



Environment

Municipal waste management in Berlin

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Foreword

Modern waste management and the reduction of climate impact

More than 3.5 million residents of Berlin are generating waste every day so that the city can make an important contribution to environmental protection by implementing modern waste management methods. Over the past two decades, Berlin has achieved much in this field. There has been a marked reduction in the amounts of waste generated, while at the same time more has been recycled. This positive development is the result of an effective combination of logistical optimisation, plant modernisation, information dissemination, new legislation, and not least also public participation.

Legislation for recycling and waste management ensures compliance with high environmental standards. Today, waste materials are increasingly being recovered for use as valuable resources or as a source of energy, and in this way they can make an important contribution to climate protection and resource conservation.

In January 2013, Berlin was the first German federal state to introduce a model waste separation strategy, with a single recycling bin for light packaging together with similar materials. New administrative regulations for “Procurements and the Environment” which came into force at the beginning of 2013 also require all public bodies in Berlin to comply with demanding criteria for active environmental protection.

As Senator with responsibility for environmental concerns, I will continue to work towards achieving further reductions in the amounts of waste generated and the mitigation of climate impacts by means of resource-efficient closed-loop waste management. I am pleased that I can rely in these goals on the cooperation and the expertise of the city owned BSR waste disposal utility and partners from the private sectors.



Michael Müller

Senator for Urban Development and the Environment



Summary

This brochure explains how municipal waste is managed in Berlin.

Municipal waste is waste from private households and similar sources, e.g. doctor's offices, local administration buildings, schools and day-care centres, as well as waste of a similar nature from small businesses and industry. The municipal waste can also include bulky waste items, market waste, road sweepings, organic waste, sewage sludge, and separately collected recyclable materials, e.g. glass or paper. Construction waste is also formally included in municipal waste, but because of the specific problems it presents, it is not dealt with in this brochure.

The relevant legislation at the level of the European Union and at the federal and federal state levels in Germany is presented, and in particular the new provisions included in the Recycling and Waste Management Act. The interrelationship between waste reports, waste management strategies, and waste management plans is explained.

For many years now, the amounts of municipal waste generated in Berlin have been declining. Waste prevention measures have proved very effective, and increasing amounts of waste are reused and recycled. Approximately 80% of Berlin's municipal waste comes from households, and the remaining 20% from the commercial sector (including road sweepings).

The city's waste management utility BSR (Berliner Stadtreinigungsbetriebe) is one of the largest waste management companies in Europe and it is responsible for dealing with the waste accumulated for disposal in Berlin. All households in the city are obliged to use its services.

Waste in Berlin which can be recycled, in particular paper, glass, light packaging and equivalent non-packaging, and biodegradable waste, is first separated by private households and businesses, then collected by one of a number of waste management enterprises and taken to be recycled.

Examples of waste management plants used by BSR are described as well as other waste sorting and recycling plants in Berlin.

Finally, some examples are provided of model waste projects which have contributed to the reduction of the quantities of waste in Land Berlin.

In recent decades, Berlin has made successful efforts to reduce the amounts of waste generated within the city. But even though levels have been declining for some time, there still remains potential for further waste prevention, better separation before collection, and for the improved re-use and recycling of waste. The City of Berlin intends to continue to exploit this potential in the future.

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The legal basis for waste management

Waste management is a component of environmental legislation, which defines the concept of waste, as well as the transport, treatment and the disposal of waste.

There is legislation at the level of the European Union, and in Germany at the federal and federal state (laender) levels.

1.1 The legal basis for waste management

1.1.1 European Union law

EU waste law forms the legally binding basis for waste legislation of the EU member states. The EU influences the legislation of the Member States by means of numerous directives and regulations.

EU waste law forms the legally binding basis for waste legislation of the EU member states. These include for example the Waste Shipments Directive, which regulates the transport of waste and hazardous waste within and outside the European Union, the End-of-Life Vehicles Directive, which specifies recycling targets for scrap vehicles, the Landfill Directive, which specifies requirements for the landfilling of waste, and the Packaging and Packaging Waste Directive which includes targets for the re-use and recycling of packaging.

The important Waste Framework Directive (WFD) was adopted on 19 November 2008. This contains the following core elements:

- ↪ Waste prevention is the first priority of waste management. Key instruments are the principle of producer responsibility and waste prevention programmes.
- ↪ The concept of waste is specified – it refers to movable property which has been or is intended to be discarded.
- ↪ A binding distinction is established between waste and by-products. This is intended to improve the acceptability of high-value recycling products.
- ↪ Separate collection of recycling materials is required. For the first time the Directive also specifies percentages for recycling paper, glass, metal and plastics (50% by 2020) and for non-hazardous construction and demolition waste (70% by 2020).
- ↪ The management of biodegradable waste is improved by separate provisions.
- ↪ The distinction between energy recovery and the disposal of waste is clarified. Waste incineration plants can also be classified as energy recovery plants if they operate with a high level of energy efficiency.
- ↪ Mixed waste disposal from private households is subject to self-sufficiency, i. e. this waste must be disposed of within the EU Member State if possible. Disposal in other countries is only acceptable by way of an exception.

1.1.2 German Federal legislation

The key Federal waste law in Germany is the **Closed-loop Waste Management Act (KrWG)**, which came into force on 1 June 2012. This transposed the EU Waste Framework Directive into German law.

The aim of the Act is to promote low-residue, closed-loop waste management in order to conserve natural resources and to protect people and the environment when waste is created and managed. In addition to the new regulations resulting from the transposition of the European directive, the new Closed-loop Waste Management Act retains the structures and elements of the previous national legislation.

The transposition of the EU Waste Framework Directive into German law in the Closed-Loop Waste Management Act establishes a new, five-level waste hierarchy.

The measures for waste prevention and waste management are ranked as follows (Article 6):



This hierarchy applies as a ranking, with priority for the option which delivers the best overall environmental outcome. In addition to the environmental impact, the administrators shall also take into account the technical feasibility, economic viability, and the social impacts. By setting these priorities for waste management measures at the European level, the prime importance of waste prevention and the reduction of waste levels is emphasised. Effective measures to avoid and utilise waste should also be adopted before the waste is generated. The re-use of products is economically and environmentally more desirable than recycling. The recycling of products is in general to be given preference over incineration, even where this is carried out under specially defined conditions as a waste-to-energy measure. And as a last resort, it is necessary to consider disposing of the waste remaining after these stages have been gone through.

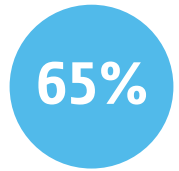
A new obligation is included to draw up a national waste prevention programme (Article 33 KrWG). The programme formulates waste prevention targets, presents and evaluates existing waste prevention measures, and develops new measures on this basis. The aim is to strengthen waste prevention policies and make them more transparent to the general public. The Federal Ministry of the Environment formulated a waste prevention programme for the first time in 2013, with the federal laender contributing from their fields of responsibility.

The Closed-loop Waste Management Act has also created the opportunity to introduce an obligatory, nationwide “uniform recycling bin”. With this collection system, households should not only dispose of packaging but also other waste of the same materials, e.g. plastics or metal, in a new recycling bin. This means that recyclables from domestic waste can be collected in better quality and in larger quantities. It is proposed to regulate further details of the collection of recyclables in a separate law in the near future.

The Closed-loop Waste Management Act implies rates of recycling which are more demanding than the recycling targets set at the European Union level:

By 2020, 65% of all domestic waste and 70% of all construction and demolition waste are to be recycled. At the end of 2016, the recycling target levels for construction and demolition waste will be reviewed and possible increases considered.

By 2015 at the latest, bio-waste, paper, metal, plastics, and glass waste must be collected separately, nationwide.



... of all domestic waste are to be recycled by 2020.



... of all construction and demolition waste are to be recycled by 2020.

Certain materials are excluded from the scope of the Closed-loop Waste Management Act – and with this from the scope of application of the German waste legislation. Such substances are dealt with in accordance with special regulations. Examples are animal carcasses and animal body parts (Animal By-product Disposal Act), nuclear fuel and radioactive substances (cf. Nuclear Energy Law) or waste water (Federal or Land water management legislation).

Producer responsibility remains a key element of the Closed-loop Waste Management Act. Producers and distributors are required to design their products in order to ensure that waste is minimised in the course of the production and during the subsequent use, and that residual materials are recycled or disposed of in an environmentally-compatible manner.

Under the Closed-loop Waste Management Act, product responsibility can be enforced by legal means (acts, ordinances) or by means of voluntary undertakings on the part of the manufacturers and distributors.

The responsibility for packaging materials was already enforced in the Packaging Ordinance (VerpackV) in 1991. This ordinance has been amended various times in recent years. It contains provisions on the obligation of producers and distributors to take back used packaging. In order to meet this obligation, retailers can participate in a system for the collection and recycling of the packaging materials. In 1993 a corresponding collection and disposal system was introduced in Germany. As a result, it was possible to significantly reduce the proportion of packaging in municipal waste.

