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## FINAL REPORT

### EUSDR-Project

Communicative, organisational, technical and economic  
problem solvings for the recovery of biological waste

Baden-Württemberg/Hungary

*"Disposal of foreign materials in compostable waste"*

submitted by

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# 1 Introduction

The Hungarian company

NHSZ Miskolc Környezetvédelmi és Hulladékgazdálkodási (Miskolc Environment and Waste Management Company)

has submitted a request to the Plattform Umwelttechnik e.V. (PU) for support for the topic of production of non-contaminant composts from biological waste.

The Plattform Umwelttechnik e.V. has assured the organisational and professional support of the engineering company AWIPLAN-PPD GmbH, Filderstadt, to deal with the topic.

In preliminary discussions between the parties, a project with the subject

**"Communicative, organisational, technical and economic solutions for the recovery of biological waste - Baden-Württemberg/Hungary"**

was developed.

The involved participants of the Hungarian waste management industry, are trying to use modern infrastructure to encourage the population to collect the green waste separately. Although collected separately, the green waste contains foreign substances that prevent unrestricted recovery. These contaminants do not degrade during the composting process. In the green waste from the public collection, the various packaging materials (e.g. glass, plastic and metal) are the most common ones.

The population often provides green waste in plastic bags that are hardly degradable, instead of using the green waste bags explicitly offered by the public services for this purpose.

Green waste is composted in Hungary according to the state of the art of technology. However, the elimination of foreign materials in green waste and therefore in the compost is a major problem. The machines and methods used cannot solve the problem satisfactorily.

The process of the whole system is at high cost. The quality of the compost is low due to the countless foreign substances. The compost, contaminated with foreign substances, cannot be recycled and ends up in landfills as covering material. In this case the recovery of organic waste cannot reduce the landfill costs and protect the environment significantly.

From an environmental point of view, the return of organic waste in a closed loop recycling is essential.

The goal of the project is to find a practical solution for the described difficulties, regarding to prevent the input from contaminants and the separation or rather the removal of foreign substances from the compost. For this purpose, technical and organizational quality improvement activities will be discussed for the city of Miskolc – and downstream for whole Hungary. It will also help to improve the daily (public) work of composting plant operators.

The aim of the professional dialogue is to improve the quality of the compost in the future for using in larger quantities for horticultural or agricultural purposes.

The project is funded by the state of Baden-Württemberg.

## **2 Project structure**

### **2.1 PROJECT SCOPE**

Based on the currently available level of knowledge for the question, the following work steps can be formulated with the aim of improving the quality of green material compost. Due to this the marketability in the existing distribution structures has to be achieved.

The contaminant levels have to be reduced by appropriate and implementable measures, so that the amounts of glass, plastics, metals not prevent or restrict a qualitative recovery in the agriculture, substrate production or other private and commercial applications.

The overall objectives of the project are:

- the introduction of quality improvement measures (organizational, technical) in the city of Miskolc and downstream in whole Hungary
- improving the daily (publicity) work of composting plant operators.

These objectives should be achieved:

- by initiating an exchange of experience between German and Hungarian experts on public relations, collection structures, plant operation in the field of green waste composting, and
- by informing the relevant Hungarian actors about best practices in Germany.

The target groups of the project are:

- NHSZ Kft.,
- NHKV Zrt. as the central organ of the Hungarian waste management,
- the 21 waste regions, with their plant operators and those who are responsible for composting organic waste, and
- all institutions, officials and stakeholders from the relevant fields of waste management, agriculture, water management and soil protection.

### **2.2 PROJECT METHODOLOGY**

The project deals with operational, technical measures for the elimination of contaminants from composts. The methodological approach for the project processing and the development of solutions, are aiming for an integration of all participants in the waste management activities. In a professional discourse the dependencies between communicative, organisational, technical and economic aspects of the disposal structures should be taught.

The development of competences in Hungary is one of the main goals, based on the administrative and practical experiences in Baden-Württemberg. A central point is the transfer of knowledge, in consideration of the existing structures and circumstances in Hungary. The outlined solutions and recommendations were discussed at a workshop in Budapest.

The workshop sees itself as a platform for communicating and discussing solutions. The expertise of the workshop speakers, the composition of the specialist audience and the political value in form of the organizer and the patronage were of vital importance for the success of the project. The workshop was held in Budapest together with the Ministry of Innovation and Technology.

As speakers and experts could be engaged experienced representatives of the administration, municipal and private waste management from both countries.

The topics of the workshop at a glance

- administrative and regulatory responsibilities and influence possibilities
- structure and accountibilities of municipal waste management structures
- participants in waste management, like waste producers, waste collection companies, plant operators and raw material/product exploiters
- communication and public relations
- technical and operational framework conditions in biological waste recycling plants
- recovery of compost products and their quality assurance

The results and solutions of the workshop will be published by appropriate media and checked by the project partner in Miskolc with the regard to practicability.

## **2.3 PROJECT WORKFLOW**

The project is divided into different stages of work.

### Data collection and situation analysis

This work step includes situation analysis and data collection in advance of further activities. In particular, organisational and personnel project structures and responsibilities were defined, as well as a timetable for the project's implementation.

Specialist aspects for the thematic areas like

- responsibilities and organisation of waste management in Hungary (NHSZ in the city of Miskolc and NHKV in Budapest),
- existing fee system,
- organisation of the collection system,
- separation of waste,
- existing public relations,
- technical equipment of the treatment facilities,
- process sequences of composting,
- product quality of the compost
- and as well sales markets and relations to the customers

were prepared for getting the most complete impression as possible of the conditions on site.

### Study trip to Hungary

The subject of the study trip in February 2019 was the on-site stocktaking with selected projects and an initial exchange of experience in Hungary and at NHKV in Budapest. The situation analysis was verified and open questions were discussed with those who are in charge. In addition to the discussions with the relevant ministry and the national waste management authority, seven projects on the collection of green waste in Hungary were visited and presented.

### Presentation of successful waste projects in Baden-Württemberg

Representatives of NHSZ Miskolc informed themselves in June 2019 about successful collections and exploitation of green goods in Baden-Württemberg. After discussions in the Ministry of State and the Environment, overall four public waste disposal officers presented their various strategies and concepts for public green waste recovery in rural and urban districts.

### Workshop for stakeholders in waste management

The project workshop was held in Budapest on September the 17<sup>th</sup> 2019 at the premises of the Ministry of Innovation and Technology. The topics can be found in the chapter above.

### Elaboration of optimization measures and derivation of recommendations for action

The project leads to the elaboration from fields of action for strategic waste planning. The presentation of changed framework conditions in public relations, in the collecting structures and plant operation as well as for the improvement of compost quality.

## **2.4 STAKEHOLDERS**

The success of the project was contributed by:

study trip to Hungary

- Tibor Nemcsek, NHSZ Miskolc
- Martin Kneisel, Ministry of Environment, Climate and Energy Baden-Württemberg
- Ingrid Müller, Plattform Umwelttechnik e.V.
- Ulrich Hommel, AWIPLAN-PPD GmbH

presentation of green waste projects in Baden-Württemberg

- Julian Kuhn, Waste Management Department, county of Göppingen
- Manfred Kopp, Waste Management Department, county of Esslingen
- Elke Schanz-Mattern, AVL Ludwigsburg
- Thomas Hill, Garden, Cemetery and Forestry Department of the state capital city of Stuttgart



#### Speakers at the workshop in Budapest

- Dr. Boros, Anita, State Secretary at the Ministry of Innovation and Technology
- Nemcsek, Tibor, NSHZ Miskolc
- Dr. Aleksza, László, Fa. ProfiKomp GmbH
- Tóth, Tibor, ZV Zöld Völgy Nonprofit Kft.
- Ingrid Müller, Plattform Umwelttechnik e.V.
- Martin Kneisel, Ministry of the Environment, Climate and Energy
- Prof. Dr.-Ing. Carla Cimadoribus, Esslingen University of Applied Sciences
- Dirk Kurzschinkel, Waste Management Department, county of Göppingen
- Ralf Müller, Biodegma GmbH, Ludwigsburg

### **3 Green waste, garden and park waste – definition**

In accordance with the regulations on the utilisation of green waste on agricultural land (amendment of the Biowaste Ordinance (BioAbfV 2012), the requirements for the treatment of this waste group in Germany have changed fundamentally.

Green waste was according to § 10 section 1 BioAbfV formerly exempted from treatment and inspection obligations. Since the 1<sup>st</sup> of May 2012 is the treatment of green waste required as for other bio-waste as well.

Green waste includes the biodegradable waste referred in annex 1 No.1a BioAbfV (AVV 20 02 01).:

- garden and park waste,
- cemetery waste,
- waste from sports facilities and children's playgrounds,
- landscape maintenance waste and wood clearing,
- plant from water maintenance, components of the drift.

For the aforementioned waste, the term *green waste* has become established in the near past.

At this point reference is made to the descriptions of the Biowaste Ordinance.

A distinction is made between bio-waste and green waste.

Biowaste includes all waste of animal and plant origin or from fungal materials that can be degraded by micro-organisms, soil-borne organisms or enzymes (§ 2 Section 1 BioAbfV). In detail, these are garden and park waste, landscape maintenance waste, food and kitchen waste from households and food processing plants (§ 3 Section 7 KrWG).

In general language bio-waste or bio-goods containing

- biodegradable waste from private households and small businesses collected by a biobin or bag
- food and kitchen waste such as vegetable and fruit residues, coffee grounds, leftover breads and baked goods or kitchen paper, and
- garden waste such as lawn cutting, foliage and fall fruit

Commercial organic material includes organic kitchen and food waste from companies (e.g. canteen waste) that is not disposed via the biobin due to its nature, quantity or quality.

Domestic green waste is all separately collected garden waste from private households, such as

- foliage,
- tree, hedge and shrub cutting,
- plants or parts of plants,
- lawn cutting,
- christmas trees (without jewelry),
- perennials,
- mowing,
- flowers and residues as well as
- weeds,

which are not collected by the biobin.

The municipal and public green wastes include all

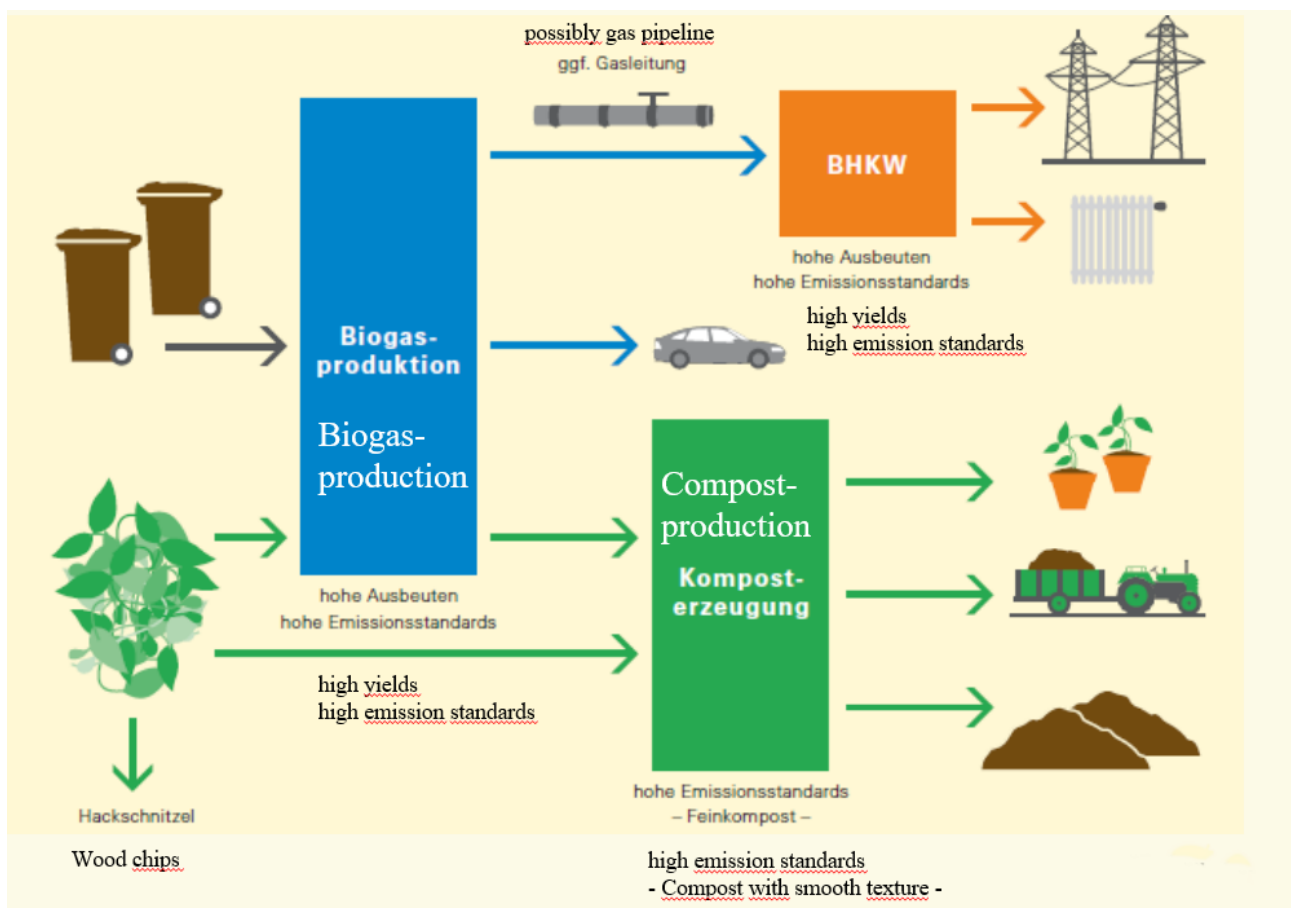
- vegetable waste generated during the maintenance of public areas, such as park and landscape maintenance waste, plant materials from roadside areas,
- biodegradable waste from public sports facilities and children's playgrounds,
- cemetery waste as well as
- vegetable waste from the maintenance and development of waters.

The commercial green goods include the vegetable waste that arises from the maintenance of commercially used areas. For example, green goods company premises or waste from gardening and landscaping.

Organic and green goods can be exploited in various ways. Currently, both are mainly used for compost production. But through the production of biogas energy can also be generated from biowaste. The emerged fermentation residues can also be refined into high-quality composts.

The woody parts of the green goods are also suitable as fuel for biomass heating (power) plants and are the starting material for high-quality nutrient-poor composts or planting and flowering soils.

The efficient material and energetic recovery of organic and green goods makes an important contribution to the energy transition and climate protection – and therefore to the achievement of current environmental policy objectives:



## 4 Legal regulations

### 4.1 EU WASTE LEGISLATION

EU waste legislation is characterised by a large number of binding stipulations. While regulations are directly applicable in the Member States, directives have to be transposed into the respective national law. One of the key directives in the field of waste management is the Waste Framework Directive (Directive 2008/98/EC). It defines essential waste-related terms and establishes a five-level waste hierarchy in order of priority:

- prevention
- preparing for re-use,
- recycling
- other recovery, e.g. energetic recovery; and
- disposal

In 2018, the European Parliament has decided major amendments to the directives on the prevention, recovery and disposal of waste in the EU. On the basis of the European Circular Economy Action Plan published in December 2015, the requirements for waste were revised with four central legislative acts:

- the Waste Framework Directive,
- the Packaging and Packaging Waste Directive,
- the Directive Landfill of Waste and
- the Directives on end-of-life vehicles, on batteries and accumulators, as well as on waste batteries and accumulators, and on electrical and electronic equipment waste.

The amendments to the Waste Framework Directive essentially include, extended requirements to support the prevention of waste, the setting of targets for recycling and preparation for the re-use of municipal waste, criteria for measuring the end of the waste status, as well as new requirements for the separate collection.

From now on, Member States will have to collect paper, metal, plastics, glass and from 2025 also old textiles separately. Member States must take measures to strengthen the reuse of products and they must create systems that promote repair and reuse. The recycling targets for municipal waste have been intensified. 65 percent of the waste has to be recycled by 2035.

The DIRECTIVE (EU) 2018/851 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 May 2018 to amending Directive 2008/98/EC on waste, based on the contract and on the functioning of the European Union:

The waste management in the Union should be improved and transformed into a sustainable material management. The Goal should be a protected, preserved and improved quality of the environment and the human health by a prudent, efficient and safe way of using natural resources. Promoting the principles of a circular economy and the spread of renewable energy are furthermore a main goal. Also, the improving of the energy efficiency, the reducing of the Union's dependence on resource imports and new opportunities for the economy to ensure a long-term competitiveness, are in this case very important. In order to create a real circular economy, additional measures must be taken to guarantee the sustainability of production and consumption. By looking at the entire life cycle of products in a way that is preserving resources and closing the cycle this could be realized. The more efficient use of resources will also lead into a substantial net saving for businesses, public authorities and consumers in the Union while reducing the overall annual greenhouse gas emissions.

