

Waste Management in Freiburg



Waste Management Concept for 2015



Department of Environment,
Youth and Education
Eigenbetrieb Abfallwirtschaft Freiburg

Freiburg 
I M B R E I S G A U



Introduction

Dear Citizens,

since introducing our first concept of waste management in Freiburg back in 1991, a profound change away from hazard protection and waste disposal oriented tasks to an economy of resources and recycling has been fulfilled. Service orientation, protection of resources, climate protection, fair charges and economics are the main focus of waste management in Freiburg today.

This development is also demanded by the legislators. Nowadays there are definite requirements for state governments and local authorities on recycling rates, material utilisation per capita as well as obligatory separation.

Over the past decades the waste management industry in Freiburg has implemented and actively developed further targets in waste prevention and recycling. This concept of waste management also shows that many targets required by law over the forthcoming years have already been achievable today:

- According to the recycling law, organic waste, paper, metal, plastic and glass are to be collected separately until 2015. This obligation has been adhered to in Freiburg since the introduction of separate collection of organic waste in 1997.
- Last year, the Freiburg recycling rate reached 69% which already exceeds the quota given in the 2020 Recycling Law for municipal waste by 65%.
- The quantity for organic waste is to be increased to 60 kg per capita by 2020. In 2013, 66 kg per inhabitant had been collected in Freiburg.
- Thanks to the exemplary way in which Freiburg citizens separate their waste, the level of domestic and bulky waste in the year 2013 at 112 kg was 22,2% below the Baden-Württemberg State average.

We currently wish to extend various measures on waste prevention by means of projects encouraging stationery shops to sell school exercise books made of recycled paper.



A further special focal point rests upon the increase in collection amounts of recycling waste by setting up joint collection points in each part of Freiburg. Further to that, we will optimise waste recycling by means of regional green waste recycling at the Eichelbuck disposal site in the near future.

As you can see, waste prevention and recycling places Freiburg in very good stead. Above all of course, we owe this circumstance to you, an environmentally conscious citizenship.

The excellent work undertaken by waste management in Freiburg has proven itself and I am convinced that we with the assistance of your personal engagement are able to reach further important milestones on the road to ecological and economically sustainable waste management.

A handwritten signature in blue ink that reads "Gerda Stuchlik". The signature is written in a cursive style with a long horizontal line extending from the end of the name.

Gerda Stuchlik
Mayor for environment,
youth and education



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1. Starting position and legal conditions



■ Starting position

Freiburg regional council has invited public waste disposal providers to update their concepts on waste management. In doing so, waste management concepts should be adapted to the new draft of the Baden-Württemberg Waste Management Plan – subplan for residential waste status 29.04.2013. The Freiburg waste management concept was last updated in 2008.

■ Legal conditions

Waste Management is based on numerous guidelines, laws and regulations on a European, federal and national level. Public disposal providers are set a legislative framework which is completed by the creation of a waste fee and management ordinance.

EU Law

The Waste Framework Directive of the European Community (guideline 2008/98EG from 19th November 2008 regarding waste) sets the legal framework for waste legislation in member states. This came into effect on 12th December 2008. Harmful effects relating to the production and management of waste material can be avoided or reduced under the guideline and reduced overall effects improve efficiency in resource usage. (Article 1).

Significant improvements in the Waste Framework Directive were:

- Definition of significant key terms such as waste, recycling and disposal
- The introduction of a five tier waste hierarchy.
 1. Prevention of waste
 2. Preparation for recycling
 3. Recycling
 4. Other uses, for example, energetic utilisation
 5. Disposal
- Framework of criteria for termination/completion of waste characteristics
- Provisions for delimitation of waste and by-products
- Demand from waste prevention programmes
- Self-sufficiency of member states and disposal of waste at the nearest plant
- Stipulation of recycling rates which must be implemented by 2020:
 - for paper, glass, plastic and metal 50%
 - for non hazardous construction and demolition waste 70%

The priority sequence of material utilisation is clarified by means of the five tier waste hierarchy. The Waste Framework Directive now also contains an energy efficiency formula from which calculations can be made whether the waste can be graded for combustion in an incinerator in the form of energetic disposal. Energy input (heat value) is then compared with energy gain. All incinerators in Baden-Württemberg operate in accordance with this formula.

Federal Law

Nationwide implementation of the European Waste Framework Directive resulted from legislation on advancement of the recycling economy and securing environmental friendly waste disposal (Recycling Law Kreislaufwirtschaftsgesetz – KrWG) from 24th February 2012 which came into effect on 01.06.2012. in which the EU five tier waste hierarchy was incorporated. The aim of this law is promotion of the recycling economy for the protection of natural resources, safeguarding mankind and the environment in waste production and recycling (§ 1 KrWG). Further to the Recycling Law for the protection of mankind and the environment there are further nationwide laws and regulations with control over private and public waste management, for example:

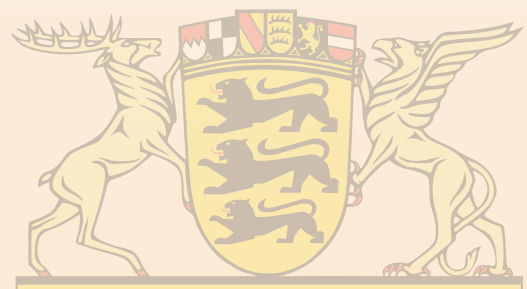
- The Electrical and Electronic Equipment Act
- The law on movement of waste
- Regulation on organic waste
- Landfill/disposal site regulation
- Commercial waste ordinance
- Packaging ordinance
- Waste wood ordinance



National Law

The Landesabfallgesetz of Baden-Württemberg dating back to 14th October 2008 version (LabfG) above all regulates the organisation of waste disposal in which other waste producing bodies and enforcement authorities are determined and guidelines defined for communal waste statutes. Moreover, it contains the obligation to compile and update waste management concepts and the setting up of waste balance via a public disposal provider. The Landesabfallgesetz is still based on the old recycling economy and Landesabfallgesetz which is currently being revised. The aim stated in Paragraph § 1 LabfG comprises further development of conserving resources, a low waste recycling economy and community friendly waste disposal.

The Ministry for the Environment, Climate and Energy Industry of Baden-Württemberg is legally obliged to establish waste management plans in a national perspective. The waste management plan, subplan for residential waste is currently being updated. The draft from 29.04.2013 was released for public involvement by agreement with the Ministerial Council on 7th May 2013. The waste management plan documents the waste disposal plants in Baden-Württemberg which offer the required disposal capacities for accumulating disposable waste and relevant disposal safety.



Local Law

by means of a statute according to local law, Community Charges Act and Municipal Code. Waste management frame conditions resulting in particular from the waste management update will also be put into practice by means of the statute on waste prevention and waste disposal in the town centre of Freiburg im Breisgau (Abfallwirtschaftssatzung/ waste disposal statute – AbfWS). The current valid waste disposal statute of 03.03.2015 contains the following:

- Connection and usage rights/obligation
- Nature of collection and transport
- Provision of waste
- Obligatory separation of waste for recycling
- Waste disposal
- Levying of fees/charges



2. The aims of waste management in Freiburg



Statistics (see chapters 6 and 7) show a following phase of sharp decline in residual waste and a significant rise of 69% in the amount of general waste. Waste management measures today have led to a stable quantity structure and material flow in the field of waste treatment and disposal. This good result was achieved through a differentiated and citizen friendly waste separation and collection scheme. On the other hand, the engagement on behalf of the citizens of Freiburg has also played a major part.

The amended law on the recycling economy and European Waste Framework Directive confirms how up to date the existing target hierarchy has been over a long period of time (waste prevention prior to use and before disposal). The waste hierarchy has even been extended into various stages in which re-utilisation measures have been differentiated into the following descending order:

1. Preparation for reutilisation
2. Recycling
3. Other uses, for example energetic use

Therefore it is in the interest of the legislators that we innovatively continue our measures on waste prevention (see chapter 4), to further extend recyclables (for example by introducing recycling points around the town) and also material and energetic use of material flow with an especially increased use of green waste. These methods in waste management will perform and contribute towards a reduction in greenhouse gas emissions.

Another issue is to safeguard long term stability in waste disposal charges which should be attained by means of fees obtained from marketing reusable materials.

New challenges in waste management will also be faced in future. These, for example, exist in relation to demographic development, their purpose for future development in waste volume along with recycling and disposal capacities required for the future.

The general aim as a whole is to create a stable foundation in coming to terms with future changes in urban society bearing a balanced ecological and economical waste management concept in mind.

3. Organisation of waste management in Freiburg



In 1999 the Municipal Council decided to change the Eigenbetrieb Abfallwirtschaft and the public cleansing department into a limited company on 16.06.1999. The background to this decision was economic optimisation taking existing standards and a contribution towards consolidation of the urban budget into consideration. At the same time, aims like price stability and job security for employees were put into practice. Furthermore, the expansion of business activity of the new company was supported in the region. One requirement for partial privatisation was the guarantee of waste oriented control capacities and previous ecological standards maintained by the City of Freiburg.

A management framework programme over a 20 year period had been completed as an important standardising body. For exact control over the delegated tasks this was completed by means of appropriate individual service contracts and a service catalogue to be updated every 5 years. Privatisation was fulfilled by 01.01.2000.

The City of Freiburg has commissioned ASF GmbH for waste management and cleansing services with the perception of the following tasks:

- Collection of residual waste, waste paper, organic waste, green waste material and bulk waste
- Operation, decommissioning and aftercare of Eichelbuck disposal or rather handling site
- Operation of 3 recycling centres
- Preparing calculation of charges, business plans etc.
- Economic management for the Eigenbetrieb Abfallwirtschaft Freiburg
- Fee assessment – assessment of charges
- Waste consulting, public relations
- Implementation of cleansing and winter road clearance

ASF see their entrepreneurial goals in the line of greater general efficiency, economic efficiency, stronger regionalisation in synergy and rationalisation.

As a result the safeguarding of jobs in an increasingly competitively characterised market has been facilitated.

Besides, Eigenbetrieb Abfallwirtschaft Freiburg (EAF) will remain as a management unit between ASF and the city administration with a predominantly high level range of tasks:

- Supervision of tasks in the range of waste management and waste management planning
- Updating of waste management concept
- Supervision and fulfillment of management outline agreement and service level agreement
- Updating of service catalogue and contracts with ASF
- Calculation of charges, business plan (high level responsibility)
- Owner is highly responsible for the Eichelbuck disposal site
- Waste management statute, conflicts and complaint proceedings
- Co-operation with Breisgau waste disposal company (GAB)
- Updates of service contracts, voting agreements with DSD and other system operators.



On 1st January 2002 ASF had sold 47% of their shares to R & M Beteiligung GmbH & Co. KG. Partners in this limited company in each case 50% had a 60% share in Meier Entsorgung GmbH and RWE Umwelt Süd GmbH. On 21.03.2005 RWE Umwelt AG was to a greater extent sold to REMONDIS Beteiligungs-GmbH. As a result REMONDIS GmbH had a 23.5% share in ASF GmbH at the time.

In February 2008 Remondis took over shares from Meier Entsorgung GmbH. This makes Remondis the sole partner as the City of Freiburg and ASF associate with a 47% share. Remondis is today one of the largest private service enterprises in the water and recycling industry worldwide and also the largest waste disposer in the republic. The urban majority with ASF remains at 53%.