There are also other regulations governing the implementation of product responsibility, e.g. relating to electronic waste, used oil, end-of-life vehicles, and old batteries.



Baled waste: By 2020, 65% of all municipal waste is to be recycled

In addition to the Closed-loop Waste Management Act there are various supplementary ordinances which specify and augment the provisions of the Act.

These include in particular:

- ↳ the Ordinance on the European List of Waste (AVV),
- ↳ the End-of-life Vehicle Ordinance (AltfahrzeugV),
- ↳ the Waste Wood Ordinance (AltholzV),
- ↳ the Waste Oil Ordinance (Altölv),
- ↳ the Biowaste Ordinance (BioAbfV),
- ↳ the Waste Depot Ordinance (DepV),
- ↳ the Ordinance on Specialist Waste Management Companies (EfbV),
- ↳ the Commercial Waste Ordinance (GewAbfV),
- ↳ the Sewage Sludge Ordinance (AbfklärV),
- ↳ the Verification Ordinance (NachwV),
- ↳ the PCB/PCT Waste Ordinance (PCBAbfallV),
- ↳ the Waste Notification and Allowance Ordinance (AbfAEV),
- ↳ the Packaging Ordinance (VerpackV),
- ↳ the Ordinance on the limitation of the use of harmful substances in electrical and electronic appliances (Elektro-StoffV),
- ↳ the Ordinance on Underground Waste Stowage (VersatzV).

The Closed-loop Waste Management Act requires that the federal laender draw up their own waste management plans and also specifies what these plans should contain.

It is necessary to include descriptions in the waste management plan about the objectives of the waste prevention and the waste recycling. Details are also to be included of the waste disposal plants which are necessary in order to ensure that the waste generated in the federal state can be disposed of safely.

Since 1 June 2005, untreated domestic and commercial waste may no longer be deposited at landfill sites. Pre-treatment may take place in mechanical-biological plants, mechanical-physical plants, or by incineration.

2005

**Since 1 June 2005,
untreated domestic
and commercial
waste may no
longer be deposited
at landfill sites.**

1.1.3 Berlin legislation

The waste legislation of the federal laender augments the legislative regulations of the German federal government. In Berlin, the Act for Promoting Closed Substance Cycle and Waste Management and Ensuring Environmentally Compatible Waste Disposal in Berlin (Closed Substance Cycle and Waste Management Act Berlin, **KrW-/AbfG Bln**) came into force in 1999. This has been augmented by various ordinances which are mainly concerned with hazardous waste: the Hazardous Waste Ordinance, the Hazardous Waste Fees Ordinance, the Problematic Waste Ordinance, and the Ordinance on the Exclusion of Wastes from Disposal by Public Waste Utilities.

The main objective of the Berlin Closed Substance Cycle and Waste Management Act is to promote closed cycles of substance management and low volumes of waste, while also ensuring environmentally-compatible and economic waste disposal.

According to Section 5.1 of the Berlin Closed Substance Cycle and Waste Management Act, Land Berlin is responsible for the disposal of the waste generated within the city. The duties relating to the collection and disposal of waste from private households and of disposable waste from other sources are entrusted to the BSR (*Berliner Stadtreinigungsbetriebe*) as a statutory body of Land Berlin. Sludge from waste water treatment plant of the city is disposed of by the Berlin Water Utilities (BWB). Since mid-2009, non-hazardous construction waste has been excluded from the disposal responsibilities of Land Berlin.

The Berlin Closed Substance Cycle and Waste Management Act also regulates waste reports, waste management strategies and waste management plans for Land Berlin.



Modern BSR vehicle: Land Berlin is responsible for the disposal of all the waste generated in the city

1.2 Berlin's waste reports, and waste management strategies and plans

Every year, the relevant Berlin Senate Department produces a **waste audit**. This provides details about the nature, quantities and the origins of the waste (municipal waste, construction waste through until 2009, and hazardous waste) as well as about its disposal within Land Berlin. The waste report provides the planning data needed for the waste management strategy and the waste management plan and allows the annual scrutiny of the progress Berlin is making in waste prevention and waste recycling.

In addition, a **waste management strategy** is prepared which includes plans for domestic waste, for construction waste, and for hazardous waste. This is regularly updated. It contains details about the nature, quantity and origins of the waste currently being generated in Berlin with forecasts for the next ten years and details of recovery or disposal. It also proposes ways of realising the goals for the prevention, recovery and environmentally compatible disposal of waste. In addition, it also contains details of the steps taken to plan, erect, or maintain the necessary waste treatment plants. The forecasts included in the waste management strategy provide a basis for advanced planning of waste management in Land Berlin, going beyond the limited scope of the annual waste audits. The current waste management strategy was passed by the Berlin House of Representatives in May 2011.

On the basis of the waste management strategy, a **waste management plan** for Land Berlin is regularly drawn up, with subsections for domestic waste, for construction waste, and for hazardous waste. This also covers a period of ten years. The objective is to ensure the safe disposal of waste in the federal state over this period. The waste management plan takes into consideration the development and trends in the waste flow together with the demographic changes in Berlin. On this basis, predictions are made for future quantities of waste and the future needs for waste treatment capacity in Berlin. Areas which will be required for waste disposal plants in coming decades can also be determined in the Waste Management Plan.

For further details of the waste management strategy, plans and reports (in German) visit:

www.stadtentwicklung.berlin.de/umwelt/abfall

Berlin's municipal waste

Municipal waste is waste from private households and comparable sources, e.g. doctor's offices, local authority buildings, schools and day-care centres, as well as waste of a similar nature from businesses and industry. The municipal waste can also include bulky waste items, market waste, road sweepings, biological waste, sewage sludge, and separately collected materials, e.g. glass or paper. Construction waste is also formally classified as municipal waste, but the specific problems it poses are not dealt with here.

2.1 Important types of municipal waste

Different types of solid municipal waste are distinguished in terms of their origins, as follows:

Domestic waste: Domestic waste comes mainly from private households and is regularly collected by public waste utilities in standardised containers, and transported away for further treatment.

Domestic waste treatment is solely the responsibility of the waste management service run by the local authority. All households are obliged to take part in this system and to pay waste collection fees to the local or municipal authority. Households, as the generators of waste, have a so-called “duty of surrender” to the public collection service. In Berlin this is BSR (*Berliner Stadtreinigungsbetriebe*, cf. 3.1)

Some 80% of municipal waste in Berlin is domestic waste, and the remaining 20% is trade or industrial waste.

Trade waste: This is produced by enterprises and is collected together with the household waste. Trade waste comes mostly from service providers, retailers, and small businesses. In the typical tenement buildings in Berlin's inner city, the small businesses frequently share the waste containers with the flat dwellers in the same building.

Commercial waste: This is produced by small businesses, retail shops, service companies, public institutions, or manufacturing companies and they are responsible for its proper disposal. They may either dispose of it themselves or contract a specialist company to collect it separately from domestic waste. It is mostly collected in large or small containers and taken by the producer or the contracted collection company to the waste disposal plants, where it is treated together with the household waste.

Bulky waste: Bulky waste is solid waste which does not fit into the normal bins or containers, and which is therefore collected separately from the other domestic waste. Most of the bulky waste comes from private households, and in Berlin it can be collected and taken away for recycling or disposal. There is a charge for this service. Members of the public themselves can also deliver private bulky items to one of the BSR recycling yards in the city without charge.

Bulky commercial waste is either accepted by the BSR or by one of various private recycling services.

Road sweepings: Waste from road sweeping can include vehicle tyre particles and worn road surface, dead leaves, and grit spread in the winter. Road sweepings are collected by the BSR road sweeping vehicles and disposed of.



80%

Some 80% of municipal waste in Berlin is domestic waste.



20%

Some 20% of municipal waste in Berlin is trade or industrial waste.

Members of the public themselves can also deliver private bulky items to one of the BSR recycling yards in the city without charge.

2.2 Important types of recyclable materials

Recyclable materials are materials that can be reused or can be turned into other products or broken down into the raw materials. Domestic waste typically includes large quantities of the following valuable materials:

Paper: Old newspapers, magazines, catalogues, office paper, packing paper, cardboard and card represent an important raw material for the production of recycled paper and card. In order to be able to recycle scrap paper as a raw material it is important that it is as free as possible from impurities. Scrap paper was already collected separately in Berlin in various ways before the Packaging Ordinance came into force. Since the 1990s there has been a system of scrap paper collection covering the whole of the city. This makes use of blue wheelie bins placed alongside the grey residual waste bins for each property (collection system). The scrap paper is collected by various waste management companies and taken away for recycling. It can also be taken to the BSR recycling yards which are located throughout the city.

Occasionally, there are still also so-called “bundled” collections by various organisations, mostly charities. Typically, piles of old newspapers and magazines are tied into bundles and these are then collected by the organisation for recycling.