[...]

The targets for preparation the re-using and recycling of waste is defined in the Directive 2008/98/EC of the European Parliament and of the Council. These targets should be increased to clarify the Union's efforts in transforming into a circular economy.

[...]

Municipal waste accounts about 7 to 10% of total waste generated in the Union. However, this waste stream is particularly difficult to handle. The way how it is managed in general is a good indicator for the quality of waste management systems in a country. The difficulties in managing municipal waste are due to its extremely complex and mixed composition, the close proximity to the citizens, it's very high public visibility and its impact on the environment and human health.

[...]

For these reasons, the handling of municipal waste requires a highly complex structure with an efficient collection system, an effective waste separation system and a proper tracking of waste streams. In addition, the active cooperation of citizens and businesses, an infrastructure tailored to the individual waste composition and a sophisticated financing system is needed.

[...]

The experience shows that waste management systems can contribute to the achievement of a circular economy regardless of how responsibilities are distributed between public and private actors. The decision how the responsibilities are spread often depends on geographical and structural conditions. The directive allows waste management systems in which the municipal or city administration has general responsibility for the collection of municipal waste. As well as systems for which these services are done by private companies or other ways of distributing responsibilities among public and private actors. Which system is chosen and whether the system is to be amended or kept is up to the responsibility of the Member States.

[...]

With regard to bio-waste, the revision of the Waste Framework Directive introduces the following innovations:

Member States shall guarantee that by 31<sup>st</sup> December 2023 and conditionally due to Article 10 Section 2 and 3 that bio-waste is either separated and recycled where it is accrued or collected separately and will not be mixed with other types of waste.

Member States may allow waste with similar biodegradability and compostability characteristics to be disposed of in accordance with the relevant European or any equivalent national standards for compostable and biodegradable degradable packaging, collected together with bio-waste.

Member States shall take measures to

1. promote recycling, including composting and fermentation of bio-waste, in such a way as to ensure a high level of environmental protection and to ensure that the output fits the appropriate high-quality standards;
2. support self-composting,
1. promote the use of materials produced from bio-waste.
2. develop appropriate qualitative and quantitative indicators and targets for the amount of waste generated and its treatment, as well as for municipal waste that is disposed or transformed into energy  
→ waste management plans.

## 4.2 WASTE LEGISLATION IN GERMANY

In Germany, the first federal regulation of waste legislation was published in 1972 with the Waste Disposal Act (Abfallbeseitigungsgesetz, AbfG). Today, the Waste Management Act (**Kreislaufwirtschaftsgesetz**, KrWG, 1 June 2012) is the core regulation of waste legislation. The KrWG replaces the Circular Economy and Waste Act (KrW-/AbfG). The KrWG transposes the requirements of the EU Waste Framework Directive (Directive 2008/98/EC) into national law. The circular economy will be even more focused on resources, climate and environmental protection.

The national Waste Management Act (KrWG) is supplemented and specified by the waste laws of the federal states. Due to the competing legislative responsibility of the national government for waste management, however federal state regulations are only possible in fields that are not already covered by the national law. Therefore, the waste laws of the federal state are mainly concerned by questions of enforcement of the legislation, for example the determination of the responsible corporate bodies for the disposal and the authorities in charge for the waste sector.

The collection and treatment of waste close to the households is determined at municipal level in form of statutes. Waste statutes, for example, contain regulations on the obligation of connection and use. Charges for the use of waste disposal are levied on the basis of municipal waste charge statutes.

As a core element, the KrWG adopts the five-stage waste hierarchy (previously three-stage) of the EU Framework Directive.

Since the 1<sup>st</sup> of January 2015, the separation of bio-, paper-, metal-, plastic and glass waste, is obligatory. In order to promote recycling and other material recovery, municipal waste recycling quotas of at least 65% will be introduced. These will be complied by the year 2020 at the latest.

On the basis of the Circular Economy and Waste Act of September 1994, the Biowaste Ordinance (BioAbfV) deals with the recovery of bio-waste on agricultural, forestry and horticultural soils. The Biowaste Ordinance contains requirements for disease and phytohygienic safety, pollutant limits, heavy metal contents and foreign materials. The fertilizer legislation (Fertilisers Ordinance) remains unchanged.

The Biowaste Ordinance (Ordinance on the Recovery of Biowaste on Agricultural, Forestry and Horticultural Soils (Biowaste Ordinance – BioAbfV)) was comprehensively amended in 2012 on the basis of the Circular Economy and Waste Act.

The BioAbfV applies (exclusively) for the recovery of bio-waste on agricultural, horticultural or forestry soils. The amendment planned for 2020 aims, among other things, to extend the scope of the regulations to include gardening and landscaping. Biowaste is organic waste of animal or plant origin. Biowaste includes, in particular, the organic substances referred to in Annex 1 N°1 BioAbfV.

Among many other classified wastes, green waste (garden and park waste) as biodegradable waste is also subject to this regulation:

AVV 20 02 01 (waste code number) - biodegradable waste (garden and park waste)

- from sports facilities, -places, -venues and children's playgrounds,
- biodegradable cemetery waste,
- biodegradable garden and park waste,
- deforestation residues,
- landscape maintenance waste,
- vegetable waste from water maintenance,
- vegetable components of the drift (including coastal and shore areas),
- (garden and park waste [including cemetery waste]).

*Note:* In the context of composting, woody materials must be crushed or the compost sifted in such a way that no materials over 40 mm (screen mesh size) are contained in the compost. The materials may be applied, also as part of a mixture, to grassland areas and to multi-cut field fodder areas. This excludes plant materials from roadside areas (roads, paths, railways, airports) and industrial sites.

### **4.3 WASTE LEGISLATION IN HUNGARY**

The legal basis for biological waste treatment in Hungary is formed by the following set of rules:

- Waste Act CXXXXV of 2012
- 23/2003. (29.12.) Decree of the Hungarian Ministry of Environment and Water ("Biowaste Decree")
- 246/2014. (29.09.) Hungarian Government Decree (Waste Treatment Plants) - 22-24.§
- 36/2006. (18.05.) Decree of the Hungarian Ministry of Agriculture and Rural Development (marketing as a product - End of Waste - EoW)
- 90/2008. (18.07.) Decree of the Hungarian Ministry of Agriculture and Rural Development on a soil protection plan

In accordance with § 32/A of the Waste Management Act CLXXXV of 2012, the Hungarian State has set up a coordinating organisation (in addition to the coordinating body) for the supply of the state public function.

The coordinating body, the NHKV – National Waste Management, Coordinating and Asset Management Private Corporation (further: NHKV Zrt.) was registered as a "closed", so-called non-stock cooperation in the district court on 20<sup>th</sup> January 2016.

NHKV Zrt. is primarily called upon to design and develop the regionally optimised and uniform waste management system in Hungary by establishing a long-term financing system.

The objectives to be achieved by NHKV Zrt. were determined in accordance with the expectations of the state:

- a uniform, public non-profit service system with a zero balance with the participation of NHKV Zrt., local self-government, public service providers and those who are connected to the service.
- full compliance with the recovery targets set by the European Union.
- the organisation of regionally optimised public services and the safeguarding of further developments and updates.
- improving the security of supply and ensuring the uniform service at a high level for the population, the comprehensive expansion of separate waste collections and their effective operation.
- the tasks of the NHKV Zrt. as coordinating body in accordance with the regulations of the Waste Management Act CLXXXV (Section (1) point 32/A.) of 2012 are:
  - determination of the objectives of waste management in Hungary,
  - formulation of guidelines for the development of waste management,
  - promoting regional coordination between self-governments,
  - preparation and updating of the public waste management plan for Hungary, which determines, the regional allocation of public services and their scope and content,
  - monitoring the implementation and development of public waste management services in accordance with the country's national waste management plan,
  - monitoring and evaluation of public services in accordance with the national waste management plan,
  - the provision and design of infrastructural resources to achieve the national objectives of waste management,
  - management of the financial resources contributed by the self-governments and their cooperations,
  - the design and collection of waste charges for public services and remuneration for public service providers; the competent ministry determines the service charges,
  - financial management of public services.

NHKV Zrt. (National Waste Management Service Cooperation), based in Budapest, unites in its structure 32 companies, which are either non-profit organisations and responsible for the public service or are profit-oriented belonging to the private waste management sector.

Some companies in the NHKV group are 100% state-owned and others state-owned with the participation of self-governments. NHSZ Miskolc Kft. is 100% owned by the Hungarian state and has contractual bonds with private waste management partners.



The NHKV has divided Hungary in overall 21 waste regions, each treating the municipal waste collected in central and/or decentralised facilities (see figure). The figure shows the waste regions. With yellow marking, the composting plants are shown. A total of 62 composting plants are recorded in Hungary. The frontiers of the waste regions do not always agree with the administrative areas which outline the current associations of municipalities.

Until the end of 2017, the goal had been to ensure that the separate collection and sorting of waste is carried out everywhere and that waste for landfilling is largely minimised.

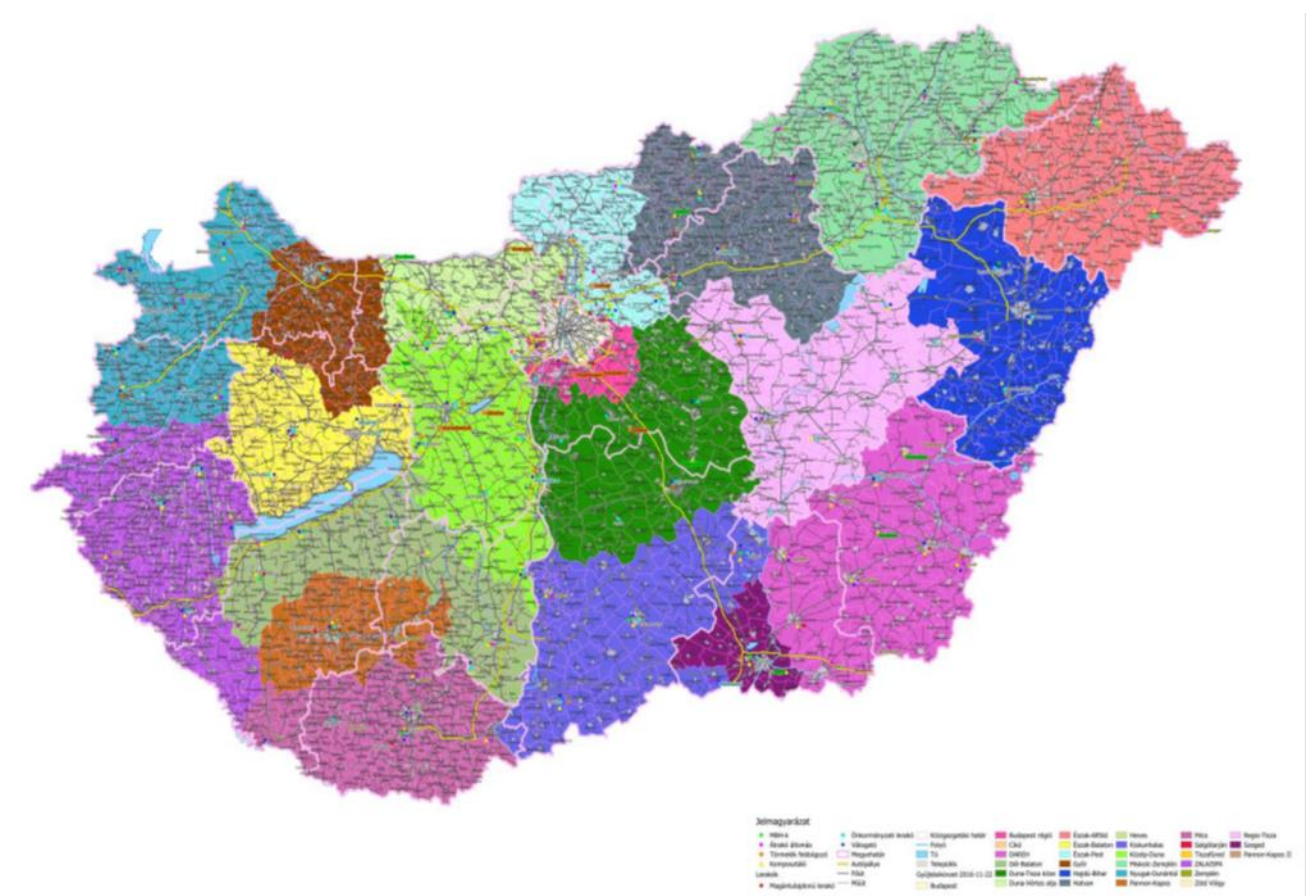
For the green waste mentioned here, this means that green waste is collected and composted separately in 21 regions. The existing composting plants have different capacities. Smaller plants are designed for processing 4,000 - 8,000 tons of green waste per year. Larger plants have a throughput of 30,000 - 50,000 tons per year (Budapest).

The main strategy for implementing the separate collection is outlined in the National Waste Management Plan (OHT) (2014-2020).

The main general objective of the waste policy is to prevent waste and increase recycling rates. Waste should be considered as a resource. The main objectives of the waste management policy are those set out in the EU directives: 50% recycling quota of household waste is to be achieved and the introduction of separate collection of glass, metal, plastic and paper waste shall be enforced. Furthermore, the facilitation of separate collection of bio-waste and a reduction of biodegradable waste deposited at landfill sites to 35% (compared to 1995) by 2016 should be stepped up.

According to the Waste Act, the principle applies:

the separate collection and recovery of biodegradable waste must be promoted so that materials of high purity can be returned to the natural cycle of organic substances after recovery!



## 5 Green waste treatment in Baden-Württemberg

### 5.1 PLANNING SPECIFICATIONS AND CURRENT MATERIAL FLOWS

In accordance with § 30 KrWG, the state of Baden-Württemberg is obliged to draw up a waste management plan. Legally, waste management plans are supra-local specialized plans. Waste management plans must be regularly evaluated and updated, at least every six years.

The current waste management plan of the state of Baden-Württemberg, sub-plan for municipal waste, applies from the date of its publication in 2015 to its re-update in 2021. The forecasts and strategies up to 2025.

The sub-plan for municipal waste deals with waste that is left to the public disposal services. This includes all types of waste generated in private households: mixed municipal waste, recyclables and separately collected waste streams (e.g. waste batteries and accumulators).

The presentation of the current state and development of the waste management as well as the corresponding infrastructure is based on the statewide waste balance sheets of recent years. The waste balance is compiled annually by the Ministry of the Environment in close cooperation with the National Statistical Office.

In 2015, the following findings with a high need for action were chosen in the waste management plan for **organic and green waste**:

<b>Definition</b>	separately collected biowaste and green waste
<b>Waste code N°</b>	kitchen waste (20 01 08), green waste (20 02 01), market waste (20 03 02)
<b>Compliance with legal requirements</b>	Utilisation of Biowaste, non-landfilling of biowaste
<b>Quantity</b>	total 1.372.000 t/y (2011), thereof 447.000 t Biowaste and 925.000 t Green Waste per capita biowaste and greenwaste 128 kg/y (2011) per capita biowaste 42 kg/y (2011) per capita greenwaste 86 kg/y (2011) progression since 1990: Biowaste +2630%, Greenwaste +300 %
<b>Collection</b>	Biowaste: separate biobin in 32 cities and counties Greenwaste: door-to-door-collection in 29 cities and counties
<b>Treatment and Recovery</b>	100% recovery Biowaste: 73 % composting, 27% anaerobic digestion Greenwaste: 18 % thermal recovery, 82 % material utilisation
<b>Need for action</b>	<b>high</b>
<b>Objectives and measures</b>	basically obligation for statewide separate collection of biowaste from 2015 on increase of biowaste per capita to 60 kg/y and resident (average, 2020) increase of greenwaste per capita to 90 kg/y and resident (average, 2020) rise of the N° of anaerobic digestion plants increase of thermal recovery of wooden greenwaste up to 20 % energy generation with material utilisation of the byproducts saving in greenhouse emissions substitution of fossil fuels decrease of food waste implementation of the requirements for green waste collecting facilities research projects for utilisation of digestion residues

Four years after the waste management plan came into force, Baden-Württemberg's public disposal providers disposed a total of around 12.44 million tons of waste in the year 2018. This is a little more than 416,000 tons, or just under 3.5% more than in the previous year (2017: 12.02 million tons). Domestic waste in the strict sense includes: household and bulky waste, including commercial waste from public collection (a total of 1.54 million tons), household recyclables (1.81 million tons) and waste from the biobin (553,000 tons). In 2018, the total amount generated rose to 3.90 million tons, which represented about one third of the total municipal waste generated. Also included in the municipal area is separately collected green waste (956,000 tons), waste out of electrical and electronic equipment (a good 81,000 tons including lamps), commercial and construction site waste (221,000 tons).

