preliminary study visit to Gusev in May 2008, and a similar study visit from Gusev is anticipated in November 2008.

During this visit to Odense in November 2008 the project partners from Gusev and Odense will together initiate the development of general principles of a solid waste management concept for Gusev as well as specify the particular issues to be covered by the project cooperation.

The preliminary suggestions for these areas of cooperation were during the study visit to Gusev in May 2008 mutually specified as:

- How to organise information campaigns to improve public awareness and behaviour in relation to solid waste sorting and recycling
- How to organise the collection and sorting of solid waste at the collection points in the city to improve recycling
- How to get in touch with / attract recycling companies to establish enterprises in Kaliningrad

Introduction to waste management in the Municipality of Odense

In Denmark the tasks of local authorities within the area of solid waste management can be split into the two parts: authority and operation. In principle a Danish municipality can be responsible for both parts, but there are also other ways to do it, as the competences may be transferred to other organisations.

In Odense the authority tasks are handled by the Municipality of Odense and the operation tasks are handled by Odense Waste Management Company, which is a limited company, 100% owned by the municipality.

In accordance with the legal requirements it is the municipality's responsibility that the necessary authority decisions, including setting of regulations, are taken within the solid waste management area. Besides it is the Municipality's responsibility that the required planning within the waste management area is undertaken.

On the day to day basis Odense Municipality and Odense Waste Management Company have a close cooperation on waste management, especially regarding the following tasks:

- Supervision of industrial enterprises (ordinary as well as specific waste producing enterprises)
- Elaboration and enforcement of regulations (household waste as well as industrial waste)
- Elaboration, updating and implementation of overall Waste Management Plan every 4 years (meeting the National Waste Management Strategy normally updated every 4 years)
- Various planning and supervision tasks in relation to handling of demolition waste
- Various supervision and control tasks in relation to import and export of waste

Introduction to Odense Waste Management Company Ltd.

Odense Waste Management Company covers the Municipality of Odense having around 185 000 inhabitants. With roots more than a 100 years back it was in 1994 transformed from a municipal waste

management department into a limited company owned by the municipality. It is a not-for-profit company, where all services are paid for by the users.

Odense Waste Management Company offers a wide range of well-functioning solid waste management activities and solutions within a limited urban area and within one organizational set-up, such as collection of household refuse, recyclable paper and hazardous waste from 89 000 households, operation of 8 recycling stations, and app. 150 bring banks for bottles. Odense Waste Management Company also participates in the operation of a central sorting facility for industrial waste in cooperation with a private waste handling company, and it operates the Odense Environmental Centre which comprises landfilling, sorting, recycling and composting activities as well as a training Centre. Another activity of Odense Waste Management Company is the extraction of landfill gas from the former Stige Island Dumpsite, providing electricity via the public grid for about 5 000 households and heating via the district heating grid for about 900 households, and including careful monitoring, collection and treatment of leachate.

In response to a growing demand for a more structured dissemination of the acquired know-how within the company, Odense Waste Management Company has been transforming its many years of experience and lessons learned into flexible packages of operation and maintenance support and manuals as well as flexible modular training and practice services. These services are focusing on the practical application of well established solid waste management technologies and knowledge.

This note will give a description of each of field of operation with a focus on services related to citizens of the municipality.

Household waste collection at household

Household waste - meaning the residual waste that cannot be recycled and is not hazardous - is collected from 89,000 households in Odense. It is transported to the Funen Works, the local waste-to-energy plant, where it is incinerated producing electric power and district heating.

Household waste is normally collected every fortnight in standard waste bins, and each household is responsible for placing the waste bin by the nearest kerbside on the day of collection. A calendar with the dates of collection is sent out every year to all households. Also a booklet of how to sort the household waste and where to hand it in – is sent out to all households in the beginning of the year.

Depending on the size of the household one out of 6 sizes of wheelie bins - containing from 130 to 800 litres – may be used. The bins all have wheels in order to make transportation from the household to the lorry easy. In certain mansions in the inner city, though, there is no room for bins. Instead we collect paper sacks in these limited areas.

Other services such as extra collection of waste or weekly collection during the summer months are available against extra payment.

Equipment for household waste: 16 lorries, 28 collection workers, app. 41.000 containers and 580 paper sacks.

