Federal Waste Management Plan 2001

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FEDERAL WASTE MANAGEMENT
PLAN 2001

Issued by the Federal Ministry of Agriculture and Forestry, Environment and Water Management on June 30, 2001
Note:
The Federal Waste Management Plan 2001 has been issued in two volumes:

• Federal Waste Management Plan,
  Federal Waste Management Report 2001


The promulgation of the Federal Waste Management Plan takes place in the gazette of the Wiener Zeitung

The Federal Waste Management Plan is also retrievable from the internet
(www.bmu.gv.at)
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1. INTRODUCTION

1.1. General

Waste management, as an essential part of comprehensive environmental protection, is undergoing a process of permanent evolution. The objectives of waste management in Austria follow the generally accepted guiding principle of sustainable development that combines the aspects of ecology, economy and social security.

Especially with regard to waste management, the re-orientation of environmental policy aims at solutions with long-lasting effectiveness, simultaneously focusing on the aspects of cost-effectiveness and the internalisation of external costs. This impact-oriented approach on the one hand focuses on the intensified implementation of market-oriented instruments, ensuring greater flexibility and deregulation, and on the other hand complies with economic cost-benefit considerations.

The core of sustainable management lies in boosting ecological efficiency; in this, priority must be given to increasing material efficiency, which is of decisive importance for waste management. This permits the conclusion that, in addition to avoiding waste production, recovery must, as a rule, be given high priority to advance sustainable development. However, this basic precept needs to be reassessed in each case in order to identify the best possible solution of either recovery or environmentally appropriate disposal. Recovery processes, too, partly entail environmental pollution. The objective must lie in deviating pollutants as effectively as possible from the material cycle to a settling location, in order to attain, in the long term, sustainable substance and material management and thus to avoid environmental hazards, such as those caused by pollutant accumulation.

In waste management, the successful implementation of sustainable principles increasingly requires that the consumption of materials is taken into account in its entirety, and material management should be based on ecological as well as on economic aspects.

Goods production is for the most part dependent on the continuous exploitation of raw materials. Both the enormous consumption of fossil energy resources and the quantities of mineral raw materials exploited continue to present an upward tendency. The massive consumption of materials to meet the demands of the economy results in ever-increasing quantities of waste and pollutants. This development can be remedied by reduced material consumption on the one hand and increased implementation of a cyclic economy on the other hand, which provides for the options of re-use and recovery already during the production stage and, thus, helps to avoid pollutants.

In this context, material flow management exerts a targeted influence on the use of materials. Material flow management always presupposes knowledge of the relevant flows of materials in order to be able to intervene into the system at the appropriate points. This creates considerable advantages, above all for sustainable industrial/commercial production.

Three of the four objectives of the Waste Management Act 1990 (AWG) as amended are (also) defined through materials; not only the quantities of goods (waste flows) but also the material loads are of great importance. For this, the implementation of the AWG objectives calls for an analysis at both levels – goods and materials.

With respect to waste management, the ecological management of material flows means the long-term control of flows of anthropogenic materials while reducing environmental pollution to a minimum.

A more detailed definition can also be derived from the common waste management strategy of the EU.

The guidelines of waste management policy primarily include: the priority of waste prevention, the recovery of unavoidable waste and the optimisation of final disposal. In addition to the efficiency principle, the precautionary and polluter-pays principles as well as the basic concept of confronting threats to the environment at their origin must likewise be observed in the practical attainment of these objectives.
Under the waste management strategy, special emphasis is placed on the responsibility of the manufacturer. The principle of producer responsibility must therefore be reflected in the future measures while equally taking account of the responsibility of the other actors involved in the economic process. The AWG provides Austria with a solid legal basis for the development of future-oriented waste management under the above-mentioned aspects that can be further evolved, thus encouraging continued progress towards sustainable development.

Top priorities include the protection of human beings and the environment, the conservation of natural resources as well as the final disposal of emission-neutral residues as well as the simultaneous sparing use of land for landfills. Environmental threats are to be reduced to a minimum through prevention, recovery and other types of waste treatment as well as landfilling.

For the implementation of these goals and principles, the Federal Minister of Agriculture and Forestry, Environment and Water Management is charged with issuing and publishing a Federal Waste Management Plan (BAWP). Following the publication of the Federal Waste Management Plan in 1992, the third amended version has now been made available in the form of the Federal Waste Management Plan 2001. Simultaneously, the National Council must be informed of the measures taken on the basis of the last Federal Waste Management Plan (Federal Waste Report, "Bundesabfallbericht"). The explanatory notes to Article 5 of the government bill for the Federal Waste Management Act state that such a plan, from the viewpoint of its legal structure, is comparable to regional planning, and that it should reflect the dynamics and developments taking place in the field of waste management by being periodically amended and updated.

### Objectives of the Waste Management Act:

1. harmful, detrimental or other effects hazardous to the general well-being of humans as well as animals, vegetation, their basis of life and their natural environment must be kept to an absolute minimum;
2. conservation of raw material and energy resources;
3. lowest possible exploitation of landfill volume;
4. substances should only be left as waste if their disposal does not constitute any hazard potential for future generations (precautionary principle).

### Requirements:

1. an analysis of the waste management situation;
2. concrete stipulations derived from waste management objectives and principles for the purpose of
   a) reducing quantities and pollutant loads of waste;
   b) recovering waste in an environmentally appropriate and economically feasible manner;
   c) disposing of unavoidable or non-recoverable waste;
   d) removal of waste and waste oils for recovery or disposal;
3. the measures planned by the Federal Republic for the attainment of these requirements;
4. the regional distribution throughout the federal territory of plants necessary for the treatment of hazardous waste.

The Federal Waste Management Plan must comprise, as a minimum:

1. waste quantities and their pollutant content must be kept to an absolute minimum (qualitative and quantitative prevention of waste);
2. waste is to be processed to an extent that is ecologically beneficial and technically feasible, if additional costs thus incurred are not disproportionate to those of other methods of waste treatment, and provided that a market for the recovered substances exists or can be created (waste recovery);
3. depending on its particular qualities, non-recoverable waste is to be treated either by biological, thermal or chemico-physical processes; solid residues are to be deposited in a state of minimised reaction and conditioned order (waste disposal).
Since it is not possible to legally pre-define the substance of such plans in detail, the importance of a concrete and comprehensive analysis is particularly underlined. As far as possible, it should be indicated which areas permit a reduction in quantities of waste and pollutant loads, and how the relevant stipulations can be met (including the provision of relevant information).

Inasmuch as this is necessary under EU legislation, the content of the Federal Waste Management Plan is also to be evaluated as an implementation programme.

1.2. The “waste” concept

When describing the waste management situation and the statements to be derived therefrom, the definition of the concept of “WASTE” is of crucial importance.

A final assessment as to whether the term “waste” applies to a specific object or substance is not possible in a generalised manner but only on an individual, case-by-case basis. In keeping with EU legislation, an object or substance ends being waste only if it has indeed been recycled and/or if legally defined product qualities have been attained.

Also important in this connection are the official decisions in which the quality and type of waste as well as the classification of waste as hazardous or non-hazardous are established.

The “waste” concept according to the Waste Management Act 1990

a) Subjective waste concept – Intent to discard

The term “to discard” is used to designate the abandonment of custody of an object or substance, which no longer is or can be used according to its original purpose. The subjective waste concept presupposes a transaction and/or a specific intention to perform a transaction involving a (movable) object or substance (transaction-related waste concept). The fact that no monetary proceeds can be attained in exchange for a (movable) object or substance is an indication that the object or substance in question constitutes waste in the subjective sense of the term.

b) Objective waste concept – Public interest

To evaluate whether something is waste in the objective sense of the term, it is necessary to consider those environmental hazards which originate from the (movable) object or substance itself and can be inhibited by identifying and treating this (movable) object or substance as waste. The decisive factor is the actual environmental hazard potential of the materials concerned with account taken of disposal and recycling options.

c) Movable objects and substances

As a general rule, objects or substances must be movable to be covered under the term “waste”. However, if such objects or substances have combined with the soil in a manner detrimental to the environment (e.g. oil-polluted soil), they are also considered waste.

Objects or substances are considered waste if either the intent to discard them exists, or if it is in the public interest to identify and treat them as waste.

1.3. Availability of data

The recording of data relating to waste management poses a problem, i.e. the Waste Management Act stipulates the requirement of detailed planning without, however, having imposed a comprehensive obligation to provide the necessary basic data for this purpose. There are only federal provisions that stipulate that proof must be submitted of the disposal of hazardous waste and, lately, also of the depositing of waste at landfills. Thus it is possible to provide at least an increasingly detailed overview of the flows of hazardous waste as well as of the waste to be ultimately landfilled.

Currently, data are derived primarily from

- statistical surveys conducted by the federal and Land governments as well as the various chambers and associations involved,
- special studies to solve specific issues,
- operators of waste treatment and recycling plants, and
- administrative documentation: documentation on administrative procedures dealing with the licensing of plants or the monitoring of waste flows re-
reveals crucial information on the operating methods and technical equipment of plants as well as on their capacities. These data recorded in the “Abfallwirtschaftliche Anlagen- und Stoffdatenbank” (Waste Management Plant and Substance Database, UBA Plant Database) provide the basis for comprehensive information on recycling and treatment plants in Austria.

The quantity indications derived from these data sources for the Federal Waste Management Plan 2001 primarily refer to the year 1999; however, in some cases, data received until early 2001 were included as well. It has been shown that the reliability and accuracy of the data on the accumulated waste volume have further increased in recent years. Only few data are available on intra-company waste flows as well as on non-hazardous industrial waste. These data have been supplemented by surveys and extrapolations as well as estimates (aiming at maximum accuracy) by the Federal Environment Agency (UBA).

Despite positive results at both the Austrian and international levels, technical foundations for the evaluation of options for waste prevention and recovery cannot be generally applied; for this reason, the potentials identified must be regarded as general indications and estimates only.

In the future, the demand for information will increase, both in Austria and at European institutions. More and more complex issues need to be addressed already today. The number and extent of the reports to be submitted to the European Union (EU) are continuously increasing. It is therefore necessary to supplement the data in part by means of the most precise assessments or estimates that are possible. Intensive investigations and the evaluation of available information have permitted the creation of a database that provides a realistic picture of the waste management situation in Austria.

In order to increase knowledge on viable solutions for the prevention and recovery of industrial and commercial wastes, the work submitted to date must be further supplemented by detailed studies on the various sectors of industry and related types of waste.

In order to gradually increase the availability of waste management data, to prepare the Federal Waste Management Plan and the Waste Management Report as well as to comply with the reporting obligations of the EU and for monitoring purposes, an improved electronic monitoring system for the systematic representation of material and substance flows must be established for all hazardous and non-hazardous waste types. In keeping with the concept of sustainable development, it is immaterial whether hazardous or non-hazardous waste types are to be re-used to increase material efficiency so that this distinction must be supplemented by a consideration of the materials involved. Approaches can be found in the Treatment Principles (see Supplement to the Federal Waste Management Plan).

1.3.1. Land Waste Management Plans
In order to be able to regulate waste management within its own sphere of competences, each Land disposes of a Land Waste Management Act. Inter alia, these acts formulate requirements concerning the substance of the Land Waste Management Plans and waste management concepts to be prepared by the Offices of the Land Governments. These plans must be updated regularly (or as required) to safeguard the implementation of their objectives and in accordance with the principles of waste management; they must also be adapted to the developments in the field of waste management.

In accordance with the stipulations of the Länder, the Land Waste Management Plans should include:
1. an analysis of the management of non-hazardous waste in the respective Land;
2. a description of current developments and trends in regional waste management;
3. strategies for
   a) the qualitative and quantitative prevention and reduction of waste;
   b) the environmentally appropriate and economically feasible recovery of waste;
   c) the treatment of unavoidable and recoverable waste;
4. the measures of the respective Land planned to attain these requirements;
5. the representation of the intended organisational system for the collection, transport, recovery and treatment of non-hazardous waste.
However, the structure, content and topicality of the plans submitted are difficult to compare and therefore only conditionally useful as equivalent and reliable sources of information – for example for the preparation of the Federal Waste Management Plan.

Current updates of the Land Waste Management Plans are available for only five Länder; four Länder dispose of waste management plans dating from the period between 1991 and 1996.

It should, however, be mentioned in this context that, in addition to the waste management analysis in the Land Waste Management Plans, most Länder prepare waste balances or waste reports, which are usually published annually and provide a good overview of the current data situation for selected non-hazardous waste types (in particular from households and similar establishments).
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2. ANALYSIS OF THE WASTE MANAGEMENT SITUATION

2.1. Overview of waste volumes and waste treatment in Austria

The information concerning the waste volumes refers to the year 1999 and is based on surveys conducted by the Offices of the Land Governments, on results of sector-specific concepts, on the evaluation of data from the Waste Data Network (AbfDV), the Waste Management Plant and Substance Database (UBA Plant Database) and expert opinions. Regarding non-hazardous waste (with the exception of waste from households and similar establishments), they constitute for the most part estimates (albeit estimates aiming at maximum accuracy) but nevertheless provide a realistic overview of waste management procedures.

Including the excavated soil quantities of approx. 20 million tonnes, the total volume may be assessed at roughly 49 million tonnes per year. In any case, the changes in the quantitative data outlined below should not be interpreted as an increase in the waste volume. Rather, they are due to, on the one hand, improved and more practice-oriented knowledge and, on the other hand, to the introduction of the Austrian standard ÖNORM S 2100 (1997).


- further increase in the waste volume from households and similar establishments by approx. 12% in 3 years;
- improved results for the separate collection of several types of recyclables (paper, plastics, biogenous waste), while the collection results for hazardous household waste have remained almost unchanged;
- the significant increase in the volume of hazardous waste by approx. 240,000 tonnes to 1 million tonnes/year is not due to the additional production of hazardous waste but rather to changes in the definition of hazard-relevant properties of waste as a result of the Ordinance on the classification of hazardous waste and hazardous household waste (Waste Classification Ordinance of 1997).

<table>
<thead>
<tr>
<th>Selected types of waste</th>
<th>In million tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous waste and waste oils</td>
<td>1.0</td>
</tr>
<tr>
<td>Waste from households and similar establishments</td>
<td>3.1</td>
</tr>
<tr>
<td>Demolition and construction waste</td>
<td>7.5</td>
</tr>
<tr>
<td>Waste of mineral origin, not including demolition waste</td>
<td>4.1</td>
</tr>
<tr>
<td>Waste wood, not including wooden packaging</td>
<td>3.8</td>
</tr>
<tr>
<td>Waste from water and sewage treatment, including all types of water use</td>
<td>2.3</td>
</tr>
<tr>
<td>Separately collected industrial/commercial waste</td>
<td>2.2</td>
</tr>
<tr>
<td>Other non-hazardous waste</td>
<td>4.6</td>
</tr>
<tr>
<td><strong>Sum total (rounded)</strong></td>
<td><strong>28.6</strong></td>
</tr>
<tr>
<td>Waste group numbers and designations according to ÖNORM S 2100 (1997)</td>
<td>Trade and Industry</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>11 Food</td>
<td></td>
</tr>
<tr>
<td>12 Waste from vegetable and animal fat production</td>
<td>200</td>
</tr>
<tr>
<td>13 Waste from animal husbandry and slaughter</td>
<td>&lt;10</td>
</tr>
<tr>
<td>14 Tanning and leather waste</td>
<td></td>
</tr>
<tr>
<td>17 Waste wood</td>
<td>&gt;1,000</td>
</tr>
<tr>
<td>18 Cellulose, paper and cardboard waste</td>
<td>400</td>
</tr>
<tr>
<td>19 Other wastes from the processing and refinement of animal and vegetable products</td>
<td>&lt;100</td>
</tr>
<tr>
<td>31 Waste of mineral origin (not including scrap metal)</td>
<td>595,000</td>
</tr>
<tr>
<td>35 Scrap metal</td>
<td>87,000</td>
</tr>
<tr>
<td>39 Other wastes of mineral origin and waste from refined products</td>
<td>&lt;100</td>
</tr>
<tr>
<td>51 Oxides, hydroxides, waste salts</td>
<td>49,000</td>
</tr>
<tr>
<td>52 Acid, lye and concentrate waste</td>
<td>28,000</td>
</tr>
<tr>
<td>53 Waste from plant treatment agents and pesticides and waste from pharmaceutical products and disinfectants</td>
<td>3,000</td>
</tr>
<tr>
<td>54 Waste from mineral oil and coal refining products</td>
<td>168,000</td>
</tr>
<tr>
<td>55 Waste from organic solvents, paints, lacquers, adhesives, cement and resins</td>
<td>37,000</td>
</tr>
<tr>
<td>57 Synthetic and rubber waste</td>
<td>2,000</td>
</tr>
<tr>
<td>58 Waste from natural and chemical fibre products</td>
<td>600</td>
</tr>
<tr>
<td>59 Other waste from chemical conversion and synthesised products</td>
<td>3,000</td>
</tr>
<tr>
<td>91 Solid municipal/household waste including similar industrial waste</td>
<td>1,100,000</td>
</tr>
<tr>
<td>94 Waste from water and sewage treatment including all types of water use</td>
<td>10,000</td>
</tr>
<tr>
<td>95 Liquid waste from treatment plants</td>
<td>10,000</td>
</tr>
<tr>
<td>97 Medical waste</td>
<td>&lt;3,000</td>
</tr>
<tr>
<td>99 Other municipal/household waste including similar industrial waste and industrial waste without detailed specification, hazardous household waste</td>
<td></td>
</tr>
<tr>
<td>Sums total in tonnes (rounded)</td>
<td>1 million</td>
</tr>
</tbody>
</table>
Figure 1: Percentages of overall waste volume (100% = 48.6 million tonnes)

1. Waste from water and sewage treatment including all types of water use 4.7%
2. Waste of mineral origin (not including demolition waste) 8.4%
3. Recyclables from trade and industry 4.5%
4. Demolition and construction waste 15.4%
5. Waste wood (not including wood packaging) 7.8%
6. Hazardous waste and waste oils 2.1%
7. Other non-hazardous wastes 9.5%
8. Waste from households and similar establishments 6.4%
9. Excavated soil 41.2%

Figure 2: Comparison of overall waste volumes in the Federal Waste Management Plans 1992–2001, indicating the share of excavated soil in the overall volume (in million tonnes/year)

BAWP 1992

BAWP 1995

BAWP 1998

BAWP 2001

Figure 3: Percentages of recovery and treatment excluding excavated soil (100% = approx. 28.6 million tonnes)

- Thermal treatment and energy recovery
- Waste collected for treatment and recovery 63%
- Other treatment 27%
In all, a total of approx. 1,900 plants for the treatment and recycling of waste are currently in operation. Roughly 160 of these plants only recycle or treat waste produced within the company.

Table 3: Austrian plants participating in waste management (plants in operation and experimental plants)

<table>
<thead>
<tr>
<th>Type of plant</th>
<th>Number of plants</th>
<th>Capacity in million tonnes/year (landfills: in million m³), rounded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemico-physical treatment and recycling plants</td>
<td>32</td>
<td>0.5</td>
</tr>
<tr>
<td>Thermal treatment and recycling plants</td>
<td>53</td>
<td>1.9</td>
</tr>
<tr>
<td>Intra-company treatment and recycling plants</td>
<td>135</td>
<td>0.8</td>
</tr>
<tr>
<td>Special treatment and recycling plants</td>
<td>175</td>
<td>0.7</td>
</tr>
<tr>
<td>Bio-technical pre-treatment plants for residual waste (MBA)</td>
<td>12</td>
<td>0.4</td>
</tr>
<tr>
<td>Bio-technical plants for separately collected biogenous waste</td>
<td>526</td>
<td>1.1</td>
</tr>
<tr>
<td>Sorting plants for separately collected waste</td>
<td>86</td>
<td>1.1</td>
</tr>
<tr>
<td>Recycling plants</td>
<td>38</td>
<td>2.0</td>
</tr>
<tr>
<td>Landfills for demolition waste and excavated soil</td>
<td>752</td>
<td>n. a.</td>
</tr>
<tr>
<td>Landfills for the disposal of residual waste and bulk waste</td>
<td>53</td>
<td>30</td>
</tr>
</tbody>
</table>

Source: UBA Plant Database (status as per May 2001), Land Government Offices

The information content of the data administered in the Waste Management Plant and Substance Database (www.ubavie.gv.at) varies. For this reason, the data on the number of plants and their capacities must be interpreted as minimum values.

### 2.2. Hazardous waste and waste oils

#### 2.2.1. Waste volume

The data on the volume of hazardous waste and waste oils are taken from two different sources. On the one hand, these are data from the Waste Data Network (consignment note information, status as per 10 August 2000) describing certifiably disposed waste volumes. On the other hand, additional data are derived from further analyses and studies, e.g. sector-specific concepts. A study of the data from these two sources reveals divergences in the quantities indicated. Due to an improvement of the data situation resulting from the consignment notes submitted, it was possible to markedly reduce these divergences in recent years.

The increase in the volume of hazardous waste and waste oils as compared to the Federal Waste Management Plan 1998 is largely due to the following causes.

With the coming into force of the Waste Classification Ordinance of 1997, the number of hazardous waste types increased from 297 (Waste Classification Ordinance 1991) to 322. Moreover, the change in the definition of hazardous waste has also influenced the waste volume notified to the Waste Data Network. Experience made so far shows that, as a rule, it takes several years until a large quantity of data on waste newly classified as hazardous is covered; the same goes for the time that elapses until new notification requirements become effective.

The data evaluated by the Waste Data Network confirm the improved coverage of waste types explicitly classified as hazardous only according to the Waste Classification Ordinance of 1997.

On the basis of the most recent analyses of the volume of hazardous waste accumulated as well as of the development of the waste quantities notified to the Waste Data Network, a volume of approx. 1 million tonnes/year was notified for the Federal Waste Management Plan 2001.

This overall volume of hazardous waste is decisively influenced by just a few types of waste. For example, it is obvious that only 17 types of waste account for as much as 80% of the overall volume.
With the amendment of the Waste Classification Ordinance of 1997 (Federal Gazette 1997/227 as amended by Federal Gazette 2000/178), which entered into force on 1 July 2000, Council Directive 91/689/EEC on hazardous waste and Decision 94/904/EC establishing a list of hazardous waste are practically implemented in Austria. The change in the definition of hazardous waste also has effects on the primary waste notified to the Waste Data Network (hazardous waste notified by waste owners to the Waste Data Network as produced and externally disposed of). In 1999, approx. 972,000 tonnes of hazardous waste were certifiably handed over to external agents for disposal.

The quantity increase since 1996 has largely been due to excavated soil (SN 31423 “oil-contaminated soil” and SN 31424 “other contaminated soil”). The reason for the increased number of notifications lies in the fact that Art. 3 (4) of the Waste Classification Ordinance stipulates that obviously contaminated excavated soil (e.g. due to stoppage or accident) as well as excavated soil of industrial sites (e.g. petrol stations, old landfills), where substances potentially hazardous to soil and water occur, must be classified as hazardous.

Since the Waste Classification Ordinance on hazardous waste entered into force, there has also been the possibility of exempting waste types listed in the register of hazardous wastes contained in Annex 1 of this Ordinance (exception: waste types classified with “n” in Annex 1). For this purpose, the waste owner must furnish proof, by means of an exemption note and the exemption assessment, that the waste in question does not present any hazard-relevant properties. Due to their “non-hazardousness”, these exempted waste types do not longer require a consignment note.
Table 4: Volume of hazardous waste – sorted by largest volumes (in tonnes)

<table>
<thead>
<tr>
<th>Waste register numbers and waste designation according to ÖNORM S 2100 ('97)</th>
<th>BAWP 2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>31423 Oil-contaminated soil</td>
<td>179,000</td>
</tr>
<tr>
<td>31308 Slag and ash from waste pyrolysis plants</td>
<td>166,000</td>
</tr>
<tr>
<td>31424 Other contaminated soil</td>
<td>121,000</td>
</tr>
<tr>
<td>35203 Vehicles, machines and machine components, including environmentally relevant quantities of hazardous components or substances (e.g. starter battery, brake fluid, engine oil)</td>
<td>50,000</td>
</tr>
<tr>
<td>54102 Waste oils</td>
<td>37,500</td>
</tr>
<tr>
<td>54402 Drilling and grinding emulsions and emulsion mixtures</td>
<td>30,000</td>
</tr>
<tr>
<td>51541 Other salts, hardly soluble</td>
<td>29,500</td>
</tr>
<tr>
<td>31211 Salt slag containing aluminium</td>
<td>25,000</td>
</tr>
<tr>
<td>31223 Dross, ash and slag from other smelting processes</td>
<td>25,000</td>
</tr>
<tr>
<td>54702 Contents of oil separators (gasoline separators)</td>
<td>24,100</td>
</tr>
<tr>
<td>54701 Sand-catcher residues containing oil or cold cleaning fluids</td>
<td>20,100</td>
</tr>
<tr>
<td>54408 Other oil-water mixtures</td>
<td>20,000</td>
</tr>
<tr>
<td>35322 Lead accumulators</td>
<td>17,000</td>
</tr>
<tr>
<td>31309 Flue-ash and dust from waste incineration plants</td>
<td>16,500</td>
</tr>
<tr>
<td>31618 Carbide sludge</td>
<td>13,800</td>
</tr>
<tr>
<td>31441 Construction waste and/or waste resulting from fires, containing hazardous pollutants</td>
<td>13,700</td>
</tr>
<tr>
<td>54930 Solid materials contaminated with grease and oil (waste generated by workshops, industry and petrol stations)</td>
<td>11,100</td>
</tr>
<tr>
<td><strong>Sum total of 17 waste types</strong></td>
<td><strong>800,000</strong></td>
</tr>
<tr>
<td><strong>Remaining 305 waste types</strong></td>
<td><strong>200,000</strong></td>
</tr>
<tr>
<td><strong>Sum total, rounded (in tonnes)</strong></td>
<td><strong>1 million</strong></td>
</tr>
</tbody>
</table>

With few exceptions, an exemption (proof of non-hazardousness) from the regime of hazardous waste is granted before the waste is transported to a recycling and treatment plant so that only a small share of the exempted waste quantities is listed as primary waste by the Waste Data Network (Table 5). In 1999, a total of approx. 342,000 tonnes of waste were thus exempted.

For the reference year 1999, the evaluation of the consignment data by Land indicates Vienna as the Land with the highest volume of hazardous waste. The development of the shares of the Länder is shown in Table 5. It is remarkable that in 1998 and 1999 the Länder of Carinthia, Lower Austria, Upper Austria and Vienna presented a relatively high increase of primary waste volumes compared to the other Länder. The reason for this lies on the one hand in the extended obligation to notify contaminated excavated soil; on the other hand, part of this volume increase of the above Länder is due to specific events, such as oil spills, but also the remediation of contaminated sites.
Figure 5: Hazardous waste 1990–1999 (primary waste in tonnes, broken down by waste groups)

![Graph showing hazardous waste 1990–1999]

Source: Waste Data Network (status as per 10 August 2000)

Table 5: Hazardous waste 1995–1999 (primary waste in tonnes, broken down by Länder)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Burgenland</td>
<td>7,050</td>
<td>11,186</td>
<td>9,816</td>
<td>11,168</td>
<td>12,530</td>
</tr>
<tr>
<td>Carinthia</td>
<td>21,186</td>
<td>27,698</td>
<td>27,454</td>
<td>67,104</td>
<td>99,429</td>
</tr>
<tr>
<td>Lower Austria</td>
<td>68,771</td>
<td>74,366</td>
<td>78,366</td>
<td>192,251</td>
<td>174,796</td>
</tr>
<tr>
<td>Upper Austria</td>
<td>106,226</td>
<td>135,157</td>
<td>120,201</td>
<td>161,289</td>
<td>202,241</td>
</tr>
<tr>
<td>Salzburg</td>
<td>32,409</td>
<td>28,033</td>
<td>52,242</td>
<td>31,672</td>
<td>50,773</td>
</tr>
<tr>
<td>Styria</td>
<td>69,668</td>
<td>69,695</td>
<td>75,473</td>
<td>96,661</td>
<td>99,391</td>
</tr>
<tr>
<td>Tyrol</td>
<td>36,603</td>
<td>39,013</td>
<td>39,063</td>
<td>36,036</td>
<td>38,499</td>
</tr>
<tr>
<td>Vorarlberg</td>
<td>13,356</td>
<td>12,812</td>
<td>17,702</td>
<td>15,808</td>
<td>20,430</td>
</tr>
<tr>
<td>Vienna</td>
<td>239,583</td>
<td>208,920</td>
<td>208,420</td>
<td>306,481</td>
<td>274,009</td>
</tr>
<tr>
<td><strong>Austria (rounded)</strong></td>
<td><strong>595,000</strong></td>
<td><strong>607,000</strong></td>
<td><strong>629,000</strong></td>
<td><strong>918,000</strong></td>
<td><strong>972,000</strong></td>
</tr>
</tbody>
</table>

Source: Waste Data Network (status as per 10 August 2000); allocation to registered place of business and not to place of actual generation.