Organic waste: Organic waste such as fruit and vegetable residues, spoilt foodstuffs, leftovers, withered cut flowers, coffee grinds, tea-leaves, egg shells, garden waste, grass cuttings and dead leaves are valuable materials which can be composted. In Berlin’s inner-city area, organic waste is collected in separate brown wheelie-bins by the BSR and taken away for treatment. Some 90% of tenement buildings are now included in this system.

In the suburbs of the city, only about 15% of the properties are covered by the so-called “BIOGUT” collection. However, many of these households have their own garden and can compost much of their organic waste themselves.

Light packaging: Since the Packaging Ordinance came into force (cf. 1.1.2), manufacturers and distributors have been obliged to take back light packaging made of plastic, metal, or composite materials, e.g. yoghurt cartons, tin cans or drink boxes, and to recycle the materials in an environmentally acceptable manner.

Until December 2012, light packaging in Berlin was collected in a Yellow Bin (tenement buildings) or a Yellow Sack (houses), to be collected by a company commissioned by the operators of the Dual System for recycling.

Similar non-packaging waste (stNVP): In January 2013 a new recycling bin for packaging and similar materials was introduced in Berlin. This united the previously separate systems (“Yellow bin”, “Yellow bin plus” and “Orange Box”).

You can put this in the new recycling bin:

Packaging and other objects made of plastic, metal or composite materials

Plastics

- ↳ Containers (e.g. for yoghurt or margarine)
- ↳ Plastic bottles (e.g. for cosmetics, washing -up liquid, or fruit juice)
- ↳ Every-day objects (e.g. watering cans, flower pots, plastic bowls, toys)
- ↳ Plastic foils
- ↳ Foamed plastic

Metals

- ↳ Tins and cans
- ↳ Pots and pans, tools, cutlery, screws
- ↳ Aluminium foil, lids and containers
- ↳ Bottle tops

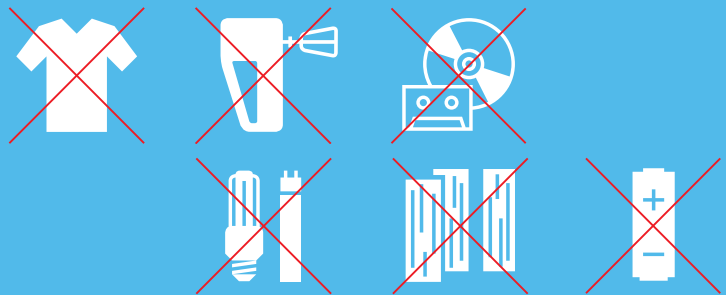


Compound materials

- ↳ Beverage containers
- ↳ Empty blister packs for medication

Do not put this in the new recycling bin:

- ↳ Electrical appliances
- ↳ Low-energy light bulbs
- ↳ Batteries
- ↳ Textiles
- ↳ Data storage media
- ↳ Wood



In the new recycling bin, packaging is collected together with other objects from equivalent plastics and/or metal, for example toys, pots and pans, tools, plastic bowls. This is then recycled or used for energy recovery. In the areas of the city covered by sack collection, the yellow sacks can be used for the recycling collection. Old clothes and small electrical appliances cannot be disposed of in the new recycling bin. It is calculated that the annual amount collected for recycling will increase by some 7 kg per capita. This corresponds to a total volume for Berlin of some 25,000 tonnes per annum.

70,000
tonnes

Every year some 70,000 tonnes of glass are collected in Berlin, which is about 20 kg per person.

Glass: Recycled glass can be used to produce new glass without any loss of quality. Recycled glass now makes up about 90% of newly produced glass. It is important that glass is sorted by colour before collection. As a rule, white glass is collected separately from green and brown glass (coloured glass).

Already in the 1970s and 1980s, glass was separated from other waste in Berlin in various ways. Since the Packaging Ordinance came into force in 1991 (cf. 1.1.2) glass has been collected separately throughout the city. The green and brown wheeled containers are provided for tenement buildings (collect system). In addition, throughout the city there are some 6,000 public “bottle bank” containers (bring system), in which members of the public can put their old glass items. The glass from the bottle banks and glass containers is collected by various companies for recycling. Every year some 70,000 tonnes of glass are collected in Berlin, which is about 20 kg per person.



In Berlin there are some 6,000 public glass collection containers

2.3 Declining levels of municipal waste in Berlin

The waste reports produced annually since 1999 (1992–1998: Waste Quantity Reports) give an overview of the developments of the amounts of municipal waste generated in Land Berlin. In 1992, the total quantity of municipal waste produced in Berlin – that is both disposed and recycled waste – totalled 2,594,000 tonnes. By 2012 this had been reduced to 1,481,000 tonnes, a decline of some 43%.

Some 79% of municipal waste comes from households, and the remaining 21% is from the commercial sector (including road sweeping). Some 57% of the municipal waste is disposed of in accordance with regulations, and about 43% is recycled or processed in waste-to-energy recovery.

However, in recent years there has been a continual decline in municipal waste disposal, which is attributable in particular to the falling amounts of commercial waste and the separate collection of other municipal recyclables. The development of municipal waste in Berlin for the period 1992–2012 is presented in the following figures.

Since the beginning of the 1990s there has been a significant decrease in the amounts of waste for disposal. In 1992 there was 2,325,000 tonnes of waste for disposal, but this had fallen by 2012 to only 822,000 tonnes. This represents a reduction of more than 60% in the municipal waste disposed of annually in Berlin since 1992. It is the result of increased activities to promote waste prevention, separate collection, and waste recycling.

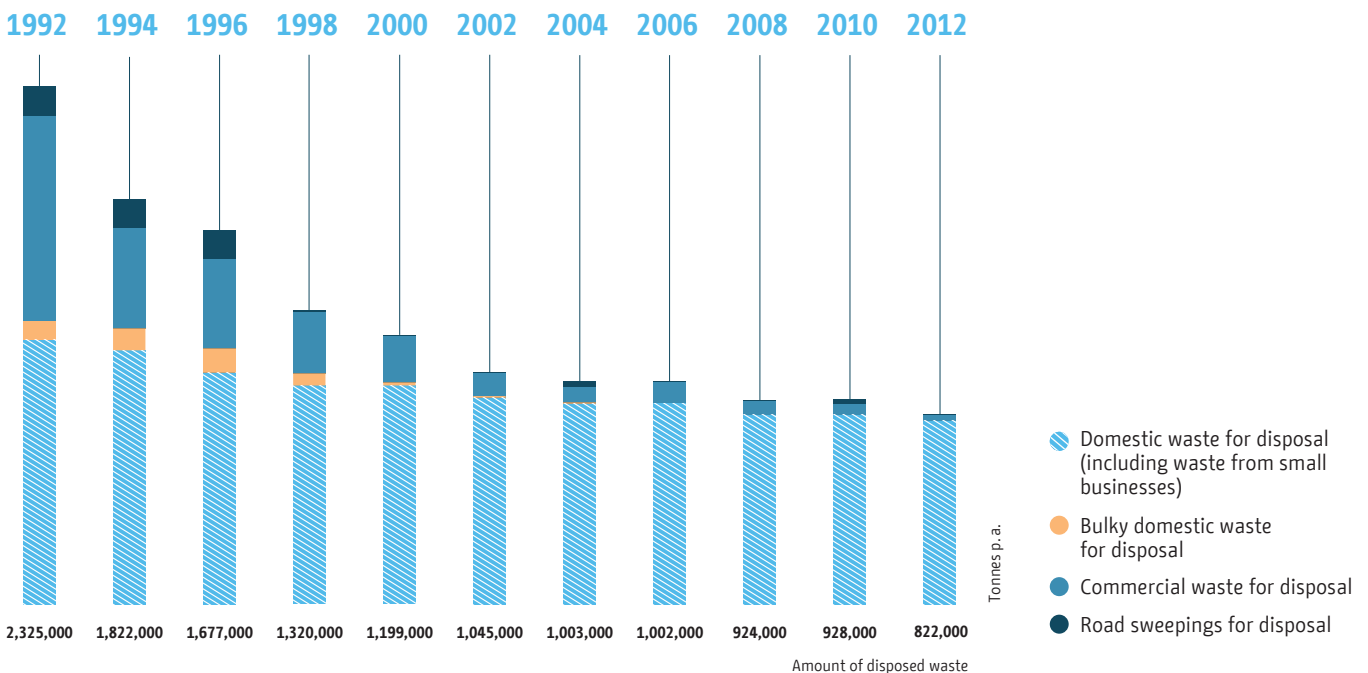


Figure 1: Development of municipal waste for disposal 1992–2012

While the amount of waste for disposal has declined, the amounts being recycled have increased markedly since 1992. Whereas only 269,000 tonnes of a total volume of waste of 2,594,000 tonnes was recovered in 1992, the recovered amount had more than doubled in 2012 to 624,000 tonnes, although the total had decreased to 1,481,000 tonnes. Proportionally, this represents an increase from some 10% in 1992 to more than 40% in 2012