Paper collection at household

Odense Waste Management Company offers each household a separate bin for collection of paper. This paper bin is for all types of recyclable paper: newspapers, magazines, circulars, letters, envelopes etc. The paper bin is emptied once a month. Less than 1 % have not accepted this offer, and we collect approximately 100 % of the paper potential.

Collecting paper directly from the household ensures a very high collection rate. Our statistics show that 51% more paper was collected in 2004 where paper was collected directly from the household, compared to 2002 with the former system of collection of paper via bring banks around the city.

Equipment for paper collection: 6 lorries, 9 collection workers, app. 39.000 containers, 1100 paper sacks.

Collection of glass and bottles from bring banks

Glass bottles, jars and other types of glass from households are collected at bring banks. Approximately 150 bring banks for glass bottles etc. are located in central places in Odense. Glass bottles can also be handed in at one of the 8 recycling stations in Odense. Some bottles are reused directly after cleaning, and others are melted and used in new glass products.

Equipment for glass collection: 150 1m³ containers, 1 lorry, 1 collection worker.

Hazardous waste collection

Hazardous waste such as oil, paint, poison, batteries, spray cans etc. must be handled with precaution, because it presents a potential danger to the environment and in some cases to individuals, too. Several solutions for collection of the hazardous waste are offered in order to make it as easy as possible for the citizens.

Each household has been given a red box for storage and transport of hazardous waste. The hazardous waste, whether in the red box or not, may be handed in by the household:

- at 2 of the biggest recycling stations all day
- at the other recycling stations every 6th weekend, where a special truck build for receiving hazardous waste circles among the recycling stations at weekends

The red box may also be collected directly from the household by previous agreement with us.

Medical waste from private households may be handed in at pharmacies.

Most paint shops and centres selling building materials accept hazardous waste, too.

Equipment for collection of hazardous waste: 2 collection workers, 2 collection lorries

Bulky waste collection at household

For those citizens who are having difficulties with transportation of bulky waste to the nearest recycling station, we offer to collect certain types of bulky waste 2 times a year, by previous agreement with us.

Equipment for collection of bulky waste: 2 lorries, 2 collection workers

Recycling Stations

Odense Waste Management Company Ltd. operates 8 recycling stations, so each neighbourhood has a station within only a few minutes drive. App. 30 categories of waste are collected – from bulky waste (furniture, refrigerators, electronic waste, and garden waste) to hazardous waste (batteries, oil, paint) and to bricks, rockwool, pvc etc.

The inhabitants of Odense have reached one of the country's highest levels of recycling: 86% of the bulky

waste is recycled. 11% is incinerated producing electric power and district heating - and only 3 % is being landfilled.

All recycling stations have a horse shoe lay out. The containers are always placed in the same order, which makes it easy to plan the order of unloading before entering the station.

From January 1, 2009 all the recycling stations are open to small enterprises as well as citizens. The opening hours are from 8-18 every day except a few holidays. The stations are manned with 1-2 workers depending on the size of the station. The smaller enterprises pay an annual fee depending on size, to use the recycling stations.

Equipment for 8 recycling stations: 6-8 lorries, 20 workers and app. 30 containers of different sizes per recycling station.

Modern landfill and waste treatment centre - Odense Environmental Centre

Odense Environmental Centre is one of the largest and environmentally safest waste management centres in Northern Europe. The Environmental Centre was built in 1994 by Odense Waste Management Company Ltd., when the capacity of the city's old dump on Stige Island had been exhausted.

The Environmental Centre is situated by Odense Fjord, approximately 8 km from the centre of Odense. The location is ideal owing to the geological conditions, which provide a natural barrier against contamination of the ground water. In terms of the infrastructure and any negative impact on the surrounding area, too, the location is particularly suitable for the activities that take place at a modern waste treatment facility.

The Environmental Centre receives and processes waste from municipalities associated with the plant. The Environmental Centre covers a total area of 110 hectares, 95 hectares of which are usable for the Centre's activities. The Environmental Centre is expected to be able to hold 10 million cubic metres of waste. An aftercare plan has been drawn up for the entire area. This ensures in the long term that when activities at the Environmental Centre cease, there will be an opportunity to use the area for recreational purposes.

