



Waste Management in Bavaria

Strategy, Objectives, Results

Europe



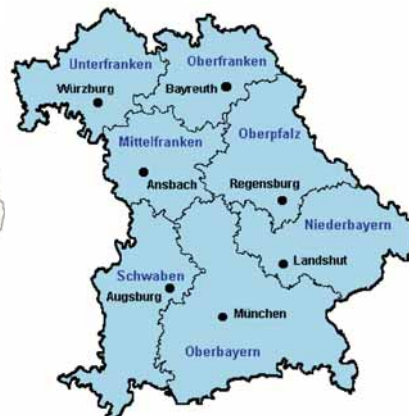
Population 450 million
25 States
Area 389.000.000 km²

Germany



Population 82 million
16 Federal States
Area 360.000 km²

Bavaria



Population 12 million
7 District Governments
Area 70.000 km²

2004

Waste Management in Bavaria

A Small Compendium for Reference

1. Refuse Collection - the Forerunner to Waste Management

Residual waste bins, compost bins, etc. are modern terms. Up until the sixties the term *Aschentonne* (*ashbin*) was used to a large extent because a substantial part of the waste was made up of ash from stoves used to heat homes. The waste also included kitchen refuse and sometimes broken crockery. Commodities were not as available as they are today and were used for a longer period of time. Used garments were not thrown into the ashbin, but were altered several times to make clothes. Used paper, used textiles, rubber, leather etc. were frequently burned in domestic stoves, which had a detrimental impact on the quality of the air.

At that time, however, a recycling system already existed as we know it today: scrap steel (old bicycles, iron fittings) was sold to scrap dealers for a small sum, sometimes also larger stacks of used paper. Ragmen went around the housing blocks collecting used paper, textiles and (wine) bottles. Beer and lemonade bottles always had a deposit on them. Residual waste was therefore kept to a minimum.



"Any rags, paper, bottles,....?" - Berlin 1912
(Source: Abfallberatung Unterfranken)

With the increase in the availability of goods and commodities and the introduction of the one-way system for beverage packaging, mountains of waste grew, polluted the soil and the air and presented problems in local planning. The finiteness of raw materials was becoming apparent. It was essential for this avalanche of waste to be stopped. This acknowledgement was followed by a rapid paradigmatic change. The key focus was placed on the avoidance of waste (e.g. by reducing the amount of packaging used). The waste that still occurred had from then on to be recycled or combusted for energy recovery. In this way, it was possible to save raw materials and reduce the volumes of waste. These principles were put into effect with the Bavarian Waste Management Act of 1991; at the end of 1996 this modern waste management scheme was then adopted on a federal scale.

2. Protection of Natural Resources, Recycling and Waste Management

Handling raw materials sparingly was not only a necessity in view of the booming economy in Germany, intensive utilisation of raw materials for goods manufacturing was also going on in the rest of Europe, in parts of Asia and in the U.S.. Today, with China and India rapidly gaining industrial weight and a dramatic increase in the worldwide demand for raw materials, an appropriate husbanding of raw materials is now of existential importance.

The ominous interaction between economic growth, rising consumption of raw materials and growing mountains of waste with their harmful impact on air, water and soil had to be curbed, and this was to be accomplished by means of

- Waste avoidance: the less waste the better
- Recycling of waste: recycling to a technically feasible and economically sensible degree
- Waste treatment: Residual waste is not just to be tipped into holes, but is first treated thermally or biologically. The volume is reduced substantially, the level of pollution falls.
- Final storage of the treated residual waste in landfills which are designed to protect the air, water and soil against pollutants.

This system, referred to as the *Integrated Waste Management Concept* was already implemented with the Bavarian Waste Management Act of February 27, 1991.

2.1 Avoidance of Waste

Top priority is undisputedly awarded to the *avoidance* of waste. Waste which does not occur does not have to be recycled, treated or stored. The key objective in our waste system is therefore to *avoid waste*. Unfortunately the state has less influence on the avoidance of waste than it does on the recycling and environmentally compatible disposal of waste. This is because the decision on the volume and scope of packaging and on the sparing use of natural resources is primarily made by industry, trades and crafts and also by private consumers who can contribute toward avoiding waste through sensible consumer behaviour. We must nevertheless endeavour to open up new perspectives through research (compare here Item 7).