## Waste Quantities in Baden-Württemberg in 2018

kind of waste	total waste			thereof to			
	material utilisation	biological utilisation	other treatment	MBT	Thermal treatment	recovery on landfills	landfilling
	1,000 tons						
household waste	1,314.3	1.4		102.2	1,210.7		
bulky waste	229.3	75.2		1.3	152.8		
greenwaste	956.1	5.1	644.9	2.1	304.0		
biobin	553.2		553.2				
valuables	1,827.3	1,684.1	0.0		143.2		
commercial waste	197.8	12.6		0.5	157.1	1.3	26.3
construction waste	23.2	1.6			11.3	0.0	10.2
sweepings	27.9	14.3		1.8	8.9	0.9	1.9
hazardous waste	8.4	0.2		6.9	1.3		
electronic waste	81.5	81.5					
demolition waste	792.9	268.2			0.5	191.2	333.0
road construction waste	175.1	93.2				23.8	58.0
excavated earth	5,998.7	375.8				649.0	4,973.9
others	250.9	1.1	0.2	1.5	67.4	33.1	147.7
<b>total</b>	<b>12,436.5</b>	<b>2,614.4</b>	<b>1,198.3</b>	<b>13.6</b>	<b>102.7</b>	<b>2,057.1</b>	<b>899.4</b>
							<b>5,551.1</b>

Biowaste is a special recyclable material which, unlike most other residues, can be used energetically and materially. Since the first of January 2015, therefore domestic biowaste must be recorded separately and used in high-quality ways in accordance with the provisions of the Waste Management Act. The aim is to optimize the use of valuable biowaste out of households, also from the point of view of resource and climate protection.

In Baden-Württemberg, almost all of the 44 responsible municipalities and counties have the opportunity to use a separate collection of domestic biowaste.

Irrespective of the collection of biowaste from households, in all municipalities and counties of Baden-Württemberg there is the possibility to a separate collection of green waste as well. This is usually done in "bring-it-yourself systems" via 1,129 municipal green waste collection sites - recycling yards, chipping areas and composting plants.

In addition to facilities for the exclusive acceptance of green waste, the total number of green waste collection sites is also including locations like recycling centers with containers for green waste. In the summer months, in some districts a collection of woody green waste is also offered in a "collection system".

Since the introduction of the biobin in the first cities and counties in the early 90s, the volume of separately collected domestic biowaste in the country has increased considerably. In 1990, the average per capita was still 2 kg/ kg/inhabitant and year. It rose to 41 kg/inhabitant and year by the year 2000 and then stagnated at this level.

It was 2011 since when the collection amount increased again. Last time around 50 kg/inhabitant and year were collected. The production of green waste also increased rapidly since the 80s. After an insufficiently developed collection of around 20 kg/inhabitant and year, its first peak was reached in 2000 at 88 kg/inhabitant and year. After a reduction down to 73 kg/inhabitant and year in 2004, the collected volume stabilized again and stood at around 87 kg/inhabitant and year in 2018. The decrease in the volume of the collection compared to the previous year is mainly due to the hot and dry summer.

In Baden-Württemberg by 2018, more than 1.5 million tons of municipal bio- and green waste were available for high-quality use as an energy and material resource. By 2020, this quantity will be increased to 1.7 million tons (equivalent to an average of **60 kg/inhabitant and year of bio-waste** and **90 kg/inhabitant and year of green waste**) to improve the use of the potential of organic waste available from the households.

The capacity of organic waste for biological waste treatment plants (like composting and fermentation plants) located in Baden-Württemberg amounted to a total of around 1.31 million tons in 2018. In addition to the waste from the separate bio-waste and the green waste collection, the plants also treat other biogenic waste, such as food waste. Two thirds of this (871,000 tons per year) were attributable as bio and green waste for composting plants. Further 251,000 tons per year for pure fermentation plants and 183,000 tons per year for combined fermentation and composting plants. In order to use all domestic biowaste in the state in a high-quality manner, additional fermentation plants are needed in Baden-Württemberg. They have to be built up in the next few years.

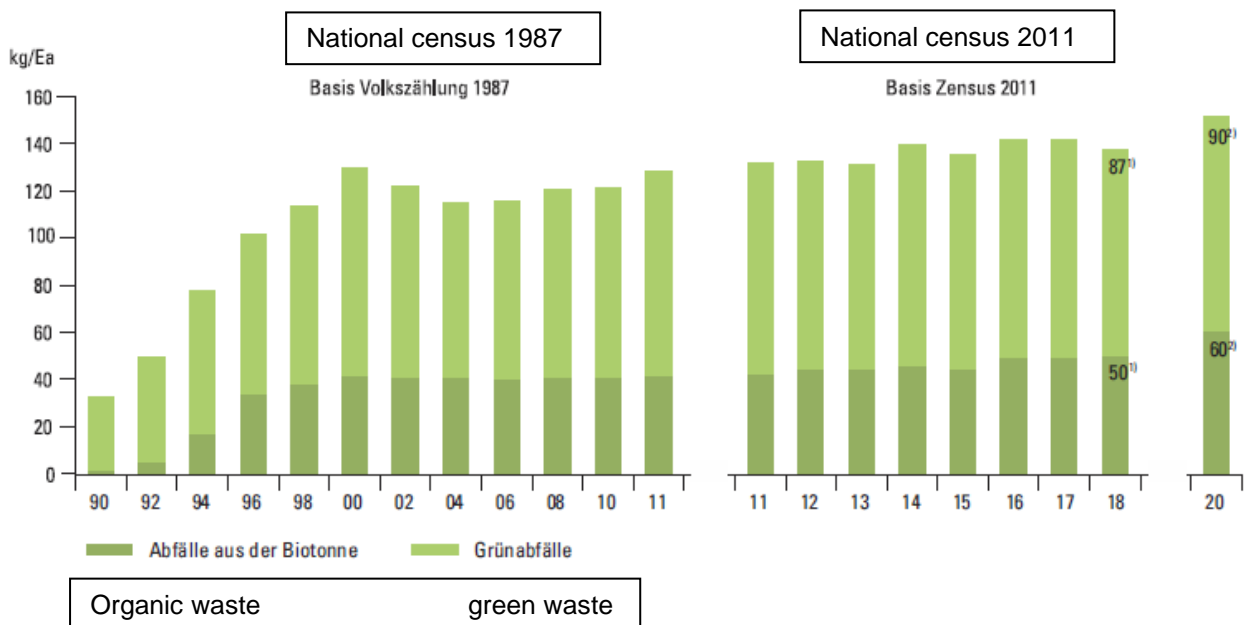
In 2019, nearly 100 plants with a processing capacity of more than 1 million t/y are members of the “Gütegemeinschaft Kompost Region Süd e.V.” (quality compost association region south) or directly of the “Bundesgütegemeinschaft Kompost e.V.” (national quality compost association). Due to this a uniform and defined quality guarantee of the produced compost goods is ensured to the consumer. Quality assurance for pure food waste fermentation is guaranteed for almost 200,000 t/y. More than 90% of the treated organic waste in Baden-Württemberg is subject to a transparent and independent quality monitoring.

## AUFKOMMEN AN ABFÄLLEN AUS DER BIOTONNE UND GRÜNABFÄLLEN IN BADEN-WÜRTTEMBERG

Quantity of organic and green waste in Baden-Württemberg

1990 – 2018 UND ZIELE FÜR DAS JAHR 2020  
IN KILOGRAMM JE EINWOHNER

1990 – 2018 and objectives for 2020  
In kg/inhabitant





# AUFKOMMEN UND VERWERTUNG VON GRÜNABFÄLLEN IN DEN STADT- UND LANDKREISEN BADEN-WÜRTTEMBERGS · 2018

Quantity and recovery of green waste in the cities and districts of Baden-Württemberg 2018

Per capita quantity in kg/inhabitant

PRO-KOPF-AUFKOMMEN

IN KG JE EINWOHNER

- unter 30
- 30 bis unter 60
- 60 bis unter 90
- 90 bis unter 150
- 150 und mehr

Landesdurchschnitt: 87

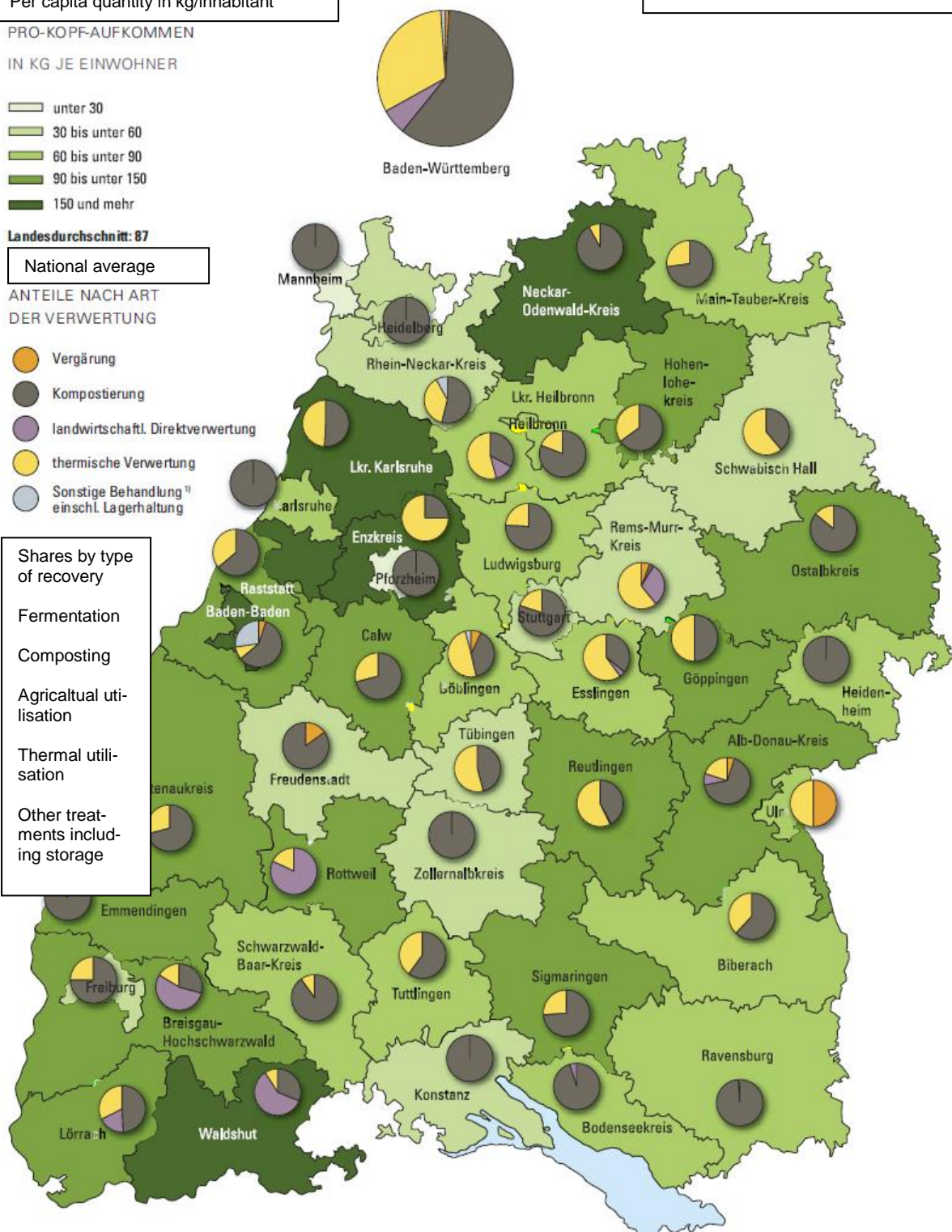
National average

ANTEILE NACH ART  
DER VERWERTUNG

- Vergärung
- Kompostierung
- landwirtsch. Direktverwertung
- thermische Verwertung
- Sonstige Behandlung<sup>1)</sup> einschl. Lagerhaltung

Shares by type  
of recovery

- Fermentation
- Composting
- Agricultural utilisation
- Thermal utilisation
- Other treatments including storage



In recent decades, various collection systems and structures have established themselves in the field of green waste treatment in Baden-Württemberg at district level.

If the biobin is introduced in a collection area, sub-quantities of green waste are also collected by this system. This must be taken into account in the quantity records of the separate green waste collection.

Besides to organic material, which can be collected via the biobin or biobag, additional quantities of shrub and tree cuttings from private and public gardens and green areas are to be regarded in the municipalities. Classically, this green waste is collected by the bring-it-yourself system. Thereby the burden of logistics is largely left to the waste producers. In order to achieve a high level of acceptance for this recording system and thus to achieve high collecting volumes, the best possible offer is required. In particular, it consists a sufficiently tight network of collecting points with opening hours outside core working hours, especially on Saturdays. This is also attractive for private individuals.

The greatest successes are achieved with a network density of less than five square kilometers of settlement area.

Another parameter for urban areas can be one delivery point per 10,000 inhabitants. The collection sites should be opened all year around. Exceptions can be, for example, snowy altitudes. In some districts, the collection sites are not fenced. Therefore, garden waste can be disposed there at any time.

This doesn't always have to be accompanied with good success due to contamination, misalignment or illegal deposits. The example of the district of Ludwigsburg shows that this isn't necessarily. The collection sites are operated and supervised by the respective municipalities. The more well-maintained the appearance, the higher the inhibition threshold for abuse. The district also employs people who take care for the places and who advise and supervise the suppliers during the core times.

The more you can rely on existing facilities and staff, the more opportune cost structure for green waste collection is given. For example, transfer points in waste management facilities such as recycling yards, waste treatment plants and landfills can be useful. Other public facilities, such as municipal building yards and sewage treatment plants, are also suitable as green waste collection points. Cooperation with companies such as construction waste treatment plants, landfills, civil engineering companies or companies in the gardening and landscaping sector should also be examined.

The example of the city of Karlsruhe shows that it is possible to provide containers for green waste even in large cities. Several freely accessible container locations have been set up there, some of them practically in the street space. The city produces high-quality green material compost, which is also quality monitored marketed at earth and substrate processing companies. This high product quality is based on a high-quality raw material, i.e. correspondingly clean garden waste. The container locations are approached daily, the containers are changed and the places are maintained. The positively developing revenue situation as well as the general problem of cash management at such institutions justifies not charging delivery fees.

Also gardening and landscaping companies are producing more and more green waste for disposal. Today only a few companies in this field are still able to convert the green waste on their company premises into composts and substrates. Therefore, it is mainly used for waste recovery. Usually the green waste comes from the maintenance of land properties, which are connected to the waste disposal. On the other hand, green waste from the maintenance of public spaces must be kept separate and charged, if it's handed over by the municipalities directly or through contracted third parties (such as companies in the gardening and landscaping sector).

Not all property owners are able or willing to load and remove the material by themselves to the collecting points. As a supplement to the services of gardening and landscaping, which are mainly concerned with the maintenance of areas, it may be useful to establish offers such as on-demand pick-up or the installation of container for a fee.

## **5.2 COMPOST PURITY AND QUALITY MONITORING**

In the case of public collection systems, foreign materials and contaminants in the organic and green material cannot be completely avoided. Metals, glass and plastics in particular can negatively affect the compost quality. This is more the case if the separation takes place uncontrolled in households or at decentralized and unguarded collection sites. The recovery/treatment process, tries via process engineering to sort existing contaminants out in order to produce a pure compost free of pollutants and contaminants. This is therefore a prerequisite for the application and recovery of the compost produced.

No technical removal of pollutants works 100% and additionally it is expensive and energy-intensive. Therefore, it is more important to minimize the input of undesirable foreign substances already when they arise. Public waste management providers are encouraged to launch appropriate information campaigns and public relations to focus the sensibility of the population as waste producers on this problem– and at least in part as compost users.

The problem of foreign substances can be found in Germany in the organic and green waste sector. Foreign materials in the bio-waste, which are collected via the biobin, are a problem that is increasingly becoming the focus of the participating actors and can be equated with the negative phenomena in the green waste sector described in Hungary.

The varietal purity of separately collected biowaste has steadily decreased in recent years. This is the experience of many private or municipal biowaste treatment plants. They have to struggle and to cope with increasing levels of foreign materials contained in bio-waste.

The main cause is a missing supervision of the separate collection of the local authorities responsible for this purpose. Whereas the biobin was previously accompanied by continuous public relations, this is hardly the case today, or no longer at all. In the municipalities, posts for waste consultants have been partly cut or completely abolished.

In addition, the biowaste treatment is practically forced to accept high levels of foreign materials in biowaste if they do not want to be on the losing side of tenders. In the contracts, it is not uncommon for the proportion of foreign substances of 5 % in weight or more to be accepted. A foreign substance content of 5 % in the biowaste means that in the treatment process, more than 99% of the foreign materials have to be separated in order to produce a pure and fine compost ready to non-restricted utilisation. Due to it, the technical feasible limits are reached.