The increased participation by Remondis of 47% has had no direct effects on the EAF from a waste economy point of view and the same applies to services in the waste industry and fee payers in Freiburg. On account of participation by Remondis, Synergy effects can be utilised by means of joint use of this large private disposal company's infrastructure. Waste disposal is secured via contracts with ASF: the management framework contract and relevant individual service contracts.

As the service catalogue is updated every five years, the good standard of waste disposal in Freiburg must be born in mind.

ASF's municipal profile remains the same on account of urban majority holding.

The urban share of the city is guaranteed at 53% which means that the content-related orientation of the waste industry and quality will remain unchanged. EAF and ASF will in future guarantee co-operative action.



4. Waste prevention – Examples of successfully undertaken measures



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Waste prevention has always been a substantial component of an ecologically oriented waste management concept in Freiburg. The aim towards waste prevention is undergoing permanent development.

4.1. Waste education – Waste prevention in schools and nurseries

An important starting point towards a campaign aiming at the waste management concept is to practice a responsible attitude towards the subject of waste in good time which has been seen since collecting recyclables began in 1988 whilst working with youths and children. A positive basis of dealing with waste responsibly is created from childhood onwards. Children and young people are taught to competently prevent waste by means of separation and careful treatment of resources.

4.1.1. Waste education in the Abfallwirtschaft und Stadtreinigung Freiburg GmbH

Due to the major significance attributed by the City of Freiburg, a female teacher working in Abfallwirtschaft und Stadtreinigung Freiburg GmbH (ASF) has become entrusted with the task. The ecostation was consulted due to major demand in 1994. Since then, there has been close co-operation with ASF. In the meantime, a number of valuable successful measures and projects have been developed in the field of waste education.

■ *Offers for schools and nurseries*

Waste consulting offers age-appropriate course units on the subjects of waste prevention, waste separation and waste disposal. The contents are stipulated in consultation with the teacher. In doing so, information on waste history, the bases of current waste management, the aspects of waste prevention and the recycling of materials are conveyed. On average between 20 and 30 school classes per year are attended. Boxes with working materials are lent out to secondary 1 students in support of the issue. Today there is a choice between boxes of materials called "Waste at nursery school", "waste at primary school", "compost and paper". Furthermore, the travelling exhibition called "The environmentally friendly schoolbag" is offered on parents' evenings for primary classes.





■ Project – “Children and Agenda 21”

Since the beginning of the 2001/2002 school year there has been a project called “Children and Agenda 21” which was a competition for primary school classes in Freiburg. The objective of the competition was to deepen and regenerate the concept of environment and climate protection at primary schools in a playful manner. The project is designed to teach environmentally conscious behaviour and social interaction which also examines consumer habits on their senses and uses.

■ Project “Waste is no refuse”

A concept known as ‘Waste is no refuse’ emerged in 2003 in conjunction with the neighbouring areas of Breisgau-Hochschwarzwald and Emmendingen. The result of this project is a guideline to waste education which all schools in the Freiburg area have incorporated as components of their reference libraries. In 2015 this guideline was replaced by internet based factual information quoting “Give refuse a value”.

■ Paper projects

A promotion for the use of recycled paper in particular for school supplies has already been the main emphasis on waste education since 2004 which since then has been extended. The City of Freiburg was also engaged in the nationwide network called “Papierwende” or “the turning point of paper”. This led to further offers and projects in schools. Among other things learning circles are there for school classes to hold discussions over the effects of deforestation of the Rain Forests, history related exhibitions, the consumption and uses of primary primary fibres, recycling paper and the arrangement of recycling cycles. By co-operation among various internal groups, pupils, teachers and parents are convinced by the advantages of recycled products. The following campaign in this context was started in 2014:

■ Project – advertising campaign for school exercise books made of recycled paper in stationery shops

School exercise books are a good example for active climate protection. For school exercise books made of recycled paper it is possible to get by with lower energy and water consumption. This is why they are distinguished with the “Blue Angel” award. The preconception stating that recycled products are dull is also no longer applicable. Nevertheless, the nationwide proportion of recycled products of around 200 school exercise books only accounts for 5%. That is why it is especially important that there are stationery shops which offer school supplies in recycling quality. To make the matter more clear, the City of Freiburg together with ASF have had a sticker made to be displayed in stationery shop windows to advertise with the motto saying “Have you thought about it? – Have you taken part?” Both items are made known and publicised in schools and on the Abfallwirtschaft und Stadtreinigung Freiburg GmbH homepage (ASF).





■ *Refuse drama*

The waste management industry has been organising annual theatrical events for daycare nursery children and primary school pupils since 1999 with varied offers (6 performances with 100 children). The theme to waste prevention and separation is playfully implemented on stage. Performances are carried out in the Ecostation building and follow-up care of the childrens' groups in the Ecogarden is then taken over by the Ecostation team after the performance.

■ *Further educational offers*

- Lectures on waste related topics
- Tours of ASF disposal plant
- Contact mediation on regional excursion spots
- Consulting in environmentally educational questions in series of lessons
- Organisation of campaigns (for example Kunscht & Krempel – Recycling Centre)
- Media library on various waste topics like recycling, recycling economy, waste disposal.

4.1.2. Ecostation duties for the waste management

On average the Ecostation takes care of 60 school classes and groups of children per year (approximately 1350 children). Consultations on compost are on offer to the general public in the Ecostation's organic garden. Events for school classes and groups take place on request. Waste Education at the Ecostation consists of a number of modules which can be combined with each other:

Project days in the Ecostation "Inspiration rather than waste":

Examples for individual topics: Avoid refuse – separation of waste, cycle of organic waste

Project "A school exercise book on its travels"

The project is a lesson unit on handling paper.

Days of waste at schools – "low waste school"

Schools are supported in improving their collection of waste and collection of recyclables.



Rotznasentheater

4.2. Public Relations –

Promotion by advertising and information

ASF is thereby assigned to inform the Citizens of Freiburg on waste management related measures, regulations and backgrounds with the aim of motivation towards responsible and environmentally conscious behaviour and to promote their interests in urban waste management. For this purpose a catalogue of measures has been developed for citizens/residents.

- Annually appearing waste product calendar
- "Green Pages" (with an overview of repair and rental services),
- Brochures and leaflets on key topics, for example disposal of construction waste, advertisements, press reports,
- Events, lectures and exhibitions
- Information in foreign languages
- online presence,
- Tours of disposal plant in Freiburg and
- consultation on waste management related questions via the waste industry telephone/hotline.

4.3. Refuse locks in large housing estates

The first refuse locks were installed in 1998. During interim periods there are 156 locations available where residents can utilise the refuse locks to dispose of residual waste. In doing so with the aid of inserting a chip into the slot, the refuse lock's input shaft opens and the 15-L bin bag can be thrown in. Each household (depending on the size of the household) makes a minimum payment for throw-ins. Additional throw-ins are calculated proportionally through which the refuse lock, with a minimal level of residual waste, constitutes a cost effective waste disposal system and a firm incentive towards waste separation for users. Due to lack of space on large housing estates, households are not able to be issued with single containers (bins) for the disposal of residual waste. The refuse lock offers an appropriate alternative to the large communal containers.

Over the last years, the refuse lock in the town of Zwickau has stood the test. This is connected to the property by means of a casing around the 1.1 cubic metre container. The mobile refuse lock introduced in the previous waste management concept was withdrawn from service and is no longer in use on account of a high level of susceptibility to failure.



Refuse locks in Freiburg



4.4. New achievements – established measures

■ Establishment of a gift market

The Freiburg online gift market contributes towards not throwing every day items away prematurely, but to keep them in circulation. Items like household utensils, electrical and electronic appliances, books, textile products or sports equipment can be given away or exchanged via the internet page under www.verschenkmarkt-freiburg.de.

On average between 5 and 30 advertisements a day are published on this page. Objects in the furniture category and household goods soon to find a new owner are in special demand.

■ Participation in Paper Atlas municipal competition

Due to the exemplary use of recycled paper, Freiburg city administration were distinguished by winning the nationwide Paper Atlas municipal award. The annual requirement lies by 34 million sheets of paper and in 2003 the City of Freiburg had saved around 5.6 million litres of water, 1.1 million kilowatts of energy and more than 30,500 kg of CO₂. The Paper Atlas draws comparisons among 92 towns with regard to paper consumption and utilisation rates of recycled paper as well as ecological savings effects.

■ Established measures

- Financial incentives towards waste prevention via the persons and household related charging system
- The used goods department store/commodity exchange – every day items in good condition are dispensed with at a favourable price.
- The municipal reusable law for the use of reusable crockery
- The environmentally friendly procurement and procurement beings of the municipal administration
- Promotion of reusable nappies
- Promotion of private composting



Commodity exchange St. Gabriel

5. Recycling facilities – CO₂ savings/Replacement for fossil fuels



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5.1. Organic waste – recycling in the digestion plant at Reterra, Freiburg

Since 1997, organic waste has been collected separately in Freiburg, 100% of which is sent to the Reterra digestion plant where it is energetically and materially recycled. In 2013, 14,757 tonnes of organic waste had been delivered to Freiburg. The District Breisgau-Hochschwarzwald also brings its waste so that the input then amounted to a total of 34,000 tonnes including further smaller amounts, for example, from local businesses.

■ *Organic waste recycling – process:*

Organic waste is delivered by collection vehicles and tipped into the so-called “Bunker”. Subsequently, materials are prepared by sieving, magnetic separator and removal of most impurities (removal of plastic sheets to a greater extent). After that, the material goes into a mixing hopper. By adding steam, internal waste water and leaven, the correct temperature is generated for the fermentation tank. The mixture is then transported to the fermentation tank where micro-organisms break down the organic components to produce bio gas.

After 3 to 4 weeks the liquid residue is discharged and drained (solid-liquid separation). The liquid is mainly handed over to agriculture for use as liquid fertilizer. In 2013 approximately 6,000 tonnes of liquid fertilizer had been gained from organic waste in Freiburg. The solid material from the worm extruder is strained after subsequent drying in order to obtain a better quality of compost. The material selected in this way consists mainly of woody components with few impurities (stones, plastic remains etc.). This is then energetically recycled by combustion in an external biomass plant (1300 tonnes from organic waste in Freiburg during 2013). The remaining 560 tonnes of impurities in the delivered organic waste are recycled energetically (combustion). The remaining fine compost is marketed to interested gardeners and agriculture for material utilisation. Approximately 3200 tonnes of fine compost had been gained from Freiburg organic waste in 2013.



Next to material recycling, organic waste is also used energetically. This is how in 2013 a total of 9,900,000 kWh of electricity and 7,500,000 kWh of thermal energy could be produced from bio gas gained from organic and kitchen waste from the Breisgau-Hochschwarzwald and City of Freiburg Districts and 43.4% of organic waste from Freiburg. Since the beginning of 2011 almost 70% of produced bio gas was joined via a new pipeline with landfill gas from the Eichelbuck disposal site and utilised in Badenova BHKW (combined heat and power station) in Freiburg Landwasser. Electricity produced there is fed into the national grid and the thermal energy used completely for the supply of thermal energy to the urban quarter of Freiburg Landwasser.

