Landeshauptstadt Magdeburg
Städtischer Abfallwirtschaftsbetrieb

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Waste Management Concept 2018

ottostadt magdeburg

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Landeshauptstadt Magdeburg

WASTE MANAGEMENT CONCEPT

2018

Resolution of the City Council of 11/04/2019

Resolution No. 2456-067 (IV) 19

The Ottersleben site designated for the anaerobic treatment facility in Annex 1, section 13.5.1 (page 82 pp.) is to be re-evaluated and will not be resolved upon as yet.

The Lord Mayor is directed to evaluate other sites including the Rothensee industrial area, to list the pros and cons of each site, commission an odour impact assessment for the candidate sites in the run-up to the permitting procedure and, after timely consultation of the affected citizens and weighing up the pros and cons of each eligible site, have a City Council resolution adopted in the 4th quarter of 2019.

ottostadt magdeburg

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1 Introduction

Article 21 of the German Circular Economy Act requires each public waste management authority (PWMA) to draw up a waste management concept for its region, taking into account the Waste Management Plans.

The detailed requirements for waste management concepts are set out in Art. 8 of the Waste Management Act of Saxony Anhalt (AbfG LSA).
The Waste Management Concept provides an overview of the current situation of public waste management and must include the following information as a minimum:

1. Details of the type, volume and fate of the waste generated in the PWMA's functional area
2. Description and substantiation of the actions planned and implemented for the preparation for reuse, recycling, other recovery and disposal of waste
3. Definition of the waste streams excluded by by-law from the waste management obligation together with a reasoned justification
4. Demonstration of 10-year waste management certainty
5. Information on the scheduling of the planned actions and estimated construction and operational costs of the waste treatment and disposal facilities needed for waste management in the respective area.

The Waste Management Concept must be updated at least every five years.

With the present revision, the previous Waste Management Concept for the period 2013 – 2017 is updated to reflect the current waste management status, taking into account the updated Waste Management Plan 2017 for Saxony-Anhalt.

2 Legal Framework

2.1 European legislation

The waste management legislation of the European Union is characterised by a wide variety of legal acts with different legal effects. While regulations directly apply in the EU member states, directives have to be transposed into national law.

One of the most important directives is the Waste Framework Directive (Directive 2008/98/EC) which sets the basic concepts and definitions related to waste management and establishes the 5-tier waste hierarchy.

Other important EU directives include the End-of-Life Vehicle Directive, the Battery Directive, the Landfill Directive, the Waste Electrical and Electronic Equipment Directive and the Packaging Directive.

Of the EU regulations, particular mention should be made of the Waste Transshipment Regulation which regulates transboundary waste shipments within, into and out of the European Community.

2.2 Federal legislation

The Act on the Promotion of a Recycling Economy and Environmentally Compatible Waste Management (Circular Economy Act, KrWG) forms the basis for the waste management regulations at national level.

The scope of the Circular Economy Act is no longer limited to "movable objects" but encompasses "all substances or objects" except for defined exemptions such as "non-excavated soil and building structures".

It regulates the delimitation of waste and by-products (which are not subject to the waste management legislation) and the end-of-waste status.

Implementing the European Waste Framework Directive, the KrWG enshrines the five-tier waste hierarchy into German law. Accordingly, the following ranking applies to waste prevention and management measures:

- Prevention
- Preparation for reuse
- Recycling
- Other recovery, in particular energy recovery and backfilling
- Disposal

Based on this hierarchy, the measure which best ensures the protection of human health and the environment is to be given priority.

The so-called heating value clause which assumes the equal ranking of energy and material recovery at a minimum heating value of 11,000 kilojoules was suspended with effect from 1 June 2017

Art. 11 and Art. 14 prescribe the separate collection of biowaste and paper, metal, plastic and glass waste respectively with effect from 1 January 2015. To promote recycling and other material recovery, Art. 14 introduces recycling targets to be achieved by 2020.

Pursuant to Art. 17 (1), waste from private households and waste for disposal from other sources will continue to be subject to transfer to the public waste management authority. At the same time, it provides, however, for an exemption for private households ("recycling on the

property used as part of the private lifestyle"). Exemptions from the waste transfer duty may also apply to commercial collections to the extent they do not run counter to public interests.

This is further detailed in Art. 17 (3). Art. 18 sets out a new notification procedure for charity and commercial collections.

Specific waste streams are additionally regulated by the End-of-Life Vehicle Ordinance (AltfahrzeugV), the Battery Ordinance (BatterieG), the Electrical and Electronic Equipment Act (ElektroG), the Biowaste Ordinance (BioAbfV), the Landfill Ordinance (DepV), the Commercial Waste Ordinance (GewAbfV) as well as the Packaging Ordinance (VerpackV) or the Packaging Act (VerpackG) which will enter into force on 1 January 2019 and supersede the Packaging Ordinance.

2.3 Law of the German Länder

The Federal Circular Economy Act is complemented and detailed by the waste management acts of the German Länder. The waste management act aims to promote a low-waste circular economy and secure environmentally sound waste management.

Pursuant to the Waste Management Act of Saxony-Anhalt, the administrative districts and administratively independent cities act as the public waste management authorities (PWMAs). Accordingly, Landeshauptstadt Magdeburg is the public waste management authority for the city region of Magdeburg.

Moreover, the Waste Management Act of Saxony-Anhalt sets out what is to be regulated in a waste management by-law, under which conditions waste can be excluded from public waste management and which costs are allocable to the eligible costs for calculating fees for waste management services.

Moreover, it defines the contents and maximum term of the municipal waste management concepts.

2.4 Local legislation of the City of Magdeburg

The municipal Waste Management By-law regulates the compulsory participation, the source segregation and the way in which the individual waste types are to be made available.

The Waste Fee By-law contains provisions on the charging of fees for the use of the waste management services.

3 Strategic Environmental Impact Assessment

Waste management concepts developed by public waste management authorities are subject to a strategic environmental impact assessment (SEA duty) in accordance with Art. 35 (1) and (3) of the Environmental Impact Assessment Act (UVPG) to the extent they define requirements setting a precedent for future permit decisions. An SEA can be dispensed with if the changes to the waste management plans and programs are of a minor nature.

No major environmental impacts are to be expected from the planned expansion of the Silberbergweg recycling centre (Action plan, Item 3.1.8).
The permit application for the extension of the Hängelsberge landfill site (Action Plan, Item 3.1.9) as provided for in this Waste Management Concept does not establish a precedent.

The necessity of an SEA for the biowaste anaerobic digestion project (Action Plan, Item 3.8) will have to be assessed by the competent authority as part of the preliminary review as per Art. 7 of the UVPG. The documents required for this purpose will be submitted timely by the project owner according to the status of the planning process.

4 Implementation of Action Plan 2013–2017

The measures set out in the Waste Management Concept 2013–2017 have been implemented as follows:

4.1 Waste information service and public education

Waste Guide

The Waste Guide provides current information, predominantly on waste management, but also on street sweeping and winter service, calendars for recycling collections (yellow bin) and the stops of the HazMobile and RecycMobile including request cards for free bulky waste collections. The brochure is distributed to all the households of the city (approx. 138,000) once per year at the end of the preceding year.
Another 4,000 copies are available at SAB's service departments and the Citizens Offices for cost-free distribution to new citizens and interested persons.

Information material

Moreover, the range of information material is being continuously expanded and updated. Information material is made available on the internet or in paper form and comprises, inter alia, instructions for waste separation, information about the diverse collection systems as well as environmental education material.
Basic and generally applicable information is also made available in English and as pictorial material.

Waste education days and project weeks

The annual Rathausfest is of particular importance to SAB's community outreach programmes. SAB was regularly represented at this event with an information and art and craft booth. In addition, environmental theatre groups presented performances for children.

Altogether 50 performances by diverse environment theatre groups were organized for primary schools between 2013 and 2017. In this way, more than 4,300 students could be introduced to the topics of waste prevention, waste separation, recycling and disposal.

For secondary schools, SAB has offered and funded the Germanwatch Resource Expedition project since 2014. Based on satellite photos, students assisted by experienced teachers and experts work on the topic of energy and resource consumption in two 90-minute teaching units. Excursions on climate change and visits to the municipal recycling centres round off the presentations.

In total, some 60 teaching units were organised for 30 classes at 15 schools, providing some 750 students with the opportunity to make themselves familiar with the problems of resource consumption.

Guided tours of the landfills and facility visits provided students and professionals with an opportunity to get an up-close look at the municipal waste management facilities and operations.

Announcements/Press releases

Using announcements and press releases, SAB regularly informs the citizens about changes to collection days after public holidays, new by-law provisions and fee schedules as well as diverse seasonally recurring topics like handling of the Bio Bin in winter and summer, pilot project and introduction of the Bio Bin with filter lid, the so-called "Bio Bin plus", the disposal of waste electrical and electronic equipment, spring clean-up, leaves management and winter service.

4.2 Prevention and recycling

European initiatives

SAB participates in the European Waste Prevention Week, informing kindergartens and schools about this initiative and supporting projects.

The spring cleanup under the motto "Magdeburg cleans up" is part of the European initiative "Let's clean up Europe.

Free flea market

The objective of the free flee market is to draw the attention to the reuse potential of articles of daily use and provoke reflection about the fast throw-away society. On the other hand, many Magdeburg residents are also prepared to give away objects to the socially underprivileged. Since its inception in 1995, the flea market has been taking place twice a year, providing a platform for intact household articles to change their owner. Besides small furniture, electrical appliances, books and records, dishes and toys are on offer.
Thanks to the extension of the storage capacity and improved storage conditions, objects can be handed in on additional acceptance days before the scheduled flea market date. In this way, the range of articles offered can be extended.

Online giveaway exchange

At www.gratisboerse.magdeburg.de, SAB offers a platform that can bring together people wishing to dispose of unwanted items and potentially interested persons, thereby contributing to waste prevention. There, users can look for, give away or swap items of daily use or rare collector objects.
Users can post their offers, possibly with photo, free of charge on this platform

One major advantage of this platform is its 24/7 availability.
In 2016, this external website was aligned with the corporate design of Landeshauptstadt Magdeburg.

4.3 Recycling

Expansion of recyclables collection

In 2015, a pilot project was launched at the recycling centres with the aim of improving metals and plastics capture from kerbside bulky waste collections. For the time being, this has not led to an increase in recycling rates so that no organisational changes were made to the bulky waste pickup service.

However, large plastic objects will continue to be separately collected as part of the kerbside bulky waste pickup service and unloaded into the designated collection container for recovery by GISE at the Hängelsberge recycling centre.

To improve decentralised plastics and metal collection, a RecycMobile was launched in October 2014. Deployed together with the HazMobile, it serves 44 stops in the city region once per month and 8 stops twice per year. The RecycMobile is well received by the citizens. It accepts plastic and metal household objects (longest dimension up to 50 cm). In 2016, the RecycMobile collected 1.5 Mg and in 2017 approx. 1 Mg of household plastics and metals which were thus diverted from the residual waste stream.

Figure 1 RecycMobile

As the Recycling Act originally planned by the legislator for the co-collection of recyclables and packaging waste in a recycling bin was ultimately not implemented, the legal basis for such initiatives is shaky. The introduction of another recycling bin for kerbside collection has been dispensed with.

Expansion of separate organic waste collection

A variety of activities were carried out to further reduce the biowaste content of the residual waste fraction.

The starting point was an inspection of biowaste segregation at the households beginning in 2015 with the aim of increasing the participation level in the municipal biowaste collection service.

As a result, the number of properties participating in the biowaste collection service increased. As at 02/01/2018, 61.8 % of Magdeburg's households participate in the biowaste collection scheme (Bio Bin). The number of Bio Bins provided to households was increased by approx. 800. This measure was accompanied by extensive public awareness and environmental education programs on the topic.
The home composting option was retained, but must be declared on a separate application form at the time of registration and re-registration. SAB carries out inspections at households having declared home composting.

To improve the acceptance of the Bio Bin, a pilot project was rolled out in 2015 to test biofilter lids.
In this connection, Bio Bins with biofilter lids were distributed to 242 test objects. Besides single-family houses, multi-family houses and large residential complexes participated in the project. Due to its weight and special design, the filter lid ensures a perfect fit and air-tight sealing of the Bio Bin. The filter material helps reduce bad smells and keep away insects.

In three surveys, the project participants were polled for their experience with the new Bio Bin lid. 95 % of the test households were pleased with the new lid system and plan to continue using it. To establish the legal prerequisites for the introduction of the “Bio Bin plus”, the waste management by-law was amended with effect from 1 January 2017. The "Bio Bin plus" has since been approved as a regular bin available against a slightly higher charge.

Residual waste analysis after the recyclables collection system switch

Following completion of the system switch to kerbside waste paper and light-weight packaging collection, a representative residual waste analysis was undertaken in the years 2013/2014.

The analysis showed a decline in the waste paper and metal volumes disposed of with the residual waste while the plastics share increased as against the previous analysis in 2009/2010.

A comparison of the results of the residual waste analyses 2000/2001 and 2013/2014 showed significantly reduced paper&cardboard, light-weight packaging and glass fractions in the residual waste over this long period.

Compositional analyses of the residual waste provide important insights for the expansion of public awareness programs on waste segregation.

Increasing the WEEE capture rate

The introduction of the RecycMobile resulted in improved capture rates for small WEEE items in particular.
The city-wide recyclables collection via the known HazMobile stops led to a capture rate of approx. 8 Mg per year in 2015 and 2016.

Expansion of Silberbergweg recycling centre

For the planned expansion of the Silberbergweg recycling centre, the neighbouring property with an area of 4,641 m² was transferred to SAB by resolution of 23/03/2016.

In the 4th quarter of 2016, an ideas contest was carried out for the engineering and design services, with four engineering and architects' offices participating. Following surveying and soil investigation at the planned site, the conceptual and basic engineering were developed from mid 2017 to beginning 2018. In July 2018, the permit application under the Federal Air Pollution Control Act for the expansion and conversion of the Silberbergweg recycling centre was filed with the State Administrative Office Halle, taking into account the quantity thresholds set out in the 4th BImSchV.

Review of economically viable implementation options for a biowaste anaerobic digestion project in cooperation with other administrative districts

Further administrative districts were contacted with regard to a cooperation in the construction and cost-effective operation of a biowaste anaerobic digestion facility. Talks held with the neighbouring administrative districts (e.g. Bördekreis, Salzlandkreis) during the period of 2014 to 2016 did not lead to an economically viable solution.
In June 2017, the Lord Mayor was directed by resolution of the City Council (Resolution No. 1513-043(VI)17) to include an anaerobic digestion facility into the Waste Management Concept and organise the associated planning activities. An economic assessment identified the Hängelsberge landfill site as a suitable location offering cost and operational advantages over other sites. Details of the study are described in Memo 10086/17.
This is setting the basis for the move of the Hängelsberge landfill site to a waste management centre.

4.4 Disposal

Preparatory measures for re-tendering residual waste treatment from 2020

In preparation of the re-tendering process for the treatment of Magdeburg's residual waste stream from 2020, the contracts for engineering services and legal support for the Europe-wide tendering process were awarded. Preparations for the tendering process began in January 2017.

Residual waste composition analysis

In four campaigns covering the different seasons of the year, a representative compositional analysis of the residual waste stream was carried out from autumn 2016 to summer 2017. The results are presented in Section 9.

Reviewing the need for a landfill and/or a permit extension

Proceeding from current estimates, the extended landfill section will reach terminal capacity before 2023. The demand for the deposition of waste for disposal exceeds the level forecast in previous years. In 2017, SAB commissioned the preparation of a project sketch for a landfill extension at the Hängelsberge site. The project sketch has been available since May 2018 and will be used as a decision-making basis and for the application for the landfill extension.

4.5 Closure

Final cover system for the closed Hängelsberge landfill unit, Phase 3

The final surface cover system was completed with the third and last construction phase in 2013. The acceptance inspection under waste law of the final Phase 3 surface cover system by the Higher Waste Authority took place on 14/02/2014. The costs of the third construction phase amounted to EUR 1,511,000 (gross). 60 % of the construction costs were financed through fund grants.

Application for transfer of the closed Hängelsberge landfill unit to the after-care phase

In preparation of the application for transfer of the closed Hängelsberge landfill unit to the after-care phase, the risk assessment of the landfill site was updated in the first quarter of 2014.

On this basis, the application for the determination of the finalisation of the closure activities as per Art. 40 (3) of the KrWG was prepared and filed with the State Administrative Office on 01/09/2014. The final closure of the closed Hängelsberge landfill unit was confirmed by notice of 25/08/2015 and the site transferred to the after-care phase. The costs of the risk assessment and the preparation of an explanatory report amounted to EUR 13,000 (gross).

4.6 After-care

Monitoring, gas utilisation

The Cracauer Anger landfill site and the closed landfill section of the Hängelsberge site have been in the after-care phase since May 2009 and August 2015 respectively.

After-care activities include mainly the continuation of the groundwater monitoring programs, settlement measurements, recording of meteorological data, landfill gas collection and disposal including monitoring as well as the necessary general site inspections and grassland maintenance.
The current legislation prescribes a minimum after-care period of 30 years after completion of the closure phase.

Gas plant at Cracauer Anger landfill site

In view of the declining landfill gas quality, planning activities for the conversion of the high-temperature flare to a lean gas flare with integral heat recovery were started timely to ensure continued beneficial use of the landfill gas.
Original plans were to feed the thermal energy generated into the locally available heat supply system of Stadtwerke Magdeburg.
The building permit was granted on 20 March 2013.
The planned replacement of the high-temperature flare by a lean-gas flare with integral heat recovery system was realised in 2013.
Following successful trial operation, the lean gas flare with integral heat recovery system was started up in September 2013.

During the period of 2014 to 2016 more than 4600 MWh heat were recovered and fed into the district heating network. Due to declining methane levels, an optimisation of the heat recovery system was first considered in 2016. After verifying the available options in a test run, the modification was initiated in the first half of 2017.

Gas plant at Hängelsberge landfill site

A similar natural trend was also observed with the landfill gas collected at the closed Hängelsberge landfill unit.
Due to the declining quality, it was no longer possible to utilise the collected landfill gas together with the landfill gas from the landfill extension for energy generation in a combined heat and power plant.
Because of the lack of demand for the recovered heat in the area of the Hängelsberge plant, provisions for heat recovery were dispensed with in the design of the lean gas flare. In order to ensure the environmentally sound disposal of the lean gas from the closed landfill site, it was decided to install a technology suitable for active gas collection from closed landfills.
The permit for the construction of the lean gas flare was granted on 10/04/2012.
The hydrocarbon converter supplied by LAMBDA provides an optimum solution for landfill gas disposal under the specific conditions of the old Hängelsberge landfill site.
Construction work started in spring 2013. The plant took up operation in June 2013. The landfill gas generated at the Hängelsberge landfill extension continues to be of high quality and is used for electricity generation.

Development of an after-use concept for the closed landfill unit at the Hängelsberge site

For the after-use of the closed landfill site, private investors had expressed their interest to install photovoltaic plants.
The closed Hängelsberge landfill unit is provided with an alternative surface cover system consisting of different mineral layers acting as a water balancing layer.
According to the Uniform National Quality Standards 7-4a "Technical Functional Layers – Photovoltaic Plants at Landfill Sites" published by LAGA Ad-hoc-AG "Landfill Technology" in 2015, the installation of a photovoltaic plant at landfill sites provided with methane oxidation and water balancing layers – as is the case with the closed Hängelsberge site – is not allowed.

Other economically viable after-use options are currently not in sight.

4.7 Certification

Preparations for certification as a specialist waste management company or under an equivalent quality management system

In 2013, the basis for the implementation of this measure was established on the human resources side. For this purpose, the necessary staff capacity at SAB was provided for by re-

allocating responsibilities and recruiting a corporate quality manager who took up work on 01/01/2014.

The as-is business processes at SAB were analysed in detail in 2014.
Based on the relevant provisions of the Ordinance on Specialist Waste Management Companies, detailed questionnaires were developed for the departments involved in waste management activities in order to identify which requirements of the Ordinance were not yet satisfied. In a next step, the measures necessary to reach conformance of our activities with the requirements were defined, implemented according to a project schedule and verified by internal audits and a third-party preliminary audit. In 2016, the Street Cleaning/Winter Service and Waste Collection Departments received the initial certification for the collection and transport of non-hazardous waste. A re-certification for these activities followed in 2017.

With the Silberbergweg recycling centre, another SAB site was certified in 2017.

5 Regional Profile

5.1 Regional and population structure

Landeshauptstadt Magdeburg covers an area of 201 km².
The current land use structure is as follows:

Land use type	Area (ha)	%
Recreation	2,374.40	11.81
Transportation	2,148.88	10.69
Agriculture	7,597.75	37.80
Forests and woodlands	1,820.96	9.06
Open water	1,413.50	7.03
Special purpose area	142.93	0.71
Built-up and non-built-up areas *of which:*	4,413.55	21.96
..- Residential	*2,036.82*	*10.13*
..- Commerce and services	*625.52*	*3.11*
..- Trade and industry	*848.69*	*4.22*
..- Mixed industrial / residential uses	*285.76*	*1.42*
Public facilities areas	188.61	0.94
Total area	**20,100.59**	**100.00**

Table 1 Land use structure
(Status: 31/12/2016; source: Landeshauptstadt Magdeburg, Office for Statistics, Statistical Yearbook 2017)

Year	Number of residents having their principal residence in Magdeburg
2011	231,550
2012	232,203
2013	229,758
2014	230,815
2015	232,824
2016	236,045
2017	238,275

Table 2 Number of residents having their principal residence in the City of Magdeburg (as at 30 June of the year)
(Source: Office for Statistics of Saxony-Anhalt)

5.2 Economic structure

As reported by the business development agency, the region's and city's economy showed a continuing positive trend in 2018.

The established companies continue to grow, expand their operations and are looking for new space. In addition, there is also keen demand for land by companies so far not located in the region. The demand for skilled labour is high and hard to meet.

The existing commercial and industrial zones in the City are enjoying keen demand. As the ongoing highly dynamic development could lead to a shortage of land relatively fast, there are currently plans to designate new commercial zones. However, equating project requests and advanced talks with new companies with prospective commercial tax income and workplaces would be premature.

Nevertheless, the business development agency expects that a high proportion of the projects currently under review will also be implemented.
Even though individual local companies are struggling with business problems, this is not reflected in the figures of the regional labour market.

Magdeburg's economy is based on medium-sized companies, with the services sector predominating.

The following table shows the number of CIC member companies by selected industries:

Industries	Number of businesses	%
Agriculture and forestry, fishery and fish farming	15	0.12
Mining and quarrying	9	0.07
Manufacturing industry	388	2.99
Energy and water supply, waste and waste water disposal, remediation of contaminated sites	155	1.19
Construction industry	656	5.06
Trade, motor vehicle servicing and repair	2,905	22.40
Transport and warehousing	400	3.08
Hospitality industry	786	6.06
IT and communication	562	4.33
Financial and insurance services	786	6.06
Housing and real estate industry	522	4.02
Others	5,787	44.61
Total	**12,971**	**100.00**

Table 3 Number of CIC member companies in Magdeburg
(Status: January 2017; source: Landeshauptstadt Magdeburg, Office for Statistics, Statistical Yearbook 2017)

Tradesman, craftsman and similar businesses are represented in the City as follows:

Crafts according to the new Trade and Crafts Code	Number of businesses	%
Trades and crafts subject to a license	1,307	54.94
Trades and crafts not subject to a license	605	25.43
Similar small businesses	467	19.63
Sum total	**2,379**	**100.00**

Table 4 Tradesman and craftsman business structure in Landeshauptstadt Magdeburg
(Status: end 2016; source: Landeshauptstadt Magdeburg, Office for Statistics, Statistical Yearbook 2017)

The following table shows the number of registered people in employment subject to social security contribution by industry:

Industries	**Gainfully employed people**
Agriculture and forestry **Livestock production and fishery**	48
Manufacturing industry *of which:*	17,391
- Manufacturing industry excluding construction industry	*11,550*
....of which: Manufacturing industry	*9,167*
- Construction industry	*5,841*
Services sector *of which:*	91,074
- Trade, transportation, hospitality	*20,207*
- IT, communication	*3,285*
- Financial and insurance services	*2,590*
- Housing and real estate industry	*1,699*
- Free-lance, *scientific, technical services; other economic services*	*23,032*
- Public administration, defence, social security, education and teaching, health care and social sectors	*35,353*
- Art, entertainment and recreation; other services; private households, exterritorial organisations	*4,908*
Total (incl. instances without data)	**108,513**

Table 5 Number of people in employment by industry
(Status: 31/12/2016; source: Landeshauptstadt Magdeburg, Office for Statistics, Statistical Yearbook 2017)

6 Waste Management Organisation

6.1 Organisational structure and responsibilities

6.1.1 Public waste management authority

Pursuant to Art. 20 of the Circular Economy Act (KrW-/AbfG)), the public waste management authorities (PWMAs) are responsible for the management of all municipal waste generated and transferred to them by private households within their functional areas as well as for all wastes destined for final disposal from other sources that are transferred to them.

Landeshauptstadt Magdeburg has delegated the responsibilities of the public waste management authority to Städtischer Abfallwirtschaftsbetrieb (SAB), a municipally owned waste management enterprise.

Responsibilities of SAB:

- Collection and transport of residual waste, biowaste, waste paper and bulky waste
- Collection of household hazardous waste
- Drafting and implementing the local waste management and waste fee by-laws
- Developing the waste management concept
- Planning waste management measures
- Operation of the Hängelsberge MSW landfill site
- After-care of the closed Cracauer Anger and Hängelsberge landfills
- Operation of the three recycling centres
- Operation of the collection points according to the Electrical and Electronic Equipment Act
- Administration and waste management information service
- Waste bin logistics, maintenance and cleaning

Individual waste management services are contracted out by the PWMA to private contractors in a public tender process. Typical services that are contracted out include the recycling of waste paper, biowaste and green waste, wood, metal scrap and street sweepings, and the recovery and treatment of residual waste.

Besides its waste management tasks, the municipally-owned SAB is responsible for street cleaning, winter service, maintenance and repair of its own specialist vehicle fleet and other vehicles of the municipality as well as for the maintenance of the public toilet facilities.

Organisation chart of SAB:

The organisational structure of Städtischer Abfallwirtschaftsbetrieb (SAB) is shown in Section 20.2
Since October 2016, SAB has held certification under the Ordinance on Specialist Waste Management Companies for the "non-hazardous waste collection and transport activities" undertaken by its street cleaning/winter service and waste collection units. These operations will be re-certified yearly.
In October 2017, the Silberbergweg recycling centre received initial certification.

6.1.2 Private-sector involvement in waste management

According to the applicable legislation, the public waste management authority is not responsible for waste destined for recycling from sources other than private households, e.g. from industry and commerce, nor for sales packaging in terms of the Packaging Ordinance including sales packaging from private households.

Waste from the commercial sector falls within the scope of the Commercial Waste Ordinance (GewAbfV). The Ordinance aims to increase recycling rates through source segregation and mandates the separate collection of waste fractions at their source of generation. Variations from this requirement, e.g. mixed collection, are only allowed in exceptional cases.
For commercial waste similar to household waste in composition, Art. 3 (1) of the GewAbfV requires the separate collection of the following waste fractions: paper, glass, plastics, metals, biowaste, wood, textiles and others.

"Dual system"

Based on the Packaging Ordinance (implementing the Packaging Act as of 2019), packaging waste is collected by the private sector as part of the "Dual System" outside the sphere of influence of public waste management. The "Dual System" is financed by packaging producers and distributors via a license fee.

As the collection and recycling of used sales packaging accruing at households plays a significant role in municipal solid waste management and the Packaging Ordinance requires the coordination between the Dual System operators and the public waste management authority, this Waste Management Concept also addresses the existing collection and recycling systems and sales packaging arisings.

Currently, the following Dual System operators are established in Saxony-Anhalt:

- Der Grüne Punkt – Duales System Deutschland GmbH (DSD)
- INTERSEROH Dienstleistungs GmbH
- Landbell AG für Rückholsysteme
- BellandVision GmbH
- Zentek GmbH & Co. KG.
- Reclay Systems GmbH
- Veolia Umweltservice Dual GmbH
- RKD Recycling Kontor Dual GmbH & Co. KG
- ELS Europäische LizensierungsSysteme GmbH
  (since 01/06/2018 under insolvency proceedings)
- Noventiz Dual GmbH

Waste electrical and electronic equipment (WEEE)

The Electrical and Electronic Equipment Act (ElektroG) requires producers to take back and recycle waste electrical and electronic equipment (WEEE) from households.
The public waste management authorities are required to provide for the acceptance of WEEE at their collection points. They have the option of either staging free of charge the WEEE sorted by six categories for pick-up in containers provided by the manufacturers or making a self-marketing declaration.

To fulfil their obligations under Art. 6 of the ElektroG, the manufacturers have established the Elektro-Altgeräte Register (EAR) Foundation which acts as the “Clearing House” defined by the legislator. Besides the responsibilities under the ElektroG, the EAR also undertakes the coordination of WEEE collection from the PWMA’s collection sites.

The public waste management authority may choose not to make all the WEEE in a specific category available for collection by making a self-marketing declaration for all the WEEE of a category with a minimum term of two years vis-à-vis the Clearing House.
Currently, SAB has declared self-marketing for WEEE categories 1 (large household appliances), 3 (screens, monitors and TV sets) and 5 (small household appliances, IT and telecommunications equipment, electrical and electronic tools, toys and similar). This end-of life equipment is collected and recycled by non-profit organisations free of charge for SAB.

Since July 2016, retailers with a sales area for electrical and electronic equipment of at least 400 square meters have been required by law to take back for free small WEEE items (no

dimension more than 25 cm) in common household quantities. For the mail order trade, this requirement applies from a minimum storage and shipping area of 400 m^2. Larger WEEE items must be taken back by the retailer only from customers supplied with like-for-like products. Where the item was originally bought is irrelevant to the take-back obligation.

Charity and commercial collections

Waste routed to a law-conformant charity or commercial collection is exempted from transfer to the public waste management authority.
The PWMA has the option to submit comments under the notification procedure as per Art. 18 of the KrWG.