On the other hand, customers rightly expect compost that is free or at least largely free of foreign materials. Therefore, operators of biowaste treatment plants find themselves in a quandary. They face challenges that they cannot solve on their own. Nevertheless, they are responsible for the quality of the fertilisers they produce and they are also obliged to provide a special "quality" when they use their compost or fermentation products. Especially when the quality label of the BGK - Bundesgütegemeinschaft Kompost e.V. is been used.

### **5.2.1 Current fertilization regulations**

According to the requirements of the current Fertilisers Ordinance (Düngemittelverordnung, DüMV), two new limit values were introduced instead of the previous limit value for external components of 0.5 % in weight:

1. a limit value for non-degraded plastics (foils) in the amount of 0.1 wt% DM and
2. a limit value for the sum of all other foreign substances in the amount of 0.4 wt% DM.

With the amendment, the legislator has reacted to increasing impurities with plastic foils with a low specific mass. The values have been valid since 01.01.2017.



### 5.2.2 Requirements of quality assurance

The requirements of RAL quality assurances go beyond the provisions of the fertilising law. Already 10 years ago, the General Assembly of the BGK had decided to introduce the degree of contamination as an additional parameter in addition to the foreign matter content in wt%. The evaluation benchmark of the level of contamination is the area sum of selected foreign materials.

Compared to the foreign materials content, the level of contamination has a much more direct relation to the optical effect of impurities in the substrate. At the time, the BGK had set a limit value of 25 cm<sup>2</sup>/l. This value is sharper in its effect than the pure mass of foreign materials how it is assessed in accordance with the legal provisions. The BGK has also decided to reduce the limit value for the area sum of selected foreign substances from 25 cm<sup>2</sup>/l down to 15 cm<sup>2</sup>/l test substrate.

The success of the circular economy of biowastes is finally decided by the market. Compost and fermentation products with more than negligible impurities will not be accepted by the market in the long term.

In the process chain of the treatment of biowaste, foreign substances can be separated with success by screening and other technical measures. However, the efficiency of these measures usually correlates with the amount of sieve residues that need to be eliminated. This in turn puts pressure on the efficiency of the recycling measure itself, because with the sieve residues also significant quantities of the product can be got lost and the residual waste disposal is at financial expense of the biowaste treatment.

The problem of foreign materials cannot be solved "end-of-the-pipe" alone. It must also be worked on at the source and at the polluters. The circular economy of waste will only be as successful in the future as it is possible to avoid foreign materials already from the separate collection.

In Baden-Württemberg, nearly 100 companies and plants treating biowaste and green waste from the public collection are members in the compost quality association (BGK) and have committed themselves to comply with these quality standards.

The plastics found in green waste are primarily plastic bags in which the plant waste is transported (unless the bags have been emptied). Furthermore, it's plant pots and materials such as cords, clamps, binding wires and other plastic used in gardens. Due to its origin, green waste is containing fewer plastics than biowaste. However, contrary to common assumptions, it is not always free of plastics.

*Note on commercial waste:* in contrast to biowaste from private households, biowaste from the retail or food processing is not subject to the hand over obligation of the responsible regional authorities. Commercial producers of biowaste are responsible for the disposal of their waste by themselves. According to the Industrial Waste Ordinance a corresponding separate collection is also required. In the field of commercial biowaste, plastics used for packaging are primarily entering the system. The recovery of packaged food waste requires unpacking and separation of packaging materials before the treatment starts.

### Limit values

For fertilisers, soil aids, culture substrates and plant aids, including composts and fermentation products, the limit values of the Fertilisers Ordinance (DüMV) as shown in the following table are applied:

	Foreign substance	legal limit value
	<b>Fremdstoff</b>	<b>Grenzwert DüMV</b>
Deformable plastics	Verformbare Kunststoffe > 2 mm Siebdurchgang	max. 0,1 % i.d. TM
Other foreign substances	Sonstige Fremdstoffe > 2 mm Siebdurchgang	max. 0,4 % i.d. TM

If these limit values are exceeded, the products are not marketable under the fertilising provisions. They cannot be handed over or applied. Besides the gravimetric limit values of the legal provisions, a further limit value in the BGK's RAL quality assurances for the area sum (regulatory area) of the sorted out foreign materials in the amount of a maximum of 15 cm<sup>2</sup>/l test substrate is applied. The parameter is stricter in effect than the legal provisions. If this limit value is exceeded, the product cannot be distributed with the RAL quality label.

In the test certificates of the RAL quality assurance, the contents of foil-like plastics as well as other foreign materials including hard plastics are indicated. In the BGK thematic paper, further differentiations are made for biowaste and green waste compost as well as fermentation products.

In addition, information on the importance of particles of size 1 -2 mm is included, which currently are not covered by the test method for foreign materials. According to this, the inclusion of the fraction 1 -2 mm increases measurement values for foreign materials and plastics by approx. 10 %. In some cases, also up to 20 %. This is especially relevant against the background of the current draft amendment to the Fertilisers Ordinance, which schedules the reduction of the reference value for foreign substances from 2 mm to 1 mm per sieve passage.

The quality requirements of the Fertiliser Ordinance or the BGK Guidelines are summarised in the following tables:

## Quality criteria and quality guidelines for mature compost

Quality characteristics	Quality requirements																							
Hygiene	<ul style="list-style-type: none"><li>• proof that can be tested on epidemic-hygienic effectiveness of the decomposition process (process test or "Konformitätsprüfung")</li><li>• Compliance with time-/temperature requirements (process control)</li><li>• exclusion of germinable seeds and sprouting plant parts ('free' means &lt; 2 plants/l compost)</li><li>• exclusion of <i>Salmonellae</i></li></ul>																							
Impurities	Impurities > 2mm <ul style="list-style-type: none"><li>• maximum 0.5 weight-% in dm selectable (&lt;0,1 weight-% in dm for light plastics/foils and &lt; 0,4 weight-% in dm for all other impurities),</li><li>• Total surface area of impurities &lt; 25 cm²/l fm (&lt;15 cm²/l fm after 01.07.2018)</li></ul>																							
Stones	<ul style="list-style-type: none"><li>• &gt;10mm: max. 5 weight %</li></ul>																							
Plant compatibility	Plant compatibility for the provided area of application																							
Decomposition degree	degree IV or V																							
Water content	<ul style="list-style-type: none"><li>• bulky material maximum 45% weight</li><li>• higher contents of water are admissible for composts with more than 40% om according to annex 3 of the RAL Quality and Test Regulations</li></ul>																							
Organic matter	at least 15 weight-% in dm, measured as volatile solids																							
Content of heavy metals	Guide values (mg/kg dm) <table><tr><td>Lead</td><td>150</td><td>cadmium</td><td>1.5</td></tr><tr><td>Chromium</td><td>100</td><td>mercury</td><td>1.0</td></tr><tr><td>Nickel</td><td>50</td><td></td><td></td></tr><tr><td>zinc</td><td>400</td><td></td><td></td></tr><tr><td>copper</td><td>100</td><td></td><td></td></tr></table>				Lead	150	cadmium	1.5	Chromium	100	mercury	1.0	Nickel	50			zinc	400			copper	100		
Lead	150	cadmium	1.5																					
Chromium	100	mercury	1.0																					
Nickel	50																							
zinc	400																							
copper	100																							
Parameter for declaration	<ul style="list-style-type: none"><li>• mature compost (grain size)</li><li>• producer</li><li>• bulk density (volume weight)</li><li>• pH-value and salt content</li><li>• plant nutrients total (N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O, MgO, CaO)</li><li>• plant nutrient soluble (N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O)</li><li>• organic matter</li><li>• net weight or volume</li><li>• information for a suitable application</li></ul>																							

dm = dry matter, fm= fresh matter, om = organic matter

### 5.3 THRESHOLDS AND LIMIT VALUES

	Unit	Fresh compost	Mature com- post	substrate compost
Weed seeds	[Pl./l]	$\leq 2$	$\leq 2$	$\leq 0,5$
Impurities > 2mm: - plastics deformable (Foil) - other impurities	[% DM] [% DM]	$\leq 0,1$ $\leq 0,4$	$\leq 0,1$ $\leq 0,4$	$\leq 0,1$ $\leq 0,4$
Impurities > 5 mm	[%]	-	-	$\leq 0,1$
Surface area of impurite („Flächensumme“)	[cm <sup>2</sup> / l FM]	$\leq 15$	$\leq 15$	$\leq 10$
Stones > 10 mm	[%]	$\leq 5$	$\leq 5$	$\leq 0,5$
Stones 2-10 mm	[%]	-	-	$\leq 5$
Particle 0-5 mm	[%]	-	-	$\geq 50$
Gaseous phytotoxins	[%]	-	-	$\geq 80$
Plant response 25 Vol. %	[%]	-	$\geq 80$	$\geq 80$
Pflant response 50 Vol. %	[%]	-	x	$\geq 80$
Rotting degree/Stability	-	II, III, [IV],[V]	IV, V	V
Water contentt (Tolerance für single analysis +20%)	[%]	nur lose $\leq 45$	lose $\leq 45$ Sack $\leq 35$	lose $\leq 45$ Sack $\leq 35$
Organic matter (Tolerance for single analysis -10%)	[% DM]	$\geq 30$ (5)	$\geq 15$ (5)	$\geq 15$ (5)
Liming material (CaO)	[% DM]	(5)	(5)	(5)
Grain size (For grain size >20mm: 90% Sieve passage <20mm)	[mm]	$\leq 40$	$\leq 40$	$\leq 25$
Salinity	[g KCl/l FM]	-	-	$\leq 5$
Salmonellae	-	None in 50 g	None in 50 g	None in 50 g
Compliance with time/temperature requirements of Biowaste directive	-	Undisputed	Undisputed	Undisputed
N <sub>total</sub>	[% DM]	(1,5)	(1,5)	(1,5)
N <sub>soluble</sub>	[mg/l FM]	-	-	600
N <sub>soluble</sub>	%	(10) if N <sub>total</sub> > 1,5	(10) if N <sub>total</sub> > 1,5	(10) if N <sub>total</sub> > 1,5
P <sub>total</sub> (P <sub>2</sub> O <sub>5</sub> )	[% DM]	(0,5)	(0,5)	(0,5)
P <sub>2</sub> O <sub>soluble</sub>	[mg/l FM]	-	-	2400

## **5.4 EXAMPLES OF GREEN WASTE PROJECTS IN BADEN-WÜRTTEMBERG**

In June 2019, a delegation from Hungary visited selected municipalities in Baden-Württemberg and learned about the respective concepts and experiences with the treatment of green waste on city and county level.

- County of Göppingen
- County of Esslingen
- County of Ludwigsburg
- State capital city of Stuttgart.

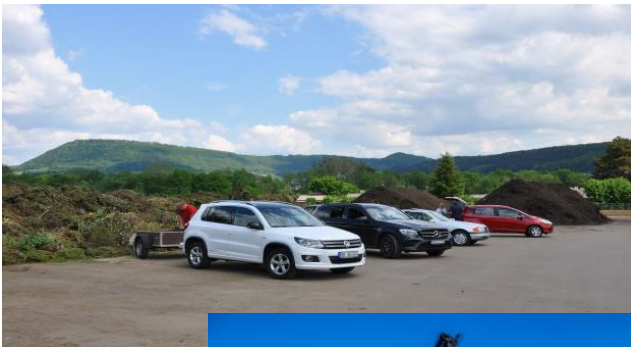
Comprehensive documentation of the individual concepts is attached to this report.



Welcome of the delegation at the Ministry of the Environment in Stuttgart

Treatment structures in the **county of Göppingen**

Population	252.000 (2011)
Area	642.3 km <sup>2</sup>
Approved waste	Garden and park waste, including cemetery waste
Excluded waste	Kitchen waste, small animal litter, plant soil
Composting sites (districts)	12 places, each 3,500 m <sup>2</sup> - 5,000 m <sup>2</sup> , opened 2-5 half days a week
Collection sites of the municipalities	11 places, 500 m <sup>2</sup> - 1,500 m <sup>2</sup> each , opened twice a week
Implementation of composting sites	2016 - 2018 Investment costs € 4.5 million Euro Operating costs 1,6 Mio. €/y
Households deliver free of charge; commercial companies are paying 10 €/m <sup>3</sup> .	
Recorded amount of green waste	approx. 32,868 t/y in 2018 thereof 14,790 t/y in thermal utilisation – heating/power plants thereof 14,790 t/y as compost in earthworks and self-marketing
Recorded amount of green waste per capita	approx. 137 kg/y in 2017 and 128 kg/y in 2018, collection of biobags (no biobin)
Treatment process	acceptance control by employees crushing unventilated triangular compost heaps, hygienization turning the compost up to 5 times screening 10 mm > overgrain in thermals, subgrain in earthworks and self-marketing





Treatment structures in the **county of Esslingen**

Population 517, 200 (2011)  
Area 641.5 km<sup>2</sup>

Approved waste Garden and park waste, non-woody greenery, foliage and grass

Excluded waste Kitchen waste, small animal litter, plant soil

Composting sites (district) 9 places, each 3,500 m<sup>2</sup> - 5,000 m<sup>2</sup>, opened 2-5 half days a week  
and compost plant Kirchheim/Teck

Collection sites 34 places, 500 m<sup>2</sup> - 1,500 m<sup>2</sup> each, open twice a week

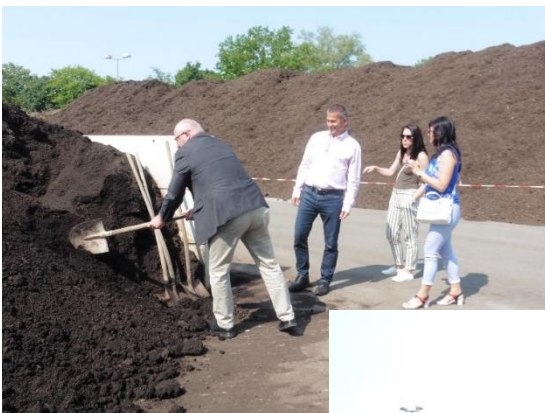
Operating costs green cutting collection sites €1.15 million/y incl. compost revenue

Households deliver free of charge, commercial companies have to pay.

Recorded amount of green waste approx. 35,700 t/y in 2018  
of that 21,300 t/y in thermal utilisation  
of that 14,400 t/y in composting

Recorded amount of green waste per capita approx. 65 kg/y in 2017 and 67 kg/y in 2018,  
additionally, via biobin

Treatment process acceptance control by employees  
crushing  
unventilated triangular compost heaps, hygienization  
turning the compost up to 5 times  
screening 10 mm > overgrain in thermals, subgrain in earthworks and  
self-marketing



Treatment structures in the **county of Ludwigsburg**

Population	542,630 (2017)
Area	686.8 km <sup>2</sup>
Approved waste	Garden and park waste, rice, tree cutting, wood, grass and foliage in containers
Excluded waste	Kitchen waste, small animal litter
Composting sites (private)	3 places, 1 earthwork
Collection/shredding sites	36 places, of which 34 municipal, 1 private, 1 AVL Municipal squares are unattended and not fenced. Support by 8 Scouts
Households deliver free of charge.	
Recorded amount of green waste	approx. 43,200 t/y in 2018 of that 8,000 t/y in thermal utilisation of that 22,000 t/y in composting of that 3,600 t/y via grass containers of that 9,600 t/y to a private shredding place
Recorded amount of green waste per capita	approx. 82 kg/y in 2017 and 80 kg/y in 2018, additionally, via biobin
Treatment process	composting at private service providers acceptance control by employees crushing unventilated triangular compost heaps, hygienization turning the compost up to 5 times screening 10 mm > overgrain in thermals, subgrain in earthworks and self-marketing





Treatment structures in the **state capital city of Stuttgart**

Population 613,400 (2012)  
Area 207.4 km<sup>2</sup>

Approved waste Garden and park waste

Excluded waste Kitchen waste, small animal litter

Collection and composting sites 2 places, fenced with opening hours

Households deliver free of charge.

Recorded amount of green waste 31,836 t/y in 2018

Recorded amount of green waste  
per capita approx. 57 kg/y in 2017 and 50 kg/y in 2018,  
additionally, via biobin

Treatment process acceptance control by employees  
crushing  
unventilated triangular compost heaps, hygienization  
turning the compost up to 5 times  
screening 10 mm > overgrain in thermals, subgrain in earthworks and  
self-marketing



## 6 Green waste treatment in Hungary

### 6.1 PLANNING SPECIFICATIONS AND CURRENT MATERIAL FLOWS

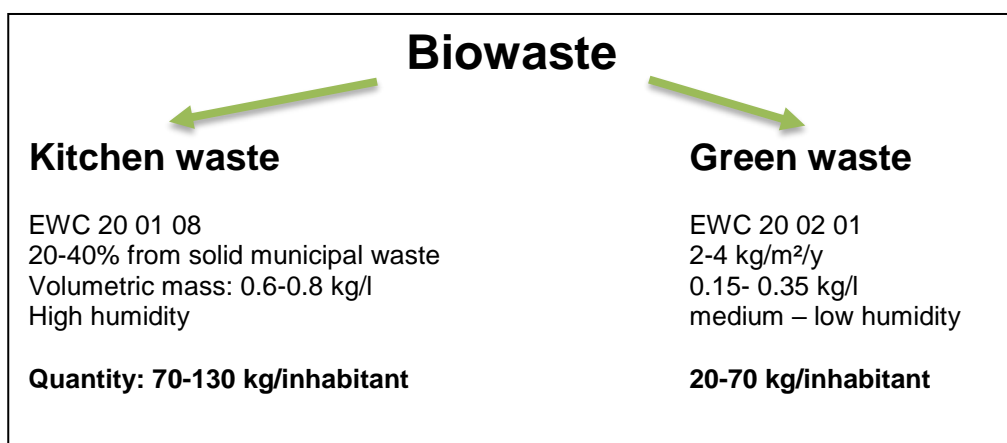
Hungary generates approximately 3.8 million tons of municipal waste per year.