In 2013, 3,300 households in Freiburg were supplied with electricity and 12,000 with thermal energy. From the remaining 30% of bio gas, electricity is generated and fed into the national grid. Furthermore, part of the thermal energy is used for the fermentation of organic waste.

■ Saving on greenhouse gas emissions – Replacement for fossil fuels

Electricity gained from the bio gas plant is 100% CO₂ neutral. Therefore 1 kWh of electricity corresponding to a CO₂ equivalent of 606 grammes ¹⁾ and 1 kWh of thermal energy 261.4 grammes of CO₂ ²⁾. Through the energy gained from the Reterra bio gas plant a total of around 8000 tonnes of CO₂ was saved in 2013 and 3,500 tonnes alone from Freiburg organic waste.

Thermal energy produced by Reterra GmbH in 2013 to a total of 7.500,000 kWh replaces around 940,000 litres of heating oil ³⁾ Recycled organic waste from Freiburg alone replaces 410,000 litres of heating oil. Furthermore, 9,900,000 kWh of electricity produced in the plant replaced a gas volume of approximately 3,000,000 cbm ⁴⁾ 1,300,000 cbm of gas can be credited from Freiburg. A total of 3,940,000 litres of heating oil or rather cbm of gas are substituted as the calorific value of 1 litre of heating oil is almost equal to 1 cbm of gas. The Freiburg share stands at 1,710,000 litres of heating oil or gas respectively.

¹⁾ according to 2013 German energy mix

²⁾ according to 4.9 mix mean value gas/oil

³⁾ Approval: 0.125 litre of oil are required to generate 1 kWh of electricity

⁴⁾ Approval: 3 kWh of gas required at an efficiency level of 33%



5.2. Green waste recycling present and future on the Eichelbuck disposal site

■ *Green waste recycling – present*

Preparation of green waste collected in Freiburg is currently taking place on the plateau of the former Eichelbuck disposal site. Green waste is shredded here and strained via a group of three star shaped sieves. The fine share (<20mm) mainly goes for composting (a larger quantity is recultivated). The coarse particles (>20 to approximately 50mm), which makes up around 15 to 20% of the total amount is brought to energetic recycling. The third fragment (oversized grains > 50mm) is chopped, sieved again and afterwards categorised into fine and coarse fragments.

■ *Green waste recycling in the Eichelbuck disposal site in future.*

A plant for material and energetic recycling of green waste on the disposal site plateau is in planning by ASF. This should be completed in 2017 whereby part composting and vegetable carbon production should already have been commenced subject to application approval and building plan procedure. The plant consists of the following significant buildings and installations:

Disposal site plateau

The disposal site plateau is planned in such a way that a bathtub shape will arise. The bath will be sealed up to begin with. A so called functional layer is applied over the sealing (asphalt building with mineral base course layer). The surface is drained via the existing sewage system. Until then, the plants will be operated on an interim basis from a location which is also attached to the north side of the plateau area.

Green waste processing

Constructions for green waste processing such as a receiving warehouse, a warehouse for intermediary products, outbound warehouse, green waste shredders and sieving plant are to be arranged on the surface of the disposal site plateau. Subsections of these constructions will be roofed subject to use. As a whole, a throughput capacity of approximately 12,000 tonnes per annum and a warehouse volume of around 2,000 cbm is intended. The entire volume of accumulated green waste in Freiburg can thereby be handled on the disposal site.

Vegetable carbon plant

Part of the woody waste yielded from green waste is to be processed into vegetable carbon by means of a thermic carbonisation process. The plant implemented by ASF is accommodated in a container frame (8.8 * 3.5 * 2,8m) which including auxilliary units will be erected under a roof (approximately 10.0 * 20.0m). The fumes emitted from the plant will be discharged via a smoke stack. The throughput performance of the plant amounts to almost 1,000 tonnes per year.



Woodchip heating system

A further element taken from woody waste in green waste is used to generate flue gas in the wood heating system. The flue gas in turn is used to generate hot air via a heat exchanging process. Part of the already available micro gas turbines use the generated hot air in a so called EFGT process (External Fired Gas Turbine). 1,000 tonnes of woodchip at around 350 kW is processed into flue gas in the plant. The plant will be installed at the foot of the disposal site opposite the gas utilisation facility.

Composting

Herbacious materials emerging from green waste preparation are fed to a stage IV degree of rotting for hygienisation of composting. This composting is carried out without housing on the disposal site plateau and is forced ventilated under a semipermeable membrane. The composting process is hereby significantly improved and the odour emissions are clearly reduced by 90%. Composting is carried out over an area of around 1,000m² and the throughput of the plant amounts to approximately 7,000 tonnes per year.

■ Compliance – organic waste

Upon utilisation of green waste the City of Freiburg as a public disposal provider is obliged to meet the requirements of the organic waste ordinance which was reworked in 2012. The following measures guarantee compliance with the organic waste ordinance in Freiburg:

- Citizen advice upon collection and at assembly points.
- Regular visual checks on green waste for any pest afflicted plant species and sorting prior to use
- Rental coverage on membranes or rather partial roofing
- Composting of fine product for fulfillment of hygienisation obligation

■ Saving of greenhouse gases – replacement of fossil fuels

Electricity gained from green waste and organic recycling is 100% CO₂ neutral. Looking ahead, 22,080,000 kWh of electricity and 34,500,000 kWh of thermal energy can be gained annually from green waste recycling at the disposal site in Eichelbuck. This results in a saving of CO₂ of around 22,400 tonnes per annum* from the generated energy.

Thermal energy of an anticipated 34,500,000 kWh produced in the green waste recycling plants replaces around 4,312,500 litres of heating oil per year. Moreover, 22,080,000 kWh of electricity produced in the plant replaces a gas volume of 6,624,000 cbm*. Included in the sum is a substitution of around a total of 11 million litres of heating oil, or rather, gas as the calorific values of 1 litre of heating oil is level with 1 cbm of gas.

*Calculation basis see chapter 5.1.



5.3. Residual waste utilised thermically in TREA

Waste that cannot be utilised is removed in an environmentally friendly manner within the region. In view of the stipulation set by the legislator stating that a deposit of untreated waste has no longer been possible since 01.06.2005, participating bodies (the Districts Breisgau-Hochschwarzwald, Emmendingen and Ortenau) with the waste management company Gesellschaft Abfallwirtschaft Breisgau mbH (GAB) have decided to build a thermic residual waste treatment and energy recycling plant (TREA) on the Breisgau industrial estate on 23.11.2000 which went into operation in November 2004. At that time, the tender was received by the bidding consortium SOTEC – today known as EEW Energy from Waste GmbH with which a disposal contract is valid up to 2030.

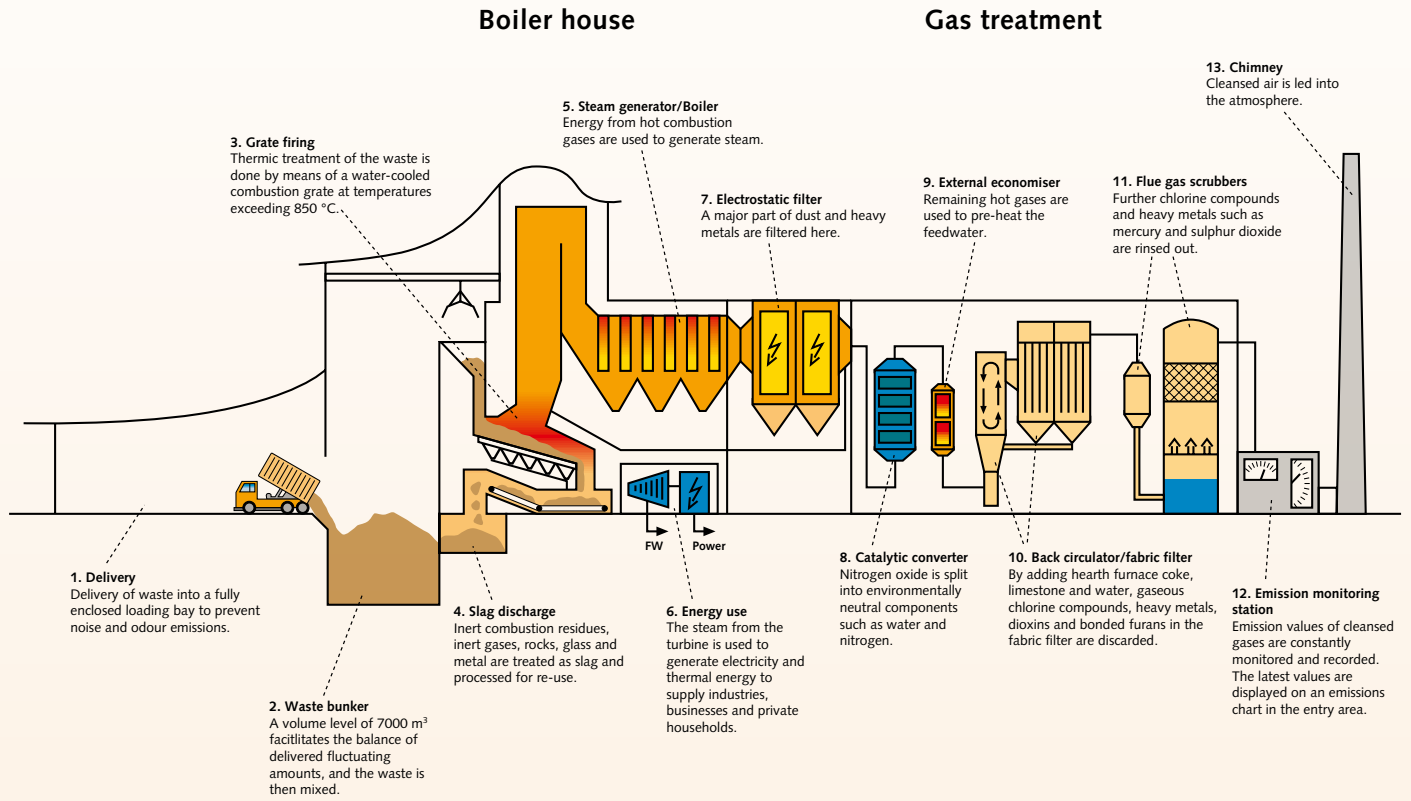
TREA has the autorisation of 170,000 tonnes output of domestic and commercial waste at their disposal. From this, waste management company Gesellschaft Abfallwirtschaft Breisgau mbH (GAB) is entitled to a waste volume contingent totalling 76,000 – 143,700 t/a. The City of Freiburg can claim a contingent of between 29,600 and 51,400 t/a. In 2013, 29,383 tonnes of residual and bulky waste had been delivered from private households and businesses on the industrial estate.

According to the reworked Kreislaufwirtschaftsgesetz, approved waste incineration plants with an efficiency degree of 60% will be able to retain their status of utilisation until 31.12.2008. The TREA waste incineration plant fulfills the energy efficiency criteria according to plant 2 to KrWG (Letter R 1 with Anm.1).

The calorific value of the waste suffices to maintain combustion at approximately 850°C. Four stage flue gas cleaning assures that the given limits are maintained. Filter dust results from the residue left by flue gas cleaning which is disposed of by a salt mine in Thuringia.