Odense Waste Management Company Ltd.'s many recycling schemes, the waste incineration module at the Funen Works Power Plant and the constant tightening-up of the law in relation to reduced production and increased recycling of waste help to extend the Environmental Centre's service life. The centre is at present expected to be able to receive waste until about the year 2100.

The Environmental Centre has around 30 experienced employees who, as a result of internal and external training, have the necessary skills to perform tasks assigned to them. Great flexibility and commitment are required together with a high level of adaptability as the many changes in the legislation affect work routines.

Design

The Environmental Centre is divided into sections. The various activities that take place at the centre are performed in their own individual sections. As new activities are added or existing activities expand, a number of sections will be incorporated. The compartmentalisation of the centre makes it possible easily to handle each activity individually, for example in connection with the handling of leachate, registration of the waste or subsequent recycling of the waste.

Odense Environmental Centre's main facilities and activities are currently as follows:

- Receiving area, workshop and administration
- Pre-treatment plant for processing leachate
- Composting of yard waste
- Composting of biomass (sludge from sewage treatment)
- Treatment of soil contaminated with oil
- Screening of slag from waste incineration
- Intermediate landfilling of possibly recyclable waste
- Intermediate landfilling of combustible waste
- Landfilling of asbestos-containing waste
- Landfilling of shredder waste
- Landfilling of waste suitable for landfilling

Environmental protection

The geology below the Environmental Centre means that there is a constant flow from the bottom to the top ground water reservoir. Most of the Environmental Centre's lined areas are located below the top ground water reservoir, with upward ground water pressure being exerted on the liners. Any rupture of the liner system will therefore mean that the ground water will enter the landfill rather than leachate leaking out.

Every section comprises an underlying liner that collects leachate. The liner system is comprised of a moraine clay layer 0.30 m thick, a 1.0 mm polymer liner and a drainage and protective layer at least 0.3 m thick.

Operation and monitoring

Operation of the Odense Environmental Centre comprises a sophisticated monitoring system. All relevant operational and environmental aspects are monitored and controlled by this monitoring system. The monitoring system covers, among other things, the recording of waste, monitoring and recording of leachate and ground water as well as operation of the pre-treatment plant.

The Environmental Centre is equipped so that all waste received must pass through the receiving area, where it is checked, weighed and recorded. The recording process logs information on hauliers, waste type, waste producer and volume. The receiving area houses the central computer system, which communicates with the control and monitoring system of the pre-treatment plant. The Environmental Centre's facilities can be operated and controlled via the control and monitoring system. Performance of the Centre's activities is based on a set of operating manuals designed as reference books that provide rapid access to relevant information on individual activities as well as on Odense Environmental Centre as a whole.

Safety systems

Analyses of ground water and leachate are carried out at regular intervals. The analyses of the ground water are performed in order to check that ground water under the Environmental Centre is not being polluted. The analyses of the leachate are used to monitor the leaching out of substances from the waste and to assess the composition of the leachate transferred to the pre-treatment plant.

If ground water under any landfill section becomes polluted, the underlying drains are designed so that they can be used to counteract such pollution. Any pollution can therefore be readily passed to the leachate system, where the pollution can be transferred for treatment at the pre-treatment plant. The landfill sections are enclosed by fencing to prevent plastic and paper from blowing away. After each

working day, all waste suitable for landfilling must be covered with soil to keep the waste in place and to ward off vermin.

Noise nuisance from the plant is minimized via, among other things, embankments of earth that provide protection for people living near the Environmental Centre. On-going environmental improvements are carried out to the machinery, for example minimization of diesel consumption and noise and the adoption of an ergonomic approach for the benefit of the environment and employees.

The computer system

One of the areas in which Odense Environmental Centre leads the field is the advanced computer system used to run the plant. The system is built around a set of decentralised computers that are linked to a central computer located in the receiving area. From this computer Odense Waste Management Company Ltd. can retrieve, for example, statistical data on the waste received, to be used for the statutory reports that must be submitted to the Danish Environmental Protection Agency and Funen Regional Authority, or for followup action on the objectives of the waste plan. All operational information from the Environmental Centre's safety and monitoring systems is collated via the control and monitoring system. If operating problems arise with plant linked to the control and monitoring system, an alarm is transmitted to the operating personnel's computer systems.