Thereof, 2.3 million tons are deposited on landfills, 1.1 million tons are recycled and 0.4 million tons are used in the incineration plant Rakospalota (HUHA) (2017, NHKV).

Biowaste recovery in Hungary 2017:

<b>Einwohnerzahl:</b>	<b>Population</b>	9.797.561
<b>Jährliche Menge des festen Siedlungsabfalls:</b>	<b>municipal w./a</b>	3.752.000 t (KSH 2017)
<b>Jährliche Menge des Bioabfalls:</b>	<b>organic waste/a</b>	1.013.000 t (27% aus festen Siedlungsabfällen)
<b>Getrennt gesammelter Bioabfall:</b>	<b>seperatly collected organic waste</b>	236 000 t/Jahr (KSH 2017) (24 kg/Person/Jahr)
<b>Eigenkompostierung:</b>	<b>self composting</b>	135 000 t/Jahr (Schätzung der NHKV)
<b>Anzahl der Kompostierungsanlagen:</b>	<b>Numer of compost plants</b>	81
<b>Durchschnittskapazität von Kompostierungsanlagen:</b>	<b>average capacity</b>	3000 t/Jahr

The predicted biowaste potential in municipal waste is shown in the figure below.



It is planned to establish three regional recycling centers in the country by 2022. In line with the objectives of the National Waste Management Plan (OHT) for the preparation of re-use and recycling of waste (such as paper, metal, plastic, glass from households and possibly from other sources) should be changed to a minimum of 50% by 2020 when these waste streams are similar to household waste.

The country's performance in terms of municipal waste recycling has improved dramatically in recent years; from almost zero (2% in 2001) to 25.4% in 2012 and further increasing.

It is estimated (2013) that household waste contains approximately 13.5% paper, 20% plastics, 5.9% glass and 6.4% metal, and around 52% of the household waste is biodegradable. This means that 54.5 kg of paper, 80 kg of plastic, 24 kg of glass and 25 kg of metal are generated per capita.

In 2012, there were a total of 9.437 recycling centers. The door-to-door collection system comprised only 500,000 households. In addition, 262 urban institutions supplemented all separate collection systems, which also included bulky waste, electrical waste and electronic equipment or other hazardous waste from households.

Bring-it-yourself systems remain the primary collection mode for thinly populated regions, which have strong seasonal fluctuations (like summer and winter holiday locations).

With the requirements of the Waste Framework Directive, the system has been gradually changed since 2011 into door-to-door collections, which is also favored in the national legislation.

The first results showed that bring-sites reached an annual collection of 8-10 kg/capita, while the door-to-door collection showed increased separation accumulations of 22-30 kg/capita. The national waste management agency (OHÜ) estimates the level of miss-sorting and impurities to be 5-6 %.

A mixed collection is only permitted for plastic and metal waste (which must be collected together) and in the new door-to-door collection.

Glass, as the only exception, has to be collected mainly through the network of collection points. The Collection rate is expected to increase to 65% by condensing the bring network.

Biowaste (green waste) is usually removed by door-to-door collections. The collection quantities are about 200,000 t per year. In addition, around 250,000 to 300,000 tons of self-composting are carried out.

In the past, the separate bring-it-yourself and collection system was essentially free of charge for the public and was financed by the packaging manufacturers. With the introduction of the door-to-door collections, there is a pay-per-bin system. Glass is excepted of this, it is usually collected in the bring-it-yourself system.

The waste collecting companies must offer two container sizes for all fractions in order to allow households to choose the size of the container. The container size defines the price of the removal.

The guidelines for green waste treatment are formulated in the National Waste Management Plan (OHT) as follows:

- By 2020, the distribution of home and municipal composting and the local recovery of green waste must be achieved.
- The dissemination of natural substances in soil management, fertilization and their methods of use must be encouraged, such as the development of the economy of organic substances for example.
- The agricultural use of compost from agricultural and food-degradable waste and secondary products must be encouraged.
- Landfilling of biodegradable plant by-products and waste in landfills must be restricted or stopped. Decentralized (home, municipal, settlement) composting should be disseminated, primarily at the site of the origin of organic waste.
- Composting and biogas plants should be built parallel with the development of the quality assurance of compost.

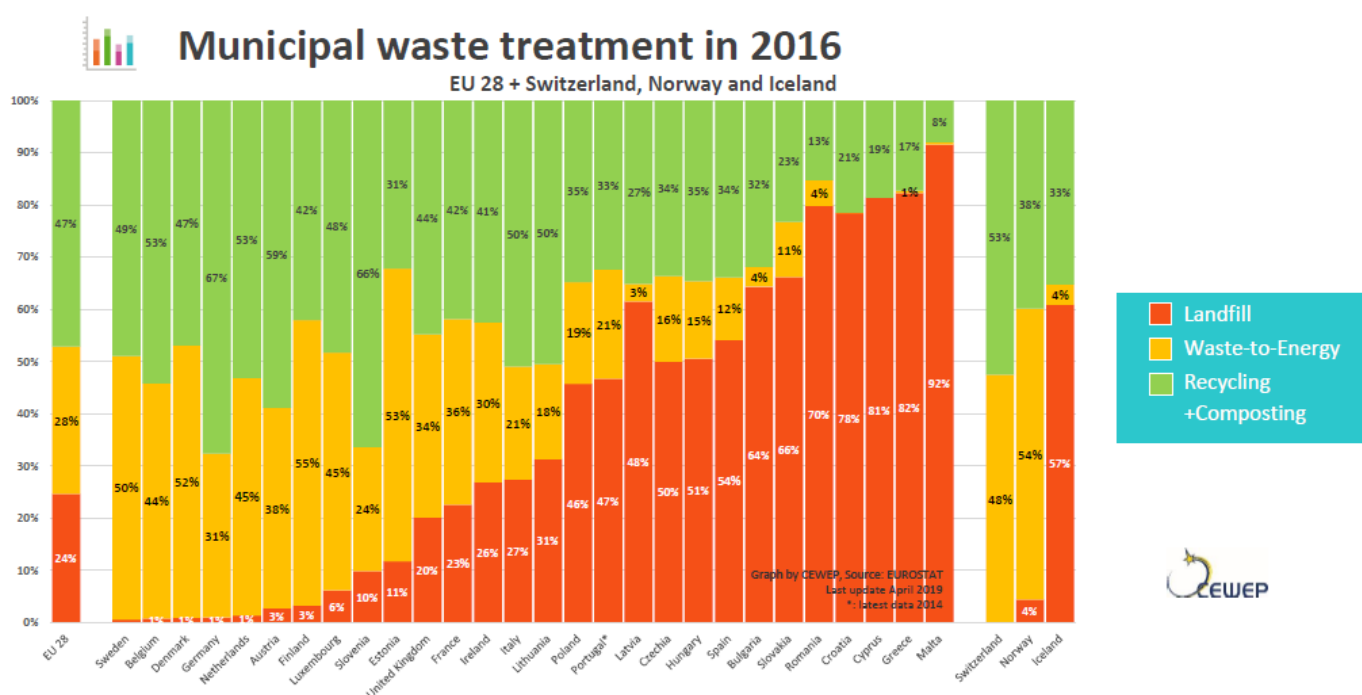
The collection and removal of green waste, which are the task of public service enterprises, should be ensured in a specific way and with a minimum frequency.

### Collection

- separate collection (provided loose, in containers or often in plastic bags)
- bundling
- on-site crushing, disposal of the crushed material
- waste collection site, recycling center or other possibility of acceptance

### Collective appointments

- at least 10 times a year in detached houses
- at least 4 times a year in apartment blocks



## 6.2 COMPOST PURITY AND QUALITY MONITORING

In Hungary, the legislator has regulated the interests for admission and quality of fertilisers by means of a relevant legal directive.

The following are the guidelines of the Ministry of Agriculture for fertilizers in general and for compost in particular:

- Regulations for the admission and marketing of fertilisers
- Scope of investigation and analysis for the approval of compost as fertiliser
- Quality regulations and requirements for the raw materials
- Declaration obligations

Annex No.1 to the Ministerial Decree of the Hungarian Ministry of Agriculture and Rural Development 36/2006 (18.05.)

**Application for authorisation and marketing**

1. Trade name of the fertiliser product.
2. Type of fertiliser product as set out in Annex No 1.
3. Name of the manufacturer and the holder of the admission, address and statistical number, place of manufacture, in the case of contract manufacturing name of the contract manufacturer, address and statistical number of the contract manufacturer.
4. Applicant's name, address and statistical number.
5. All components of the fertilising product, name and concentration of active substances and contaminants, place of origin and concentration of basic materials.
6. Quality features guaranteed by the manufacturer.
7. Applications and doses specified by the manufacturer, mode of action of the fertiliser product.
8. Classification in fire hazard classes.
9. Conditions of storage and durability specified by the manufacturer.
10. Packaging unit, packaging material and label design for marketing specified by the manufacturer.
11. The first six digits of the customs tariff number of the fertilising product specified by the applicant.
12. The UN number and the ADR/RID class if the fertiliser product is subject to the Regulations on the Carriage of Dangerous Goods (ADR/RID).
13. Decision of the Mining Inspectorate on the technical operational plan of exploration and production if the products are obtained from mining.
14. Description of the production process of the fertiliser product.
15. The documents attached to the application:
  - 15.1. Test results of the fertilizing product.
  - 15.2. Safety data sheet of the fertilizing product in accordance with the provisions of the Chemical Safety Act.
  - 15.3. Proof of payment from the approval fee.
  - 15.4.
  - 15.5. According to the separate provision, the fertilizing product and its effect must be described in the soil and on groundwater if it contains dangerous elements.
  - 15.6. It must be stated in writing that the product to be allowed, due to its respective characteristics and its designation do not infringe the intellectual property rights of third parties.
  - 15.7. The manufacturer must have a power of attorney for the authorization if the manufacturer and the applicant are not the same person.
  - 15.8. There must be a statement by the manufacturer designating the license holder if the manufacturer and the license holder are not the same person.
  - 15.9. There must be the consent of the owners of trade names or protected brand names.
  - 15.10. There must be confirmation from the manufacturers of fertilizers that they agree to the use of the basic material in the given fertilizer product and ensure delivery for at most one year.
  - 15.11. There must be a permit to treat the waste when waste is processed.
  - 15.12. Veterinary authorities must obtain authorization for the processing of animal by-products.
  - 15.13. An operating license must be obtained.

*Annex No 1.*

**Types of fertilizer products**

**4. COMPOSTS**

*Annex No. 2 to the Ministerial Decree of the Hungarian Ministry of Agriculture and Rural Development 36/2006 (18.05.)*

**Scope of the investigation and information to be attached to the application for admission**

**4. COMPOSTs**

**4.1. Physical-chemical examination from a sample quantity of 3 x 1 kg:**

- Appearance: color, smell, physical condition,
- pH (in a 10% suspension in water),
- volumetric mass,
- dry matter content,
- organic substance content,
- total water-soluble salinity,
- distribution of particle size,
- active substances indicated by the manufacturer (N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O, Ca, Mg, etc.).

**4.2. Testing of toxic elements from a sample quantity of 3 x 1 kg:**

- As, Cd, Cr, Co, Cu, Hg, Ni, Pb, Se.

**4.3. Testing of organic contaminants from a sample quantity of 3 x 1 kg or l**

Depending on the quality of the waste recycled into compost, the following substances can be examined or their examination can be arranged:

- total PAH content (19 compounds),
- benzo(a)pyrene content,
- mineral oil content (TPH C5-C40),
- total indicator PCB content (sum of PCB-28, 52, 101, 118, 138, 153, 180),
- total PCDD/F content in WHO TEQ.

**4.4. Investigation of the anti-germ-inhibiting effect and weed effect, or study of the freedom of plant pathogens and vermin from a sample quantity of 4 x 3 kg.**

**4.5. Investigation of biological effects.**

4.5.1. 2-4 Studies in the open-field or in the closed cultivation system of products which have not yet been approved for the given purpose, depending on a separate legislation.

4.5.2. 2-4 Biological studies, each in separate legislation, in the field or in the closed cultivation system for products which have not proved their worth during the study of the anti-germ.

4.5.3. Investigation with 1-2 experimental fungi in fungal composts and fungal covering grounds.

**4.6. Occupational safety and health information: hazard classification, warning signs, rates indicating risks (R) and safety (S), experience with the manufacturer and the user, local irritating effects (skin, eyes, respiratory tract), sensitization, other symptoms.**

**4.6.1. Hygienic microbiological examination from a sample quantity of 3 x 0.5 kg:**

- determination of the number of Faecal Coliforms,
- determination of the number of Pseudomonas Aeruginosa,
- determination of the number of Faecal Streptococcus,
- Detection of Salmonella sp.,
- Determination of the larvae count of the human-parasitic intestinal worm.

4.6.2. Radiologic tests out of a sample quantity of 3 x 0,5 kg. (only in case of import peat)

4.7. Depending on the quality of the waste recycled into compost, further ecotoxicological studies (daphnia, fish and algae tests) may be ordered.

Annex No.3 to the Ministerial Decree of the Hungarian Ministry of Agriculture and Rural Development 36/2006 (18.05.)

### **Quality regulations for fertilizer products**

#### **4. COMPOSTS**

##### **4.1. Regulations relating to active substances**

- pH (10% suspension in water) 6.5-8.5
- volumetric mass (kg/dm<sup>3</sup>) not more than 0.9
- Dry matter content (m/m%) at least 50.0
- organic substance content (m/m%) TS at least 25.0
- total water-soluble salinity (m/m%) TS no more than 4.0
- Distribution of particle size below 25.0 mm at least 100.0
- N-content (m/m%) TS at least 1.0
- at least 20 m/m% for mushroom composts
- P<sub>2</sub>O<sub>5</sub> content (m/m%) TS at least 0.5
- K<sub>2</sub>O content (m/m%) TS at least 0.5
- Ca content (m/m%) TS at least 1.2
- Mg content (m/m%) TS at least 0.5
- exclusively from green waste
- N-content of compost (m/m%) TS at least 0.5

##### **4.2. Regulations relating to toxic elements**

	As	Cd	Co	Cr	Cu	Hg	Ni	Pb	Se
	Maximum content mg/kg dry matter content								
Composts	10	2	50	100	300	1	50	100	5

##### **4.3. Requirements relating to organic contaminants**

- Total PAH content (19 compounds) <1.0 mg/kg TS
- Benz(a)pyrene content < 0.1 mg/kg TS
- Mineral oil content (TPH C5-C40) < 100.0 mg/kg TS
- total indicator PCB content (sum of PCB-28, 52, 101, 118, 138, 153, 180) < 0.1 mg/kg TS
- total PCDD/F content in WHO TEQ < 5.0 ng/kg TS T.E.Q.

4.4. The product cannot contain any foreign substances that may not be introduced into the biological cycle. These substances could be germ-inhibiting and anti-growth substances. Furthermore, it cannot contain cores or vegetative parts of quarantine pests, micro- and macro-elements which are for the human, animal and plant health as harmful or contagious, toxic substances, pollutants and radioactive substances.

4.5. Biological efficiency shall be equivalent to the effect guaranteed by the manufacturer.

##### **4.6. Requirements on microbiological soil hygiene**

- Number of Faecal Coliforms < 10 pcs/g or 10 pcs/ml
- Number of Faecal Streptococcus < 10 pcs/g or 10 pcs/ml
- Number of Pseudomonas Aeruginosa < 10 pcs/g or 10 pcs/ml
- Salmonella sp. negative / 2 x 10 g or ml
- Larvae number of the human-parasitic intestinal worms negative 100 g or 100 ml

Annex No.4 to the Ministerial Decree of the Hungarian Ministry of Agriculture and Rural Development 36/2006 (18.05.)