Functions of the thermic residual waste and energy recycling plant



TREA energy balance 2014

From a maximum conversion to electricity from waste, 95,000 MWh per annum could be fed into the public grid. Alongside this, district heating is fed into the district heating system by means of a power-heat-coupling operation. It is possible to generate up to 160,000 MWh per annum and even 65,000 MWh of electricity in addition. Currently, 71,000 MWh/a of thermal energy are contractually secured and sold. Furthermore, the TREA Breisgau Energy Utilisation Company (TREA Breisgau Energieverwertung GmbH) are at present conducting promising negotiations with further bulk purchasers. TREA is thereby showing major engagement towards a continual expansion of the power-heat-coupling operation. The aim is to approach maximum sales in district heat output.

Saving of greenhouse gases – Replacement for fossil fuels

About 50% of combustible material have a biogenic origin and count as biomass (for example paper, wood, plant or animal waste). These materials do not produce any additional CO₂ upon combustion. A CO₂ saving of 50% is obtained from the use of residential waste to generate electricity and thermal energy compared to fossil fuels (coal, oil, natural gas). As a result, it can be assumed that 1 kWh of electricity has a CO₂ equivalent of 303 grammes and 1 kWh of thermal energy 130.7 grammes of CO₂. Upon complete acceptance of the contractually secured 71,000 MWh/a of thermal energy around 9,300 tonnes of CO₂ could be saved, or rather 8,875,000 litres of heating oil replaced. (approximately 15% of the savings through residual and bulk waste from private households in Freiburg)*.

*Calculation basis see chapter 5.1.

■ Utilisation of slag/clinker/bottom ash/cinders

Residues also accrue a in highly modern waste incineration plant. Clinker from TREA Breisgau corresponds to a quarter of its original weight and approximately 1/10 of its original waste volume. For utilisation purposes the company Schlackeverwertung Breisgau (SVB), a subsidiary of SOTEC GmbH and Breisgau-Hochschwarzwald, was founded in 2003.

In 2004 SVB established a slag preparation plant on the Gewerbepark Breisgau 400 metres away from TREA which since February 2005 has divided and led untreated slag into mineral based building materials, scrap iron and non-ferrous metals for general utilisation. This is done with the aid of three sieves, a magnetic drum, two overbelt magnets and a current flow separator. After a 3 month period of storage, the slag will form an environmental and structural element to retain its necessary characteristics and values, for example, as a secondary building material for surface sealing on disposal sites in place of natural building materials such as shingle or gravel.

Participating shareholders with GAB will in each case take back residual waste in proportion to the amount delivered to them for the decommissioning of their disposal sites. The City of Freiburg has contractually committed itself to take back 105,800 tonnes of slag for utilisation on the Eichelbuck disposal site by 31.12.2018. The aim is even to accept 155,000 tonnes until 2020.

■ Logistics

A logistics concept has been implemented for TREA which will to the greatest possible extent transfer the transport of waste to rail which above all, will disburden the adjoining communities. At the moment 45,000 tonnes of domestic and commercial waste is delivered by rail and the City of Freiburg delivers 100% of its residual and bulky waste by rail.



6. Waste recycling – collection systems and responsibility

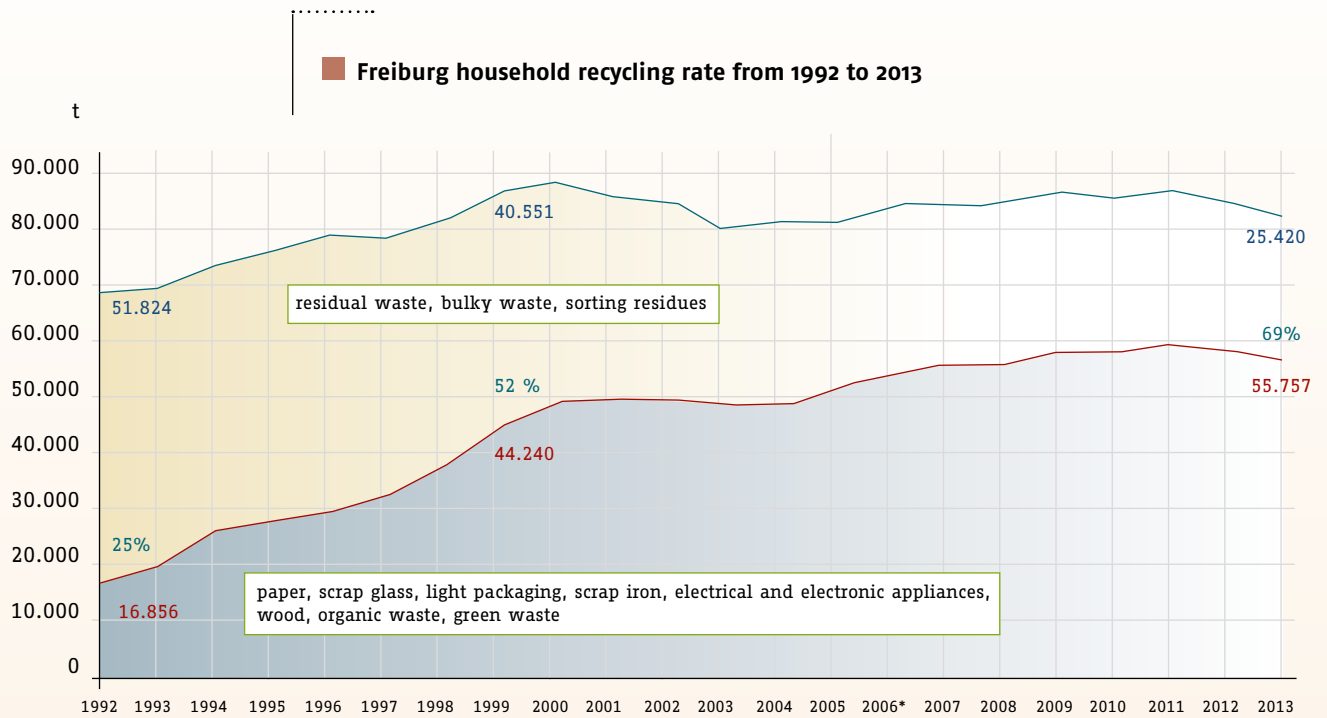


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6.1. Reusable materials – total recycling rate

Back in the 1990s, a comprehensive waste separation system had already been introduced in Freiburg in which glass, paper, organic waste, green waste, packaging waste, old clothes, metal, electronic scrap, old wood and even batteries and bottle corks are collected separately. On account of major engagement by the residents of Freiburg the recycling rate had risen to 69% in 2013. Freiburg occupies a leading position nationwide.



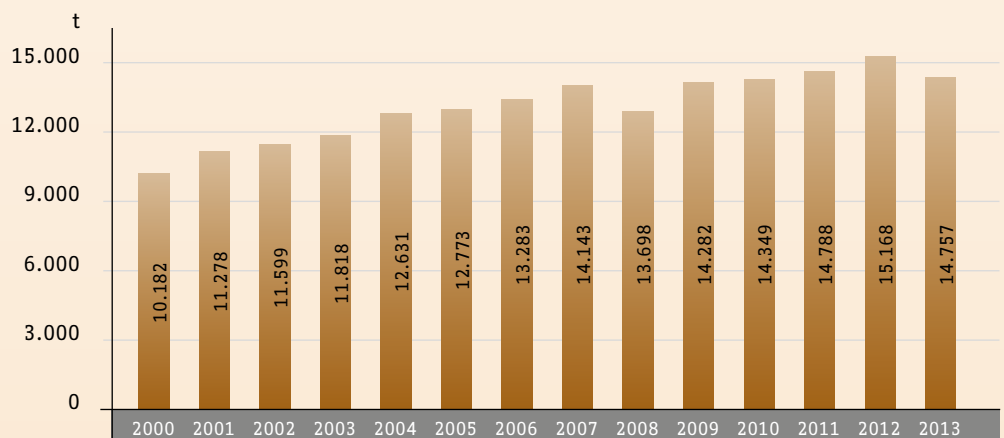


6.2. Organic waste

Around 180,000 inhabitants in Freiburg are connected to the organic waste bin but due to lack of space or rather bad results from sorting in the old town and on some large housing estates it had not been implemented. Alongside weekly emptying of the 140 litre bin, a twice yearly cleaning operation of the containers is part of the service which contributes towards hygiene and much appreciated by the public.

With a collection amount of 66 kg per capita in 2013, Freiburg clearly stands above the national average of 45 kg and today already fulfills the draft in the Baden-Württemberg Waste Management Plan (status 29.04.2013) for the stipulated target of 60 kg of organic waste per resident per year for 2020. In order to maintain this good result, households in Freiburg will in future be comprehensively be connected to the organic waste bin.

Collection of recyclables from 2000 to 2013 (input quantity)



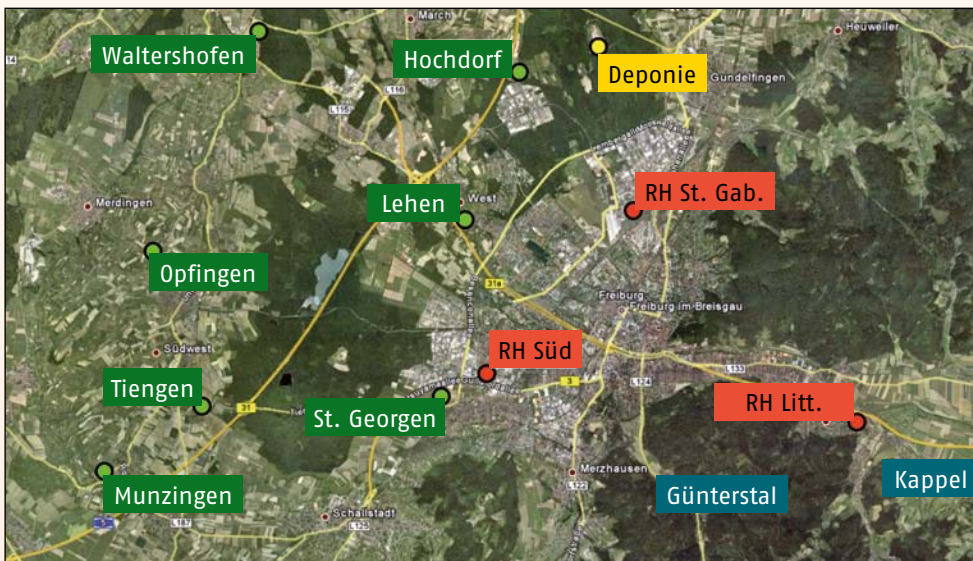
6.3. Greenwaste

Green waste collection concept

Two more collection points have been added to the eleven existing ones. Since 2013 the citizens of Freiburg have been able to take their green waste to the following 13 collection points: Waltershofen, Opfingen, Tiengen, Munzingen, St. Georgen, Lehen, Hochdorf, Kappel, Günterstal, Eichelbuck disposal site, Recyclinghof Littenweiler, Recyclinghof St. Gabriel.

Furthermore, Christmas trees are collected in January. In March and November a street collection takes place for the collection of bundled green waste. Businesses have the opportunity to take their green waste to the Eichelbuck disposal site for a fee.