Other waste groups
- Waste from organic solvents, paints, lacquers, adhesives, cement and resins
- Waste from mineral oil and coal refining products
- Acid, lye and concentrate waste

Oxides, hydroxides, waste salts
- Scrap metal
- Waste of mineral origin (not including scrap metal)
- Waste from vegetable and animal fat products

Table 5: Hazardous waste 1995–1999 (primary waste in tonnes, broken down by Länder)
2.2.3. Exports and imports

Table 6: Notified exports of hazardous waste, 1997–1999 (in tonnes)

<table>
<thead>
<tr>
<th>Waste register numbers and waste designation according to ÖNORM S 2100 ('97)</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>31211 Salt slag containing aluminium</td>
<td>28,814</td>
<td>26,586</td>
<td>20,993</td>
</tr>
<tr>
<td>31223 Dross, ash and slag from other smelting processes</td>
<td>9,340</td>
<td>16,241</td>
<td>10,634</td>
</tr>
<tr>
<td>51541 Other salts, hardly soluble</td>
<td></td>
<td></td>
<td>24,530</td>
</tr>
<tr>
<td>31308 Slag and ash from waste incineration plants</td>
<td>1,258</td>
<td>14,916</td>
<td></td>
</tr>
<tr>
<td>31424 Other contaminated soil</td>
<td></td>
<td></td>
<td>14,400</td>
</tr>
<tr>
<td>31205 Light-metal slag containing aluminium</td>
<td>1,271</td>
<td>4,617</td>
<td>1,491</td>
</tr>
<tr>
<td>31108 Worn refractories from metallurgic processes</td>
<td>5,628</td>
<td>1,144</td>
<td>296</td>
</tr>
<tr>
<td>31312 Solid residue containing salt from the flue-gas purification of waste incineration plants and waste pyrolysis plants</td>
<td>1,759</td>
<td>981</td>
<td>1,014</td>
</tr>
<tr>
<td>Others</td>
<td>9,519</td>
<td>8,935</td>
<td>13,933</td>
</tr>
<tr>
<td><strong>Sums total, rounded (in tonnes)</strong></td>
<td><strong>56,000</strong></td>
<td><strong>68,000</strong></td>
<td><strong>109,000</strong></td>
</tr>
</tbody>
</table>

Table 7: Notified imports of hazardous waste, 1997–1999 (in tonnes)

<table>
<thead>
<tr>
<th>Waste register numbers and waste designation according to ÖNORM S 2100 ('97)</th>
<th>1997</th>
<th>1998</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>35322 Lead accumulators</td>
<td>11,398</td>
<td>10,244</td>
<td>3,718</td>
</tr>
<tr>
<td>54710 Grinding sludge containing oil</td>
<td>5,302</td>
<td>1,189</td>
<td>2,063</td>
</tr>
<tr>
<td>59507 Catalytic converters and contact substances</td>
<td>8,081</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>55220 Solvent mixtures containing halogens</td>
<td></td>
<td>266</td>
<td>2,294</td>
</tr>
<tr>
<td>55503 Lacquer and paint sludge</td>
<td>265</td>
<td>626</td>
<td>1,568</td>
</tr>
<tr>
<td>54930 Solid materials contaminated with grease and oil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(waste generated by workshops, industry and petrol stations)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55370 Solvent mixtures without halogenated organic components,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>paint and lacquer fluxes (e.g. “thinner”) including anti-freezers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31435 Used filters and absorbents with application-specific harmful</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>admixtures (e.g. diatomite, activated soil, activated carbon)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>1,410</td>
<td>1,154</td>
<td>3,824</td>
</tr>
<tr>
<td><strong>Sums total, rounded (in tonnes)</strong></td>
<td><strong>27,000</strong></td>
<td><strong>15,000</strong></td>
<td><strong>16,000</strong></td>
</tr>
</tbody>
</table>

Source: Waste Data Network (status as per December 2000)

According to consignment note data (Waste Documentation Ordinance) and transit advice notes (Waste Shipment Regulation), approx. 56,000 tonnes of hazardous waste were exported in 1997, to be followed by approx. 68,000 tonnes in 1998 and approx. 109,000 tonnes in 1999. Compared with the total volume of hazardous waste in Austria, the share of waste treated abroad amounts to roughly 10% and hence is relatively small. The significant increase in hazardous waste exported in 1999 is largely due to the disposal of waste resulting from the remediation of a contaminated site. For individual waste types, however, exports constituted an important way of disposal. As in the years before, all salt slag containing aluminium was exported in the 1997-1999 period. The largest share of this volume was shipped to Germany, a smaller part to Norway. Almost the entire volume of worn refractories from metallurgic processes with production-specific harmful admixtures is exported to
Great Britain. Dross, ash and slag from other smelting processes, too, as well as filter dust containing non-ferrous metals are chiefly disposed of abroad, mainly in Germany and Belgium.

As demonstrated by the consignment notes and transit advice notes, the imports of hazardous waste totalled approx. 27,000 tonnes in 1997, 15,000 tonnes in 1998, and 16,000 tonnes in 1999. Thus the sum total of hazardous waste imports accounts for less than 3% of hazardous waste in Austria. Principally, lead accumulators, catalytic converters and contact substances were imported from Germany and Hungary to be recycled in Austria. In addition to these countries, hazardous waste was chiefly imported from Italy and Slovenia.

2.3. Non-hazardous waste

2.3.1. Waste from households and similar establishments

Waste from households and similar establishments originates in private households, administrative facilities of commerce, industry and public administration, kindergartens, schools, hospitals, small enterprises, agriculture, markets and other generation points if these are covered by the municipal waste collection system.

In 1999, waste from households and similar establishments totalled approx. 3.1 million tonnes, of which roughly 1.315,000 tonnes of residual waste and roughly 219,000 tonnes of bulk waste were disposed of by the public waste collection service. In addition, about 23,000 tonnes of hazardous household waste, roughly 1.061,000 tonnes of recyclables and approx. 478,000 tonnes of biogenous waste were gathered through separate collection; this corresponds to approx. 50% of the overall volume of waste generated in households and similar establishments.

Table 8: Volume of waste from households and similar establishments in 1999
(in tonnes)

<table>
<thead>
<tr>
<th>Residual waste</th>
<th>1,315,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk waste</td>
<td>219,000</td>
</tr>
<tr>
<td>Hazardous household waste</td>
<td>23,000</td>
</tr>
<tr>
<td>Waste paper</td>
<td>540,000</td>
</tr>
<tr>
<td>Waste glass</td>
<td>180,000</td>
</tr>
<tr>
<td>Scrap metal – packaging</td>
<td>34,000</td>
</tr>
<tr>
<td>Scrap metal – household scrap</td>
<td>112,000</td>
</tr>
<tr>
<td>Light-weight fractions</td>
<td>100,000</td>
</tr>
<tr>
<td>Textiles</td>
<td>21,000</td>
</tr>
<tr>
<td>Other recyclables</td>
<td>74,000</td>
</tr>
<tr>
<td>Biogenous waste</td>
<td>478,000</td>
</tr>
<tr>
<td><strong>Sum total (in tonnes)</strong></td>
<td><strong>3.10 million</strong></td>
</tr>
</tbody>
</table>

Source: Data provided by the Land Government Offices
Figure 6: Waste from households and similar establishments

Waste from households and similar establishments 1999: about 3.100,000 tonnes

<table>
<thead>
<tr>
<th>Residual waste and bulky waste: 1,534,000 t</th>
<th>Separate collection: 1,562,000 t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual waste: 1,315,000 t</td>
<td>Waste destined for recovery collected separately: 1,061,000 t</td>
</tr>
<tr>
<td>Bulky waste: 219,000 t</td>
<td>Biogenous waste collected separately: 478,000 t</td>
</tr>
<tr>
<td>Sorting and other treatment</td>
<td>Sorting and other treatment</td>
</tr>
<tr>
<td>Secondary materials collected separately: 989,000 t</td>
<td></td>
</tr>
<tr>
<td>Recycling</td>
<td>Residual substances: 162,000 t</td>
</tr>
<tr>
<td>Thermal recovery</td>
<td>Secondary materials collected separately: 813,000 t</td>
</tr>
<tr>
<td>Secondary materials: 813,000 t</td>
<td>Residual waste: 77,000 t</td>
</tr>
<tr>
<td>Recycling</td>
<td>Rotting end products: 62,000 t</td>
</tr>
<tr>
<td>Thermal recovery</td>
<td>Residuesal substances: 123,000 t</td>
</tr>
<tr>
<td>Residual waste, bulky waste, rotting end products, residual substances from treatment: 1.33 million t</td>
<td>Compost: 159,000 t</td>
</tr>
<tr>
<td>53 Landfills</td>
<td>Hazardous household waste - collected separately: 22,000 t</td>
</tr>
<tr>
<td>MBpt</td>
<td>St Special treatment</td>
</tr>
<tr>
<td>Mechanical - Biological pre - treatment</td>
<td>R Recovery</td>
</tr>
<tr>
<td>SMBw Secondary materials from bulky waste</td>
<td>St Special treatment</td>
</tr>
</tbody>
</table>

Legend:

- MBpt: Mechanical - Biological pre-treatment
- SMBw: Secondary materials from bulky waste
- St: Special treatment
- R: Recovery
Figure 7: Recycling and treatment of waste from households and similar establishments, 1989–1999

- First treatment step:
  1. Recovery of biogenous waste
  2. Recovery of recyclables
  3. Treatment of chemicals of concern
  4. Thermal treatment (WIP)
  5. Mechanico-biological treatment of residual waste
  6. Direct landfilling

Figure 8: Total quantity of waste from households and similar establishments deposited at landfills, including residues of treatment; 1989–1999

- 74.8 % in percent by weight
- 43.1 % in percent by weight
The quantity of residual waste amounting to approx. 1,315,000 tonnes corresponds to a volume of about 9.74 million m³ in the waste containers (as loose bulk).

Comparisons with the quantities generated in 1996 (the last reference year of the Federal Waste Management Plan 1998) reveal the following trends:

- The total volume of waste from households and similar establishments increased by approx. 321,000 tonnes, i.e. by roughly 12%.
- The quantities of residual waste increased slightly by approx. 24,000 tonnes, i.e. by about 2%, while those of bulk waste decreased slightly by approx. 2,000 tonnes, i.e. by about 1%.
- Since 1996, the quantity of separately collected household waste increased by approx. 24%, i.e. from approx. 1,263,000 tonnes to approx. 1,562,000 tonnes.
- The quantities of separately collected recyclables increased by approx. 182,000 tonnes, i.e. by about 21%.
- With respect to biogenous waste, the separately collected quantities increased by approx. 118,000 tonnes, i.e. by about 33%.

In 1999, the recycling and treatment of the approx. 3.1 million tonnes of waste from households and similar establishments (see Figure 7) were carried out proportionately as follows:

- 34.3% in plants for the recycling of separately collected waste,
- 15.4% in plants for the recycling of separately collected biogenous waste,
- 0.8% in plants for the treatment of hazardous household waste,
- 6.3% in plants for the mechanico-biological pre-treatment of residual waste,
- 14.7% in plants for the thermal treatment of residual waste,
- 28.5% directly and without treatment at landfills.

In 1999, residual matter from the recovery of recyclables and the recovery of biogenous waste as well as residual matter from the mechanico-biological and thermal treatment of residual waste accounted for approx. 43% of the waste from households and similar establishments deposited at landfills. Compared to 1996, the total quantity deposited at landfills increased by approx. 72,000 tonnes, i.e. by about 6%.

However, if the landfilled quantities are viewed in reference to the total waste volume, the overall quantity of landfilled waste has decreased by more than 2%.

### 2.3.2. Excavated soil, demolition and construction waste

The accumulated quantities of excavated soil, demolition and construction waste amount to approx. 27.5 million tonnes. Thus this waste group accounts for roughly 57% of the entire waste volume. With a quantity of approx. 20 million tonnes/year, excavated soil represents the largest item amongst the various waste types. The quantity indicated for excavated soil constitutes the most accurate estimate possible on the basis of various data sources and comprises only the share deposited or used for landscaping. The volume used for concrete architectural or landscaping measures such as filling or banking work at the excavation site, etc. is not included here. Approx. 90% of the excavated soil are

<table>
<thead>
<tr>
<th>Waste register numbers and waste designation according to ÖNORM S 2100 ('97)</th>
<th>BAWP 2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>31409</td>
<td>Demolition waste and/or waste resulting from fires (excluding construction waste)</td>
</tr>
<tr>
<td>31410</td>
<td>Road-construction waste</td>
</tr>
<tr>
<td>31411</td>
<td>Excavated soil</td>
</tr>
<tr>
<td>31412</td>
<td>Asbestos cement and SN 31413 asbestos cement dust</td>
</tr>
<tr>
<td>31427</td>
<td>Waste concrete</td>
</tr>
<tr>
<td>31467</td>
<td>Track ballast</td>
</tr>
<tr>
<td>91206</td>
<td>Construction waste (not including debris)</td>
</tr>
<tr>
<td><strong>Sum total, rounded (in tonnes)</strong></td>
<td><strong>27.5 million</strong></td>
</tr>
</tbody>
</table>
recovered, while about 10% are dumped at landfills.
The quantity of demolition waste, i.e. of construction waste, road-construction waste, asbestos cement, asbestos cement dust and waste concrete, amounts to approx. 5 million tonnes/year for Austria. As in the past years, the 65 member companies of the Österreichischer Baustoff-Recycling Verband (Austrian Association for Construction Material Recycling, ÖBRV) recover roughly 4 million tonnes/year and deposit roughly 1 million tonnes/year. Since 1995, the recovery rate has been consistently increasing from 45% to nearly 80%.

2.3.3. Waste of mineral origin, not including demolition waste and excavated soil

The quantity of non-hazardous waste of mineral origin accumulated without including demolition waste and excavated soil equals approx. 4.1 million tonnes/year. This figure likewise does not include the share of waste glass, which on the one hand must be classified as waste from households and similar establishments and on the other hand belongs to the commercial/industrial waste category.
The changes as compared with the data featured in the 1998 BAWP result from new findings concerning the volume of mineral sludge. Moreover, the first notifications under Art. 29 of the Landfill Ordinance have contributed towards a more accurate specification of the quantity data for these types of waste.
Approx. 80% of the quantity generated are recovered; the rest is treated. This waste mainly originates from energy supply companies, ironworks and steelworks, from the construction industry, foundries and furnace plants.

Table 10: Volume of waste of mineral origin, not including demolition waste and waste glass (in tonnes)

<table>
<thead>
<tr>
<th>Waste register numbers and waste designation according to ÖNORM S 2100 (1997)</th>
<th>total</th>
<th>Of which non-hazardous</th>
</tr>
</thead>
<tbody>
<tr>
<td>311 Worn refractories, smelting and foundry debris</td>
<td>94,800</td>
<td>94,800</td>
</tr>
<tr>
<td>312 Metallurgic slag, scrapping, dust</td>
<td>2,260,600</td>
<td>2,190,000</td>
</tr>
<tr>
<td>313 Ash, slag and dust from thermal waste treatment and furnace plants</td>
<td>927,700</td>
<td>738,500</td>
</tr>
<tr>
<td>314 Other solid mineral waste</td>
<td>855,000</td>
<td>538,600</td>
</tr>
<tr>
<td>316 Mineral sludge</td>
<td>547,900</td>
<td>529,300</td>
</tr>
<tr>
<td><strong>Sums total, rounded (in tonnes)</strong></td>
<td><strong>4.7 million</strong></td>
<td><strong>4.1 million</strong></td>
</tr>
</tbody>
</table>
2.3.4. Waste wood, not including wooden packaging

Wood is used in numerous sectors of the economy; as a result, waste wood occurs in a wide variety of areas. In determining the quantity of waste generated, it is important to decide whether waste wood, such as bark, slabs, chips, fine or coarse sawdust, should or should not be classified as waste. Since this can only be decided on a case-by-case basis, these data must be considered less reliable.

In all, the quantity of non-hazardous waste wood accumulated may be assessed at approx. 3.8 million tonnes/year. This does not include the portion of recyclable wood classed as household waste and wooden packaging of commercial or industrial origin.

The wood originating in the wood-processing industry is almost entirely recycled.

2.3.5. Waste from water and sewage treatment and all types of water use

The volume of this waste primarily occurring in the form of sludge is stated at approx. 2.3 million tonnes/year. In addition to sludge from sewage purification plants, this category also includes waste from water treatment, water use and other sludge from sewage treatment.

In 1998, an overall quantity of approx. 1.2 million tonnes of sewage sludge, referred to 30% of dry matter content (SN 945, SN 948), was produced; of this volume, roughly 54% were of municipal, and roughly 46% of industrial origin. This corresponds to the data of the Water Conservation Report 1999 (Federal Ministry of Agriculture and Forestry), according to which a quantity of sewage sludge amounting to approx. 393,000 tonnes (DM) was produced. It is expected that this volume will increase further.

The following recycling and disposal methods were used for a total of approx. 393,000 tonnes (DM) of sewage sludge generated in 1998.

Table 11: Quantities of waste wood, not including wooden packaging (in tonnes)

<table>
<thead>
<tr>
<th>Waste register numbers and waste designation according to ÖNORM S 2100 ('97)</th>
<th>BAWP 2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>17101</td>
<td>Bark</td>
</tr>
<tr>
<td>17102</td>
<td>Slabs, chips from clean, uncoated wood</td>
</tr>
<tr>
<td>17103</td>
<td>Fine and coarse sawdust from clean, uncoated wood</td>
</tr>
<tr>
<td>17104</td>
<td>Wood-planing dust and sludge (dry matter)</td>
</tr>
<tr>
<td>17114</td>
<td>Dust and sludge from chipboard production</td>
</tr>
<tr>
<td>17115</td>
<td>Chipboard waste</td>
</tr>
<tr>
<td>17202</td>
<td>Construction and demolition timber</td>
</tr>
<tr>
<td>17207</td>
<td>Railway sleepers</td>
</tr>
<tr>
<td>17209</td>
<td>Wood (e.g. stakes and poles), oil-impregnated</td>
</tr>
<tr>
<td>Sum total, rounded (in tonnes)</td>
<td>3.8 million</td>
</tr>
</tbody>
</table>
Table 12: Quantities of waste from water and sewage treatment and all types of water use (in tonnes, rounded)

<table>
<thead>
<tr>
<th>Waste register numbers and waste designation according to ÖNORM S 2100 (’97)</th>
<th>BAWP 2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>941 Sludge from water treatment</td>
<td>3,000</td>
</tr>
<tr>
<td>943 Non-stabilised sludge from mechanico-biological sewage treatment, unless covered under other items (raw and fresh sludge)</td>
<td>1,000,000</td>
</tr>
<tr>
<td>945 Stabilised sludge from mechanico-biological sewage treatment, unless covered under other items (30% dry matter)</td>
<td>636,000</td>
</tr>
<tr>
<td>947 Residues from sewers and sewage treatment (not including sludge)</td>
<td>83,000</td>
</tr>
<tr>
<td>948 Sludge from sewage treatment (30% dry matter)</td>
<td>559,000</td>
</tr>
<tr>
<td>949 Waste from water use</td>
<td>40,000</td>
</tr>
<tr>
<td><strong>Sum total, rounded (in tonnes)</strong></td>
<td><strong>2.3 million</strong></td>
</tr>
</tbody>
</table>

Figure 9: Recycling and disposal of sewage sludge (other forms of treatment: processing, landscaping and aggregates, temporary storage)
2.3.6. Separately collected industrial recyclables

A quantity of approx. 2.2 million tonnes/year of industrial recyclables is collected separately.

### Table 13: Quantities of separately collected industrial recyclables (in tonnes)

<table>
<thead>
<tr>
<th>Waste register numbers and waste designation according to ÖNORM S 2100 ('97)</th>
<th>BAWP 2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>17201</td>
<td>Non-contaminated wooden packaging and waste wood</td>
</tr>
<tr>
<td>18718</td>
<td>Uncoated waste paper, paper and cardboard</td>
</tr>
<tr>
<td>31408</td>
<td>Glass (e.g. sheet and plate glass)</td>
</tr>
<tr>
<td>31468</td>
<td>Transparent glass (glass packaging)</td>
</tr>
<tr>
<td>31469</td>
<td>Coloured glass (glass packaging)</td>
</tr>
<tr>
<td>351</td>
<td>Iron and steel scraps</td>
</tr>
<tr>
<td>35105</td>
<td>Iron packaging and iron containers</td>
</tr>
<tr>
<td>35315</td>
<td>Non-ferrous metal scrap and non-ferrous metal packaging</td>
</tr>
<tr>
<td>58107</td>
<td>Cloth and textile scraps, old clothing</td>
</tr>
<tr>
<td>91207</td>
<td>Light-weight fractions from collected packaging</td>
</tr>
<tr>
<td><strong>Sum total, rounded (in tonnes)</strong></td>
<td><strong>2.2 million</strong></td>
</tr>
</tbody>
</table>

2.3.7. Other non-hazardous waste

The annual quantity of formerly not described, non-hazardous wastes may be assessed at approx. 4.6 million tonnes/year. This category includes, for example, pruning and grass cuttings, street sweepings, waste from food production, slaughterhouse waste, plastics and rubber waste as well as non-hazardous industrial waste deposited at landfills. Sector-specific concepts, information furnished by the Land Government Offices, studies and the Federal Ministry’s own evaluations were used to determine the quantities. Although these data permit an adequate overview of waste volumes, they cannot be used for providing a general forecast of future developments due to the diversity of the waste types.

2.4. Recycling and treatment plants

The following information on recycling and treatment plants is largely taken from the Waste Management Plant and Substance Database. These data published under the Federal Environmental Information Act are publicly accessible at the Web site of the Federal Environment Agency (www.ubavie.gv.at). They are essentially based on administrative documentation and on information provided by plant operators. Since the information content of the available data records varies and hence is not always complete, all indications regarding the number of plants and their capacities should be interpreted as minimum values.
2.4.1. Chemico-physical recycling and treatment plants

At present, 32 chemico-physical treatment plants for organic and inorganic wastes are in operation in Austria; of these, three are in the trial-run stage. In all, these plants have a maximum treatment capacity of approx. 500,000 tonnes/year.

Roughly half of the chemico-physical treatment plants are run as combined plants capable of handling and treating both organic and inorganic wastes. Another twelve plants are exclusively outfitted for the handling and treatment of organic wastes, mostly contents of oil separators, waste oils, oil-water mixtures, drilling and grinding oil emulsions and mixed emulsions. Another four plants treat only inorganic wastes.

Table 14: Chemico-physical recycling and treatment plants

<table>
<thead>
<tr>
<th>Land</th>
<th>Number of plants</th>
<th>Capacity in tonnes/year (rounded)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burgenland</td>
<td>2</td>
<td>3,000</td>
</tr>
<tr>
<td>Carinthia</td>
<td>2</td>
<td>4,000</td>
</tr>
<tr>
<td>Lower Austria</td>
<td>2</td>
<td>5,500</td>
</tr>
<tr>
<td>Upper Austria</td>
<td>5</td>
<td>62,000</td>
</tr>
<tr>
<td>Salzburg</td>
<td>2</td>
<td>20,000</td>
</tr>
<tr>
<td>Styria</td>
<td>5</td>
<td>23,500</td>
</tr>
<tr>
<td>Tyrol</td>
<td>4</td>
<td>19,900</td>
</tr>
<tr>
<td>Vorarlberg</td>
<td>4</td>
<td>27,500</td>
</tr>
<tr>
<td>Vienna</td>
<td>6</td>
<td>332,000</td>
</tr>
<tr>
<td><strong>Austria</strong></td>
<td><strong>32</strong></td>
<td><strong>500,000</strong></td>
</tr>
</tbody>
</table>

Source: UBA Plant Database (status as per May 2001)

Figure 10: Chemico-physical recycling and treatment plants

Source: UBA Plant Database (status as per May 2001)
2.4.2. Thermal recovery and treatment plants

The Waste Management Plant and Substance Database currently lists 188 plants for the thermal recycling and treatment of waste (see Figure 11) with a total capacity of around 2.7 million tonnes. Since the capacities of all plants are not known, this total capacity must be regarded as a minimum value that in reality may be much higher.

Of a total of 188 plants, 135 treat waste generated exclusively within their own enterprise. The remaining 53 plants are partly publicly accessible. However, others only treat waste of specific partner enterprises, the so-called “selected third parties”.

Due to current developments (incineration requirements under Art. 6 of the Federal Act on Protection Measures against TSE and the Feeding of Animal Protein, Federal Gazette II 2000/143), ten existing treatment plants were also given a licence to incinerate ground offal. Another plant in Upper Austria is currently undergoing the licensing process.

The assessment of whether they have sufficient capacity for treating and recovering hazardous waste and waste oils takes account of all 53 plants which incinerate hazardous waste either on its own or together with non-hazardous waste and are publicly accessible or accept waste from selected third parties (see Figure 12).

As a result, a total of 14 plants with an overall capacity of approx. 233,000 tonnes/year remain; Fernwärme Wien GmbH with its Simmeringer Haide plant (the former EbS), accounts for the major share of this capacity. It may be assumed that these plants can thermally treat approx. 150,000 to 170,000 tonnes of hazardous waste per year.

At the moment, three waste incineration plants with a capacity of approx. 530,000 tonnes/year are in operation. In addition, capacities amounting to another approx. 370,000 tonnes/year for the recycling of wastes with high calorific value (plastics, wood, etc.) have been approved. In this context, the very advanced plans for incineration plants in Carinthia, Lower Austria, Upper Austria and Styria deserve special mention; construction permits have already been granted for some of these facilities.

Figure 11: Thermal recycling and treatment plants

Source: UBA Plant Database (status as per May 2001)
If all existing plans are implemented, it may be assumed that the total waste incineration capacities in 2004 will be between approx. 1.1 million tonnes/year and a maximum of 1.3 million tonnes/year and that further capacities of approx. 750,000 tonnes/year will be available for wastes with high calorific value.

2.4.3. Special recycling and treatment plants

At present, 175 plants handle the recycling and treatment of special, partly hazardous wastes. The materials extracted thereby are for the most part recycled. These plants are capable of handling the following types of waste:

- end-of-life vehicles
- contaminated soil
- waste electronic equipment
- workshop waste
- waste asbestos
- refrigerators and refrigerating sets
- fluorescent lighting tubes
- lacquer sludge and solvents
- lead accumulators
- fats and frying oils
- waste plastics
- accumulator acids
- concentrates containing metallic salts
- photographic chemicals
- zinc carbon batteries and alkaline manganese batteries
- zinc-containing dust, ash and sludge
- nickel-containing catalytic converters
- non-ferrous scrap metal and precious metal scrap
- amalgam sludge
- used photographic film

Depending on the degree of impurity, contaminated soil is treated either at stationary or mobile plants using bio-technical, chemico-physical or, to a smaller extent, thermal processes. In case of slight contamination, it is also deposited directly. Figures from the Waste Data Network show that approx. 250,000 tonnes of contaminated soil were treated in 1999.

At present, approx. 30 plants with a total capacity of roughly 250,000 tonnes/year handle contaminated soil. These are mostly stationary bio-technical treatment plants, soil-washing plants and mobile soil...
air-suction plants. Ten plants have been licensed for mobile operation. Moreover, contaminated soil may be thermally treated in the rotary tubular kilns of Fernwärme Wien GmbH at its Simmeringer Haide plant (the former EbS). However, figures from the Waste Data Network reveal that very little use is made of this disposal method.

**Refrigerating and refrigerating sets** are treated in seven processing plants. However, full recycling (refrigeration cycle and insulating material) is only provided by one stationary and two mobile plants. The overall capacity of all seven plants is estimated at approx. 5,600 tonnes/year.

**Rod-shaped fluorescent lighting tubes** are treated in three processing plants with an overall capacity of approx. 1,300 tonnes/year.