**Information to be given on the packaging material of the fertilizing product or in the accompanying document of the bulk goods for a net weight of 100 kg**

1. Number and scope of the authorization.
2. Trade name of the fertilizer product (clearly visible, unambiguous, readable).
3. Type of fertilizer product according to approval.
4. Name, address and statistical number of the manufacturer.
5. Name, address and statistical number of the holder of the authorization.
6. The nutrient content required by the authorization and the solubility required by the authorization, as specified in the annex to Annex No 4.
7. Instructions for use.
8. Hazard classification, warning signs, rates indicating risks (R) and safety (S), necessary protective equipment during use, first aid.
9. Environmental legislation.
10. Classification in fire hazard classes.
11. Storage regulations.
12. Date of manufacture (year, month, day), shelf life, manufacturing number or identification mark of the lot, as indicated by the manufacturer.
13. The first six digits of the customs tariff number of the fertilizing product specified by the applicant.
14. Guaranteed net weight or volume.
15. The UN number and the ADR/RID class if the fertilizer product is subject to the Regulations on the Carriage of Dangerous Goods (ADR/RID).
16. Other provisions.
17. Minimum font size of mandatory information on labels:

	A	B	C	D
1.	Packaging (kg oder l)	0□0,5	0,5<2	2□
2.	Minimum font size	8	10	12



### **6.3 EXAMPLES OF GREEN WASTE PROJECTS IN HUNGARY**

In February 2019, a delegation from Baden-Württemberg visited selected Hungarian waste disposal companies and learned about the respective concepts and experiences with green waste treatment.

#### **Ministry of Innovation and Technology, State Secretariat for Public Services**

- Mr. Zoltán Törő, Deputy of the Department of Public Services
- Ms. Enikő Vadász, Officer of the Department of Public Services
- Ms. Vivien Vadkerti, Officer of the Department of Public Services

#### **NHKV (National Holding for the Coordination of Waste Management)**

- Ms. Mária Bodnár, Service and Technical Director
- Ms. Júlia Fülöp, Head of the Development Office
- Ms. Ágnes Czibók, Project Manager

#### **Kaposvárer Waste Management Nonprofit GmbH (Kaposvári Hulladékgazdálkodási Nonprofit Kft)**

- Mr. Ádám Szilágyi, Managing Director
- Ms. Erzsébet Gelencsér, Head of Service

#### **Fővárosi Kertészeti Nonprofit Zrt., Capital Market Garden Nonprofit gAG**

- Mr. László Sohajda, Operations Manager

#### **Regional waste treatment plant in Debrecen**

##### **NHSZ Tisza Kft.**

- Mr. Béla Szabó, Environmental Officer

#### **Waste treatment center in Sajókaza**

- Mr. Péter Sztupák, Managing Director of Zöldvölgy Kft. on behalf of the association for waste management of the Sajó-Bódva Valley and its surroundings

#### **NHSZ Észak-KOM Hulladékgazdálkodási Közszolgáltató Nonprofit Kft.**

- Landfill in Hejőpapi

## **Kaposvárer Waste Management Nonprofit GmbH (Kaposvári Hulladékgazdálkodási Nonprofit Kft.)**

### **Adress:**

Kaposvári Complex Hulladékkezelő Központ  
7400 Kaposvár, külterület 0324/27., 0324/28 hrsz.  
EOV Koordinate: X: 113 940, Y: 559 670  
<http://www.khg.hu/>

### **The delegation was received by:**

- Mr. Ádám Szilágyi, Managing Director
- Ms. Erzsébet Gelencsér, Head of Service

### **Disposal area**

- City of Kaposvar 60,00 -70,000 inhabitants
- Surrounding area 120,000 inhabitants

### **Organization**

- In the area of green waste service providers for the citizen
- Ownership
  - 40% NHSZ Miskolc
  - 50% City of Kaposvar
  - 10% surrounding municipalities
- NHSZ Miskolc is the operator of the plant on behalf of the owners

### **Plant details, technical equipment**

- Area 10,000 m<sup>2</sup>, asphalted
- Leachate retaining basin with return irrigation
- Crusher: Willibald company fast runner, wheel loader
- Drum sieve

### **Mass flows**

- Input approx. 2,500 t/y from street collection, industry and municipalities
- Street collection over plastic bags (because paper bags tear)
- no private supplier on the plant because of too long distances

### **Composting process**

- ventilated intensive rotting in triangular heaps covered with Goretex membrane
- Intensive rotting, rotting time 3 - 4 weeks
- Fans with temperature and O<sub>2</sub>-control, data recording
- Post maturation for 4 - 5 months
- Plastic bags are partially removed in manual sorting
- Compost sieving before landfilling

### **Compost use/marketing**

- Compost is used as a covering material on the landfill (runtime until 2038)

### **Other**

- Plant has been oversized
- Intensive rotting is only 25% occupied
- Asphalt surface of the post maturation largely unoccupied, because of using as cover material in land-fill
- Street collection 8 times a year plus 2 removals for Christmas trees
- Additionally, available at the site:
  - Sorting of packaging material
  - Production of RDF for thermal utilisation in cement plants
  - Residues are deposited
- Financing of the plant with EU funds in 2016



## **Fővárosi Kertészeti Nonprofit Zrt.**

Adress:

Capital city garden market Nonprofit gAG  
1106 Budapest, Keresztúri út 130.

<https://www.fokert.hu>

The delegation was received by:

- Mr. László Sohajda, Operating Manager

### **Disposal area**

- Area of origin: green areas of the city, road maintenance, commercial deliveries

### **Organization**

- Business enterprises, not service providers for the citizen
- belongs to the city of Budapest
- none contact and relationship with NHKV

### **Plant details, technical equipment**

- Area approx. 10,000 m<sup>2</sup>, asphalted
- Leachate retaining basin with return irrigation
- Crusher: Willibald company fast runner, telehandler
- Doppstadt company star sieve, Doppstadt screen drum, 2-stage

### **Mass flows**

- 50 – 70,000 m<sup>3</sup>/y, approx. 15,000 t/y, 15 own (small) trucks for delivery
- 7,000 to 8,000 t/y are marketed internally in the urban garden markets
- Private pick-up (approx. 800 - 1,000 t/y) pay 5,000 HUF/m<sup>3</sup> for compost

### **Composting process**

- Non-ventilated triangular heap, turning machine with PTO drive shaft
- Intensive rotting, post-maturation, process time 8-10 months
- Overgrain 1st stage re-cutting, subgrain 2nd stage 20 mm > compost, possibly re-screening at 10 mm, overgrain 2nd stage in thermal recovery > power plants approx. 1,000 t/y
- Grass cutting is mixed in

### **Compost use/marketing**

- Marketing requirement: Monthly compost sampling and analysis in the state laboratory.





## **Regional waste treatment plant in Debrecen**

Address:

A.K.S.D. Városgazdálkodási Kft.

4002 Debrecen, Vértesi út 9/b.

<http://www.aksd.hu/komposztalas-agromass-kombi-komposzt>

Delegation was received by:

- Mr. László Barna, Sales Director

### **Disposal area**

- Commissioning composting 2006 with product requirements

### **Organisation**

- Shareholdings: 51% NHSZ-Holding, 49% Debrecen Asset Management gAG

### **Plant details, technical equipment**

- Leachate retaining basin with return irrigation
- Bucket loader, triangular heap turning machine with PTO drive shaft, drum sieve

### **Mass flows**

- Sewage sludge at 45%, 8,000 - 9,000 m<sup>3</sup>/a, TS 20%
- Green waste 55% as structural material, 3,000 - 4,000 t/y
- non-hazardous industrial sludge 5,000 - 6,000 m<sup>3</sup>/y > waste compost for landfill cover

### **Composting process**

- unventilated triangular heap H=1.5-2 m
- Intensive rotting approx. 65°C for 3-4 weeks, post-rotting/storage 2-3 months
- in wintertime application ban, then composting; In summertime more direct KS application on agricultural land

### **Compost use/marketing**

- Composting since 2006
- until 2015: bagged goods/flower soil with approx. 200-300 t/y to private consumers (approx. 3 € for 50-l bag)
- since 2015 as loose goods to commercial garden markets (8 €/m<sup>3</sup>)
- Sewage sludge brings in 6,500 HUF per m<sup>3</sup>.

### **Other**

- A compost analysis costs 5,000 € and is valid for 10 years with a constant product.
- Service: 10 times street collection a year in brown bin (approx. 1 €/emptying), in addition financing by NHKV not secured.



## **NHSZ Tisza Kft.**

Adress:

5350 Tiszafüred, Húszöles út 149.

Delegation was received by:

- Mr. Béla Szabó, Environmental Officer

### **Disposal area**

- Commissioning composting 2006
- Connected inhabitants approx. 100,000
- 25 municipalities, up to 70 km distanced

### **Organisation**

- Shareholdings: 49% NHSZ holding, 51% municipalities

### **Plant details, technical equipment**

- Leachate retaining basin with return irrigation
- Wheel loader, telehandler, shredder, drum sieve

### **Mass flows**

- Green waste from public collection 1,870 t/y

### **Composting process**

- 3 boxes equipped with pressure ventilation

### **Compost use/marketing**

- Compost material is used as covering material at the landfill site
- Quality requirement for pH

### **Other**

- Runtime of the landfill until 2025-2035
- Service in the green waste sector consists of 10 removals in plastic bags (non-profit company), 3 collection vehicles
- Pre-profit company disposes business
- Recyclables collection: paper/paperboard, metals, glass, plastics
- RDF production on site 40%, landfilling 60%





## **Waste treatment center in Sajókaza**

Adress:

<https://www.zoldvolgy.hu/sajokazai-hulladekkezelo-centrum>

[http://www.sajobodva.hu/fileadmin/downloads/skaza\\_vesz\\_pres\\_mod\\_A3\\_1\\_.pdf](http://www.sajobodva.hu/fileadmin/downloads/skaza_vesz_pres_mod_A3_1_.pdf)

Delegation was received by:

- Mr. Péter Sztupák, Managing Director of the Zöldvölgy Kft.  
on behalf of the association for waste management of the Sajó-Bódva Valleys and its surroundings

### **Disposal area**

- Area of origin: Sajó-Bodva Valley, 145 municipalities, approx. 200,000 inhabitants, commissioning composting 2006
- Alternative to green waste collection: incineration of waste by citizens or illegal dumping

### **Organisation**

- Service provider for green waste

### **Plant details, technical equipment**

- Composting under the roof and in open space
- Leachate retaining basin with return irrigation
- Crusher Willibald company fast runner, telehandler, Top-Turn-Machine
- Drum sieve Komptech Company

### **Mass flows**

- Sewage sludge 6,000 - 7,000 t/y (can be increased if required)
- Green waste 3,000 - 4,000 t/y (cannot be increased)
- Straw in case of need
- Approval is more than 40,000 t/y

### **Composting process**

- Non-ventilated triangular heaps, self-propelled Komptech turning machine
- Intensive rotting, post-maturation
- Sewage sludge, greenery, straw is mixed and put on for triangular heaps, partly under roof

### **Compost use/marketing**

- Marketing requirement: compost sampling and compost analysis 1 time per year, initial analysis 1 million. HUF, then 100,000 HUF per year
- Sewage sludge earnings 4,000 HUF per ton
- Marketing partner pays HUF 3,000 per ton of compost
- Marketing partner "Green Valley Limited" has been in business relations with the operator since 2014. In February, the first 650 t of compost were delivered. Marketing in agriculture area in the east of Miskolc, about 60 km distanced. The marketing partner has set the goal of marketing a quantity of 8,000 t/y compost by 2019.

### **Other**

- Landfill operation since 2006, remaining runtime (1 million m<sup>3</sup>) until approx. 2029
- Reusable material sorting, RDF production
- Operator carries out PR work in schools and kindergartens (the association provides 3 million. HUF)





## **Landfill in Hejőpapi I – does not belong toNHSZ**

Adress:

3594 Hejőpapi, Pz. 073/6

Delegation was received by:

- Ms. Andrea Nagy

### **Disposal area**

- Area of origin: town of Miskolc and surrounding area, 85 municipalities, approx. 200,000 inhabitants, up to 80 km distanced, via transfer stations
- Under operation for 10 years

### **Organization**

- Service providers for the citizen

### **Plant details, technical equipment**

- Area approx. 2,000 m<sup>2</sup>, asphalted
- Leachate retaining basin with return irrigation
- Shredder, telehandler, top turn machine
- Doppstadt drum sieve

### **Mass flows**

- Green waste 10,000 - 12,000 t/y
- Collection in bags, exclusively corn starch material (thermal utilization)

### **Composting process**

- unvented triangular heaps H=1.50 m
- Intense rotting, post-rotting for 10-12 weeks
- Sieving before wood chip heating

### **Compost use/marketing**

- Wood chip heating plant, cornstarch-based bags are not decomposed

### **Other**

- Landfill operation since 2006, area 1 ha, landfill volume 2 million m<sup>3</sup>





## **NHSZ Észak-KOM Hulladékgazdálkodási Közszolgáltató Nonprofit Kft., Landfill in Hejőpapi II**

Adress:

3594 Hejőpapi, Pz. 073/5

Delegation was received by:

- Mr. Tamás Hegedűs, Managing director
- Mr. Roland Belkó, Service manager

### **Disposal area**

- Area of origin: city of Eger and surrounding area, 85 municipalities, approx. 200,000 inhabitants, up to 80 km distanced, via reloading stations
- for 10 years in operation

### **Organization**

- Service providers for the citizen, non-profit companies of NHSZ Holding

### **Plant details, technical equipment**

- Area approx. 2,000 m<sup>2</sup>, asphalted
- Leachate retaining basin with return irrigation
- Shredder, wheel loader, turning machine
- Drum sieve

### **Mass flows**

- Green waste 2,500 t/y, collection in bags (cornstarch-based bas, different kinds of plastics)

### **Composting process**

- Non-ventilated triangular heap
- Intense rotting, post-rotting

### **Compost use/marketing**

- Cover material for the landfill

### **Other**

- Landfill operation since 2006, area 1 ha, landfill volume 2 million m<sup>3</sup>
- Reuseable material sorting, RDF production



## **7 Symposium in Budapest - September 2019**

### **7.1 ORIENTATION**

The project deals with operational and technical measures for the elimination of contaminants from composts. The methodological approach to project process and the development of solutions also aims to integrate all participants in waste management activities and to establish interdependencies between communicative, organizational, technical and economic aspects of disposal structures.

In a workshop, solutions based on the exchange of experiences in 2018 and 2019 have been communicated and discussed. The expertise of the speakers of the workshop, the composition of the professional audience, as well as the political value, by the Ministry of Innovation and Technologies as house and patronage, have been decisive for the success of the event.

As speakers and experts, we were able to attract experienced representatives of the administration, municipal and private waste management from the Hungarian and Baden-Württemberg side.

The workshop covered the thematic fields

- Administrative and regulatory responsibilities and potential influence,
- Building and responsibilities of municipal waste management structures,
- Participants in waste management, such as waste producers, waste collection companies, plant operators, raw material and product users,
- Communication and public relations,
- Technical and operational framework conditions in biological waste recycling plants as well as
- Exploitation of compost products and their quality assurance

and gave insights into tried-and-tested examples.

The technical discussion of the lectures covered in particular the measures

- compliance and implementation of the legal requirements,
- the division of responsibilities of those involved in waste management,
- appropriate public relations work,
- the necessary separation, collection and capture structures,
- good management of composting plants,
- for the reduction and removal of contaminants on composting plants,
- establishment and operation of quality assurance, as well as
- definition of indicators and strategy development.

The detailed lectures of the workshop are attached to the annex to this report.

## 7.2 THEMATIC OVERVIEW

Workshop-agenda. *disposal of foreign materials in compostable waste* on 17 September 2019 at the Ministry of Innovation and Technology in Budapest.



### Workshop Budapest

Disposal of foreign materials in compostable waste

**Date:** 17<sup>th</sup> of September

**Location:** Ministry of Innovation and Technology, (Fő utca, 44-50. Budapest 1011), 701. hall

Time	Program	Speaker
9.00-10.00	Registration, Coffee	
10.00-10.10	Welcoming speech	<b>Dr. Anita Boros</b> , Secretary of State at the Hungarian Ministry of Innovation and Technology
10.10-10.30	Condition of the Hungarian composting and green waste collection	<b>Tibor Nemcsek</b> , NHSZ Kft., Director
10.30-11.00	Advantages of the Hungarian composting	<b>Dr. László Aleksza</b> , ProfiKomp Környezettechnika Zrt., General Director
11.00-11.30	Presentation composting plant of the Sajókaza- waste management center	<b>Tibor Tóth</b> , ZV Zöld Völgy Nonprofit Kft., Team Manager
11.30-12.00	Project presentation - contents, goals	<b>Ingrid Müller</b> , Plattform Umwelttechnik e.V.
12.00-12.15	Discussion	Moderation: Tibor Nemcsek
12.15-13.15	Break	
13.15-13.45	Legal basis and implementation of biowaste collection in BW	<b>Martin Kneisel</b> , Umweltministerium Stuttgart
13.45-14.15	Data recording and strategy development in the biowaste management	<b>Prof. Dr.-Ing. Carla Cimatoribus</b> , Hochschule Esslingen
14.15-14.45	Green waste management in the county of Göppingen	<b>Dirk Kurzschenkel</b> , Abfallwirtschaftsbetrieb Landkreis Göppingen
14.45-15.15	Technique for separation of foreign materials	<b>Ralf Müller</b> , Biodegma GmbH, Ludwigsburg
15.15-15.45	Discussion	Moderation: Prof. Dr.-Ing. Carla Cimatoribus

### 7.3 SUMMARY OF LECTURES

On 17<sup>th</sup> of September, representatives of the 21 waste regions from Hungary have been invited to participate actively in the Hungarian Ministry of Innovation and Technology in the final information event of our project. Nearly 70 participants came to Budapest to find out more of technical basics and to discuss the topics.