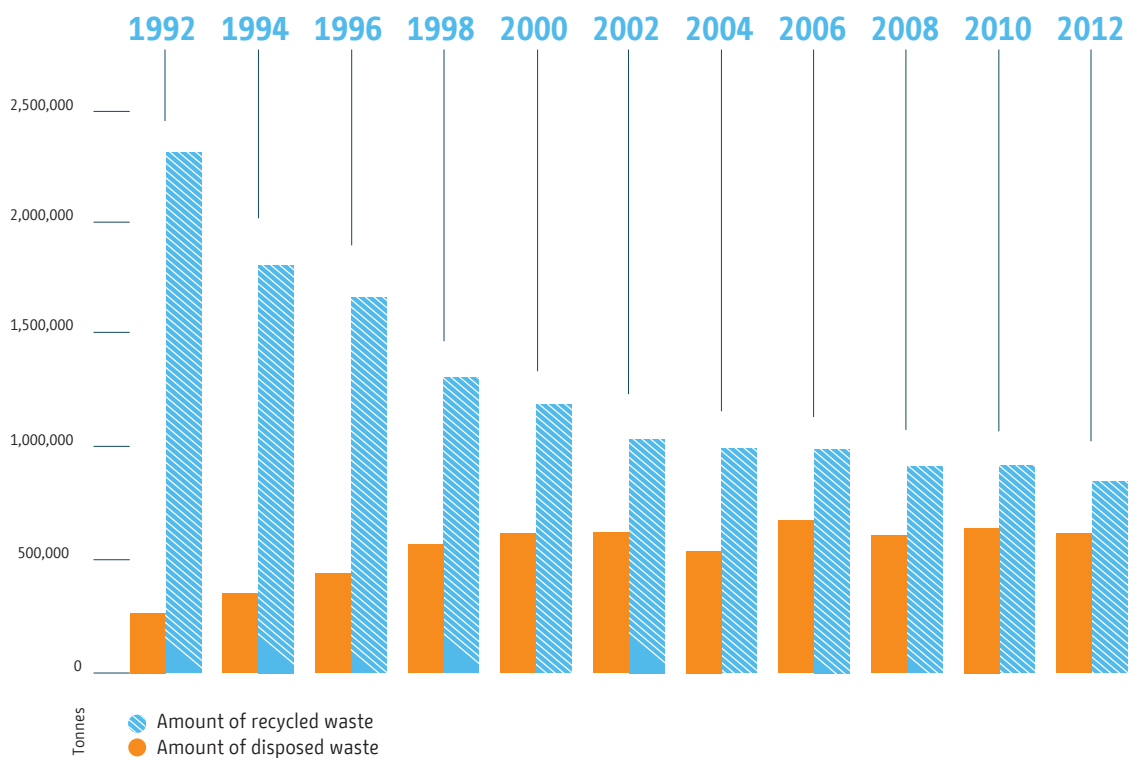


Figure 2: Development of amounts of recycled and disposed waste, 1992–2012

The treated municipal waste consists of the separately collected and recycled waste from households and small businesses, the domestic bulky waste, and treated road sweepings. This recycled quantity increased from 445,000 tonnes in 1996 to 624,000 tonnes in 2012. Whereas the recycling rate in 1996 was only about 20.9%, this had more than doubled by 2012 to 42.2%.

There is no legal requirement to surrender waste from commercial operations to the public collection service. Therefore it is not possible to fully document the recycling of commercial waste.

In 2012 the municipal waste in Berlin had the following composition (figures rounded to the nearest 1,000 tonnes):

Type of waste	Quantity tonnes	Proportion by weight-%	Amount per resident ¹ kg per capita pa
Domestic waste (without trade waste)	1,093,000	73.8	310.4
for disposal	673,000	45.4	191.1
for recycling	420,000	28.4	119.3
Trade waste	149,000	10.1	42.3
for disposal	149,000	10.1	42.3
Commercial waste recycled through the Dual System	46,000	3.1	13.1
Bulky waste from households	103,000	7.0	29.3
for disposal	0	0.0	0.0
for recycling	103,000	7.0	29.3
Commercial waste²	34,000	2.3	9.7
for disposal	34,000	2.3	14.5
Street sweepings	56,000	3.8	15.9
for disposal	1,000	0.1	0.3
for recycling	55,000	3.7	15.6
Total sum	1,481,000	100.0	420.6
for disposal	857,000	57.9	243.4
for recycling	624,000	42.1	177.2

¹ Population size: 3.520.809

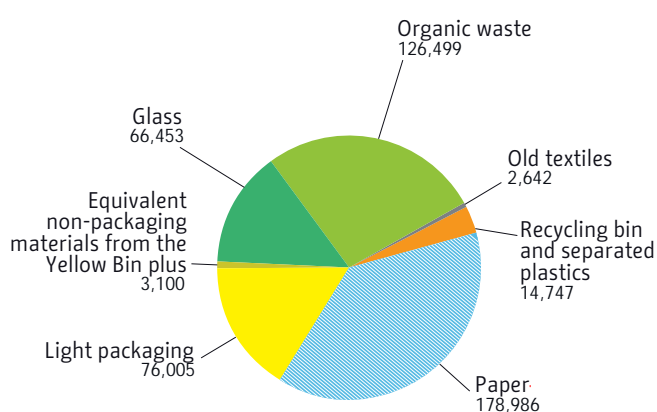
² Complete data about recycled commercial waste is not available

Table 1: Berlin municipal waste 2012



A Berlin tenement: Different types of waste are collected in different coloured bins

In 2012, nearly half a million tonnes of waste from households and small businesses in Berlin was recycled. The largest fractions by weight were paper and organic waste. The recovered waste was distributed as follows between households and small businesses:



Type of waste	Households	Small businesses	Total
Paper	146,769	32,217	178,986
Light packaging	69,165	6,840	76,005
Equivalent non-packaging materials from the Yellow Bin plus	3,100	0	3,100
Glass	59,143	7,310	66,453
Organic waste/ Garden clippings	123,969	2,530	126,499
Old textiles	2,642	no data	2,642
Recycling bin and separated plastics	14,747	no data	14,747
Total	419,534	48,898	468,432

Amounts in tonnes p. a.

Table 2: Waste recycled from Berlin households and small businesses in 2012

2.4 Waste management strategy for Land Berlin

In May 2011, the Berlin House of Representatives approved for the first time a binding waste management strategy for Land Berlin. This creates the boundary conditions for the prevention of waste and the disposal of all waste generated in Berlin for a planning period through until 2020. The strategy specifies the key steps needed for the development of waste management in Berlin into a modern, closed-loop system in the coming years. Particular attention is paid to climate protection and resource conservation.

The Berlin Waste Management Strategy includes ambitious climate protection targets which extend beyond securing waste disposal in Berlin. In addition to the reduction in the annual emissions of greenhouse gases of 1.2 million tonnes of CO₂-equivalent per annum already achieved by Berlin's waste management sector, it is hoped that relevant measures will make it possible to achieve a further annual reduction to the climate impact equivalent to 1.1 million tonnes of CO₂ 2020.

As an illustration: This planned reduction of climate impact corresponds to about 25% of the reduction in greenhouse gas emissions targeted by Land Berlin for the decade from 2010 to 2020. Sustainable waste management can therefore make a considerable contribution towards achieving the climate policy goals of Land Berlin.

This ambitious reduction in greenhouse gas emissions is to be achieved above all by high-quality recycling and cleaner recovery of waste and also by obliging government authorities and public bodies to apply criteria of environmental conservation when placing orders for products, building works, and services.

By 2020, relevant contributions to the reduction of CO₂-emissions and to the conservation of resources are to be achieved by making greater use of the potential for recovering materials and energy from all the biogenic and non-biogenic waste generated in Berlin.

For many years, a large proportion of refuse was indiscriminately dumped at waste disposal sites, where it was not available to be used in a sustainable manner as a CO₂-neutral source of energy. The goal of the waste management strategy is to handle municipal waste from 2015 onwards in such a way that it is all goes through recycling and energy recovery processes, and that no untreated materials are used as landfill.

The accelerated withdrawal from the current treatment of biogenic materials in basic composting plants can also lead to considerable reductions in emissions of greenhouse gases (e.g. methane, nitrous oxide). Therefore from 2016 onwards, all collected biogenic materials (some 1,200,000 tonnes/a), such as grass cuttings and dead leaves, will be treated in an energy-efficient manner while minimising the climate impact. Together with further measures for the high-quality recycling of biogenic materials – for example the city-wide collection of organic waste without charge – it is intended to achieve a reduction of greenhouse gas emissions of 260,000 tonnes CO₂ per annum by 2016.

As an illustration, this potential reduction corresponds to some 11% of the current annual CO₂-emissions of all car journeys in Berlin.

All the individual measures included in the waste management strategy were developed with the aim of achieving a higher quality recycling of waste and to reduce climate impact. Against this background, the goal is to increase the amount of recycled municipal waste by some 100,000 tonnes/a by 2020, and in consequence to reduce the amount of residual waste for disposal to some 820,000 tonnes/a.