Locations of green waste collection points



- Previous green waste collection points
- New green waste collection points
- Recycling points
- Eichelbuck disposal site

The following amounts of green waste gathered in Freiburg during 2013:

198 t	Christmas trees, hedge and tree cuttings
3745 t	Collection of cuttings from 11 collection points
1.229 t	Garden and park waste by self delivering deposit site
4.207 t	Commercial amounts of green waste
751 t	Green waste from recycling centres
386 t	Urban cleansing/foilage removal

Amount for 2013 **10,516 tonnes of green waste**

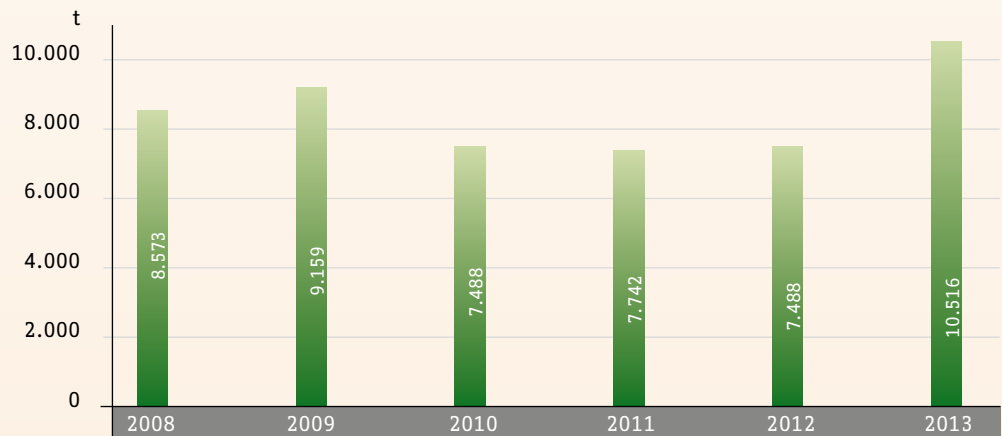
Low quantity of green waste in Freiburg

The green waste quantity in Freiburg amounted to 48 kg/Ea in 2013. According to the waste management plan for Baden-Württemberg (status 29.04.2013) a state-wide average of 90 kg/Ea was set for 2020. The state average in Baden-Württemberg already stood at 85 kg/Ea in 2013. An explanation for the low amount of green waste is found in the high proportion of green waste which is disposed of in the organic waste bin and emptied weekly. According to estimations by Reterra GmbH, organic waste from Freiburg comprises near 45% in summer. This amount found in organic waste in the form of green waste, for example in 2013, is being ascertained:

Total volume of organic waste:	15,000 tonnes
Proportion in the summer months:	9,000 tonnes
Green waste contained therein (40 – 45%)	4,000 tonnes
Green waste in the organic waste bin per inhabitant:	18 kg

As a result an increase of green waste amount from 48 kg/E to 66 kg/E in 2013

Collection amount for green waste from 2008 to 2013



The rising amount in 2013 results from the acceptance of commercial amounts.

6.4. Paper – paper board – cardboard

Since 1993 the green bin has served for the collection of paper and cardboard. ASF provide 140 litres and 1.1 cubic metre bins depending on the number of residents per property. Emptying the bins is done every fortnight. The disposal costs are levied via household charges. Tradespersons can make use of this service against separate fees or engage private disposal providers.

The dual systems carry around 17% of utilisation cost of waste fractions like paper, paper board and cardboard (PPK). This percentage share was reported through an analysis of packaging waste. The remaining 83% was financed through the waste disposal charges. Paper products collected in 2013 – 20,240 tonnes correspond to a yearly average of about 93 kg per resident. The average for the State of Baden-Württemberg lay at 83 kg per resident in 2013.



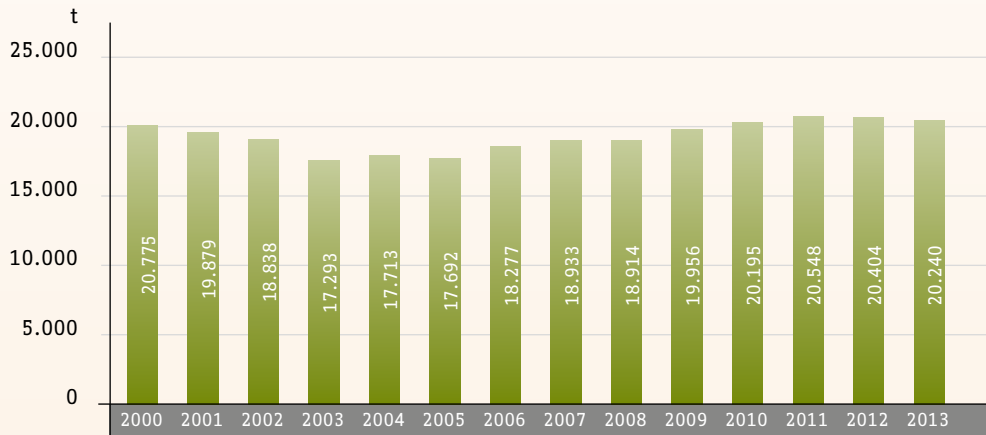
WEISSGLAS

GRÜNGLAS

BRAUNGLAS

Waste paper from Freiburg's green bins is currently transported to carton manufacturer Mayr-Meinhof in Gernsbach on the Northern-Baden Rhine plain. The factory annually produces 260,000 tonnes of cardboard which to a greater extent is processed into folding cartons.

Collection of recyclables paper, paper board and cardboard from 2000 to 2013



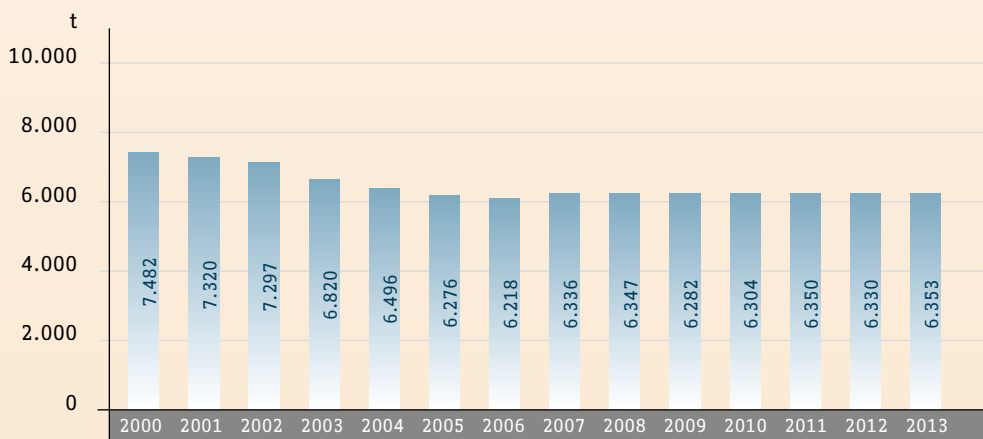
6.5. Used glass

Separated glass collection has been well accepted for years by Freiburg citizens on account of the dense container network. In 2013 a total of around 300 stands with about 1,000 single sound proofed containers were provided for the disposal of old glass. The collected old glass in 3 colour categories (white brown and green) is transported to the recycler after weighing. The dual systems responsible for old glass recycling publicly write out the collection and sorting of old glass.

In 2013 a total of 6,353 tonnes of old glass was collected corresponding to 29 kg per resident. The average for Baden-Württemberg stood at 26 kg of old glass per resident.



Old glass collection from 2000 to 2013



in 2013





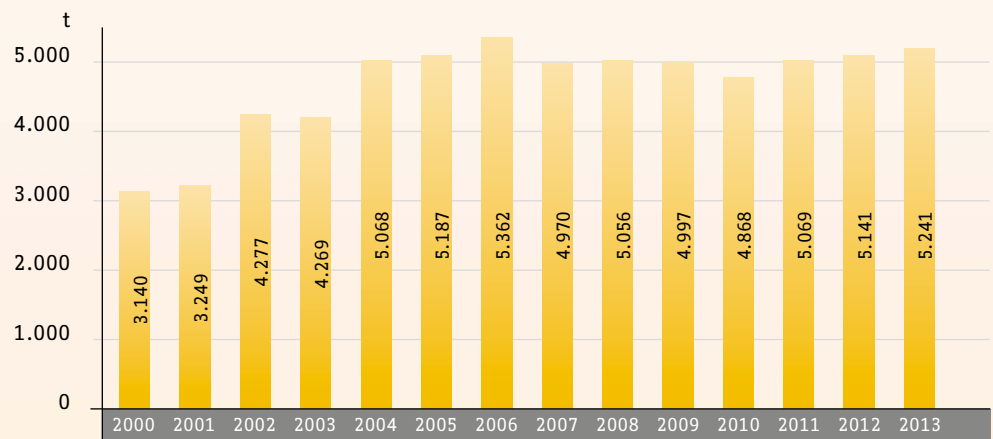
6.6. Light packaging

The yellow bin introduced to Freiburg in 1993 to collect light packaging of metal, plastic and composite material was replaced by yellow bin bags in 1997. Households in Freiburg have the facility for collection of full yellow bags placed in front of their house doors every 14 days.

Manufacturers and distributors of packaging are obliged to take back accumulated packages for renewed usage or to supply them for energetic recycling. To organise, maintain, sort and utilise this collection comprehensively, the Dual System Deutschland (DSD) was founded in the form of a public limited company for trade and industry. For a long time DSD has had a monopoly status. Nowadays there is a total of 10 systems analysts who share this task. The system is not financed by the waste disposal charges but via licence fees from the packaging manufacturers. Finally, the consumer bears the costs for the system from the purchase of packaged products.

In 2013 a total of 5,241 tonnes of light packaging was collected which corresponds to 24 kg per resident.

■ Collection of recyclables, yellow bin bag 2000 to 2013 (input amount as from 2004)



6.7. Old electrical and electronic appliances

Citizens of Freiburg can have their old electrical and electronic appliances picked up during bulk waste collection or they may bring them to the one of the three recycling centres. The old appliances are gathered there in containers which correspond to five collection groups under the electrical appliance law. From there on, they are brought to the transfer point of the foundation Stiftung Elektro-Altgeräte-Register (EAR) at the St. Gabriel recycling centre. Collection and recycling of gathered electrical and electronic appliances lies in the responsibility of the foundation.

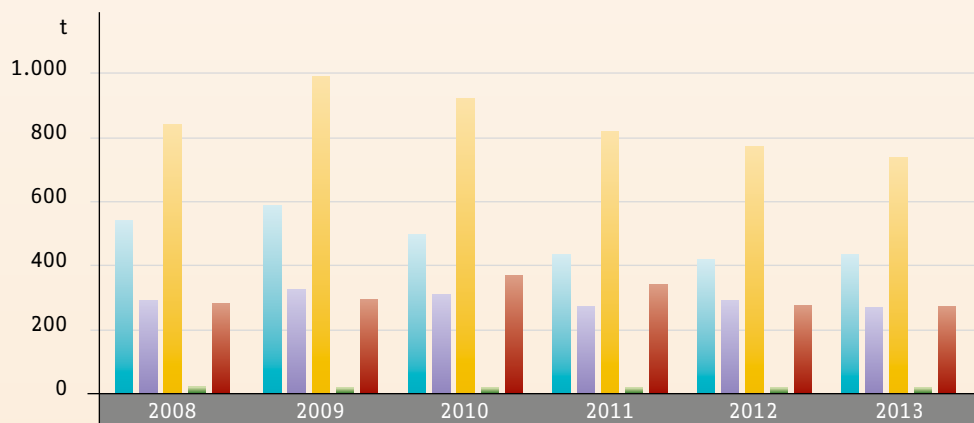
Small electrical appliances may also be brought to a recycling point in any part of town. Monitors or flat screens cannot be thrown in there because they can easily shatter, but for mobile phones, DVD players or printers the recycling points can, for instance, offer a comfortable disposal system.