Commercial collections are subject to the requirement that they are not in conflict with overriding public interests. This also includes planning certainty, organisational responsibility and fee stability.
Commercial collections are profit-oriented and collect waste streams that have a positive market value, in particular waste paper, metals and textiles. According to current court rulings, bulky waste may also be collected by commercial entities. The status of notifications of commercial bulky waste collections to the State Administrative Office is not known to the PWMA. Comments on bulky waste collection have not been requested so far. In this connection, it should be noted that household clearances, for instance, would classify as bulky waste collection.

As SAB maintains no collection system of its own for textiles, charity and commercial collections are accepted for these waste streams.
By contrast, a high-quality kerbside collection system exists for metals and waste paper. For this reason, SAB invokes adverse effects on public interests in its comments submitted under the notification procedure. Commercial collections remove considerable quantities of these recyclables streams from the purview of the PWMA, leading to a loss of sales proceeds, proceeds that would have a fee-reducing effect in the fee calculation.

6.2 Collection systems and recycling/disposal routes

In analogy with the Waste Management Plan of Saxony Anhalt (AWP LSA), waste is classified into the following types:

Organic waste of which biowaste of which green waste
Recyclables (packaging only)
Recyclables (excluding packaging)
WEEE
Small quantities of household hazardous and other wastes (scrap tyres, end-of-life vehicles)
Municipal solid waste
of which: household waste
of which: CWSHW
of which: bulky waste
of which: street sweepings
Wastes from municipal waste water treatment Screenings, grit chamber residues, sludges from municipal waste water treatment
Construction & demolition waste
Secondary wastes

6.2.1 Organic waste

According to the nomenclature of the AWP LSA, the term organic waste subsumes BIOWASTE and GREEN WASTE.

Home composting

Organic waste, e.g. food waste, leaves, tree and grass clippings, may be composted by residents on their own premises. Residents composting the complete organic waste generated on their premises are exempted from participation in the Bio Bin system.

Kerb-side collection

Kitchen and garden waste is source-separated via the Bio Bin and collected at the kerbside.

The bins are provided by SAB.
18,550 of 30,030 households are equipped with Bio Bins (61.8 %) (status: 02/01/2018).

Figure 2 Bio Bin plus

Since 2017, SAB has been offering Bio Bins equipped with odour filters. The so-called "Bio Bin plus" is designed to reduce odours, keep away vermin and insects and thus enhance acceptance of separate biowaste collection.

The Bio Bin is normally hauled off biweekly or weekly under a full-service scheme.

For one-time or temporarily increased volumes, SAB provides waste sacks for leaves and green waste.

Moreover, residents have the option of having their tree and brush clippings (up to 2 m³) collected once per year in lieu of one cost-free bulky waste collection.
With the first amendment to the Waste Management By-Law of 18 March 2013, which entered into effect on 1 January 2016, containers for garden waste haul-off have been available as another alternative. In addition, containers of various sizes are available against a service charge for garden waste haul-off.

Drop-off system
Green waste is mainly collected through the drop-off system at the recycling centres of the City and an acceptance site operated by GISE.

Recycling

Like green waste, 100 % of the biowaste is recycled through composting with the compost produced being used in agriculture, horticulture and land reclamation.
Recycling is contracted out in two separate public tendering processes (bio bin/green waste) without any specifications as to the technology to be employed.
As no bids or no economically viable bids have so far been submitted for anaerobic digestion, this waste stream is recycled by composting for the time being.

Collection from the ALB quarantine zone

Due to interceptions of the Asian long-horned beetle (ALB), a large zone with its centre in the Rothensee district, but partly also extending to the neighbouring districts has been quarantined since September 2014.

To prevent the propagation of the beetle, no tree clippings, pruning wood or fire wood may leave the quarantine zone. For this reason, a separate collection point has been established for these wastes at the bio-pellet facility which also undertakes their further processing.

Citizens can deliver their waste to this collection point or request a container from SAB for collection. The containers meeting the operator’s delivery specifications are likewise delivered to the bio-pellet facility.

Where quarantined waste is intermingled with other green waste, it is disposed of in the Magdeburg Rothensee waste-to-energy facility.

The Bio Bin remains unaffected by these rules.

The quarantine zone will be maintained for a minimum period of four years after the last interception, i.e. until 2022 according to the current status.

6.2.2 Recyclables

Packaging

Based on the Packaging Ordinance, packaging waste is collected by the private sector as part of the "Dual System" outside the sphere of influence of public waste management.
The coordination agreement between the system operators and the PWMA includes the system description which is updated and adapted for each contract term (typically 3 years) and specifies the exact scope of services and specific collection requirements.

Light-weight packaging (LWP)

Since the system switch to kerbside collection was completed in April 2012, light-weight packaging has been exclusively collected through the kerbside collection system.
For kerbside collection, approx. 28,000 recycling bins (yellow bin) in sizes of 120 l, 240 l or 1100 litres are in place.
The collection of this recyclables stream does not fall within the scope of the municipal waste management by-law, but is regulated by the provisions of the system description in the waste management contract.
This has implications for the presentation of the bins, in particular.
As a matter of principle, no full service is provided for 120 l and 240 l bins. These bins must be placed out at the kerbside by the property owner or a person acting on their behalf and wheeled back after emptying.
For future participation in the LWP collection service, the presentation of the yellow bins at the kerbside is to be retained.

By contrast, yellow bins with a capacity of 1100 l are collected from the bin storage area and returned provided they are readily accessible.

Neither the Packaging Act nor the Circular Economy Act clearly regulates the presentation of the bins.

The coordination agreement between the system operators and the PWMA is negotiated on the basis of the Packaging Act and requires a consensus between both parties. To what extent a requirement for the collection of the yellow bins from the property can be enforced, either under the system description in the coordination agreement or by an administrative act, has so far not been decided by the courts.

Glass packaging

Glass packaging waste is exclusively collected through the drop-off system comprising some 786 depot containers with a volume of 3.2 cubic metres each.
These are distributed over some 362 recycling banks in public spaces throughout the city.
Clear glass is collected in single-compartment containers, green and brown glass in two-compartment containers.
In total, 28 underground containers are installed at twelve recycling bank sites.

Underground container sites	**Installed in**	**Number of containers**	
	Replacement	**Paper & cardboard**	**Glass**
Kapellenstraße	October 1997 March 2016	1	1 clear 1 green 1 brown
Roßlauer Straße	April 2001	4	1 clear 1 green/brown
Johannes-R.-Becher- Str./ Bürgerhaus	August 2003	2	1 clear 1 green/brown
Granitweg	June 2004	2	1 clear 1 green/brown
Moritzplatz/ Umfassungsweg	June 2006 August 2016	3	1 clear 1 green 1 brown
Geißlerstr./ Leibnizstr.	September 2006	3	1 clear 1 green/brown
Schönebecker Str. 34/ Engpass	January 2007	2	1 clear 1 green/brown
Blumenberger Str./ Alt Salbke (Lesezeichen)	June 2009	-	1 clear 1 green/brown
Schellheimerplatz	August 2011	2	1 clear 1 green/brown
Planetenweg/Straße A	August 2012	-	1 clear 1 green 1 brown
Galileostraße/ Zentrumsachse Reform	October 2013	-	1 clear 1 green 1 brown
Elbbahnhof	December 2014	-	1 clear 1 green/brown

Paper & cardboard packaging
Paper & cardboard packaging is collected together with the municipal waste paper on the basis of contractual agreements with the system operators, with paper representing the bulk of this recyclables stream.

Cardboard packaging currently accounts for 21.67 % by weight of the total combined waste paper and cardboard packaging stream.

Under existing agreements, some of the system operators are entitled to market for their own account a proportional share in the paper & cardboard packaging quantities collected through the system.

Recyclables (excluding packaging)

Waste paper

“Municipal“ waste paper (recyclable household waste subject to transfer to the PWMA, e.g. newspapers and other print products, office paper) and paper & cardboard packaging waste are captured through a common collection system.

For decentralised collection (kerbside collection system), approx. 30,700 waste paper recycling bins in sizes of 120 l, 240 l or 1100 litres are in place.

Under the drop-off system, eight underground paper & cardboard recycling bank sites equipped with 19 containers in total are operated in public spaces within the city boundary. The containers have a capacity of three cubic metres each.
Delivery to the three recycling centres is likewise part of the drop-off system.

100 % of the collected waste paper is recycled. The recycling of this material stream is contracted out to private-sector companies in a public tender process.

Despite the existing full-coverage kerbside collection system, a significant share of the collected waste paper is removed from the purview of the PWMA through commercial collections.
In February 2018, the waste paper quantity collected by SAB amounted to approx. 12,600 Mg, excluding the packaging share. 6,442 Mg/a had been notified for commercial collection by February 2018. The irrelevance threshold of 15 % of the total quantity is 2,916 Mg. The actual commercial collection volume is not known to SAB, nor is it taken into account in the Saxony-Anhalt Waste Management Plan.

With its supreme court decision BVerwG 7 C 4.15 of 30/06/2016, the Federal Administrative Court confirmed the regulatory presumption of Art. 17 (3), sentence 3, No. 1 of the KrWG stating that the market access of commercial collectors severely affects the PWMA's planning certainty and organisational responsibility, thereby jeopardising its function whenever a highly developed collection and recycling system exists.

The irrelevance threshold below which no adverse effects on the PWMAs’ collection and management infrastructure is to be expected is set at 10 to 15 % of the total collection volume of the given waste fraction.

In this connection, the specific notified collection must not be viewed in isolation but in its interaction with other collections (all notified and law-conformant commercial and charity collections).

As commercial waste paper collections clearly exceed the irrelevance threshold, SAB demands the prohibition of such collections in the PWMA's comments under the notification procedure. In two cases of already approved commercial waste paper collections, Landeshauptstadt Magdeburg has taken legal action against the approval.

By its decision of 17/09/2018 (file no: BVerwG 7 C 23.16), the Federal Administrative Court ruled that a PWMA cannot secure the right to issue a prohibition order against commercial collectors by recourse to the courts. Accordingly, the PWMA has no right to sue. SAB considers withdrawing the action.

The PMWA will continue to submit comments on commercial collections to the State Administrative Office under the notification procedure as per § 18 (4) of the Circular Economy Act.

Wood waste

Wood waste is collected at the recycling centres by two categories:

1. as mixed wood waste assortment (Category AI to AIII wood waste)

2. as Category AIV wood waste

Recycling is undertaken by private contractors.

Category AIV wood waste is shredded and sent to thermal treatment.

The Category AI to AIII mixed wood waste assortment is sorted by different qualities and pre-processed in facilities meeting the requirements of the Waste Wood Ordinance. This includes size reduction and screening to the desired size for further processing. Deleterious materials are removed by metal separators and manual sorting. The sorted wood waste is used as a starting material for recycling products (e.g. in the particle board industry).

Textile waste

Discarded textiles are collected on public and private premises within the city boundary by charity and commercial collectors, mainly in textiles recycling banks.
The "discarded textiles concept" was updated by the City Council in September 2018 (printed document DS0417/18). It defines the criteria by which Landeshauptstadt Magdeburg can make decisions on granting or refusing approvals for special street uses in the public space to set up collection containers. The concept is aimed at ensuring uniform handling of discretionary powers.
As a matter of principle, textiles recycling banks must be allocated to the glass container collection sites. The concept defines for each site whether one or two textiles containers are permitted. Criteria reviewed as part of the approval process include the admissibility of the collection under waste law, the guarantees for proper and reliable collection, the appealing design of the containers and the local accessibility of the collector.
The special use permit is normally granted for a period of three years.
Data on collection quantities are not accessible to the PWMA.

Corks

All SAB recycling centres and the Sternstraße Depot accept natural bottle corks.
Moreover, this valuable natural resource is collected by wine shops, wholefood shops, pubs, kindergartens and the blood bank of the university hospital.
The central collection site is the Sternstraße Depot.
Once a volume of five cubic metres has been collected, the bags are picked up by carriers and delivered free of charge to the sheltered workshop in Kehl-Kork for further processing.
As part of the sales packaging, bottle corks are subject to the system participation duty laid down in the Packaging Act (with effect from 01/01/2019) and can also be disposed of in the yellow bins. Accordingly, such bottle corks of natural materials are subject to transfer to the PMWA or must be collected via the systems in place. Plastic corks belong into the yellow bin.

CDs
These items are likewise collected at the recycling centres, the Sternstraße Depot and by the HazMobile. The 120 l drop-off boxes set up by the recycler are shipped to the recycling site by parcel services, free of charge.

6.2.3 Waste electrical and electronic equipment (WEEE)

Kerbside collection

WEEE is collected at the kerbside as part of the bulky waste pickup service.

Drop-off system

Under the drop-off system, WEEE is mainly collected at SAB's three recycling centres.
In line with the provisions of the Electrical and Electronic Equipment Act, collection points are available to which end-users and distributors can return end-of-life electrical and electronic equipment from private households in the city region. This cost-free service has been in place since March 2006.

Individual small electrical appliances such as hair dryers, mobile phones, toasters, coffee machines and similar including low-energy light bulbs can also be dropped off at the Waste Information Centre at Sternstraße and the acceptance site at Sandbreite operated jointly with GISE mbH.

Toners, printer cartridges as per the ElektroG
Toner and printer cartridges with integrated chip, sensor or LED status display for communication with the printer or level display, printhead cartridges with integrated electrically actuated print jets fall within the ElektroG and are separately collected.

Recycling

Art. 14 of the ElektroG requires the PMWAs to stage – free of charge – the WEEE sorted by the following five categories in suitable containers at their transfer points for haul-off by the manufacturers or their representatives:

Category 1: Large household appliances, automatic dispensers

Category 2: Refrigerators and freezers, oil-filled radiators

Category 3: Screens, monitors and TV sets

Category 4: Lamps

Category 5: Small household appliances, IT and telecommunications equipment, electronic home entertainment equipment, lamps and other lighting fixtures as well as light diffusers and controls, electrical and electronic tools, toys, sports and leisure time equipment, medical products, monitoring and control instruments

Category 6: Photovoltaic modules

100 % of the WEEE is routed to recycling.
WEEE categories 2, 4 and 6 are handled by “Stiftung Elektro-Altgeräte Register“ (EAR).

For WEEE categories 1, 3 and 5, SAB has made a self-marketing declaration. This end-of life equipment is collected and recycled by non-profit organisations free of charge for SAB.
Amendments to the ElektroG regarding notification duties, designations and numbering, allocation to categories as a function of the equipment size will enter into force as of December 2018.

6.2.4 Small-volume hazardous waste and other waste

Small hazardous waste quantities from private households and hazardous waste in similar quantities from the commercial sector are classified according to waste codes into the following categories:

Waste code	Designation
06 04 04*	Wastes containing mercury
15 02 02*	Absorbents and filter materials
16 02 09*	Transformers/capacitors containing PCBs
16 05 04*	Gases in pressure containers containing dangerous substances (spray cans)
16 05 05	Gases in pressure containers
16 05 07	Discarded inorganic chemicals
16 05 08*	Discarded organic chemicals
16 06 01*	Lead batteries
16 06 02*	Ni-Cd batteries
16 06 03*	Mercury-containing batteries
20 01 13*	Solvents
20 01 14*	Acids
20 01 15*	Bases
20 01 17*	Photochemicals
20 01 19*	Pesticides
20 01 26*	Oils and fats
20 01 27*	Paints, inks, adhesives
20 01 28	Dispersion paint
20 01 32	Expired medicines
20 01 33*	Batteries and accumulators

Collection

SAB operates a mobile collection service (HazMobile) and two stationary collection sites (recycling centres) for household hazardous waste.
The HazMobile serves 44 stops once per month on an annual tour schedule.

There, citizens have the opportunity to dispose of small volumes of household hazardous waste (up to 20 litres or 20 kg) for one hour.

Another eight stops are served at 6-month intervals for 2 hours at a time.

The stationary collection sites are located at the Cracauer Anger and Hängelsberge recycling centres.

Recovery, recycling and disposal

Recycling and/or environmentally sound disposal of small-volume household hazardous waste is undertaken by private-sector contractors and regularly put out to tender in a public tender process.

PU foam cans

PU foam cans from the construction sector are accepted and packaged by the City's mobile and stationary collection services as well as by the DIY shops.
In 1993, a take-back and recycling system was set up by the leading manufacturers for the return of PU foam cans.
PDR Recycling GmbH & Co KG provides a cost-free service for the collection of the packaged cans from the municipal drop-off sites and their transfer to material recovery.

PU foam cans are routed to the Thurnau recycling facility. PDR reprocesses some 95 % of the popular construction and insulating PU foam cans into raw materials and products, i.e. PU prepolymer, liquefied gas, thermoplastics, tin sheeting and aluminium. These are reused in industry or are melted down.

Batteries

Under the Battery Act (BattG), battery manufacturers are required to take back and recycle spent batteries placed onto the market by them.

Both retailers and the municipal household hazardous waste collection service accept portable end-of-life batteries and accumulators. Batteries are also accepted at all three recycling centres run by SAB and at the Sternstraße depot.
The GRS joint battery take-back system (Stiftung Gemeinsames Rücknahmesystem Batterien) set up by the manufacturers and distributors organises the free pickup at the City's and retailers' collection points as well as the recycling or environmentally sound disposal. GRS Batterien provides cost-free boxes or drums at the designated collection points where spent batteries (except for industrial batteries, starter batteries or open Ni-Cd batteries) can be deposited unsorted and regardless of the brand.

Batteries having a mercury content in excess of 0.0005 % by weight have been banned from the market since 2001.

According to information from GRS, the mandatory collection target of 45% was already exceeded in 2015.
45.9% of the batteries placed onto the market were taken back and recycled by GRS [source: www.grs-batterien.de].

Batteries and accumulators not collected by GRS Batterien can be disposed of via the HazMobile. Starter batteries, for instance, have a high lead content and are virtually 100 % recycled.

6.2.5 Municipal solid waste

6.2.5.1 Household waste

Collection

Household waste (residual waste) is exclusively collected through the kerbside collection system.
The bins are provided by SAB.
Residual waste is normally collected biweekly.
Where the storage area is insufficient to accommodate the necessary waste bins – in particular in large residential complexes or commercial facilities - the residual waste is collected several times a week. For economic reasons and because of the varying emptying intervals, these collection cycles should, however, be reserved to exceptional cases. For hygienic reasons, longer emptying intervals are only allowed in exceptional cases (40 l residual waste bin only for residential properties with one or two residents).
SAB offers a full service, i.e. the bins are collected from their storage area and returned there after having been emptied, provided that the bin store conforms to the by-law provisions.
Otherwise, the bins have to be placed out for collection at the designated time by the property owner or other persons subject to participation in the public waste management system.
For one-time or temporarily increased residual waste volumes, SAB provides waste sacks that can be placed out for collection on the collection day together with the residual waste bins.

As at 31/12/2017, 36,871 residual waste bins are set up in the city region, of which 82.5 % 40 - 240 l bins and 17.5 % 770 and 1,100 l bins. Taking into account the different collection cycles (four-weekly to several times a week), this translates into an available residual waste bin volume of approx. 480,000,000 litres, corresponding to a bin volume of 38 l per capita and week for residual waste.

Recovery, recycling, disposal

Since the coming into force of the landfill ban on untreated municipal solid waste on 01/06/2005, the complete residual waste stream has been sent to the Rothensee waste-to-energy facility for thermal treatment.
Household waste and commercial waste of a similar composition are directly hauled to the WTE facility by the collection trucks. After weighing, the waste is directly tipped into the waste bunker. Thermal treatment is accomplished in a grate firing system.

The contract with MHKW Rothensee GmbH was signed for a term of 15 years beginning in June 2005 to ensure waste management certainty until June 2020.
The Europe-wide tender for a new contract from mid-2020 is currently in preparation.

6.2.5.2 Bulky waste

Bulky waste includes all large household items such as furniture, carpets, mattresses, plastic components and similar.

Kerbside collection

Bulky waste is hauled off on request. Each household is entitled to either two free collections of up to two cubic metres each or one collection of four cubic metres of household bulky waste (including e-scrap) without additional charge (financed through the residual waste fee).

Users of the service make a request for collection (by phone, personally, by email, internet, telefax or postcard), indicating the items to be picked up.
The pickup requests in the individual neighbourhoods are then consolidated and taken as a basis for scheduling efficient collection tours.
The scheduled collection day is communicated to the household by postcard.

At this date, the bulky waste must be set out in front of the house / premises for pickup.
Bulky waste is not picked up directly from inside the homes.
Pickup at a requested date and hour can be arranged against a service charge.

SAB operates three types of collection vehicle for bulky waste:
- bulky waste compaction trucks for furniture, wood and mattresses
- platform trucks for metal scrap, WEEE and plastic components
- box-type trucks for intact furniture suitable for reuse

Separate tour schedules ensure that the correct collection vehicles are assigned to the specific pickup address.

For bulky waste volumes in excess of the cost-free limits, a collection system complete with the provision of containers in different sizes or loose pickup by a truck is available against a service charge.

Drop-off system

Bulky waste may also be transferred to the City by delivery to the recycling centres.

Recovery, recycling, disposal

The mixed bulky waste collected by the compaction trucks is delivered to a sorting facility.
The separately collected bulk items destined for recycling are hauled to the Hängelsberge land disposal facility by the platform trucks. Here, they are sorted into the respective containers before the individual fractions are picked up for material recovery.
Intact furniture is handed over to a non-profit organisation where it is restored and offered for resale.

Part of the bulky waste is recycled or sent to thermal recovery.

6.2.6 Construction & demolition waste

C&D waste makes up a major portion of the waste arisings. It is generated in the process of construction, renovation and demolition activities and includes the following main waste categories:

- concrete
- bricks
- tiles, bricks, ceramics
- mixtures of concrete, bricks, tiles and ceramics
- soil and pebbles
- construction site wastes

Commercial C&D waste has to be recovered for reuse by the waste producer in the first instance. Only the non-recyclable C&D waste fraction is subject to transfer to the public waste management authority. The PWMA is required to once again check the municipal component of the C&D waste for recovery potential.

Kerbside collection
Skips with an effective volume of 1.3 m^3 are available for construction, demolition and excavation waste.
Larger volumes of this waste stream are not to be expected from private households or are not transferred to the PWMA because of the recycling obligation imposed on commercial waste producers.

Drop-off system
Construction, demolition and excavation waste can also be delivered to the City's recycling centres.

Recovery, recycling, disposal

Building rubble and excavation waste are 100 % recycled for landfill cover and road construction.
Mixed construction and demolition waste is sent to the WTE facility for disposal.

Inert waste for disposal, such as asbestos and man-made mineral fibres, is sent to the Hängelsberge landfill site.

Other wastes generated by construction, repair and rehabilitation activities (e.g. coal tar and tarry products including doors and windows) are transferred to third-party contractors for recycling.

6.2.7 Secondary wastes

Secondary waste is generated by the mechanical treatment operations (waste code 19 12 12) at the Hängelsberge waste transfer station. There, several waste categories having the same disposal route are compacted and consolidated to larger transport units.

This waste stream is sent to the WTE facility for thermal treatment.

6.2.8 Overview of waste collection systems

For ease of overview, the available collection systems for the individual waste categories are tabulated below:

Waste category	Collection system	Collection frequency / Acceptance
Household waste	Kerbside collection system ▪ 40*, 60, 80, 120, 240, 770, 1100 l bins *) 40 l bins for residential properties with one or two residents only	Rule: biweekly Exception: one to several times per week every four weeks (40 l bins for residential properties with one resident only)
	▪ Additional 110 l bags	as required
	▪ Large-volume and compaction containers available for CWSHW	as required

Waste category	Collection system	Collection frequency / Acceptance
Biowaste	<u>Kerbside collection system</u> ▪ 60, 120, 240 l Bio Bin or Bio Bin plus; additional 110 l bags	Rule: biweekly Exception: weekly as required
Green waste	<u>Kerbside collection system</u> ▪ 770 and 1100 l bins ▪ Containers for garden waste ▪ Bundle collection <u>Drop-off system</u>	weekly, biweekly Pickup on request Pickup by appointment Delivery to recycling centres
Hardwood tree clippings from the ALB quarantine zone	<u>Kerbside collection system</u> ▪ Containers for garden waste <u>Drop-off system</u>	Pickup on request Drop off at a designated collection point within the quarantine zone
Bulky waste	<u>Kerbside collection system</u> ▪ Placed out loose; container <u>Drop-off system</u>	Pickup on request and/or by appointment Delivery to recycling centres
WEEE Small WEEE items and low-energy light bulbs	<u>Kerbside collection system</u> <u>Drop-off system</u>	Pickup by appointment Delivery to recycling centres Delivery to the HazMobile or the Waste Information Centre
C&D waste, excavation waste	<u>Kerbside collection system</u> ▪ 1.3 m³ container <u>Drop-off system</u>	Pickup on request Delivery to recycling centres
Household hazardous waste	<u>Drop-off system</u>	Drop-off at the HazMobile or at the stationary HHW collection points
Waste paper	<u>Kerbside collection system</u> ▪ 120, 240, 1100 l bins . <u>Drop-off system</u> ▪ 3 m³ underground containers	Rule: monthly Exception: weekly or biweekly as required one to three times per week as required

Waste category	Collection system	Collection frequency / Acceptance
Light-weight packaging (system operator)	Kerbside collection system ▪ 120, 240, 1100 l bins	weekly and biweekly
Household plastics and metals	Drop-off system	Drop-off at the HazMobile or at the stationary municipal collection points
Glass	Drop-off system ▪ 3.2 m³ depot containers	as required, biweekly at a minimum
Textiles	Kerbside collection system Drop-off system	Charity and commercial collections Charity and commercial textiles recycling banks
Corks	Drop-off system	Private and municipal collection points
Toner, CDs, printer cartridges	Drop-off system	Drop-off at the recycling centres, the Sternstraße depot or at the HazMobile

6.3 Fee system

Art. 6 of the Waste Management Act of Saxony-Anhalt (AbfG LSA) provides that public waste management authorities shall charge fees for municipal waste management services in accordance with the requirements of the Municipal Fees Act.

Service fees are regulated by the Waste Fee By-law.

Eligible costs in terms of the Municipal Fees Act include all expenses for waste management functions undertaken by the public waste management authority itself or on its behalf. According to the AbfG LSA, this includes in particular the costs of

1. collection, transport and disposal of
   - waste generated by households, including small quantities of hazardous waste,
   - waste for disposal generated by commercial enterprises, other businesses or public institutions,
   - organic waste accruing in gardens, parks, cemeteries, public spaces, streets and on roads, and
   - illegally dumped waste in terms of Art. 11 of the AbfG LSA;
2. marketing waste-derived recyclable materials to the extent the costs exceed the proceeds;

3. performing the communication and advisory duties as per Art. 46 (1) of the Circular Economy Act;

4. planning, construction, operation, after-care, recultivation and renaturation of waste recovery and disposal facilities including costs incurred through compensation or substitution or restauration measures for interventions into nature and landscapes;

5. setting up reserves for foreseeable future costs of closure and after-care of waste recovery and disposal facilities;

6. closure of waste recovery and disposal facilities and the associated after-care activities to the extent no sufficient reserves have been set up to cover these costs.

Pursuant to the Saxony-Anhalt Municipal Fees Act (KAG LSA), the type and extent of service use must be taken into account in the determination of the service fee. For this purpose, a probability scale may be applied. In the case of installations and facilities that also serve to protect natural resources or the use of which could jeopardise natural resources, the service fee can be set such as to incentivise environmentally sound behaviour (Art. 5 (3/3a) KAG LSA).

To promote waste prevention and recycling, waste fees should be levied according to the pay-as-you-throw principle wherever possible. At the same time, the fee level should provide a certain steering effect.

This implies that the disposal costs for certain waste types, e.g. hazardous waste, are covered by the residual waste fee in order to preclude illegal disposal routes for these waste types.

Landeshauptstadt Magdeburg uses a linear, bin-dependent fee system which is based on the bin type (residual waste bin, Bio Bin) the bin size made available (e.g. 60 l, 120 l), the number of bins and the emptying cycle. There is no basis fee.

The waste fee covers the following services:

Residual waste fee

- Collection, transport and disposal of residual waste and/or commercial waste similar to household waste in composition
- Bulky waste haul-off in the defined volumes per household
- Collection and environmentally sound disposal of household hazardous waste
- Free delivery of green waste or bulky waste to the recycling centres in volumes up to one cubic metre per delivery
- Free delivery of small volumes of certain waste types in defined volumes once per day and household
- Waste paper collection and recycling (proceeds from waste paper sales reduce service fees!)
- Removal of illegally dumped waste
- Waste information service
- Recultivation and after-care of closed landfill sites

Biowaste fee

- Biowaste collection, transport and recycling
- Disposal of biowaste contaminant fraction
- Waste information service

Fee for "Bio Bin plus"

- Biowaste collection, transport and recycling
- Disposal of biowaste contaminant fraction
- Bin including filter replacement and cleaning
- Waste information service

7 Waste Management Facilities Operated by PWMA

7.1 Hängelsberge landfill site

7.1.1 Hängelsberge landfill site (active)

SAB operates the Hängelsberge landfill site in the south-west of the City of Magdeburg. The Class II landfill was constructed in three phases during the period of 1995 to 2004. Reflecting the state-of-the-art, it is equipped with leachate management and gas collection systems.
The bottom liner system consists of a composite liner with a geological barrier and retrofitted engineered barrier, a mineral liner and a geosynthetic liner. The landfill has an area of 8 ha and a waste capacity of 980,000 m^3. The deposition of waste at the Hängelsberge site has been permitted for the period of 26/10/2009 to 31/12/2023 on the basis of the planning application determination.

The leachate contained by the sealed landfill base is collected, led to hold tanks and provided the statutory discharge limits are not exceeded, disposed of in public sewage treatment plants under an existing indirect discharge permit.

The environmentally harmful landfill gas is collected via a gas collection system and utilised for heat and power generation. Currently, 250 kW of electricity are generated by a gas engine designed for an electrical output of 323 kW. In 2017, 708,420 kWh were fed into the electricity grid in total.
The gas collection system is operated by an engineering company under an operator contract. The CHP plant is operated by a private-sector contractor.

As at 01/01/2017, the landfill has a remaining void capacity of 100,000 cubic metres. Proceeding from current fill rates of approx. 20,000 m^3, the landfill capacity will be exhausted by the end of 2021. As there will also be demand for landfill capacity in future, the PWMA is planning an extension of the Hängelsberge landfill site to be able to ensure waste disposal certainty. See also 13.5.2 .