In this context, the city-wide introduction of a new recycling bin for packaging and similar materials which began in January 2013 is particularly important for waste management. This will lead to the collection of an extra 25,000 tonnes of recyclables annually, and the recovery of materials will lead to a further reduction of environmental impacts.

To evaluate the waste management and to determine further potential for reducing climate impact, the Senate Department of the Environment has carried out an audit of flows of substances and the environmental and climate impacts for all relevant types of waste and this will be continued on an annual basis (see 5.2). This instrument is the first of its kind to be introduced in Germany, and it can provide important impulses for comprehensive and sustainable recycling.

The BSR (*Berliner Stadt- reinigungsbetriebe*)

BSR is one of the largest waste management companies in Europe.

It has around 5,300 employees and a fleet of some 1,600 vehicles – of which more than 1,200 are for special purposes. In 2012, BSR collected and disposed of more than 1 million tonnes of waste.

3.1 The remit of BSR

The *Berliner Stadtreinigungsbetriebe* (BSR) was founded in 1951 as a municipal enterprise of Land Berlin and since 1 January 1994 it has been a statutory body in 100% ownership of Land Berlin. BSR is one of the largest waste management companies in Europe. It has around 5,300 employees and a fleet of some 1,600 vehicles – of which more than 1,200 are for special purposes. In 2012, BSR collected and disposed of more than 1 million tonnes of waste.

The core operational sectors of BSR include the safe and environmentally-compatible treatment of domestic waste and organic waste (safe waste management), the promotion of waste prevention, waste consultancy, keeping the city clean and tidy, and ensuring that main roads are clear in winter.

BSR finances itself from the collection fees and other charges for services (cost recovery principle) but it does not generate profits and cost reductions directly benefit the fee-payers. The waste collection and disposal in Berlin is organised from four BSR depots. Operating some 194 trips every day for residual waste collection and 42 ‘BIOGUT’ trips (collection of organic waste), BSR collects some 820,000 tonnes of residual waste annually and more than 62,000 tonnes of biodegradable waste from households and businesses. The residual waste then goes through recycling or energy recovery procedures. Biogas is produced from organic waste in a fermentation plant.

In January 2013, Berlin introduced a new recycling bin for packaging and similar materials. This will be used not only to collect packaging from private households, but also other waste containing the same materials (for example watering cans or toys made of plastic, metal pots and pans, tools, etc.). These will then either be recycled or used for energy recovery. BSR and ALBA will share the responsibility for emptying the bins. BSR empties a fifth of the recycling bins in Berlin.

In addition, BSR operates 15 recycling yards in the city with 6 collection points for harmful substances, collecting 20 recyclable substances and 30 harmful substances. Here members of the public can hand in domestic recyclable substances, e.g. bulky waste items, wood, scrap paper, electric and electronic waste, as well as problem waste. The recycling yards are visited by about 2.2 million customers annually. Every year, the recycling yards collect some 140,000 tonnes of recyclable materials and 3,000 tonnes of harmful waste.

BSR is also responsible for cleaning Berlin’s road network. The operations are organised from its five regional centres. Some 2,000 personnel clean 1.5 million km of the city’s roads and pavements annually. Each year, this results in about 80,000 tonnes of road sweepings being collected and more than 21,000 public litter bins being emptied some 5.7 million times.

Two levels of winter services are provided, with the teams working round the clock if necessary to clear 10,500 road kilometres. In addition, they also clear snow from 18,500 pedestrian crossings – often many times a day. BSR winter service teams also clear selected city squares, bus stops, and cycleways.

some
820.000
tonnes
of residual
waste

some
62.000
tonnes
of biodegradable
waste

Operating some 194 trips every day for residual waste collection and 42 ‘BIOGUT’ trips (collection of organic waste), BSR collects some 820,000 tonnes of residual waste annually and more than 62,000 tonnes of biodegradable waste from households and businesses.

BSR also offers independent consultancy services for private households, small businesses, public administrations, schools and pre-school facilities on waste avoidance, recycling, and environmental considerations when dealing with waste. By means of a range of products ranging from card games for children or a BSR app for mobile phones through to target-group specific fact sheets, brochures and posters, BSR provides information about how to deal with waste and to protect the environment. For more information (in German) visit the website of BSR (www.bsr.de) or trenntstadt-berlin.de.

BSR also has subsidiaries through which it offers commercial waste disposal services. One of these is Berlin Recycling, which collects sorted glass on behalf of the Dual System in Berlin, and offers additional services such as the collection of waste paper and container services for all types of waste, as well as waste management and the destruction of data storage media. Berlin Recycling is a 100% subsidiary of BSR.

BSR has a 50% holding in BRAL Reststoff-Bearbeitungs GmbH, which recycles and recovers materials from refrigerators, electrical and electronic waste, and disposes of waste



In Berlin there are some 20,000 public litter bins

food from the gastronomy sector. BSR also has a 51% holding in gbav (*Gesellschaft für Boden- und Abfallverwertung mbH*). This provides dry and wet mechanical treatment for contaminated soil, building waste, and road sweepings.

15
recycling
yards

BSR operates 15 recycling yards in the city for collecting recyclable and harmful substances.

3.2 Waste treatment plants used by BSR

For the environmentally-compatible treatment of the waste it collects BSR operates various plants – in some cases alone, in other cases in public-private partnerships. The most important plants are described in the next chapter.

BSR is sole owner of the Waste-to-energy power station (MHKW) in Ruhleben, the Biogas fermentation plant in Ruhleben, the MPS mechanical-physical stabilisation plant in Pankow, and the Gradestrasse sorting station and waste handling plant, and it is a shareholder in the MPS mechanical-physical stabilisation plant in Reinickendorf.



Waste collection from Berlin households

Waste treatment plants in Berlin

On the following pages, some of the important waste treatment plants in Berlin are described. There are also other waste treatment plants in the city.

4.1 Waste-to-energy power station MHKW Ruhleben

BSR's MHKW Ruhleben Waste-to-energy power station with an annual capacity of 520,000 tonnes of waste forms the centrepiece of Berlin's waste disposal. It went into operation in 1967, and has since been successively extended and refitted many times. With the commissioning of the new Line A in September 2012 (together with the decommissioning of Lines 5 to 8), the MHKW now has a total of five incineration lines (Line A and Lines 1 to 4). It operates in a continuous three-shift system.

The majority of the waste is delivered by BSR, with a smaller proportion being delivered by other companies. When the waste arrives at the MHKW it is inspected, weighed and transported to the waste incineration lines, where it is incinerated on the moving grates. The flue gases resulting from the combustion have a temperature of more than 850° C. High-pressure super-heated steam is produced which is passed on to the neighbouring Reuter Power Station, where it is used to generate electricity and for district heating.

The flue gas treatment plants for the incineration lines 1 to 4 operates with dry adsorption and selective catalytic reduction of the nitrogen oxides (DeNO_x plant), while the flue gas

The levels of pollutants in the emissions are well below the limit values.



Entrance area of the Ruhleben waste-to-energy power station

170 kg

For every tonne of incoming waste, the MHKW achieves a reduction of greenhouse gas emissions of some 170 kg CO₂-equivalent.

treatment for the new Line A uses dry adsorption combined with wet, closed-cycle scrubbing and DeNO_x plant. The purified flue gases are emitted into the atmosphere through a 102 metre chimney. The levels of pollutants in the emissions are well below the limit values specified in the 17th Ordinance of the Federal Ambient Pollution Act, including the limit values for dioxins and furans (0.1 ng/m³).

After incineration, about 25% by weight of the original waste remains in the form of slag. This is further treated in the slag treatment plant. In particular, any remaining scrap metal is removed from the slag. Annually, this procedure leads to the collection of about 12,000 tonnes of ferrous scrap, which can be passed on to scrap metal merchants. The remaining slag is used by BSR on its waste disposal sites to form the substrate for the surface sealing system when upgrading waste depots.

Harmful substances are concentrated as dust in the filters and collected by the flue gas treatment plants. This non-recoverable portion of the waste, accounting for some 2.2% by weight of the total, is disposed of in underground depots.

For every tonne of incoming waste, the MHKW achieves a reduction of greenhouse gas emissions of some 170 kg CO₂-equivalent.

4.2 Mechanical-Physical Stabilisation plants (MPS)

Within the framework of a public-private partnership (PPP), MPS Betriebsführungsgesellschaft mbH was established in 2004 by BSR and the private company ALBA. It operates two mechanical-physical stabilisation plants in the Berlin Districts of Pankow and Reinickendorf. The Pankow plant is owned in full by BSR, which also holds a share in the Reinickendorf plant.

Mechanical-physical stabilisation is an innovative method for the treatment of residual waste. Initially, the waste is prepared mechanically. After delivery, the waste passes through a series of separation and treatment processes (receipt, drying, inspection, and classification). Valuable substances such as metals are removed as well as bulky waste and other waste which would disturb the process. The waste is then dried. The drying process leads to reduction of about 30% in the weight of the waste being treated. After drying, the material is sorted in order to separate combustible fractions (paper, plastics, textiles) from non-combustible ones (minerals, ashes from domestic fires, glass). The combustible elements are either used in the form of loose fluff in cement production or they are compressed into pellets and used as material or as fuel.