Collection groups 1, 3 and 5 (white goods, office, information and communication appliances, small electrical and electronic appliances) are independently marketed. The decision over independent marketing is checked regularly and newly targeted according to economic criteria. The proceeds from this permissible market lead to a relief in the budget covered by charges. With all the current possibilities including bring and collection systems to facilitate the comfortable disposal of old electric and electronic appliances, the collected amount for 2013 stood at 7.8 kg/Ea (National average for 2013: 7.6 kg/Ea). According to the draft of the waste management plan for Baden-Württemberg on residential waste (status 29.04.2013) the aim of the collected amount of old electronic and electric appliances is targeted at 12 kg/Ea until 2016 and 17 kg/Ea until 2019. An increase in the collective amount in Freiburg is still to be expected by means of the newly arranged recycling points.

It can fundamentally be assumed that the Freiburg collection quota is not complete, reason being that regular thefts of large electrical appliances in bulk waste collections cannot be prevented. Furthermore, a number of old electronic and electrical appliances have meanwhile been taken back by the large retail stores like Saturn and Mediamarkt and then passed on to the EAR foundations which is not to be underestimated. These amounts which cannot be allocated to individual towns according to information by the EAR foundations are losses to the Freiburg collection amount.



Collection amounts for electric and electronic appliances



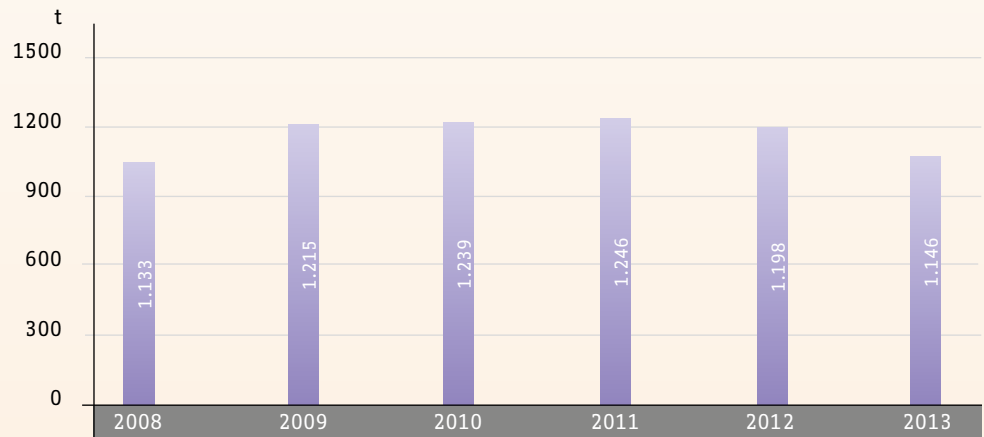
	2008	2009	2010	2011	2012	2013
Large household appliances	528 t	579 t	485 t	419 t	416 t	429 t
Refrigerators	285 t	319 t	301 t	267 t	279 t	260 t
Office and communication	835 t	984 t	920 t	812 t	761 t	734 t
Fluorescent tubes	11 t	9 t	10 t	12 t	12 t	13 t
Small electric/electronic appliances	273 t	289 t	362 t	334 t	272 t	266 t
TOTAL	1932 t	2180 t	2078 t	1844 t	1740 t	1702 t



6.8. Scrap iron

977 tonnes of scrap metal (excluding unbranded products) was gathered in bulk waste collections in 2013. The proceeds achieved from sales disburden the budget and also the fee payer directly. As marketing prices for steel and other metals have clearly risen due to strong demand, the marketing of scrap metal has developed into a relevant source of income over the last years. In 2013 the proceeds lay by around 100 to 150 EUR per tonne. As a whole, the amounts of scrap metal per capita in Freiburg of 5.2 kg were clearly lower than the national average of 9.7 kg/Ea in 2013 (see chapter 6.12.). As with electrical appliances, this is due to the fact that the disposal of scrap iron facilitates access to private scrap iron via private or commercial collectors. Scrap iron can only be delivered to the recycling centres in the surrounding area. This indeed leads to higher collection amounts though at the expense of the service for the citizens.

■ Collection amounts of scrap metal from 2008 to 2013



6.9. Waste wood



Wood which has not been treated with preservatives can be taken to bulky waste. Waste wood is thereby loaded onto a press truck and transported to Remondis where is sorted and recycled. Untreated, varnished or layered wooden components are accepted at any of the three recycling centres where old wood is sorted into untreated wood (pollutant class A I) and treated wood (pollutant class A II and-III with no assumed danger to the environment) according to the Waste Wood Ordinance. Pollutant class I-III wooden components are, for example, recycled into chipboard (material recycling) or burnt (energetic recycling). Class A IV waste wood (for example, palisades treated with preservatives) is accepted against charge only at the St. Gabriel recycling centre and handling site and from there on passed on for hazardous waste incineration.

In 2013, 2,977 tonnes of waste wood (without A IV) had been collected. This corresponds to 13.6 kg per resident.

6.10. Construction waste

Citizens of Freiburg can take their recyclable and non-recyclable waste to the recycling centres at the Eichelbuck disposal site. Disposal of 50 litres of recyclable construction waste is deducted via the waste disposal charges. The fees for excess amounts or delivery of non-recyclable construction waste are charged according to the maintenance charges. As a whole, delivered amounts of recyclable and non-recyclable construction waste are in steep decline.

Recyclable building waste is taken from collection points to the recovery plant and non-recyclable construction waste is partially passed on to the Merdingen disposal site via the handling site at Eichelbuck. Asbestos and mineral fibres go to the disposal site in Kahlenberg. Due to the co-operation agreement of 16.12.1993., the Breisgau District holds responsibility for disposal of non-recyclable mineral based and asbestos waste until 2030.

6.11. Extension of recyclables – waste points

A review in Freiburg led to a decision as to whether an “extended reusable material sack” should be introduced. According to urban specific evaluation and discussions with system operators, this would lead to significant additional costs. Due to the incurred costs and lack of influence over the recycling network and quality (these would lie in a negotiable draft regarding the competence of the dual systems) the extended reusable sack had not been introduced.

The system of a recycling bin corresponds to that of the recycling sack. Households in Freiburg already own three different types of bins. The introduction of a fourth bin is not recommendable due to lack of space and eventual incorrect sorting/throwing.

Due to the current remarkably low amount of residual waste per capita and the already high recycling rate it is unassumable that considerable amounts of recyclable material can be exploited from residual waste in Freiburg as the costs would justify a separate recycling bin (between 2.5 to 4.5 kg/EW/a are estimated). In the meantime, experience gathered from pilot projects in other communities confirmed that the introduction of a recycle bin would lead to extra costs. Recycling points have been arranged in every part of Freiburg to still be able to achieve the waste management objectives and best possibly attain a separate collection of recyclables.



Recycling points

The first recycling points were set up in Freiburg in 2013. Meanwhile, there are in all 26 recycling points in every part of town. The new recycling containers are uniformly painted, soundproofed and placed in central easy to reach locations or in superstore car parks. These recycling points offer Freiburg citizens the facility to locally dispose of waste glass, old clothes and electrical appliances in the respective containers. Even scrap metal containers are available in some locations. Collection amounts with regard to the short time after set-up are satisfactory according to experiences reported by ASF. ASF assume that throwing waste into the wrong bins will recede further after a learning process. In 2014, 205 tonnes of old clothing, 52 tonnes of electrical waste and 1.5 tonnes of scrap metal had been disposed of in the recycling points.





Locations of recycling points in Freiburg



6.12. Comparison – waste volume per capita Freiburg – Baden-Württemberg

(Figures taken from Baden-Württemberg waste balance)

Waste for valuation per resident	 Freiburg 2013	 Baden-Württemberg 2013
Organic waste	66 kg	45 kg
Green waste	48 kg	85 kg
LVP	24 kg	27 kg
PPK	93 kg	83 kg
Glass	29 kg	26 kg
Metal	5,2 kg	9,7 kg
Plastic	2,2 kg	7,9 kg
Old electronic & electric appliances	7,8 kg	7,6 kg
Total waste for valuation	277,2 kg	291,2 kg
Abfall zur Beseitigung pro Ew.		
Residual waste	94 kg	123 kg
Bulky waste	18 kg	21 kg
Total waste for disposal	112 kg	144 kg
Total waste	389,2 kg	435,2 kg

7. Waste disposal



7.1. Residual waste	27
7.2. Bulk waste	28
7.3. Pollutants	28

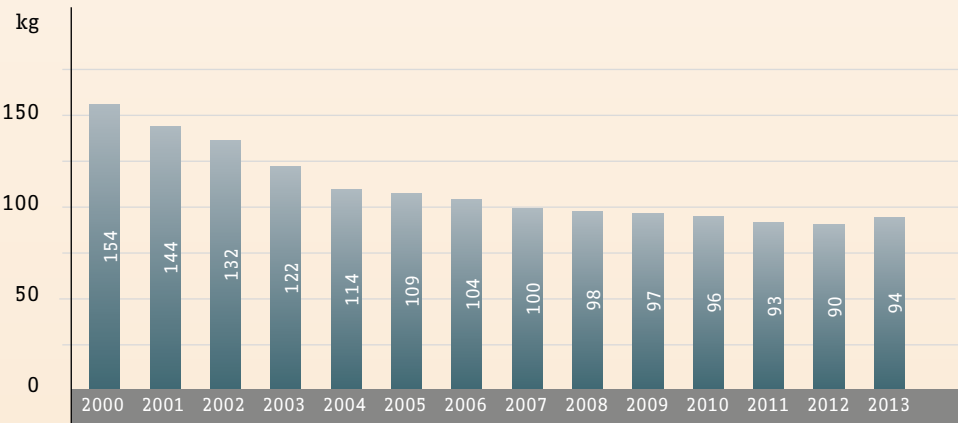
7.1. Residual waste

Every household in Freiburg has a granted right to vote in the Waste Management Ordinance with regard to container size for residual waste and collection intervals.

This can be determined on either a weekly or fortnightly basis. Beyond that, additional accumulated residual waste can be disposed of in red bin bags available at retail outlets. Wheelie bins introduced in 2000 are available in 35-, 60-, and 240-, litre versions. 770 or rather 1,100 litre refuse containers for households solely on large housing estates have been retained. An increasing portion of these containers will be successively replaced by refuse locks. By means of this process, waste on housing estates may also be calculated according to user related charges. To reduce container charges, it is possible for households to form a disposal collective for joint use of the residual waste containers.

The successes of material recycling are expressed by a continually rising recycling rate which reached a remarkably high level of 69% in 2013. At the same time, this positive development led to a steady reduction in residual waste. This had most significantly fallen from 154 kg to 100 kg per resident from 2000 to 2007. The amount of residual waste has stagnated at a low level for five years. In 2013 a total of 20,637 tonnes of residual waste was collected which corresponds to 94 kg per resident. The Baden-Württemberg average stood at 123 kg of residual waste per resident in 2013.