7.1.2 Closed Hängelsberge landfill unit

The closed Hängelsberge landfill unit is located in the south-west of the City of Magdeburg. It has an area of 21.5 ha and a capacity of 6.9 million m^3 of waste. Waste deposition at the Hängelsberge site was ceased in 2005, after which site closure activities began.

The final surface cover system of the closed Hängelsberge landfill unit was finalised with the third and last surface cover construction phase.

The acceptance inspection under waste law of the final Phase 3 surface cover system by the Higher Waste Authority took place on 14/02/2014.

The final closure of the closed Hängelsberge landfill unit was confirmed by notice of 25/08/2015 and the site transferred to the after-care phase. The current legislation prescribes a minimum after-care period of 30 years.

During the after-care phase, extensive monitoring measures, such as landfill gas monitoring, surface and groundwater analyses as well as settlement measurements, will be routinely performed. To maintain the function of the surface cover and gas collection systems, maintenance measures, such as grass mowing, cleaning the water drainage channels, maintenance and repair of technical equipment, are regularly carried out.

Due to the Uniform National Quality Standards 7-4a "Technical Function Layers – Photovoltaic Plants at Landfill Sites" published by LAGA Ad-hoc-AG "Landfill Technology" in 2015, the installation of a photovoltaic plant cannot be further pursued as an after-use concept.
The closed Hängelsberge landfill unit is equipped with a surface cover system consisting of different mineral components acting as a water balancing layer. According to current knowledge, PV plants and water balancing layers are not system-compatible.

Other after-use options are not planned for the closed Hängelsberge site in the medium term

7.1.3 Transfer station

The transfer station operated at the Hängelsberge landfill site serves to accept and compact large waste volumes having the same recycling route to larger transport units for subsequent transfer to third-party recyclers.

Moreover, street sweepings are accepted, temporarily stored, dewatered and staged for haul-off to recyclers.
Part of the waste from the spring cleanup is also sent to the transfer station and bulked up to larger loads. In the process, obvious deleterious material is sorted out.

The transfer station operates under an open-ended permit under the Federal Air Pollution Control Act.

7.2 Cracauer Anger landfill site

The Cracauer Anger landfill site is located in the east of the City of Magdeburg and was used for waste deposition during the period of 1945 to 1998. The landfill has an area of 40 ha and received 10,5 million cubic metres of municipal solid waste and commercial waste during its active life. After completion of the active phase, landfill closure activities and the construction of a surface cover system began in 1998. The surface cover system was finalised in 2000.

Since May 2009, the Cracauer Anger landfill site has been in the after-care phase.
After-care activities mainly include the continuation of the groundwater monitoring programs, settlement measurements, recording of meteorological data, landfill gas collection and disposal including monitoring, grassland maintenance as well as the necessary general checks and inspections. For Class II landfills, the current legislation prescribes a minimum after-care period of 30 years after completion of the closure phase.

A photovoltaic plant designed to generate some 8.5 MWp of electricity was installed by a private investor at the Cracauer Anger site in the second half of 2011 and took up operation in December 2011. Städtischer Abfallwirtschaftsbetrieb is entitled to a share of the feed-in tariff in return for making available the area.

Because of its poor quality, the extracted landfill gas can no longer be used for heat generation in a steam boiler. Currently, the captured landfill gas is disposed of in an environmentally sound manner via a lean gas flare with integrated heat recovery system. The recovered thermal energy is fed into the local heating network of SWM GmbH. Additional engineering measures were carried out in 2017 to increase the efficiency of heat recovery.

The use of the landfill sites for energy generation from landfill gas makes a contribution to the "Magdeburg - Model City for Renewable Energy Sources" concept and is currently practised at all landfill sites operated by the City of Magdeburg.

7.3 Recycling centres and green waste acceptance sites

7.3.1 Recycling centres

Städtischer Abfallwirtschaftsbetrieb is operating three recycling centres in the city region: Hängelsberge, Cracauer Anger and Silberbergweg.

They provide citizens and businesses with the opportunity to route their recyclable wastes and waste for disposal to proper management.
Since their startup, the recycling centres have been very well received by the citizens. Over the years, the type and range of services offered have been continuously improved with the aim of meeting statutory requirements through more efficient recyclables collection, separation and capture.

The Hängelsberge and Cracauer Anger recycling centres with their lowered containers are very user-friendly. Both recycling centres have stationary hazardous waste collection points with an open-ended permit. As these recycling centres have been in operation since 1998, a number of concrete and pavement rehabilitation measures have been carried out in recent years.

At the Silberbergweg recycling centre, conditions for small-volume self-haulers are less user-friendly and very crowded. As this site with its good connection to residential areas and shopping malls is being intensively used and also for demographic reasons, SAB is planning a site expansion including a hazardous waste collection point.
For this purpose, the neighbouring properties were transferred to the SAB by the City in 2016. Planning and permitting activities are scheduled for the period of 2017 to 2019, the expansion for mid 2021.

The Silberbergweg recycling centre is located on hereditary leasehold properties, the contract for which expires in 2016. Construction work will not start until after the hereditary leasehold contract has been extended for another 20 years.

7.3.2 Sandbreite green waste acceptance site

GISE mbH runs an additional green waste acceptance site at Sandbreite on behalf of SAB.

The additional acceptance site is highly frequented in particular by citizens living in the southern city districts. To continue to maintain this acceptance site for the population, the following activities are undertaken by GISE mbH under a labour market integration scheme:
Waste delivered to the site is inspected and vegetable waste and IT and entertainment equipment are accepted. The waste is sorted by compostable waste (tree and grass clippings, vegetable garden waste), wood (root wood and pruning wood) and Category 5 IT and home entertainment equipment and loaded into the staged containers.

The Sandbreite acceptance site expands the existing waste acceptance network and thus helps reduce illegal waste dumping.

8 Waste Arisings

Assignment of waste codes to the individual waste categories

Waste category	Waste code
Biowaste	20 03 01
Green waste	20 02 01
Recyclables (packaging only)	15 01 02 (light-weight packaging) 15 01 07 (glass packaging) 15 01 01 (paper & cardboard - DSD share 21.67%)
Recyclables (excluding packaging)	20 01 01 (municipal waste paper) 20 01 38 (wood waste) 20 01 40 (metals)
WEEE	20 01 35 (Cat. I, III, V, VI) 20 01 23 (Cat. II) 20 01 21 (Cat. IV)
Small-volume household hazardous and other wastes	06 04 04*, 15 02 02*, 16 02 09*, 16 05 04*, 16 05 05, 16 05 07*, 16 05 08*, 16 06 01*, 16 06 02*,16 06 03*, 20 01 33*, 20 01 13*, 20 01 14*, 20 01 15*, 20 01 17*, 20 01 19*, 20 01 26*, 20 01 27*, 20 01 28, 20 01 32
Scrap tyres	16 01 03
End-of-life vehicles	16 01 04*
Municipal solid waste	18 01 04 (clinical waste) 20 03 01 (household waste) 20 03 01 (CWSHW) 20 03 03 (street sweepings) 20 03 07 (bulky waste)
Wastes from municipal waste water treatment	19 08 01 (screenings) 19 08 02 (wastes from desanding)
Construction & demolition waste	Diverse waste codes of AVV Chapter 17
	17 04 07 (metals) 17 06 01 (insulation material containing asbestos) 17 06 05 (asbestos illegally dumped) 17 06 03 (man-made mineral fibre waste, commercial) 17 03 03 (roofing felts, total) 17 02 04 (Cat. AIV wood waste) 17 09 04 (C&D waste to WTE facility 17 01 01 (concrete) 17 01 02 (bricks) 17 01 03 (tiles and ceramics) 17 01 07 (mixtures of concrete and bricks) 17 02 02 (glass) 17 08 02 (gypsum-based construction materials) 17 05 06 (dredging spoil) 17 05 04 (dredging spoil, self-haulers)

Waste category	Waste code
Secondary wastes	19 12 12 (secondary wastes, other wastes and sorting residues to incineration) 19 12 05 (non-recyclable glass) 19 12 09 (minerals)
Non-hazardous high-volume waste	10 01 01 (ash and slag) 10 02 01 (wastes from the processing of slag) 10 02 02 (unprocessed slag) 10 09 03 (furnace slag) 10 09 06 (casting cores and moulds which have not undergone pouring) 10 09 08 (casting cores and moulds which have undergone pouring) 10 09 10 (filter dust) 10 10 06 (casting cores and moulds which have not undergone pouring) 10 10 08 (casting cores and moulds which have undergone pouring) 10 11 03 (waste glass-based fibrous materials) 10 11 05 (particulates and dust) 10 12 03 (particulates and dust) 10 12 08 (waste ceramics) 10 11 14 (glass polishing and grinding sludge) 10 12 13 (sludge from on-site effluent treatment) 10 13 11 (waste from cement-based composite materials) 10 13 14 (concrete sludge) 19 01 12 (bottom ash and slag) 19 02 03 (premixed wastes)
Other wastes	02 04 02 (calcium carbonate sludge) 03 03 11 (sludge from on-site waste water treatment) 10 12 06 (discarded moulds) 11 01 10 (sludges and filter cakes) 12 01 13 (welding wastes) 12 01 17 (waste blasting material) 12 01 21 (spent grinding bodies and grinding materials) 16 11 04 (linings and refractories) 16 11 06 (linings and refractories) 19 02 06 (sludges from physical-chemical waste water treatment) 20 03 06 (waste from sewer cleaning) 08 02 02 (aqueous sludges containing ceramic materials) 12 01 15 (machining sludges) 20 02 03 (other non-biodegradable wastes)

8.1 Organic waste

Year	Biowaste		Green waste		Total	
	20 03 01		20 03 01			
	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]
2013	9,372	41	13,909	61	23,281	102
2014	10,190	44	16,619	72	26,809	116
2015	9,932	43	15,635	67	25,567	110
2016	9,751	41	15,547	66	25,298	107
2017	9,758	41	16,568	70	26,326	110

Table 6 Biowaste arisings

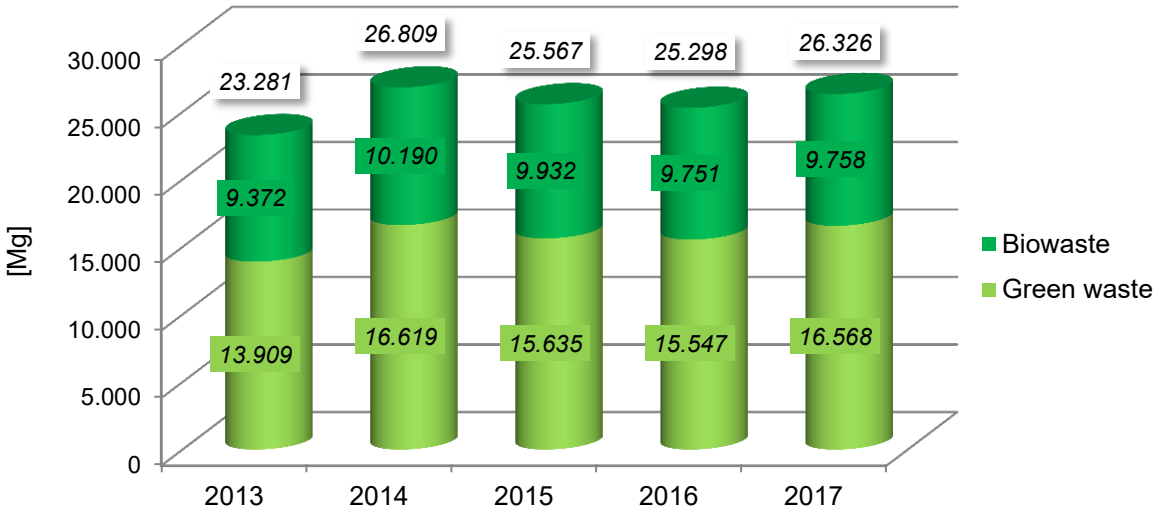

Figure 3 Biowaste arisings

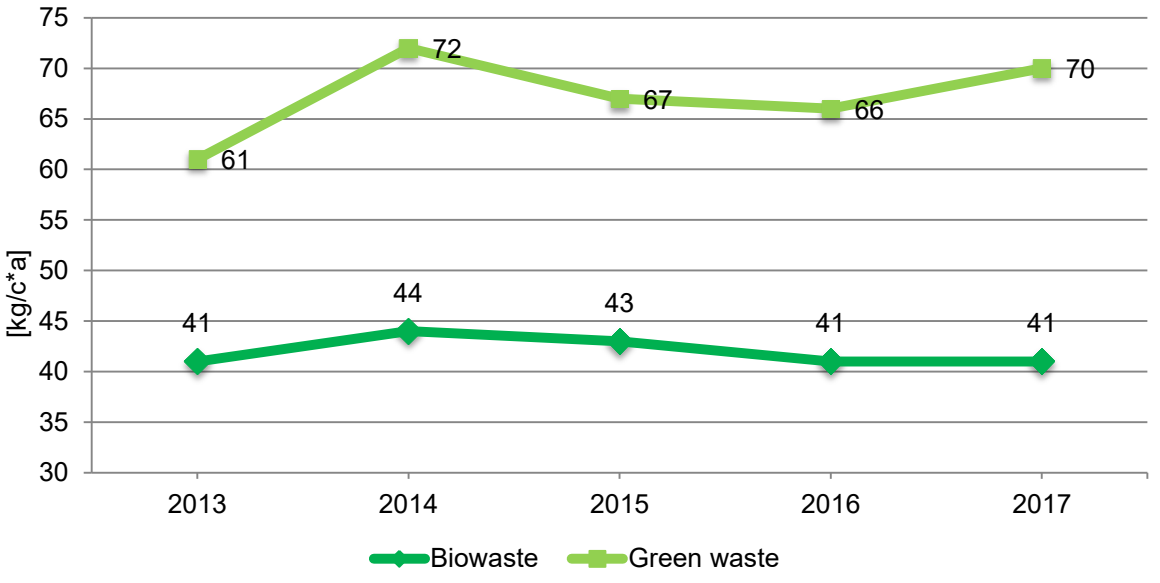

Figure 4 Per capita biowaste arisings

As can be seen from Table 6, biowaste collection rates were subject to slight variations over the years. After a slight decline in 2015 and 2016, the 2017 collection rate seems to have levelled out at the previous year's level. To be able to make a reliable statement, future trends will have to be watched.

Biowaste and green waste collection rates vary partly significantly across the individual municipalities of Saxony-Anhalt. Due to the different settlement structure and different collection systems, the collection rates of the individual municipalities are only conditionally comparable. If at all, the total collection rate lends itself to a comparison. At 105.46 kg per capita, Magdeburg roughly reached Saxony-Anhalt's average per capita collection rate of 122.43 kg in 2016. The target set in the Waste Management Concept 2013–2017 was 112 kg/c for 2015.
Tailored public awareness programs will be needed to improve the quality of the separately collected biowaste.

8.2 Recyclables

8.2.1 Recyclables (packaging only)

Year	Paper & cardboard		Glass		LWP		Total	
	15 01 01		15 01 07		15 01 02			
	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]
2013	2,686	12	3,815	17	7,161	31	13,662	60
2014	2,682	12	3,782	16	7,806	34	14,270	62
2015	2,676	11	3,679	16	7,998	34	14,353	61
2016	2,729	12	3,279	14	7,582	32	13,590	58
2017	2,817	12	3,720	16	8,378	35	14,915	63

Table 7 Recyclables arisings (packaging only)

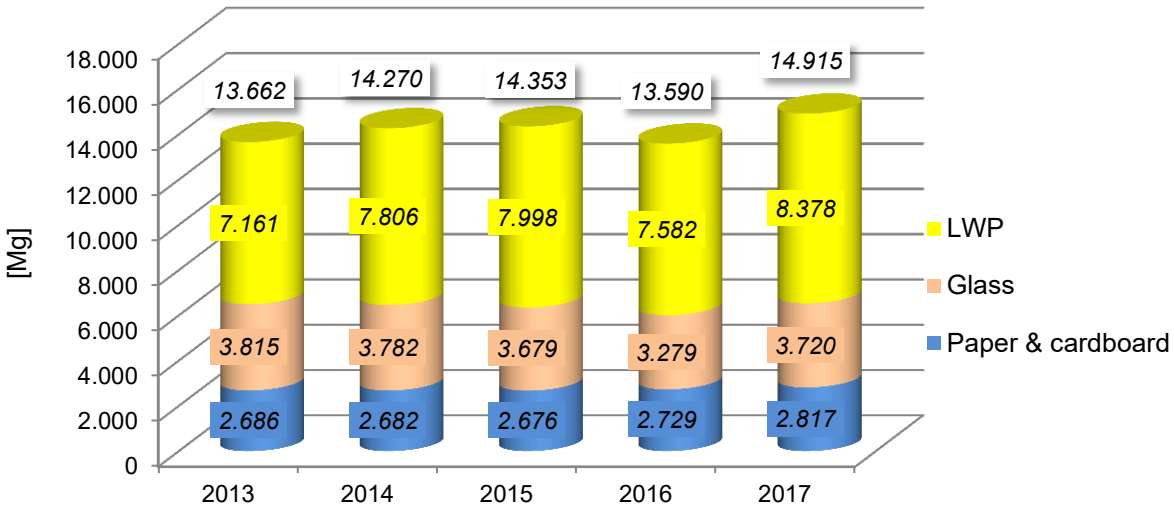

Figure 5 Recyclables arisings (packaging only)

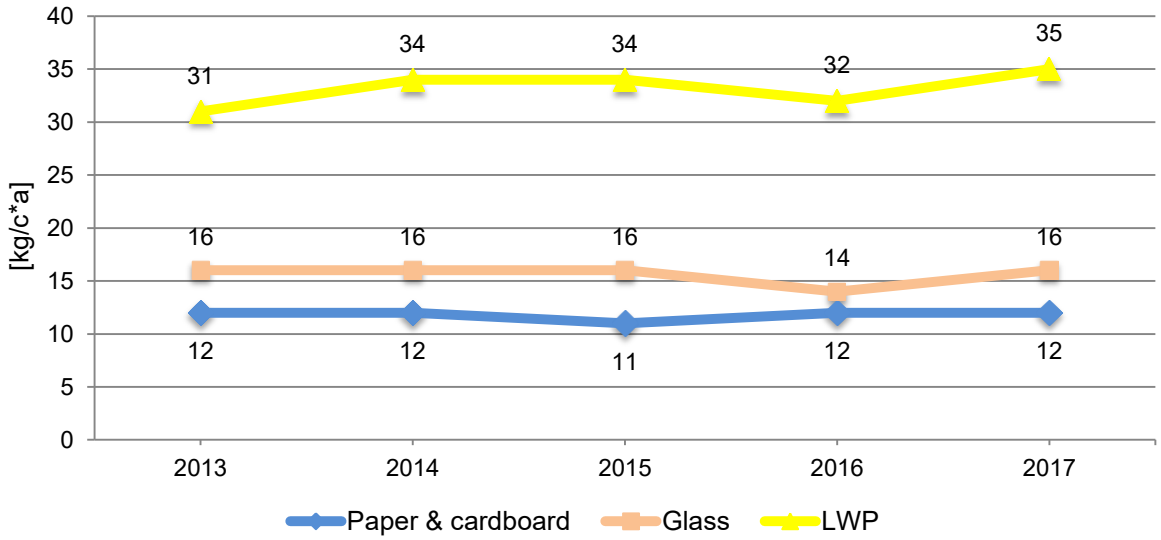

Figure 6 Per capita recyclables arisings (packaging only)

For all three recyclables fractions, a slight increase in the absolute packaging waste quantities was recorded in 2016 to 2017.

Until 2015, paper & cardboard arisings fell. The subsequent increase in quantities may be attributable to the rise of e-commerce and the associated packaging waste.

However, the per capita figures show a relatively stable level of approx. 12 kg/a for paper & cardboard waste over the years. Like the absolute waste arisings, light-weight packaging and glass arisings increased slightly from 2016 to 2017.

According to the Waste Balance for Saxony-Anhalt, per capita arisings of separately collected recyclables (packaging: paper & cardboard, glass and light-weight packaging collected via the Dual Systems) averaged 75.60 kg in 2016. At 58 kg, per capita arisings in Landeshauptstadt Magdeburg were below this average.

8.2.2 Recyclables (excluding packaging)

Year	Paper & cardboard		Metals		Wood waste		Total	
	200101		200140		200138			
	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]
2013	9,710	42	528	2	2,751	12	12,989	56
2014	9,693	42	601	3	2,961	13	13,255	57
2015	9,673	42	657	3	3,424	15	13,754	59
2016	9,864	42	788	3	3,804	16	14,456	61
2017	10,184	43	878	4	4,732	20	15,794	67

Table 8 Recyclables arisings (excluding packaging)

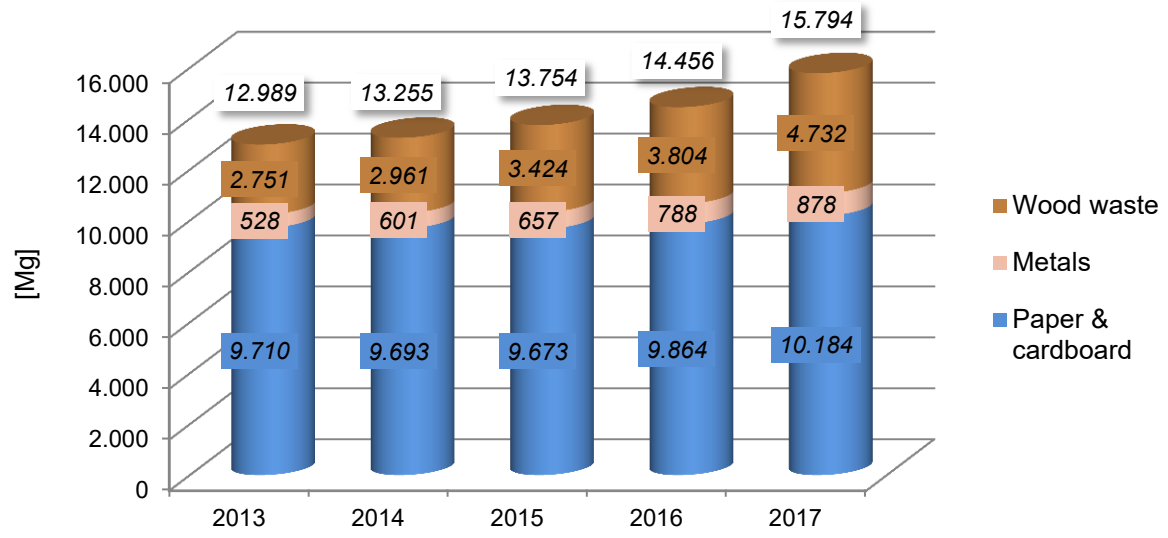

Figure 7 Recyclables arisings (excluding packaging)

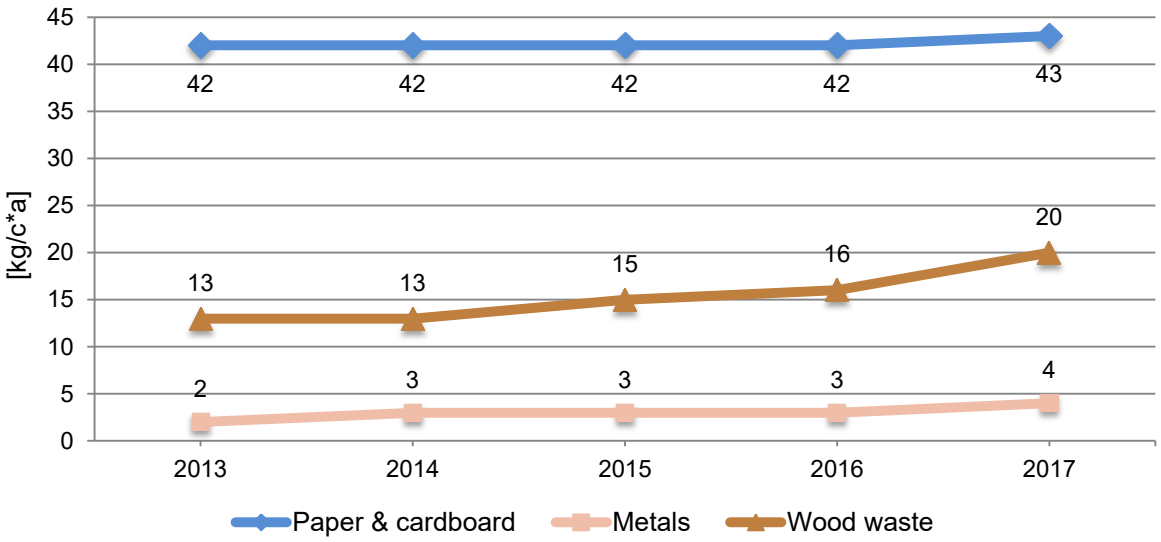

Figure 8 Per capita recyclables arisings (excluding packaging)

Wood waste and scrap metal arisings continuously rose during the period of 2013 to 2017. This is likely a reflection of increased construction activities of private households.

At 42 or 43 kg/a, the per capita paper & cardboard quantities collected by the PWMA were relatively constant. According to data from the Waste Balance for Saxony-Anhalt, the per capita paper & cardboard capture rate averaged 45.78 kg per person in 2016. This figure is just about reached by Landeshauptstadt Magdeburg.

8.2.3 Waste electrical and electronic equipment (WEEE)

WEEE is collected at the collection points established by the PWMA or since July 2016, taken back free of charge by the retailers subject to certain conditions.

Besides the municipal acceptance sites, defective or end-of-life WEEE can be returned at many retail outlets or via the mail order sector. Details are regulated by the Electrical and Electronic Equipment Act (ElektroG).The aim is to capture more items - also via the retailers - and route them to recycling or other recovery.

WEEE collected at the PWMA's collection points is transferred to a recycler via Gemeinsame Stiftung EAR or, in case a self-marketing declaration has been made by SAB, to a charity institution for recycling.

WEEE is collected at the City's acceptance sites sorted by the following categories:

WEEE Categories

Cat. I	Large household appliances, automatic dispensers
Cat. II	Refrigerators and freezers, oil-filled radiators
Cat. III	Screens, monitors and TV sets
Cat. IV	Lamps
Cat. V	Small household appliances, IT and telecommunications equipment, electronic home entertainment equipment, lamps and other lighting fixtures as well as light diffusers and controls, electrical and electronic tools, toys, sports and leisure time equipment, medical products, monitoring and control instruments
Cat. VI	Photovoltaic modules

Year	Cat. I		Cat. II		Cat. III		Cat. IV		Cat. V		Total	
	20 01 35		20 01 23		20 01 35		20 01 21		20 01 35			
	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]
2013	236	1	261	1	660	3	8	0.03	150	1	1,315	6
2014	258	1	268	1	672	3	7	0.03	193	1	1,398	6
2015	381	2	291	1	619	3	8	0.03	205	1	1,504	7
2016	511	2	281	1	335	1	8	0.03	460	2	1,597[1]	6
2017	524	2	314	1	318	1	8	0.03	520	2	1,684	6

[1] includes Cat. VI WEEE. Cat. VI was introduced with the new ElektroG in 2016.
In 2006, 2 Mg of PV modules were collected.

Table 9 WEEE arisings

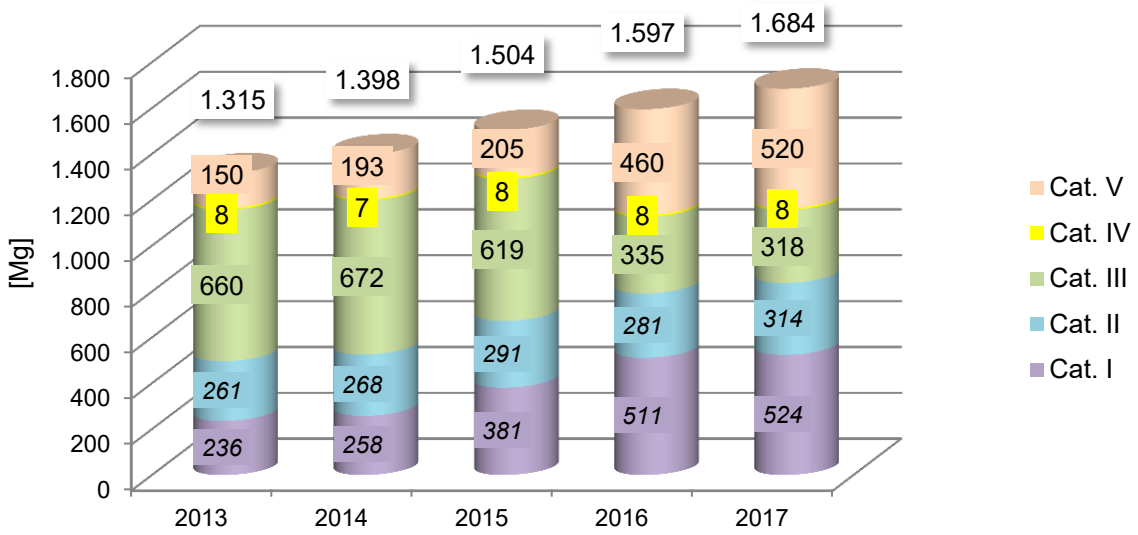

Figure 9 WEEE arisings

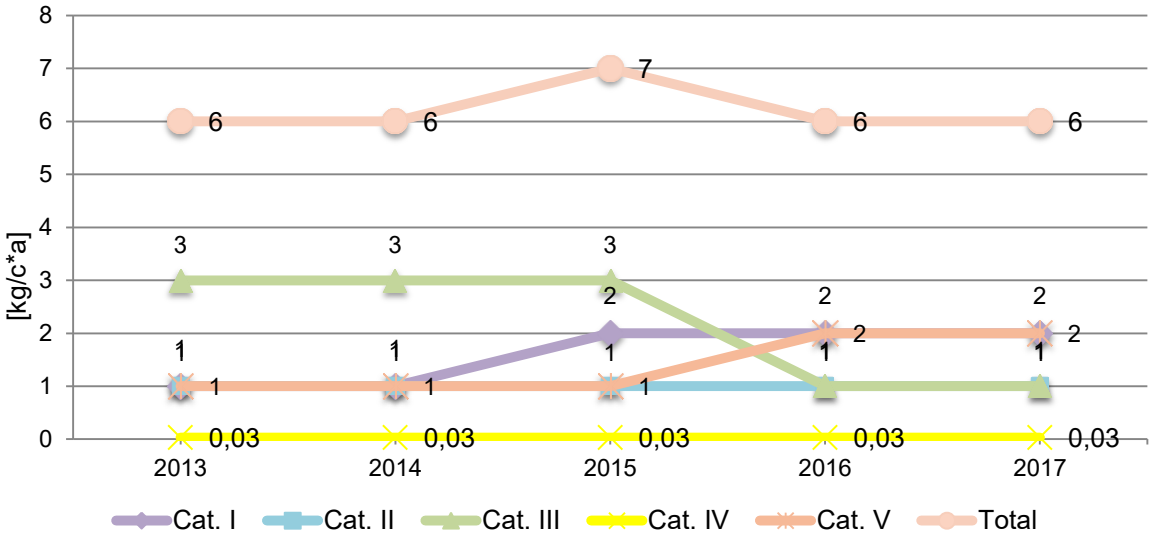

Figure 10 Per capita WEEE arisings

Arisings of small WEEE items (Category V) increased continuously over the 2013–2017 period. IT, telecommunications and electronic home entertainment equipment in particular is being replaced at shorter intervals by households, which may explain the increased arisings. Per capita WEEE arisings ranged between 1 and 2 kg/ over the years.