If operating problems occur outside normal working hours, alarms are transmitted via the telephone network to the operator on duty, who can then rectify the problems. In particularly critical locations the safety systems are duplicated so that a standby system cuts in if the primary system fails.

The central computer system also comprises software for recording drain and leachate piping, and the system also serves all the Environmental Centre's administrative systems. The pipe recording system is continuously updated so that it can be used as a basis for extensions and maintenance of drain and leachate pipework and for any future changes at the site. Piping can always be identified precisely by the system so that work can be carried out quickly and without any problem.

Leachate treatment

The collected leachate from the landfill is transferred to the Environmental Centre's pre-treatment plant. The leachate is pre-treated here so that it corresponds to ordinary urban effluent and is then transferred for further treatment at one of the Odense local authority's waste water treatment plants.

Gas extraction

A relatively small volume of household waste has been landfilled at Odense Environmental Centre. This waste was landfilled before the Funen Works facilities for incinerating household waste were constructed. Gas is formed as a result of the biological processes that take place during the decomposition of waste. This gas is extracted and transferred with the gas from Stige Island to a custom-built combined heat and power plant.

Waste Treatment

Composting: Both pure yard waste and a mixture of yard waste and biomass (sewage sludge) are composted at Odense Environmental Centre. The compost, which is produced purely from yard waste, is used in private gardens by the city's citizens. The particularly nutritious compost type, which is produced from both yard waste and biomass, is called biocompost. The compost is typically applied to farmland. Each

year, the Environmental Centre produces enough biocompost to meet the fertiliser requirements of more than 1,600 hectares of farmland.

Biocompost: Odense Environmental Centre receives biomass from all three waste water treatment plants in the municipality of Odense, with the annual volume received totalling approximately 38,000 tonnes. During the production of biocompost, yard waste is shredded and then stacked together with biomass and straw. The straw is converted very readily and therefore helps to give the composting process a quick start. Within one day, the temperature in a windrow reaches up to 70°C.

The composting process itself takes 8 weeks, with the windrows being turned once a week to oxygenate the process. The windrows are monitored electronically to make it possible to check continuously whether optimal oxygen and temperature conditions apply in each individual windrow. After the actual composting process, the compost is cooled for a further 2 weeks and then allowed to mature for 12 weeks. The compost is then screened and is finally ready for use. This type of compost is especially rich in nutrients owing to the composted biomass. The bulk of the biocompost is used on farmland.

The biocompost must not be used in private gardens, public parks or the like without prior heat treatment (hygienisation). To enable the biocompost to be used freely, it must be heated to 70°C in a closed reactor for a minimum of one hour. It must be possible to substantiate this heat treatment to the authorities. With the support of the Danish Agency for Trade and Industry, the Environmental Centre has for this reason developed a hygienisation facility. The facility has capacity to hygienise up to 5,000 tonnes of biocompost a year. The facility is not used for biocompost applied in farming.

Yard waste compost: Some of the yard waste is composted without any addition of other waste types. This compost is produced in windrows in accordance with the same principle as for biocompost. The yard compost is very popular among the citizens of Odense. The compost can be bought daily for a token amount, and can be collected free of charge on two annual compost days.

Operational monitoring program for composting process

A specially designed computer program that collects and processes all data on the compost is used to monitor and control the many parameters in the composting process.

The temperature of the windrows is measured every half an hour throughout the composting process. The measurements are transmitted via a radio signal to a PC, on which the data are collected and input in the operational monitoring program. The strict demands made of the compost mean that a number of initial and final analyses are performed on each individual batch of compost. These analytical data are received in, among other things, electronic format from the analytical laboratory and entered directly in the operational monitoring program.

All information on a batch is recorded in a log in the operational monitoring program, with each batch having its own log specifying precisely what the batch contains and what reactions it exhibited during the composting process.

The process is therefore kept under control throughout the composting phase, and there is always a way of seeking information on a particular batch. Besides actual control of operation, the program helps to ensure and substantiate the fact that the compost regulations are met in relation to such aspects as concentrations

of heavy metals and environmentally harmful substances.