**Waste asbestos and asbestos dust** are disposed of in 14 asbestos treatment plants, according to data provided by the Plant Database of the Federal Environment Agency. Waste asbestos is predominantly treated on-site using mobile processing equipment.

Until recently, **zinc carbon batteries and alkaline manganese batteries** were either exported or stored on a temporary basis. Since the summer of 2000, the Chemtec company has been operating a thermal treatment plant with a capacity of 3,000 tonnes/year at the Simmeringer Haide plant of Fernwärme Wien GmbH (the former EbS).

**Paint and lacquer sludge** is treated in four plants. The overall treatment capacity exceeds 10,000 tonnes/year.

**End-of-life vehicles** are for the most part handled by motor vehicle workshops and dealers as well as used-car and scrap-metal processors. Several hundred companies deal with the elimination of pollutants from these vehicles. The material is then further processed by six shredder operations.

**Waste electric and electronic equipment**, e.g. worn-out computer monitors, computers, television sets, radios and printed circuit boards, are processed in 16 disassembly plants. These are primarily plants where the waste electric and electronic equipment is disassembled manually, using small tools and separating units, into individual recyclable groups of components. The total treatment capacity at the moment may be estimated at approx. 28,000 tonnes/year.

**Fats and frying oils** are processed in 13 plants with an annual capacity of approx. 53,000 tonnes.

**For non-ferrous scrap metal** and **precious metal scrap**, **six treatment plants with a capacity of approx. 95,000 tonnes/year** are available.

Photographic chemicals are currently processed in four special recycling and treatment plants with a treatment capacity of approx. 2,000 tonnes.

The recycling of **waste plastics** (e.g. polystyrene and foams, waste PVC) is performed by eight processing plants with an annual capacity of more than 20,000 tonnes.

A variety of different hazardous and non-hazardous types of waste are treated in another five recycling plants.

Further treatment plants are available for the processing of

- lead accumulators, accumulator acids, dust, ash and sludge containing zinc and lead, acids and acid mixtures (two plants in Arnoldstein/Carinthia),
- concentrates and solvents containing metal salts (Brückl/Carinthia and Inzing/Tyrol),
- catalytic converters containing nickel (Treibach-Althofen/Carinthia),
- used photographic film (Hof bei Salzburg/Salzburg),
- workshop waste (Kilb/Lower Austria) and
- amalgam sludge (Rum/Tyrol).

### 2.4.4. Bio-technical recycling and treatment plants

Throughout Austria, the following bio-technical plants are currently in regular or trial-run operation:

- 526 plants for the largely aerobic processing of separately collected biogenous household and municipal wastes (pruning and grass cuttings from parks, cemeteries and roadside greenery) with a capacity of at least 1.1 million tonnes/year.
- 12 plants for the mechanico-biological pre-treatment of residual waste, sewage sludge and other types of waste with a capacity of approx. 390,000 tonnes. In 1999, the residual waste input into these plants equalled roughly 194,000 tonnes.
Eighty-six sorting plants with a capacity of more than 1.1 million tonnes/year are in regular or trial-run operation. These plants sort separately collected recyclables from households and similar establishments as well as industrial recyclables, residual waste and bulk waste. The fractions sorted in the plants may vary according to changing market requirements. For example, changes may occur with respect to the sorting of waste paper, cardboard, plastics, etc. This may influence both the number of plants sorting a particular type of waste and the minimum throughput data.

### 2.4.6. Plants for the processing of separately collected recyclables

Throughout Austria, a total of 38 plants with a capacity of at least 2 million tonnes/year process separately collected recyclables from households and similar establishments as well as industrial recyclables.
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2.4.7. Demolition-waste treatment plants, excavated-soil and construction-waste landfills

Throughout Austria, more than 100 plants handle the processing of demolition waste. These stationary and mobile plants were developed into a recycling system with comprehensive coverage over a period of 10 years.

These plants primarily include facilities processing waste asphalt and concrete materials as well as construction waste of mineral origin. The capacities available attain over 5 million tonnes/year. As in past years, the member companies of ÖBRV process approx. 4 million tonnes/year, while roughly 1 million tonnes/year are deposited. Since 1995, the share of recycled material has been consistently increasing from 45% to nearly 80%.

According to information furnished by the Land Government Offices, 752 landfills for excavated soil and construction waste were operated in 1998 throughout Austria. This number comprises numerous small-scale landfills (capacity < 100,000 m³) licensed according to provisions under Land law. These facilities chiefly serve for the depositing of excavated soil, construction waste, waste concrete and road-construction waste.

Table 17: Plants for the processing of separately collected recyclables

<table>
<thead>
<tr>
<th>Number of plants</th>
<th>Types of recyclables processed</th>
<th>Minimum throughput 1999 in tonnes/year (rounded)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Paper, cardboard, paperboard</td>
<td>1,400,000</td>
</tr>
<tr>
<td>5</td>
<td>Glass</td>
<td>250,000</td>
</tr>
<tr>
<td>6</td>
<td>Metals</td>
<td>215,000</td>
</tr>
<tr>
<td>11</td>
<td>Plastics, compound materials</td>
<td>90,000</td>
</tr>
<tr>
<td>3</td>
<td>Wood</td>
<td>94,000</td>
</tr>
<tr>
<td>38</td>
<td>-</td>
<td>2 million</td>
</tr>
</tbody>
</table>

Source: UBA Plant Database (status as per May 2001)

Table 18: Landfills for the depositing of excavated soil and construction waste 1998

<table>
<thead>
<tr>
<th>Land</th>
<th>Plants in operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burgenland</td>
<td>50</td>
</tr>
<tr>
<td>Carinthia</td>
<td>13</td>
</tr>
<tr>
<td>Lower Austria</td>
<td>379</td>
</tr>
<tr>
<td>Upper Austria</td>
<td>143</td>
</tr>
<tr>
<td>Salzburg</td>
<td>4</td>
</tr>
<tr>
<td>Styria</td>
<td>52</td>
</tr>
<tr>
<td>Tyrol</td>
<td>103</td>
</tr>
<tr>
<td>Vorarlberg</td>
<td>4</td>
</tr>
<tr>
<td>Vienna</td>
<td>4</td>
</tr>
<tr>
<td>Austria</td>
<td>752</td>
</tr>
</tbody>
</table>

Source: Information furnished by the Land Government Offices (status as per May 2001)
2.4.8. Landfills for the disposal of residual waste and bulk waste

In 1999, 53 plants with a total free landfill volume of approx. 30 million tonnes/year were in operation in Austria. Most types of waste deposited at these landfills belong to the following categories: residual waste, bulk waste, construction waste, mixed industrial waste, road sweepings, sewage sludge, raking and residual matter from waste treatment. The following table indicates the distribution of the landfill sites and the volume still to be landfilled at each site:

Table 19: Landfills for the disposal of residual waste and bulk waste

<table>
<thead>
<tr>
<th>Land</th>
<th>Plants in operation</th>
<th>Free landfill volume in million m³ (rounded)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burgenland</td>
<td>2</td>
<td>1.2</td>
</tr>
<tr>
<td>Carinthia</td>
<td>4</td>
<td>0.7</td>
</tr>
<tr>
<td>Lower Austria</td>
<td>13</td>
<td>7.2</td>
</tr>
<tr>
<td>Upper Austria</td>
<td>9</td>
<td>5.0</td>
</tr>
<tr>
<td>Salzburg</td>
<td>3</td>
<td>1.6</td>
</tr>
<tr>
<td>Styria</td>
<td>12</td>
<td>6.3</td>
</tr>
<tr>
<td>Tyrol</td>
<td>6</td>
<td>2.8</td>
</tr>
<tr>
<td>Vorarlberg</td>
<td>3</td>
<td>1.8</td>
</tr>
<tr>
<td>Vienna</td>
<td>1</td>
<td>3.0</td>
</tr>
<tr>
<td>Austria</td>
<td>53</td>
<td>30</td>
</tr>
</tbody>
</table>

Source: UBA Plant Database (status as per May 2001)

In 1999, approx. 884,000 tonnes of residual waste and bulk waste were landfilled directly and without treatment. Including the directly deposited waste, the residues from the mechanico-biological and thermal treatment of residual waste and the residues from the processing of recyclables and biogenous waste, approx. 1.33 million tonnes of waste from households and similar establishments were landfilled in the year under review.

Figure 13: Landfills for residual waste and bulk waste

Source: UBA Landfill Database (status as per May 2000)
3. A COMPARISON OF AUSTRIA’S WASTE MANAGEMENT SYSTEM WITH OTHER EUROPEAN COUNTRIES

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A COMPARISON OF AUSTRIA’S WASTE MANAGEMENT SYSTEM WITH OTHER EUROPEAN COUNTRIES

The European Environment Agency (EEA) publishes annual reports on the environmental situation in the EEA Member States. In its publication “Environmental Signals 2000”, “waste indicators” serve as a basis for comparing Austria’s waste management system with those of other European states. This comparison shows that Austria takes a leading position amongst European countries concerning almost all indicators. With respect to the generation of household waste per capita, Austria (together with just one other state) was the only one to achieve the target of the Fifth Environment Action Programme of the EU. With respect to the percentage of landfilled biodegradable waste, Austria (together with Denmark) presents the lowest values and already complies with the targets set by the EU Landfill Directive for 2016. This success can be partly explained by the fact that Austria is one of the countries that have increased the cost of landfilling through economic measures imposed by the state. In the field of packaging waste recycling and recovery, Austria is amongst the three leading countries regarding all packaging materials examined. Thus it attains all targets of the EU Packaging Directive; with respect to the recycling of plastics waste, it is one of only two countries to do so.

3.1. Indicator “Household waste”

For this indicator, “waste from daily household and commercial activities” comprises the fractions “bagged wastes” (residual waste) and separately collected wastes, such as “paper and cardboard”, “glass”, “metal packaging” and “food/organic waste”. The collection schemes applied in the Member States only permitted a rough comparison of these types of waste. Other recyclables separately collected in Austria, such as “scrap metal from households”, “textiles”, “plastics and composite materials” or “waste wood” were separately collected in only a few European countries and hence not included in this comparative study. The waste volume per capita in kilograms for 1996 is compared with a target laid down in the Fifth Environment Action Programme of the EU, which was set at 300 kg per capita and year for all municipal wastes (see Figure 14).

The diagram shows that Iceland and Austria were the only countries to attain the target of the Fifth Environment Action Programme. All other states exceed this value. Consequently, the average of all countries examined likewise markedly exceeds the threshold of 300 kg/capita; this is not only true of the overall waste volume, but also of bagged (residual) waste considered on its own. The percentage of separately collected waste in the overall volume of household and municipal waste generated is highest for Austria.
3.2. Indicator “Landfilling of biodegradable waste”

The landfilling of biodegradable waste not only entails a loss of resources, but also contributes to the emission of gaseous and liquid substances from the landfill. For this reason, the EU Landfill Directive stipulates a phased plan which limits the percentage of biodegradable waste that may still be landfilled in the future. In the final phase, which will come into force in 2016, it will be possible to landfill only 35% of this type of waste. Figure 15 shows the status quo in 1995 for municipal wastes (not including sewage sludge).

A number of countries led by Austria and Denmark achieved the limit value of the Landfill Directive for 2016 already in 1995.

3.3. Packaging waste management

One of the waste streams given special attention by the EU is packaging. The Packaging Directive includes measures aimed at preventing waste generation and increasing the recovery and recycling of packaging waste. Paper/cardboard is by far the largest fraction of packaging waste, followed by glass and plastics.

A number of targets have been set by the Packaging Directive. Target 1 requires Member States to reach a recovery level of between 50% as a minimum and 65% as a maximum by weight of all packaging waste. In this case, recovery includes all kinds of recycling, energy recovery and composting. To achieve Target 2, Member States must reach a recycling level of between 25% as a minimum and 45% as a maximum by weight of all packaging waste.

Figure 16 documents that a number of countries met these two targets. In this, Austria takes second place for recycling and third place for recovery in general.

Another target has been set for the individual packaging waste fractions. The obligation for Target 3 is to reach a minimum recycling level of 15% for plastics, glass and paper/cardboard. With respect to plastics packaging waste, only Austria and Germany have so far attained a recycling rate of 15%. For glass and paper/cardboard, Target 3 is met by nearly all states; here, Austria takes second place for both packaging materials.
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4. REQUIREMENTS FOR WASTE PREVENTION, RECOVERY AND TREATMENT

4.1. Overview

4.1.1. Waste prevention and waste recovery

The term “waste prevention” is used to designate measures taken to avoid or reduce the generation of waste at its source.

Conversely, “recovery” refers to measures taken to permit the utilisation of the material properties or energy content of already existing waste under specific framework conditions. Compliance with these framework conditions is the decisive factor in determining whether such measures taken constitute recovery or another type of treatment. Both the prevention and recovery of waste should contribute to the conservation of natural resources and the minimisation of the quantities of waste to be treated. Waste minimisation can thus be expressed as the sum total of prevention and recovery.

Waste minimisation = waste prevention + waste recovery

This is in accordance with the EU waste strategy and the OECD definition of “waste minimisation” with respect to the following points:

- complete or partial prevention of waste accumulation (quantitative prevention),
- improvement of the quality of waste generated, e.g. by producing less hazardous waste (qualitative prevention),
- re-use, recycling and other recovery methods (recovery).

The percentages by weight and the minimisation potential of selected types of waste are shown in Table 20. Where recovery rates are known, these are also given. Minimisation potentials for all waste substances are indicated as estimated values and shown separately either under “Prevention” and “Recovery”. With respect to individual waste types, the range of accuracy of the estimates varies due to the different level of detailed information available; this can be seen from the differences between the minimum- and maximum-value figures given. So far, only very few evaluations of these figures according to economic principles have been carried out.
Table 20: Overview of BAWP 2001 mass portions and minimisation potentials

<table>
<thead>
<tr>
<th>Grounds of Waste</th>
<th>Total volume generated, in tonnes</th>
<th>of which hazardous waste in tonnes</th>
<th>Share in percent BAWP 2001</th>
<th>Minimisation potentials, in percent</th>
<th>Minimisation potentials, related to the volume generated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>of total volume generated</td>
<td>of which hazardous waste generated</td>
<td></td>
<td>Min.</td>
<td>Max.</td>
</tr>
<tr>
<td>Demolition waste, excavated soil, track ballast and construction waste</td>
<td>27,521,850</td>
<td>13,850</td>
<td>56.62</td>
<td>1.39</td>
<td>5</td>
</tr>
<tr>
<td>Waste wood not including wooden packaging</td>
<td>3,791,675</td>
<td>1,275</td>
<td>7.80</td>
<td>0.13</td>
<td>0</td>
</tr>
<tr>
<td>Waste from households and similar establishments</td>
<td>3,096,000</td>
<td>23,000</td>
<td>6.43</td>
<td>2.31</td>
<td>0</td>
</tr>
<tr>
<td>Waste from water and sewage treatment and all types of water use</td>
<td>2,330,975</td>
<td>10,000</td>
<td>4.80</td>
<td>1.00</td>
<td>0</td>
</tr>
<tr>
<td>Recyclables from commerce and industry</td>
<td>2,166,000</td>
<td>4,46</td>
<td>1.19</td>
<td>0.17</td>
<td>6</td>
</tr>
<tr>
<td>Waste from iron and steel production</td>
<td>2,148,479</td>
<td>230</td>
<td>0.42</td>
<td>0.02</td>
<td>0</td>
</tr>
<tr>
<td>Plastic and rubber waste</td>
<td>578,813</td>
<td>1,695</td>
<td>1.19</td>
<td>0.17</td>
<td>6</td>
</tr>
<tr>
<td>Flue-ash and dust from furnace plants</td>
<td>487,400</td>
<td>400</td>
<td>1.00</td>
<td>0.04</td>
<td>0</td>
</tr>
<tr>
<td>Contaminated soil</td>
<td>367,000</td>
<td>300,000</td>
<td>0.75</td>
<td>30.09</td>
<td>50</td>
</tr>
<tr>
<td>Slag and ash from waste incineration plants</td>
<td>200,000</td>
<td>166,000</td>
<td>0.41</td>
<td>16.65</td>
<td>0</td>
</tr>
<tr>
<td>End-of-life vehicles</td>
<td>150,000</td>
<td>50,000</td>
<td>0.29</td>
<td>0.02</td>
<td>0</td>
</tr>
<tr>
<td>Waste from vegetable and animal fat products</td>
<td>143,072</td>
<td>200</td>
<td>0.26</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Tanning and leather waste</td>
<td>127,225</td>
<td></td>
<td></td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Foundry waste</td>
<td>110,707</td>
<td>3,292</td>
<td>0.23</td>
<td>0.33</td>
<td>5</td>
</tr>
<tr>
<td>Gypsum from flue-gas desulphurising plants</td>
<td>87,000</td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Waste from electronic equipment</td>
<td>85,000</td>
<td>5,000</td>
<td>0.17</td>
<td>0.50</td>
<td>10</td>
</tr>
<tr>
<td>Waste from aluminium production</td>
<td>56,500</td>
<td>35,500</td>
<td>0.12</td>
<td>3.56</td>
<td>10</td>
</tr>
<tr>
<td>Flue-ash and dust from waste incineration plants</td>
<td>50,000</td>
<td>16,500</td>
<td>0.10</td>
<td>1.65</td>
<td>0</td>
</tr>
<tr>
<td>Waste salt not including SN 51520</td>
<td>38,476</td>
<td>38,460</td>
<td>0.08</td>
<td>3.86</td>
<td>5</td>
</tr>
<tr>
<td>Waste oils</td>
<td>37,500</td>
<td>37,500</td>
<td>0.08</td>
<td>3.76</td>
<td>30</td>
</tr>
<tr>
<td>Drilling and grinding-oil emulsions and emulsion mixtures</td>
<td>30,000</td>
<td>30,000</td>
<td>0.06</td>
<td>3.01</td>
<td>0</td>
</tr>
<tr>
<td>Oil separator contents (petrol separator contents)</td>
<td>24,100</td>
<td>24,100</td>
<td>0.05</td>
<td>2.42</td>
<td>10</td>
</tr>
<tr>
<td>Waste from paints and varnish</td>
<td>22,220</td>
<td>13,920</td>
<td>0.05</td>
<td>1.40</td>
<td>20</td>
</tr>
<tr>
<td>Other oil-water mixtures</td>
<td>20,000</td>
<td>20,000</td>
<td>0.04</td>
<td>2.01</td>
<td>10</td>
</tr>
<tr>
<td>Batteries</td>
<td>18,749</td>
<td>18,549</td>
<td>0.04</td>
<td>1.86</td>
<td>5</td>
</tr>
<tr>
<td>Waste from non-halogenated organic solvents</td>
<td>17,049</td>
<td>17,049</td>
<td>0.04</td>
<td>1.71</td>
<td>10</td>
</tr>
<tr>
<td>Oil-containing waste from workshops, industry and petrol stations</td>
<td>16,150</td>
<td>16,150</td>
<td>0.03</td>
<td>1.62</td>
<td>0</td>
</tr>
<tr>
<td>Galvanic sludge</td>
<td>14,151</td>
<td>7,571</td>
<td>0.03</td>
<td>0.76</td>
<td>0</td>
</tr>
<tr>
<td>Textile waste not including recyclables</td>
<td>11,172</td>
<td>612</td>
<td>0.02</td>
<td>0.06</td>
<td>10</td>
</tr>
<tr>
<td>Acids and acid mixtures, inorganic</td>
<td>9,000</td>
<td>9,000</td>
<td>0.02</td>
<td>0.90</td>
<td>10</td>
</tr>
<tr>
<td>Refrigeration equipment containing CFC’s and refrigeration equipment containing other refrigerants</td>
<td>5,600</td>
<td>5,600</td>
<td>0.01</td>
<td>0.56</td>
<td>0</td>
</tr>
<tr>
<td>Waste from photographic baths</td>
<td>5,430</td>
<td>5,430</td>
<td>0.01</td>
<td>0.54</td>
<td>5</td>
</tr>
<tr>
<td>Oil-containing grinding sludge</td>
<td>5,000</td>
<td>5,000</td>
<td>0.01</td>
<td>0.50</td>
<td>0</td>
</tr>
<tr>
<td>Solid salt-containing residues from flue-gas dust cleaning from furnace plants for conventional fuels (not including gypsum from flue-gas desulphurising plants)</td>
<td>2,700</td>
<td>2,700</td>
<td>0.01</td>
<td>0.27</td>
<td>0</td>
</tr>
<tr>
<td>Lyes and lye mixtures</td>
<td>1,500</td>
<td>1,500</td>
<td>0.00</td>
<td>0.15</td>
<td>0</td>
</tr>
<tr>
<td>Laboratory waste and chemical residues</td>
<td>1,400</td>
<td>1,400</td>
<td>0.00</td>
<td>0.14</td>
<td>0</td>
</tr>
<tr>
<td>Plant treatment agents and pesticides</td>
<td>1,350</td>
<td>1,350</td>
<td>0.00</td>
<td>0.14</td>
<td>10</td>
</tr>
<tr>
<td>Waste from halogenated organic solvents</td>
<td>1,279</td>
<td>1,279</td>
<td>0.00</td>
<td>0.13</td>
<td>5</td>
</tr>
<tr>
<td>Sludge from oil-separating plants</td>
<td>1,200</td>
<td>1,200</td>
<td>0.00</td>
<td>0.12</td>
<td>0</td>
</tr>
<tr>
<td>Gas discharge lamps (e.g. fluorescent lamps; fluorescent tubes)</td>
<td>1,000</td>
<td>1,000</td>
<td>0.00</td>
<td>0.10</td>
<td>0</td>
</tr>
</tbody>
</table>

Sums total, rounded                                                               | 44 Mio                           | 0.86 Mio                          | 91 %                        | 89 % | 100  | 100  | 80   | 90   |
Studies of waste prevention and recovery potentials show that a high degree of waste recovery is already being implemented in crucial sectors:

- primary wastes of mineral origin, which shows the highest volume of waste generated;
- scrap metal and wastes with high metal content (e.g., end-of-life vehicles);
- waste oils;
- in the hazardous waste sector concerning batteries and fluorescent lighting tubes.

Examinations of future minimisation potentials were carried out on all wastes whose volume accounts for 91% of the overall waste volume generated. Also included in this group are those types of hazardous waste whose share in the total volume of all types of hazardous waste totals 89%. In the recovery sector, a long-term reduction in volume is only possible by implementing measures that enable the re-introduction of materials into the production cycle and thus reduce the quantity of primary raw materials used; as a rule, this triggers a simultaneous, marked prevention effect in the production of primary raw materials.

To an extent, substitution technologies shift the generation of waste to other sectors. However, it is very difficult to predict what effects this will have on qualitative changes. Usually, substitutions are aimed at qualitative improvement (reduction of hazardous materials or substances) and should definitely be implemented, in accordance with the objectives and principles of the Federal Waste Management Act, irrespective of the volume problem. It has therefore been avoided to state—as the result of the examinations conducted to prevent or recover waste—any volume potential for minimisation in the form of a sum total covering all waste substances examined. With respect to recovery processes, it is important to make sure that the material problem is not shifted or distributed. For this reason, operating licences for plants should also ensure that the transfer of all relevant substances is known. Not taking account of this premise might lead to a lack of information about the destination of the substances dealt with in the recovery processes, which might entail future problems. The same is obviously also true of waste treatment processes.

4.1.2. Waste treatment

As in the past, attaining and maintaining a high degree of independence of waste disposal and treatment remains the declared objective of Austria’s waste management system. In keeping with the “principle of short distances”, the transport of waste at a regional level, i.e., to neighbouring countries, may of course prove a viable and effective method.

While the recovery and treatment plants listed in Chapter 2.4 present a degree of implementation that has further increased since the last Federal Waste Report, marked treatment bottlenecks continue to persist with respect to complying with the requirements of the Landfill Ordinance as of 2004, in particular concerning thermal and mechanico-biological plants for residual waste treatment amounting to approx. 1 million tonnes (see also Chapter 4.5.3). The possible or best recovery and treatment methods for specific types of waste and the related requirements are determined in the Treatment Principles.

A recent study on the Evaluation of Waste Management Measures Aiming at Final Disposal compares and evaluates different waste management measures with special account taken of long-term effects. It was examined which of the alternative measures defined in co-operation with the commissioning bodies best comply with the objectives of the Austrian Waste Management Act, with special attention paid to long-term low environmental impact and low cost to the national economy.

The basis for this was provided by an Austrian waste management model developed in the context of the 1998 GUA & IFIP study “Management of Waste from Households and Similar Establishments in Austria”, which was reviewed and complemented in keeping with the specific requirements. The system input for this model was defined as waste from households and similar establishments as well as municipal sewage sludge. The study uses the alternative case technique, examining the following alternative cases and juxtaposing them with the baseline case P0 (continuation of status quo): a maximum of untreated waste disposal (M1), 3 alternative cases with a maximum of thermal treatment
(grate firing with (M2a) and without (M2b) solidification of the residues and a high-temperature process (M2c)) as well as 4 alternative cases with a maximum of mechanico-biological treatment (light-weight fraction in the fluidised bed (M3a, M3c) or in cement rotary kilns (M3b, M3d), with (M3c, M3d) and without (M3a, M3b) introduction of the heavy-weight fraction with higher calorific value into waste incineration plants).

In order to comply with the precautionary principle laid down in the Waste Management Act, the short, medium- and long-term landfill behaviour of the residues deposited in the individual alternative cases was modelled.

As evaluation methods, the authors used the economic cost-benefit analysis on the one hand while developing a new evaluation method called “modified cost-efficiency analysis” (MCEA) on the other hand. This method permits the increased capturing and evaluation of long-term effects of the alternative cases examined – above all those due to the landfilling of waste treatment residues –, which, at least to this extent, was not possible with the traditional instruments of economic analysis such as cost-benefit analysis. MCEA is based on a hierarchy of objectives whose highest level corresponds to the objectives of the Waste Management Act. The objectives were weighted differently in the context of sensitivity analyses.

The results of MCEA show that, irrespective of the weighting of the objectives of the Waste Management Act, thermal processes must be definitely classified as the best (2c above 2a and 2b), while direct landfilling definitely should be evaluated as the worst technique. Mechanico-biological treatment without introduction of the heavy-weight fraction with its higher calorific value into waste incineration plants is slightly superior to landfilling; mechanico-biological treatment with introduction of the heavy-weight fraction with its higher calorific value into waste incineration plants must be evaluated as markedly more efficient.

The result of the cost-benefit analysis largely corresponds to the results of MCEA. Thermal processes get the best marks, followed by mechanico-biological processes, the baseline case and direct landfilling. However, amongst these measures, the order differs from that based on MCEA. In all, grate firing without follow-up treatment of the residues presents the smallest economic loss of all alternative cases. Thus both economic analyses show that thermal waste treatment processes should be favoured over mechanico-biological processes and above all over the direct landfilling of untreated waste.

4.1.3. Material flow management (orientation of waste management along material-related aspects)

Material flow management to attain the objectives of the Waste Management Act

In order to attain the objectives “protection of mankind and the environment” and “conservation of energy and resources” laid down in the Waste Management Act, material flows must be directed: potential pollutants must not be allowed to affect mankind and the environment, and resources must not be wasted. At the end of the material flow, waste management fulfils an important function in the control of material streams: on the one hand, it serves as a “filter” between the anthroposphere (the area of human activity) and the environment and should thus ensure that only emissions with low environmental impact on water, soil and air occur to guarantee sustainable development. On the other hand, waste management is to recycle substances to increase ecological efficiency. This is above all true of substances that are available in economically recoverable form or could be transformed into such, for example, by means of upgrading processes. Furthermore, waste management is to provide important impulses for the material-oriented design of goods and processes, thereby permitting to take account of the possibilities of recovery and environmental protection already at the levels of production and supply (design for recycling, design for disposal). If these measures are continued, the Federal Waste Management Plans of the future will be able to highlight the importance of waste management for an environmentally sound control of the streams of substances and materials.

Decisions concerning material flows are taken by numerous actors: producers, consumers, disposal companies, authorities, etc. The objectives of waste management apply to every sustainable method of
management and for this reason are demanded in the National Environmental Plan (NUP) for the Austrian economy in general. Measures for waste disposal have limits and therefore should be designed so as to engage with the production and distribution process.