Total WEEE arisings over the 2013–2017 period amounted to approx. 6 to 7 kg/c*a, representing a significant increase on the 2007–2012 period (4.32 to 5.65 kg/c*a). The average level for Saxony-Anhalt in 2016 was approx. 7 kg/c*a so that Magdeburg's capture rate roughly reflects this average.

In 2002, the EU set a per capita collection target of 4 kg/a for WEEE from private households which was achieved in Magdeburg by 2015. A new collection target was set in 2016. Instead of the hitherto per capita target, a new percentage collection target was introduced. The minimum annual collection rate to be achieved is 45% from 2018 and 65 % from 2019 related to the average weight of EEE placed on the market in the three preceding years. This target includes, however, different sources of WEEE generation, private households and businesses.

8.3 Small-volume hazardous waste and other wastes

Year	Small-volume hazardous waste miscellaneous		Scrap tyres 16 01 03		Total	
	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]
2013	263	1.1	51	0.2	314	1.3
2014	238	1.0	53	0.2	291	1.2
2015	229	1.0	61	0.3	290	1.3
2016	254	1.1	70	0.3	324	1.4
2017	234	1.0	72	0.3	306	1.3

Table 10 Small-volume hazardous waste and scrap tyres

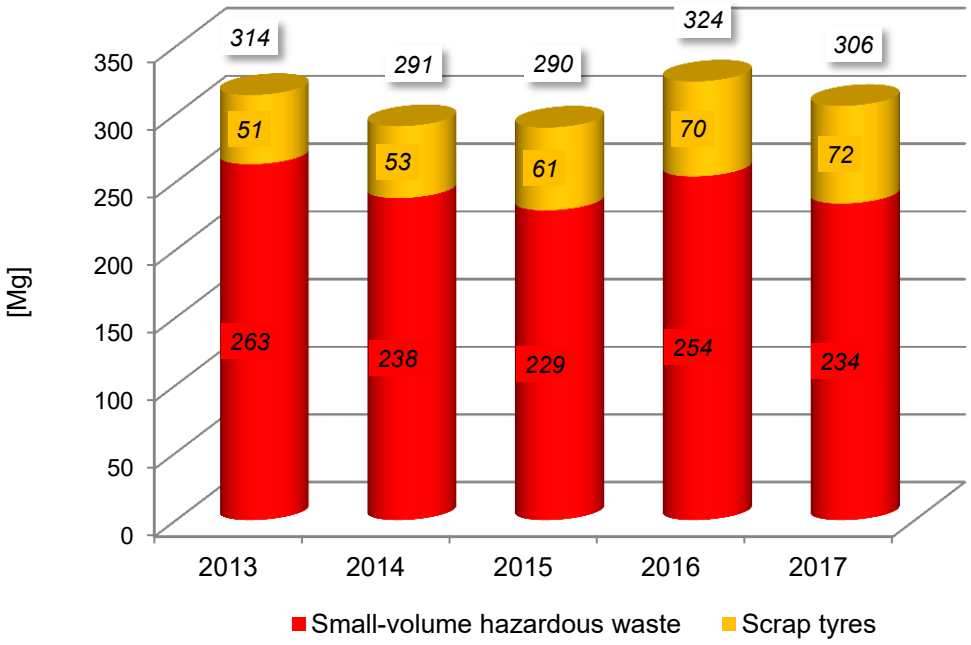

Figure 11 Small-volume hazardous waste and scrap tyre arisings

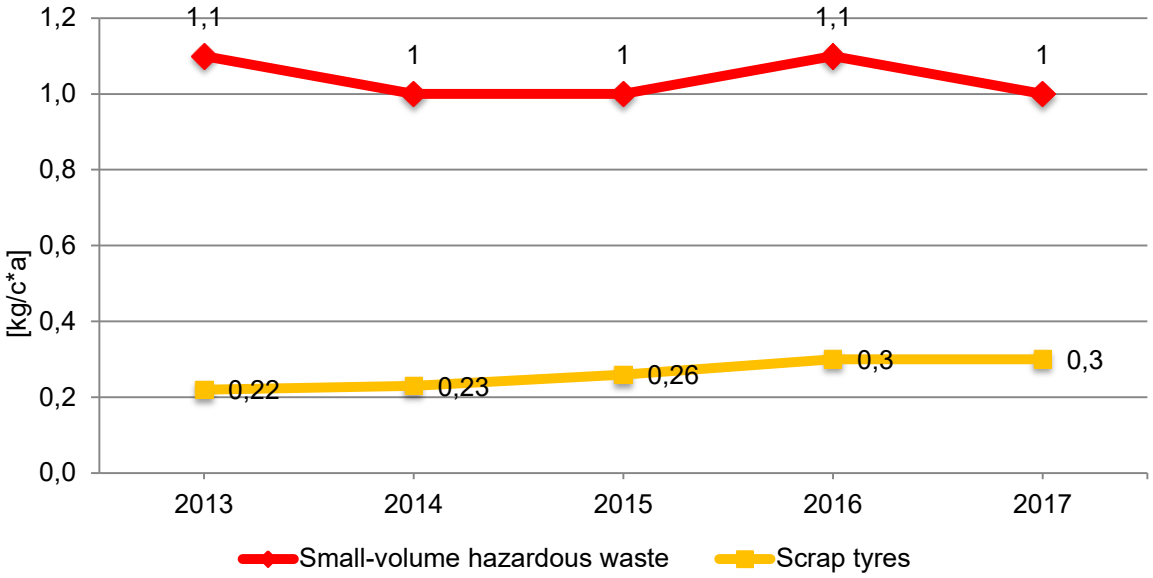

Figure 12 Per capita small-volume hazardous waste and scrap tyre arisings

Waste code	Waste category	2013	2014	2015	2016	2017
		[kg]	[kg]	[kg]	[kg]	[kg]
060404*	Wastes containing mercury	34	34	29	76	51
150202*	Absorbent and filter materials (incl. oil filters not otherwise specified) wiping cloths and protective clothing contaminated with dangerous substances	4,093	3,869	3,442	3,466	3,436
160209*	Transformers and capacitors containing PCBs	-	251	-	-	-
160504*	Gases in pressure containers containing dangerous substances (including halons) (spray cans)	2,988	3,272	3,234	3,306	4,057
160505	Gases in pressure containers other than those mentioned in 16 05 04	-	-	-	-	1,448
160507*	Discarded inorganic chemicals consisting of or containing dangerous substances	-	-	143	56	96
160508*	Discarded organic chemicals consisting of or containing dangerous substances	145	199	97	94	536
160601*	Lead batteries	2,493	4,166	6,523	12,189	5,556
160602*	Ni-Cd batteries	764	35	73	-	339
160603*	Mercury-containing batteries	-	-	-	-	-
160604	Alkaline batteries (other than 16 06 03)	8,195	-	-	-	-

Waste code	Waste category	2013	2014	2015	2016	2017
		[kg]	[kg]	[kg]	[kg]	[kg]
200133	Batteries and accumulators mentioned in 16 06 01, 16 06 02 or 16 06 03 and mixed batteries and accumulators containing such batteries	-	6,359	7,024	8,675	8,230
200113*	Solvents	15,095	15,538	16,680	17,303	15,574
200114*	Acids	2,238	1,756	2,006	2,250	1,451
200115*	Bases	2,736	2,493	3,415	2,699	2,925
200117*	Photochemicals	435	719	642	893	750
200119*	Pesticides	2,878	3,736	3,567	3,641	2,873
200126*	Oils and fat other than those mentioned in 20 01 25	9,218	10,358	10,024	12,701	11,027
200127*	Paints, inks, adhesives and resins containing dangerous substances	36,468	33,530	38,121	39,534	38,426
200128	Paint, inks, adhesives and resins other than those mentioned in 20 01 27 (dispersion paint)	175,158	151,197	134,093	147,332	136,852
200132	Medicines other than those mentioned in 20 01 31	-	-	-	-	-
Total		**262,938**	**237,512**	**229,113**	**254,215**	**233,627**

Table 11 Small-volume hazardous waste by waste code

Small-volume hazardous waste arisings fluctuated only slightly over the period under review. Ultimately, the per capita level was constant at 1 to 1.1 kg/a over the years.
Scrap tyre arisings increased only marginally.

8.4 Municipal solid waste

Year	Household waste		CWSHW		Bulky waste		Street sweepings		Clinical waste		Total	
	20 03 01 Household Waste		20 03 01 CWSHW		20 03 07		20 03 03		18 01 04			
	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]	(Mg/a)	[kg/c*a]
2013	46,944	204	4,710	21	9,573	42	3,191	14	52	0.22	64,470	281
2014	46,484	201	4,650	20	8,201	36	2,748	12	184	0.80	62,267	270
2015	46,099	198	4,665	20	7,024	30	2,519	11	203	0.87	60,510	260
2016	45,752	194	4,602	20	6,408	27	2,742	12	235	1.00	59,739	254
2017	45,889	193	4,487	19	6,601	28	2,661	11	455	1.91	60,093	253

Table 12 Municipal solid waste arisings

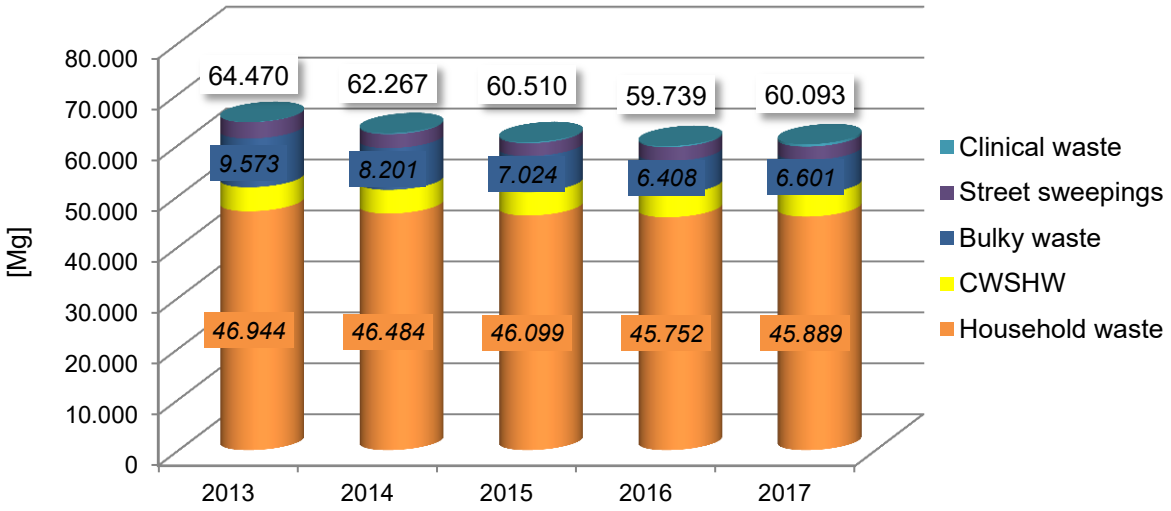

Figure 13 Municipal solid waste arisings

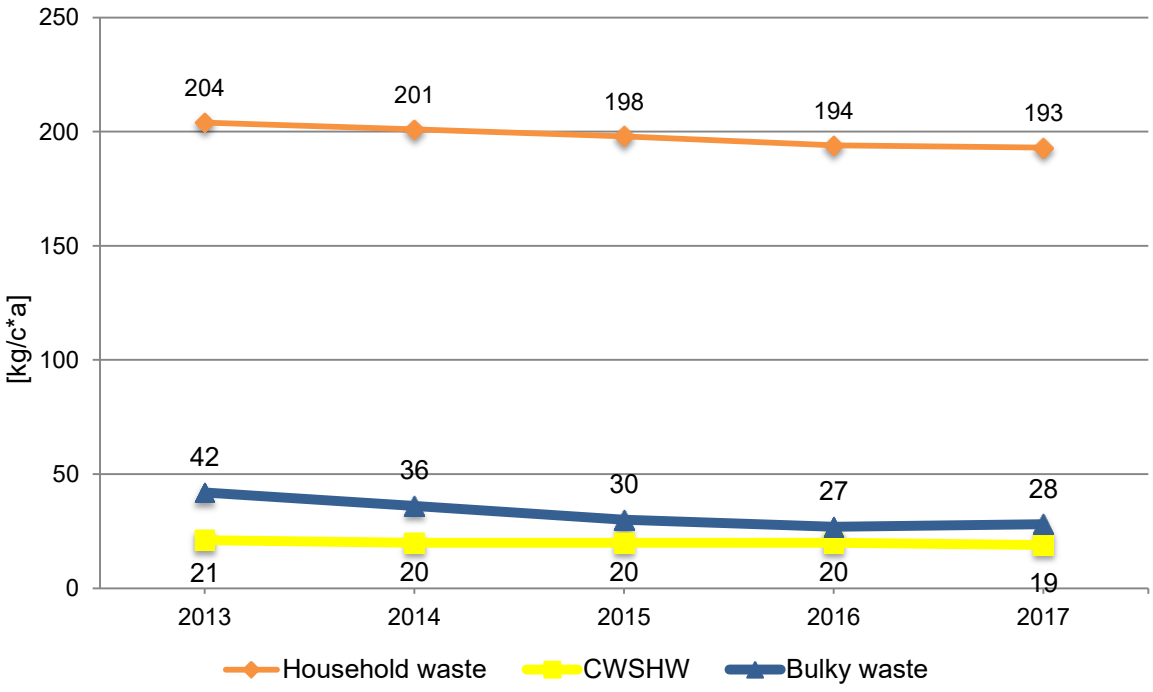

Figure 14 Per capita municipal solid waste arisings

Municipal solid waste arisings were already on the decline during the 2007–2012 period. This trend continued. In the period under review, per capita total waste arisings decreased continuously from 281 kg/a to 253 kg/a.

Household waste and bulky waste arisings in particular showed a downward trend. In the case of household waste, this can be explained by improved waste segregation through the kerbside collection system. Moreover, waste prevention measures play a role.

According to the Waste Balance for Saxony-Anhalt, per capita household waste arisings (waste code 20 03 01) averaged 149.71 kg/a in 2016. In view of the significantly higher household waste collection rate in Landeshauptstadt Magdeburg, measures will be needed for the reduction of the biowaste component in the residual waste. At approx. 27 kg/a, per capita bulky waste arisings were slightly below the 2016 average for Saxony-Anhalt.

8.5 Construction & demolition waste

Year	Construction site wastes	Building rubble	Excavation waste	Total
	[Mg]	[Mg]	[Mg]	[Mg]
2013	3,050	7,133	8,546	18,729
2014	3,011	8,362	996	12,367
2015	5,379	8,869	5,049	19,299
2016	5,953	9,405	6,016	21,374
2017	6,474	8,819	6,571	21,891

Table 13 Construction & demolition waste arisings

Waste code	Waste category	2013	2014	2015	2016	2017
		[Mg]	[Mg]	[Mg]	[Mg]	[Mg]
170202	Glass	0	2	0	0	27
170204*	Glass, plastics and wood containing or contaminated with dangerous substances	685	783	800	847	597
170303*	Coal tar and tarred products	199	158	172	150	257
170601*	Insulation materials containing asbestos	0	7	0	0	0
170603*	Other insulation materials containing or consisting of dangerous substances	383	261	217	217	350
170605*	Construction materials containing asbestos	142	97	105	98	314
170802	Gypsum-based construction materials other than those mentioned in 170801	-	-	622	627	256
170904	Mixed construction and demolition wastes other than those mentioned in 170901, 170902 and 170903	1,641	1,703	3,463	4,014	4,701

Table 14 Construction site wastes by waste code

Waste code	Waste category	2013	2014	2015	2016	2017
		[Mg]	[Mg]	[Mg]	[Mg]	[Mg]
170101	Concrete	145	176	3	87	279
170102	Bricks	3,143	3,541	4,749	4,389	3,727
170103	Tiles and ceramics	3,697	3,948	3,955	4,400	4,614
170107	Mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 170106	148	697	162	529	199

Table 15 Building rubble arisings by waste codes

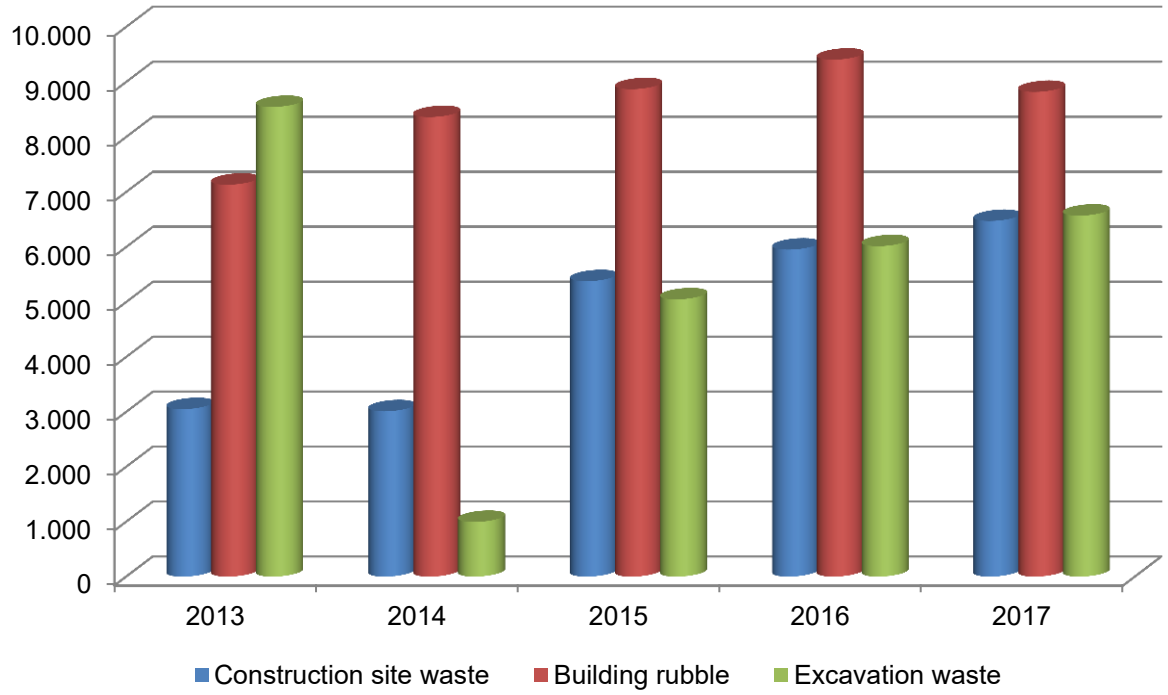

Figure 15 Construction & demolition waste arisings

All three fractions – construction site waste, building rubble and excavation waste – showed a marked increase in arisings in the last three years of the period under review.

The greater part of the construction waste transferred to the PWMA originates from construction sites and/or public sector civil engineering projects. This rise can be explained by the increased construction activities in the public sector.

In the 2016 Waste Balance for Saxony-Anhalt, only 11 PWMAs reported data on construction & demolition waste arisings. Of these, Magdeburg recorded the highest arisings at 21,374 Mg. Given the planned construction measures in Magdeburg and its surroundings, arisings are expected to continue to increase.

8.6 Secondary wastes

Year	Secondary wastes	Wastes from municipal waste water treatment	Non-hazardous high-volume waste	Other wastes	Total
	[Mg]	[Mg]	[Mg]	[Mg]	[Mg]
2013	2,764	14	23,261	715	26,754
2014	2,979	18	7,923	2,005	12,925
2015	11,015	13	11,387	1,476	23,891
2016	10,594	12	10,936	3,487	25,029
2017	17,380	47	10,207	2,659	30,293

Table 16 Secondary and other wastes

Waste code	Waste category	2013	2014	2015	2016	2017
		[Mg]	[Mg]	[Mg]	[Mg]	[Mg]
191205	Glass	251	-	5,067	1,345	-
191209	Minerals (e.g. sand, stones)	-	265	2,927	5,529	13,219
191212	Other wastes (including mixtures of materials) from mechanical treatment of waste other than those mentioned in 191211	2,513	2,714	3,021	3,719	4,160

Table 17 Secondary wastes by waste code

Waste code	Waste category	2013	2014	2015	2016	2017
		[Mg]	[Mg]	[Mg]	[Mg]	[Mg]
100101	Bottom ash, slag and boiler dust excluding boiler dust mentioned in 10 01 04	63	64	11	73	183
100202	Unprocessed slag	-	-	10	58	95
100906	Casting cores and moulds which have not undergone pouring other than those mentioned in 100905	-	-	312	581	303
100908	Casting cores and moulds which have undergone pouring other than those mentioned in 100907	60	47	59	331	336
100910	Fly ash other than those mentioned in 100909	-	-	-	526	398
101006	Casting cores and moulds which have not undergone pouring other than those mentioned in 101005	276	311	124	553	1,922
101008	Casting cores and moulds which have undergone pouring other than those mentioned in 101007	-	-	416	160	-
101103	Waste glass-based fibrous materials	2,625	2,344	2,056	2,749	3,341
101105	Particulates and dust	-	-	-	165	106
101114	Glass-polishing and grinding sludge other than those mentioned in 101113	43	38	69	97	40
101208	Waste ceramics, bricks, tiles and construction products (after baking)	-	1,506	2,597	-	-
101311	Wastes from cement-based composite materials other than those mentioned in 101309 and 101310	-	1,069	2,293	2,563	2598
190112	Bottom ash and slag other than those mentioned in 190111	20,194	2,544	2,063	2,556	-
190203	Premixed wastes composed only of non-hazardous wastes	-	-	1,377		887

Table 18 Non-hazardous high-volume wastes by waste code

Waste code	Waste category	2013	2014	2015	2016	2017
		[Mg]	[Mg]	[Mg]	[Mg]	[Mg]
020402	Off-specification calcium carbonate sludge	-	-	-	1,437	-
030311	Sludges from on-site effluent treatment other than those mentioned in 030310	-	-	-	421	-
080202	Aqueous sludges containing ceramic materials	-	12	26	34	21
110110	Sludges and filter cakes other than those mentioned in 110109	-	-	-	366	890
120115	Machining sludges other than those mentioned in 120114	-	-	26	21	13
120117	Waste blasting material other than those mentioned in 120116	45	689	449	167	240
120121	Spent grinding bodies and grinding materials other than those mentioned in 120120	11	3	7	-	4
161104	Other linings and refractories from metallurgical processes other than those mentioned in 161103	-	-	-	51	39
161106	Linings and refractories from non-metallurgical processes other than those mentioned in 161105	-	-	-	82	-
190206	Sludges from physico/chemical treatment other than those mentioned in 190205	437	409	285	317	430
200203	Other non-biodegradable wastes	222	892	684	591	711

Table 19 Other wastes by waste code

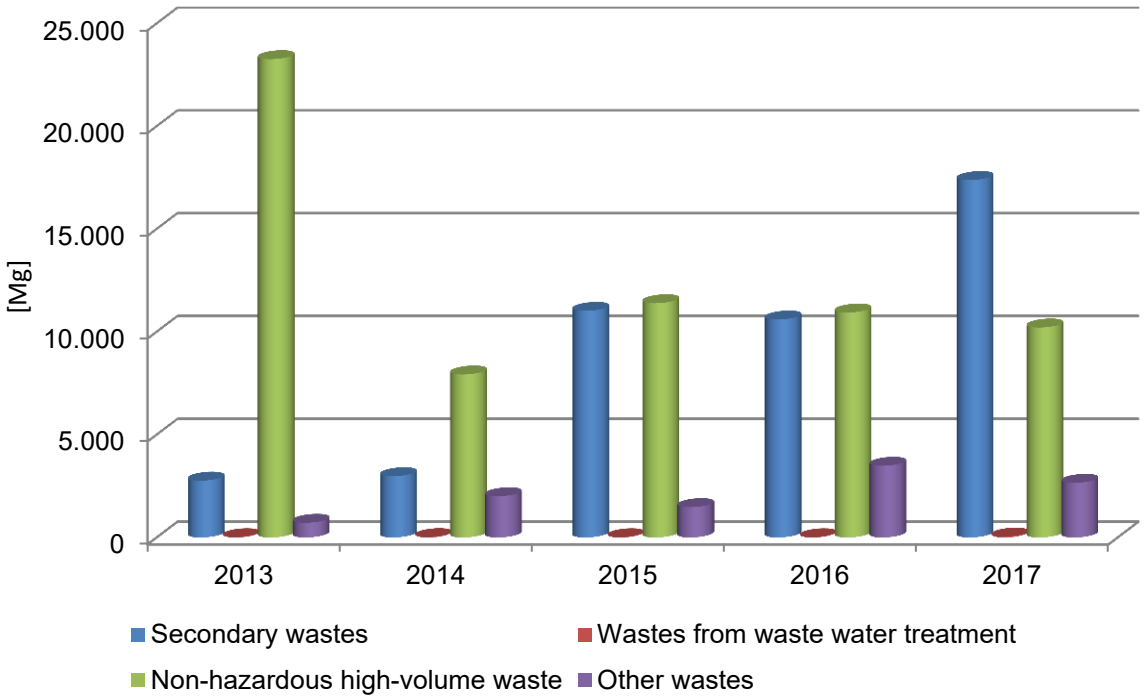

Figure 16 Secondary wastes, high-volume wastes, other wastes

Secondary wastes can be broadly classified into sludge, e.g. from waste water treatment, secondary waste from sorting facilities and product-specific wastes, e.g. foundry and blast cleaning sand. For a detailed breakdown, see Table 17 to Table 19.

Total secondary waste arisings ranged between 14,939 and 28,767 Mg during the 2013–2017 period. At roughly 12 to 18 Mg, wastes from municipal waste water treatment play a secondary role. Secondary waste, other wastes (including mixtures of materials) from mechanical waste treatment increased sharply until 2017.

8.7 Recycling rate

Under the new 5-tier waste hierarchy of the Waste Framework Directive, preparation for reuse and recycling of municipal waste and hence, material recovery take precedence over other recovery.

Recycling is defined as any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the preprocessing into materials for use as fuels or backfill.
The recovery of construction & demolition waste for use as landfill construction material classifies as recycling as the recovered material substitutes other materials.

The legislator sets a 65 wt.% preparation for reuse and recycling target (input rate) for municipal waste to be achieved by 2020. In order to promote recycling, paper, metal, plastic and glass waste must be separately collected with effect from 2015. Biowaste, which is subject to transfer to the public waste management authority, must likewise be separately collected.

As the Saxony-Anhalt Waste Management Plan sees no need for a binding specification of the treatment technologies to be employed, thermal recovery of household waste (residual waste) without prior sorting in mechanical treatment plants continues to be allowed.

In view of Magdeburg's residual waste composition, the PWMA will have to enhance communications on the separate collection obligation for defined material streams as provided by the Waste Management By-Law.

Figure 17 presents the bulky waste treatment route.

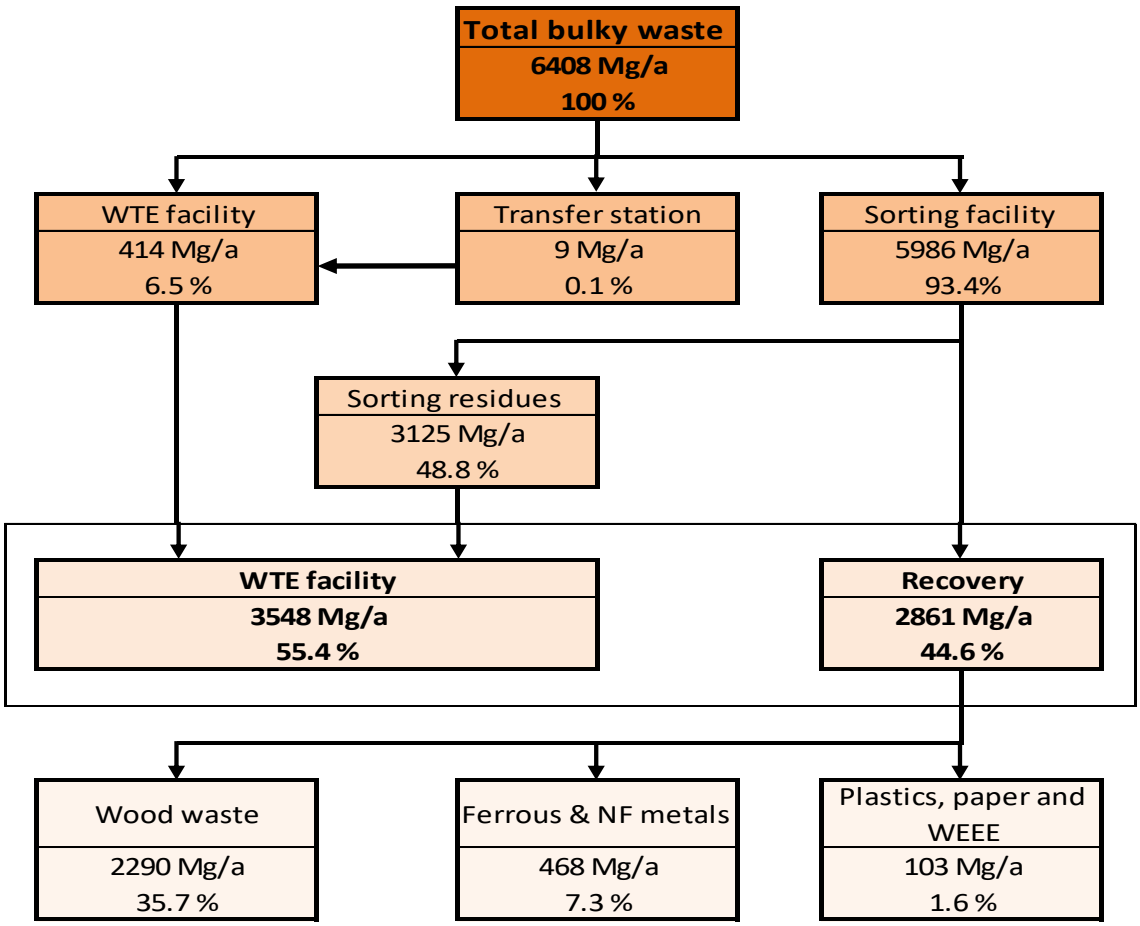

Figure 17 Bulky waste treatment routes and quantities 2016

The relative shares of materials recovered from the collected bulky waste are presented below.