Oil polluted soil

Oil-polluted soil with an oil content of up to 5% and a tar content of up to 0.2% is treated at the Environmental Centre. To ensure that the soil received does not contain pollution greater than or different from what the Environmental Centre is allowed to receive and to give the soil the correct treatment, the soil must always be accompanied by data on a specific number of analyses. Treatment of the soil at the Environmental Centre is a low-technology process in which the soil pollution is broken down by micro-organisms naturally present in the soil. If pollution that is particularly difficult to break down is received, it is nevertheless possible to add other materials that can speed up the decontamination process. Such materials might include compost.

The contaminated soil is placed in windrows that are turned at regular intervals depending on the type and degree of contamination. Turning is carried out to ensure that there is always sufficient oxygen present for the micro-organisms to function optimally.

A log is kept for each batch of soil, with the log containing information on such aspects as where the soil comes from, when it was transferred to the soil treatment plant, where the contaminated soil was at the time of receipt and after treatment, and where the soil was used after treatment.

In connection with the plant for treating oil-polluted soil, a soil store has been constructed which is used in emergencies. In cases of this kind, there is no way of arranging for analyses of the soil before it is supplied to the Environmental Centre. The samples are taken afterwards, with the soil then being dealt with according to whether it is shown to be clean or contaminated.

Incineration slag

Incineration slag from Funen Works is screened at the Environmental Centre. The slag is screened into the following fractions:

- Mineral slag
- Iron
- Screen residue

The mineral slag is recycled for building and construction work. To be recyclable, the slag must meet prescribed requirements. If the slag does not meet these requirements, it is discarded and landfilled. Any iron removed is recycled. The screen residue is taken off-site for further treatment or landfilled. To reduce the volume of screen residue for landfilling, the residue is treated using, for example, a compacter to loosen burned-on slag before the residue is again treated in the screening facility. Around 96% of the slag received is passed on for recycling, and the remaining 4% is landfilled. Around 45 – 50,000 tonnes of slag are received at the landfill each year.

Intermediate landfilling

New developments and possibilities for recycling waste are improving rapidly, and the intermediate disposal of waste components means that waste can be treated later on if future technology and legislation allow this in an environmentally responsible way.

Impregnated wood is stored separately with a view to possible subsequent recycling. If the Environmental Centre receives truckloads containing both impregnated wood and pure wood, this is screened and the pure wood is recycled.

Truckloads of recyclable PVC suitable for landfilling are screened; PVC suitable for landfilling is landfilled, while the rest is recycled.

As combustible waste volumes exceeded capacity at the Funen Works over the period 1997 – 2000, some of the combustible waste was transferred to the intermediate landfill at the Environmental Centre over this period. This combustible waste is supplied continuously to the Funen Works, as capacity of the incinerator allows.

Combustible waste is currently supplied to the Environmental Centre if the Funen Works are out of service or being renovated. The waste is brought back once the plant is back in service. Combustible waste that has had to be stored for longer has been wrapped to reduce the risk of spontaneous ignition and surface water pollution.

Final landfilling

The volume of waste for landfilling is constantly minimised by turning away truckloads of purely recyclable or combustible material and by screening mixed loads, where this is possible – as for example with PVC waste.

The waste is compacted as effectively as possible, with the volume of waste that can be landfilled per unit of volume being optimised. Landfilling the greatest possible amount of waste per unit of volume considerably extends the service life of the individual sections.

As of 2003, the Environmental Centre has three landfill sections for waste suitable for landfilling. Landfilling is carried out at only one of the sections at a time.

Asbestos-containing waste is one type of final landfilling. On receipt, asbestos dust and other waste containing asbestos fibre must be packed in dustproof twin bags that are sealed and labelled. The waste is covered with gravel or soil immediately after landfilling to prevent the release of asbestos fibres into the air.

Shredder waste – residues from the scrapping of, for example, vehicles and refrigerators from which the iron and metal have as far as possible been removed – is landfilled at the Environmental Centre's special depot for shredder waste. The waste is landfilled separately to allow for subsequent utilisation, for example incineration.

Former Dump Site at Stige Island

Stige Island Dump, which the Municipality of Odense has used for dumping waste for 27 years, was closed down in 1997. The entire dump has been covered with a soil layer at least 1 m deep, and the terrain has been modified to provide a harmonious landscape. The topcover of Stige Island Dump was completed in 2006. The closed Stige Island Dump is now being used for recreational purposes, and the area is an attractive playground for children and adults with plenty of opportunities to enjoy the splendid nature in this area with a unique history.