**Importance of waste management for the overall management of materials and substances**

For reasons inherent in the system, goods and substance inputs into the national economy of a society of growth are always greater than the outputs (the volume of capital goods and consumer goods increases). Quantitatively speaking, waste is therefore less important than the goods produced. Ultimately, however, all goods are subjected to waste management. The adequate handling of the volumes generated must be improved by means of analyses of the flows of goods and materials; the importance of waste management should be given a corresponding position. Therefore, aspects of substance and material management provide an essential approach for the Federal Waste Management Plan. For this, balances of the economically and quantitatively most important goods and materials must be developed, as only this knowledge will ensure that the measures taken in the field of waste management are efficient and economically viable in the context of the national economy as a whole.

**Effect-oriented evaluation of waste management measures**

Due to the environmental protection measures of the past three decades, production-related emissions have continuously decreased. The quantities of consumer goods and related emissions have steadily increased during the same period. The emissions caused by the use of goods are therefore relatively larger than the production-related emissions. For this reason, requirements concerning the protection of humankind and the environment as well for resource conservation must not only refer to the production of goods and their recovery/disposal, but also to the use and consumption of goods. By way of summary, one may say that every measure taken to protect humankind and the environment as well as to conserve energy and resources must be preceded by an assessment of what actually constitutes the gravest threat to the goods and resources to be protected. A sectoral approach, such as an approach solely oriented towards recovery/disposal, does not do justice to the problem; it may lead to inefficient, uneconomical measures. Only a holistic analysis of all sources, paths and disposal locations for any substance permits us to recognise where significant environmental loads may occur or be expected in the future, which resource potentials are reduced or accumulated and which possibilities of control are most effective within the entire substance and material management system in keeping with the objectives of the Waste Management Act.

A principal problem of modern-day waste management lies in the question of whether a waste is an asset suitable for recovery or must be disposed of. Since waste to be recovered is given priority and various processes can change waste destined for disposal into waste suitable for recovery, the risk exists that waste will not be treated or recovered in keeping with the objectives of the Waste Management Act (fake recovery). If waste is characterised and designated according to its material properties, it will prove impossible to “hide” substances or materials in goods for recovery; moreover, the recovery process must meet the challenge of appropriately recovering or disposing of each individual component. For this reason, it should be clarified whether the waste concept could not be extended in the future to comprise a material or substance component, and whether material or substance properties are sufficiently described by their hazard properties. For this purpose, it is necessary to provide a comprehensive characterisation of the key components of a type of waste (matrix elements accounting for 95% of the waste volume; proportion of key organic and inorganic trace elements). This information is vital both for the improved allocation of waste to treatment and recovery processes and for the dimensioning of processes including landfilling. It can provide a better data basis for waste management in its entirety and contribute markedly to permitting an objective evaluation of whether waste management actually attains its ambitious goals. As an appropriate new definition of waste would entail
a significant change in the applicable legal situation, the greater importance attached to the evaluation of substances and materials contained in waste should be gradually examined with special account taken of the further effects on the entire national and European waste management regime.

At the moment, the limits to waste management processes are primarily set on the basis of emission standards. However, as a rule, these only concern a small part of the entire material flow. Efficient environmental protection and efficient resource use call for the active control of the entire material flow in waste management. This can prevent the transfer of substances to areas where no current regulations apply (e.g. heavy metals in recycled plastics). The first approaches in this direction are provided by the treatment principles laid down for specific groups of waste.

The systematic, holistic orientation of waste management along material-related aspects makes it possible to

- obtain better and more up-to-date data on waste quantities and pollutants and recoverable substances contained in them than would be possible using traditional methods,
- recognise threats to the objectives of the Waste Management Act concerning the protection of humankind and the environment (accumulation of pollutants in the environment and anthroposphere, increase and decrease of emissions, transfer of pollutants into recycled products, etc.) and the conservation of resources (accumulation or exhaustion of resources in deposits) at an early time,
- define priorities for waste management measures (which measures have the strongest effect, which measures are most urgent – time schedule?), and
- design a waste management system optimised according to technico-economic and ecological principles.

For this purpose, the following steps are considered necessary:

Step 1 (2001–2004): The users of the Federal Waste Management Plan must be familiarised with the idea of substance and material management in order to learn about the possibilities of active substance and material management and understand the practical usefulness of a material-oriented approach by means of case studies. In this context, mention should also be made of the study conducted by the Institute for Water Quality and Waste Management of the Vienna University of Technology headed by professor Dr. P. Brunner on behalf of the Federal Ministry of Agriculture and Forestry, Environment and Water Management, Studies of the Possibilities to Orient the Federal Waste Management Plan along Material-Related Aspects and the accompanying volume on selected case studies.

Step 2 (2004): In order to provide documentation for planning future measures and optimising existing ones, holistic analyses of flows of selected, important goods and wastes will be included in the Federal Waste Management Plan. In particular, this concerns construction materials including demolition waste, wood including waste wood, biomass including agricultural products and waste, paper, plastics, glass and selected metals (aluminium, iron). The analysis of the flows and storage sites of these goods makes it possible to develop more efficient management methods and to examine and evaluate, for example, new options for collection and recycling systems.

Step 3 (2004): For the same reason, the Federal Waste Management Plan should include material flow analyses for selected, important potential resources and pollutants. Matrix elements (i.e. elements accounting for 95% of the volume of the main components) and trace elements (<5% by weight) should be selected here. As a result, it is expected that the main flows and main storage sites of these substances and materials will become visible. This will enable the implementation of efficient measures safeguarding a high degree of attainment of the objectives of the Waste Management Act.

Step 4 (2004): For measures included in future Federal Waste Management Plans, the effect of the proposed measures with respect to the objectives of the Waste Management Act are to be examined by means of analyses of goods and material flows; it is likewise to be examined whether the objectives “protection of humankind and the environment” and
“conservation of resources” as well as the “polluter-pays principle” are best attained by means of the planned measures, or whether other combinations of procedures might prove more efficient. In particular, the summary of the results is to show on a quantitative basis what progress towards its objectives waste management has achieved as a whole (reduction of residual flows into the environment, better use of resources, i.e. reduced energy consumption, more efficient substance concentration).

Step 5 (2007): For the most important goods and materials, material accounting regimes based on material balances are planned; i.e. flows and storage sites are recorded every three years on the basis of only a few measurements at those measuring points which have proven efficient for the capturing of all flows and storage sites according to the preceding material balance.

4.1.4. Overall economic cost of waste management

The objectives of Austria’s waste management can be attained by means of different measures. Each measure presupposes specific flows of goods and materials and is linked to specific operational and economic costs.

On behalf of the Federal Ministry of Agriculture and Forestry, Environment and Water Management, the economic and ecological effects of the collection and recovery of waste were estimated by means of a model. For this purpose, the flows of waste from households and similar establishments were visualised and the economic cost and benefit calculated.

The cost-benefit analysis is one possible method of evaluating the economically relevant effects of certain measures. It is used in the wake of simulation or forecast models (e.g. an input-output model) in order to evaluate their results on a comparative basis. It is the objective of the cost-benefit analysis to express the effects related to a specific measure as precisely as possible in monetary units to render them comparable. Markets do not provide correct prices for some inputs and outputs. An example of this are externalities, i.e. beneficial or harmful effects that are caused by the activity of an economic subject and act on other economic subjects but cannot be credited or debited to the agent causing them. These effects are often difficult to measure in both the physical and monetary sense. By largely incorporating and monetarising external effects, environmental effects can be taken account of in the evaluation of recovery and disposal paths.

In this way, settlement structures and collection potentials serve as a basis for calculating collection quantities for which a balance was prepared by means of a complex system of recovery and treatment processes. In this context, the term “process” stands for every necessary activity and plant. The operating costs of all processes were determined. The plants and activities do not directly mirror the actual situation at present but were modelled as “corresponding to the state of the art in technology and economic efficiency”.

The model examined the effects of different combinations of measures on

- material- and substance-related factors (emissions, primary resources, residual waste to be landfilled),
- energy inputs,
- operating cost and benefit factors, and
- economic cost and benefit factors.

Internal effects (in case of the present study, e.g. construction and operating costs) can partly be evaluated only by conducting extensive investigations and applying simplifying assumptions. Where market prices exist, these may be used as a starting point.
For external effects (e.g. air pollutant emissions) for which no market prices exist, corresponding substitute factors must be found to permit their monetary evaluation. The evaluation of emissions is a central problem frequently discussed in the relevant literature. The number of different approaches used to monetarise external effects is indicative of the difficulties and complexity of the problem. The present model uses the prevention cost approach. For this purpose, those cost factors are assessed which would have to be alternatively incurred to prevent the external effects. The existing environmental standards as well as the binding minimisation objectives of environmental policy provide the basis for assessing which emissions should be prevented to what extent. The prevention costs were calculated in accordance with the costs resulting from the use of the technologies necessary to attain these set objectives.

The results of the cost-benefit analysis permit the following conclusions:

- The largest cost component is provided by the operating costs of the waste management enterprises. The biggest benefit factor is provided by the (avoided) costs of the alternative production of goods from primary resources. Evaluated from a monetary angle, the influence of the economic costs of emissions on the total balance is relatively low. A comparison between the subsystems (such as sorting, recovery, landfilling) shows that the subsystem “collection” accounts for the largest portion of the costs.
- The increased recovery of plastic and metal packaging calculated in this model by way of example entails positive ecological effects (emissions, energy, regranules) but also causes higher costs, which mainly occur in the subsystems “collection” and “sorting”.
- A comparison between the scenarios in which the share of waste incineration is markedly reduced in favour of direct landfilling shows an outcome favouring incineration. While the operating costs of waste incineration are slightly higher, they are more than compensated by the economic evaluation of the risk inherent in landfilling.

The principal and by far biggest benefit factor resulting from waste management, i.e. the removal of waste from the immediate human environment and its treatment, is almost impossible to quantify and was not included in the calculation. Absolute figures therefore have little expressive value.

It should be borne in mind that every cost-benefit analysis can monetarise only part of the relevant environmental aspects. For example, the present study used the emission of CO₂, CO, SO₂, CH₄, NOₓ, CₓHᵧ, dust and the COD as water pollution indicators. This is partly due to a lack of data and partly a consequence of the fact that some effects are almost impossible to quantify or cannot be adequately monetarised at all (intangible effects).

A recently completed study commissioned by the European Commission, DG Environment, states that the evaluation of externalities is affected by a high degree of uncertainty. The available information is often insufficient. The range of the external costs applied in the different studies is extremely wide. Despite the uncertainties and dangers inherent in such analyses, e.g. the definition of costs, the determination of system limits and the evaluation of environmental effects, these analyses are regarded as a possibility of rendering transparent the factors underlying political decisions. What is important here is the careful application of both method and findings. In particular, the interpretation of cost-benefit analysis results must take account of the underlying assumptions and their consequences as well as of the qualitative evaluation of non-quantified effects.

The model described above was used, in modified and extended form, for an economic comparison of systems of non-returnable and re-usable containers for selected types of beverages.
4.2. Basic principles for the prevention and recovery of waste

4.2.1. Prevention

The term “quantitative prevention of waste” is used to designate the partial or complete avoidance of materials or processes which entail the generation of waste.

The qualitative aspect refers to the toxicity and hazard potential of waste. Qualitative waste prevention is defined as the substitution of substances hazardous to the environment with substances that are environmentally less harmful.

In the area of waste prevention, differentiation can be made between product and plant-related measures. Further distinction is made between the sectors “Production/Trade/Consumers”.

Generally, both qualitative waste prevention (in the form of a reduction of loads of dangerous substances) and quantitative waste prevention can be achieved through the implementation of product-related measures. This can be reinforced by regulatory political action (e.g. implementation of the End-of-Life Vehicle Directive).

When implementing the precautionary and polluter-pays principles, the recovery and disposal costs of a product should be charged as part of the product price, in the sense of internalising external costs. The polluter-pays principle should also be taken into account by considering the product responsibility of the manufacturers and/or distributors of goods even after their intended use.

Product-related waste prevention above all encompasses measures that

• allow for the repeated use of a product,

• increase the product life, or

• change a product’s design in such a way that the production waste, the waste volume following the use of the product and its polluting potential are minimised.

The term “plant-related waste prevention” comprises measures taken to change a production process and/or plant technology in such a way that the waste generated during the manufacture of products is minimised, e.g. internal recovery of auxiliary agents and production waste.

With respect to waste prevention measures, two further types of waste minimisation should be mentioned, i.e. re-use and further use.

• Re-use is defined as the repeated utilisation of an object or substance in accordance with its original intended purpose (e.g. re-usable bottles).

• Further use is defined as the continued utilisation of an object or substance in a permissible manner other than according to its original intended purpose.

In 1997, the Scientific Council for Waste Management and the Remediation of Contaminated Sites, an inter-university board of experts maintained by the Federal Ministry of Agriculture, Forestry, Environment and Water Management, presented the following, still valid theses on the prevention of waste:

• The correlation between the gross domestic product (GDP) and the quantities of waste observed until now continues to exist; however, the increase in the correlation curve is becoming flatter, i.e. the quantities of waste are increasing less markedly in proportion to the GDP.

• At present, the task of the national economy is to increase quantitative growth, which by necessity entails greater flows of goods. A transition towards qualitative growth could decisively reduce the flow of goods and therefore the generation of waste.

• For such a transition to take place, regulations for both the market and behaviour patterns need to be implemented. In this context, it must be borne in mind that regulations concerning laws and the market take effect relatively quickly, whereas concepts concerning values and fundamental changes in consumer behaviour require a long time to assert their influence.

• Waste prevention leaves off at the point where measures are taken which lead to a transfer of environmental contamination to another level.
• Measures arrived at by mutual consent (for example between employers and employees) can be implemented more efficiently.

• As a rule, the initiation of waste prevention measures at any level also requires funding.

Findings regarding the “Production/Trade” sector:
• Waste prevention entails immediate benefits, such as improved image and economic advantages.

• Numerous documented examples show that waste and emission prevention can be of economic interest. Apart from economically rational waste prevention, normative regulations for the creation of a further prevention measure potential are called for. Harmonisation at the international level is required.

• The Packaging Ordinance provided the impetus for innovative action in the commercial sector (especially in the area of re-usable transport packaging).

• The first limits of waste prevention are emerging (e.g. further reduction of the amount of packaging materials may reduce the stability of transport packaging and thus lead to more waste due to damage to goods in transit).

• With respect to the prevention of harmful substances, improvements have already been made. However, there is still considerable prevention potential in the areas of product design, production and distribution processes. In this context, findings derived from various sector-specific concepts should be increasingly applied.

• Waste prevention within companies is primarily a task of management and hence should also be handled by this level.

• The more waste generated within companies is prevented, the more the product gains in relative importance with respect to future emissions/waste.

Findings regarding the “Consumers” sector:
• Measures entailing a personal benefit are more effective than general appeals to the individual’s sense of responsibility.

• The Packaging Ordinance led to a reduction in the quantities of residual waste.

• The total quantities of waste are still increasing.

• Beyond the issue of packaging, improved exploitation of prevention potentials in the household sector is only possible if consumer values change (increase in the consumption of immaterial goods at the expense of material goods).

• Developments will only be effective in terms of future trends if they are shared by 15% of the total population and include many different groupings within society.

• In order to be successful, waste prevention measures must be affordable, comprehensible, viable and attractive.

4.2.2. Recovery

When considering the issue of environmentally appropriate and economically feasible waste recovery, different modes of recovery must be distinguished.

• Recycling utilises waste material as a secondary source of raw materials. Here, a distinction should be made between

  – recycling on an equivalent level (= recycling in the narrower sense), i.e. the manufacturing of materials of equal value. Examples: waste glass, scrap iron, aluminium; and

  – cascade recycling (=downcycling), i.e. the transformation of an object or substance into materials of inferior quality or into other substances.

• Energy (thermal) recovery utilises the high energy content of waste (within the limits of specific frame conditions).

• Combinations of recycling and energy recovery are possible.

Experience has shown that ecologically and economically viable recovery reaches its limit when the input required for the collection, cleaning and treatment of waste entails a greater quantity of emissions or other environmental contamination than would be generated by the use of primary materials. Therefore it is especially important to place more
emphasis on long product life and ease of repair with respect to material goods and plants of all types, and to use renewable raw materials preferentially in production. This applies not only to the use of material resources but also to the energy resource input. The thermal recovery of organic waste from renewable raw materials (in particular wood) will be of increasing importance in the future.

Active support of companies is necessary for the further intensification of the management of recoverable waste. In 1996, the then Federal Ministry of Environment, Youth and Family Affairs together with its partners launched a pilot project for a recycling network in Upper Styria. Management consulting sessions were carried out in over 30 production companies in order to identify recycling potentials and methods and thus establish a functioning recycling network. In the meantime, these consultation activities have led to the formation of a recycling information centre which so far works at the university level but will be outsourced. Some of the economic relations established in 1996 are still firmly upheld; at the moment, intensive networking is underway concerning waste lacquers, granite residues and pallets. For logistic planning, GISs are used in addition to economic modelling in order to optimise the material flows.

Effective recovery exchanges require a sufficient supply of information on what is available in the field, otherwise they remain largely unused. The actual problem is obviously not a lack of suitable recovery options but the lack of referral and consulting activities as well as the need to overcome communication barriers. Help could be provided by establishing regional and/or waste-specific “recycling agencies”. For these reasons, a so-called Recycling Exchange for the Construction Industry was established for the construction sector at the ÖBRV; since 1998, the Exchange has been managing information on the supply and demand of demolition and construction waste and excavated soil.

An additional simplification of inter-company recovery could also be achieved by legally stipulating that, in cases of certain clearly defined waste fractions (e.g. waste paper, sawdust, untreated wood, specific fractions of demolition waste, still functioning old appliances), their classification as waste ceases to apply as soon as they meet specific quality requirements, comply with specific notification obligations, and if a market for them exists. However, these quality requirements must not merely apply to product requirements such as solidity, durability, grain size, etc. but must also take account of the specific properties of the waste, in particular typical pollutant content and probable contamination. Such regulations would mean a definite simplification for users of secondary materials. The necessary legal preconditions for ordinances suspending the classification of waste as such were created with the 1998 amendment to the Waste Management Act (Federal Gazette I 1998/151), Art. 2 (3a) to (3d). However, it should be remarked in this context that this progressive approach has met with very little understanding in the EU and that a national solo venture is not viable at the moment (transport problem). Still, a discussion of this approach at the EU level has already been initiated.

In any case, a certain quality standardisation for waste generated in relevant quantities would surely facilitate recovery (irrespective of any ordinances suspending the classification of waste as such). In this context, the Federal Ministry of Agriculture and Forestry, Environment and Water Management in 1999 established a working group for the development of material- and input-specific recovery criteria for excavated soil and demolition waste in cooperation with the economic actors involved; the first interim results were already presented.

4.2.3. Strategies

The most effective waste prevention and recovery measures are expected to occur mainly in the industrial and commercial production sector due to the large volume turnovers. In this context, the following solutions are proposed:

• closing of material cycles,
• substitution of raw and process materials,
• monitoring of the material flows of relevant, in particular of environmentally hazardous, substances and substitution of pollutants,
• conversion to technologies producing less waste.

In this respect, the following measures can be taken although overlapping occurs frequently:
• Implementation of economic policy instruments, such as environmental charges, environmental certificates, obligatory take-back and deposit systems, the stipulation of return rates and subsidies as well as the ecological orientation of the taxation system (in particular in the fields of resources, energy and transport).

• Mandatory measures generally prescribed by laws and ordinances for the purpose of defining and implementing minimum standards, e.g. determining the state of the art for specific production and recovery plants, determining product requirements, recovery rates and emission thresholds. This mostly concerns ordinances under both the Chemicals Act (ChemG 1996) and the Waste Management Act (AWG 1990), which primarily aim at qualitative waste prevention.

• By addressing the issue of intra-company waste management, whether voluntarily or obligatorily (sector-specific concepts, establishment of inter-company interest groups, waste management concepts, waste officers, environmental charges, the eco-label, the EMAS Regulation), the companies render this area more transparent, which very often leads to increased investment in waste minimisation for economic reasons.

• Finally, non-public control measures often provide an impetus for the introduction of waste-minimising action. This may be seen as a self-regulating mechanism of the economy due to increased waste disposal costs, consumer expectations and pressure exerted by the public sector on the economy regarding environmental matters (image promotion).

• Last but not least, there exist a number of environmental subsidy programmes on the basis of the Environmental Subsidy Act (Federal Gazette 1993/185, Art. 1 (2) and Art. 2) that support measures for the protection of the environment by minimising environmental contamination such as air pollution, climate-related pollutants, noise (not including traffic noise) and waste; however, even greater incentives should be created by extending the subsidy options to prevention and recovery measures for non-hazardous waste and to the exploitation of the energy contained in waste.

4.2.4. Concepts and programmes

In order to step up the implementation of waste prevention and recovery measures, the Federal Ministry of Agriculture and Forestry, Environment and Water Management has established working groups composed of representatives of the economic, scientific and administrative sectors to develop prevention and recovery concepts for specific sectors of the industry. It is the objective of these sector-specific concepts to describe and quantify the waste prevention and recovery potentials for various industrial sectors in Austria (see also Chapter 5.2.1). The industrial sectors can be selected on the basis of studies on relevant substances. Apart from the sector-specific concepts, there are numerous other programmes and initiatives aimed at implementing waste minimisation potentials. Amongst these, the following should be primarily mentioned:
• PREPARE programmes examine and actively implement waste minimisation in selected companies, covering as many industrial sectors as possible.
• ÖKOPROFIT programmes compile empirical information on integrated environmental protection within a given region, e.g. an urban area, by covering a sufficient number (around 30) of small and medium-sized companies.
• PREGAS is a project for the reduction of hazardous waste in Styria that directly addressed those companies which according to waste statistics were identified as particularly affected and called upon them to participate in the project. In 1996, selected wastes from the code groups 54 and 55 were processed according to ÖNORM S 2100.
• Ecological management consulting is offered in several Länder of Austria.
• NUS (Lower Austrian Environmental System) supports and subsidises environmental efforts of Lower Austrian enterprises, institutions and municipalities.

4.2.5. Product-related waste management

Product-related objectives of waste management cannot be attained through responsive action alone. As early as at the planning stage for the manu-
facturing of a product, the significance of energy aspects and waste management over the entire life-cycle of the product must be taken into consideration to ensure resource efficiency by seeking an optimum combination of the following factors:

• minimisation of material consumption while simultaneously maintaining functionality,
• long product life,
• use of high-quality, low-wear and repeatedly recoverable materials,
• product must be easy to repair,
• optimisation of energy consumption over the entire life-cycle,
• it must be possible to disassemble the product in such a way that different materials can be sorted separately and distinctly according to type and, to the extent separable, that they can be processed for the purpose of recovery with little residues, using existing technologies and involving only low energy input,
• non-use of toxic components.

Product-related waste management thus encompasses all strategies and measures for the prevention and recovery of waste as well as qualitative aspects of low environmental impact of materials in the physical goods sector. Total life-cycle (TLC) analyses are suggested as an evaluation instrument. The objective of all efforts lies in achieving sustainability.

4.2.6. General technical developments to support waste minimisation

High waste prevention potentials can be mainly identified in industrial production processes. In order to render these minimisation potentials exploitable, the individual technical procedures aimed at reducing and recovering waste must be fine-tuned with the production process. Possibilities of intervention are provided by

• changes in the raw material input and development of new ways of synthesis, which can lead to less generation of waste,
• reduction of processing phases,
• optimisation of reaction control,
• use of alternative reaction agents,
• use of alternative reaction media,
• increased selectivity, which in most cases can be achieved by the development of suitable catalysts,
• optimisation of plant and control engineering,
• development of material cycles and other measures for the re-use and saving of raw and process materials,
• energy saving.

From the technological viewpoint, in particular the following recent developments are available for introducing these process changes:

• manufacturing of chemical products using biotechnical methods,
• anhydrous reaction media,
• reaction media derived from inorganic molten salts,
• SCF (super-critical fluids),
• improvements in the reaction control of heterogeneous reactions,
• development of new, and improvement of existing, catalysts,
• reactive distillation,
• infrared technology.

In addition to processes integrated into production which foster waste minimisation, there are also a number of technological developments offering special, novel problem solutions, especially for the operation of waste recovery plants.

In the field of thermal technologies, mention should be made of the:

• CEP process (catalytic extraction processing), which is suitable for many different types of waste. Organic pollutants are destroyed in a liquid metal bath at temperatures exceeding 1300 °C; the recoverable products extracted include synthesis gas and metals enriched in the bath. Even mineral fractions of the waste accumulated in the slag can be recovered, e.g. as abrasives. By excluding oxygen from the metal bath, the process can be implemented with only minimal emissions.

• VTR process (vacuum thermal recycling), an advanced vacuum distillation process in which appropriate variations in pressure and temperature
make it possible to extract substances from mixed waste, thus enabling the separated components to be re-introduced into production cycles. The process has successfully undergone testing with metal sludge, oil-containing grinding sludge and batteries. It should also be suitable for old tyres, waste from electronic equipment and other types of waste

- RCP process (recycled clean products), a pyrolysis melting process with subsequent slag refinement and afterburning. The products generated include an iron-copper alloy for copper melting and a slag that has proven excellently suited as a cement aggregate. The process is suitable for mixed wastes as an alternative or complement of existing waste incineration technologies.

- The plasma furnace technology, too, permits the conversion of organic components of waste into recoverable gases that also have a high calorific value. However, the energy input a plasma reactor requires is largely identical to the energy content of the products derived; for this reason, this approach focuses on aspects of waste treatment rather than on aspects of recovery.

Not only high but also low temperatures are valuable assets for recovery processes. So-called cryogenic processes make use of the fact that physical properties of materials contained in waste change markedly with very low temperatures. This is above all exploited in the embrittlement and separation of plastics from compound materials containing plastics, in the recovery of old tyres (granulation after embrittlement), waste from electronic equipment, light-weight fraction from shredders, carpeted flooring, etc.

Chemical and electro-chemical processes can equally contribute to waste minimisation. Super-critical fluids – above all water and carbon dioxide – can be used as selective solvents for the recovery of oils and metals from grinding sludge. Glass grinding sludge, too, can be recovered in this manner, and qualitative waste prevention is made possible by selective separation and subsequent destruction of toxic substances from waste (dioxins, furans, PCBs). Metal ions solved in process water are extracted by means of electrolysis as metals, which reduces the large quantities of sludge that so far had been caused by precipitation reactions.

Yet not only developments relating to plant technology but also innovations in the area of applications will boost recovery in the future. A particularly important role is played by the simple, non-destructive disassembly of old products; this is above all true of complex mass-produced goods such as cars. Fixing parts with interlocking plastic strips (according to a principle similar to the Velcro fastening) is already being tested. The advantages lie in simple disassembly, which ensures precise separation of individual types of waste, but also in the fact that these products are easy to repair and allow for the reuse of still functioning components.

4.3. Further treatment principles

Stipulations concerning waste treatment are amongst the key regulation areas. The following chapters contain principal statements on the most frequent processes. Further treatment principles, in particular with respect to individual waste groups, are contained in the Supplement to the Federal Waste Management Plan 2001 “Guidelines for Waste Shipment and Treatment Principles” (see also Chapter 5.4.3).

4.3.1. Chemico-physical treatment

The treatment of waste using physical or chemical methods aims at the attainment of the following objectives:

- recovery of valuable substances
- pre-treatment of waste for subsequent material or thermal recovery
- separation of pollutants from aqueous solutions
- reduction of risk potential
- reduction of waste volumes to be landfilled
- immobilisation of pollutants prior to landfilling

Waste which due to its chemical, physical or toxicological properties must be subjected to chemical or physical treatment can be basically subdivided into the following two categories:
• liquid, solid-containing and organically contami-
nated waste, such as emulsions, water containing
solids or oil, contents of oil and petrol separators,
residues from tank cleaning and similarly polluted
water. The above-mentioned types of waste origi-
nate primarily in enterprises of the metal and mi-
neral oil-processing industries as well as in petrol
stations and car-repair workshops;
• liquid, solid-containing or solid-free inorganically
contaminated hazardous waste, such as acids
and lyes, sewage containing cyanides, nitrites,
chromates and heavy metals as well as thin slur-
ries from the metal-processing, electro-technical
and electroplating industries.