Residual waste collection – grey bin from 2000 to 2013 per capita



7.2. Bulk waste

Every household in Freiburg pays for a total of 4 cbm of bulk waste per annum via the household budget. This can be collected or brought to the disposal site Eichelbuck in line with bulk waste collection. The amount of collected bulk waste (excluding wood, electrical and metal) taken from communal collection and accepted at recycling centres and from private deliveries to the waste disposal site stood at 3,613 tonnes which corresponds to a figure of 23.5 kg per resident. This stands a little above the national average at 20.1 kg/Ea. Secondary raw material recovery is attained in Freiburg in which three vehicles are commissioned for the collection and separate removal of bulk waste such as wood, metal, old electrical appliances and other forms of bulk waste.



7.3. Pollutants

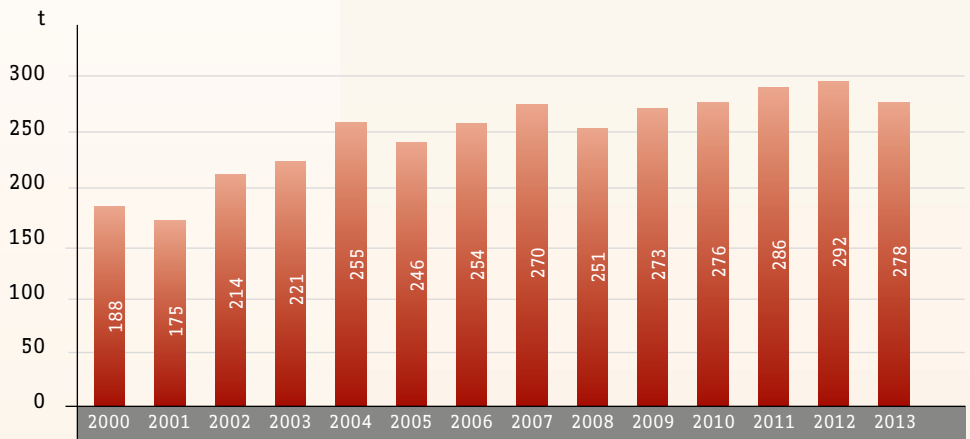
Environment and health endangering pollutants from Freiburg households are taken at three municipal recycling stations. Additionally, the ASF Mobile Hazardous Waste Unit drives to all parts of Freiburg twice a year. Mobile pollutant collection offers the elderly without transport the facility to dispose of pollutants from the household via the shortest way.

Primarily paints, varnishes, and also cleaning materials, batteries and pharmaceuticals are rendered. The collection of harmful substances was used by 54,265 people in 2013 and 278 tonnes of pollutants from mobile and stationary acceptance were in all allocated to recycling and disposal. Commercial enterprises can also take pollutants to the St. Gabriel recycling centre. The pollutants are classified, declared and weighed. Disposal here is, however, subject to charge.

Pollutants from the communal pollutant collection and recycling centres are brought to the interim warehouse at Remondis under ASF approved collection and disposal certification, and partially conveyed to recycling/reutilisation. Spray cans are conveyed to aluminium and tinsheet recycling after vacuuming of propellant. Lead batteries are recycled up to 100%. Paints and varnishes can, depending on the contents, be used thermally as a substitute fuel in cement factories as well as absorption and filter materials.

Laboratory chemicals and pesticides are recycled via the HIM GmbH company. Disposal of electrical and electronic appliances is regulated under the Elektrogesetz and is implemented by the EAR foundation (Elektro-Altgeräte-Register).

Pollutant collection 2000 to 2013



8. Eichelbuck disposal site today



■ Decommissioning of Eichelbuck disposal site (2007 to 2020)

Since 2008, the upper surface of the Eichelbuck disposal site was sealed up in sections (total area – 210,000 m²). Construction stage 2 of the surface sealing (46,000 m²) was completed a short time ago and the procurement procedure for the third construction phase (66,000 m²) has meanwhile been completed. Upon sealing the Eichelbuck disposal site, a sealing system based on prepared waste incineration slag TREAMin ® mixed with clay from the Alsace Region had been applied. Waste material in Freiburg is used to permanently cover deposited waste by means of this innovative and environment friendly solution. In the meantime, 125,000 tonnes of prepared waste incinerated slag has been commissioned on the east/west access roads along with support and base layer material in construction phases 1 and 2 (target until 2020 : acceptance of 155,000 tonnes of slag).



■ Aftercare, Eichelbuck disposal site (2020 to 2050)

The set-up decision for the “Eichelbuck” development plan was taken hold of in 2011. By fixing a photovoltaic plant in the partial development plan “Eichelbuck”, ASF Solar GmbH & Co. KG were able to install a photovoltaic plant on the southern part of the plan area in 2012. The intended construction of an infopavillion on the disposal site plateau for use as an information and further education centre had in the meantime also been turned into reality. In 2015, an adventure path with various stations was set up over which conducted tours for visitors can be facilitated to the disposal site onto the platform on foot. An overall utilisation concept for the Eichelbuck disposal site was created in 2014 and the energy concept had been introduced to the environment and construction committee in the same year. This already comprises the existing plants as well as the construction of new plants for the creation of regenerative energy from green waste following the decommissioning phase. At the moment, participation by the public and authorities is taking place under this concept. Furthermore, an Initial Environmental Evaluation is being carried out.



■ Green waste recycling on the Eichelbuck disposal site

Part of the 2014 energy concept is the construction of further plants for material and energetic recycling of biogenic waste on the disposal site plateau by ASF. In future, Freiburg green waste is hereby utilised locally and energetically recycled. In all, it is assumed that by means of the new recycling plants 22,080,000 kWh of electricity and 34,500,000 kWh of thermal energy per year can be generated through which a total of around 11 million litres of heating oil or gas can be substituted (see chapter 5.2 for calculations). Green waste recycling in planning will in the long term also facilitate a replacement for the declining disposal site gas.

■ Declining disposal site gas

A new pipework arrangement was built through which bio gas from Reterra Freiburg GmbH and deposit site gas from Eichelbuck deposit site is brought together. Since the beginning of 2011, 70% of the bio gas from Reterra Freiburg GmbH complements the declining deposit site gas in order to continue generating electricity and heating at BHKW of Badenova in Freiburg Landwasser for the local inhabitants. This energy facilitated the provision of 3,300 Freiburg homes with electricity and 12,000 homes with thermal energy/heating on 2013.

9. Safe disposal



9.1. Disposal safety for waste disposal

■ *Residual waste*

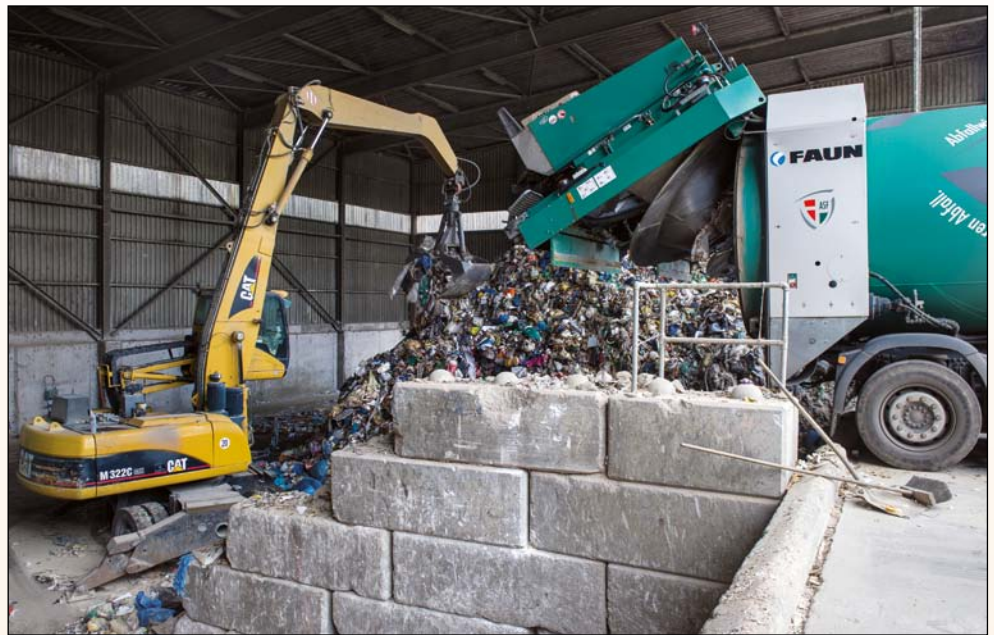
An agreement was made between the District Breisgau-Hochschwarzwald and the City of Freiburg on 16.12.1993 in which the district committed itself to provide systems to safeguard residual waste disposal for the next 25 years as from 01.06.2015. In return, the City of Freiburg authorised the District to deposit its waste from the west side onto the extended Eichelbuck disposal site until 2005.

The District Breisgau-Hochschwarzwald founded the Gesellschaft Abfallwirtschaft Breisgau (GAB) in 1998 which next to the Urban District of Freiburg became connected to the Emmendingen and Ortenau Districts via Kahlenberg Waste Treatment and Waste Association (ZAK). GAB decided on a Europewide call invitation to tender for the construction of a waste incineration plant on the Gewerbepark Breisgau on 23.11.2000. The TREA residual waste and energy processing plant, in operation since 09.11.2004, forms the basis of safe disposal of urban waste. The plant is in a position to annually treat 170,000 tonnes of domestic and commercial waste. In each case, a contingent to this disposal capacity has been contractually reserved for the City of Freiburg and ZAK under defined price conditions.

• City of Freiburg	29,600 – 51,400 tonnes p.a.
• District Breisgau-Hochschwarzwald	26,500 – 52,200 tonnes p.a.
• Zweckverband Abfallbehandlung Kahlenberg	20,000 – 40,000 tonnes p.a.

Almost all the TREA incineration capacity for the disposal of residual and bulk waste is hereby tied to the associates involved with GAB. This bond has been secured until 31.05.2030 by the contractual period in the disposal contract. Upon judging the question on whether the combustion capacity will suffice for the future implies that waste amounts of past years may be raised. The graph on amounting residual waste (see chapter 7.1) shows that the amount of residual waste has evened out to today's level. The waste separation system in Freiburg (organic waste, paper bin and recycling centres) has come together and proven itself and an increase in waste for disposal would only be expected from a significant rise in population.

Freiburg delivered about 29,400 tonnes of residual and bulk waste in 2013. Thus it can be assumed that the City of Freiburg's contingent will cover the amounts of waste for disposal by TREA in years to come. Taking commercial waste into special consideration, disposal safety for unexpected increased amounts is then secured by means of the disposal contract should the agreed quantity level be exceeded.



■ Mineral and asbestos waste for disposal

Going back to the agreement of 16.12.1993, the District Breisgau-Hochschwarzwald will on 01.06.2015 take over responsibility for the disposal of non-recyclable mineral and asbestos containing waste up to the year 2030. Initially this waste was taken to the disposal site for residual construction waste in Merdingen which nowadays offers insufficient filling capacity. According to an agreement between the District and Waste Disposal Association, waste treatment Kahlenberg (Zweckverband Abfallbehandlung Kahlenberg (ZAK), polluted waste has been taken to the Kahlenberg disposal site since 2006. Unpolluted waste will continue go to Merdingen.