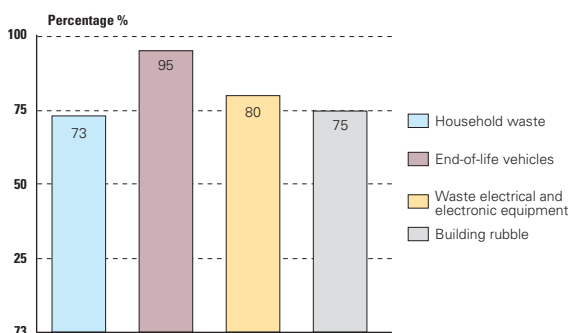
2.2 Waste Recycling

In spite of the key significance awarded to waste *avoidance*, it is the *recycling* segment that requires the greater amount of planning and technical and logistical expenditure. The recycling concept comprises 2 parts:

Municipal waste disposal

The counties or large towns are responsible for the disposal of organic waste, paper (e.g. newspapers and such), bulky household waste (e.g. old chairs and sofas) and problem waste. Once the aforementioned recoverable fractions have been sorted from the household waste, you are left with the residual waste. The municipalities deliver this residual waste to the waste incineration plants for thermal treatment. A few municipalities still directly tip their residual waste into local landfills. As from June 1, 2005, however, it is no longer allowed to store untreated waste. Refer also to the following items 4 and 5.

Recycling quota targets in Bavaria:



Disposal of waste through private enterprises

Trade and industry are primarily responsible for the disposal of industrial waste. The disposal of packaging material that lands with the private user is collected and recycled through special private systems.

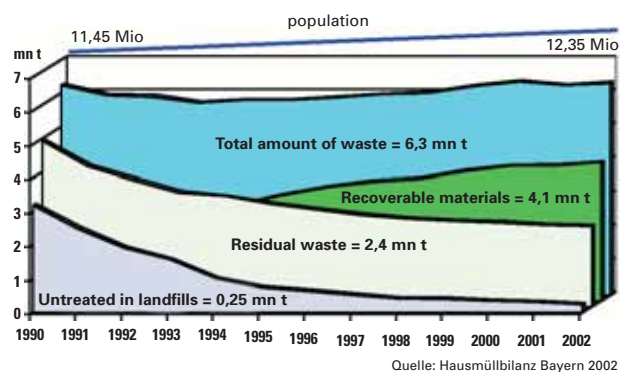
Since 1990 the waste recycling quota has risen from 31 % to 71 %. In the same period of time the amount of residual waste has been halved from 4.9 million tonnes to 2.4 million tonnes. This is mostly thanks to efforts on behalf of the Bavarian municipalities who take a very serious approach to recycling and protecting natural resources. It is most important to have a user-friendly disposal structure and well-informed and open-minded citizens who demonstrate a distinct waste awareness.

3. Disposal of Domestic Waste in a Bavarian County

The separating of waste starts in the private home. Packaging material, non-returnable bottles, organic waste (e.g. kitchen waste, garden waste), newspapers and residual waste are separated from each other. Depending on the local situation, residual waste and organic waste are collected separately by the waste disposal organisations; beyond this, possibly also newspapers and, at greater intervals, problem waste (e.g. fluorescent lamps, chemical residues) and bulky household waste. Depending on the size of the municipality, collection sites for recoverables staffed with trained personnel are provided where the respective types of waste can be deposited, excluding the residual waste. Throughout Bavaria there are 1,762 collection sites for recoverables. In addition to this, there are some 18,500 banks where containers are installed (without personnel). Here packaging, bottles and paper can be deposited. The recoverables deposited are reprocessed or used to recover energy, depending on their aptitude. The residual waste is thermally treated in central waste incineration plants.

Record of success in Bavaria 1990 - 2002

household waste, bulky household waste, household-similar waste from trade and industry



4. Thermal waste treatment in Bavaria

Thermal waste treatment plants play a key role in Bavaria's waste management. There are 16 waste incineration plants in operation today. At these plants it is possible to bring about a major reduction of the residual waste in one single working process and also the *inertisation* thereof, i.e. its conversion into non-reactive material.

- At the same time, the energy contents of the waste is reused in the form of electricity, process steam or long-distance heating. This saves 700 000 t of oil fuel each year.
- It is possible to separate scrap and other non-ferrous metals from the remaining combustion slag. Treated slag can be recycled for use in structural engineering works in conformity with the pertinent technical regulations.