In addition, waste is also subjected to chemico-
physical treatment if it is both organically and inor-
ganically contaminated. Furthermore, the following principles apply to che-
mico-physical treatment:
• Treatment must not result in a transfer of the pol-
lutant problem from waste to sewage (see also
Sewage Emission Ordinances in accordance with
the Water Pollution Control Act).
• The depositing of non-recoverable residual mat-
ters remaining after treatment and/or subsequent
processing must not entail any potential risks for
future generations. This also applies to the solidi-
fication of residual matter. The state of the art in
waste depositing (including special regulations
for solidification products) was laid down in the
Landfill Ordinance.
• Combustible residual matter must be treated in
highly concentrated form yielding the maximum
possible calorific value.
• As a rule, the upgrading of combustible materials
can also be carried out using mobile equipment.
In this case, the same requirements must be im-
p osed concerning the control and monitoring of
emissions as those applicable for stationary
equipment. Since there is some doubt as to
whether the currently available mobile treatment
 technologies ensure operational safety and moni-
toring options comparable to those of stationary
equipment, priority should generally be given to
treatment with stationary equipment.
• Separated treatment zones for organic and inor-
ganic wastes should be available at least up to
the stage of drainage of the residues remaining
after treatment.

Due to the wide variety of types of waste, chemico-
physical treatment calls for the use of various tech-
nologies for the specific treatment of individual ty-
types of waste. Notwithstanding, the technical equip-
ment of the different plants has been very variable
to date, even in view of comparable treatment pat-
terns. In 1997, the Federal Environment Agency
concluded a study on Technical Instruction Prin-
ciples for the Chemico-Physical Treatment of Waste
containing a comprehensive presentation of the
current status as well as definitions of the require-
ments for the equipment and methods of operation
of chemico-physical treatment plants. Sewage
emissions from the biological and chemico-physical
treatment of waste are subject to limitations under
water law.

4.3.2. Thermal treatment
Waste incineration is a form of treatment necessary
to attain the objectives and principles of the Waste
Management Act and will markedly gain in signifi-
cance in the future.

Waste incineration plants must comply with the hig-
hest standards concerning efficient waste destruc-
tion, protection against emissions and quality of re-
sidues. The study on the Relevance of Waste Ma-
nagement for the Climate documents that the effec-
t of incineration beneficial to the environment are
superior to those of alternative treatment methods,
if suitable technologies are used.

Since 1 February 1999, the corresponding basic
conditions and standards for the incineration of ha-
dazardous waste are binding both for plants speciali-
sing in the incineration of waste (waste incinerati-
on plants) and for plants that in addition to normal
fuel also use waste for energy generation in the
context of production processes (co-incineration
plants).

With the Ordinance of the Federal Minister of Envi-
ronment, Youth and Family Affairs on the incinerati-
on of hazardous waste, Federal Gazette II 1999/22,
and the Ordinance of the Federal Minister of Economic Affairs on the incineration of hazardous waste in industrial plants, Federal Gazette II 1999/32, the European Directive 94/67/EC on the incineration of hazardous waste was transposed into national law.

This entails binding stipulations for:
- the greatest possible minimisation of the risk and pollution potential of waste through decomposition of its organic constituent matter,
- the upgrading of the inorganic constituent matter in separable form,
- the reduction in quantity and volume of waste,
- the quality of residual matter (with respect to environmentally friendly recoverability and/or landfilling) and
- the recovery of usable energy.


The Directive is to combine the existing Directive 94/67/EC on the incineration of hazardous waste with the Directive on the incineration of waste and aims at raising the standard of waste incineration and co-incineration of waste in production plants throughout the Community and at regulating it for all types of waste. This is to replace the two Directives on the incineration of municipal waste, which no longer correspond to the state of the art.

The preparatory work to implement the EU Directive on waste incineration in the national legislation has already been initiated. In this, the following principles must be observed:
- This regulation applies to the incineration of both hazardous and non-hazardous waste. At the national level, this signifies resorting to the Federal Republic’s waste management competence reserved for specific cases of non-hazardous waste. This is the only way to ensure uniform implementation instead of creating different sets of regulations.
- For ecological, but also for competitive reasons, every type of waste incineration must be subject to the same technical requirements in the long term. Special regulations for individual groups of plants should be tightly restricted. This means that the co-incineration of waste must principally fulfil the same requirements as waste incineration carried out in plants exclusively licensed for this purpose.
- If possible, all aspects of waste incineration (input, process technology, secondary measures relating to the media of air, water and soil) should be regulated. This concept forms the basis of both Directive 94/67/EC on the incineration of hazardous waste and the new Directive 2000/76/EC on the incineration of waste as well as the IPPC Directive 1996/61/EC.
- All requirements concerning waste incineration must correspond to the state of the art.
- Existing plants (older plants) must be brought up to this standard within specified transition periods.

4.3.3. Bio-technological treatment

Bio-technological processes are to be applied not only to the manufacturing of products from renewable raw materials and to preventive processes to avoid waste generation (N₂ fixing, bio-pesticides, bio-tensides), but also to waste recovery and disposal processes (aerobic and anaerobic biological treatment).

Principally, organic waste can be used in many different ways. In addition to various direct recovery options or its recovery as raw material in other processes, organic waste can also be used in a number of refining processes for the production of chemicals or bio-chemicals. By the same token, use can be made of the energy content of waste (peels, fibres, packaging, etc.) through incineration or pyrolysis. Due to its importance as a classic recycling process, the recycling of waste as fertiliser and animal feed should be specially mentioned.

The largest portion of waste from the foodstuffs industry deployed as fertiliser in agriculture (such as plant residue from fruit and vegetable processing, press residue, sludge, slops, residual sieved matter, etc.) is as a rule used without pre-conditioning. In some cases, the matter is drained of water. As a re-
result, valuable organic constituent matter (e.g. sugar, protein, lipids) is subjected to subordinate recovery only although it could be used more effectively after bio-technological refining treatment. However, unfavourable economic conditions (low raw material costs) have a negative effect on this development. Some bio-technological recovery processes also suitable for waste treatment include protein extraction, alcohol production, extraction of organic acids (lactic acid, citric acid, gluconic acid, itaconic acid), solvent production (acetone, butanol, butandiol), bio-polymer production (xanthan, pullulan, poly-hydroxy-butyric acid) or bio-chemicals.

Of the wide range of available bio-technological processing options, only composting and methane fermenting (alkali putrefaction) correspond to state-of-the-art technology. Both processes involve the conversion of organic matter by means of mixed microbial cultures. While traditional aerobic composting constitutes a restructuring and stabilising process, anaerobic methane fermenting (alkali putrefaction) is primarily a biological decomposition process of organic matter.

4.3.4. Mechanico-biological pre-treatment of residual waste

The exemptions made in the Landfill Ordinance increase the significance of mechanico-biological treatment combined with incineration as a process preceding landfiling. A future application potential for mechanico-biological treatment is also inherent in dry stabilisation processes, as is documented by an ecological analysis of the Development Potentials of Mechanico-Biological Waste Treatment. Thirteen years ago, 17 plants for the biological treatment of household waste were in operation throughout Austria, the total nominal capacity of which amounted to 600,000 tonnes/year. Most of these plants were constructed between 1975 and 1981, at a time when the separate collection of biogenic waste was still far from being an integral part of waste management. Originally, it was the purpose of these plants to minimise the volume of waste deposited by subjecting it to aerobic treatment (rotting) and to enable the production of a recyclable "residual waste compost", comparatively low in pollutant content, by means of corresponding organisational and technological measures. In recent years, this type of treatment has decreased, especially since the production of re-cultivation matter from residual waste no longer resulted in the desired quality.

Mechanico-biological processes before landfiling (mechanico-biological treatment plants before landfiling) are to pre-treat waste, following the (mechanical) separation of high-calorific fractions, in such a way that the gross calorific value (upper calorific value) of the residual matter to be disposed of is low, that the waste is biologically stable and, simultaneously, that the treatment will not generate any environmentally hazardous emissions. In order to implement the objectives and principles of the Waste Management Act, ecologically viable waste recovery is to be given priority over landfiling. For this reason, the matter input into mechanico-biological treatment plants for pre-treating before landfiling should exclusively be substances that are unsuitable for recovery or for which no recovery method exists.

Mechanico-biological dry stabilisation processes (mechanico-biological treatment plants for dry stabilisation) are to prepare waste, following a first (mechanical) preparation stage for conditioning by means of biogenic drying (with the lowest possible loss of organic matter, primarily to reduce moisture) and other preparation phases, in such a way that high-calorific waste (so-called dry stabilates, etc.) for energy recovery is produced and metals, inert and contaminating substances are separated without generating, at this stage, a fraction for landfiling. At the same time, the heat generated as a result of the self-heating of the organic waste constituents is to be used in a targeted manner for evaporating the moisture contained in the waste. This type of treatment too, must not generate any environmentally hazardous emissions. In keeping with preventive environmental protection, mechanico-biological treatment plants must also comply with strict and precise requirements. On the basis of the Technical Instruction Principles for the Chemico-Physical Treatment of Waste (Federal Ministry of Environment, Youth and Family and Federal Environment Agency, 1998) and the draft Guidelines for the Mechanico-Biological Treatment of Waste (Federal Ministry of Agriculture and
Forestry, Environment and Water Management and Federal Environment Agency, 2001), this *inter alia* entails the following requirements for the technical equipment and operation of plants for the mechanico-biological treatment of waste (see also Chapter 4.3.3.2):

- optimisation of the inputs with regard to the respective objective of the process (mechanico-biological treatment plants before landfilling, mechanico-biological treatment plants for dry stabilisation) taking account of the objectives and principles of the Waste Management Act
- incoming inspection including identity checks and a monitoring system for the waste thus treated
- separation of ferrous metals and non-ferrous metals (if applicable)
- separation of the high-calorific fraction(s) for thermal treatment (mechanico-biological treatment plants before landfilling)
- homogenisation of residual waste and sewage sludge prior to biological treatment (no co-treatment of hazardous waste)
- monitoring, regulation and/or control of the biological process
- use of closed systems in the first rotting stage ("intensive rotting")
- greatest possible enclosure and collection of outgoing air throughout the entire treatment and rotting stages; in case of multi-stage biological treatment, there exists, under certain conditions, the alternative possibility of follow-up treatment under aerobic conditions in an open or non-enclosed system without collection and cleaning of the outgoing air, but with corresponding measures to avoid the formation of contaminated leachate and/or with leachate monitoring (to be evaluated on a case-by-case basis)
- plant-specific optimisation of air management
- treatment of outgoing air, adaptation of plants to attain the outgoing-air limit values for loads and concentrations
- options for monitoring outgoing-air emissions
- compliance with the stability criteria for the reduction of gas-forming and leachability potentials of the treated waste (mechanico-biological treatment plants before landfilling)
- avoidance of wastewater, or alternatively, measures for the protection of groundwater and compliance with the specific Wastewater Emission Ordinance (AEV, Federal Gazette II 1999/9)
- employee protection, in particular with respect to problems of hygiene, during transport within the plant, during conversion and storage (the manual sorting of residual waste is to be avoided)
- redundancy and modular structure for key technical installations to ensure a high degree of plant availability

**4.3.5. Landfilling**

The Landfill Ordinance (Federal Gazette 1996/164), which came into force on 1 January 1997, created a decisive and future-oriented basis for the long-term implementation of the predominant objectives of the Waste Management Act – protection of humankind and the environment, sparing exploitation of landfill areas, reserves of raw materials and energy as well as disposal of slow-reacting residues.

With the simultaneous amendment to the Water Act and the amendment to the Waste Management Act (Federal Gazette I 2000/90), older plants are gradually being integrated into the system, which has already been completed in particular for the criteria concerning landfill construction technology as per the preliminary adaptation deadlines of 1 July 1998 and 1 July 1999. Full adaptation to meet state-of-the-art technological standards in accordance with the Landfill Ordinance, in particular the requirements concerning the quality of waste to be landfilled, must be completed by 2004 at the latest and with a few exceptions by 2009 (see also Chapter 5.4.3.1). Contrary to compliance with requirements concerning landfill construction technology, the attainment of the stipulated waste qualities for landfilling calls for steps to be taken upstream in the form of suitable, in particular thermal, treatment plants.

Thus clear-cut basic conditions have been available for over four years and must be complied with. In particular, all efforts to postpone the above-mentioned implementation deadlines must be clearly re-
...jected. Ordinances promulgated by the heads of the Land governments to postpone the adaptation periods are only admissible if the requirements under Art 45.a (7) of the Waste Management Act are strictly observed.

In order to be able to implement Council Directive 1999/31/EC on waste landfills in due time, an amendment to the Landfill Ordinance is being prepared in addition to the already promulgated amendment to the Waste Management Act (Federal Gazette I 2000/90); however, this proposed amendment will not entail any changes in essential requirements, in particular concerning the ban on the landfilling of organic waste.

4.4. Hazardous waste and waste oils

4.4.1. Prevention and recovery

Hazardous waste is primarily generated in the industrial sector in the course of the manufacturing and use of products. For this reason, measures for waste prevention and recovery in these areas should
• substitute raw and process materials,
• close material and substance cycles and
• opt for technological conversion.

Above all qualitative prevention effects were achieved with respect to waste from mineral oil products, paints and painting agents, oil-contaminated soil as well as concerning the particularly hazardous transformer oils and batteries. However, these positive developments are not reflected in the quantitative records on the waste volume generated. The reasons for this lie in increased waste quantities caused by favourable economic growth, but also in changes in definitions of terms describing various types of hazardous waste.

A study of minimisation potentials was carried out for those hazardous waste types that account for a high share of the overall waste volume and/or present a high risk potential (approx. 89% of the total volume of hazardous waste) and for which suitable prevention and recovery technologies are already used.

This study of minimisation potentials shows that almost complete (material and thermal) recovery is possible for the following types of waste.
• waste from aluminium production
• oil-contaminated soil
• end-of-life vehicles
• batteries
• fluorescent lighting tubes
• waste oils
• refrigerating equipment

In the long term, the volume of hazardous waste can be minimised by the use of prevention and recovery measures; however, problems of marketability concerning products made from secondary raw materials as well as readiness to set up recovery plants, disproportionately high costs, deadlines for implementation and other factors must be taken into consideration. Yet a quantification of the total minimisation potential does not seem to be feasible, since the simple addition of minimisation potentials of individual types of waste would hardly contribute to the attainment of the objectives.

4.4.2. Treatment and plant requirements

On the basis of the volume of hazardous waste generated, totalling approx. 1.0 million tonnes/year, and following allocation to the corresponding treatment procedures, the necessary treatment capacities were calculated. The overall situation may be summarised as follows:

• approx. 172,000 tonnes/year are to be allocated to special recovery and treatment plants (e.g. end-of-life-vehicles, aluminium saline slag and aluminium light-metal dross, lead accumulators, fluorescent lighting tubes, refrigerating equipment),
• approx. 48,000 tonnes/year of inorganic waste (e.g. acids, lyes, galvanic sludge) are to be processed in chemico-physical recovery and treatment plants,
• approx. 100,000 tonnes/year are to be processed in chemico-physical recovery and treatment...
plants for organic waste (e.g. oil-water mixtures, oil-separator and grit-chamber contents, emulsions),

- approx. 304,000 tonnes/year are to be allocated to the treatment of contaminated oil. Depending on the degree and type of contamination, the waste is to be directly landfilled but for the greater part to be treated in physical, bio-technological or thermal plants,

- approx. 126,000 tonnes/year are to be earmarked directly for thermal treatment. With residual matter from CPO treatment and other forms of treatment, a total of approx. 155,000 tonnes of hazardous waste need to be treated thermally each year,

- approx. 40,000 tonnes/year are to be deposited underground,

- more than 625,000 tonnes/year are to be landfilled either directly (depending on the waste properties and composition) or following conditioning and/or binding into a solid matrix. Primarily, this concerns:
  - approx. 303,000 tonnes of originally contaminated soil,
  - approx. 212,000 tonnes of slag, ash, flue-ash, dust and salt-containing residual matter from waste incineration plants, solid salt-containing residual matter from flue-gas cleaning of firing plants for conventional fuels, slag and ash from waste pyrolysis plants and other waste for landfiling, such as worn refractories and carbide sludge,
  - approx. 62,000 tonnes of non-recoverable residual matter from the special treatment of metal grinding sludge; light-metal dross containing aluminium; demolition waste and/or waste resulting from fires, containing hazardous contaminants,
  - approx. 43,000 tonnes of residual matter from the thermal treatment of waste oils, solvents, waste lacquers, lacquer and paint sludge and

A comparison of existing and required capacities for the treatment of hazardous waste and waste oils reveals that no additional plant capacities need to be created unless the volume resulting from the remediation of contaminated sites should increase markedly. The fact that currently no demand for further capacities for the thermal treatment of hazardous waste has been identified as compared to the 1998 Federal Waste Management Report results from the changes in the waste volume generated and the greater willingness on the part of the industry to accept secondary fuels – also because of higher energy prices.

It may become necessary to establish intermediary or temporary waste storage points for wastes that currently cannot be recovered or treated. No detailed data on the additionally required capacities for the intermediate storage of hazardous waste can be put forward at the moment. All waste treatment plants have facilities of this type. A forecast to determine storage capacities does not seem feasible for attaining the set objectives.

In accordance with the provisions of the Landfill Ordinance, hazardous waste must be treated prior to landfiling in order to make it suitable for storage. In all, provision must be made for the landfiling of approx. 625,000 tonnes/year of residues from the recovery and treatment of hazardous waste. It may be assumed that the existing capacities for waste and/or residual matter landfills are sufficient to contain this residual waste. However, mention should be made in this context of the ban on the landfiling of hazardous waste, which takes effect on 16 July 2001. Still, hazardous waste may be classified as non-hazardous following a positive overall evaluation under the Landfill Ordinance and thus deposited as non-hazardous waste at residual matter and waste landfills.

Specific types of waste and/or residual matter resulting from waste treatment will still have to be stored in underground landfills sealed off from the biosphere. As a rule, this applies to types of waste for which suitable treatment plants do not yet exist or which, although pre-treated prior to landfilling, cannot be transformed into a state suitable for aboveground depositing (requirements concerning the quality of waste to be deposited under the Landfill Ordinance). Since no underground landfills are as yet in operation in Austria, these wastes are currently exported. While a second-instance licence for a landfill of this type has been granted, no investment decision has been taken yet.
Figure 18: Disposal of hazardous waste - projected status

Total amount about 1 million tonnes

<table>
<thead>
<tr>
<th></th>
<th>35,000 t</th>
<th>172,000 t</th>
<th>304,000 t</th>
<th>100,000 t</th>
<th>126,000 t</th>
<th>212,000 t</th>
</tr>
</thead>
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<tr>
<td><strong>SPECIAL</strong></td>
<td></td>
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<td><strong>TREATMENT</strong></td>
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<td><strong>CPI</strong></td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CPO</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RECOVERY</strong></td>
<td>172,000 t</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>US</strong></td>
<td>20,000 t</td>
<td>3,000 t</td>
<td>2,500 t</td>
<td>3,000 t</td>
<td>3,000 t</td>
<td>2,500 t</td>
</tr>
<tr>
<td><strong>THERM</strong></td>
<td>6,000 t</td>
<td>1,000 t</td>
<td>116,000 t</td>
<td>43,000 t</td>
<td>126,000 t</td>
<td>22,000 t</td>
</tr>
</tbody>
</table>

- Slag and ash from waste incineration plants
- Slag and ash from conventional fuels and slags and ash from waste pyrolysis plants
- Other materials to be landfilled (e.g. Furnace lining, carbide sludges)

Legend:
- TCS Treatment of contaminated soil
- CPI Chemico - physical treatment of inorganic waste
- CPO Chemico - physical treatment of organic waste
- Therm Thermal treatment or energy recovery
- US Underground storage

Legend:
- TCS Treatment of contaminated soil
- CPI Chemico - physical treatment of inorganic waste
- CPO Chemico - physical treatment of organic waste
- Therm Thermal treatment or energy recovery
- US Underground storage

Umweltbundesamt
Federal Environment Agency - Austria
4.5. Waste from households and similar establishments

4.5.1. Prevention

Although the total volume of residual and bulk waste throughout Austria could be reduced by about 27% from 2.10 million tonnes to 1.53 million tonnes, an increase of these types of waste by approx. 4.5% or roughly 66,000 tonnes was recorded since 1998. By the same token, an increase of the total volume of waste from households and similar establishments, i.e. of residual waste, bulk waste and separately collected recyclables, biogenous waste and hazardous waste from households by approx. 6.2% or roughly 182,000 tonnes was observed since 1998.

Despite these increases, the portion earmarked for landfilling decreased further from 45.4% to 43.1% since 1996, the last reference year of the previous Federal Waste Management Report of 1998. The increase in the total quantity of waste from households and similar establishments could therefore be set off by over-proportionate success in the separate collection and recovery of recyclables, which underlines the importance of the measures taken so far. These measures also form an important precondition for the success of waste prevention and hence must be further intensified.

However, attention must be drawn in this connection to limiting factors such as real population growth and continuing increasing prosperity, linked to the growing trend towards single households (e.g. the purchase of new household articles and/or the exchange of household furniture within increasingly short periods entails correspondingly greater volumes of bulk waste and of separately collected bulk fractions, such as household scrap and waste wood).

Although it is difficult to quantify to which extent the success of waste prevention is attributable to the minimised use of materials and energy during production, the use of low-waste product and packaging design, the introduction of re-usable and deposit systems or the purchase of ecologically preferable products, these measures should be further prioritised as key elements of waste management to support sustainable economic approaches; the same goes for qualitative waste prevention strategies concerning material substitution (reduction of the hazardous contents of waste) and refraining from putting large quantities of hazardous waste (hazardous household waste) into circulation in the domestic sector, in particular on the basis of the Chemicals Act.

4.5.2. Collection and recovery

Altogether, approx. 1.56 million tonnes of recyclables, biogenous waste and hazardous household waste were separately collected in 1999, which equals roughly 50% of the overall volume of approx. 3.1 million tonnes of waste from households and similar establishments. In addition, bulk waste amounting to approx. 0.22 million tonnes was collected, equalling roughly 7% of the total volume generated. If in addition to these quantities, one considers the amount of residual waste collected in waste containers in 1999, i.e. approx. 1.31 million tonnes or roughly 42.5% of the total volume of waste from households and similar establishments, further potentials for separate collection and subsequent recovery of up to 200,000 tonnes remain after subtracting the portions not accessible for separate collection:

- approx. 8% of residual waste (roughly 107,000 tonnes of recyclables) can still be separately collected and recycled. The actually recyclable portion of this waste depends on the extent to which qualitative aspects preclude recycling or make it ecologically non-feasible or on the extent to which economic aspects do not permit a balanced cost-benefit ratio;
- approx. 7% of residual waste (approx. 92,000 tonnes of biogenous waste) can still be collected separately and treated bio-technically; in this, however, the qualities to be achieved due to the settlement structure and the additional cost related to an extension of the collection systems must be considered in this context;
- approx. 1,000 tonnes of hazardous household waste are to be additionally extracted from residual waste.
In addition to the recyclable fraction in the residual waste, approx. 14% of bulk waste (roughly 9,000 tonnes of scrap metal and roughly 24,000 tonnes of waste wood – a total of approx. 33,000 tonnes) can be separately collected and recovered.

### 4.5.3. Treatment and plant requirements

The following “realistic” scenario, which aims at giving the best possible idea of the management of waste from households and similar establishments in 2004, was developed to assess the future recovery and treatment of such types of waste.

The authors selected the year 2004 because at this moment all stipulations of the Landfill Ordinance (Federal Gazette 1996/164) will have become effective. This means implementing the principle of treating non-recoverable waste, depending on its composition, by means of bio-technical, thermal or chemico-physical processes in such a way that only solid residual matter in a state of minimised reaction and conditioned order will be landfilled.

The forecast is based on the composition and volume of these types of waste in 1999.

The following methodology was applied to develop the scenario:

- Future collection potentials and rates as well as recovery and treatment methods were assessed starting from the 1999 volume.
- For every year from 1999 to 2004, an average annual increase of the total volume of household waste by approx. 65,000 tonnes is estimated.

This rate is calculated on the basis of the average increase of these types of waste since 1989, the first year to document waste management for Austria as a whole (Federal Waste Management Plan 1992).

The reasons for the volume increase are *inter alia* attributable to further population growth, a corresponding increase in the number of households, the decrease in the size of average households, changes in consumers’ eating habits (demand for convenience foods in smaller, pre-packaged portions) as well as to a wider range of disposable products on the market.

In addition, increasing amounts of waste from household gardens (“pruning and grass cuttings”) also end up in containers for the collection of biogenous waste.

Moreover, additional waste is generated in the field of electronic appliances, which are being used in relevant quantities by households only in recent years, e.g. personal computers (PCs), PC scanners, PC printers, video recorders, cellular phones, answering machines, video play-stations, etc.

It is furthermore assumed that

- the composition of household waste will not change significantly between 1999 (the starting point of the forecast) and the target year;
- collection qualities of separately collected fractions will remain roughly the same;
- self-composting rates for biogenous waste will change only minimally.

### Table 21: Distribution of waste from households and similar establishments in 2004, broken down by fractions

<table>
<thead>
<tr>
<th>fraction</th>
<th>Volume in tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual waste</td>
<td>1,230,000</td>
</tr>
<tr>
<td>Bulk waste</td>
<td>210,000</td>
</tr>
<tr>
<td>Separately collected recyclables</td>
<td>1,320,000</td>
</tr>
<tr>
<td>Separately collected biogenous waste</td>
<td>630,000</td>
</tr>
<tr>
<td>Separately collected hazardous household waste</td>
<td>30,000</td>
</tr>
<tr>
<td>Sum total, rounded (in tonnes)</td>
<td>3.42 Mio</td>
</tr>
</tbody>
</table>
As a result, the distribution of waste from households and similar establishments for 2004 is estimated as follows:

Based on the waste volume predicted for 2004 as well as on the assumptions for allocation to the corresponding recovery and treatment plants, the required plant capacities were determined (cf. Figure 19).

Starting from this basis for 2004,

- approx. 540,000 tonnes of residual waste will be delivered to specialised sorting plants for residual waste (mostly to the mechanical recovery section of mechanico-biological waste treatment plants);
- of which approx. 260,000 tonnes of waste will be treated (mechanico-) biologically (as low-calorific fraction of prior mechanical treatment);
- a total of approx. 1,290,000 tonnes of waste will be earmarked for thermal treatment and recovery plants (approx. 690,000 tonnes directly as residual waste; approx. 270,000 tonnes as low-calorific fraction of mechanical treatment in mechanico-biological plants; approx. 330,000 tonnes of waste from the sorting of separately collected waste);
- approx. 1,060,000 tonnes of sorted recyclables will be recycled, of which approx. 1,040,000 tonnes will be bulk recyclables separately collected near households while approx. 20,000 tonnes will be waste from residual waste sorting and/or thermal treatment of residual waste (magnetic separator);
- approx. 570,000 tonnes of sorted biogenous waste from separate collection will be treated biotechnically (estimated compost production volume of approx. 200,000 tonnes);
- approx. 30,000 tonnes of hazardous household waste will be processed in special treatment plants;
- approx. 660,000 tonnes of waste from sorting and treatment (slightly less than 20% of the total volume) will have to be landfilled.

The plant capacities currently available for sorting approx. 1.32 million tonnes of separately collected recyclables and for recycling approx. 1.06 million tonnes of this waste are adequate. Sufficient plant capacities for the sorting of 0.63 million tonnes of separately collected biogenous waste and/or the bio-technical treatment of approx. 0.57 million tonnes of this waste are likewise in place.