Baden-Württemberg was represented by (from left):

- Martin Kneisel (Ministry of Environment, Climate and Energy)
- Ingrid Müller (Environmental Technology Plattform, Plattform Umwelttechnik e.V.)
- Prof. Dr. Carla Cimadoribus (University of Esslingen)
- Dirk Kurzschinkel (waste management company Göppingen)
- Ralf Müller (Biodegma GmbH)
- Ulrich Hommel (AWIPLAN-PPD GmbH)







The greeting was given by **Dr. Anita Boros** (Secretary of State at the Hungarian Ministry of Innovation and Technology) and noted that at least 70% of the compostable green waste in Budapest is already recycled, but this is not nearly achieved in other parts of the country. She announced that a waste strategy is in progress and that the results of the study as part of our EUSDR project are highly awaited eagerly.

Afterwards, **Mr. Tibor Nemcsek** (Managing Director of NHSZ Waste Management Ltd., Budapest) gave a brief outline of the history and current state of composting and green waste collection in Hungary. He said that already a giant step has been already taken in waste reduction, but the EU directives were not yet being complied. The most important task at the moment is a clean, separate collection.

**Mr. Dr. László Aleksza** (Director General of Profikomp Környezettechnika Zrt., Gödöllő) reported afterwards with his presentation about the challenges in Hungarian composting. An important goal is to save artificial fertilizers and also to boost economic efficiency as the most important factor in the circular economy. Since 2003, there has been a corresponding legal regulation, but its enforcement has not been sufficiently controlled.



Before **Ms. Ingrid Müller** (network manager of the Platform Environmental Technology) introduced the contents and objectives of the EUSDR waste project to the audience, **Mr. Tibor Toth** (team leader of ZV Zöld Völgy Nonprofit Kft., Sajókaza) presented his composting plant from the Sajókaza Waste Management Center. This facility had been built as part of a waste project developed with HUF 2.3 billion of financial support in Northern Hungary. It had been developed for 230,000 inhabitants and in cooperation with the University of Debrecen. The plant was handed over in 2006 and is under operation since 2007. Initially, there has been a marketing concept for the compost, which unfortunately has been paused from 2009-2019 due to Hungarian legislation. With a re-focused marketing strategy, 3,000 tons of compost has been marketed so far in 2019. The biggest obstacle is that a compost quality scheme is so far lacking in Hungary.



After the lunch break, the German participants had their turn and spoke about conditions and prerequisites in waste management in Baden-Württemberg:

- **Mr. Martin Kneisel:** Legal basis and implementation of bio-waste collection in Baden-Württemberg
- **Prof. Dr. Carla Cimatoribus:** Data recording and strategy development in the biowaste management
- **Mr. Dirk Kurzschinkel:** Green waste management in the county of Göppingen
- **Mr. Ralf Müller:** Technique for separation of foreign materials

It was made clear that the most important aspect for the acceptance of waste management activities by the population are public relations. The dependences on public relations, on the type of the collection system and on the contaminant content in the green waste were pointed out significantly. A prerequisite for the development of a comprehensive green material treatment and later also a (supplementary) biogas production is a scientific approach (development of indicators and measurable key-data). Furthermore also the removal of contaminants by controlling the collection and the delivery as well as an estimation of the pros and cons of the technology used. Waste management always is connected to high costs. However, a certain cost coverage could be achieved through generated revenues.

Finally, **Prof. Dr. Carla Cimatoribus** put the topics up for discussion and asked for statements.





## Impressions of the workshop in Budapest on 17<sup>th</sup> of September 2019

Welcome by **Mr. Tibor Nemcsek** (Managing Director of NHSZ Waste Management Ltd., Budapest) and greeting from the Secretary of State, **Dr. Anita Boros** (Ministry of Innovation and Technology Hungary)



Exchange of views with **State Secretary Dr. Anita Boros**





**Presentations by Dr. László Aleksza** (Director-General of the Profikomp Környezettechnika Zrt., Gödöllő) and **Ms. Ingrid Müller** (network manager of the Platform Environmental Technology)



**Mr. Tibor Toth** (Team Leader of the ZV Zöld Völgy Nonprofit Kft., Sajókaza)  
and the interpreting team, **Ms. Iza Nyari** and **Ms Nóra Uhri**



**Mr. Martin Kneisel** (Ministry of Environment, Climate and Energy Baden-Württemberg)





**Prof. Dr. Carla Cimatoribus** (University of Applied Sciences Esslingen)



**Mr. Dirk Kurzschenkel** (waste management company, Göppingen)



**Mr. Ralf Müller** (*Biodegma GmbH, Ludwigsburg*)





## 8 Fields of action in Green Waste Management

### 8.1 TARGET DEFINITION AND WASTE MANAGEMENT PLANNING

The main principles of modern circular economy policy are laid down in the legal basis. The regulations include, on the one hand, the requirements for sustainability and the conservation of resources and, on the other hand, the requirement to ensure comprehensive health and environmental protection.

Sustainability is now widely recognized as an indispensable basic political principle. In the field of waste management, sustainability builds the concept behind the transition from a waste policy focused on security and waste disposal to a strategic circular economy policy. Due to it waste does not, if it's possible, arise in the first place or they do valuable contributions as a secondary raw material and save resources.

The waste collected and the secondary raw materials extracted have become increasingly important resources for our economy today.

As a basis for sustainability and resource conservation, the five-stage waste treatment hierarchy with a clearly specified prioritization is defined:

1. Waste avoidance
2. Preparing for re-use,
3. recycling (e.g. waste glass or waste paper),
4. other recycling (e.g. energy recovery during combustion and landfilling) as well as
5. disposal (e.g. landfilling).

The aim of the waste hierarchy in the words of the EU Waste Framework Directive is to move closer to a "recycling society" "by avoiding the production of waste and using waste as a resource".

This made it clear that the mere disposal of mixed municipal waste, whether through landfilling or incineration without efficient energy recovery, is no longer a serious strategic option.

Strategies for implementing EU requirements need to be developed at national level. State institutions have an obligation to review the implementation of the objectives and achievements of the plan. They determine policy priorities, quantitative targets for certain parameters, monitor and develop them.

The basis for each strategy development is data on the basis of which the actual state is collected and from which a target state is derived. Within a functioning control circuit, the collected data can be compared with the target state and consequently formulated into an assessment. Appropriate measures shall be taken in the event of a deviation from the target value.

The strategy development includes

- Target definitions,
- Identification of strategic areas and activities,
- Definition of structural characteristics and categories,
- Agreement on measurable indicators,
- Recording of the actual state as well as
- Comparison with target state and measures.

A waste management plan is the central instrument at national or regional level for waste management planning, with respect of existing structures and habits. The various elements of the plan can be derived from the EU Waste Framework Directive. They are mainly aiming to a more detailed planning discussion of the objectives of waste management, the overall existing situation, the measures in the field of waste management and the existing disposal infrastructure.

The task of the public waste management providers is to formulate waste management concepts. The public waste management authorities develop an internal planning

- on the regional implementation of waste prevention and recycling,
- for methods, installations and facilities for the recovery and disposal of waste, including collection, transport, treatment and storage,
- to determine information on the expected runtime of existing waste facilities,
- for the presentation of the disposal safety for at least 10 years, including the measures and time-tables taken;
- for the definition of the locations of the necessary waste facilities,
- with the presentation of the essential cooperation with other public waste management providers or private waste disposal service providers and the measures to implement them, and
- the collection of the type, quantity, origin and whereabouts of the waste generated and disposed in their area.

Waste management concepts need to be regularly updated and new legal, economic, social and demographic frameworks adapted.

In the Baden-Württemberg Waste Management Plan of 2015, the comparison of existing activities and collection structures on the basis of the annual waste balance sheet for the area of **green waste** revealed the planning guidelines for goals and measures. They are shown in excerpts in the recommendation for action below.

#### General objectives of the Waste Management Plan 2015

- Action plan biowaste recovery
- Collection target 60 kg/inhabitant for domestic biowaste; 90 kg/inhabitant for green waste
- Advance the comprehensive coverage
- Expansion of energy recovery
- Infrastructure expansion
- Improving biowaste quality

#### Current work targets 2018/19/20

- Extension of infrastructure for high-quality recovery
  - Expansion of cascade use
  - Green waste collection points
  - Food waste fermentation
- Increasing of the collection volumes in districts with below-average results
- Collection of landscape maintenance material
- Further minimization of plastics in the biowaste collection
- Ensuring high quality:
  - Large-scale residential complexes
  - Food waste

Potential improvements	<ul style="list-style-type: none"> <li>• Increase of the collected waste quantity</li> <li>• Extension of thermal recovery of green waste</li> <li>• Optimisation of green waste quality and process technology</li> </ul>
Objectives	<ul style="list-style-type: none"> <li>• Increase of the collected quantity up to 90 kg/capita by 2020</li> <li>• Increase by 2020 <ul style="list-style-type: none"> <li>◦ Incineration of wooden parts: 20 %</li> <li>◦ Anaerobic digestion and post-composting: 25 % (parts with high water content)</li> </ul> </li> <li>• Power generation</li> <li>• Reduction of greenhouse gas emissions</li> <li>• Substitution of renewable resources</li> </ul>
Measures	<p><b>Increase of the collected waste quantity</b></p> <ul style="list-style-type: none"> <li>• Discovery of material from unknown sectors so far, e.g. requirements for delivery in public tenders</li> <li>• Control of revision of waste statutes and collection, collection system more easy to handle for the people, restructuring of the fee rates to incentivise private households</li> <li>• Benchmarking</li> <li>• Public relation</li> </ul> <p><b>Offering of adequate processing capacity (esp. CHP-plants)</b></p> <ul style="list-style-type: none"> <li>• Technical optimisation of existing and planned facilities (Digestion, composting plants, power plants based on wooden chips)</li> <li>• Implementation of additional facilities (about 6-7 new digestion plants, capacity each 35,000 t/y): <ul style="list-style-type: none"> <li>◦ Construction of the plants by public or private companies</li> <li>◦ Composting of the digestion residues for material recovery nearby</li> </ul> </li> <li>• Cooperation of public bodies is promoted by the Government</li> <li>• Improved separation of wooden material out of greenwaste</li> </ul>
Support programmes	<ul style="list-style-type: none"> <li>• ClimateProtectionConcept 2020PLUS, new: integrated energy- and climate protection concept of Baden-Württemberg – IEKK</li> <li>• Biomass-plan-of-action</li> <li>• Guideline for optimisation of bio- and greenwaste treatment</li> <li>• Resources of waste (within the scope of strategy for sustainability)</li> <li>• Strategy of phosphorus recovery</li> </ul>

For the assessment of the respective green material collection of the public waste management providers, the guide “biowaste” provides the following handout:

	No action needed	Optimisation where possible	Check obligatory
Greenwaste Collection	Existing combination of bring and door-to-door collection; region-wide, close-meshed service network implemented, all season opening hours, out of regular working time, attractive for commercial companies as well	Existing combination of bring and door-to-door collection; region-wide, but wide-meshed service network implemented, all season opening hours, out of regular working time,	Greenwaste collection in few days in autumn and spring
Public bodies as model	Total greenwaste amount out of public green areas and from landscape gardening is transported to the facilities	Total bush- and hedge-cut transported to the facilities	Greenwaste is transported to the facilities only in single cases
Public Relation	Intensive and regular public relation campaigns and consulting on the sites, multilingual	Brochures and flyer; call centre for waste issues	No special Public Relation for bio- and greenwaste

## 8.2 GREEN WASTE AND CLIMATE PROTECTION

After the Paris Agreement in the year 2015, the world community pledged to limit global warming to below two degrees Celsius and, if possible, below 1.5 degrees Celsius over pre-industrial levels. Furthermore, the European Union (EU) has committed itself to reduce their greenhouse gas emissions by at least 40 percent by 2030 compared to 1990 levels.

The EU is working to reduce its greenhouse gas emissions by the Climate Protection Ordinance, which defines the Union's objectives, in particular for transport, buildings, agriculture and **waste**.

The so-called Effort Sharing Decision (ESD) distributes the EU emission reduction targets between EU Member States for the period up to 2020. It sets national emission targets for each Member State for 2020; shown as relative changes comparing to the year 2005.

For the next period from 2021 to 2030, the so-called Effort Sharing Regulation (ESR) for all Member States sets national emission targets, ranging from 0% to a 40% reduction compared to 2005 levels.

The European Commission expects Germany will completely fail its targets for 2020 and 2030 (-14% and -38% respectively). Hungary must fulfill a target of -7% by 2030.

Since the scope also includes waste management, recommendations for action on the use of green waste as a renewable energy source for the substitution of fossil fuels can also be derived from this.

Primary resources, the environment and the climate can be spared by using residual and waste biomass as valuable secondary resources. Their exploitation is more efficient the more extensively their material and energy potential is utilized. This also applies for biowaste generated in private households and in the maintenance of private and public green areas.

### *Biogas production as a component of the energy transition:*

In principle, the entire organic material and the herbaceous green material should first be used for biogas production. When planning a biogas plant, it is compelling to pay attention to high net energy yields and at the same time low emission level. Biogas can be used effectively by generating electricity via CHP in combination with excess heat utilization. In order to ensure high energy efficiency, the CHP must be operated in a place that ensures the effective use of the excess heat. Ideal customers can be larger heating grids, public facilities or industry and commerce.

### *Compost recycling as a component for climate protection:*

The solid fermentation residues produced during biogas production are suitable for composting. Biowaste and green waste with earthy lignin-rich components, which are less desirable in the biogas process. Transporting compost over long distances makes no ecological or economic sense. Therefore, a biowaste treatment plant should preferably be located where compost is needed or the compost product must be adapted to the market conditions. In the past, compost was partly marketed with co-payments in the event of an unfavorable demand situation or an inappropriate choice of location. This can be avoided by good forward-looking planning.

Plant nutrients are contained in the compost. Its high proportion of stabilizing organic matter can also contribute significantly the formation of humus in soils. Compost can also be refined into earth and culture substrates for horticulture and for nurseries or potting soil for private households. If these products are successful in competing with peat or peat products, compost recycling can be an important component in nature and climate protection. When peat is extracted and applied to soils, the fossil carbon is released, which increases the greenhouse effect. In addition, peat mining destroys moors worthy of protection.

Agriculture is an important compost customer. There is a high demand, especially for the cultivation of humus consumptive crops (root crops) or special crops (e.g. viticulture). With a sufficient supply of humus to the soils, the negative consequences of climate change can be successfully countered, as the water storage capacity of the soils increases with the humus content.

Bush, hedge and tree cuttings, which are mainly gathered at collection sites or in street collections, can serve as a starting material for high-quality compost or potting soils. In addition, sawn timber can be transformed into fuel; it can be marketed to big biomass power plants in this sales route. On the other hand, fermentation of wooden biomass does not make sense.

The wooden parts of the green waste are also suitable as biofuel for biomass heating (power) plants and are the starting material for high-quality nutrient-poor composts or potting soils.

The separate collection and recovery of organic waste reduces the landfill volume. It also prevents landfill gases which are produced during landfilling. They have an often-higher greenhouse gas potential due to the methane concentration, in combination with partially uncontrolled discharge into the atmosphere.

The efficient recycling of organic and green material makes an important contribution to the energy transition and climate protection and to the achievement of environmental policy goals at national and European levels.

### **8.3 PUBLIC RELATIONS**

The public must be regularly informed about current issues and developments in the circular economy. Awareness-raising takes place at an early stage, target group-oriented and comprehensive. Active participation of citizens and the active approaching to target groups are decisive success factors in order to develop a circular economy in an ecologically and socially responsible manner. The exchange of information between authorities also plays an important role.

The Ministry of Environment and the public waste management providers are responsible for public relations in Baden-Württemberg.

In particular, the Ministry of Environment provides the public with extensive information on waste prevention and disposal on the Internet, which is regularly revised and updated. The yearly state's waste balance sheet provides comprehensive information on the current state and development of the circular economy in the field of municipal waste management. Specialist studies and other information materials will also be made available to the public via the Internet. On the homepage of the Ministry of Environment, there are numerous publications covering a wide range of topics, from environmental education for primary school children to the correct disposal of medicines and the guide for tradesmen.