9.2. Safe disposal of waste for recycling

■ Organic waste

Organic waste has been taken to the Reterra Freiburg GmbH digesting plant on the Freiburg-Nord industrial estate and processed into compost since 1999 (see chapter 6.2). At that time, it was contractually agreed that Reterra would take on accumulating organic waste of the District Breisgau-Hochschwarzwald and City of Freiburg District regional authorities over a 20 year period up to 2019. The digestion plant was constructed to an annual recycling capacity of 36,000 tonnes. The district delivered around 16,500 tonnes and the City of Freiburg around 14,800 tonnes of organic waste to the Reterra GmbH company in Freiburg totalling to 31,300 tonnes. Organic waste accumulation had evened out to this level. In the event of arising long term higher amounts, the capacity reserve of 4,700 tonnes from the District Breisgau-Hochschwarzwald and the City of Freiburg can be used in priority over other deliverers. This means that safe disposal is given for the next 4 years inspite of rising amounts of organic waste.

■ Green waste

The operating period of the planned green waste recycling plants on the Eichelbuck site is unlimited. They have sufficient capacity for the treatment of accumulating green waste under former conditions in Freiburg. The recycling plants are the property of ASF.

■ Paper, paper board and cardboard

The public disposal provider is to the greater extent highly responsible for amounts of paper, paper board and cardboard (PPK). Besides, dual systems in Germany are responsible for the recycling of packaging made from paper, paper board and cardboard (PPK). Due to an analysis on packaging waste these result to 17% of the entire amount of paper, paper board and cardboard (PPK). ASF are commissioned to undertake the tasks of collection, sorting, recycling and disposal of the remaining amounts of paper, paper board and cardboard under the Master Agreement until 2019. Collection takes place by means of nearby paper bins and the three recycling centres.

■ Light packaging and waste glass

The public disposal provider is fundamentally responsible for household waste. The responsibility for packaging waste (light packaging, waste glass and paper packaging) has been conveyed to the dual systems nationwide which implies that the public disposal provider bears no responsibility for disposal.



10. Co-operation with other disposal carriers



The demands on waste disposal in the preceding years have been increasingly tightened according to changes in the law. The most serious issue was the decision to no longer permit waste disposal without pretreatment. In order to meet these requirements it was economically and ecologically sensible to co-operate with neighbouring disposal providers. For this reason, the District Breisgau-Hochschwarzwald and the City of Freiburg reached an agreement on co-operation in Waste Management back in 1993. The agreement was adapted in the year 2000 and implemented in various sectors:

The most important joint project was and still is the securing of remaining waste disposal. The agreement met between the City and District in 1993 and the public contract from the year 2000 states that the City had issued the right to deposit its waste from communities West of the Rhine Valley onto the Eichelbuck disposal site until 2005. In return, the District will bear responsibility for disposal of the town's residual waste over the next 25 years as from 1st June 2005. The district was thereby obliged to seek a location for a waste incineration plant which the City would be able to use from 2005 to 2030. The background to this provision was the requirement set by the legislator saying that depositing untreated waste would no longer be possible as from 01.06.2005. That is why the Eichelbuck deposit site was closed that year. In order to keep up with contractual obligations, the District Breisgau-Hochschwarzwald founded the Gesellschaft Abfallwirtschaft Breisgau mbH (GAB) in 1998 which next to the Municipality of Freiburg was also joined by the Administration Union of Waste Treatment Kahlenberg (Emmendingen and Ortenau Districts). The share ratios of co-shareholders in GAB are 50.1% for the District, 29.8% for the City of Freiburg (from these 2% for ASF and 20.1% for the Zweckverband Abfallbehandlung Kahlenberg (ZAK).

The City of Freiburg had also co-operated with the District Breisgau-Hochschwarzwald for the recycling of organic waste. Recycling of organic waste was commonly already tendered throughout Europe in 1997. As a result, a contract was made with the regional enterprise Meier-Entsorgung (Meier Disposal) from Bad-Krozingen on planning, financing, construction and operation of a recycling plant in Freiburg-Nord. The contract stipulates that the digestion plant should process accumulating organic waste into compost over a 20 year period.

For the disposal of non-recyclable construction, waste as well as contaminated excavated soil and rubble, the District set up the building waste disposal site at Merdingen in 1991. From 2005 onwards, the District committed itself to dispose of asbestos containing waste on request due to an agreement made in 1993 and the public contract with the City of Freiburg from 18.12.2000 as disposal of building materials was no longer possible due to closure of the Eichelbuck disposal site.



11. Costs and charges for waste disposal



11.1 Waste Disposal Costs

In the latest calculation, the Freiburg waste industry assumes an annual requirement of fees to the sum of 20.5 million EUR for 2014/2015. This fees needs assessment underlies the results of the 2012 economic year and the target figures from updated economic plans for 2013/2014 including the forecast figures for the medium term financial plan.

Reserves were set aside for the decommissioning and aftercare of the Eichelbuck disposal site. The assigned Roth Engineering Office has newly calculated the provisioning requirements on 01.01.2014 by means of the procurement procedure on the third construction phase taking price increases and corresponding interest rates into consideration. After that, there is a provisioning requirement to the sum of 28 million EUR. Accruals amounted to 26.1 million EUR on 01.01.2014. By proceeds taken from recycling materials and interest, the mathematical funding gap is, having said this, prospectively compensated so that as from today it can be assumed that the accruals will suffice to the end of aftercare in 2050.

11.2. The Freiburg Refuse Charging System

For a long time, Freiburg has expressed itself as one of the few towns in favour of a household related charging system. This means that each household is entitled to a residual waste container related to the size of the household. The aim of entitling residents to a usage and demand oriented choice on container size and weekly or fortnightly collection was a deciding factor behind this charging system. Each resident in Freiburg has a direct influence on waste disposal charges by means of waste prevention and careful waste separation. This freedom of choice is only limited to stipulation on a minimum volume. After that, a weekly residual waste minimum of 5 litres per week per person must currently be registered for disposal.

Besides, there is the possibility for more households to join together to form a waste disposal collective and share the container charges. A weekly minimum volume of 5 litres per person must also be taken into consideration.

Refuse locks can be used to collect the waste individually and responsibly on large housing estates where single containers for each household cannot be placed due to lack of space.

■ What is paid by the waste disposal charge?

As a rule, waste disposal charges in Freiburg are recalculated every 2 years. According to the Waste Management Ordinance of the City of Freiburg dated 03.03.2015., (AbfWS) the user charges for the disposal of waste from private households are based on the number of people in the household (household charge), volume of the residual waste container in use and collection frequency (container charge).

The **household charge** is among other raised by

- collection, transport and use/disposal
 - paper and cardboard (collection every 14 days)
 - organic waste (weekly collection)
 - bulk waste upon request
 - green waste and Christmas trees (twice a year per district)
 - collection of pollutant (twice a year per district),
- cleaning of organic waste bins (twice a year)
- services provided by recycling centres including the acceptance of pollutants.

The **container charge** is raised by

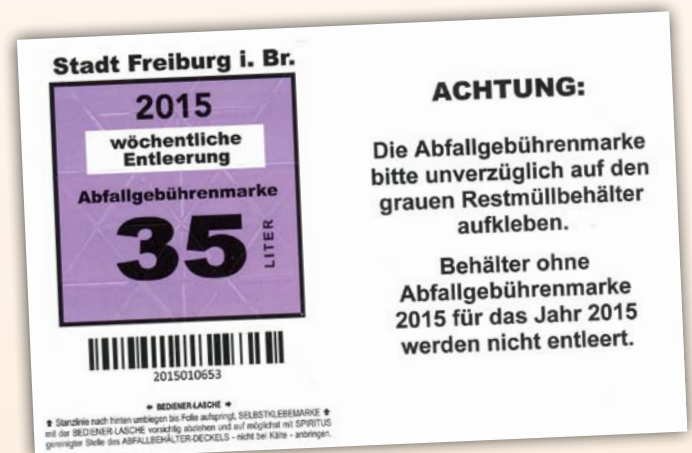
- collection, transport and disposal of residual waste subject to container size and regular collections.



A comparison between the charges raised by individual towns and districts is hardly possible due to the various charging systems. The level of charges depends purely on the comfort of the respective system. Next to disposal of residual waste, the charges cover a multitude of services as today's waste management industry is a highly sophisticated service. The necessary high technical standards and pricing thereby contribute to the welfare of the community.

The waste management services in Freiburg show a broad and overall above average comfortable offer. For example, the organic waste bin is emptied weekly throughout the year which from a hygienic point of view is a valuable service. Twice yearly cleaning of the organic waste bins is of valuable significance in this context. The green and bulk waste collection is offered here in a collect and return system.

In contrast to most other communities, every recycling point in Freiburg accepts all fractions as well as pollutants without extra charges. Waste containers for organic and residual waste are made available to residents free of charge. Only one service charge is made for changing the container/bin. One contribution to waste saving is also the offer of a locally financed bulk waste exchange and mart. In short, all aforementioned services are rendered without raising any extra charges.



12. “What’s on in town at the moment?” ...



■ Introduction of waste points

The first waste point in Freiburg was arranged in 2013. Meanwhile, they are available at 26 locations around the town. By means of the waste points, residents of Freiburg are now offered the facility to locally dispose of waste glass, old clothes and electrical appliances into the respective containers. Scrap metal containers are also placed at some locations. The aim of this measure on the one hand is to collect more reusable materials, and on the other hand to promote further waste separation. The waste points may be expanded depending on the success of this measure.

■ "Lid to the campaign"

With the "closed lid campaign" Freiburg Waste Management wants to sensitise residents and businesses into user related financing of residual waste removal. Overfilled waste containers furthermore disrupt the image of the town leading to unpleasant odours and more difficult working conditions for the refuse collection operators. An appropriate campaign has been prepared and will be carried out in 2015.

■ Ident system

ASF have had all residual, organic waste and green bins equipped with a chip in 2014 which is electronically read upon emptying at the dustcart. The container identification system facilitates the allocation of the around 100,000 refuse bins in Freiburg to their respective households or property to optimise the logistics of waste disposal.

■ Full service

A full service is expected to be arranged in order to meet the needs of demographic change. The containers are thereby collected from their location and returned by personnel members of the collection vehicle. This is an additional service which residents can make use of against an extra charge.

■ Promotion of waste preventing behaviour

The waste management teacher at ASF, commissioned by the city regularly offers courses, teaching units, drama and project weeks for all grades in which pupils learn which waste belongs in the sack or bin, and what has to be recycled and why recycling helps to save the environment. In a playful manner pupils learn how to think and develop ideas in circulation systems to avoid waste. These activities facilitate a rehearsed responsible approach to the topic of waste at an early stage.



13. Contact details/ Imprint



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■ Recycling points

- St. Gabriel, Liebigstraße
- Schnaitweg 7
- Carl-Mez-Straße 50

Recycling exchange and mart on St Gabriel recycling centre Liebigstraße
Eichelbuck, handling site, Eichelbuckstraße

Information on opening hours and technical facilities available under
www.abfallwirtschaft-freiburg.de or in waste calendar

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