Some 93.4 % of the collected bulky waste is directly sent to a sorting facility for material recovery.

Preparation in the sorting facility yields the following fractions:
- approx. 38 % wood waste for recovery
- approx. 6 % ferrous and non-ferrous metals for recycling
- approx. 2 % paper and plastic waste as well as e-scrap for recycling.
- approx. 52 % residual waste for thermal treatment

The high proportion of sorting residues suggests that too many wastes not lending themselves to material recovery are still routed to sorting.

Here, it will be a future task to precisely analyse the material streams involved and separately collect those waste fractions that can be directly routed to material recovery. The bulky waste logistics concept must be optimised to provide for non-recoverable bulky waste to be separately captured as residual waste at the time of collection and sent to thermal treatment.

Moreover, the quality of separate collection must be improved and the material streams analysed in cooperation with the recyclers.

The same applies to other material streams, e.g. the biowaste collected via the Bio Bin. Here, SAB will participate in the Germany-wide #wirfürbio campaign.

Figure 18 #wirfürbio.campaign – vehicle signage

The waste paper stream including packaging waste is already collected in good quality. The contaminant level - especially light-weight packaging and residual waste - in the waste paper fraction is 4.4.%, corresponding to approx. 2.6 kg /c*a.

9 Waste Composition

9.1 Residual waste

To be able to identify measures for the separate collection of defined material streams and assess the trend in waste arisings, compositional analyses of the residual waste must be carried out among other things. With a residual waste generation rate of 194 kg/c*a in 2016, the target of 195 kg/c*a set for 2015 in the Waste Management Concept 2013-2017 was achieved.

In **2013/14**, a representative analysis of waste category *200301 mixed municipal waste (household waste)* was undertaken by SAB.
The objective was to gain insights into the waste composition after the introduction of the kerbside waste paper and light-weight packaging collection system.
In four seasonal campaigns (spring, summer, autumn, winter), the waste composition was analysed, focussing on defined housing types.

1. New residential developments:
   – Areas with multi-storey residential buildings predominantly built in the 1970s and 1980s

2. Residential areas:
   – Areas with multi-family houses predominantly built before 1970

3. Single-family house areas:
   – Areas with predominantly single- and two-family houses

The analysis showed the following residual waste composition:

Substance group	**% by weight**
Ferrous metals	1.65
Non-ferrous metals	0.56
Paper & cardboard	5.76
Glass	7.52
Plastics	8.67
Organics	51.49
Wood	1.39
Textiles	2.68
Minerals (no glass)	2.42
Composites	3.61
Hazardous substances	1.35
Other substances	8.28
Fines (< 10 mm)	4.64
	100.00

Table 20 Residual waste composition 2014

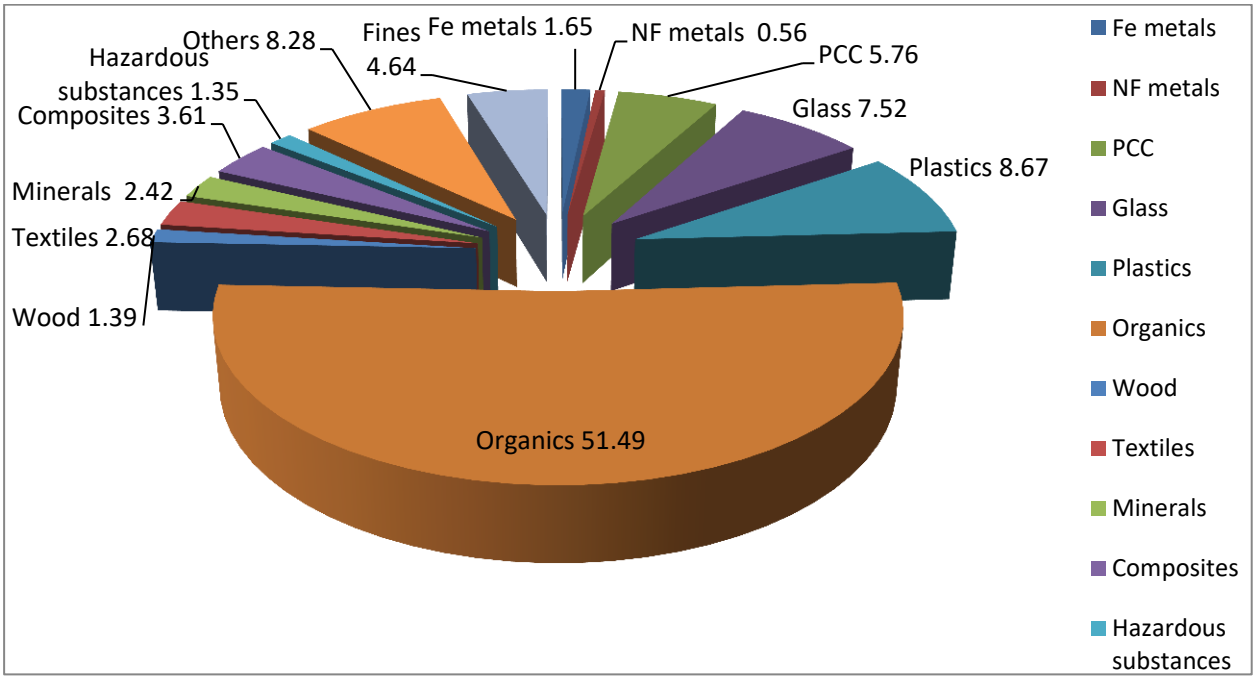

Figure 19 Residual waste composition 2014

Another residual waste compositional analysis was undertaken in 2016/2017.
For this purpose, the housing types sampled were adapted to the changed conditions. For single-family houses, an additional distinction was made between single-family houses with and without Bio Bin in order to determine whether the residual waste from single-family houses without Bio Bin differs from that of single-family houses participating in the biowaste collection service.
Here as well, the analysis was performed in four campaigns. The housing types were classified as followed:

Housing type (HT)	Description
HT 1	Residential buildings with a minimum of 5 floors
HT 2	Residential buildings with up to 5 floors and a minimum of 3 dwelling units
HT 3.1	Single-/two-family houses (residential buildings with maximum 2 dwelling units) with bio bin
HT 3.2	Single-/two-family houses (residential buildings with maximum 2 dwelling units) without bio bin

The analysis showed the following average residual waste composition:

	HT 1	HT 2	HT 3.1	HT 3.2	Total
Ferrous metals	1.7	2.0	1.0	1.5	1.7
Non-ferrous metals	0.8	0.9	0.5	0.4	0.8
Paper & cardboard	9.4	7.2	2.6	2.4	6.9
Glass	6.9	8.1	8.1	5.4	7.6
Plastics	8.5	7.1	3.8	3.2	6.7
Organics	36.9	39.2	42.4	48.0	39.6
Tissue papers	3.8	4.9	5.3	4.7	4.6
Wood	1.8	0.5	0.7	0.5	1.0
Textiles	4.5	4.1	4.2	3.8	4.2

	HT 1	HT 2	HT 3.1	HT 3.2	Total
Minerals	2.1	2.8	5.5	5.8	3.2
Composites	7.4	5.6	3.1	2.1	5.5
Hazardous substances	0.5	0.3	0.4	0.2	0.4
Materials not otherwise specified	7.4	10.1	9.5	7.6	8.9
Screen cut < 10 mm	8.1	7.2	13.1	14.4	8.8

Table 21 Average residual waste composition 2017 [% by weight]

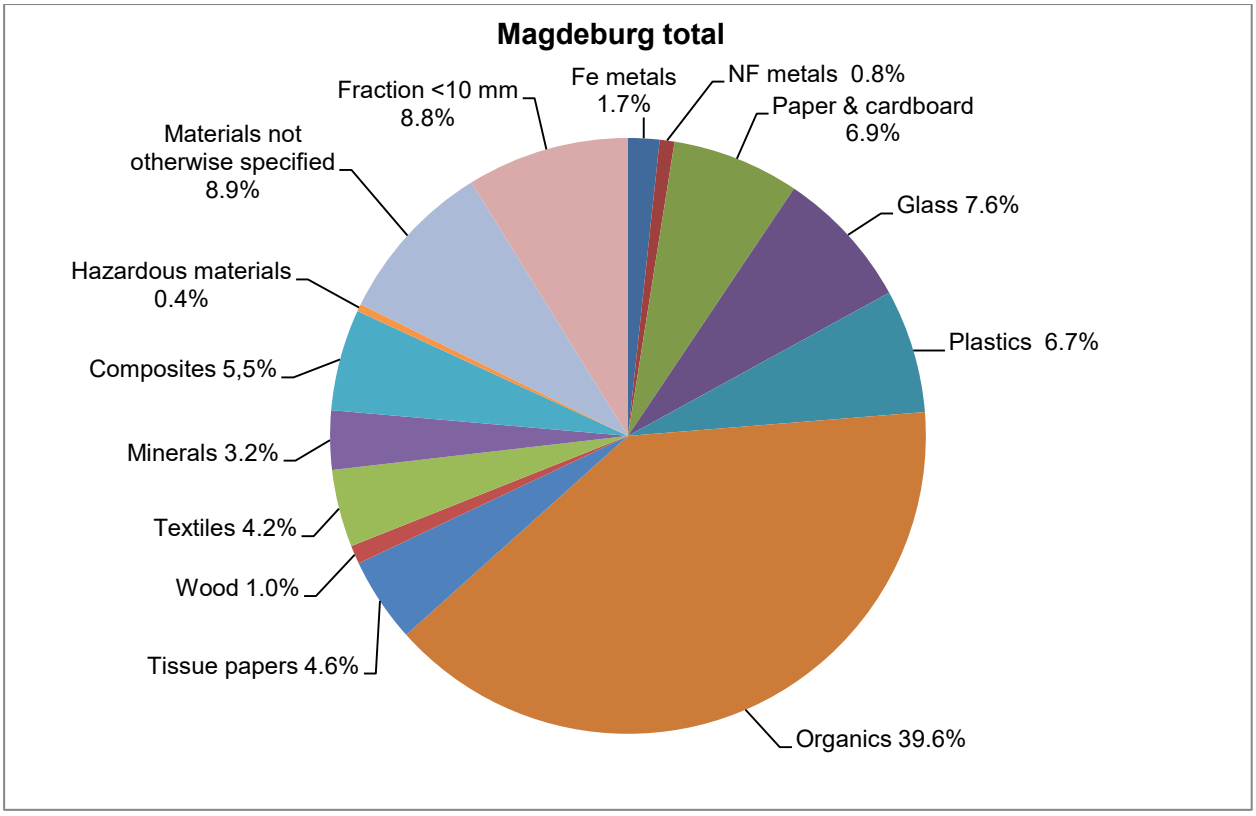

Figure 20 Residual waste composition 2017 [% by weight]

	2013/14		2016/17		Difference	
Substance group	**[wt.%]**	**[kg/c*a]**	**[wt.%]**	**[kg/c*a]**	**[percent points]**	**[kg]**
Ferrous metals	1.7	2.9	1.7	2.8	-	- 0.1
Non-ferrous metals	0.6	1.0	0.8	1.3	+ 0.2	+ 0.3
Paper& cardboard	5.8	9.7	6.9	11.4	+ 1.1	+ 1.7
Glass	7.5	12.6	7.6	12.6	+ 0.1	-
Plastics	8.7	14.6	6.7	11.1	- 2.0	- 3.5
Organics	51.5	86.5	39.6	65.4	- 11.9	- 21.1
Tissue papers	(not separately captured)		4.6	7.6	+ 4.6	+ 7.6
Wood	1.4	2.4	1.0	1.7	- 0.4	- 0.7
Textiles	2.7	4.5	4.2	6.9	+ 1.5	+ 2.4
Minerals	2.4	4.0	3.2	5.3	+ 0.8	+ 1.3
Composites	3.6	6.0	5.5	9.1	+ 1.9	+ 3.1
Hazardous materials	1.4	2.4	0.4	0.7	- 1.0	- 1.7
Substances n.o.s.	8.2	13.8	8.9	14.7	+ 0.7	+ 0.9
Screen cut <10 mm	4.6	7.7	8.8	14.5	+ 4.2	+ 6.8

Table 22 Waste composition 2013/14 versus 2016/17

Due to the different sorting criteria (different assignment to screen cut), a comparison of the 2013/2014 analysis results with those of 2016/17 is not or only conditionally possible.
The reduction of the organics component in the residual waste is partly a result of the intensive public awareness programme including Germany-wide anti-food waste campaigns and other measures promoting source segregation of biowaste (see Section 4.3).

9.2 Biowaste

A representative analysis of waste category *200301 mixed municipal waste (biowaste)* on behalf of SAB was last undertaken in **2008/09**.

The analysis showed average total biowaste arisings of 56.4 kg per capita and year for Magdeburg with a total contaminant level of 0.59 kg per capita and year. The average contaminant level was approx. 1 % by weight in the standard campaigns. Contaminant levels as high as 4.9 percent by weight were reported for individual biowaste loads from collection tours.

Figure 21 Contaminants in biowaste

The tender specifications for biowaste treatment services state a contaminant level of 3 %. According to information available from treatment facilities and seminars, the contaminant level would have to be reduced to 1 % in order to meet the quality specifications for compost soil while ensuring economically viable operation of the facilities. Treatment prices for biowaste and green waste have increased by about 300 % in the past two years and remain at this high market price level. This also has implications for the residual waste and/or biowaste fee.

In 2019/2020, SAB will commission a biowaste analysis in order to obtain the necessary information for more targeted public information and communication campaigns. The #wirfürbio campaign primarily aims to divert the plastic fraction including biodegradable plastic bags from the biowaste stream. The aim is to encourage the use to paper bags.

Figure 22 Poster of the #wirfürbio campaign

10 Wastes Excluded from PWMA's Waste Management Obligation

Pursuant to Art. 20 (2) of the KrWG, the public waste management authorities may - subject to the consent of the competent authority - exclude wastes from public waste management to the extent that there is a take-back obligation for such wastes on the basis of a statutory ordinance issued pursuant to Art. 25 of the KrWG and appropriate take-back systems are actually in place. This also applies to wastes destined for final disposal from sources other than private households to the extent such wastes cannot be disposed of together with household waste on account of their nature, quantity or composition or that environmentally sound disposal in line with the waste management plans of the federal states is ensured by another public waste management authority or third parties.

The exclusion does not apply to wastes from households and similar sources (including wastes from small and mini-businesses in quantities similar to those generated by households).

A list of excluded wastes is no longer part of the new Waste Management By-Law which will enter into force in April 2019.

Where required, wastes can be excluded on a case-by-case basis by administrative act subject to the approval of the competent authority.

11 Waste Management Targets and Projections

11.1 Future waste management trends and targets

Waste management will have to move forward towards resources management to support the transition to a circular economy.
The future development towards sustainable waste management will continue to be based on the five-tier waste hierarchy, meaning that material recovery takes precedence over energy recovery.

The Circular Economy Act requires the separate collection of paper, metal, plastic and glass waste as well as organic waste. These requirements will be implemented by Magdeburg's waste management organisation where technically and economically practicable. The objective is to improve the separate collection of recyclables, in particular of the organic waste stream. Moreover, collection logistics and the material streams will have to be reviewed to improve the starting conditions for the recycling facilities.

The concept of a citizen-friendly, consumer-friendly, efficient and ecological “Recycling Act” providing for the transfer of the collection responsibility to the municipalities and the phase-out of the Dual System was ultimately considered not to be implementable. The Packaging Act adopted in its place does not implement compulsory co-collection of packaging waste and non-packaging waste of similar materials through the Dual System. The Packaging Act will enter into full force and effect on 1 January 2019. The public waste management authorities and system operators are called upon to negotiate the coordination agreement on the cooperation principle. The terms and conditions for paper & cardboard waste will have to be re-negotiated. As the packaging share in the paper fraction will continue to increase, the take-over of the collection costs and proportional shares in the marketing proceeds and/or the surrender of paper shares will have to be negotiated.

Waste education and awareness programmes for light-weight packaging (yellow bin) will have to stepped up to stem the current trend of residual waste disposal to the yellow bins. For cost reasons but also because of the negative impacts on recycling rates, system operators have begun excluding individual sites from LWP collection. Here, an LWP analysis should be carried out in cooperation with the negotiating system operator in order to improve the effectiveness of the joint waste information and education activities.

In 2017, approx. 55 kg of waste paper & sales packaging were collected per person through the kerbside collection system, of which 12 kg sales packaging per person. The aim is to further increase the capture rate by reviewing the participation level and enforcing participation. Regarding commercial waste paper collections, SAB in its comments to the State Administrative Office has pointed to the existing full-coverage kerbside collection service via the PMWA and the impacts on the fee budget in order to obtain a prohibition. So far commercial waste paper collections have been allowed as they do not jeopardise the PWMA's function in the State Administrative Office’s view. Considering the total notified commercial waste paper collections, the paper quantities removed from the PWMA's control exceed the 15 % relevance threshold defined in the legal decision. In making its decisions, the State Administrative Office should consider the new legal situation as it is the only entity that can determine the actual commercial collection volumes. Here, waste paper quantities of good recovery quality are removed from the PWMA's control.

In 2016/2017 a residual waste analysis was undertaken in preparation for the public tender process for residual waste treatment from 2020 and to identify key themes for the waste information service.
Based on the analysis results, options for action and measures to respond to current trends and implement the necessary changes were presented. As before, actions will continue to focus on the reduction of the residual waste quantities through waste prevention, improved waste

separation as a prerequisite for reuse and recovery, in particular the beneficial use of biowaste for material recovery or combined energy and material recovery.

With the implementation of the Circular Economy Act, the required separate collection of glass, paper, plastics and biowaste is expected to lead to a further reduction in residual waste quantities.
The target is to reduce household waste arisings to 163 kg/c*a by 2025 and 145 kg/c*a by 2030.
The organics component makes up the largest share of the residual waste. The aim is to reduce the organics share or capture it as biowaste through citizen-centred educational and outreach programmes.
To this end, waste prevention measures, product design including packaging technologies and incentives via fee systems must be considered.

It is the PWMA's responsibility to ensure waste management certainty for the waste streams falling within its responsibility. Moreover, the updated Saxony-Anhalt Waste Management Plan must be considered by the PWMA in the implementation of future tasks. The decisions on the planned waste treatment facilities will be a landmark for the development of Magdeburg's waste management.

Since 2015, the quantities of waste for disposal delivered to the Hängelsberge landfill site have been on the increase. It is to be expected that the landfill will reach terminal capacity before the end of its lifetime in 2023. According to the Waste Management Plan, Saxony-Anhalt has sufficient landfill capacity and new landfill construction will therefore not be required. In its comments to the State Administrative Office, SAB pointed out that an extension of the Hängelsberge land disposal site would be favoured to guarantee waste disposal certainty at close proximity to the City. The need for an extension of the Hängelsberge landfill site is demonstrated by the project sketch.

11.2 Forecasts

11.2.1 Demographic trend

Year	Residents having their principal residence in Magdeburg
2020	241,164
2025	242,376
2030	241,056

Table 23 Demographic trend until 2030
(Source: 6th regionalised demographic forecast 2014 – 2030; Office for Statistics of Saxony-Anhalt)

11.2.2 Economic trend

The wind power industry, an important employer in Magdeburg, is currently going through a rough patch as a result of the cap on annual generating capacity additions under the changed legislation. So far, this has not had any major repercussions on Magdeburg’s labour market. Although a moderate decline in employment is to be expected in this sector, this will prospectively be compensated for by the labour demand of other industries.

In the north of Magdeburg, the City has developed the Magdeburg Rothensee industrial and logistics centre (ILC). Motorway A2 with the Magdeburg-Rothensee junction and Magdeburg's harbour are located in close proximity. With the upcoming establishment of new companies at the Magdeburg Rothensee ILC, further attractive jobs will be available on Magdeburg's labour market, broadening the spectrum of employment opportunities in the region. Companies from the logistics sector have announced investments providing some 200 jobs in Magdeburg and have already purchased land.

In future, increased efforts will be made to facilitate the integration of people with a migrant background into the labour market. After having passed language and integration programmes, trained people with a migrant background are already available so that more companies can draw on this labour market reserve.
Nevertheless, there is still substantial need for action to promote the cultural and occupational integration of these groups into our society. In particular, the City's social infrastructure has no longer been able to absorb the increased demand for kindergarten and school places in the past few months. Here, corrective action will be needed in future. This will take some time since besides investments in construction measures, child care workers and teachers will also be needed.

11.2.3 Trend in waste arisings

Table 24 Projected per capita waste arisings

Waste category	2015 Arisings	2016 Arisings	2017 Arisings	2020 Forecast	2025 Forecast	2030 Forecast
	[kg/c*a]	[kg/c*a]	[kg/c*a]	[kg/c*a]	[kg/c*a]	[kg/c*a]
Biowaste	42.66	41.31	40.95	44	50	54
Green waste	67.15	65.86	69.53	64	64	64
Recyclables (packaging only)	*61.65*	*57.58*	*62.60*	*60*	*62*	*62*
Recyclables (excluding packaging)	*59.07*	*61.24*	*66.28*	*70*	*70*	*68*
Recyclables (total)	120.72	118.82	128.88	130	132	130
WEEE	6.46	6.76	7.07	7	7	7
Small-volume hazardous and other wastes (scrap tyres, end-of-life vehicles)	1.25	1.38	1.28	1.5	1.5	1.5
Municipal solid waste[1)]	249.07	241.47	241.04	234	214	196
of which: Household waste	*198.00*	*193.83*	*192.59*	*183*	*163*	*145*
of which: CWSHW	*20.04*	*19.50*	*18.83*	*20*	*20*	*20*
of which: Bulky waste	*30.17*	*27.15*	*27.70*	*30*	*30*	*30*
of which: Street sweepings[2)]						
Wastes from municipal waste water treatment[2)] *Screenings. grit chamber residues, sludges from municipal waste water treatment*						
Construction & demolition waste[2)]						
Secondary wastes[2)]						
Non-hazardous high-volume waste[2)]						
Other wastes[2)]						
Total arisings	**479.23**	**470.98**	**495.50**	**479.5**	**467.5**	**451.5**

[1)] incl. clinical waste (18 01 04)
[2)] no per capita data available

Table 25 Projected absolute waste arisings

Waste category	2015 Arisings	2016 Arisings	2017 Arisings	2020 Forecast	2025 Forecast	2030 Forecast
	[Mg]	[Mg]	[Mg]	[Mg]	[Mg]	[Mg]
Biowaste	9,932	9,751	9,758	10,611	12,119	13,017
Green waste	15,635	15,547	16,568	15,435	15,512	15,428
Recyclables (packaging only)	*14,353*	*13,590*	*14,915*	*14,470*	*15,027*	*14,946*
Recyclables (excluding packaging)	*13,753*	*14,457*	*15,793*	*16,881*	*16,966*	*16,392*
Recyclables (total)	28,106	28,047	30,708	31,351	31,993	31,338
WEEE	1,504	1,596	1,684	1,688	1,697	1,687
Small-volume hazardous and other wastes (scrap tyres, end-of-life vehicles)	290	325	305	362	364	362
Municipal solid waste[1)]	60,509	59,721	60,094	59,132	54,568	49,947
of which: Household waste	*46,099*	*45,753*	*45,889*	*44,133*	*39,507*	*34,953*
of which: CWSHW	*4,665*	*4,602*	*4,487*	*4,823*	*4,848*	*4,821*
of which: Bulky waste	*7,024*	*6,408*	*6,601*	*7,235*	*7,271*	*7,232*
of which: Street sweepings[2)]	*2,519*	*2,742*	*2,660*	*2,700*	*2,700*	*2,700*
Wastes from municipal waste water treatment[2)] *Screenings. grit chamber residues, sludges from municipal waste water treatment*	13	12	47	50	100	100
Construction & demolition waste[2)]	19,299	21,374	21,891	11,200	29,950	29,950
Secondary wastes[2)]	11,015	10,594	17,380	12,000	26,000	26,000
Non-hazardous high-volume waste[2)]	11,387	10,736	10,207	8,750	32,750	32,750
Other wastes[2)]	1,476	3,488	2,659	2,180	11,200	11,200
Total arisings	**159,166**	**161,191**	**171,301**	**152,597**	**216,253**	**211,779**

[1)] incl. clinical waste (18 01 04)

Table 26 Forecast – Wastes sent to material recovery/recycling

Waste category	Share [%]				2020 Forecast	2025 Forecast	2030 Forecast
	Recycling	Thermal treatment	Landfill		(Mg/a)	(Mg/a)	(Mg/a)
Biowaste	100				10,611	12,119	13,017
Green waste	100				15,435	15,512	15,428
Recyclables (packaging only)	100				*14,470*	*15,027*	*14,946*
Recyclables (excluding packaging)	100				*16,881*	*16,966*	*16,392*
Recyclables (total)	100				31,351	31,993	31,338
WEEE	100				1,688	1,697	1,687
Small-volume hazardous and other wastes (scrap tyres, end-of-life vehicles)	10	90			36	36	36
Municipal solid waste[2)]					9,077	9,109	9,074
of which: Household waste		100					
of which: CWSHW		100					
of which: Bulky waste	90	10			*6,512*	*6,544*	*6,509*
of which: Street sweepings[2)]	95	5			*2,565*	*2,565*	*2,565*
Wastes from municipal waste water treatment *Screenings, grit chamber residues, sludges from municipal waste water treatment)*			100				
Construction & demolition waste[2)]	[1)] 47	13	40		5,264	14,077	14,077
Secondary wastes[2)]		13	87				
Non-hazardous high-volume waste[2)]			100				
Other wastes[2)]		3	97				
Total arisings					**73,462**	**84,543**	**84,657**

[1)] reuse for landfill construction [2)] incl. clinical waste (18 01 04)

Table 27 Forecast – Waste sent to thermal treatment/energy recovery

Waste category	Share [%]				2020 Forecast	2025 Forecast	2030 Forecast
	Recycling	Thermal treatment	Landfill		(Mg/a)	(Mg/a)	(Mg/a)
Biowaste	100						
Green waste	100						
Recyclables (packaging only)	100						
Recyclables (excluding packaging)	100						
Recyclables (total)	100						
WEEE	100						
Small-volume hazardous and other wastes (scrap tyres, end-of-life vehicles)	10	90			326	328	326
Municipal solid waste[2)]					50,056	45,459	40,873
of which: Household waste		100			*44,133*	*39,507*	*34,953*
of which: CWSHW		100			*4,823*	*4,848*	*4,821*
of which: Bulky waste	90	10			*724*	*727*	*723*
of which: Street sweepings[2)]	95	5			*135*	*135*	*135*
Wastes from municipal waste water treatment *Screenings, grit chamber residues, sludges from municipal waste water treatment*			100				
Construction & demolition waste[2)]	[2)] 47	13	40		1,456	3,894	3,894
Secondary wastes[2)]		13	87		1,560	3,380	3,380
Non-hazardous high-volume waste[2)]			100				
Other wastes[2)]		3	97		65	336	336
Total arisings					**53,463**	**53,396**	**48,809**

[1)] reuse for landfill construction [2)] incl. clinical waste (18 01 04)

Table 28 Forecast – Wastes sent to disposal/landfill

Waste category	Share [%]				2020 Forecast	2025 Forecast	2030 Forecast
	Recycling	Thermal treatment	Landfill		(Mg/a)	(Mg/a)	(Mg/a)
Biowaste	100						
Green waste	100						
Recyclables (packaging only)	100						
Recyclables (excluding packaging)	100						
Recyclables (total)	100						
WEEE	100						
Small-volume hazardous and other wastes (scrap tyres, end-of-life vehicles)	10	90					
Municipal solid waste[2)]							
of which: Household waste		100					
of which: CWSHW		100					
of which: Bulky waste	90	10					
of which: Street sweepings[2)]	95	5					
Wastes from municipal waste water treatment *Screenings, grit chamber residues, sludges from municipal waste water treatment*			100		50	100	100
Construction & demolition waste[2)]	[3)] 47	13	40		4,480	11,980	11,980
Secondary wastes[2)]		13	87		10,440	22,620	22,620
Non-hazardous high-volume waste[2)]			100		8,570	32,750	32,750
Other wastes[2)]		3	97		2,115	10,864	10,864
Total arisings					**25,655**	**78,314**	**78,314**

[1)] reuse for landfill construction

12 Assessment of Waste Management Situation

The PWMA's existing waste collection systems are in line with the waste quantities to be managed and the structural conditions. The logistics systems will be aligned with the demands of the waste industry. Private waste management contractors are crucial to the treatment and recycling of the waste streams. These services are contracted out in public tender processes.
For biowaste and green waste recycling, the latest tender results showed a changed, high market price level. The treatment facilities are located at a distance of up to 100 km from the transfer stations. For both economic and environmental reasons, the construction of own facilities must be considered in the future strategy.

To secure waste management certainty, a contract for the treatment and disposal of Magdeburg's residual waste must be awarded by end 2019. The required treatment capacities are available on the private market.
Waste management certainty for other recoverable waste streams is ensured through ongoing public tendering and the involvement of the private sector.

For waste for disposal, an extension of the Hängelsberge landfill site will be necessary to ensure disposal at close proximity to the place of generation. The need for an extension of the Hängelsberge landfill site is demonstrated by the attached project sketch.