The state of Baden-Württemberg also participates in the organisation of events in the waste sector, in particular the annual Congress BW (Resource Efficiency and Circular Economy Congress Baden-Württemberg), which is well-known also beyond the state borders. In order to establish current topics various specialist events are regularly held. An example for the various topics is the energy recovery of waste such as the production of biogas due to the fermentation of biowaste.

The Baden-Württemberg State Institute for the Environment, Measurements and Nature Conservation operates the portal Umwelt-BW on behalf of the Ministry of Environment. This provides comprehensive information on the topics of the waste and circular economy and refers to numerous Internet offers, e.g. to the appearances of the individual circles (<http://www.umwelt-bw.de/suche?q=abfall>) also in their function as public service providers.

In addition to the Governmental activities, the public waste management providers independently conduct own information and public relations work. An important element of this is the advice to which the public waste management provider is obliged under the KrWG. All 44 municipalities and counties offer call center services on disposal issues as well as on waste prevention. The publication of a waste calendar as well as a separate website of the public waste management provider are also national standard.

The information portals of those involved in this project from Baden-Württemberg can be reached at the following internet addresses:

- <https://um.baden-wuerttemberg.de>
- <https://www.awb-es.de>
- <https://www.avl-ludwigsburg.de/>
- <https://www.awb-gp.de/>
- <https://stuttgart.de/abfall>

Public waste management providers make available all information about relevant topics and through various media and information channels like brochures, leaflets, waste magazines, public events of various formats, as well as on the mentioned websites:

- Collection schedules
- Disposal facilities
- Fee structures
- Waste information
  - on the individual types of waste,
  - with a waste lexicon,
  - and, if necessary, the provision of a smartphone suitable waste APP,
  - for the handling of problem substances and hazardous waste as well as
  - for waste prevention.
- Phone consulting and call centers and on-site advisers and supervisors
- Media library with information materials
- Waste management concept
- Waste Management Statute

The important information is available to foreign citizens in up to 12 foreign languages.

A list of the numerous activities of the 44 cities and counties in Baden-Württemberg can be found in the following figure:

### Activities of the 44 cities and districts in Baden-Württemberg on waste consulting

In 2011, there were round about 200 waste consultants active in Baden-Württemberg  
The effort for the public relations were about one euro per inhabitant and year

Measures	Districts	Measures	Districts
waste calendar/timetable for the removal	44	media box for kindergardens/schools/adults	21
online presence	44	actions on disposal of waste (for example topic: "clean city"	20
telephone consulting for avoidance/disposal/fees and service	44	mailshots	19
reports in the local press	41	holiday programme (for children)	19
waste lexicon	40	public relations on busses, trams, refuse collection vehicles, waste bins, containers	18
leaflets	40	Speeches at associations, trade guilds, trade associations	18
guided tours at disposal/recycling plants	40	Supports of self-composting	18
promotional items (sticker, baseballcaps with imprints, colouring books etc.)	40	Playbox/Bookbox for the topic waste	18
advices for the disposal of waste	39	information stands (for example in front of supermarkets)	17
cork collection	39	bulky waste marketplace	17
statistics	39	exhibition on the topic waste	16
support for recycling centers	37	fair stands	16
advices on asbestos	35	series of advertisements in the press	16
advices on composting, like a "compost lexicon"	35	waste journal	15
speeches at kindergardens, schools and training institutes	35	sorting poster for large residential complexes	15
bulky waste and used goods marketplace (for example bicycles)/internet platform for the exchange of used goods	35	container positions in the city map	14
public relations and press talks	34	campaign days at schools and kindergardens	14
controls of provided wastes	34	compost marketing and sales promotion campaigns	14
consulting of residential complexes	32	open day actions and parties at waste plants	13
consulting of the local commercial enterprises	31	children's theatres and puppet theatres on the topic waste	12
seperation lists	30	competition	12
clean up operations	30	recycling of building rubble and earth mass balancing	12
waste management concept	30	repair guide	11
information flyers/letters on disposal/recycling sites and organisational collections as well	28	rinse and dishwashing vehicle	11
information materials for the industry (information folders, brochures, leaflets), for example mineral wastes	28	poster campaigns	9
consulting hazardous waste collection vehicle	28	newsletter (paper/mail)	7
bilingual leaflets	26	trainings for teachers/educators	6
actions for waste avoidance (for example using of lunch boxes, linen bags etc.)	26	second-hand department store	5
christmas tree campaign for the collection of christmas trees	25	video films participations at projects for the disabled on the avoidance and recovery of wastes	4
working together with associations (for example sponsoring)	24	cinema spots	3
employee training	24	waste adventure path	2
controls of the commerical enterprises	24		
consulting of construction companies in avoidance/recovery of building rubble and excavated soil	23		
actions on measures of the citizens' office	21		



## 8.4 COLLECTION LOGISTICS

Green waste is produced in the municipalities in private and public garden and green areas. Green waste can be collected via the biobin or bio-bag or in containers. The combination of green material collection with other collection systems leads to displacements of individual material flows. Self-composting, incineration of green material or the introduction of a separate biobin are thereby in competition to a separate green material collection.

In principle, various options are available for the disposal of those who are responsible for collection.

In the case of **bring-it-yourself systems**, the question of logistics is in the responsibility of the waste producer. In order to achieve a high acceptance for this collecting system and to generate high collection quantities, it is necessary to propose a preferable good offer and a sufficiently dense network of transfer points. If necessary, the opening hours have to be suitable for the population, especially on Saturdays.

Accessibility and distance determine the success and the quantities that can be collected. A network density of a few square kilometers of settlement area per transfer point or for urban areas one transfer point per 10,000 inhabitants can be used as a design parameter in the first approximation.

Generally collection points should be opened all year round. In the case of collection points that are not fenced, the green waste can be unloaded at any time.

The county of Göppingen offers 11 collection points and 12 composting sites where the material can be unloaded during opening hours. In the county of Ludwigsburg there are 36 transfer points and in Esslingen 44.

Specific characteristics of the named counties.

Responsible for the disposal - regional authority	Special characteristics
County Administration of Göppingen	ca. 11.000 inhabitants/transfer point
	ca. 28 km <sup>2</sup> /transfer point
County Administration of Esslingen	ca. 11.750 inhabitants/transfer point
	ca. 15 km <sup>2</sup> / transfer point
County Administration of Ludwigsburg	ca. 13.000 inhabitants/transfer point
	ca. 17 km <sup>2</sup> / transfer point

In the urban conurbations, such as the state capital city of Stuttgart, the connected population increases significantly per transfer point.

In the case of the type of transfer points, suitable facilities such as waste treatment facilities, transfer stations, recycling centers and landfills can be used, if they are available. In cooperation with the municipalities, municipal collection points, building yards and sewage treatment plants have proven as green waste collection points, if areas are available. Private companies in the waste management industry, agriculture, garden markets and horticultural enterprises have also to be considered. But simple container provision in public spaces and conveniently situated locations is also possible.

For the transfer points, organizational, emission protection and waste management requirements may be obligatory:

- Noise protection (permissible delivery and processing/shredding times)
- Requirements for minimizing odour, dust and germ emissions (minimum distances to sensitive areas)
- Storage time until shredding, removal times after shredding, special requirements for grass cuttings

- Fortified areas, suitable for local traffic and heavy machinery
- Leaking leachate from the storage areas must not enter the traffic areas or the underground. Impermeable surfaces shall be fixed, collection basins have to be built
- Treatment of leachate and rain water
- The green waste can be stored in dense and covered containers instead of fortified areas.

Not all landowners are able to operate with a bring-it-yourself system. **Collection systems** are particularly suitable for garden waste, which cannot be put in the biobin due to seasonal variability. These include tree cuttings and Christmas trees. The pick-up can be done on-call or as a street collection on fixed dates. Pick-up is usually limited to the vegetation-rich period. In this respect, a combination of bring-it-yourself and collection system has become established in many places.

In practice, green waste is sometimes not recycled, but left unused at the areas of origin or incinerated. This is not satisfactory from the point of view of immission protection.

An effective collection of the green waste required accompanying measures:

- Offer of cost-effective, tear-resistant paper bags, plastic bags are an undesired contamination of the green material. Biodegradable plastic bags cannot easily be distinguished from other plastic bags
- Prohibition of the disposal of green waste via the residual waste bin (Governmental Waste Act, Waste Regulations)
- Acceptance of private, commercial and public green waste
- No additional acceptance fees for quantities from fee charged households and areas
- Generous calculation of toll-free delivery quantities
- Tight mesh density of the transfer points
- Sufficient number of transfer points open all year round
- Customer-friendly opening hours (all year round, also on Saturdays)
- concept for public relations; especially at the start of introduction, but also accompanying and especially at the times of the seasonally high quantities
- immission protection regulations for the incineration of garden waste on private land
- In the case of the public tendering of landscaping work, the handling of the green waste is to be regulated by contract

## **8.5 GREEN WASTE TREATMENT**

The treatment of the separately collected green waste takes place after the separation of predominantly woody material for thermal recovery as wooden chip fuel. The rest will be transformed into compost. The plants with sufficient processing capacity must be extended or held available.

In case of biobins, that contain green waste, green waste enters composting or fermentation plants and is used there as bio compost. In some instances, additional green waste is used as a structural material in composting or fermentation plants in certain seasons.

Basic sequence of processes in composting:

1. Quality control of input materials
  - a. Visual inspection
2. First separation of coarse contaminants
  - a. Manual sorting of coarse contaminants (plastic bags, glass, bulky waste, contaminated wood, etc.)
3. As few crushing work steps as possible at high contaminants
  - a. Advantages of crushing by means of slow runners
  - b. Advantages when converting the heaps by using wheel loaders
4. Contaminant removal
  - a. Wind shifter for foils, heavy material separators of stones
5. Final preparation
  - a. Screening to separate the contaminants

During sieving step the efficiency of the deposition of foreign substances depends on the factors:

Sieving-Technology, as well as mesh aperture.

Usually holes between 10 and 25 mm are used for final sieving. In the case of fine-grained sieving, higher proportions of foreign substances are separated, but also higher proportions of well usable compost material have gone lost.

Sieving ability of the compost:

The sieving ability is mostly determined by the water content. Very moist material is difficult to sieve with fine-grained sieves. By using medium-grained sieves, the sieve yield is generally higher. But there are in the sieve passage and also in the final product higher proportions of foreign substances than in the case of fine-grained sieving.

In addition to sieving, further techniques such as wind shifters, metal and hard material separators may be required. The use of additional machine technology places a heavy burden on economic efficiency, especially in the green waste sector.

Basically, foreign materials that do not enter the biowaste don't have to be sorted out with great effort in addition. The avoidance of foreign material inputs also avoids consequential risks to the quality of the end products. The avoidance of foreign material is therefore a top priority!

## 8.6 COMPOST UTILIZATION

Composts made of organic and green waste are used on a large scale for fertilization on farmlands, in earth-works for substrate production, in gardening and landscaping and as well in the private sector.

The immediate benefit of organic fertilizers and soil improvers is due to the supply of plant nutrients for fertilization. In addition, organic matter is fed to the soil. This humus is used to maintain soil fertility and improve soil functions.

The circular economy requires a production of compost from organic waste which uses suitable raw materials and do not contain foreign substances that significantly affect the quality of the final products. And therefore, the acceptance of market participants for the use of the product. Organic and green waste from the separate collection can sometimes have high levels of foreign substances, like plastics, glass stones, metals.

For the final products, requirements for a limit value of foreign substances and uniform methods for the determining of the foreign substances are applied. When assessing the compost, it is not sufficient for the fertilizing limit values to be (only just) complied with regard of the contained foreign substances. Most fertilizer users expect the products to be free or largely free of foreign substances. However, they are only if the current limit values for fertilizers are significantly exceeded.

The production of compost depends on the existence of a market and if this market can be maintained in the long term. Local Markets within a short transport distance have a particular importance here. These markets must be served with qualities that ensure long-term customer satisfaction. This means, above all, that foreign materials may not be contained, or rarely, to a small extent.

Foreign materials, which occurred at the green waste collection can be separated in the process chain of treatment on the plant. The processing of the waste delivered at the treatment plant involves personnel, technical and economic effort. In this respect, the avoidance of the input of foreign materials at the source of the waste is of particular relevance. The various measures and approaches to this have been described in detail in the previous chapters.

In Baden-Württemberg and Germany, compost manufacturers and plant operators have come together in the Federal Quality Association Compost e. V. (BGK) as an organization for voluntary self-regulation. The Bundesgütegemeinschaft Kompost e. V. (BGK) is a registered association based in Cologne, Germany, which is dedicated to ensuring the quality of compost and fermentation products in Germany.

The task of the BGK as an independent and neutral organization is to monitor compliance with the quality regulations laid down by the RAL Institute for the processing of organic waste from households, gardens and parks. The BGK's RAL quality assurance ensures a secure consumer-oriented application of the products obtained from composting and fermentation by ensuring quality assurance for its members. Members shall demonstrate a guaranteed and monitored quality standard to consumers by authorizing the quality label, testing certificates and labelling of their products. In Baden-Württemberg, more than 90% of processed quantities of green, organic and catering waste are subject to BGK monitoring.

Quality compost label of the BGK



Quality criteria and limit values are already listed in the previous chapters.

Marketing concepts are geared to regional conditions and requirements. In addition to the green waste, compost produced from separately collected biowaste must also be taken into account from 2023 onwards:

#### **Quantity forecasts**

- Forecast of the accrued compost during the year (per month)
- detailed listing of storage capacities on the plants
- Forecast intermediate storage options
- Identification of difficult marketing periods
- Determination of compost outputs in seasonal cycles in the past

#### **Quality management**

- Quality monitoring of the compost
- Certification of the qualities produced – handover of test certificates to inform users
- Information on properties and ingredients, application recommendations
- Dealing with fertilizer traffic control
- Dealing with complaints

#### **Sales locations**

- Attractive appearance for commercial and private customers
- Providing of loading equipment
- areas partly roofed
- if necessary, own service tent
- Offer bulk material and/or bagged goods
- Products of the highest quality, no lumps, no paper and plastic drifts
- no accumulation of water; cover if necessary

Composting plants: for all market segments (agriculture, gardening and landscaping, hobby gardeners)

Recycling centers: mainly for small customers (shovel, loose sale, bagged goods)

Municipal building yards: storage box e.g. 0-15 mm

Cemetery offices: storage box rather 0-10 mm finished compost

Gardencenters: storage box 0-15 mm

Building material trades: storage box 0-15 mm

Allot settlement: targeted delivery e.g. 1x per year with wheelbarrow activities

#### **Range of products**

Fresh compost: hygienised but not yet fully matured compost (degree of rotting II or III), for agriculturing only

Matured compost: hygienised, biologically stabilized and matured compost (degree of rotting IV or V), different Grains 0-10 mm, 0-15 mm, 0-25 mm

Substrate compost: finished compost with limited content of soluble plant nutrients and salts, grain 0-10 mm. Substrate compost is mainly used in the production of plant soils, potting soils and in the earth industry.

Compost topsoil mixture

- Procurement and storage of soil
- Assessment of soil qualities (e.g. heavy metals)
- Purchase of sand as a surcharge component if necessary
- if necessary, examination and declaration according to DüMV (fertilizing law)

Bagged goods

- Storage options
- Sale also via garden centers, DIY stores, etc. (local reference!)
- Development of your own bag design and own brand
- Cooperation with earthworks
- Pure compost 0-10 mm in 30 l bag
- Potting soil (peat-reduced; 30% compost; 40 l bag)

Special mixtures

- Planting mixtures, e.g. from compost, soil, lava, brick split for large tree plantings
  - Tree substrate
  - Potting soil
  - Gerania soil
  - Cemetery soil
  - Bog soil
  - Plant soil
  - shrub soil
  - Vegetation substrate
  - Surface mixture
  - Lawn support layer with lava sand
  - Gravel turf substrate
  - Lawn grid soil
  - Roof substrates extensive, intense
  - Substrate for noise barriers

Purchase/Acceptance

- Bark mulch
- Other additives

Biofuels/wooden chips

- e.g. wooden chips 20-80 mm or 80-200 mm

**Marketing segments**

- Arable farms
- Fruit growing
- Vegetable
- Wine
- Tree nurseries
- Organic farming
- Marketing via contractors and service providers
- Gardening and landscaping
- Horticultural architects
- Hobby gardeners
- Municipalities
- Earthworks
- Biofilter material
- Recultivation
- Garden centers and DIY stores
- Building materials trade

**Delivery**

own transport capacities  
Gardening and landscaping companies

**Marketing elements**

Public relations and PR measures via media  
Application Consultants, Training Sales Personnel  
"Open Day"

After the development of a marketing concept and its implementation, continuous measures are necessary to promote the demand for compost material, but also to motivate the participating population continuously in the separation of green material and the successful participation in the production of quality compost.



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