The creation of capacities for the sorting of approx. 540,000 tonnes of residual waste must be safeguarded by refurbishing existing plants for the mechanico-biological pre-treatment of residual waste as well as by constructing new, adequate plants. For the future thermal treatment of residual waste, the high-calorific fraction of residual waste sorting and of waste from the sorting of separately collected recyclables (wood, plastics, etc.) with a volume of slightly less than 1.3 million tonnes/year (not including the demand for similar wastes of commercial and industrial origin), capacities amounting to approx. 400,000 tonnes are still lacking. However, intensive plans to cover this lack are already underway and must be further intensified.
**Figure 19: Waste from households and similar establishments - Forecast of recovery and treatment scenario in 2004**

**Waste from households and similar establishments 2004: about 3,420,000 tonnes - SZENARIO**

<table>
<thead>
<tr>
<th>Waste stream</th>
<th>Quantity (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual and bulky waste</td>
<td>1,440,000</td>
</tr>
<tr>
<td>Residual waste</td>
<td>1,230,000</td>
</tr>
<tr>
<td>Residual waste</td>
<td>690,000</td>
</tr>
<tr>
<td>Residual waste</td>
<td>540,000</td>
</tr>
<tr>
<td>Secondary materials</td>
<td>1,040,000</td>
</tr>
<tr>
<td>Biogenous waste</td>
<td>570,000</td>
</tr>
<tr>
<td>Hazardous household waste</td>
<td>30,000</td>
</tr>
<tr>
<td>Bulky waste</td>
<td>210,000</td>
</tr>
<tr>
<td>High - caloric value fraction</td>
<td>270,000</td>
</tr>
<tr>
<td>Low - caloric value fraction</td>
<td>260,000</td>
</tr>
</tbody>
</table>

**Legend:**
- **St**: Special treatment
- **R**: Recovery
- **Tt**: Thermal treatment/recovery
- **MBpt**: Mechanical - Biological pre-treatment

[Diagram showing waste management processes and quantities]
4.6. Excavated soil, demolition and construction waste

4.6.1. Prevention and recovery
Positive effects for the qualitative and quantitative prevention of waste in the construction industry can be achieved by means of the following measures:
• increased observance of waste-avoiding measures in the construction planning phase
• prolongation of the useful life of constructions and parts thereof
• examination of the toxicity and degradability of construction process materials before licensing
• restricted use of especially toxic and biologically resistant materials by means of constructive measures

Separate collection is necessary to allow for the effective recycling of unavoidable demolition and construction waste. The Ordinance on the separation of waste generated during construction activities, which came into force on 1 January 1993 (Federal Gazette 1991/259), prescribes the separation, contingent upon specific quantity thresholds, of the material and substance groups generated.

4.6.2. Treatment and plant requirements
Additional plants for the processing of demolition waste and construction waste are not necessary. Analyses have shown that the existing plants are operating at merely 50% of their full capacity.

4.7. Waste from water and sewage treatment and all types of water use

4.7.1. Prevention and recovery
Sewage sludge is the degradation product of an environmental measure necessary to conserve the purity of water and soil. It is generated daily and unavoidably. A quantitative prevention of sewage sludge generation will not be possible neither now nor in the future.

Strategies aimed at ensuring the recovery of sewage sludge should follow the principle of systematic implementation of measures for qualitative waste prevention in order to improve the quality of sewage sludge. An important objective of these measures lies in the implementation of a regionally oriented form of sewage sludge recycling in agriculture, which in the long term will not entail any significant changes in the content of potential pollutants in the soil.

For this purpose, the following strategies are necessary:
• minimisation of pollutants at the source by means of intensified monitoring by the authorities
• monitoring of soil-protection regulations of the Länder
• monitoring of uniform quality standards for the use of sewage sludge in agriculture
• clarification of the liability issue regarding the agricultural use of sewage sludge
• resolution of the issue of sewage-sludge treatment and recovery already at the moment of establishing sewage treatment plants
• introduction of state-of-the-art sewage technology for indirect release

With respect to indirect release, there only exist very limited legal possibilities to enforce the minimisation of pollutants at the source in each case and subject it to monitoring by the competent authorities; with respect to release requiring no licence, the responsibility was principally transferred to the operators of sewer systems and sewage treatment plants.
4.7.2. Treatment and plant requirements

Basically, there exist two different strategies for the recovery and/or treatment of sewage sludge:
- recycling in agriculture (partly after composting)
- depositing at landfills (partly after de-watering or incineration)

Most sewage sludge treatment concepts of the Länder basically prioritise agricultural recycling, where this is ecologically and economically feasible. At the moment, roughly 20% of municipal sewage sludge is absorbed by agriculture. However, due to requirements under ÖPUL (Austrian programme for the promotion of environmentally sound, extensive agriculture protective of the natural living environment) or due to biological cultivation, etc., no substantial increase of this percentage is expected. According to the Landfill Ordinance, the depositing of sewage sludge at landfills will as a rule require thermal treatment as of 2004. This concept can be implemented without entailing excessive costs in the urban agglomerations, where the major share of sewage sludge is generated (already practised in Vienna). In the many smaller municipalities, where approx. 90% of sewage treatment plants are operated but which produce only about 20% of sewage sludge, this approach would, however, entail markedly higher costs. In these areas, the use of high-quality sewage sludge (after pre-treatment) on agricultural land should be pursued.

In order to counter any hygiene risks resulting from the use of sewage sludge in agriculture, the applicable soil protection laws of the Länder implement several strategies. For example, the use of sewage sludge for specific forms of cultivation (e.g. vegetable and small-fruits cultivation) is strictly prohibited. Other applications are restricted with respect to the times of use. Moreover, specific applications (e.g. grassland) require that the sewage sludge must first be sanitised.
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5. MEASURES

In accordance with Art. 5 (2) (3) of the Waste Management Act, the following chapters outline the measures to be implemented on the basis of the report on the status of waste management and the provisions concerning the prevention, recovery and treatment of waste. In their turn, these measures must conform to the objectives and principles of the Waste Management Act and take account of the present situation.

Parallel to this objective and as in the previous chapters, a report will be submitted on the measures taken on the basis of the Federal Waste Management Plans of 1992, 1995 and 1998 (Federal Waste Report).

5.1. Options and instruments

The options and instruments available for the attainment of stipulated objectives may be categorised as follows:

- legal and organisational measures as well as preparation and compilation of the necessary expert documentation
- public awareness and information campaigns as well as consultation and training
- exemplary action by public authorities
- international co-operation (in particular within the EU)
- market economy instruments and financial incentives
- voluntary agreements

The Waste Management Act provides the primary basis for the implementation of requirements concerning waste prevention and recovery. According to the Waste Management Act, there are two principal options for the implementation of product-related waste prevention and recovery.

On the one hand, the Federal Minister of Agriculture and Forestry, Environment and Water Management, in co-operation with the Federal Minister of Economic Affairs and Labour, issue target ordinances according to Art. 8 of the Waste Management Act if it can be assumed that, within a reasonable period of time, the necessary minimisation of the quantities, or the reduction of the pollutant loads, of waste usually generated by end users can be attained through autonomous action on the part of the economy.

On the other hand, measures for the prevention and recovery of waste can be prescribed by ordinances under Art. 7 of the Waste Management Act, such as mandatory designation of materials identifying their pollutant content and/or recoverability as well as obligatory take-back for purposes of re-use or recovery by manufacturers and distributors, the establishment of collection systems, the obligation to sell goods only against payment of a return deposit or payment of a contribution towards recovery and disposal as well as the unconditional ban on the sale of goods which, as waste, are liable to release particularly dangerous substances.

The Chemicals Act provides the basis for the introduction of measures which can improve the situation of waste management, above all in the field of qualitative waste prevention. To the extent necessary for the prevention of hazards to human life and health or the environment, the Federal Minister of Agriculture and Forestry, Environment and Water Management, is to introduce, in accordance with Art. 14 of the Chemicals Act, ordinances banning the production, placing on the market or use of specific dangerous substances, preparations or finished products, or else prescribe their production, circulation and use only in specific forms, quantities, style, packaging or designation, or else only for specific purposes or with limitations; furthermore, the Federal Minister may also ban, by way of ordinance, all processes of production or use through which specific dangerous substances or preparations accumulate.

With respect to waste oils, it can be established, by way of ordinance according to Art. 25 of the Waste Management Act, that motor oils and other types of lubricants with specific additives may not be introduced into commercial trade if such additives are harmful to the environment or make recovery substantially more difficult.

According to Art. 9 of the Waste Management Act, the construction and start-up of plants as well as the modification of older plants, during the operation of which waste is generated, shall require licensing under the Waste Management Act. The
Trade Regulation Act ("Gewerbeordnung") of 1994 and the Act on Mineral Resources, respectively, provide for analogous provisions concerning commercial plants and plants covered under mineral resource legislation. According to these provisions, licensing applications must in any case be accompanied by a description of the waste generated during operation of the plant, including a description of operational precautionary measures for the prevention, recovery and disposal of such wastes (waste management concept). This provision contains the important option for licensing authorities to directly influence the formulation of procedures relevant for waste management and should be intensively applied in the enforcement of these provisions.

Furthermore, Art. 10 of the Waste Management Act stipulates that the Federal Minister of Agriculture and Forestry, Environment and Water Management, in co-operation with the Federal Minister of Economic Affairs and Labour, may decree by ordinance that goods may only be produced if a corresponding portion of recyclables (treated in compliance with state-of-the-art technology and fulfilling all requirements for the recovery of recyclables) has been used in the manufacturing of such goods, inasmuch as this is necessary to attain the objectives set down in the Federal Waste Management Plan.

On the basis of Art. 11 (3) of the Waste Management Act, the Federal Minister of Agriculture and Forestry, Environment and Water Management, in co-operation with the Federal Minister of Economic Affairs and Labour, may decree by ordinance which materials (including non-hazardous waste) may in any case be earmarked for separate collection, storage and treatment.

According to Art. 29 (18) of the Waste Management Act, the Federal Minister of Agriculture and Forestry, Environment and Water Management may, by way of ordinance, decree more specific provisions concerning the state-of-the-art equipment and operating methods of waste treatment plants to be licensed under the Waste Management Act, as required for the prevention of impairments defined in Art. 1 (3) of the Waste Management Act, including stipulations concerning the quality of the waste to be treated, criteria and threshold values for the allocation of this waste to these plants, monitoring and supervision during operation as well as follow-up monitoring and state-of-the-art emission thresholds to be observed by these plants.

The preparation of comprehensive expert documentation for each individual case must be considered an essential prerequisite for the implementation of the measures described above. In addition to the development of general concepts, this also refers to the awarding of contracts for expert opinions, studies and research papers.

Voluntary declarations, obligations binding on the declarer, agreements and co-operation are other instruments for the implementation of necessary measures that have proven their worth in the field of recovery measures. Guidelines and standards also contribute to the specification and introduction of state-of-the-art technologies for plants and operating procedures.

Public awareness and information campaigns as well as consultation and training are equally essential instruments of environmental policy and hence of waste management measures. On the one hand, they help to communicate awareness and understanding for selected objectives and for the implementation of the necessary measures; on the other hand, lasting changes can only be achieved through training and increasing the basis of knowledge of those directly involved.

By persistently pursuing the objectives and principles of the Waste Management Act, public authorities, as important contractors of economic activities, primarily in the procurement and construction sectors, can act as models to emulate, which for example, can decisively influence the development, market introduction and competitiveness of ecologically friendly products or processes. International co-operation plays a strategic and hence decisive role in environmental policy, especially as, inter alia, environmental pollution and waste do not remain within a nation's territory but are transported across borders. Due to Austria's accession to the European Union and the declared objective of creating a common market, this field constitutes an additional and important challenge, also from the point of view of waste management. This applies in particular to the establishment of financial incentives for the implementation of envi-
5.2. General measures

5.2.1. Sector-specific concepts

In the past few years, numerous sector-specific concepts have been developed in Austria for the purpose of describing and quantifying the potentials for the prevention and recovery of waste generated in various sectors of industry and production stages. Primary consideration must be given to those types of waste which occur in large quantities or, due to their constituent substances, represent a relatively high hazardous potential.

The majority of these intra-industrial concepts were drawn up in co-operation between the Federal Ministry of Agriculture and Forestry, Environment and Water Management and the Austrian Federal Economic Chamber as well as the respective trade organisations (Institute of Economic Development – WIFI, trade associations, guilds). They are to offer assistance and suggestions to companies concerned and also are to serve as a basis for decision-making in the field of environmental subsidy measures under the Environmental Subsidy Act.

Currently, sector-specific concepts are available for the following industries:

- wood and timber
- agriculture
- medical waste
- paint and lacquer waste
- non-halogenated solvent waste
- waste from leather-processing enterprises
- foundry waste
- waste from food production
- dry cleaning
- metal-surface cleaning using chlorinated hydrocarbons
- cellulose/pulp and paper industry
- textiles (two-part concept for waste and sewage)
- photographic waste and sewage
- waste oils and waste lubricants
- electroplating
- chemical industry

A system study for the development of sector-specific concepts was developed for the automobile industry.

Although the sector-specific concepts have attained a certain degree of notoriety and although their standard is generally judged to be high, they were only applied in individual cases so far. Amongst other causes, impeding factors and deficits mentioned by companies include a lack of information, uncertainty about provisions, lack of counselling and lack of subsidies.

However, companies should not only be offered information, but should also be motivated to apply the concepts in practice. More information on practical application should be supplied by the individual industries’ associations. Such objectives, especially with respect to small and medium-sized companies, combine ecologically oriented impulses with technologically innovative approaches so that the companies’ competitiveness can be improved. In the face of increasing globalisation, the implementation of sector-specific concepts is thus an important step with respect to both environmental and economic policies.

In order to meet the objectives of the Waste Management Act, the range of time-tested sector-specific concepts was expanded to prioritise an orientation towards practical implementation. For this purpose, a project was carried out in order to increase the efficiency of sector-specific concepts with respect to the implementation of the measures suggested, in particular concerning the exploitation of prevention and recovery potentials. At the same time, the experience acquired so far was to serve as a basis to adapt the content and structure of future sector-specific concepts so as to increase the levels of efficiency and acceptance.

It was the purpose of this project to determine which industries most urgently require implementation initiatives and which of the already completed sector-specific concepts offer the best opportunities for the successful implementation of waste minimisation potentials. The concepts were evaluated according to the criteria “quantity relevance”, “need for priority action” and “chances of actual implementation”.

With respect to quantity relevance, those quantities of waste need to be determined which, within
the scope of each sector of industry, contribute to the overall primary quantity of waste generated in Austria. Moreover, the total of prevention and recovery potentials indicated in the respective sector-specific concept is to be determined as well.

First of all, the **need for priority action** must be assessed proportionally to the urgency of waste minimisation measures imposed by legal provisions, competition and ecological requirements. In addition, the viability of the technologies described in the sector-specific concepts should likewise form part of the assessment. In order to determine the pressure generated by legal provisions, the status quo of each individual sector of industry must be compared with the limit values prescribed or intended by law, while also taking account of the time-frame by introducing transition regulations. The viability of the technological measures recommended can be determined by assessing the degree of dissemination by means of the criteria “pilot processes or solutions not yet established”, “individual applications”, “widely used alternative”.

For the assessment criterion “chances of actual implementation”, the consequences of key alternatives with respect to economic, technological and ecological aspects are to be determined; deficits and impeding factors in companies are to be identified as well. Here, the consequences for the economy, to be established by means of a comparison of operating costs and currently used technologies, and the technological consequences, i.e. changes in product quality, may be juxtaposed with ecological consequences, e.g. changes in air and emissions as well as in energy consumption.

As a result of the project, the sector-specific concepts for paint/lacquers and the foundry industry seem to be best suited for implementation initiatives. In addition, implementation initiatives are to be recommended for the sector-specific concepts for wood and timber, medicine, electroplating, non-halogenated solvents and dry cleaning. For the equally important sector-specific concept for metal surface cleaning, there already exists an excellent implementation initiative whose positive findings are being applied to the priority concepts for paint/lacquers and medicine.

At the moment, the Federal Ministry of Agriculture and Forestry, Environment and Water Management is preparing the implementation of prevention and recovery potentials for the electroplating industry.

### 5.2.2. Waste management concepts

The Waste Management Act and the Trade Regulation Act require operators of older plants to draw up a waste management concept if waste is generated in the course of operation of the plant and if more than 100 persons were employed at the plant as of the effective date 1 July 1990 (or at a later date). By the same token, such a concept must be enclosed in applications for the licensing of new plants and/or the modification of older plants.

A waste management concept is to provide an overview of the type and quantity of the waste generated at the plant as well as to highlight possibilities for effective waste prevention and recovery. Substance and material flows are rendered transparent, and optimisation options are identified.

Waste management concepts should also contain material and substance balances – at least for those pollutants and recoverable substances for which the company is a key forwarder, transformer or warehouse-keeper in the context of Austria’s waste management system. Sector-specific and waste management concepts offer the best possibility of using substance and material flow analyses. Material and substance flow analyses permit taking correct, efficient decisions concerning the prevention, recovery and environmentally friendly disposal of waste.

Environmental impact declarations, too, must contain material and substance balances. Only balances that link the waste input to the output by means of transfer coefficients permit a detailed verification of emission prognoses and the recommendation of necessary measures, if so required. This may entail direct advantages, such as possible cuts in disposal costs and greater certainty concerning the observance of legal provisions. Likewise, this builds up a climate of trust when co-operating with public authorities.

To be able to make full use of these opportunities, it is important to update waste management concepts in order to monitor the waste management situation regularly, verify the effects of steps taken, identify changes and derive new measures from them.
Waste management concepts developed for plants which are subject to the Waste Management Act, have more than 100 employees and were older than five years as per 1 July 2000 must in any case be updated within a period of three months.

The subject-matter laid down in Art. 45 (6) of the Waste Management Act is described more concretely and explained in a textbook. Manuals containing instructions and forms were developed for schools and motor vehicle shops and made available to them as well as to hospitals, printing-shops and the office and administrative sector.

Experience to date has shown that, while the preparation of a waste management concept involves a certain degree of effort, the thorough investigation of waste management inside a company can also have distinctly positive effects for the company, not only from the ecological, but also from the financial viewpoint.

5.2.3. Waste officer

Since 1 October 1995, it has been mandatory for all companies in Austria with 100 or more employees to appoint a qualified waste officer and a deputy in writing and to report their names to the authorities. This is a requirement under Art. 9 (6) of the Waste Management Act.

The duties of the waste officer include monitoring of compliance with the stipulations of the Waste Management Act and the related administrative activities as well as informing the plant owner of his/her findings, in particular concerning identified shortcomings. Moreover, the waste officer is to develop proposals to eliminate shortcomings. He/she is to work towards the implementation of waste prevention measures and the effective organisation of waste separation, waste recovery and waste control systems as well as towards the implementation of all provisions under waste management legislation affecting the plant.

Since 1 October 1998, the following facts must be demonstrated in the notification to the district administrative authority:

- the consent of the waste officer and his/her deputy, and
- the technical qualification of the waste officer for the task.

This provision does not apply to waste officers whose appointment was notified to the authorities before 1 October 1998.

At the moment, the discharge of a waste officer from this task equally requires notification.

**General requirements relating to waste officers**

The waste officer must be permanently employed by the company and must either be present or at least easy to reach during business and operating hours. If the waste officer is unable to discharge his/her duties, a deputy must step in.

By carrying out these tasks, the waste officer can significantly contribute to the optimisation of waste prevention and the organisation of waste management within the company and can consequently reduce storage and disposal costs.

To enable the waste officer to cover this comprehensive sphere of duties, he/she must not only be given adequate training but also sufficient leeway to carry out his/her tasks. A leaflet by the Federal Ministry of Agriculture and Forestry, Environment and Water Management outlines the minimum requirements in this regard. Currently, certain institutions and educational facilities are already offering numerous courses and events designed to communicate the knowledge necessary for discharging the duties of a waste officer.

5.2.4. Eco-audit (EMAS Regulation)

Council Regulation (EEC) No. 1836/93 of 29 June 1993 allowing voluntary participation by companies in the industrial sector in a Community eco-management and audit scheme (in short: EMAS Regulation) also came into force in Austria with the country’s EU accession in 1995. The accompanying national provisions necessary for the application of the Regulation were set out in the Federal Act on the accreditation and supervision of environmental auditors as well as to the maintenance of a list of sites (UGStVG). On 24 April 2001, the revised EMAS-V Regulation (No. 761/2001) was published in the
EU’s Official Journal (L 114); it entered into force on 27 April 2001.

The Federal Ministry of Agriculture and Forestry, Environment and Water Management and the Federal Ministry of Economic Affairs and Labour have created the basis for the implementation of the eco-audit system in Austria, thus taking another step towards sustainable and environmentally sound development, emphasising in particular the importance of further development of environmental protection in the industrial sector. With the Ordinance on the definition of additional sectors to which the provisions of the EMAS Regulation and the UGSIVG shall be applied on the experimental basis (Sector Extension Ordinance), other enterprises in the transport and banking sectors that are not covered by the EMAS Regulation were temporarily allowed to participate in the system.

The European Union bases its actions on the polluter-pays principle, stressing entrepreneurial responsibility for environmental protection. Companies may participate voluntarily in the system, fulfil all requirements of the regulation and then be registered in a list of sites.

For this purpose, a corporate environmental policy must be defined for each site, according to which the enterprise undertakes to abide by all pertinent environmental stipulations and moreover to continuously improve company environmental protection through the application of the best available, economically viable technologies; as a result, increasingly positive effects on the industrial waste management situation may be expected.

Apart from the obvious economic advantages of this system, individual companies also benefit from their participation. So far, it has always proven possible to significantly reduce the costs of corporate waste management at the respective industrial site.

In co-operation with the Federal Ministry of Agriculture and Forestry, Environment and Water Management, the Federal Ministry of Economic Affairs and Labour is in charge of the licensing and supervision of ecological verifiers as the licensing body under UGSIVG 1995. At present, 17 environmental verifiers and environmental verifying organisations have been licensed for Austria and the entire EU following a strict, three-part examination according to the Expert Audit Ordinance 1996. Moreover, more than 300 sites in Austria have been examined according to the EMAS Regulation and been registered in the international register of the EU in Brussels as sites with valid environmental statements. It is planned to transform the Federal Act pertaining to the accreditation and supervision of environmental verifiers as well as to the maintenance of a list of sites into an updated waste environmental management act that meets the latest findings in the field of eco-auditing.

5.2.5. Voluntary agreements and co-operation efforts

Old tyres
The Austrian cement industry has undertaken to continuously accept old tyres in order to subject them to energy recovery. Thus nearly 50% of a total annual volume of approx. 55,000 tonnes of old tyres are thermally recovered.

PVC-containing window-frame casements and synthetic pipes
The Austrian manufacturers of PVC window-frame casements accept such waste and process it as secondary raw material in the inner core sections of new window components. Manufacturers of plastic pipes have likewise undertaken to voluntarily re-accept used pipes in the context of the Austrian Working Group for Plastics Recycling (ÖAKR). Together with ABCO Abfallconsulting GmbH (Wels/Upper Austria), this type of waste is accepted at approx. 70 collection points throughout Austria and used in the production of new pipes. Roughly 620 tonnes were collected in 1998 and approx. 530 tonnes in 1999.

Packaging
See Chapter 5.4.2.2

End-of-life vehicles
See Chapter 5.4.2.3
5.2.6. Procurement of environmentally friendly products

In Art. 6, the Waste Management Act postulates that the Federal Republic should primarily purchase products which, following their use or consumption, will cause the minimum possible impact on the environment as waste. In addition, consideration must also be given to the principles of cost-efficiency, economy and expediency.

Austria’s procurement legislation, too, integrates numerous ecological approaches of relevance for waste management. For example, for purchases by the Federal Republic below certain minimum thresholds, the Austrian standard ÖNORM A 2050 is applied; this standard stipulates that “the awarding procedure must take account of the ecological impact of the service rendered/product purchased”. Moreover, the specification of each service or product must integrate “criteria for the delivery of environmentally friendly products or for the rendering of services performed according to environmentally sound processes”. In addition, the Federal Act on the Awarding of Contracts prescribes the incorporation of ecological aspects into the awarding procedures.

As a first step towards the implementation of the OECD Council of Ministers Act, “Greening the Environmental Performance of Government”, the Austrian federal government on 1 April 1998 decided to adopt the application of concrete guidelines for the greening of the federal administration, which focus on the orientation of the procurement system along ecological principles. This resolution of the federal government constitutes a binding instruction for action for all Austrian federal agencies and bodies and must be observed by them in all procurement procedures. The recommendations contained in the OECD Council Act encompass compliance with ecological criteria in the purchase of goods and services, identification of objectives and setting of deadlines for optimising energy and water consumption, in particular through reduction and recovery, minimisation of consumption of natural resources and of volume of waste generated in the course of the construction, renovation, etc. of buildings and installations and so forth.

An important precondition for the orientation of the procurement system along ecological principles lies in providing the officials in charge of procurement procedures with the necessary information on the ecological qualities of products and services. For this purpose, the Federal Ministry of Agriculture and Forestry, Environment and Water Management launched an initiative to establish Beschaffungs Service Austria, which acts as an environmentally oriented consulting and information body for public authorities, operates a hotline for officials in charge of procurement procedures and moreover launched a training campaign in 1999. Furthermore, the project “Development of a Catalogue of Criteria to Prioritise Environmental Protection in Public Procurement and Awarding Procedures” was launched to pursue the following objectives:

• integrating the existing instruments and product evaluations and the available know-how of Austrian research and consulting facilities and developing this body of data scientifically, making use of synergy effects,
• discussing the criteria and instruments in individual discussions and workshops together with officials in charge of procurement procedures of the Federal Republic, the Länder and municipalities in order to incorporate experiences made and adjust the instruments to practical requirements,
• having best-practice case studies of environmentally friendly procurement techniques drawn up in a European context by I.C.L.E.I. (European Secretariat) to motivate and serve as examples to emulate,
• discussing criteria and instruments for selected areas together with enterprises and industry associations and incorporate existing instruments at this level (e.g. agreements for specific industries), and
• providing a concise summary of the criteria and instruments in a “catalogue of criteria to prioritise environmental protection in public procurement and awarding procedures”.

As further steps to take more account of ecological aspects in public procurement systems and in order to safeguard the application of the above-mentioned catalogue of criteria, it is moreover planned
to organise, *inter alia*, a series of seminars for employees of the various procurement departments, in whose course specimen calls for tender will be developed for different product groups.

Representatives of the departments charged with environmental protection are present in all relevant working groups and bodies at all political levels, ranging from municipal associations to the OECD, in order to participate in the continuous improvement of the frame conditions for the orientation of public procurement along ecological principles.

In order to orient the federal administration along ecological principles, procedural instructions for the application of the Federal Act on the Awarding of Contracts and the Awarding Standard are to be provided for federal officials in charge of procurement procedures. For this purpose, guidelines were worked out through inter-ministerial co-ordination in order to provide in particular officials in charge of procurement with a tool for ecological procedures in their work.

5.2.7. Training

As in the past, the information activities of eco-consultants and waste consultants are of crucial importance. Especially with regard to the on-site implementation of waste management measures, eco-consultants and waste consultants are indispensable. For waste officers, training courses are organised by numerous institutions.

Depending on the type of landfill concerned, the Landfill Ordinance lays down concrete training requirements for landfill personnel, above all for the heads of the department inspecting incoming wastes. The Austrian Water and Waste Management Association (ÖWAV) has published a form sheet on the job specifications for heads of these departments as well as for monitoring personnel (ÖWAV-Regelblatt 504) and also organises courses in this field.

The apprenticed trade “waste recycling and disposal technician”, which was established in 1992 as a trial training course, was converted into a regular training curriculum in April 1998 (Federal Gazette 1998/129). Efforts were made to create employment opportunities by adapting the content of the curriculum to the experience made so far as well as by opening up new fields of work.

To create uniformity in the training of the operational staff of hazardous household waste collection points, materials for training and work were prepared in co-operation with the Austrian Water and Waste Management Association.

The ÖWAV form sheet 507 (ÖWAV-Regelblatt 507) on the Training of the Operational Staff of Waste Treatment Plants was published as well to bring the qualification level of the operational staff of waste treatment plants up to the latest technological standards.

5.2.8. Information and public awareness

The Federal Ministry of Agriculture and Forestry, Environment and Water Management supports activities promoting uniform information of the public throughout Austria, in particular with respect to waste prevention and the separate collection and recovery of waste. In addition, the following activities were carried out:

**Biogenous waste**

Biogenous waste accounts for 30% of the waste generated in households. As a first step towards the development of a material cycle for biogenous waste, the Ordinance on the separate collection of biogenous waste came into force on 1 January 1995. At the Land and regional levels, such issues as “compost” and “composting” were largely covered by information material, in particular for households. The demand for specific information material specially prepared for individual target groups was taken as an occasion to provide uniform material on biogenous waste for the entire Federal Republic to inform the target groups “schools”, “multipliers” (municipalities, associations) and “food trade”.

In order to encourage preliminary collection in the household, biogenous-waste sacks were distributed throughout Austria in co-operation with the
Austrian waste management associations. Demand shows that the behaviour and awareness of citizens to collect household waste separately are very strongly developed.

Specialised information on key issues for an expert public

Additional information work is done by the Federal Ministry of Agriculture and Forestry, Environment and Water Management with its project “Communication Network for Eco-Consultants”, which was specially designed to support the activities of eco-consultants and waste consultants.

Events organised twice a year are to strengthen the professional image of waste consultants on the one hand and present and discuss current issues and developments or changes on the other hand.