13 Actions

13.1 Waste information service, environmental education, public outreach campaigns

As part of its responsibilities, SAB in its capacity as public waste management authority undertakes the obligations under Art. 46 of the KrwG to communicate and advise on waste prevention, recovery and disposal opportunities in its own right.

The Waste Information Service is open to the public at fixed hours and is the main point of contact for face-to-face advice. The current opening hours largely reflect customer needs and will be retained.
Where needed, face-to-face advice is also provided by field visits. Questions dealt with mainly relate to waste segregation, the bin size and also to the bin storage area.

Citizen concerns and queries are also handled on the phone, by email and by post.

Online offerings are updated, optimised and expanded on an ongoing basis, thus answering to the need for modern communication media.

The established information material, such as the Waste Guide, brochures and flyers on all topics of waste prevention, recycling and disposal, are re-edited every year or as needed and distributed in SAB's public areas and the City's Citizens Offices.

The environmental education material for schools and kindergartens comprises a wide array of information material, teaching resources and arts and crafts material.

To acquaint children with the topics of waste prevention, waste separation and an environmentally sound lifestyle, SAB regularly organises theatre performances on environmental topics at primary schools and supports teachers in the preparation and follow-up of the learning content.
For secondary schools, SAB offers close-to-life recycling weeks providing the young people with insights into resource conservation and waste prevention. Guided tours of the City's landfill sites and recycling centres round off the educational programmes for schools.

Presentations held by the Waste Information Service at high-visibility events, e.g. Rathausfest, environment days and similar, allow to reach out to a wider audience. For the integration of citizens with a migrant background, information material will be re-designed using pictograms and providing for different languages.

Other main areas of future activity will be the support of major customers, especially housing companies, intensive communication with and field visits to home composters as well as increasing the participation level in the kerbside waste paper collection scheme.
In the case of large residential complexes, plans are to improve waste separation, in particular the organic and LWP components, but also glass, through ongoing intensive awareness and education activities in close cooperation with the landlords.
Regarding properties having declared home-composting of their biowaste and not using the Bio Bin service, the residual waste analysis once more showed high proportions of biowaste in the residual waste. Aside from intensifying communications, this will also require inspections and possibly also the enforcement of compulsory participation in the Bio Bin collection scheme.

13.2 Prevention and reuse

Avoiding waste in the first place and making unavoidable waste available for recycling is a key theme of the Waste Information Service. SAB will support the development of a waste prevention concept, taking into account the federal waste prevention programme and, at state level, the food waste prevention programme contributed by Saxony-Anhalt.

Measures planned by the PWMA are summarised in the table below and described in greater detail in the subsequent text.

Action	Initiator / PWMA participation
Environmental education	Waste prevention, waste separation and reuse are the thematic priorities of the PWMA's environmental education activities. In the area of environmental education, the Waste Information Service will offer environmental theatre performances and a pedagogical programme for primary schools as well as the resources week for secondary schools on a yearly basis. A pedagogical programme is to be developed. The range of activities will be expanded to include the prevention of food waste. Guided tours of the recycling centres will continue to be offered.
	With the expansion of the Silberberweg recycling centre, a variety of measures will be implemented (e.g. waste educational trail, book exchange corner)
	The information material will be made available via different media.
Preparation and implementation of a waste concept for schools	Waste segregation and waste prevention at schools are to be implemented by means of a waste concept.
Model tests	To promote waste prevention, reduction and recycling and test new methods / systems, the waste management by-law will be amended to provide for model tests.

<u>Prevention of food waste</u>

SAB supports the "Too good for the bin" campaign of the Federal Ministry for Nutrition and Agriculture. Thematic information material will be made available and SAB's website complemented by this topic.

<u>Avoidance of plastic bags</u>

To reduce the use of plastic shopping bags, SAB will distribute cloth bags printed with slogans and pictograms promoting waste prevention and waste separation.

<u>Avoidance of single-use cups</u>

Based on a City Council initiative, it will be checked to what extent the City can support and fund initiatives for the prevention of single-use coffee-to-go cups.
For this purpose, the various existing nation-wide campaigns will be evaluated for practicability and economic feasibility.

As the Federal Government is currently not contemplating a uniform deposit return scheme, it will be more or less left to municipal initiatives to test the feasibility of a project on a regional scale.
The project is to be pioneered by the local trade which could be supported by seed funding from the City. The introduction of a special reusable cup could at the same time serve as a city

marketing measure. In 2018, the PWMA will conduct a survey to explore the local trade's interest to participate in a deposit return scheme or a refill service for thermo-bottles or returnable cups brought along by the customers.

Waste prevention in the area of furniture and household appliances

"Give away instead of Throw-away" is the motto of the free flea market which is hosted by SAB at least twice a year.
This event has been firmly established in Magdeburg for almost 20 years and will be continued in the proven way. As far as allowed by space constraints, additional acceptance hours will be offered to provide an outlet option for people wishing to give away intact furniture or household articles. Moreover, an extension of the opening hours for the issue of articles of daily use will be considered.

In addition, articles can be swapped via cost-free advertisements posted on the www.gratisboerse.magdeburg.de website.

Review / modification of the fee system

In designing the fee system, care must be exercised to provide sufficient incentives for waste prevention and waste separation. In this respect, the fee by-law can have a (limited) steering effect on the behaviour of the service users.

When re-calculating waste fees, the fee system as well must therefore be reviewed and, if required, adapted. SAB envisages a calculation period of two years (current calculation period 2019/2020).

Any intended changes to the fee system require a lead time to enable continuous and reliable planning, allow for any necessary changes in the logistics and accounting systems and plan technology and staff requirements. In 2019/2020, eligible fee systems incentivising waste prevention and waste separation will be examined by the PWMA in cooperation with a consultant. The evaluation of the Waste Balance 2015 showed that Magdeburg's total waste arisings were above the state's average.

As outlined in the Saxony-Anhalt Waste Management Plan, the growing use of electronic identification systems for waste collection in conjunction with a pay-as you-throw fee system can provide incentives to reduce waste arisings and/or improve separate collection of non-avoidable waste. Given Magdeburg's residential structure, it will be difficult for an identification system to identify which bins have been placed out for collection without giving up bin collection from the storage area.

First attempts of housing companies to achieve greater fee fairness through the use of waste chute systems have shown that the residual waste is redirected into the bins not subject to a fee. This frequently results in problems with the collection of the yellow bin.

With the unchanged fee system of 2013, per capita household and bulky waste arisings (including CWSHW) have already fallen from 265.5 kg to 245.2 kg in 2015 and 240 kg in 2017.

13.3 Collection and transport

Vehicle fleet and alternative drive technologies

The waste collection and municipal street cleaning vehicles are for the greater part diesel vehicles that meet current environmental standards and can thus also be deployed in the green zone city region.

In cooperation with the City, SAB will commission a feasibility study to examine the use of alternative drive systems for waste collection and street cleaning vehicles. Options are waste collection vehicles with electric drive but also with hydrogen combustion engines. Tests have already been run with small electric street sweepers for cleaning bicycle lanes and the city centre and electric-drive transport vehicles deployed for container site cleaning. The price of electric waste collection vehicles is three times that of diesel vehicles so that public funds should be made available for their purchase.

Another feasibility study (e-mobility concept) is to examine the most efficient way of supplying the vehicles with electricity, taking into account economic aspects and the technologies currently available on the market. Apart from energy storage in batteries permanently installed in the vehicle, other technologies such as battery exchange stations, LPG / hydrogen and others are conceivable options. The results of the study will be used as a basis to develop a concept showing which vehicle electrification measures produce the maximum effect in terms of greenhouse gas emission savings while keeping costs to a minimum.

Points to be examined by the example of Städtischer Abfallwirtschaftsbetrieb include:

- utilisation analysis of the currently 150 special vehicles for waste collection, street cleaning and transport
- market analysis regarding availability of electric vehicles for these applications
- requirements for the charging infrastructure in consultation with the local utility and vehicle manufacturers
- maintenance concept for the SAB-owned vehicle workshop
- procurement plan for electric vehicles
- cost assessment and impacts on fee development

Tour planning

The DGUV 114-601 Industry Rules for Waste Collection set out the requirements to be observed by collection service providers in tour planning. According to these Rules, reversing of the waste collection vehicles must be avoided or is only allowed after an approval based on a risk analysis. A risk assessment must be conducted for each location where reversing might be required.

The PWMA will revise its tour plan to this effect. In this connection, bin storage areas will be relocated, smaller vehicles deployed at discretion, households be requested to present their bins in the next accessible street or a special distance-dependent fee (transport surcharge) will be levied for collecting the bins.

This is a common procedure and permitted by law.

Insufficient or parked-up turning circles, narrow and parked-up streets are another major problem. Here, the PWMA relies on cooperation with the Public Order Office / Civil Engineering Office. Support with parking offenders and the mounting of no stopping signs in problematic streets will be coordinated at regular intervals.

To support the vehicle drivers, new vehicles will be equipped with the necessary safety technology.

Optimisation of bin management system

SAB will examine to what extent the introduction of a bin identification system is practicable and economically viable for kerbside waste collection (Action Plan, Item 5).
The aim is to optimise the bin management system, i.e. recording bins not presented, optimising collection routes, bin replacement, tour processing support in the case of changes in personnel, recording bin replacement, bin cleaning, bins needing repair, control of "Bio Bin plus" replacement.

All residual waste, biowaste and waste paper bins will be successively fitted with a transponder (electronic chip) and the waste collection vehicles equipped with an on-board computer and the necessary software.
In addition, all waste bins will be provided with a sticker attached to the bin side wall. The identification sticker shows the bin number, type and size. In this way, the bins can be clearly allocated to a location.

The system is designed to record the current status of the presented bins, support the deployment manager in enforcing fee equity and improve tour planning efficiency. Otherwise, there will be no change in the waste collection service for the citizens.

The objective is to facilitate bin management and to augment the service provided to citizens.
The introduction of the system will ensure that only registered bins, i.e. bins that are paid for, will be emptied on the collection day. Unregistered bins for which no fee is paid, misplaced or mixed-up bins, bins reported stolen or not belonging to the collection tour are identified and excluded from emptying. This will increase fee fairness.
Citizens can be provided with proof of services received. The system records why the bin was not emptied, e.g. bin not presented, premises parked-up, or bin defective and requiring replacement. With this information, complaints can be processed timely and more effectively.

A switch of the fee system will have no impact on the further use of the bin identification system.

Evaluation of material stream management - bulky waste logistics

SAB sends more than 90 % of the recyclable bulky waste arisings to the sorting facility operated by GISE GmbH.

Currently, roughly one half of this amount leaves the facility as sorting residue and is sent to the WTE facility for thermal treatment (see Figure 17).

This suggests that certain waste fractions not amenable to material recovery should be separately collected at the time of pick-up in order to avoid unnecessary trips and sorting costs.

For traffic reasons, separate collection is, however, meeting its practical limits as regards the number of vehicles simultaneously deployed at the same pickup address.

For this reason, the overall logistics of the bulky waste pickup service will be reviewed with a view to ensuring cost-effective collection and optimum capture of the different waste fractions.

For the review of the material streams and logistics, the PWMA may be able to resort to students of Otto von Guericke Universität specialising in the respective areas of study.

13.4 Recovery, recycling, disposal

13.4.1 Biowaste

Biowaste collection is the responsibility of the PWMA; recycling services for the 2019/2020 period have been put out to tender.
Biowaste can be routed to material recovery or combined energy and material recovery. Both processes produce compost as the end product.

The compost quality is crucial to its market acceptance. The market expects compost that is free from visible foreign matter.
There are no statutory provisions regulating the input materials including the Bio Bin contents. Manufacturers and facility operators report increasing contaminant levels in biowaste. Plastics and micro-plastics in particular interfere with the treatment processes. Options for mechanical contaminant separation, notably biodegradable plastics, are limited.

There is a correlation between the input and output contaminant level. For compost to meet the limit values specified by the Fertiliser Ordinance, i.e. 0.1 % by weight for film plastics and 0.4 % by weight for other foreign matter, an input-side contaminant level of 3 % constitutes the upper limit. This presupposes 99% contaminant removal efficiency of the treatment process, which can only be achieved at the expense of an increased effort and hence, higher costs.

Some municipalities have already amended their waste by-laws to prohibit the use of kitchen bucket liners and biodegradable plastic bucket liners.
In the next calculation period 2019/2020, SAB will use the initiatives under the i#wirfuerbio campaign to raise citizens' awareness of the implications of foreign materials in the compost and the need for quality separation of biowaste, and to stimulate a rethink towards using a biowaste bucket and paper bags in households.
The aim is to ensure that biowaste is made available to the recycler largely free from contaminants. This requires targeted public awareness programmes, Bio Bin inspections and cooperation with the recycler.

Another aim is to improve the acceptance of the Bio Bin and separate biowaste collection.
For this purpose, SAB will continue to offer the "Bio Bin plus" service. Communications in hot spots have to be intensified and provided on an ongoing basis. Moreover, a biowaste analysis is to be conducted to obtain an indicative value for biowaste arisings per person and week.

For green waste, in particular shrub and tree clippings, it will have to be checked whether separate collection at the recycling centres would be feasible and whether woody fractions can be sent to a biomass-to-energy facility.

13.4.2 Recyclables

No changes are planned for the recyclables collection systems (Item 6.2.2). The provision of an additional recycling bin for plastics and metals has been shelved for economic reasons. Plastics (non-packaging) and metals will continue to be collected via the bulky waste pickup service and can also be delivered to the RecycMobile and the recycling centres.

Regarding recyclables (packaging waste), the requirements of the Packaging Act will have to be implemented by the Dual System operators in coordination with the municipalities.
This will require new, more comprehensive coordination agreements. Priorities include the LWP/glass coordination agreement, the agreement on paper & cardboard sharing and the negotiation of the compensation for sharing the PWMA's waste information service.

The current coordination agreement for Magdeburg expires at the end of 2019. For the revision of the coordination agreement, reference is made to a published Guidance Note and a draft ancillary compensation agreement between the local authority associations and the Dual Systems.
The Dual System operators are concentrating on the preparations for the LWP tenders as some municipalities will be switching from yellow bag to yellow bin collection. In Magdeburg, recyclables will continue to be collected via the yellow bin. The glass collection and recycling contract for the period of 2018 to 2020 has been awarded, with the underground containers continuing to be serviced. The lead negotiator for glass was Grüner Punkt – Duales System Deutschland GmbH.

In 2019, the collection of light-weight sales packaging from 2020 will have to be re-tendered. Pending the appointment of the system operator responsible for negotiating the coordination agreement, the tender leadership will rest with Dual System operator BellandVision who offers to conduct initial talks on the coordination agreement.
Accordingly, negotiations on paper & cardboard sharing in particular will not be on the agenda. Paper & cardboard sharing will have to be included in the new coordination agreement by the end of 2019 so as to obviate the need for individual paper & cardboard service agreements with each system operator. Here, it is important to negotiate standard terms for paper & cardboard sharing / the paper system description, e.g. collection costs, agreement of joint recycling or SAB's entitlement to a share of the collected paper & cardboard.
In these negotiations, the packaging share of the paper & cardboard stream and how it will be quantified (on a volume or a mass basis) will be key points of contention. SAB will use the mass share as determined in the 2016 paper & cardboard sorting analysis as a basis and a market price-based value compensation for the cost structure.
The ancillary cost agreement on the Dual Systems' proportional contribution to the costs of waste information and education activities and container site cleaning must likewise be renegotiated.

13.4.3 Waste electrical and electronic equipment (WEEE)

The implementation of the changes introduced with the ElektroG means an increased administrative effort and the reorganisation of the acceptance facilities due to changed category allocations, also as a function of WEEE size.
The employees of the recycling centres, waste information service and bulky waste service must receive a corresponding training and the collection processes be aligned with the changed situation.
The changes must be posted at the recycling centres and customers be advised accordingly.

As of 15 August 2018, furniture or clothes with electrical functions, so-called open-scope electrical equipment, will also classify as electrical equipment and the PWMA must ensure the take-back of this type of WEEE from this date.

The new WEEE categories apply from 01 December 2018 and will be automatically taken over by EAR (source: EAR circular to PWMAs of January 2018).

Previous category until 30/11/2018	New category from 01/12/2018
Category 2 Refrigerators and freezers, oil-filled radiators	**Category 1** Heat exchangers
Category 3 Screens, monitors, TV-sets	**Category 2** Screens, monitors and devices containing screens with a surface area of more than 100 square centimetres
Category 4 Lamps	**Category 3** Lamps
Category 1 Large household appliances	**Category 4** Large appliances
Category 5 Small household appliances: IT and telecommunications equipment, electronic home entertainment equipment, lamps and other lighting fixtures as well as light diffusers and controls, electrical and electronic tools, toys, sports and leisure time equipment, medical products, monitoring and control instruments	**Category 5** Small equipment and small IT and telecommunications devices
Category 6 Photovoltaic modules	**Category 6** Photovoltaic modules

The collection systems including the RecycMobile will be retained.
The installation of e-scrap recycling banks is not envisaged.

13.4.4 Municipal solid waste

The household and bulky waste collection systems have proved to be effective and will not be changed in the medium term. New decisions on these services will have to be made after the material stream management / bulky waste logistics review and modification of the fee system, if applicable.

Tour planning must be adapted to meet occupational health and safety requirements and account for the changed collection quantities.

To support tour planning/bin administration, IT-supported techniques will have to be evaluated and introduced.

Depending on the outcome of the public tender process for residual waste treatment from mid-2020, logistics may have to be re-aligned.

13.5 Facilities

13.5.1 Anaerobic digestion (AD) facility

The Waste Management Concept 2013–2017 presented for the first time a comparative evaluation of biowaste anaerobic digestion versus composting. The study came to the conclusion that the 2011/2012 market prices for composting available from public tenders were well below the specific costs of anaerobic treatment as determined by the economic assessment. In view of the high treatment costs, the construction of an AD facility for the exclusive treatment of Magdeburg's biogenic waste was not further pursued.

By resolution no. 1361-49(V)12 the City Council in its meeting held on 31/05/2012 directed the city administration to evaluate technology supplier experience and take up negotiations with potential suppliers for the construction of a biogas plant for energy and material recovery from biowaste and residual materials in Magdeburg/Rothensee in terms of a supra-regional collaboration and the improvement of the regional economic structure.
As part of this resolution, potential sites, located inter alia in the Rothensee commercial area and at the Hängelsberge landfill site, were to be evaluated. In the Rothensee commercial area, no suitable site was identified. The Hängelsberge landfill site was found to be suited in principle.

In recent years, talks about a potential cooperation were held with the neighbouring districts. As the negotiations on pooling biowaste volumes from neighbouring rural districts failed, this approach is not being further pursued.

Technology and economic trends in biowaste recycling were pursued and the feasibility of a biowaste AD project in the City of Magdeburg investigated in greater detail.

To underpin the feasibility study on the construction of an AD facility at the Hängelsberge site, anaerobic digestion trials were performed on local biowaste and green waste in 2014/15. All in all, these tests confirmed that the biowaste and green waste composition is suitable for the (dry) anaerobic digestion process. The energy content of the biogas can be used for electricity generation and feed-in to the public electricity grid.
The results of the updated feasibility study differ slightly from those of the more theoretical study performed in 2014.
Apart from the results of the anaerobic digestion trials, the updated feasibility study and economic assessment 2017 also considered possible changes in legislation.

In June 2017, the Lord Mayor was directed by resolution of the City Council (Resolution No. 1513-043(VI)17) to include a biowaste AD facility into the Waste Management Concept and organise the associated planning activities. An economic feasibility study identified the Hängelsberge landfill site as a suitable location offering cost and operational advantages over the other sites. Details of this study are described in Memo 10086/17.

The Saxony-Anhalt Waste Management Plan includes a list of composting and AD facilities that are supposed to offer sufficient capacities to handle the quantities of biowaste generated. However, only very few of these AD facilities are permitted for processing biowaste (Bio Bin contents).
Given the long distances to the treatment facilities and their lack of funding and/or economic benefits deriving from the use of existing infrastructure, e.g. gas collection systems (landfill gas), the Hängelsberge location offers both economic and ecological advantages.

The reasons speaking in favour of the construction of an AD facility by SAB at the Hängelsberge site are described in greater detail below.

Access to biowaste from the Bio Bin and green waste

SAB has been running a full-coverage separate biowaste collection scheme (Bio Bin) in Magdeburg for at least 20 years. For many years, collection rates have totalled approx. 10,000 Mg per year, with a slight downward trend.

Via its waste information service, public outreach programmes and the design of the fee by-law, SAB is in a position to influence the biowaste quality and quantity.

The quantity forecast for biowaste is presented in the following table.

	2017 Population 238,275 *		**2020** Population 241,164 **		**2025** Population 242,376 **		**2030** Population 241,056 **	
	kg/c·a	Mg/a	kg/c·a	Mg/a	kg/c·a	Mg/a	kg/c·a	Mg/a
	Actual	Actual						
Biowaste	40.95	9,758	44	10,611	50	12,119	54	13,017
Green waste	69.53	16,568	64	15,435	64	15,512	64	15,428
Sum total	**110.48**	**26,326**	**108**	**26,045**	**114**	**27,631**	**118**	**28,445**

*Population as at 30/06/2017, Office for Statistics of Saxony-Anhalt
**Demographic forecast of the Office for Statistics of Saxony-Anhalt

The bulking agents needed for the anaerobic digestion process can be derived from the green waste collected at the recycling centres. The latter can also be used to make up for seasonal fluctuations in the biowaste quantities delivered. The green waste share should, however, be restricted to 30 % of the total input. The suitability of the biowaste generated for anaerobic treatment has been demonstrated by anaerobic digestion trials. Based on the projected biowaste levels, a treatment capacity of 15,000 Mg/a will be needed.

Land plot for the construction of an AD facility

With its Hängelsberge location, SAB has a suitable site for the construction of an AD facility.
Due to its existing infrastructure and synergies, the Hängelsberge site offers economic advantages over other sites. The gas collection and utilisation systems, the technical infrastructure and receiving area including weigh-bridge can also be used for the AD facility.
Another advantage is the use of the biogas for landfill gas reforming, thus prolonging the period of landfill gas utilisation for energy recovery.
Other factors speaking in favour of the Hängelsberge site are the location of the AD facility between the closed landfill unit and the landfill extension and its distance from the nearest residential area. The traffic connection will be via the Ottersleben bypass so that there will be no adverse effects on the nearby residential area.

SAB will initiate the necessary measures for the engineering, permitting and construction of an AD facility at the Hängelsberge site (Action Plan, Item 3.1.9) once the permit for the extension of the Hängelsberge landfill has been granted. As the existing planning application determination covers the complete operating area at the Hängelsberge site, a modification of the planning approval decision for the Hängelsberge site and the omission of the affected areas has to be applied for. The area earmarked for the construction of the AD facility (so far ecological compensation area, landscape planning) will be re-assessed in the planning approval procedure for the landfill extension.
A plot plan of the biowaste anaerobic digestion facility is attached as Annex 20.3.

Ecological advantages

Combined energy and material recovery from biowaste in an AD facility at the Hängelsberge site offers several ecological benefits. The biogas produced by the process can be used to generate electricity and heat and to support landfill gas utilisation at the Hängelsberge landfill site. Part of the recovered heat can be returned to the anaerobic treatment process.
As the facility will be located in the city region of Magdeburg, biowaste haulage to composting facilities located further away can be avoided. The current biowaste transfer stations are located in the vicinity of the Hängelsberge landfill site so that there will be no increased vehicular traffic, nor will tour routes have to be changed.

The compost obtained as a by-product of the anaerobic digestion process can be used in agriculture or horticulture, thus reducing fertiliser or peat use, for example. Distribution of the compost to the citizens would also be an option and contribute to resource conservation.

The engineering services will be put out to tender in a public procurement process. Regional engineering contractors can participate in the tender process and contribute their technical knowhow. The design parameters of the facility will be verified as part of the engineering process. The selection of a suitable process technology and the adaptation of the plant equipment to the site-specific conditions and biowaste quality are part of the engineering process.
To find an optimum solution for anaerobic biowaste treatment, different process variants have been examined. The preferred option is a single-stage dry anaerobic digestion process using several box digesters which are intermittently fed by a swap container system. The process is operated in the thermophilic temperature range. The choice of the process technology is governed by the type of raw substrates from the biogenic Bio Bin waste and the green waste shares (shrub cuttings, grass clippings, leaves etc.).
The process flow diagram is shown in Annex 20.4.

Anaerobic digestion is a forward-looking biowaste treatment technology. Energy and material recovery from separately collected biowaste in an AD facility with downstream composting stage meets the criteria for a modern and future-oriented waste and resource management strategy.
The capital costs for the engineering and construction of an AD facility at the Hängelsberge site are estimated to be EUR 8.23 million (gross). The funds for the implementation of the measure will be considered in SAB's medium-term investment plan.

13.5.2 Further operation of Hängelsberge landfill site

Approval for the further operation of the active landfill section until 31 December 2023 was granted by the planning application determination of 26 October 2009. At the same time, the timely unlimited operation of the other areas of the Hängelsberge landfill site including the recycling centre was permitted.

In view of the increased waste quantities delivered, the alternative of extending the term of the operating permit as still considered in the Waste Management Concept 2013–2017 cannot be further pursued. As at 01/07/2017, the Hängelsberge landfill site has a remaining void capacity of some 100,000 m^3.
The current intake rate is approx. 20,000 m³ per year. Over 60 % of this input originates from Landeshauptstadt Magdeburg.

Following the federal cabinet resolution of May 2017 on the Secondary Building Materials and Soil Protection Umbrella Ordinance – of which the Secondary Building Materials Ordinance is a central component – the more stringent limit values for recycled building materials are expected to lead to increasing mineral waste quantities being disposed of to landfill. This is underpinned by projections of the local private sector.

Given this trend, the remaining void capacity of the Hängelsberge landfill is expected to be exhausted before the end of the permit term.

Wastes for land disposal falling under the control of the PWMA, e.g. waste from construction measures, the clearing of industrial waste land, asbestos and man-made mineral fibres, industrial waste and non-hazardous high-volume waste streams- will continue to be generated in City of Magdeburg in the future.

In view of the existing demand for land disposal of Class II wastes, plans are to construct a Class II land disposal facility to ensure medium-term disposal certainty (until 2030) for non-recyclable waste from Landeshauptstadt Magdeburg. The newly constructed landfill capacities could also accept waste from the Magdeburg region and waste assigned by the State Administrative Office of Saxony-Anhalt.

Due to the existing infrastructure and non-built-up areas south of the existing Hängelsberge landfill site, an extension of this site would be possible. The further use of the existing site would also make a contribution to resource conservation.

Another factor speaking in favour of the Hängelsberge landfill site is its location in Saxony-Anhalt. In Saxony-Anhalt, the following Class II landfill sites are currently still in operation.

Landfill	Remaining void capacity (31/12/2014 to 06/02/2015) (m^3)	Jurisdiction	Distance from Hängelsberge to other sites (km)
Lindenberg	78,800	Salzwedel	62
Roitzsch	2,800,000	Anhalt-Bitterfeld	95
Hängelsberge	147,000	Magdeburg	0
Nißma	221,100	Burgenlandkreis	165

(Data partly sourced from the Draft Waste Management Plan for Saxony-Anhalt)

As can be seen from Figure 23 sourced from the Saxony-Anhalt Waste Management Plan, the Hängelsberge land disposal facility is considered to be sufficient to meet the Class II landfill demand in central Saxony-Anhalt. A decision against an extension of the Hängelsberge landfill site would have economic implications for the Magdeburg region and also environmental impacts due to the long transport distances.

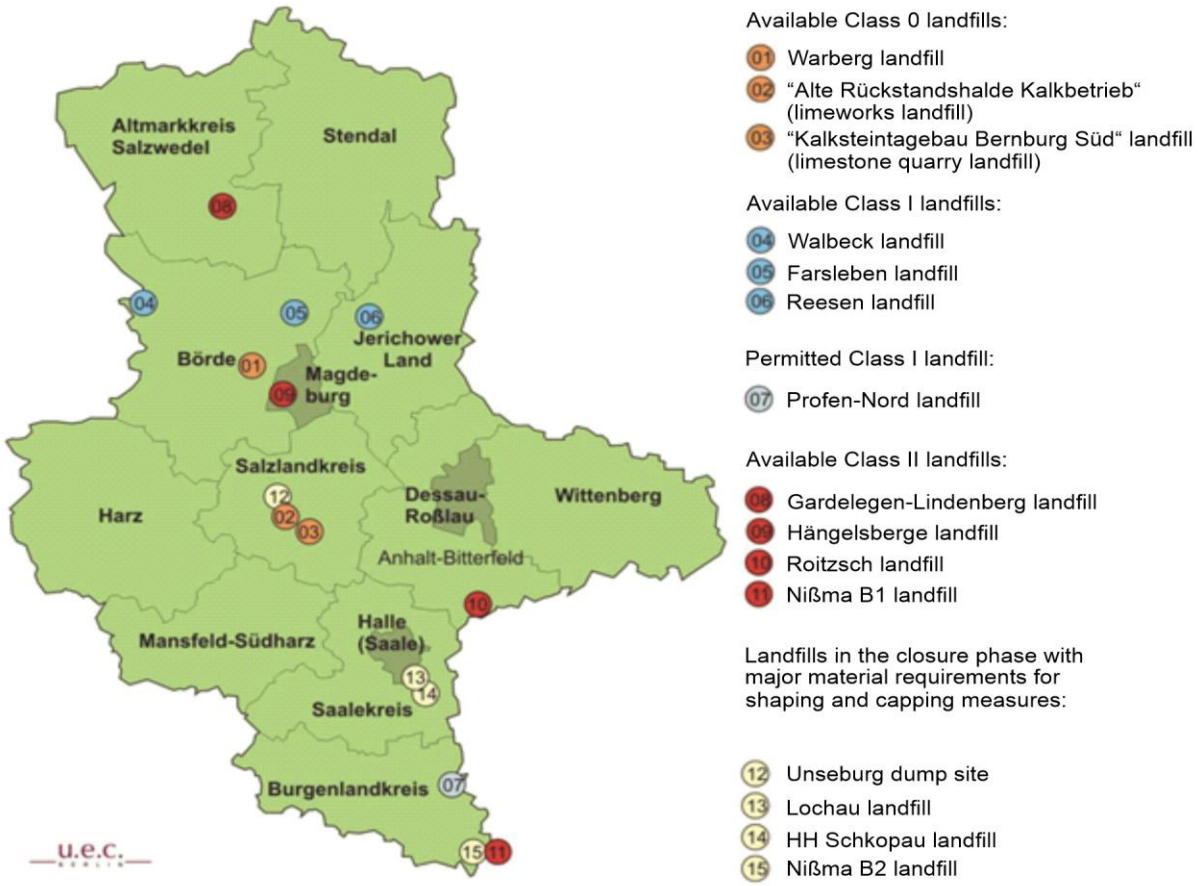

Figure 23 Landfill demand in Saxony-Anhalt

The Saxony-Anhalt Waste Management Plan does not show any demand for landfill capacity until 2025 nor does it designate any locations. On the other hand, it does not expressly exclude an addition of landfill capacities. Accordingly, the demand for a concrete project must be demonstrated in the planning justification report. SAB participated in the consultation process for the Saxony-Anhalt Waste Management Plan and pointed out the need for an extension of the Class II landfill capacity at the Hängelsberge site.