After the coming into force of the recycling and waste management act in 1996 the Free State of Bavaria was the first federal state to also approve the *recovery of energy* from waste in waste incineration plants. With a thermal treatment quota of almost 90 % in 2002 Bavaria ranks top of the league among the federal states in Germany. The federal average is only approximately 40 %. Methods for drastic reduction of dioxin emissions have been state of the art for years.

5. Waste Storage

Thanks to the trend-setting technology of energy recovery, the quantity of household refuse that has to be stored in specially designed landfills dropped during the period between 1991 and 2002 from an annual 2.56 million tonnes to some 0.25 million tonnes per annum. In accordance with the regulations in force (Waste Storage Ordinance of the Federal Republic of Germany, see also item 8), as from mid 2005 there is to be no further storage of untreated waste. This is not a problem for Bavaria! Because here there are adequate treatment capacities available.

Waste collection

Collect systems (household)

Grey bin	Residual waste
Blue or green bin	Paper
Brown bin	Organic waste
Yellow bin or yellow bag	Packaging



Bring systems

Container banks
18.500 local sites



Collection sites for recoverables (1.762)



6. New Approaches through Research

Bavaria was quick to recognise that the established classic means of waste disposal were no longer suitable for establishing a recycling and waste management that protects natural resources. Bavaria has turned to the new environmental approach of *Integrated Product Policy (IPP)* as well as *material flow management* and supports these approaches through research and by applying them to business.

IPP seeks to consistently improve products and associated services (product systems) with regard to their impact on mankind and the environment in all phases of a product's life cycle. As defined in the guiding principle of cooperation between the state and industry, Bavaria supports research projects with the aim to convince the industry of the benefits IPP has to offer, e.g. through economic benefits such as material and energy saving.

Integrated Product Policy (IPP)

- **New environmentally compatible product concepts optimised from the cradle to the grave**
- **Environmental protection = Mainspring for innovations**
- **Thinking in systems and correlations**

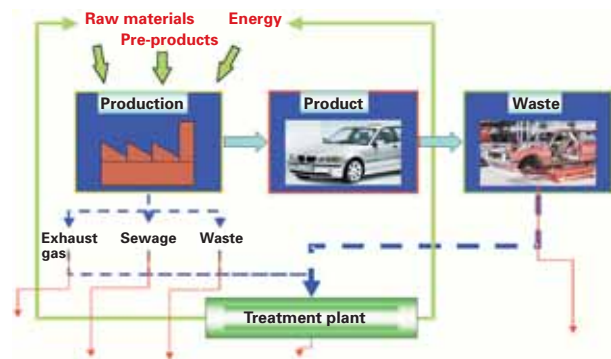


- **IPP makes sustainability tangible**
High-Tech vacuum cleaner, medical technology, construction design

Material flow management is based on the idea that every form of production creates a flow of materials. Material systems are to be influenced in such a way that, taking social aspects into account, these operate in an altogether ecologically and economically efficient manner. A key starting point is the analysis and - whenever necessary and possible - the control of material flow when relevant to waste. This requires adequate knowledge concerning the flow of materials on the one hand, and, on the other hand, it is interlinked with the task of optimising the structures and tools of waste monitoring. The goal is to equally relieve industry *and* administration of unnecessary effort and expenditure.

Flow of material and energy

Lever for material flow management



Waste research

The classic form of waste research is still rated highly. This involves a networked system of different research institutes and serves the development of solution approaches to problems arising in the sectors of waste avoidance, recycling, treatment and storage of waste. It focuses on the requirements of a modern recycling and waste management which is geared to a sustainable and effective protection of the environment.

Waste research in Bavaria is mostly based on university research. In order to promote these activities further, research institutes (e.g. BifA and BayFORREST) were already launched in the nineties and supported with substantial funding, not only from the Free State of Bavaria but also from the European Union.

Meanwhile, also other federal states and even the EU are now looking at new ways of thinking. In Bavaria we shall take all steps to maintain the leading role when it comes to sensible and sustainable progressive approaches.

7. Medium and Long-term Goals of Bavarian Waste Management

In a joint effort of the State Government, the municipalities as well as trade and industry it has been possible to disengage economic growth from the occurrence of waste. Efforts must be made to ensure that the occurrence of waste in relation to economic growth continues to decrease. A prerequisite for this is the reduction in the overall volume of waste through stepping up waste avoidance, through a more rational use of natural resources, in short, through sustainable waste management.