Exhibition “entSORGEN”

In order to encourage Austrians to ask themselves crucial questions such as “What can I do to avoid hazardous household waste?”, “What are the alternatives?” and to motivate them to act accordingly, the Federal Ministry of Agriculture and Forestry, Environment and Water Management has prepared a travelling exhibition on hazardous household waste entitled “entSORGEN”. Using 15 display boards and an accompanying brochure, the problems relating to hazardous household waste are presented in informative, comprehensive, vivid and easily understandable style. The show supports the information work relating to waste implemented at the local and regional levels by the Länder.

Since the autumn of 1996, the travelling exhibition “entSORGEN” is lent free of charge to interested organisations and institutions, which have manifested great demand. In addition, the exhibition was made available on the Internet (http://www.bmu.gv.at) to an interactive public.

5.2.9. Certified companies specialising in waste management and disposal

With the objective of improving and safeguarding the quality of disposal, the association of private waste management companies (VÖEB) together with the Austrian Water and Waste Management Association (as representative of the municipal waste management enterprises) established an association for the awarding of certificates to companies specialising in waste disposal. A comparable institution has also been created in Germany, which provides an important parallel for waste management and disposal companies in the border region.

This voluntary certification is to safeguard transparency and comparability of providers as well as an increase and protection of the quality standards in waste disposal. This not only addresses the observance of corresponding legal provisions but also the voluntary provision of disposal services according to the latest standards as well as transparent and clear-cut documentation.

The principal approach is similar to that of other quality certificates where a selected expert examines the enterprise in question and confirms and/or evaluates its compliance with requirements and conditions. Moreover, an annual repeat audit must be passed to entitle the enterprise to keep the certificate.

Thus this certification, just like other quality classifications, is highly welcome from the viewpoint of environmental protection; in this context, special attention must be paid to granting this quality mark exclusively to companies worthy of certification.
5.3. Environmental subsidies in Austria

The objective of federal environmental funding lies in the lasting improvement of the environmental situation in Austria. It has a supporting function amongst the various instruments of prevention-oriented environmental policy and is mainly to influence investment decisions in an environmentally friendly and resource-conserving manner while at the same time increasing the rate of economic and technological innovation. With the Environmental Subsidy Act 1993, duties that previously had been a competence of the Environment and Water Management Fund were placed on a new legal basis. One of a total of four subsidy objectives is concerned with environmental protection by minimising contamination in the form of air pollution, pollutants of relevance for the climate, noise (with the exception of traffic noise) and waste; it is entitled “Environmental Subsidies in Austria”.

Since 1 April 1993, Kommunalkredit Austria AG has been handling environmental subsidy issues. Funding in the waste sector aims at promoting the use of technologies for the prevention and recovery of hazardous waste within companies. Process conversion and pilot projects are granted particularly high subsidies. Prevention and recovery measures to reduce the volume of non-hazardous waste can only be funded within the context of pilot projects. It is moreover considered necessary to include, for a limited period of time, projects aimed at the quickest possible implementation of waste-law frame conditions with significance for the general environmental strategy, such as the establishment of suitable waste treatment plants in keeping with the requirements of the Landfill Ordinance.

As expected, the trend towards a decrease in the number of waste prevention and waste recovery projects submitted for funding, which began in the early 1990s, has continued. A still greater number of projects has been reported for 1996 and 1997; this is due to the fact that these projects were submitted under a different classification and also meet other

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objectives of environmental funding granted to companies – for example, a high number of enterprises were funded since 1995 in the context of a special lacquer plant campaign. This campaign aims primarily at the reduction of solvent emissions. As a further effect, the operation of the new lacquer plants reduces production waste both with respect to its quantity and hazard potential.

For the purpose of reducing substance and material flows to enable sustainable management, it is also imperative to minimise substances that entail non-hazardous waste; as a result, the extension and re-orientation of environmental subsidies towards this field might also cause the current trend to take a new direction. Many companies are principally willing to invest; for these enterprises, an incentive that offers concrete subsidy activities and is linked to measures to implement the sector-specific concepts should be created. The first subsidy activity of this type was initiated for foundries. Table 22 shows the projects funded between 1995 and 2000 in connection with measures for waste prevention and recovery.

5.4. Regulatory measures including ordinances according to the Waste Management Act

5.4.1. System-related measures

5.4.1.1. Legislation, amendment to the Waste Management Act

5.4.1.1.1. Amendment to the Waste Management Act concerning landfills, Federal Gazette I 2000/90

The amendment to the Waste Management Act concerning landfills

- implements the IPPC Directive for waste treatment plants and
- the Seveso II Directive for waste treatment plants and moreover
- streamlines the landfill legislation by including the relevant provisions of the Water Act into the Waste Management Act and implements the Landfill Directive at the level of legislation.

Implementation of the IPPC Directive


Annex 1 Part I of the Waste Management Act enumerates the waste treatment plants subject to the IPPC Directive. The recovery processes mentioned in the IPPC Directive (R1, R5, R6, R8 und R9) refer to the Directive 75/442/EEC on waste as amended by 91/156/EEC.

The definition of “state of the art” (Art. 2 (8) of the AWG) remains unchanged. The term “state of the art” is to be interpreted in conformity with Community legislation. Regarding the question of what, for example, constitutes best available technologies, Annex IV of the IPPC Directive is to be used where the amendment does not already (by analogy) contain the wording of Art. 2 (8) of the AWG. Here, the last indent of Art. 2 (11) of the IPPC Directive “…shall mean most effective in achieving a high general level of protection of the environment as a whole” must serve as the basis for interpretation.

Art. 29 (1) of the AWG is a special provision adding to the provisions enumerated in Art. 29 (2) of the AWG. The priority of application of the Waste Management Act also holds with respect to Art. 77a (6) of the amendment to the Trade Regulation Act, Federal Gazette I 2000/88.

As of 1 September 2000, residual waste and mass waste landfills with a volume of less than 100,000 m³ are subject to mandatory licensing according to Art. 29 (1) AWG. Competence for residual waste and mass waste landfills with a volume of less than 100,000 m³ passes from the authority administering water law (in case of commercial landfills, from the labour inspectorate, which acts as a first-instance authority administering water law) to that administering waste legislation.

Integrative approach

It is the key objective of the IPPC Directive to provide for the prevention or reduction of environmen-
ntal pollution by means of a so-called "integrated approach". This is on the one hand to prevent the transfer of environmental pollution from one medium to another and on the other hand to achieve a high level of protection of the environment taken as a whole (see the recitals of the IPPC Directive).

The integrative approach is already being partially implemented by the licensing concentration in the AWG. In addition, the Land governors are charged with co-ordinating the procedure and requirements if further licences (in particular under Land law) should be necessary; for example, this is the case for licences under nature protection or regional planning laws.

To provide assistance in integrative evaluation, the Federal Ministry of Agriculture and Forestry, Environment and Water Management has published the manual "Operationalisation of Integrated Plant Evaluation at the Local Level" (May 2000).

Updating of requirements

In addition to the integrated approach to achieve a high level of protection of the environment taken as a whole, the regular updating of licensing decisions is the second important novelty.

Public participation

In addition to the necessary procedural steps (notification of public proceedings according to Art. 41 of the General Administrative Procedure Act (AVG), or notification of the application according to Art. 44a of AVG), the public is equally to be involved. The application is to be announced; any person may submit a statement concerning the planned project within a specified period of at least 6 weeks.

The decision is to be communicated in the same manner and must be made available at the Land governor's office during the normal business hours for a period of at least 6 weeks.

Inasmuch as a project may affect another state, that state must be involved in the procedure.

European pollutant emission register (EPER)

According to Art. 15 (3) of the IPPC Directive, an inventory of the principal emissions and sources responsible is to be published every three years by the Commission on the basis of the data supplied by the Member States. The format and particulars of this register were already decided upon (Commission Decision of 17 July 2000 on the implementation of a European pollutant emission register (EPER) according to Article 15 of Council Directive 96/61/EC concerning integrated pollution prevention and control (IPPC), OJ L 192/36 of 28 July 2000).

The first data are to be submitted in 2003 (optionally, data from 2000, 2001 or 2002 may serve as a basis). For each IPPC plant, specific emissions into air and water exceeding a certain threshold must be reported. The extent of the emissions may be determined by means of measurements, calculations or estimates.

According to Art. 29b (9) of the AWG, the operators of IPPC plants are obligated to maintain corresponding emission records and submit these records to the Land governor if requested to do so. The Federal Minister of Agriculture and Forestry, Environment and Water Management may issue an ordinance which specifies the requirements concerning the procedures employed for determining emissions (measurements, calculations or estimates) as well as the format of the relevant recording obligations. Preparatory work for such an ordinance has been initiated.

Implementation of Seveso II

The provisions for the implementation of Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances (Seveso II Directive) are contained in the Trade Regulation Act, to which Art. 29e of the amendment to the Waste Management Act concerning landfills refers. Accordingly, these provisions of the Trade Regulation Act are also binding on waste treatment plants.

The implementation of the Seveso II Directive replaces the previous accident regime. The Seveso II regime lays down the obligations of both operators and authorities.
Plants subject to these provisions
According to the previous accident regime, all waste treatment plants are subject to the accident regime. As of now, the focus is, as in all other plants, on the quantity of dangerous substances and preparations that may be present within the plant in accordance with the technological possibilities. The dangerous substances and preparations including quantity thresholds are enumerated in Annex 5 of the Trade Regulation Act. Part 1 of Annex 5 of the Trade Regulation Act lists specific substances and preparations by name. Part 2 of Annex 5 of the Trade Regulation Act lists categories of dangerous substances and/or preparations as well as classifications as dangerous substances or preparations; this part will be mainly relevant for waste treatment plants. Both parts contain quantity thresholds in column 2 and column 3 and hence distinguish between two categories of operators. Additional requirements must be met if the quantity thresholds of column 3 are attained.

Landfills are principally not subject to the Seveso II provisions (cf. Art. 29e of the amendment to the Waste Management Act concerning landfills).

Obligations of the operator
- Obligation to institute precautions
- First report (Art. 84c (2))
- Safety concept – for “column 2 plants” or
- Safety report – for “column 3 plants”
- Safety management system for “column 3 plants”
- Internal emergency plan for “column 3 plants”
- Exchange of useful information between adjoining establishments to avoid the so-called “domino effect”
- Other obligations to report to and inform the authority
- Obligation to inform the public

Tasks of the authority
- Submission of data to the central information body
- Development of an inspection programme (definition of the deadlines for monitoring)
- Planned and systematic monitoring of plants (including written records)
- Prohibition of use and/or closedown of the plant, if required

Further tasks of the authority (within the competences of the Länder)
- Development of an external emergency plan and information of the public concerned with respect to hazards and behaviour to be adopted
- Monitoring of the establishment of plants in the vicinity of a Seveso plant

Streamlining of landfill legislation, implementation of the Landfill Directive in legislation
Art. 30a ff. of the amendment to the Waste Management Act concerning landfills summarises the relevant provisions on landfills, which hitherto had been embodied in the Waste Management Act, the Water Pollution Control Act and in the Landfill Ordinance; these provisions entered into force on 1 January 2001. Furthermore, the provisions for the implementation of Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste (Landfill Directive) necessary at the level of legislation are being standardised as well.

Ban on the surface depositing of hazardous waste
As a result of the implementation of Article 6 of the Landfill Directive and the concept for landfills in Austria, hazardous waste as of 16 July 2001 may be deposited solely in underground landfills. However, there exists the possibility of classifying wastes as non-hazardous and hence to deposit them in (aboveground) landfills.

Procedural provisions for landfills
The procedural provisions were taken from the previous substantive laws and summarised. Additions and more precise indications for the implementation of the Landfill Directive were integrated. Since the obligation to obtain a landfill licence is waived under Art. 31b of the Water Pollution Control Act, all required provisions relating to landfill licensing were explicitly transferred from the Water Pollution Control Act to the Waste Management Act. In connection with the necessary rights of tolerance and enforcement, these provisions are declared ap-
applicable by means of a reference to the corresponding articles of the Waste Management Act. The concomitant application of the substantive provisions (Art. 29 (2) of the AWG) concerning other facts or situations requiring permits under water law remains unchanged.

With respect to commercial landfills for excavated soil and demolition waste with a volume of less than 100,000 m³, the previous competences of the administrative district authorities is upheld.

**Obligations of the landfill operator**

Art 30d of the Waste management Act stipulates the following obligations of the landfill operator:

- reporting after establishment of the landfill (landfill section)
- ban on the introduction of waste before evaluation of the landfill by the competent authority
- operation of the landfill according to the state of the art
- recording obligations: type, quantity and origin of wastes including waste producers or, in case of household waste and waste of a similar type, the collecting enterprise, delivery date, characteristic properties of wastes, examinations of wastes, waste acceptance, precise location (deposition point) of wastes at the landfill, monitoring results
- obligations to report the wastes landfilled and the results measured
- reporting on wastes refused
- obligation to report substantial negative effects of the landfill on the environment
- obligation to report the temporary suspension or shutdown of the landfill operation, any changes in the landfill (sections) or upgrading to state-of-the-art landfill technologies

**Tasks of the authority**

Under Art. 30f of the Waste Management Act, the competent authority, in addition to licensing and notification procedures, fulfils the following tasks:

- evaluation procedure concerning the establishment of a landfill
- institution of construction and landfill monitoring
- stipulation of supplementary requirements
- temporary ban on the introduction of wastes into the landfill (Art. 30f (5) of the AWG)
- other administrative/inspection measures

**Mandatory treatment of wastes at landfills**

As of 1 January 2001, Art. 138 of the Water Pollution Control Act no longer applies to landfills (exception: pending cases). Under Art. 32 (1a) of the Waste Management Act, an administrative inspection mandate must be granted for shutdown or closed landfills, if public interest requires this; as a result and in contrast to Art. 138 of the Water Pollution Control Act, the lack of consensus – irrespective of the effects on the environment – is immaterial in these cases. Moreover, the authority may employ a phased approach (examinations, regular sampling, presentation of a safety or remediation concept, stipulation of safety or remediation measures).

**5.4.1.1.2. General reform of waste legislation**

The government agreement states that the new version of the Waste Management Act should be based on the principle of waste prevention, taking account of the frame conditions of European legislation. Together with observance of the cost-benefit principle, this is also to give greater weight to an ecologically viable form of waste recovery.

Since the Waste Management Act came into force in 1990, waste management has developed into an important industrial sector. With Austria’s accession to the European Union, the frame conditions of waste management are decisively influenced by the provisions of the European Union. Considering these developments, the reformulation of legal requirements must in the future meet the demand for deregulation without, however, jeopardising preventive environmental protection.

**OBJECTIVES:**

Sustainability – Conservation of resources

Seen against the background of economic growth and growing waste volumes despite increasingly positive developments in the field of cycle management, one of the major challenges lies in the environmentally sound, sustainable use of these wastes. A comprehensive amendment to the Waste Management Act is to exploit the opportunity of orienting waste management increasingly along the objectives of sustainability, based on a holistic approach.
The priorities laid down in the Waste Management Act, i.e. protection of humans and the environment, conservation of natural resources and the effort to produce only residues with minimum emission levels, combined with the lowest possible exploitation of landfill volume, still apply. Relevant concrete stipulations should be embodied in the legislation.

**Simplification on the basis of evaluation**

A key point lies in the “weeding” of all provisions with the purpose of simplification. This approach is to compensate for the elimination of regulated areas and/or obligations while preserving existing environmental standards.

The following areas are covered in this context:

**Streamlining of legal provisions relating to plants**

The recently adopted amendment to the Waste Management Act concerning landfills anticipates an important sub-sector. The amendment to the Waste Management Act concerning landfills in particular streamlines landfill legislation. The consolidation of procedures is a crucial point for the efficient management of licensing procedures. As a positive fact in this context, it should be emphasised that this approach has been part of the Waste Management Act since 1990 and – an especially important fact – even results in a consolidation of the construction technology provisions of the Länder. Experience gathered with enforcement so far shows that these procedures can be handled quickly and efficiently by the Land governors. Moreover, the Land governors are also the competent authority for procedures under the ALSAG (Act on the Remediation of Contaminated Sites) concerning safety and remediation measures, which in some cases also require licensing for on-site waste treatment plants. For waste treatment plants subject to mandatory environmental impact assessment, the Land government (i.e. principally the same level) is competent under the Environmental Impact Assessment Act.

The further development of the focus “streamlining of legal provisions relating to plants” will have to take account of the work done to create uniform provisions relating to plants.

**Avoidance of overlaps; exploitation of synergies in the relationship between the Federal Waste Management Act and the Land Waste Management Acts**

In exploiting the synergies between the Federal and the Land Waste Management Acts, the creation of equal terms of competition plays an important role as well.

- Merging and/or elimination of authorisations to decree legal provisions
- Integration of waste oil provisions into the Waste Management Act
- Fulfilment of reporting obligations through improved data management (databases)

**Conformity with EU law**

Of course, safeguarding conformity with EU legislation is a key pillar in the updating of the Waste Management Act.

**FOCAL ISSUES:**

On the basis of the objectives specified, the following focal issues of the amendment are being discussed – in addition to the points mentioned to safeguard conformity with EU law – with respect to legislative implementation in the Waste Management Act:

- **greater emphasis on the conservation of resources**; this is to address the resources “raw materials”, “energy” and “landscape (area)”.
- **qualitative waste prevention** taking account of the principle of the manufacturer’s responsibility; concrete measures are already necessary in the implementation of the End-of-Life Vehicle Directive.
- **increased use of recycled materials**
- **quality standards for waste treatment**: implementation of the principle that comparable conditions should apply to all plants working with waste. The environmental effects must be evaluated holistically.
- **reformulation of the frame conditions for systems** so as to create equal conditions for competition. In this context, it must be clarified which economic incentives could be instituted.
the provisions contained in the **Federal Waste Management Act** should effectively deal with issues in a harmonised manner in a **uniform** economic space.

- **waste balances and statistics** – increased use of electronic data processing; in this context, possibilities to increase the efficiency of authorities and plants in meeting their accountability and reporting obligations should be looked into. For the monitoring and transparency of treatment and recovery methods, too, efficient documentation making use of electronic potentials (networking) is imperative.

Moreover, the consequences of EU law must be taken into account, since membership in the EU entails a continuous demand for new provisions. On the part of the European Commission, the following proposals and projects are being prepared:

- amendment of the Waste Shipment Regulation
- amendment of the Directive on batteries and accumulators
- amendment of the Directive on sewage sludge
- amendment of the Directive on waste oil
- provisions relating to compost
- mining waste
- merger of the provisions relating to waste shipment to non-OECD countries

The time schedule and scope of the implementation measures will differ markedly from Directive to Directive.

### 5.4.1.2. Hazardous waste


This Directive imposes special mandatory precautionary measures for the handling of hazardous waste (e.g. licensing, reporting, inspection and identification).

**Decision 94/904/EC establishing a list of hazardous waste**

In accordance with Art. 1 (4) of the Directive on hazardous waste and based on the fundamental structure of the European Waste Catalogue (EWC), the European List of Hazardous Waste (HWC) was drawn up and published on 20 December 1994 as a Council Decision concerning a catalogue of hazardous wastes. This catalogue of hazardous waste provides a first, binding minimum list and comprises approx. 230 types of waste.

In accordance with the Directive on hazardous waste, all types of waste included in the catalogue as well as other types of waste which, in the opinion of a Member State, display one of the properties listed in Annex III are to be considered hazardous wastes. The Commission must be notified of such types of waste. The Committee for the Adaptation to Scientific and Technical Progress of Community Legislation, which is composed of representatives of the Commission and the Member States, examines these types of waste with a view to possible changes in the HWC. The Member States have notified the Commission of approximately 400 applications for additions or amendments to the HWC.

On 3 May 2000, the Commission decided on a first review of the List of Hazardous Waste and of the European Waste Catalogue. These modifications will enter into force on 1 January 2002. The extension of the EU List of Hazardous Waste will entail an amendment of Annex 2 of the Waste Classification Ordinance, since the Commission Decision has extended the definition of the criteria “teratogenic” and “mutagenic”. With respect to the List of Hazardous Waste (Annex 1 of the Waste Classification Ordinance), the Commission Decision does not entail any necessity for action, as the wastes entered into the list as new hazardous wastes had already been covered under the Waste Classification Ordinance of 1997. A second addition and review of the European Waste Catalogue and of the List of Hazardous Waste is to be adopted by the Commission already in 2001 and to enter into force simultaneously with the first modification in 2002.

The List of Hazardous Waste currently only defines the criteria H3 to H8 of the Directive on hazardous waste, although the Directive sets out 15 hazard criteria. Criteria such as “infectious” or “eco-toxic” have so far not been defined more precisely at the
EU level. Work to define the hazard properties more precisely is therefore done at EU Committee level. This is also to further the harmonisation of these criteria with international provisions (Basel Convention).

The Member States may decree ordinances according to which, in exceptional cases and upon sufficient proof provided by the waste owner, it may be established that certain types of waste contained in the list do not display any of the hazard properties set out in Annex III of the Directive 91/689/EWG on hazardous waste. This option was implemented in the Waste Classification Ordinance of 1997 by means of the exemption procedure under Art. 5 and Art. 6.

Implementation

The contents of Council Decision 94/904/EC establishing a list of hazardous waste were adopted by virtue of the Waste Classification Ordinance of 1997 and took effect on 1 March 1998.

An amendment introduced in 2000 has simplified and clarified the Ordinance; the waste description according to ÖNORM S 2100 was likewise maintained.

The Waste Classification Ordinance on hazardous waste decrees which types of waste should be considered hazardous waste and hazardous household waste under the Waste Management Act, and how waste owners can demonstrate that a specific type of waste is not hazardous.

Hazardous waste is defined as:
• every type of waste listed in Annex 1 of the Ordinance,
• waste contaminated with hazardous waste (Annex 1 of the Ordinance), a simple evaluation of which cannot exclude the presence of a hazard-relevant property (Annex 2 of the Ordinance),
• excavated material from a specific, contaminated location (a contaminated site, specific industrial sites, excavated material contaminated by an accident or stoppage of operations), regarding which it is justified to assume the presence of a hazard-relevant property,
• excavated material, if a contamination is identified during excavation, entailing the justified assumption of the presence of a hazard-relevant property.

Finally, the Waste Classification Ordinance stipulates which wastes are to be considered hazardous. By necessity, some code numbers and/or peripheral areas also comprise non-hazardous wastes presenting no hazard-relevant properties. To take account of this fact and support the further evolution of production processes towards cleaner production, it is possible, on a case-by-case basis, to prove for a specific lot of waste listed in Annex 1 of the Ordinance that this waste does not present any hazard-relevant properties (exemption).

Both individual lots and waste from defined processes characterised by unchanging quality may be exempted.

Exemptions may be implemented by the waste owner in question (general exemption) or by the landfill operator for the purpose of depositing the waste at its landfill.

In case of a general exemption, the following points must be observed:
• objectively verifiable hazard criteria (Annex 2 of the Ordinance; this concerns the hazard-relevant properties according to the EC Directive on hazardous waste, which are defined precisely in the Waste Classification Ordinance on hazardous waste)
• assessment by an external authorised expert or specialised institution; the expert opinion must certify that the waste presents no hazard-relevant properties according to the Ordinance
• use of forms according to Annex 3 of the Ordinance to prove that the waste is non-hazardous
• for excavated material, the exemption assessment must take place before the excavating or clearing of the material

Exemption for the purpose of landfilling

Since the Landfill Ordinance already contains comprehensive provisions on the examination of waste, simplifications for exemption for the purposes of landfilling are possible. Such exemptions must take place on the basis of a general assessment according to the Landfill Ordinance.
In accordance with Art. 17 (1) of the AWG, the depositing of hazardous waste on aboveground landfills is banned since 16 July 2001, i.e. the waste must be exempted before being landfilled above-ground.

5.4.1.3. Waste data compilation

Quantitative data on industrial, non-hazardous waste are often determined on the basis of case-by-case analyses, compilations and estimates. Waste-management planning measures are therefore already plagued by gross uncertainties from the outset, which substantially impairs their chances of success. Systematic success monitoring as well as individual examinations of companies’ observance of waste disposal provisions (reconstruction of disposal channels of a company’s specific waste) are practically impossible. Although waste recording has been introduced as a legal requirement, these data cannot be directly used as long as no standardised format exists.

For this reason, the Federal Ministry of Agriculture and Forestry, Environment and Water Management is conducting a project to reform the current waste recording system. An important point lies in electronic data management. For efficiency and cost reasons, the implementation of a uniform system for the transmission of waste-related data stipulated by various statutory provisions is urgently needed. Pilot projects on electronic data management are being carried out in the fields “landfills”, “packaging”, “end-of-life vehicles” and “consignment notes”. The new version of the Waste Management Act is to contain the legal basis for the introduction of electronic data management as well as data protection provisions necessary for this purpose.

The first step towards the practical introduction of the recording system for non-hazardous waste was already taken in the form of the Landfill Ordinance.

Apart from the Austrian situation, current developments at the European level must also be taken into consideration. Since the existing draft Council Regulation on Waste Management Statistics is likely to entail additional responsibilities regarding waste data recording by companies, the waste recording system must be designed in a way that permits obtaining the data required by the EU. While the Statistics Regulations will not stipulate any specific method of data compilation and will also admit administrative data as a source, it will definitely call for very comprehensive information on quantities and channelling of wastes.

5.4.1.4. Waste shipment

Export

The export of waste from the EU for purposes of disposal is only possible with a corresponding permit and only to EFTA Member States (Iceland, Norway, Switzerland).


Notification of (and permission for) the export of specific types of waste destined for disposal as well as of waste destined for recovery is always mandatory, if these wastes are covered by Annexes III or IV of the Waste Shipment Regulation.

In all cases, the notification documentation must be submitted to the Federal Ministry of Agriculture and Forestry, Environment and Water Management, which then carries out the notification procedure (official notification) including verification of the completeness of the notification documentation.

The export, for recovery purposes, of wastes covered by Annex II of the Waste Shipment Regulation to countries in which the OECD Council Decision on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations of 30 March 1992 applies, does not require notification; in these cases, documentation data according to
Art. 11 of the Waste Shipment Regulation must be taken along with the shipment for presentation upon request.

If wastes covered by Annex II of the Waste Shipment Regulation are shipped, for recovery purposes, to countries in which the OECD Council Decision on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations of 30 March 1992 does not apply, the type of control to be effected must currently be determined for each individual case. In this, Council Regulation (EC) No. 1420/1999 and Commission Regulations (EC) No. 1547/1999, 334/2000 and 1552/2000 must be observed, as they determine which control procedure should be applied for which third country.

With respect to the shipment of waste for disposal purposes, it should be noted that within the EU permission must always be granted by the importing state, while taking account of the objections of other countries involved.

Import

No notification is necessary for the shipment to Austria of waste covered by Annex II of the Waste Shipment Regulation (see also Art. 11 of the Waste Shipment Regulation).

As a rule, notification of the shipment to Austria of types of waste requiring notification must be carried out by the foreign waste generator or waste owner.

Germany and the Netherlands also require official notification, i.e. applications for permission or approval of cross-border waste shipments are first examined by the competent foreign authorities and then submitted to the Federal Minister of Agriculture, Environment and Forestry, Environment and Water Management.

In cases of waste imports too, the sufficiency of financial guarantees must now be examined.

The shipment of waste subject to notification and involving transportation through foreign territory (e.g. via the “Deutsches Eck” route from Austria through Germany to Austria) also requires notification and permission.

Transit

The transit through Austria of wastes requiring notification is subject to notification and permission but may be prohibited only in exceptional cases.

Notification obligations

According to the Waste Shipment Regulation, the notifying person is moreover obliged to notify the moment of waste shipment to the competent authorities three working days before the transport actually takes place. Likewise, the recipient of the waste is obliged to inform the competent authorities of receipt of the waste within a period of 3 days and, within a period of 180 days, of recovery/disposal of the waste.

At the Federal Ministry of Agriculture and Forestry, Environment and Water Management, a database was installed to keep the documentation on the export, import and transit of waste up to date.

Of the 1999 hazardous waste volume, approx. 40,000 tonnes were recovered with respect to metals and metal compounds (R4 according to Annex II B of the Directive 75/442/EEC on waste, as amended), while other inorganic materials (R5) were recovered from approx. 13,000 tonnes; rough-

Statistics on official procedures

Table 23: Number of export, import and transit permits in the 1998-2000 period

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<tr>
<td>Export</td>
<td>196</td>
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</tr>
<tr>
<td>Import</td>
<td>137</td>
<td>162</td>
<td>131</td>
</tr>
<tr>
<td>Transit</td>
<td>378</td>
<td>399</td>
<td>362</td>
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</table>
hly 15,000 tonnes were exported for thermal treatment (D10 according to Annex II A of the Directive 75/442/EEC on waste, as amended), and roughly 42,000 tonnes were disposed of underground (D12).