With the extension of the Hängelsberge landfill, Landeshauptstadt Magdeburg will meet the requirements of the AbfG LSA

- Art. 1 (1) No..5 – to dispose of non-recyclable waste or waste requiring no further treatment in a manner that is commensurate with the public good
- Art. 1 (1) No. 6 – to dispose of non-recyclable waste in suitable facilities located as close as possible to its place of origin.

In line with the Circular Economy Act, permit applications for new landfills or landfill sections are normally evaluated in a planning approval procedure with public consultation.

The extension of the landfill areas requires a new planning approval procedure as per Art. 35 of the Circular Economy Act.

According to the Saxony-Anhalt Waste Management Plan, the planning justification report must consider the following criteria in particular:
- priority of recovery/recycling measures over disposal
- waste disposal near the place of generation where possible and balanced spatial distribution according to the self-sufficiency and proximity principles
- further use of existing landfill sites as a contribution to resource conservation (economical land use, use of existing infrastructure)

In August 2017, SAB commissioned ICL GmbH with the preparation of the project sketch for the extension of the Class II landfill at the Hängelsberge location. The final version was submitted end of May 2018.

The preferred option is a landfill cell with an additional capacity of 600,000 m^3 directly adjoining the existing landfill extension (Annex **Fehler! Verweisquelle konnte nicht gefunden werden.**). Based on the estimated waste volumes going to landfill, this capacity will be sufficient for the period until 2030 (Annex 20.6, Waste Forecast).This estimate is based on the assumption that the allowed waste types stated in the landfill positive list will continue to be accepted for disposal and the acceptance of road construction waste be additionally applied for.

To cover further planning beyond 2031, additional adjoining areas will be included as landfill areas in the planning approval process.

The project sketch was submitted to the State Administrative Office for inspection and coordination of the necessary application documents.
The State Administrative Office in its capacity as permitting authority explained the legal procedure and provided information on the necessary documents to be submitted with the application. In order to be able to file the application documents and fix a date for the scoping meeting, the landfill extension project must first be included in the Waste Management Concept and adopted. The requirements for the contents of the environmental impact assessment report must be coordinated in the scoping meeting.

In a next step, SAB will commission an engineering contractor with legal and technical support for the Europe-wide tender process for engineering services for the landfill extension project. This requires a service provider commanding specialist experience in the engineering and permitting of landfills as well as expertise in legal aspects of waste management, landfilling and tender processes.
Moreover, a business consultant has been commissioned with the calculation of the reserves to be set up for the new landfill cell so as to be able to make a statement on the fee trend.

The engineering and permitting phase is expected to take 2.5 years. Thus, the implementation phase of the landfill extension project could start from 2021. This means that disposal reliability for Landfill Class II non-recyclable waste can be ensured from 2022/2023.
Should the landfill extension project be rejected or not be timely completed, the commercial waste streams and waste streams from private households will have to be sent to other treatment facilities. The services for waste streams from private households will have to be put out to tender.
As in other municipalities that cannot draw on own landfill sites, the exclusion of commercial wastes will have to be regulated by by-law and approved by the State Administrative Office.

13.5.3 After-care of the closed landfill unit at the Hängelsberge site

The final closure of the old Hängelsberge landfill unit was confirmed by notice of 25/08/2015 and the site transferred to the after-care phase.
The costs of the hazard assessment and the preparation of an explanatory report amounted to EUR 13,000 (gross).

Routine activities carried out during the now ensuing after-care phase of the old Hängelsberge landfill unit include extensive monitoring programmes such as landfill gas monitoring, surface runoff, groundwater and leachate analyses as well as settlement measurements.

13.5.4 After-care of the Cracauer Anger landfill site

Since May 2009, the Cracauer Anger landfill site has been in the after-care phase.

In 2009, the City of Magdeburg assigned the property to the special assets of Städtischer Abfallwirtschaftsbetrieb.

After-care activities mainly comprise the continuation of the monitoring programmes including groundwater monitoring, settlement measurements, recording of meteorological data, landfill gas collection and disposal including monitoring as well as the necessary general checks and field inspections. For Class II landfills, the current legislation prescribes a minimum after-care period of 30 years after completion of the closure phase.

Because of its poor quality, the extracted landfill gas can no longer be used for heat generation in a steam boiler. Currently, the generated landfill gas is therefore disposed of via a lean gas flare with integrated heat recovery system. The recovered heat is fed into SWM GmbH's local heating network where it is also used to heat the leisure pool. Additional engineering measures were carried out in 2017 to increase the efficiency of heat recovery.

13.5.5 After-use of the landfill sites

A photovoltaic system designed to generate some 8.5 MWp of electricity was installed at the closed Cracauer Anger landfill site in the second half of 2011 and took up operation in December 2011. Städtischer Abfallwirtschaftsbetrieb is entitled to a share of the feed-in tariff in return for making available the area.

As the surface cover system installed at the closed Hängelsberge landfill unit does not meet the Uniform National Quality Standards 7-4a "Technical Function Layers – Photovoltaic Plants at Landfill Sites" published in 2015 by LAGA Ad-hoc-AG "Landfill Technology", the installation of a photovoltaic plant could not be further pursued as an after-use concept. Regarding the future recultivation of the Hängelsberge landfill extension section, potential after-uses must therefore be evaluated beforehand and the surface cover system be designed to meet the new standards.

The use of the landfill sites for energy generation from landfill gas also makes a contribution to the "Magdeburg - Model City for Renewable Energy Sources" concept and is currently practised at all landfill sites operated by the City of Magdeburg.

13.5.6 Construction of a waste transfer building

Because of the limited market for transfer stations and interim storage facilities in Magdeburg, SAB will check the economic viability of a waste transfer building on the premises of the Hängelsberge landfill site.

This transfer station or building would be used for interim storage in the case of operating upsets in other treatment facilities, for the inspection of material streams and sorting activities, if required.

SAB regularly contracts out the recycling of some 12,500 Mg/a of waste paper to third parties. As the recycling plants are located at some distance from Magdeburg, direct delivery to the recycler by the collection vehicles is uneconomical. In this case, the waste is delivered to a transfer station in the City of Magdeburg which is operated by the recycler. There the waste paper is bulked into larger loads and stored for haul-off by the system operators. Because of the

maximum allowable moisture content of 10%, the delivered waste paper must be protected from rain and weathering influences in a closed building or a roofed-over structure provided with side-walls. This task could be undertaken under the management of SAB.

Judging from the results of material stream analyses, it would also be possible to sort out the high-calorific green waste fraction and route it to energy recovery.

13.5.7 Recycling centres

Expansion of Silberbergweg recycling centre

To improve the waste acceptance conditions at Magdeburg's recycling centres, the Silberbergweg recycling centre will be upgraded and expanded in the coming years. The transfer of the land plot adjoining the existing Silberbergweg recycling centre by the City of Magdeburg has created the prerequisites for the expansion of the recycling centre and the construction of a new facility to cope with the increasing recyclables quantities delivered and the sorting requirements. Another prerequisite is the extension of the hereditary leasehold contract for the land used. Besides improving the working conditions for the employees, the aim is to offer the citizens a user-friendly recycling centre with improved acceptance conditions that take account of the demographic change.

With the transfer of the plot adjoining the existing Silberbergweg recycling centre by the City of Magdeburg in 2016, the area available to the recycling centre is more than doubled.

The basic design concept for the recycling centre provides for a user-friendly arrangement of the individual waste containers isolated from the site truck traffic.
Via a ramp, customers access a parking by-pass located at a higher level from where they can conveniently serve the containers for the different waste fractions without having to climb stairs. The engineering services comprise the new construction of an entrance area with weighbridge and a barrier system, an office and social building with customer check-in and inspection points, a roofed-over structure for the technical equipment and a hazardous waste collection point.

Consistent with the Circular Economy Act, the use of recycled materials and sustainable construction concepts will be taken into account in project planning.

To avoid closure during the construction period, the recycling centre on the new plot will be built in a first step. In a next step, the existing recycling centre will be upgraded. The basic and permit engineering were carried out and the permit application under the Federal Air Pollution Control Act filed in 2018.The permit under the Federal Air Pollution Control Act includes the building permit.
Once the building permit has been granted, plans are to complete the detail engineering, tender process and award of the construction services by mid-2019.
The Phase 1 construction work will be completed by the 3rd quarter of 2020, the connection and upgrade measures at the existing recycling centre are scheduled for 2021.
The capital costs for the extension and upgrade of the Silberbergweg recycling centre are estimated at EUR 3,236,000.00.

13.6 Certification

The certified units of SAB are audited once per year by an independent authorised auditor for continued conformance with the requirements of the Ordinance on Specialist Waste Management Companies”. Plans are to obtain certification of other areas of the "WMF Operation" unit.

Activities of relevance to certification in this business unit include the operation of the recycling centres including hazardous waste acceptance point, the Hängelsberge landfill site and transfer station and the mobile hazardous waste and recyclables collection services.
This involves diverse waste management tasks, such as collection, transport, storage, treatment, recover and final disposal, for a wide variety of waste types.

13.7 Action Plan

Consec. No.	Action	Timeline	Costs (EUR)
1	**Waste information service and public education**		
1.1	Waste guide for all households	once per year	**40,000**
1.2	Information material	ongoing	**15,000**
1.3	Action days/environmental theatre performances	3 times per year	**15,000**
2	**Prevention and reuse**		
2.1	Free flea market	twice per year minimum	
2.2	Online giveaway exchange	ongoing	**2,000**
2.3	Waste prevention/reuse material e.g. bags, recyclables bag	as required	**27,000**
2.4	Review / modification of fee system for fee calculation	biannually	
	Review of fee system alignment by a consultant	2019/2020	**30,000**
3.	**Recycling**		
3.1.1	Expansion of recyclables collection scheme as per statutory requirements - Expansion of metals and plastics collection at the recycling centres and depots - Mobile collection via the "RecycMobile"	continuous	
3.1.2	Revision/recast of the coordination agreement with the system operators for sales packaging collection/recycling as per Packaging Ordinance	2018/2019	
3.1.3	Expansion of separate organic waste collection - Increasing the participation level for the Bio Bin system - Inspection of home composting activities - Reduction of organics fraction in the residual waste	ongoing	**30,000**
	- Improving the biowaste quality; no plastics in the Bio Bin; #wirfuerbio campaign	2018-2020	**10,000**
3.1.4	Improving waste segregation in large residential complexes	ongoing	
3.1.5	Residual waste analysis	2022	80,000

Consec. No.	Measure	Timeline	Costs (EUR)
3.1.6	Increasing the capture rate for small WEEE items - Expansion of collection point network - Mobile collection via "RecycMobile"	ongoing	
3.1.7	Biowaste analysis	2019-2020	**70,000**
3.1.8	Expansion of Silberbergweg recycling centre	2018-2021	**3.236 million**
3.1.9	Construction of a biowaste AD facility 2021 2022 2023 2024		**8.23 million** **20,000** **130,000** **150,000** **7,930,000**
3.2.	Review/alignment of material streams/bulky waste pickup logistics and green waste collection		
4	**Disposal**		
4.1	Tendering residual waste treatment from 2020	2018/2019	**50,000**
4.2	Construction of a waste transfer building at the Hängelsberge landfill site (engineering, permitting, construction)	2020-2021	**250,000**
4.3	Preliminary planning activities for the extension of the Hängelsberge landfill areas Phase1, Class II C&D waste	2019-2021 2021-2022	**390,000** **2,200,000**
5.	**Logistics / tour planning**		
	Introduction of a bin management system	2019-2021	**250,000**
	Electric mobility concept for transport vehicles	2019/2020	**50,000**
6	**Landfill after-care**		
6.1	Lawn mowing, monitoring program, gas recovery and disposal	ongoing	
	- Cracauer Anger landfill - Closed Hängelsberge landfill unit		**280,000** **260,000**
7	**Certification as specialist waste management company**		
7.1	Annual recertification	from 2018	**20,000 per year**

14 Assessment of Waste Management Certainty

Currently, the waste management capacities are expected to be arithmetically sufficient to accommodate municipal solid waste arisings until 2025 as outlined in the Saxony-Anhalt Waste Management Plan.
Planning for necessary future facilities including landfill capacities requires a longer time horizon and the consideration of potential changes in legislation.
The present Waste Management Concept looks at the period until 2030.

Certainty of household waste management is secured until end of May 2020 through the contract with MHKW Rothensee GmbH. The tender process for residual waste treatment is in the award phase and scheduled to be completed by June 2019. Treatment capacities are available in private-sector facilities. Depending on the treatment location, logistics may have to be realigned.

For wastes going to landfill, disposal is theoretically ensured through the permit for the further operation of the Hängelsberge land disposal site (Class II landfill) until 2023. However, the landfill capacity will already be exhausted by end 2022. The acceptance of waste from outside the city region of Magdeburg will be further restricted from 2018 in order to extend the landfill lifetime. Should the landfill extension project included in the Waste Management Concept not be permitted, certainty of local disposal will no longer be given and land disposal of non-recyclable wastes must be contracted out to other facilities in a public tender process.
Similar to other municipalities having no landfill sites of their own, new management routes for wastes falling within the responsibility of the PWMA will have to be routinely evaluated, applying the waste hierarchy defined in the Circular Economy Act. Waste transfer, if necessary, can be carried out at SAB's facilities.

The recovery of municipal solid waste is secured through contracts with different validity terms and follow-up tenders.

It cannot be ruled out that once the Umbrella Ordinance enters into force, mineral waste, which currently can still be recycled, will have to be routed to landfill.
To prepare for such a development, public tenders for civil engineering projects should require the use of recycled materials, taking into account statutory requirements. Here, public contracting authorities are called upon to play a pioneering role. In this connection, reference is made to the Guiding Notes on Mineral Waste Reuse and Recovery in Saxony-Anhalt which set out rules for the preparation and use of mineral wastes in terms of quality-controlled recycled building materials in building structures and for the selective dismantling of buildings to recover building materials for further use, for example.

Law-conformant and environmentally sound recovery and environmentally compatible disposal of the remaining waste streams are secured by private-sector facilities. New trends likely to lead to new management routes for tarry wastes (roofing felts) can currently be observed on the private market.
These services will be re-tendered in due time before expiry of the existing contracts.

15 Outlook

The EU waste legislation package for more recycling and less land disposal must be transposed into national law by 2020. Key action points identified by the Federal Ministry for Environmental Affairs are to increase and re-calculate recycling rates for municipal solid waste and packaging waste, to further reduce waste volumes sent to landfill and to tighten and expand the separate collection duties in particular for biowaste and from 2025 for household hazardous waste and textile waste. There will be new requirements for product stewardship and take-back systems. Another focus will be on strengthening waste prevention, inter alia, food waste.
The calculation method for the recycling rate will be changed from an input-based to an output-based method. This means that the separately collected quantities will not be directly counted as recycling material. This will lead to lower recycling rates as non-recyclable materials separated in the recycling process will have to be deducted in future.
Reaching the new recycling target of not less than 65 % of the total packaging waste arisings (glass, paper & cardboard, plastics, wood, aluminium and steel) will be a challenge with the new calculation method.

Magdeburg's citizens have accepted the available systems for separate recyclables collection. To keep it that way, public outreach and education will be an ongoing task and have to be further developed.
A circular economy not only relies on good waste management practices, but also on manufacturers and producers that face up to the end of the product life cycle and improve the recyclability of their products and packaging.

Recycling is important, but waste prevention has first priority. In future, information on waste prevention measures will therefore have to play a greater role in the public outreach and awareness programmes.

Separate collection of biowaste has already been implemented, but must be improved in terms of both quality and quantity.
For biowaste treatment, combined energy and material recovery will gain growing importance from both economic and ecological aspects.
Combined energy and material recovery from separately collected biowaste in an AD facility with downstream post-composting stage satisfies the criteria for an advanced and forward-looking waste and resource management strategy.

The 10 % landfill target related to the total amount of municipal waste generated must be achieved by 2035. Accordingly, the landfill extension project has been planned on the basis of a quantity forecast until 2030.

The construction of the waste treatment facilities will mark a move of the Hängelsberge landfill site towards a waste management centre.
To be able to ensure waste management certainty over the planning horizon until 2030, market trends, legislative trends and decisions will have to be analysed and implemented on an ongoing basis.

City cleanliness is becoming an ever greater concern of municipal waste management enterprises. Litter cleanup and management require additional staff deployment and municipal funding. Public outreach and awareness programs will have to be expanded to address this topic.

For the future development of the waste management and street cleaning services, it is important to know the citizens’ standpoints in order to be able to better shape the services and sharpen the focus of the public awareness and outreach programs. The City's citizens panel could be used as a platform for public opinion polls on specific topics.

16 Abbreviations and Units

AbfG LSA	Waste Management Act of Saxony Anhalt
AD	Anaerobic Digestion
ALB	Asian long-horned beetle
AVV	Waste Catalogue Ordinance
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
C&D	Construction and demolition waste
CHP plant	Combined Heat and Power plant
CIC	Chamber of Industry and Commerce
CWSHW	Commercial waste similar to household waste
DSD GmbH	Der Grüne Punkt - Duales System Deutschland GmbH
EAR	Stiftung Elektro-Altgeräte Register (entity registering e-equipment manufacturers, coordinating the provision of collection containers and WEEE collection at the PWMAs' collection sites)
ElektroG	Electrical and Electronic Equipment Act
EWC	European Waste Code
GISE mbH	Gesellschaft für Innovation, Sanierung und Entsorgung mbH
GRS	Stiftung Gemeinsames Rücknahmesystem Batterien (entity organizing the take-back and recycling/disposal of used batteries)
ha	hectare
kg/a	kilograms per year
kg/c·a	kilograms per capita per year
KrW-/AbfG	Circular Economy Act
LAGA	Interstate waste working group
LWP	Light-weight packaging
m^3	cubic metres
Mg	megagrams
MWp	megawatt peak (peak generating capacity)
NStNVP	Non-packaging of similar material
PCC	Paper, cardboard, carton
PDR	Produkte durch Recycling (Products from Recyclables)
PWMA	Public Waste Management Authority
SAB	Municipal Waste Management Enterprise of Landeshauptstadt Magdeburg

StNVP	Non-packaging made of similar materials
t/a	tons per year
WFD	Waste Framework Directive
WTE	Waste-to-Energy facility, here a combined heat and power plant
WTF	Waste Treatment Facility

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19 References

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Project sketch – Landfill Extension; ICL GmbH, August 2017

Circular to public waste management authorities; Stiftung Elektro-Altgeräte Register, January 2018

Demographic forecast of the Office for Statistics of Saxony-Anhalt

Office for Statistics of Saxony-Anhalt

Statistical Yearbook 2017, Landeshauptstadt Magdeburg, Office for Statistics.

20 Attachments

20.1 Legal Basis of Waste Management.

Status: 10/2018

20.1.1 European legislation (selection)

Directive 2008/98/EC of the European Parliament and the European Council of 19 November 2008 on Waste (Waste Framework Directive - WFD), (Official Journal of the European Union L 312/3 of 22/11/2008).

20.1.2 Federal legislation

1. Gesetz zur Förderung der Kreislaufwirtschaft und Sicherung der umweltverträglichen Bewirtschaftung von Abfällen (Kreislaufwirtschaftsgesetz – **KrWG**) vom 24. Februar 2012 (BGBl. I S. 212), zuletzt geändert durch Artikel 4 des Gesetzes vom 4. August 2016 (BGBl. I S. 569)

   Act on the promotion of a recycling economy and environmentally compatible waste management (Circular Economy Act – KrWG) of 24 February 2012 (Federal Law Gazette I p. 212) as last amended by Article 4 of the Act of 4 August 2016 (Federal Law Gazette I p. 569)

2. Gesetz über die Umweltverträglichkeitsprüfung **(UVPG**) in der Fassung der Bekanntmachung vom 24. Februar 2010 (BGBl. I S. 94), zuletzt geändert durch Artikel 2 des Gesetzes vom 30. November 2016 (BGBl. I S. 2749)

   Hinweis: Änderung durch Art. 2 G v. 30.11.2016 I 2749 (Nr. 57) textlich. nachgewiesen, dokumentarisch noch nicht abschließend bearbeitet

   Act on the Assessment of Environmental Impacts (UVPG) in the version published on 24 February 2010 (Federal Law Gazette I p. 94) as last amended by Article 10 of the Act of 30 November 2016 (Federal Law Gazette I p. 2749)
   Note: Amended by Art. 2 of the Act of 30/11/2016 I 2749 (No. 57): text evidenced, as yet not finally documented

3. Verordnung über das Europäische Abfallverzeichnis (Abfallverzeichnis-Verordnung - **AVV**), Artikel 1 vom 10. Dezember 2001 (BGBl. I S. 3379), zuletzt geändert durch Artikel 2 der Verordnung vom 22. Dezember 2016 (BGBl. I S. 3103)

   *Ordinance on the European Waste Catalogue (Waste Catalogue Ordinance – **AVV**), Article 1 of the Ordinance of 10 December 2001 (Federal Law Gazette I p. 3379) as last amended by Article 2 of the Ordinance of 22 December 2016 (Federal Law Gazette I p. 3103)*

4. Verordnung über die Nachweisführung bei der Entsorgung von Abfällen (Nachweisverordnung - **NachwV**), Artikel 1 der Verordnung vom 20. Oktober 2006 (BGBl. I S. 2298), zuletzt geändert durch Artikel 7 der Verordnung vom 2. Dezember 2016 (BGBl. I S. 2770)

   Hinweis: Änderung durch Art. 97 V v. 31.8.2015 I 1474 (Nr. 35) textlich nachgewiesen, dokumentarisch noch nicht abschließend bearbeitet Änderung durch Art. 7 V v. 2.12.2016 I 2770 (Nr. 58) textlich nachgewiesen, dokumentarisch noch nicht abschließend bearbeitet.

   *Ordinance on Waste Recovery and Disposal Records (Ordinance on Waste Evidence – **NachwV**), Article 1 of the Ordinance of 20 October 2006 (Federal Law Gazette I p. 2298) as last amended by Article 7 of the Ordinance of 2 December 2016 (Federal Law Gazette I, p.2770)*

   Note: Amended by Art. 97 O of 31/08/2015 I 1474 (No. 35): *text evidenced, as yet not finally documented*

Amended by Art. 7 O of 02/12/2016 I 2770 (No. 58): *text evidenced, as yet not finally documented*

5. Verordnung über das Anzeige- und Erlaubnisverfahren für Sammler, Beförderer, Händler und Makler von Abfällen (Anzeige- und Erlaubnisverordnung – **AbfAEV**) vom 5. Dezember 2013 (BGBl. I S. 4043), zuletzt geändert durch Artikel 8 der Verordnung vom 2. Dezember 2016 (BGBl. I S. 2770)

   Hinweis: Änderung durch Art. 8 V v. 2.12.2016 I 2770 (Nr. 58) textlich nachgewiesen, dokumentarisch noch nicht abschließend bearbeitet

   *Ordinance on the notification and licensing procedure for waste collectors, carriers, dealers and brokers (Notification and Licensing Ordinance – **AbfAEV**) of 5 December 2013 (Federal Law Gazette I p. 4043) as last amended by Article 8 of the Ordinance of 2 December 2016 (Federal Law Gazette I p. 2770)*

   Note: Amended by Art. 8 O of 02/12/2016 I 2770 (No. 58): *text evidenced, as yet not finally documented*

6. Verordnung über Entsorgungsfachbetriebe (Entsorgungsfachbetriebeverordnung -**EfbV**) vom 10. September 1996 (BGBl. I S. 1421), zuletzt geändert durch Artikel 2 der Verordnung vom 5. Dezember 2013 (BGBl. I S. 4043)

   *Ordinance on Specialist Waste Management Companies (Specialist Waste Management Company Ordinance - **EfbV**) of 10 September 1996 (Federal Law Gazette I p. 1421) as last amended by Article 2 of the Ordinance of 5 December 2013 (Federal Law Gazette I p. 4043)*

7. Altölverordnung (**AltölV**) in der Fassung der Bekanntmachung vom 16. April 2002 (BGBl. I S. 1368), zuletzt geändert durch Artikel 5 des Gesetzes vom.24. Februar 2012 (BGBl. I S. 212)

   *Waste Oil Ordinance (**AltölV**) in the version published on 16 April 2002 (Federal Law Gazette I p.1368) as last amended by Article 5 of the Act of 24 February 2012 (Federal Law Gazette I p. 212)*

8. Verordnung über die Entsorgung gebrauchter halogenierter Lösemittel (**HKWAbfV**) vom 23. Oktober 1989 (BGBl. I S. 1918), zuletzt geändert durch Artikel 7 b der Verordnung vom 20. Oktober 2006 (BGBl. I S. 2298)

   *Ordinance on the Disposal of Spent Halogenated Solvents (**HKWAbfV**) of 23 October 1989 (Federal Law Gazette I, p. 1918) as last amended by Article 7b of the Ordinance of 20 October 2006 (Federal Law Gazette I p. 2298)*

9. Verordnung über die Vermeidung von Verpackungsabfällen, (Verpackungsverordnung - **VerpackV**).vom 21. August 1998 (BGBl. I S. 2379), zuletzt geändert durch Artikel 1 der Verordnung vom 17. Juli 2014 (BGBl. I S. 1061)

   *Ordinance on the Avoidance and Recovery of Packaging Wastes (Packaging Ordinance - **VerpackV**) of 21 August 1998 (Federal Law Gazette I p. 2379) as last amended by Article 1 of the Ordinance of 17 July 2014, (Federal Law Gazette I, p.1061)*

10. Gesetz zur Fortentwicklung der haushaltsnahen Getrennterfassung von wertstoffhaltigen Abfällen (**VerpackG**) vom 05.Juli 2017 (BGBl. I S. 2234)

    Act on the Further Development of Kerbside Collection of Recyclable Wastes (VerpackG) of 5 July 2017 (Federal Law Gazette I p. 2253)

11. Verordnung über Überlassung, *Rücknahme* und umweltverträgliche Entsorgung von Altfahrzeugen (Altfahrzeug-Verordnung – **AltfahrzeugV**) in der Fassung der Bekanntmachung vom 21. Juni 2002 (BGBl. I S. 2214), zuletzt geändert durch Artikel 3 der Verordnung vom 2. Dezember 2016 (BGBl. I S. 2770)

   Hinweis: Änderung durch Art. 3 V v. 2.12.2016 I 2770 (Nr. 58) textlich nachgewiesen, dokumentarisch noch nicht abschließend bearbeitet

   *Ordinance on the Transfer, Collection and Environmentally Sound Disposal of End-of-life Vehicles (End-of-life Vehicle Ordinance - **AltfahrzeugV**) in the version published on 21 June 2002 (Federal Law Gazette I, p. 2214), as last amended by Article 3 of the Ordinance of 2 December 2016 (Federal Law Gazette I p. 2770)*

   Note: Amended by Art. 3 O of 02/12/2016 I 2770 (No. 58): *text evidenced, as yet not finally documented*

12. Gesetz über das Inverkehrbringen, die Rücknahme und Entsorgung von Batterien und Akkumulatoren (Batteriegesetz - **BattG**) vom 25. Juni 2009 (BGBl. I S. 1582), zuletzt geändert durch Artikel 1 des Gesetzes vom 20. November 2015 (BGBl. I S. 2071)

Act Governing the Sale, Return and Environmentally Sound Disposal of Batteries and Accumulators (Battery Act - BattG) of 25 June 2009 (Federal Law Gazette, I p. 1582) as last amended by Article 1 of the Act of 20 November 2015 (Federal Law Gazette I p. 2071)

13. Gesetz über das Inverkehrbringen, die Rücknahme und die umweltverträgliche Entsorgung von Elektro- und Elektronikgeräten (Elektro- und Elektronikgerätegesetz – **ElektroG**) vom 16. März 2005 (BGBl. I S. 762), zuletzt geändert durch Artikel 3 der Verordnung vom 20. Oktober 2015 (BGBl. I S. 1739)

*Act Governing the Sale, Return and Environmentally Sound Disposal of Electrical and Electronic Equipment (Electrical and Electronic Equipment Act - **ElektroG**) of 16 March 2005 (Federal Law Gazette, I p. 762) as last amended by Article 3 of the Ordinance of 20 October 2015 (Federal Law Gazette I p. 762)*

14. Verordnung über die Entsorgung von gewerblichen Siedlungsabfällen und von bestimmten Bau- und Abbruchabfällen (Gewerbeabfallverordnung – **GewAbfV**) vom 19. Juni 2002 (BGBl. I S. 1938), zuletzt geändert durch Artikel 4 der Verordnung vom 2. Dezember 2016 (BGBl. I S. 2770)

Hinweis: Änderung durch Art. 4 V v. 2.12.2016 I 2770 (Nr. 58) textlich nachgewiesen, dokumentarisch noch nicht abschließend bearbeitet

*Ordinance on the Management of Municipal Wastes of Commercial Origin and Certain Construction and Demolition Wastes (Commercial Waste Ordinance – **GewAbfV**) of 19 June 2002 (Federal Law Gazette I, p. 1938) as last amended by Article 4 of the Ordinance of 2 December 2016 (Federal Law Gazette I, p. 2770)*

Note: Amended by Art. 4 O of 02/12/2016 I 2770 (No. 58): *text evidenced, as yet not finally documented*

15. Verordnung über Anforderungen an die Verwertung und Beseitigung von Altholz (Altholzverordnung – **AltholzV**) vom 15. August 2002 (BGBl. I S. 3302), zuletzt geändert durch Artikel 6 der Verordnung vom 2. Dezember 2016 (BGBl. I S. 2770)