The avoidance of waste is the key to a reduction in total waste volumes. This must first and foremost be carried out at the source, i.e. already during the production. In order to achieve production processes that create minimum waste it is necessary to optimise the use of raw materials and increase the life cycle of products. On the other hand, consumer behaviour and market demand must develop an awareness for products that create less waste. Waste management of the future will embrace the entire life cycle of products. Means to this end are the provided by the already mentioned *material flow management, management, integrated product policy* and - with regard to a waste hazard reduction - *a joint cross-border chemicals policy*.

Based on well-established disposal structures as well as new waste avoidance strategies Bavaria is planning

- a reduction in the annual per capita volume of household waste and industrial waste similar to household waste of 10 % by 2010
- to step up the recycling quota of household waste from what is now 71 % to 90 % by 2020. The recycling of other forms of waste is also to be increased in the medium term
- to increase the recycling quota for building rubble from currently 50 % to 75 %
- a further increase in the recycling quota for hazardous waste to 50 %
- to reduce the storage of residual waste to almost zero by 2030
- implementation of an integrated product policy (IPP) and material flow management as a tool for sustainable waste management.

Waste research in Bavaria

- * **BayFORREST**
Bavarian research cooperation for waste management and recycling research (Universities)
- * **FES**
Research & Development centre for special technologies (Schwabach)
- * **BlfA**
Bayerisches Institut für angewandte Umweltforschung und Technik GmbH
Bavarian institute for applied environmental research and technology)
- * **Bavarian Environmental Protection Agency**
- * **Josef-Vogl-Technikum (Engineering Centre)**
- * **Augsburg University / University of Applied Science**

8. Laws on Waste within the European Framework

Bavarian legislation relating to waste is organised in a four-tier normative hierarchy:

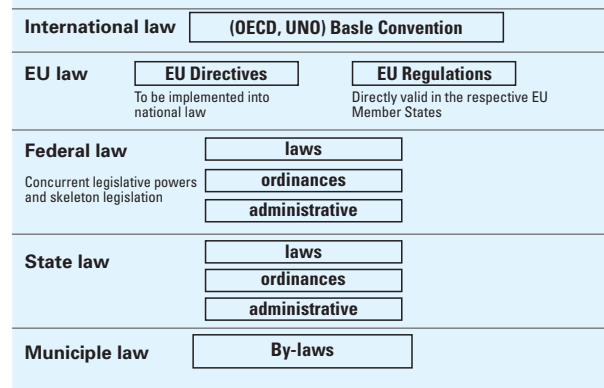
- EU legislation
- Federal legislation
- State legislation
- Law-making of the municipalities

The EU enacts regulations (e.g. regulations on the shipment of waste) which are immediately valid in the Member States and directives which are to be implemented by the Member States into national law.

Examples:

Waste Framework Directive (*EU Directive*), EC Waste Shipment Regulation (*EU Regulation*), Recycling and Waste Management Act (*Federal law*), Packaging Ordinance (*Federal ordinance*), Technical Guide on Domestic Waste (*Federal administrative regulations*), Bavarian Waste Management Act (*State law*), Bavarian Ordinance on Waste Distribution of Powers (*State ordinance*), Waste Management By-laws of the City of Munich (*Municipal By-law*)

Structure of laws for waste management




The federal waste legislation is laid down in the recycling and waste management act of 09.27.1994. This act specifies the basic definitions of waste, the obligations of the owner of waste, the monitoring of the flow of waste as well the principle structure of waste disposal. On the basis on this act and concerning the implementation of the corresponding EU directives, the federal government has issued further ordinances, such as the Packaging Ordinance, the Battery Ordinance, the Waste Storage Ordinance, the Landfill Ordinance, the Waste Verification Ordinance, the Waste Oil Ordinance, the Sewage Sludge Ordinance and the End-of-life Vehicle Ordinance.

The regulations of the federal government are directly valid in the 16 federal states of the Federal Republic of Germany. The

states are responsible for enforcing the regulations. The states organise the distribution of power for the enforcement of the regulations within their respective area and specify who is responsible for the disposal of waste. They can also make additional legal regulations which supplement the federal law, in as far as these additional regulations do not infringe federal law. Based on this competence the Bavarian Parliament issued the Bavarian Waste Management Act of February 27, 1991 and the new version of August 9, 1996.

The municipalities organise public waste disposal within their boundaries with by-laws, especially the collection and disposal of household waste.

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