The treated flows are combined at the 30m-high chimney and released together into the atmosphere.

Energy recovery takes place in power stations and in cement production.

The air extracted from the halls and from aggregate treatment are combined in three main gas flows for separate treatment:

- ↳ Dust removal by filters,
- ↳ Biological treatment of the odorous, dust-free exhaust air flow,
- ↳ Regenerative thermic oxidation (RTO) of the exhaust air from the dryers after dust extraction, followed by additional treatment of the RTO-exhaust air over an active-carbon filter.

460 kg

For each tonne of waste input, the MPS plants achieve an average reduction of greenhouse gas emissions of some 460 kg CO₂-equivalent.

In this way it is possible to directly replace primary fuels. The MPS treatment procedure is capable of providing material and waste-to-energy recovery for 95% of the treated waste. Only 5% of the waste finally remains to be disposed of.

The two MPS plants are each certified for an annual total intake of up to 220,000 tonnes of waste and currently they are operating with an input of 190,000 tonnes per annum. Every year, each of the two Berliner MPS-plants produces some 90-95 thousand tonnes of refuse-derived fuel (RDF).

For each tonne of waste input, the MPS plants achieve an average reduction of greenhouse gas emissions of some 460 kg CO₂-equivalent.



Inside the Mechanical-Physical Stabilisation Plant Reinickendorf

98%

After the biogas has been cleaned, treated and concentrated, it consists of 98% methane, and is therefore chemically identical with natural gas.

4.3 Biogas fermentation plant

Some 60,000 tonnes of organic waste are collected by BSR every year in the city's BIOGUT bins. Since the summer of 2013, this organic waste has been treated in the newly-erected biogas fermentation plant in Berlin-Ruhleben. Recycling and energy recovery mean that in comparison with the composting procedures previously used it has been possible to reduce emissions of greenhouse gases.

The biogas plant of BSR in Ruhleben has a capacity of 60,000 tonnes. The plant operates using the dry fermentation method. Microorganisms from the organic waste generate the biogas. This method is particularly suitable for organic waste with a water content of 60–80%, which is typical for kitchen waste from Berlin households.

After the biogas has been cleaned, treated and concentrated, it consists of 98% methane, and is therefore chemically identical with natural gas. After having been prepared in this way it can therefore be fed into the gas supply so that the natural gas vehicles used by BSR for waste collection can be refuelled at its own filling points. In the coming years it will be possible for BSR to operate as many as 150 natural gas vehicles.



Tipping area of the Ruhleben biogas plant

4.4 Paper sorting plant Neukölln

Wertstoff-Union Berlin GmbH (WUB), a company newly founded by BSR and Remondis in 2011, opened a new sorting plant for waste paper in the Neukölln district of Berlin in September 2012. This is one of the most modern paper sorting plants in Germany. In a two-shift operation, waste paper, card, and cardboard are sorted into various quality classes, before being compressed and then marketed. The waste paper is collected from small businesses, shops, manufacturers, and from private households, mostly from Berlin and Brandenburg.

The approved annual capacity of the plant is 225,000 tonnes. It operates 24 hours every day, except on Sundays and public holidays.

With each tonne of paper intake, the plant achieves a saving of approx. 640 kg CO₂-equivalent.

640 kg

With each tonne of paper intake, the plant achieves a saving of approx. 640 kg CO₂-equivalent.



Inside the WUB Paper sorting plant in Neukölln

4.5 Mechanical Treatment Plant Köpenick

Since 2005, Otto-Rüdiger Schulze GmbH & Co KG has been operating a mechanical waste treatment plant in Berlin-Köpenick, in which Berlin municipal waste and construction waste are sorted and treated or passed on for utilisation.

The plant consists of two separate lines.

The first of these handles mixed construction waste, bulky waste, and low-grade construction waste left over after sorting. Every year up to 78,000 tonnes of this waste is treated and up to 100,000 tonnes transported to other locations for further treatment. The waste is first passed through gratings and vibration sieves and passed along a conveyor belt under a magnet separator. In a sorting cabin, the waste is then also sorted manually. In the reception area for construction and demolition waste, wood and bulky items, the smaller delivered loads are sorted and batched to form larger units for transport elsewhere.

On the other line, up to 100,000 tonnes of mixed municipal waste is processed every year. Most of this waste is delivered by BSR. The incoming waste is first inspected and bulky or unwanted items are sorted out. The material is then passed through a shredder. This is then followed by a magnet separator which removes ferrous metal. Finally, a drum sieve

420 kg

For each tonne of waste intake, the plant achieves a reduction of approx. 420 kg CO₂-equivalent.



Bio-filter plant of the Mechanical Treatment Plant Köpenick

separates the material into a mineral-biological fraction and a high-calorific fraction. Dust and odours produced in the course of the treatment are extracted by two separate systems and passed through a wet-treatment and bio-filter system.

Only a small part of the waste pre-treated in this way at the mechanical treatment plant will later have to be disposed of, while much the largest part can be used as refuse-derived fuel in Brandenburg RDF-plants.

For each tonne of waste intake, the plant achieves a reduction of approx. 420 kg CO₂-equivalent.

4.6 Sorting plant for recyclable materials

Since 2005, the firm ALBA has been operating one of Europe's most modern sorting and processing plants for light packaging waste such as plastics, metal and composite packaging, which has been collected in the recycling bins. The plant operates at a high technical standard, with various optoelectronic and near infrared controlled operations.

After delivery to the sorting plant, the recyclables are sorted preliminarily and put through a shredder. The materials then go through three sieve drums followed by a complicated

510 kg

Per tonne of waste intake, the plant achieves a saving of approx. 510 kg CO₂-equivalent.



Sorting plant for lightweight packaging in Hellersdorf

system of conveyor belts, along which 15 separators sort the reduced packaging waste into various fractions.

Foils are removed by pneumatic separator, and ferrous-metals by means of magnets above the conveyor belts. A ballistic separator distinguishes between flat and formed plastics. Various near-infrared scanners separate out further fractions, e.g. tetrapacks. Finally there is a manual quality control.

The individual types of material (metals, wood, card/paper, various types of plastic or foils) are compressed and bailed or filled in containers. These valuable substances are then transported to the relevant recycling plants. About 50% of the waste deliveries is separated out into a high-calorific value fraction, bailed and transported to plants where it is used as refuse-derived fuel (RDF).

The sorting plant can process up to 140,000 tonnes of waste annually. For the various waste fractions it achieves a degree of purity of up to 95%. Per tonne of waste intake, the plant achieves a saving of approx. 510 kg CO₂-equivalent.

4.7 Plants for the disassembly of refrigerators and the recycling of electrical and electronic appliances

Refrigerators have a very high proportion of components which contain harmful substances. For example, the refrigeration cycle of an older fridge will contain about 150 to 200 g of environmentally-harmful CFC R12 (dichlorodifluoromethane), and another 300 g in its compressor oil. The foamed polyurethane (PUR) insulating material of a fridge contains about 500 g of the environmentally harmful CFC R11 (trichlorofluoromethane). New refrigerators



Refrigerator Disassembly Plant Neukölln: Emptying the refrigeration cycle

are largely CFC-free, and they operate with ammonia or pentane as the cooling agent. Refrigerators also contain a variety of valuable materials, e.g. ferrous and non-ferrous metals, plastics, glass or electro-technical components.

Electrical and electronic appliances (e.g. computers, televisions, vacuum cleaners, washing machines, photocopiers) and small appliances (e.g. toasters, irons, hair dryers, telephones) can also be disassembled and valuable components recycled. At the same time, harmful substances can also be separated out.

In Berlin there are two larger plants for the disassembly of refrigerators and the recycling of electrical and electronic appliances.

Since 1996, BRAL-Reststoff-Bearbeitungs GmbH has been operating such a plant in Berlin-Hohenschönhausen. Every year, about 170,000 refrigerators and 11,000 tonnes of small electrical and electronic appliances are delivered. In the refrigerator disassembly plant the refrigerators operating with either CFC, ammonia, or cyclopentane can be disassembled in batches. Firstly, the appliances are sorted according to the type of refrigerant, the housing insulation, etc., and then disassembled. The plant is able to deal with up to 40 refrigerators and up to 25 domestic freezers every hour.

A further plant for the disassembly of refrigerators and freezers and the recycling of electrical and electronic appliances has been operated since 1996 by the company Remondis (before 2005: Rethmann Elektrorecycling GmbH) in Berlin-Neukölln. Every year, up to 300,000 domestic refrigeration appliances are delivered for disassembly and recycling, and also about 12,000 tonnes of electrical and electronic waste.

The electrical appliances are mostly disassembled manually on a semi-automated conveyor belt. The various types of material are separated and harmful substances are identified and removed.