*Ordinance on the Management of Waste Wood (Waste Wood Ordinance – **AltholzV**) of 15 August 2002, (Federal Law Gazette I, p. 3302) as last amended by Article 6 of the Ordinance of 2 December 2016 (Federal Law Gazette I, p. 2770)*

16. Verordnung über Deponien und Langzeitlager (Deponieverordnung – **DepV**) vom 27. April 2009 (BGBl. I S. 900), zuletzt geändert durch Artikel 2 der Verordnung vom 2. Dezember 2016 (BGBl. I S. 382)

*Ordinance on Landfills and Long-Term Storage Facilities (Landfill Ordinance – **DepV)** of 27 April 2009 (Federal Law Gazette I, p. 900) as last amended by Article 2 of the Ordinance of 2 December 2016 (Federal Law Gazette I, p.382)*

17. Verordnung über die Verwertung von Bioabfällen auf landwirtschaftlich, forstwirtschaftlich und gärtnerisch genutzten Böden (Bioabfallverordnung – **BioAbfV**) in der Fassung der Bekanntmachung vom 4. April 2013 (BGBl. I S. 658), zuletzt geändert durch Artikel 5 der Verordnung vom 5. Dezember 2013 (BGBl. I S. 4043)

Änderung durch Art. 3 Abs. 2 V v.27.09.2017 I 3465 textlich nachgewiesen, dokumentarisch noch nicht abschließend bearbeitet

*Ordinance on the Utilisation of Biowastes on Land used for Agricultural, Silvicultural and Horticultural Purposes (Biowaste Ordinance – **BioAbfV)** in the version published on 4 April 2013 (Federal Law Gazette I p. 658) as last amended by Article 5 of the Ordinance of 5 December 2013 (Federal Law Gazette I p.4043)*

Note: Amended by Art. 3 (2) O of 27/09/2017 I 3465: text evidenced, as yet not finally documented

18. Tierische Nebenprodukte-Beseitigungsgesetz (**TierNebG**), vom 25. Januar 2004 (BGBl. I S. 82), zuletzt geändert durch Artikel 1 des Gesetzes vom 4. August 2016 (BGBl. I S. 1966)

*Animal Byproducts Disposal Act (**TierNeb**) of 25 January 2004 (Federal Law Gazette, p. 82) as last amended by Article 1 of the Act of 4 August 2016 (Federal Law Gazette I, p. 1966)*

19. Verordnung über die Entsorgung polychlorierter Biphenyle, polychlorierter Terphenyle und halogenierter Monomethyldiphenylmethane (PCB/PCT-Abfallverordnung - **PCBAbfallV**), Artikel 1 der Verordnung vom 26. Juni 2000 (BGBl. I S. 932), zuletzt geändert durch Artikel 5 des Gesetzes vom 24. Februar 2012 (BGBl. I S. 212)

*Ordinance on the Disposal of Polychlorinated Biphenyls, Polychlorinated Terphenyls and Halogenated Monomethyl-Diphenyl-Methanes (PCB/PCT Waste Ordinance - **PCBAbfallV**), Article 1 of the Ordinance of 26 June 2000 (Federal Law Gazette I, p. 932) as last amended by the Act of 24 February 2012 (Federal Law Gazette I, p. 212)*

20. Verordnung zur Beschränkung der Verwendung gefährlicher Stoffe in Elektro- und Elektronikgeräten ' (Elektro- und Elektronikgeräte-Stoff-Verordnung - **ElektroStoffV**) "Elektro- und Elektronikgeräte-Stoff-Verordnung vom 19. April 2013 (BGBl. I S. 1111), zuletzt geändert durch Artikel 1 der Verordnung vom 3. Juli 2018 (BGBl. I S. 1084)

*Ordinance on the Restriction of Use of Hazardous Substances in Electrical and Electronic Equipment (**RoHSV**) of 19 April 2013 (Federal Law Gazette I p. 1111) as last amended by Article 1 of the Ordinance of 2 July 2018 (Federal Law Gazette I p. 1084).*

21. Verordnung über das Inverkehrbringen und die Bereitstellung von Messgeräten auf dem Markt sowie über ihre Verwendung und Eichung (Mess- und Eichverordnung - **MessEV**) vom 11. Dezember 2014 (BGBl. I S. 2010, 2011), zuletzt geändert durch Artikel 2 des Gesetzes vom 29. August 2016 (BGBl. I S. 2034)

*Ordinance on placing measuring instruments on the market and their use and calibration (Measurement and Calibration Ordinance - **MessEV**) of 11 December 2014 (Federal Law Gazette I p. 2010, 2011) as last amended by Article 2 of the Act of 29 August 2016 (Federal Law Gazette I p. 2034)*

22. Verordnung über die innerstaatliche und grenzüberschreitende Beförderung gefährlicher Güter auf der Straße, mit Eisenbahnen und auf Binnengewässern (Gefahrgutverordnung Straße, Eisenbahn und Binnenschifffahrt - GGVSEB) in der Fassung der Bekanntmachung vom 30. März 2015 (BGBl. S. 2010, 366), zuletzt geändert durch Artikel 6 des Gesetzes vom 29. August 2016 (BGBl. I S. 1843)

*Ordinance on the inland and transfrontier transport of hazardous goods by road, rail and inland waterways (Hazardous Goods Ordinance Road, Rail, Inland Waterways – **GGVSEB**) in the version published on 30 March 2015 (Federal Law Gazette p. 2010, 366) as last amended by Article 6 of the Act of 29 August 2016 (Federal Law Gazette I p. 1843)*

20.1.3 Legislation of Saxony-Anhalt (state-level legislation)

1. Abfallgesetz des Landes Sachsen-Anhalt (**AbfG LSA**) in der Fassung der Bekanntmachung vom 1. Februar 2010 (GVBl. LSA S. 44), geändert durch § 38 Absatz 1 des Gesetzes von 10. Dezember 2010 (GVBl. LSA S. 569), geändert durch Artikel 2 des Gesetzes vom 17. Dezember 2014 (GVBl. LSA S. 522, 523), zuletzt mehrfach geändert durch § 1 des Gesetzes vom 10. Dezember 2015 (GVBl. LSA S. 610)

*Waste Management Act of Saxony-Anhalt (**AbfG LSA**) in the version published on 1 February 2010 (LSA Law Gazette, p. 596) as amended by Article 2 of the Act of 17 December 2014 (LSA Law Gazette pp. 522, 523), last amended several times by Art. 1 of the Act of 10 December 2015 (LSA Law Gazette, p. 610*

2. Zuständigkeitsverordnung für das Abfallrecht (**AbfZustVO**) vom 6. März 2013, (GVBl. LSA S. 107)

*Ordinance regulating the allocation of responsibilities for waste management (**AbfZustVO**) of 6 March 2013 (LSA Law Gazette, p. 107)*

3. Kommunalabgabengesetz (**KAG LSA**) in der Fassung der Bekanntmachung vom 13. Dezember 1996 (GVBl. LSA S. 405), zuletzt geändert durch §§ 13 und 13a.sowie neuer § 13c eingefügt durch Gesetz vom 17. Juni 2016 (GVBl. LSA S. 202)

*Municipal Fees Act (**KAG LSA**) in the version published on 13 December 1996 (LSA Law Gazette p. 405) as last amended by Articles 13 and 13a and the new Article 13c added by the Act of 17 June 2016 (LSA Law Gazette p. 202)*

20.1.4 Local legislation of the City of Magdeburg

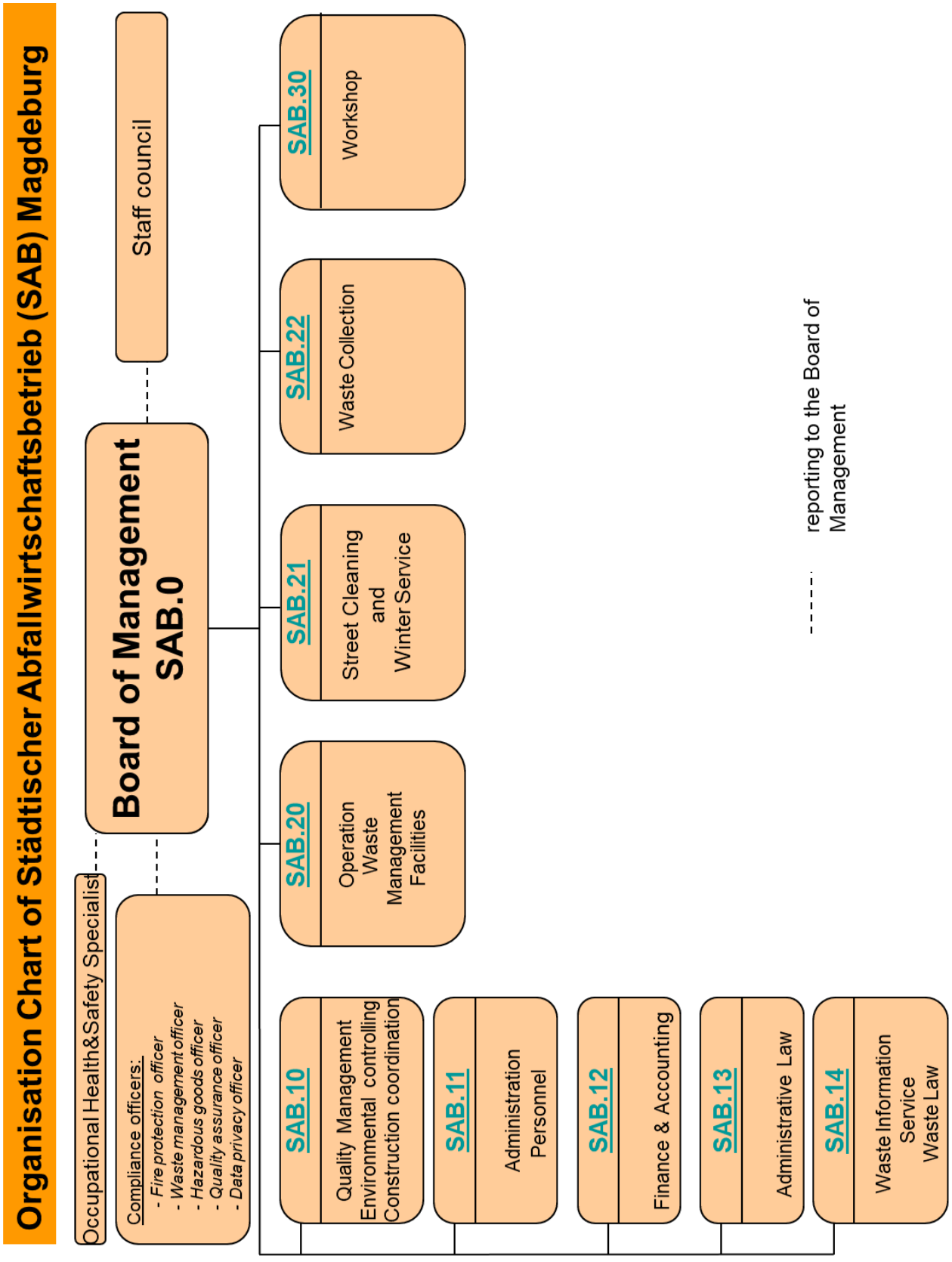
1. Satzung zur Vermeidung, Verwertung und Beseitigung von Abfällen der Landeshauptstadt Magdeburg **(Abfallwirtschaftssatzung)** vom 28. Februar 2013 (Amtsblatt für die Landeshauptstadt Magdeburg, Nr. 12/13 vom 22. März 2013), zuletzt geändert durch die Zweite Änderungssatzung vom 23. Dezember 2016 (Amtsblatt Nr. 28/2016)

   *By-law on the Prevention, Recycling and Final Disposal of Wastes produced within the area of Landeshauptstadt Magdeburg (**Waste Management By-Law**) of 28 February 2013 (Official Journal for Landeshauptstadt Magdeburg, No. 12/13 of 22 March 2013) as last amended by the second amendment by-law of 23 December 2016 (Official Journal No. 28/2016)*

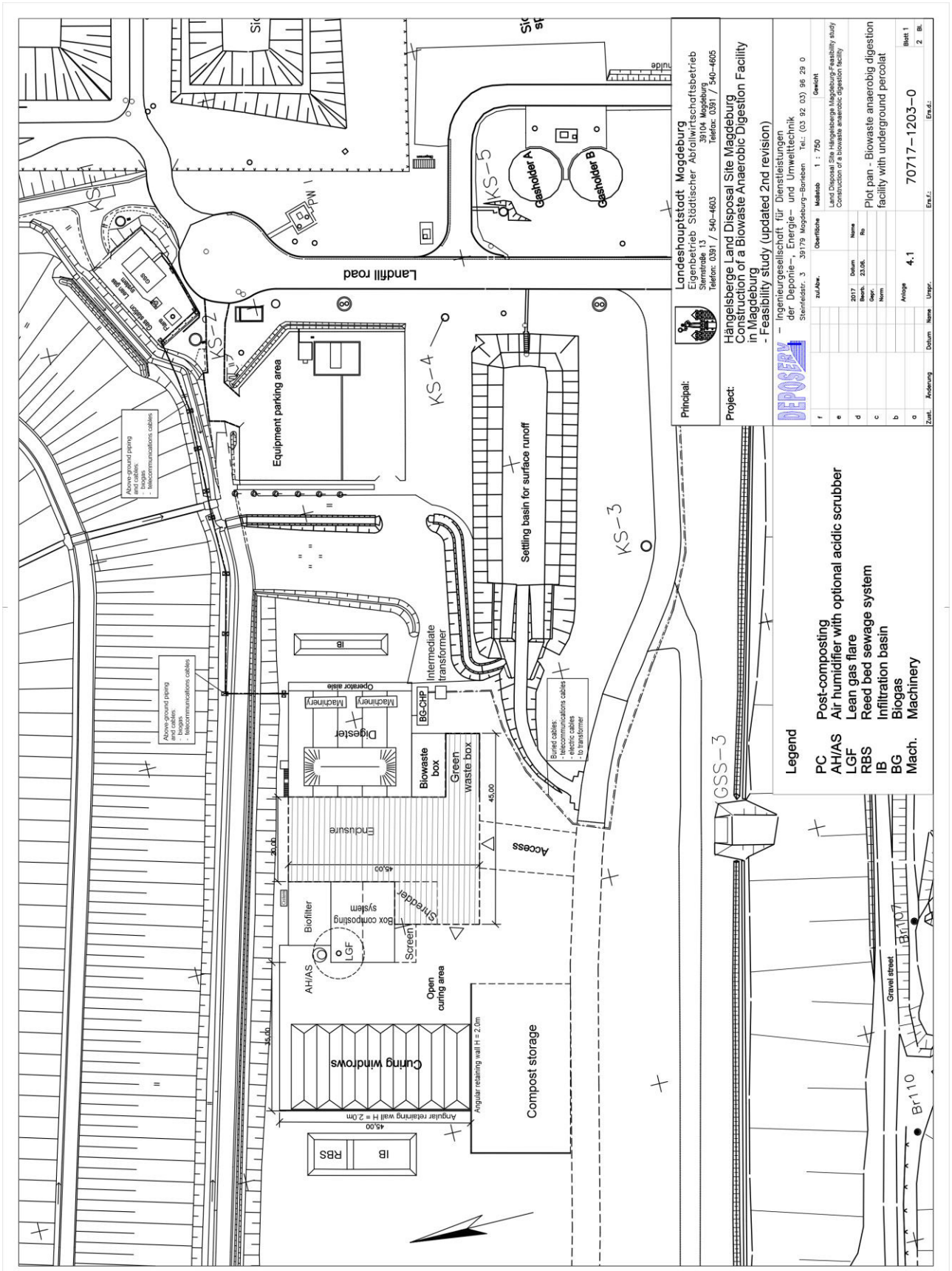
2. Satzung über die Erhebung von Gebühren für die Abfallentsorgung in der Landeshauptstadt Magdeburg (**Abfallgebührensatzung**) vom 28. Februar 2013 (Amtsblatt für die Landeshauptstadt Magdeburg, Nr. 12/13 vom 22. März 2013), zuletzt geändert durch die Zweite Änderungssatzung vom 23. Dezember 2016 (Amtsblatt Nr. 28/2016)

   *By-law on the Levying of Fees for Waste Management at Landeshauptstadt Magdeburg (**Waste Fee By-law**) of 28 February 2013 (Official Journal for Landeshauptstadt Magdeburg, No. 12/13 of 22 March 2013) as last amended by the Second Amendment By-law of 23 December 2016 (Official Journal No. 28/2016)*

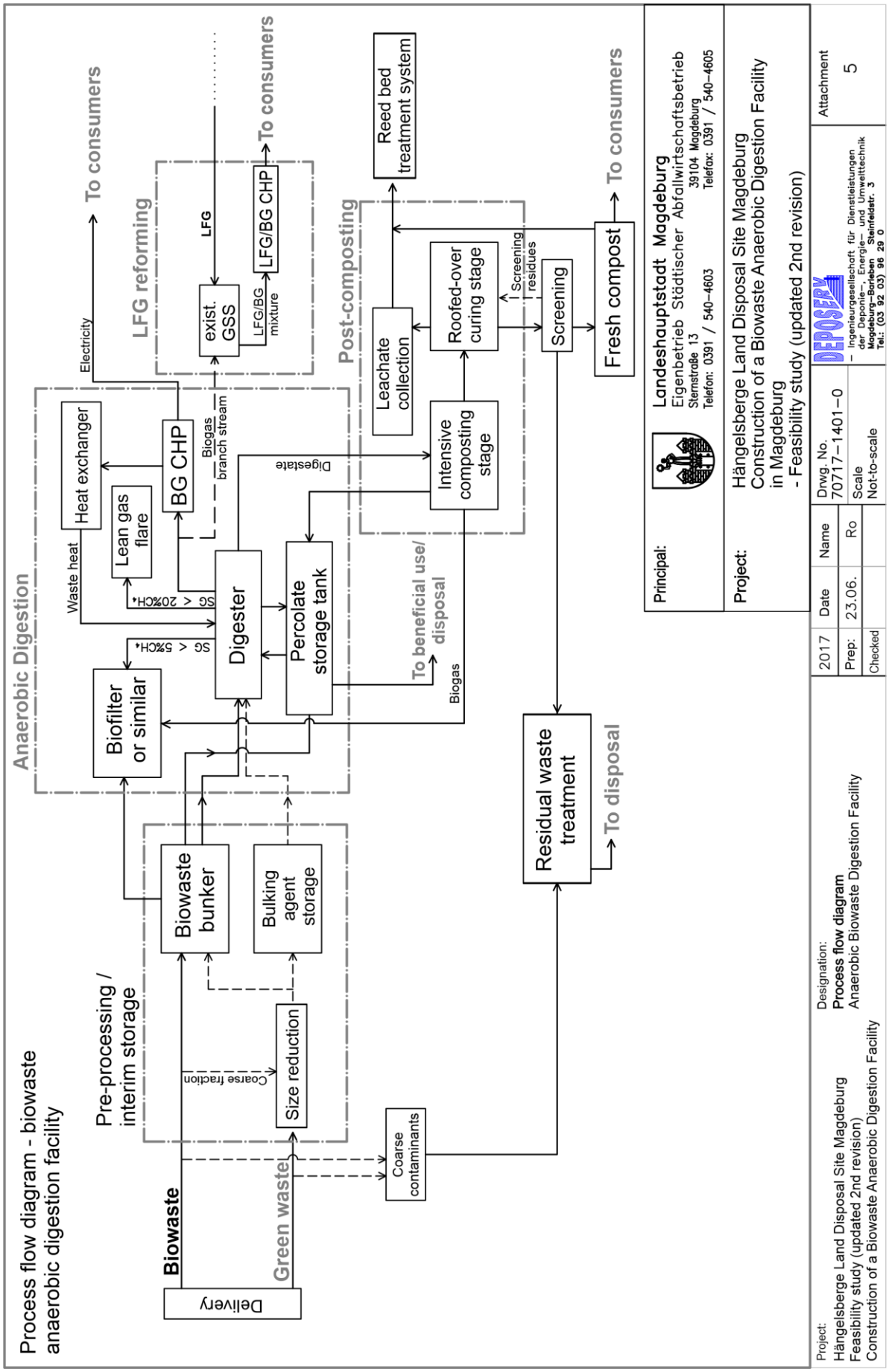
20.2 Organisation Chart of Municipal Waste Management Enterprise (SAB)



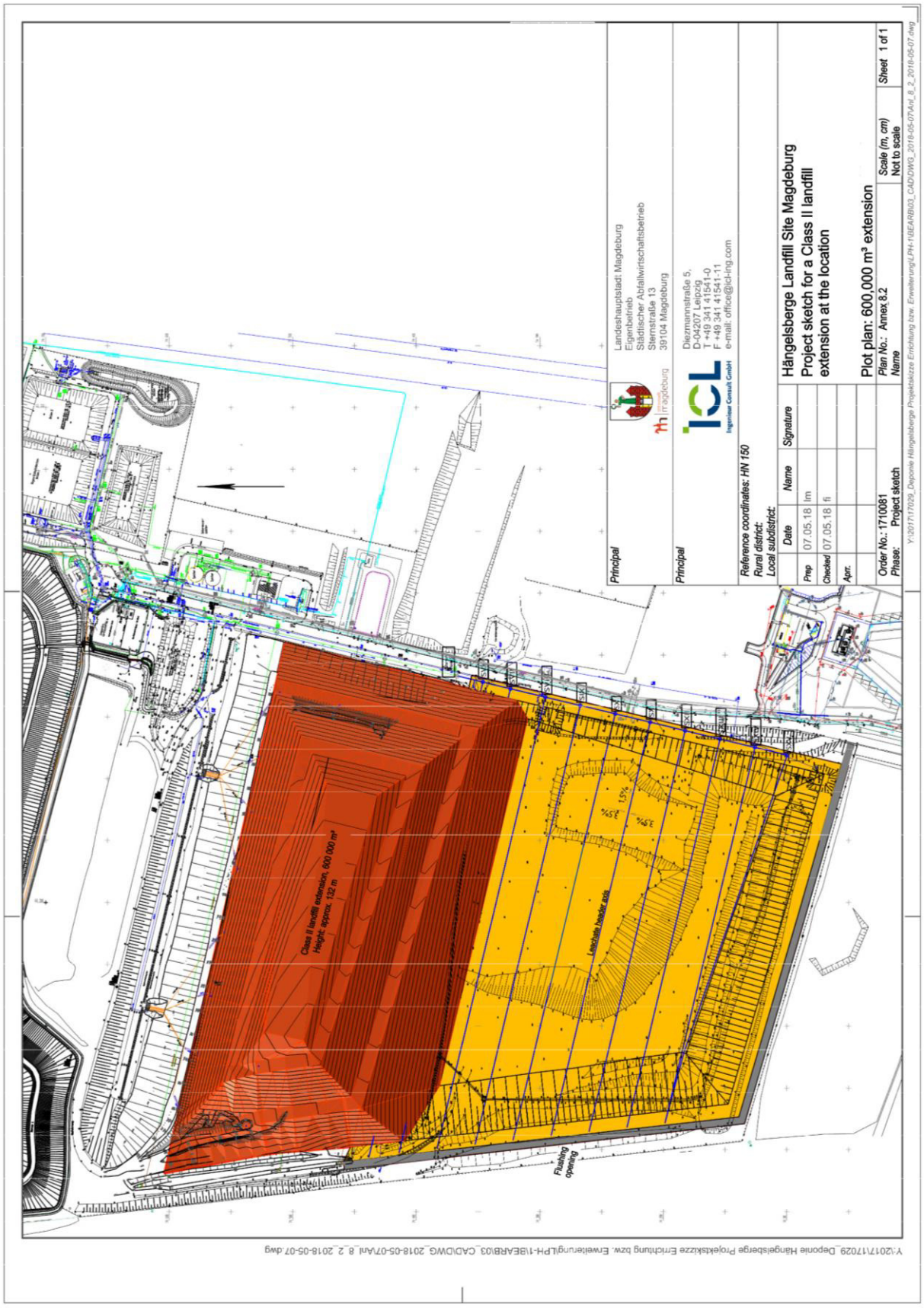
20.3 Plot Plan of Biowaste Anaerobic Digestion Facility



20.4 Flow Diagram of Biowaste Anaerobic Digestion Facility



20.5 Plot Plan of Landfill Extension



20.6 Waste Forecast

Waste Forecast Class II Hängelsberge Landfill – Phase 1 – (planning phase) 2022 to 2030

EWC	Waste designation	Waste category	2022	2021	2024	2025	2026	2027	2028	2029	2030
			Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg	Mg
010413	Wastes from stone cutting and sawing other than those mentioned in 01 04 07	Commercial and industrial waste	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000	35,000
060314	Solid salts and solutions other than those mentioned in 06 03 11										
100201	Wastes from the processing of slag										
101105	Particles and dust										
101114	Glass-polishing and grinding sludge other than those mentioned in 10 11 13										
101120	Solid wastes from on-site effluent treatment other than those mentioned in 10 11 19										
101201	Waste preparation mixture before thermal processing										
101203	Particles and dust										
101206	Discarded moulds										
101208	Waste ceramics, bricks, tiles and construction products (after baking)										
101304	Wastes from calcination and hydration of lime										
101306	Particulates and dust (except 10 13 12 and 10 13 13)										
101311	Wastes from cement-based composite materials other than those mentioned in 10 13 09 and 10 13 10										
120102	Ferrous metal dust and particles										
120117	Waste blasting material other than those mentioned in 12 01 16										
120121	Spent grinding bodies and grinding materials other than those mentioned in 120120										
160304	.Inorganic waste other than those mentioned in 160303										
161102	Linings and refractories from non-metallurgical processes other than those mentioned in 161101										
161104	Linings and refractories from metallurgical processes other than those mentioned in 16 11 03										
161106	Linings and refractories from non-metallurgical processes other than those mentioned in 16 11 05										
170603*	Other insulation materials containing or consisting of dangerous substances		300	300	300	300	300	300	300	300	300
010504	Freshwater drilling muds and wastes	Industrial sludge	900	900	900	900	900	900	900	900	900
010508	Chloride-containing drilling muds and wastes other than those mentioned in 01 05 05 and 01 05 06										
060503	Sludges from on-site effluent treatment other than those mentioned in 06 05 02										
080202	Aqueous sludges containing ceramic materials										
100215	Other sludges and filter cakes										
101314	Waste concrete and concrete sludge										
110110	Sludges and filter cakes other than those mentioned in 110109										
120115	Machining sludges other than those mentioned in 12 01 14										
190814	Sludges from other treatment of industrial waste water other than those mentioned in 19 08 13										
191306	Sludges from groundwater remediation other than those mentioned in 19 13 05										
190802	Wastes from desanding	Gully sludge, grit chamber residue	100	100	100	100	100	100	100	100	100
200306	Waste from sewer cleaning										
170504	Soil and stones other than those mentioned in 17 05 03	Excavation waste not containing hazardous substances	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
170506	Dredging spoil other than those mentioned in 17 05 05										
191209	Minerals (for example sand, stones) not differentiable										
200202	Soil and stones										
170101	Concrete	Building rubble, demolition waste, track ballast	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
170102	Bricks										
170103	Tiles, bricks and ceramics										
170107	Mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06										
170508	Track ballast other than those mentioned in 17 05 07										
*170301**	*Bituminous mixtures containing coal tar*	*Road demolition waste*	*10,000*	*10,000*	*10,000*	*10,000*	*10,000*	*10,000*	*10,000*	*10,000*	*10,000*
170302	*Bituminous mixtures other than those mentioned in 17 03 01*										
100103	Fly ash from peat and untreated wood	Ash, dusts	500	500	500	500	500	500	500	500	500
100117	Fly ash from co-incineration other than those mentioned in 10 01 16										
100910	Fly ash other than those mentioned in 10 09 09										
190114	Fly ash other than those mentioned in 19 01 13										
100101	Bottom ash, slag and boiler dust excluding boiler dust mentioned in 10 01 04	Slag	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
100115	Bottom ash, slag and boiler dust from co-incineration other than those mentioned in 10 01 14										
100202	Unprocessed slag										
100501	Slags from primary and secondary production										
100903	Furnace slag										
190112	Bottom ash and slag other than those mentioned in 19 01 11										
100105	Calcium-based reaction wastes from flue-gas desulphurisation in solid form	Reaction products	300	300	300	300	300	300	300	300	300
100107	Calcium-based reaction wastes from flue-gas desulphurisation in sludge form										
100119	Wastes from gas cleaning other than those mentioned in 10 01 05, 10 01 07 and 10 01 18										
100208	Solid wastes from gas treatment other than those mentioned in 10 02 07										
101210	Solid wastes from gas treatment other than those mentioned in 10 02 09										
190206	Sludges from physico/chemical treatment other than those mentioned in 19 02 05										

EWC	Waste designation	Waste category	2022	2021	2024	2025	2026	2027	2028	2029	2030
100906	Casting cores and moulds which have not undergone pouring other than those mentioned in 10 09 05	Foundry sands	800	800	800	800	800	800	800	800	800
100908	Casting cores and moulds which have undergone pouring other than those mentioned in 10 09 07										
101008	Casting cores and moulds which have undergone pouring other than those mentioned in 10 10 07										
101112	Waste glass other than those mentioned in 10 11 11	Other wastes	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500	4,500
170202	Glass										
190203	Premixed wastes										
190305	Stabilised wastes other than those mentioned in 19 03 04										
190307	Stabilised wastes other than those mentioned in 19 03 06										
191205	Glass not differentiable										
191302	Solid wastes from soil remediation other than those mentioned in 19 13 01										
170601*	Insulation materials containing asbestos	Wastes containing asbestos	100	100	100	100	100	100	100	100	100
170605*	Construction materials containing asbestos										
	Total deposited wastes per annum (Mg/a)		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Density (Mg/m³)		1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
	Total deposited volume per annum (m³/a)		62,500	62,500	62,500	62,500	62,500	62,500	62,500	62,500	62,500
	Remaining landfill capacity as at 31/12 (m³)	**600,000**	**537,500**	**475,000**	**412,500**	**350,000**	**287,500**	**225,000**	**162,500**	**100,000**	**37,500**
		(Phase 1 landfill capacity)									

Note: *italics: deposition not applied for so far*