However it is still necessary to collect leachate. When rainwater filters down through deposited waste, leachate is formed with differing types and concentrations of chemical substances. Stige Island Dump has been established without a bottom liner, and therefore the leachate seeps into Odense Channel and Odense Fjord. Odense Waste Management Company Ltd. has been asked by the Funen Regional Authority to minimize the leakage of this leachate. A system has therefore been established on Stige Island Dump for monitoring the infiltration, recovery, transport and treatment of leachate and for the recovery, monitoring and discharge of surface water. The system was put into service in 2003.

Leachate is collected via a collecting drain encircling Stige Island Dump. This drain collects as much as possible of the leachate, which would otherwise seep into the fjord. A minimum of 58% of the leachate formed is required to be collected. Stige Island Dump is divided into 8 sections, each with a separate drainage system. Dividing the island and the drainage system into sections makes it possible to optimize the collection of leachate in the individual sections.

Gas extraction

Stige Island Dump Site has the largest landfill gas plant in Denmark. The gas formed from the biological processes that take place in dumped waste is collected via 160 vertical boreholes. The total length of the boreholes is more than 2,000 metres. A suction pipe system measuring 25 km in length links the 160 boreholes to 4 pump modules, which are each able to pump up a maximum of 720 cubic metres of gas from the dump per hour. In the pump module, the gas is compressed to a gauge pressure of 1 bar and is transferred to the custom-built combined heat and power plant over a distance of about 4 km via an underground plastic gas pipe.

The gas is utilised in a building housing 4 gas motors each comprising 16 cylinders. Each gas motor powers a generator, which produces electricity. The motor's refrigerating energy together with heat from the exhaust gas is used for district heating production. The gas motors and the generators each have an electricity output of 736 kW (1,000 hp) and a heat output of 1,000 kW.

The electricity is supplied to Odense Energi's public grid via two transformers, and the heat is sold to the Odense Municipal District Heating Supply System. The amount of gas will continuously decrease as the waste is being transformed. Annual production accounts for around 8,100,000 m³ of dump gas, yielding 11,300,000 kWh of electricity and 14,200,000 kWh of heat. This covers the annual electricity requirements of just under 5,000 households and the annual heat requirements of very nearly 900 households.

At the combined heating and power plant, a control and monitoring system has been erected from which operating personnel can monitor the facility. The plant can be monitored, shut down and started up via PCs and telephone links, regardless of the operator's whereabouts. The control and monitoring system also records all parameters such as electricity and heat production, gas production, when an alarm has occurred, etc.

According to the calculations, it will be profitable to utilise the gas from the dump at least until the year 2025.

Facts and figures

Table 1: Amounts of waste at recycling stations in 2007

Amounts of waste at recycling stations 2007 in tonnes				
	Recycling	Incineration	Deposit	Total
Deposit			2.878	2.878
Concrete and bricks	18.714			18.714
incinerable waste	9.952	8.457		18.409
Garden Waste	17.852			17.852
Soil	10.017			10.017
Newspapers	612			612
Mixed paper	354			354
Cardboard	1.665			1.665
Metal and white goods	3.585			3.585
Fridges and freezers	0			0
Glass bottles	1.265			1.265
Glass bottles	873			873
Accumulators	79			79
Textiles	231			231
Asbestos	0		554	554
Plastic	1.041			1.041
Carpets	644			644
Tires	103			103
Pressure treated wood		714		714
Gypsum	854			854
Electric and electronic waste	3.564			3.564
TOTAL	71.402	9.171	3.432	84.005
Hazardous waste	0	308	0	308
Total with haz.waste	71.402	9.479	3.432	84.313
Percentages	85%	11%	4%	100%

Table 2: Amounts of waste from all citizens' services

Amounts of waste 2005-2007						
	2007	%-2007	2006	%-2006	2005	%-2005
Residual waste	64.159	42%	62.501	43%	61.445	44%
Bulky waste collection	3.155	2%	1.879	1%	1.990	1%
Bring banks for glass and bottles	1.238	1%	1.230	1%	1.262	1%
Recycling stations	84.005	55%	80.833	55%	75.978	54%
Hazardous waste	308	0%	299	0%	313	0%
In total	152.865	100%	146.742	100%	140.988	100%

Figure 1: Development in household waste amounts over a decade