The refrigerators are disassembled in a number of steps, in the same procedures as in the Hohenschönhausen plant. The Neukölln plant can process up to 45 refrigerators per hour.

More than 80% of refrigerants which contribute to ozone depletion or act as greenhouse gases are recovered by the Berlin refrigerator disassembly plants. They are among the best plants of their type in Germany.

More than 80% of refrigerants which contribute to ozone depletion or act as greenhouse gases are recovered by the Berlin refrigerator disassembly plants. They are among the best plants of their type in Germany.

Model Berlin waste projects

*On the following pages,
some model Berlin waste projects
are described.*

5.1 Administrative regulations for environmentally-friendly purchases

The public acquisition system can play an important role in a modern closed-cycle economy. Every year, official bodies in the city, from the city and district administrations to the public corporations, statutory bodies and public-law foundations purchase products and services costing some EUR 4 to 5 billion. When placing orders, a considerable contribution can be made to environmental protection by giving preference to environmentally-friendly products and materials and to processes which reduce the impact on the environment. In this way it is not only possible to conserve resources such as energy and water, but also to prevent threats to health and the environment.

The communal bodies can and should become a driving force for innovation in numerous product and service sectors by promoting the use of durable, energy-efficient products which have a limited impact on the climate, the environment and public health, and which are produced under fair conditions. This can therefore also result in increased economic efficiency. Follow-on costs, which in the past have either been ignored or underestimated, can now be effectively reduced. This can strengthen modern closed-cycle waste management and contribute to waste avoidance.

In its policy statement the Berlin City Government emphasises that it is paying increasing attention to the acquisition of environmentally compatible services and products. This applies not only for Land Berlin but also all its holdings. The Berlin House of Representatives passed the Berlin Public Procurement Act (BerlAVG) which came into force on 23 July 2010. This obliges all public purchasing offices in Land Berlin to take environmental criteria into consideration for their procurements, including the lifecycle costs. Article 7 BerlAVG establishes the basis for the Senate to decree administrative regulations for an environmentally-compatible procurements system.



Berlin's city administration now predominantly uses recycled paper

In line with this provision, on 23 October 2012 the Berlin Senate issued a Decree on the application of regulations for environmentally-friendly purchases and order placements for deliveries, construction work and services – VwVBU”, which came into force on 1 January 2013. It establishes minimum environmental criteria for the acquisition of relevant products, construction work and services in the form of datasheets, constraints on purchases, and specifications for the evaluation of tenders by calculating life cycle costs for electric appliances, vehicles, and buildings.

In this way, environmental and economic targets are combined. The life-cycle approach considers both the purchasing costs and also the costs for use or operation. These also have to be taken into account when planning new buildings or refurbishing energy-relevant office buildings.

With this administrative regulation, Berlin has set an example for the rest of Germany. The regulation contains demanding environmental criteria, for example for office materials, office equipment, cleaning agents and cleaning services, road vehicles, large-scale events, tenders for power supplies, the planning of office buildings, and for the recycling of commercial waste. By 2020, environmentally-compatible procurements and the establishment of a model closed-loop system are expected to reduce annual greenhouse gas emissions by up to 800,000 tonnes CO₂-equivalent.

Before the administrative regulation came into force, the personnel of the city’s purchasing departments were provided with training at the Berlin Administrative Academy. In addition, practical guidelines were issued on the implementation of the new provisions, and an Internet platform was set up on the website of the Berlin Senate Department for Urban Development and the Environment.

In the coming years, evaluations will be carried out not only of the environmental effects of the administrative regulation but also of the economic consequences, and where necessary appropriate adaptations will be made.

It is also intended to draw up additional information sheets in dialogue with corresponding companies and associations (e.g. concerning recycling concrete, lifts, work and safety wear, computer centres, telephone systems).

5.2 Auditing material flows and climate & environmental impacts for Berlin waste

The waste management strategy adopted by the Berlin House of Representatives for the period 2010 to 2020 also provides for an extension of the annual waste audits to provide a comprehensive report on material flows, and climate and environmental impacts for non-hazardous waste, in order to improve the control and evaluation of waste material flows.

Therefore the Senate Environment Department, partially financed through the “Climate Protection – Sector strategies” programme of the Federal Ministry of the Environment, commissioned the IFEU Institute Heidelberg and the ICU Berlin to develop a plan for the implementation of exemplary, climate-friendly waste management measures for Land Berlin.

The final report was published in March 2013. No other German federal state has adopted such comprehensive approach for the auditing of material flows and climate and environmental impacts of waste material flows.

The study showed that in 2010, Berlin’s waste management strategy had already led to a considerably reduction in greenhouse gas emissions, totalling some 900,000 tonnes CO₂-equivalent. Optimisation of the treatment of 36 different types of waste and the improved separate collection of dry recyclables and organic waste from domestic and commercial waste can lead to a further reduction in greenhouse gas emissions (carbon dioxide, methane and nitrous oxide) amounting to some 248,000 tonnes CO₂-equivalent.

Such improvements to the treatment of the most relevant types of Berlin waste could therefore lead to a total reduction of greenhouse gas emissions of some 1,148,000 tonnes



In future, Berlin will regularly analyse material flows and carry out climate and environmental audits for the most relevant types of waste

CO₂-equivalent. This corresponds to some 25% of the reductions in greenhouse gases targeted by Land Berlin from 2010 to 2020.

Sustainable waste management can also contribute significantly towards achieving the climate policy goals of Land Berlin. The measures proposed in the study (e. g. increased recovery of materials from commercial waste, reduction of nitrous oxide emissions from sewage sludge incineration and higher-quality treatment of biogenic materials such as dead leaves and grass cuttings) are to be implemented as quickly as possible. In addition to regulations for public bodies, voluntary agreements are also planned with private companies.

In particular, the following instruments are to be used:

- ↳ Specification of relevant environmental protection requirements in future versions of the Berlin Administrative Regulations for Environmentally-friendly Procurements (VwVBU),
- ↳ Initiating or specifying climate protection agreements, in particular with BSR, ALBA, BWB, the district parks and gardens departments, and landscape architects.

The study began with an evaluation of waste disposal measures on the basis of greenhouse gas emissions. Further environmental parameters – such as resource conservation and air pollutant emissions – are also being considered in an on-going environmental audit for Berlin's most important types of waste. The first complete audit of material flows and climate and environmental impacts for the most relevant types of waste in Land Berlin is available for 2012.

For the full version in German of this extensive report (370 pages) and the summary, visit the Website of the Senate Department:

www.stadtentwicklung.berlin.de/umwelt/abfall/entsorgung/de/klimakonzeption.shtml

5.3 The new recycling bin for packaging and similar materials

An important contribution to the reduction in the amounts of residual waste is achieved by the separate collection of recyclable materials. For many years, Berlin has had a well-established system for collecting substances separately for recycling. In 2012, some 163,000 tonnes of paper was collected in Berlin, as well as 66,000 tonnes of glass, 80,000 tonnes of light packaging, 120,000 tonnes of organic and green waste and then recycled using a range of technical processes. Meanwhile, nearly 50% of Berlin's municipal waste is recycled to recover either substances or energy.

In January 2013, Berlin introduced a new recycling bin for packaging and similar materials as one of the first federal states in Germany. In addition to light packaging, these bins are also used to collect equivalent non-packaging waste (stNVP). Equivalent non-packaging recyclables include objects made of metal and/or plastics, e.g. watering cans, flower pots, plastic bowls, toys, pots and pans, tools, cutlery, etc. Collections from the new bins are carried out by BSR and by ALBA. The contents of the recycling bins are sorted at the ALBA Sorting Plant at Hultschiner Damm in Berlin-Mahlsdorf.

The introduction of the new recycling bin promises to further reduce environmental impacts in the future. According to an Audit of material flows and climate impacts (2012) commissioned by the Senate Department for Urban Development and the Environment, the recycling bin in combination with an appropriate waste management system and supplementary measures can be expected to increase the annual amounts collected and recycled by up to 7 kg per resident per annum (corresponding to a total for the city of 25,000 tonnes/a) by the year 2020.



Meanwhile, nearly 50% of Berlin's municipal waste is recycled to recover either substances or energy.

In 2013, Berlin was one of the first German Länder to introduce a new recycling bin for packaging and similar materials

5.4 Using recycled concrete for building construction

The waste management strategy for Land Berlin also addresses the high-quality recycling of building materials. Every year, about 1 million tonnes of recycling concrete is generated in Berlin. An on-going investigation of the environmental and climate impacts of material flows in Berlin has shown, among other things, that the utilisation of recycled concrete in the building industry could make an important contribution to increasing resource efficiency.

However, so far the recycled concrete has only been used in less critical civil engineering construction work, for example as substrate for carriageways or car parks, or for temporary access roads and noise abatement walls.

Although industrial standards were introduced for the use of recycled aggregate in concrete for building construction in 2004 – so that this represents a controlled building product – no recycled concrete has as yet been utilised in building projects in Berlin.

These measures mean that it would be possible to dispense with the extraction of gravel aggregate. The direct availability of the raw material in the urban conurbations (demolition sites) also eliminates the long transport routes from gravel quarries to the concrete production plants. And using the materials of anthropogenic origins makes it possible to conserve resources, minimise impacts on nature and the landscape, and avoid much of the environmental impacts caused by transport.



Every year, about 1 million tonnes of recycling concrete is generated in Berlin.

The use of recycling concrete in construction can represent an important contribution towards increasing resource efficiency

In order to stimulate demand and to overcome the prejudices which exist against the use of recycling concrete, in 2013 the Berlin Senate Department for Urban Development and the Environment initiated a pilot project on the use of recycled concrete in the course of the construction of a new laboratory for the Food Sciences Department of Humboldt University in Berlin-Mitte. The project was supported by experts from the Brandenburg Technical University Cottbus (Construction Recycling).

In order to realise the higher-quality recycling of concrete, Land Berlin is promoting the increased use of recycled concrete in public building projects. Corresponding environmental requirements are to be included in future versions of the Berlin Administrative Regulations for Environmentally-friendly Procurements.

This can represent a noticeable contribution to the advancement of waste management in Berlin towards a modern closed-cycle system with high resource efficiency.

5.5 Recycling biomass

The Berlin waste management strategy 2010 also included provisions for the sustainable recovery of materials and energy from biogenic waste collected in the city with the goal of achieving appreciable reductions in greenhouse gas emissions by 2016 at the latest.

In 2008, the Berlin Senate Environmental Department commissioned a biomass study to determine how much biogenic material was generated. The study also developed strategic proposals to optimise the high-quality treatment of organic matter while reducing climate impacts. The catalogue of measures proposed in the biomass study have meanwhile been detailed in the form of guidelines for action and a study on the treatment of grass cuttings with the aim of reducing the impact on the climate. The project was funded as part of the Environmental Relief Programme II through the European Fund for Regional Development (EFRD) together with Land Berlin (Project No. 11268 UEPII / 3). Representatives of public utilities and the waste management industry also contributed to the study.

Since the guidelines were intended in particular to be of assistance to the public institutions of Land Berlin in the implementation of the catalogue of measures, it was developed in close consultation with the district parks and gardens departments.

In the course of the investigations, various ideas for higher-quality handling technologies were considered (e.g. energy recovery or fermentation processes) and the climate impacts evaluated.

The study showed that the district parks and gardens departments alone collected some 41,000 tonnes of grass clippings and dead leaves every year, and that this could be treated in ways which promised to offer higher quality than simple composting. The implementation of these measures can reduce annual greenhouse gas emissions in Berlin by some

12,000 tonnes CO₂-equivalent. The further refinement of the separate collection of green waste – in particular dead leaves – could further increase this reduction to 20,000 tonnes CO₂-equivalent.

Large quantities of dead leaves and grass cuttings are also collected by the BSR utility and private companies. In total, some 150,000 tonnes of green waste are generated every year in Berlin which could in future be available for high-quality handling with corresponding reductions in climate impacts.

The conclusions of the study were also integrated as requirements in the Berlin Administrative Regulations for Environmentally-friendly Procurements (VwVBU, see 5.1). In future calls for tenders, the district park and gardens departments will have to specify stringent environmental criteria (e.g. energy efficiency), in this way ensuring the high-quality treatment of green waste in the city.

The implementation of these measures could lead to further reductions in greenhouse gas emissions at comparatively low costs.



In Berlin, some 150,000 tonnes of green waste will be available every year for high quality recycling

The prospects for waste management in Berlin

Waste is becoming an increasingly important resource and a valuable raw material, which also has a growing importance as a source of energy which can reduce climate impacts and conserve resources. In view of rising prices for raw materials and the threats of global climate change, waste management in future will have to increase its efforts to develop and introduce more efficient technologies while being even more careful in the consumption of resources.

Over the past two decades, Land Berlin has been successful in its efforts to ensure that the waste generated in the city is handled in an environmentally responsible way. Much has already been achieved but there are still things to be done. There is still potential in the city to further prevent waste and to improve the separation of waste before collection, as well as to achieve higher-value recycling of waste.

In particular, the collection of organic waste from private households and from small enterprises needs to be expanded in the coming years. There is also scope to further optimise the recovery of small electrical appliances by means of appropriate measures.

In 1999, the German Federal Environment Ministry formulated its “Target 2020” for waste management. According to this, waste handling technologies are to be developed and implemented such that by 2020 all municipal waste in Germany should be completely recycled in an environmentally compatible manner.

Land Berlin is framing its waste management strategies with the aim of meeting this ambitious target. In the coming years, Berlin Senate Environmental Department will be carrying out regular audits of material flows and environmental and climate impacts for the most-relevant types of waste in Land Berlin. This will provide the basis for the higher-quality handling of waste material flows. The future goal is then to exploit the remaining potential for resource conservation as fully as possible while at the same time reducing environmental impacts.

Annex

7.1 Waste management legislation and regulations

European Union level:

- ↪ Waste Framework Directive (WFD): Directive 2008/98/EC of the European Parliament and of the Council dated 19 November 2008 on waste and repealing certain Directives (Official Journal of the European Union L 312 dated 22.11.2008, p. 3).

German Federal level:

- ↪ Act for Promoting Closed-loop Waste Management and Ensuring Environmentally Compatible Waste Management (KrWG) dated 24 February 2012 (Federal Law Gazette (BGBl.) I p. 212), last amended by Section 44 Para. 4 of the Act dated 22 May 2013 (BGBl. I p. 1324)
- ↪ Ordinance on the Avoidance and Recovery of Packaging Wastes (VerpackV) dated 21 August 1998 (BGBl. I p. 2379), last amended by Article 5 Para 19 of the Act, dated 24 February 2012 (BGBl. I p. 212)

Federal state level:

- ↪ Act for Promoting Closed Substance Cycle and Waste Management and Ensuring Environmentally Compatible Waste Disposal in Berlin (KrW-/AbfG Bln) dated 21 July 1999 (GVBl p.413), last amended by law dated 2 February 2011 (GVBl. p. 50)
- ↪ Hazardous Waste Disposal Ordinance (SoAbfEV) dated 11 January 1999 (GVBl. p.6), last amended by the Fifth Ordinance to Amend SoAbfEv dated 21 October 2013 (GVBl. p. 586)
- ↪ Decree on the application of regulations for environmentally-friendly purchases and order placements for deliveries, construction work and services (VwUBU) dated 23 October 2012, Circular of SenStadtUm VI A No. 07/2012 dated 20 Nov 2012

7.2 Websites

Further information about municipal waste management is provided at the following websites:

www.berlin.de/sen/umwelt/abfall

Website of the Berlin Senate Department for Urban Development and the Environment (Waste Management Section)

www.bmu.de/abfallwirtschaft

Website of the Federal Ministry for Environmental Affairs, Nature Conservation and Reactor Safety (Waste Management Section)

www.umweltbundesamt.de/abfallwirtschaft

Website of the Federal Environmental Agency (Waste Management Section)

www.bsr.de

BSR website

7.3 Abbreviations

approx.	approximately
AVP	Waste prevention programme
AWK	Waste management strategy
AWP	Waste management plan
BerlAVG	Berlin Public Procurement Act
BMU	German Federal Ministry for Environmental Affairs, Nature Conservation and Reactor Safety
BSR	Berliner Stadtreinigungsbetriebe
BVG	Berlin transport utility
BWB	Berlin water utilities
C	Celsius
cf.	compare
CFC	Chlorofluorocarbon
CO₂	carbon dioxide
DeNO_x	Flue gas denitrification
EFRD	European Fund for Regional Development
e. g.	for example
EU	European Union
g	gramme
GmbH	Company with limited liability
ICU	Ingenieurconsulting Umwelt und Bau
i. e.	that is
IFEU	Institut für Energie- und Umweltforschung
kg	kilogramme
KrWG	Closed-loop Waste Management Act
LVP	Light packaging
MA	Mechanical treatment plant
MHKW	Waste-to-energy power station
MPS	Mechanical-physical stabilization plant
MWh	Megawatt-hour
ng/m³	Nanograms per cubic metre
p. a.	per annum
PUR	polyurethane
RDF	refuse-derived fuel
RTO	regenerative thermal oxidation
SCR	selective catalytic reduction
stNVP	Similar non-packaging waste
VerpackV	Packaging Ordinance
VwVBU	Decree on the application of regulations for environmentally-friendly purchases and order placements for deliveries, construction work and services
WFD	EU Waste Framework Directive
WUB	Wertstoff-Union Berlin

Photos:

BSR: S. 1, 12, 27, 29, 32, 33, 46

ALBA Group: S. 10, 31, 35, 41, 43

Grafikbüro Kaluza-Schmid: S. 18, 26

Senatsverwaltung für Stadtentwicklung und Umwelt Berlin: S. 21, 44

Firma Otto Rüdiger Schulze: S. 34

Firma Remondis: S. 36

Der Grüne Punkt DSD GmbH: S. 39