Of the non-hazardous waste volume exported in 1999, the overwhelming share (approx. 24,000 tonnes) was recycled for the recovery of organic substances (R3).

5.4.1.5. Waste control and inspection measures

Within the EU, there is agreement that environmental crime must be fought both individually and jointly. The conclusions of the Cardiff Summit stated that environmental crime is a grave and serious issue often entailing transboundary consequences, concerning which measures should be adopted, with priority given to the prevention of illegal waste shipment.

UNEP experts, too, have recorded that the growing volume of environmental crime can only be countered by increased international co-operation. Inter alia, co-operation with Interpol and the international customs authorities regarding illegal waste shipment must be intensified.

Legal status quo

In combination with national as well as European waste legislation (Regulation on the inspection of waste shipments), the Federal Ministry of Agriculture and Forestry, Environment and Water Management is charged with controlling transfrontier shipments of waste and initiates, co-ordinates and directs the implementation of inspections.

The aim lies in ensuring correct treatment of waste in suitable and licensed plants in order to safeguard environmentally sound recovery and disposal of waste and to prevent eco-dumping.

Together with the Federal Environment Agency (UBA), close co-operation projects involving the following organisational units are carried out:

Federal Ministry of the Interior
- Interpol
- environmental task-forces of the divisions of the Federal Police Directorates and Land Police Headquarters
- transport divisions
- river patrol

Federal Ministry of Finance
- central office: Div. III/7/c (Prohibitions and Restrictions)
- Div. III/1 (Federal Customs Inspectorate)
- customs organs: border customs offices, mobile customs inspection groups (“Mobile Überwachungsgruppen”, MÜG), special customs task-forces (“Sondereinsatzgruppen”, SEG)

Federal Ministry for Transport, Innovation and Technology
- Supreme Navigation Authority (“Oberste Schiffahrtsbehörde”)
- Federal Motor-Vehicle Inspection Bureau (“Bundesprüfanstalt für Kraftfahrzeuge”)

Co-operation was institutionalised by creating a joint investigative group of the Federal Ministry of Agriculture and Forestry, Environment and Water Management and the Federal Ministry of the Interior.

Moreover, the Federal Ministry of Agriculture and Forestry, Environment and Water Management is

<table>
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<th>Year</th>
<th>Export</th>
<th>Import</th>
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<tr>
<td>1998</td>
<td>107,552</td>
<td>80,251</td>
<td>37,733</td>
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<tr>
<td>1999</td>
<td>159,415</td>
<td>88,198</td>
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<tr>
<td>2000</td>
<td>178,599</td>
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also developing international contacts with authorities handling transfrontier waste shipment. Key issues include the exchange of experience and the implementation of joint inspection activities, above all with the neighbouring states along the external borders of the EU (Switzerland, Slovakia, Slovenia, Hungary, Czech Republic).

In addition, contacts were further intensified for the implementation of joint waste inspections and staff exchange programmes focusing on inspection techniques together with the competent authorities in the Netherlands, Bavaria and Italy.

Within the EU, experts are exchanged regularly; technical discussions and the exchange of practice-oriented information are to ensure uniform enforcement throughout the EU and to intensify joint cooperation projects in the field of international waste inspection and control.

By the same token, the neighbouring Eastern European partner countries (in particular Slovenia, Slovakia, the Czech Republic and Hungary) are integrated into the complex issue of international and European waste legislation and enforcement.

Waste transport and plant inspections

Each year, transport and plant inspections are carried out on roughly 50 days (involving approx. 100 man days).

In waste inspection, the main emphasis is still on road, rail and river transport inspections. These inspections are carried out regularly at different periods under the aegis of the “Waste Inspection” division together with experts of the Federal Environment Agency and the representatives of the environmental police task-forces as well as the customs authorities across the entire Federal Republic by means of selective checks.

Long-standing inspection experience and above all excellent co-operation with the investigating task-forces of the environmental police divisions and customs authorities entail increasingly positive investigation results despite scarce staff resources.

Border controls are carried out along both external and internal borders of the EU, with particular attention paid to transit routes and border areas, and co-ordinated by the Federal Ministry of Agriculture and Forestry, Environment and Water Management.

Waste inspections aboard ships navigating the Danube are organised in co-operation with representatives of the Bavarian authorities.

On behalf of the IMPEL/TFS Working Group, a transnational project for waste inspection on rails was agreed between the participating countries Belgium, Germany, Netherlands, Italy and Austria.

Landfill inspections

Inspections of the quantities of waste deposited at landfills are carried out in co-operation with the major customs offices in connection with the contributions paid for the remediation of contaminated sites. The project “Aerial Measurement of Volume Increases” is carried out in this context.

Results are already expected for 2001. This procedure to determine the increase of landfill volumes (plausibility test for remediation contributions) with photogrammetrical evaluation of current aerial photographs and terrestrial mapping (by means of GPS) is used with success.

Perspective

To increase inspection efficiency, the following improvements should be aimed at:

• widening the scope of authority (Art. 33 and Art. 40 of AWG) for environmental police divisions
• creating access to the notification database of the Federal Ministry of Agriculture and Forestry, Environment and Water Management for customs authorities (Federal Ministry of Finance), environmental police divisions and Land Government Offices
• extension of the statute of limitation for environmental crime

5.4.1.6. Basel Convention

As part of the United Nations Environment Programme (UNEP), the Basel Convention (BC) on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted by the Conference of Plenipotentiaries in 1989; the Confe-
rence of the Parties decides on amendments to the Convention and its annexes as well as on supplementary protocols.

It is the objective of the Basel Convention to provide protection against the uncontrolled transboundary transportation of wastes by means of efficient inspection of transboundary waste flows as well to safeguard environmentally sound treatment of these wastes in appropriate plants.


In 1995, the Third Conference of the Parties (COP-3) adopted an amendment to the Convention that generally bans exports from countries listed in a newly created Annex VII (OECD, EU and Liechtenstein) to non-Annex VII countries.

To make this Ban Amendment effective and enforceable, COP-4 (1998) adopted two new Annexes VIII und IX, which, by way of example, enumerate wastes subject to the Ban (Annex VIII) or not subject to the Ban (Annex IX).

Both the EU as the Community and Austria as a Party have ratified the two amendments to the Convention (Federal Gazette III 2000/6).

COP-5 (1999) adopted a draft Protocol on Liability and Compensation. One of the Annexes of the Protocol (with minimum financial limits for transports) may be again amended at COP-6 of the Basel Convention (May 2002), as a result, the final version of the protocol will only become available in 2002.

The provisions of the Basel Convention are implemented in the Waste Management Act. Inasmuch as they concern the transboundary transport of wastes, they are implemented by directly applying the Waste Shipment Regulation.

At the moment, the following activities are at the centre of the Basel Convention:

- development of more precise definitions of the hazard criteria contained in Annex III of the Basel Convention as a prerequisite for due and equal implementation by all Parties. The current application of UN classification criteria for the transport of hazardous goods, which only partly reflect considerations relevant to the due treatment of waste, causes recurring problems in identifying delimiting factors. Moreover, certain hazard criteria are not covered by the UN classification. The Technical Working Group of the Basel Convention is currently developing harmonised definitions for the criteria H6.2, H10, H11, H12 and H13 in accordance with Annex III of the Convention.

- guidelines for environmentally sound waste management (including waste prevention) are to improve the world-wide environmental standard. Due to the wide scope of the problems involved, some of these guidelines are being developed in close co-operation with other international organisations (WHO, ILO, IMO) (e.g. technical guidelines for the environmentally sound dismantling of ships).

In the spirit of the “Basel Declaration” adopted at the COP-5, the next decade of the Convention will be chiefly dedicated to co-operation in the establishment of environmentally sound waste management in developing countries and countries with economies in transition. In addition to pilot projects for environmentally sound waste management and sustainable production, the Regional Technical Centres of the Basel Convention (RTC) are in particular to promote the development of sustainable waste management. Austria co-operates especially closely with the RTC for Central and Eastern Europe headquartered in Bratislava.

5.4.1.7. OECD

The OECD (Organisation for Economic Co-operation and Development) has drawn up a three-part list system with various control procedures for recoverable waste, each according to the degree of hazard presented by the individual waste, as a multilateral agreement of the OECD countries in accordance with Article 11 of the Basel Convention (OECD Council Decision C(92)39/Final; Green, Amber and Red Lists of recoverable waste).
The so-called Green List merely provides for an inspection (as usual with normal merchandise) for waste whose recovery within the OECD territory poses no risks.

The Amber list contains a catalogue of those types of recoverable (hazardous) waste which are subjected to a simplified – i.e. in relation to the Basel Convention – control regime. The advantages of the Amber List include the option of plant pre-authorisation, shorter decision-making times and the option of implied consent of import, export and transit authorities. The Red List provides for inspections corresponding to those set out in the Basel Convention.

A separate body, the OECD Review Mechanism, reworks and adapts the lists periodically to bring them up to state-of-the-art recovery technologies in the OECD countries.

The current lists of the Council Resolution C(92)39 were entirely incorporated into the Waste Shipment Regulation and are hence binding on all EU Member States in case of waste transports to countries that have implemented the OECD Council Resolution.

The OECD three-list system was also applied as a basis for the implementation of Decision III/1 of the Basel Convention (Ban on exports of waste to non-OECD countries in accordance with Art. 1.1. a of the Basel Convention) and the relevant Annexes VIII (List A – Hazardous wastes covered by the Ban) and IX (List B – Wastes not covered by the Ban).

Due to a ranking of priority environmental-policy issues within the bodies of the OECD as well as to budget cutbacks, the OECD lists (classification according to risk with consideration of recovery possibilities in 30 industrialised OECD countries and not solely according to the hazard factors of the wastes) are harmonised with Annexes VIII and IX (Lists A and B) to the Basel Convention (classification solely on the basis of the hazard factors of the wastes with additional consideration of the lack of appropriate technologies in developing countries) at the OECD level.

The amendment to the OECD Council Decision C(92)39 is to be adopted by the Council in 2001, transforming the OECD three-list system used so far into a two-list system (Green and Amber Lists). The OECD classification of wastes, i.e. by taking account of the risk approach, is to be continued.

In the future, the OECD Review Mechanism for adapting the three-list system to the state of the art will no longer exist in its former structure. Hence amendment proposals for the lists must be submitted to the Basel Convention (TWG), preferably following preliminary discussions at the EU and OECD levels. In the context of a so-called adjustment procedure, wastes listed in the Basel Convention could at most be subjected, for the purpose of intra-OECD transport, to a different control regime with account taken of the risk approach.

The two lists (green and amber control regime; red control regime is cancelled) are to be primarily composed of the respective Lists A (Annex VIII) or B (Annex IX) of the Basel Convention as well as of an additional list of those wastes which were either not yet included in the Basel lists or which will be listed in the future in deviation from the Basel Convention specifically for intra-OECD transports.

Another priority issue of the Working Group on Waste Management Policy is the development of standards for environmentally sound management of wastes – ESM). Electronic waste was identified as a priority waste stream for which pilot standards should be developed at the OECD level to ensure the environmentally sound management of this type of waste.

**Environmental reports of the OECD countries**

Environmentally relevant legislative efforts undertaken by all OECD countries as well as their operative implementation are examined at the OECD level (programme of the Group on Environmental Performance, GEP).

The primary objective of the programme for country assessments lies in the promotion of sustainable
development in all OECD countries by means of mutual, intensive exchange of information. The publication of the country-specific assessment report also creates an additional incentive to boost the efficiency of all measures taken in this area.

The next country assessment of Austria will cover the structural theme “Promotion of Ecologically Sustainable Growth”.

Waste Minimisation

The issues of waste minimisation occupy a particularly important position within the OECD; it is primarily handled by WPPPC (Working Party on Pollution Prevention Control).

It is the primary objective to harmonise the definitions concerning waste prevention in the OECD countries. In this context, studies containing comparisons of countries in terms of definitions in waste legislation were developed, and efficient and targeted instruments for waste minimisation were discussed. The OECD project “Definitions, Evaluating Systems for Waste-Minimisation Strategies in OECD Countries” as well as an ongoing project entitled “Government Self-Assessment Guide on Integrated Waste Minimisation” constitute crucial elements of the entire OECD waste prevention programme.

5.4.1.8. Reporting obligations in the European Union

Almost every Directive and Regulation in the field of waste contains a provision obliging the Member States to report regularly on the implementation of the legislation in question to the European Commission (in addition to the notification of implementing legislation).

In most cases these reports are prepared using questionnaires adopted by the European Commission and submitted nine months after the end of the reporting period of usually three years. Within nine months of receipt of the national reports, the Commission publishes a Community report.

This reporting system is defined in Council Directive 91/692/EEC of 23 December 1991 standardising and rationalising reports on the implementation of certain Directives relating to the environment.

Moreover, certain provisions require the preparation of programmes (e.g. Battery and Packaging Directives) that also have to be submitted to the European Commission and need to be reviewed regularly.

The following table gives an overview of the reporting duties and the obligation to prepare and regularly update programmes.
### Table 25: Reporting and programming duties of the EU

<table>
<thead>
<tr>
<th>Directive</th>
<th>Article</th>
<th>Contents of the report</th>
<th>Period</th>
<th>Submission</th>
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</thead>
</table>
| Waste Framework Directive  
| Hazardous waste  
| | Art. 8 (3) | Facilities and enterprises for the disposal / recycling of hazardous waste  
Form according to Decision 96/302/EC | Annually | For the first time in Dec. 1996 |
| Batteries  
Measures for informing consumers | Every 4 years; from 1993 on | Next one in March 2005 |
| Sewage sludge  
| Waste shipment  
Commission Decision 1999/412/EC | Art. 41 | Report according to Art. 13 (3) of the Basel Convention | Annually | Annually |
| | Art. 41 | Waste Shipment Regulation | Annually, for the first time on 2001 | For the first time in Dec. 2001 |
| PCB/PCT  
<table>
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<tr>
<th>Directive</th>
<th>Article</th>
<th>Contents of the report</th>
<th>Period</th>
<th>Submission</th>
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<tbody>
<tr>
<td><strong>Packaging</strong></td>
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<tr>
<td>Commission Decision 1999/177/EC of 8 February 1999 establishing the conditions for a derogation for plastic crates and plastic pallets in relation to the heavy metal concentration levels</td>
<td>Art. 8  in conjunction with Art. 17 Packaging Directive</td>
<td>Practical measures, controls and examinations</td>
<td>Every 3 years; first period: 1998-2000</td>
<td>For the first time in Sept. 2001</td>
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<tr>
<td><strong>Waste incineration</strong></td>
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<tr>
<td>Directive 2000/76/EC on the incineration of waste</td>
<td>Art. 15</td>
<td>Questionnaire, decision pending</td>
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<tr>
<td><strong>IPPC</strong></td>
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<td></td>
<td>Art. 16: exchange of information</td>
<td>Representative data Incineration plants for hazardous waste (7) Waste incineration plants (3)</td>
<td>For the first time in April 2001</td>
<td></td>
</tr>
<tr>
<td><strong>Waste oil</strong></td>
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<tr>
<td>Directive</td>
<td>Article</td>
<td>Contents of the report</td>
<td>Period</td>
<td>Submission</td>
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<tr>
<td><strong>Groundwater</strong></td>
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<td><strong>Landfill</strong></td>
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<tr>
<td></td>
<td>Art. 15</td>
<td>Quantity of waste landfilled, capacities and origin of wastes according to the questionnaire received</td>
<td></td>
<td>2003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decision of 17 Nov. 2000</td>
<td>16 July</td>
<td>30 Sept. 2004</td>
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<td><strong>Seveso</strong></td>
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<tr>
<td>Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances</td>
<td>Art. 9</td>
<td>Inventory of establishments that fall under the provisions of Art. 9 and only have to prepare a reduced safety report.</td>
<td></td>
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<td></td>
<td>Art. 15 (1)</td>
<td>Report to the Commission on major accidents meeting the criteria of Annex VI which have occurred within the Member State’s territory.</td>
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<td></td>
<td>Art. 15 (2)</td>
<td>Submission of the accident analysis</td>
<td></td>
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<td></td>
<td>Art. 15 (3)</td>
<td>Name and address of any body which might have relevant information on major accidents and which is able to advise the competent authorities of other Member States which have to intervene in the event of such an accident.</td>
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<tr>
<td></td>
<td>Art. 19</td>
<td>Report on the establishments falling under the Seveso II Directive</td>
<td>Every 3 years</td>
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<tr>
<td><strong>Asbestos</strong></td>
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<td><strong>End-of-life vehicles</strong></td>
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<tr>
<td>Directive 2000/53/EC of 18 September 2000 on end-of-life vehicles</td>
<td>Art. 9</td>
<td>Report on the implementation according to the Decision Questionnaire under preparation</td>
<td>Three-year period</td>
<td>9 months after the period covered</td>
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<tr>
<td><strong>Titanium dioxide</strong></td>
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<tr>
<td>Council Directive 78/176/EEC on waste from the titanium dioxide industry</td>
<td>Art. 14</td>
<td>Questionnaire according to Decision 95/337/EC</td>
<td>Every 3 years;</td>
<td></td>
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</tbody>
</table>

Under the Basel Convention, an annual report is to be submitted to the Basel Convention Secretariat and a copy thereof to the Commission.
5.4.1.9. Other relevant EU legislation

Based on national implementation possibilities, political and technical strategies are further developed, in particular at the level of the European Union as well as under the Basel Convention and within the framework of OECD.

General information
In general, the Community aims at harmonising the Member States' legislation in order to be able to achieve sustainable development across national borders. To this effect, suitable measures are:

- establishment of harmonised concepts,
- recording, analysis and assessment of data,
- creation of uniform, high-level standards,
- introduction of suitable approval and control procedures,
- restrictions and bans,
- reporting obligations.

When the Single European Act entered into force on 1 July 1987, a special environmental chapter was introduced into the EC Treaty (Art. 100a and Art. 130r ff.) which also forms the basis of measures in the field of waste. Like environmental measures in general, waste legislation may be based either on Art. 130s or 100a of the EC Treaty. The selection of the legal basis depends on whether the primary focus is on harmonisation measures related to the internal market (Art. 100a of the EC Treaty) or on environmental measures (Art. 130s).

Art. 100a (4) of the EC Treaty makes it possible to maintain higher standards; in such cases the Commission has to be notified of the national provisions and the grounds for maintaining them for environmental reasons. Art. 130t of the EC Treaty allows for maintaining or introducing more stringent protective measures compatible with the Treaty.

The ruling of the European Court of Justice on the Waste Framework Directive was decisive for the selection of the legal basis for numerous waste-related pieces of legislation. In this ruling, the Court confirmed that the Waste Framework Directive pursued the objective of efficient waste management so that Art. 130s of the EC Treaty had to be used as a legal basis. As a result, not only the Waste Framework Directive, but also the Waste Shipments Regulation was based on Art. 130s of the EC Treaty. This also applies to Directives related to incineration plants and landfills.

Directives have to be implemented in the Member States within a certain period of time. In line with its legal system, each country has to adopt an act or an ordinance to this effect. Regulations adopted by the EU apply directly, i.e. without any action by national parliaments or ministries. European Regulations exist, for example, for transfrontier shipments of waste (Waste Shipment Regulation).

The Treaty of Amsterdam introduced the following new elements:

- The term “sustainable development” is used in the Preamble and in Art. B of the Treaty on European Union.
- According to Art. 2 of the EC Treaty, the tasks of the Community also include the promotion of “a harmonious, balanced and sustainable development” and of a “high level of protection and improvement of the quality of the environment”.
- The newly introduced Art. 6 (ex Art. 3c) stipulates that environmental protection requirements must be integrated into the definition and implementation of the policies and activities referred to in Art. 3, in particular with a view to promoting sustainable development.
- The derogation of Art. 95 (ex Art. 100a) of the EC Treaty also applies to measures the Commission may adopt within the scope of its powers. In spite of the existence of European legislation, a Member State may both maintain and introduce national provisions relating to the protection of the environment. In the latter case, however, the Member States’ scope for action is restricted by the fact that the provisions have to be justified by new scientific evidence and specific national problems.
- Like harmonisation measures, legislation based on Art. 175 (ex Art. 130s) of the EC Treaty may be adopted by a qualified majority. This does not apply to provisions primarily of a fiscal nature, measures concerning town and country planning as well as land use with the exception of waste management.
The influence of the European Parliament is strengthened as the co-decision procedure also applies to measures taken to achieve the objectives referred to in Art. 174 (ex Art. 130r) of the EC Treaty.

Please note that the articles of the EC Treaty have been re-numbered after its amendment and modification by the Treaty of Amsterdam. In cases in which the new article numbers are quoted in the text, the previous numbers are indicated in parentheses.

Directives and Regulations

The following European Directives and Regulations form the basis of European waste management. These are complemented by specific legislation discussed in other chapters on concrete measures related to products, waste types and plants.


This Directive focuses on a harmonised waste terminology, recording duties, the Community’s autonomy in the field of waste disposal and the preparation of waste management plans.

By Commission Decision 94/3/EC of 20 December 1993, a list of wastes was published pursuant to Article 1 (a) of Council Directive 75/442/EEC on waste as amended (European Waste Catalogue (EWC)). This list covers the waste groups identified in the Annex of the Directive. The EWC does not constitute an exhaustive list. There is not direct need to adjust national provisions, though attention has to be paid to the different structure and coding within the framework of reporting duties.

The Federal Ministry of Agriculture and Forestry, Environment and Water Management has already completed the preparation of a conversion catalogue published in the form of the Austrian standard ÖNORM S 2100 “European Waste Catalogue (EWC)”.

Meanwhile, two further Commission Decisions have been adopted to combine and significantly supplement the waste list and the list of hazardous waste.


Both lists have to be implemented by 1 January 2002.


This Directive defines limit values for the concentration of heavy metals in soil on which sewage sludge is to be applied as well as in sewage sludge to be used in agriculture. Work on the amendment of this Directive is underway.


This Directive replaces Directive 76/403/EEC that only contained general duties of care, such as the obligation of controlled disposal, and proved to be insufficient. The new Directive provides for the compilation of an inventory and the labelling of equipment, prohibits the topping of transformers with PCBs and prescribes the decontamination of transformers.

This Directive has been implemented by the Halogen Ordinance and the Waste Management Act in Austria. The 1998 amendment to the Waste Management Act specifies an explicit deadline for handing over dangerous wastes to authorised companies and clearly states a ban on the incineration of PCBs in unauthorised plants.
Plan and principles for the decontamination and/or disposal of equipment containing PCBs pursuant to Article 11 of Council Directive the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCB/PCT)

The Austrian Ordinance on the ban of halogenated substances (Federal Gazette 1993/210, Halogen Ordinance) and the Waste Management Act 1990 (Federal Gazette 1990/325) introduced a plan on the decontamination and disposal of equipment containing PCBs into Austrian law. This plan is presented in a systematised way below.

Since 24 March 1993, it has been prohibited:
• to place on the market equipment containing PCBs;
• to produce, place on the market and use PCBs or substances and preparations containing PCBs in accordance with Art. 1 of the Halogen Ordinance;
• to produce and place on the market finished products containing such substances in accordance with Art. 2 of the Halogen Ordinance;
• to use hydraulic equipment using hydraulic fluids containing more than 30 ppm of PCBs in accordance with Art. 3 of the Halogen Ordinance.

Any equipment containing PCBs (except for hydraulic equipment using hydraulic fluid containing more than 30 ppm of PCBs as their use has been banned since 1993) that already was on the market on 24 March 1993 must be labelled and notified to the Federal Minister of Agriculture and Forestry, Environment and Water Management as follows:
• Electrical equipment containing more than one litre of fluid or groups of spatially linked electrical equipment containing more than two litres of fluid that have an apparent PCB concentration of more than 30 ppm had to be labelled and notified to the Federal Minister of Agriculture and Forestry, Environment and Water Management by 24 March 1994.
• Likewise, electrical equipment containing more than one litre of fluid had to be analysed in case of suspected contamination with PCBs when they were taken out of operation, but no later than 31 December 1996. If the analysis showed a PCB content of more than 30 ppm, they had to be labelled and notified to the Federal Minister of Agriculture and Forestry, Environment and Water Management by 31 December 1996.

The Federal Ministry of Agriculture and Forestry, Environment and Water Management (formerly Federal Ministry of Environment, Youth and Family Affairs) has kept records on all the notified equipment subject to this obligation since 31 December 1996.

On 24 March 1993, a phased plan for a gradual ban on the use of all the equipment to be labelled entered into force in accordance with Art. 8 (1) to (4) of the Halogen Ordinance:
• The use of electrical equipment subject to the labelling requirement — except for transformers — containing more than one litre of fluid was permitted until they were taken out of operation, but no longer than 31 December 1996.
• The use of transformers subject to the labelling requirement having a PCB concentration of more than 500 ppm was permitted until they were taken out of operation, but no longer than 31 December 1999.
• The use of transformers contaminated with PCBs at a concentration lower than 500 ppm may be used until they are taken out of operation.
• According to Art. 17 (3) of the AWG, hazardous waste may be stored by the owner for a maximum period of 24 months.

PCBs, whose placing on the market was prohibited in 1993, as well as equipment that must not be used any longer pursuant to the phased plan of the Halogen Ordinance constitute hazardous wastes. If their holder is not authorised or able to perform the appropriate treatment, they have to be handed over to a party authorised for the collection or treatment of hazardous waste according to Art. 15 (1), (2) (2) or (4) or Art. 24 of the AWG, delivered to a public collection centre or shipped according to Art. 34 ff. within 24 months.

Wastes according to Art. 2 (11) (2) of the AWG must not be placed into intermediate storage at the treatment operator’s for more than one year before treatment is performed.
This means that the maximum period from the end of operation to decontamination or disposal is three years.

In line with the phased plan on the taking out of operation this means that, by 31 December 2002, all PCBs and all equipment containing PCBs have to be decontaminated or disposed under the terms of Council Directive 96/59/EC on the disposal of polychlorinated biphenyls and polychlorinated terphenyls.

The following principles have to be applied during the disposal of PCBs:

Electrical equipment containing PCBs belong to the code numbers 541101 (electrical equipment containing PCBs and PCTs), 54107 (transformer oils, thermal oils, containing halogen) or 59901 (polychlorinated biphenyls and polychlorinated terphenyls) according to ÖNORM S 2100 (issued on 1 September 1997) are hazardous waste under the terms of the Waste Classification Ordinance, Federal Gazette II 1997/227 (cf. HWC 13 03 01 and 16 02 01). The labelling and taking out of operation of electrical equipment containing PCBs is governed by the Ordinance on the ban on halogenated substances, Federal Gazette 1993/210.

Electrical equipment containing PCBs are characterised by two major hazards:

1. the potential release of PCBs (and PCTs), and
2. the potential formation of polychlorinated dibenzodioxins and polychlorinated dibenzofurans (PCDDs/PCDFs) at high temperatures (in particular above 180 °C).

Due to these hazards, the safe disposal of electrical equipment containing PCBs has to be considered the primary objective, and any recovery is only permitted if environmental contamination by PCBs or PCDD/PCDF can be absolutely prevented. Accordingly, oils containing PCBs primarily are to be submitted to thermal disposal. In this context, it has to be considered a minimum requirement that the incineration plant maintains the combustion gases at a temperature level above 1200 °C for at least 2 seconds (cf. the recommendations of the technical working group of the Basel Convention on the treatment/disposal of waste containing PCBs; Basel Convention Series/SBC No 94/005, Geneva, 1994). The PCBs have to be destroyed by at least 99.99995%.

Alternative treatment methods, in particular for oils with a low PCB content, are dehalogenation by means of liquid alkali metals (DEGUSSA and similar processes) and catalytic high-pressure hydrogenation/dehalogenation (VEBA and similar processes). In these cases, too, it has to be ensured that the PCBs are destroyed to an appropriate extent.

For solid electrical equipment (transformers, capacitors), possible disposal options currently are underground storage or thermal treatment. Any pretreatment for this disposal (e.g. draining) has to take into account the following aspects:

- When PCB oils are drained from electrical equipment, it has to be ensured that PCBs are not released into the environment. In particular, any PCB oils that leak during such work must be collected in suitable oil- and solvent-resistant troughs. The draining of PCBs "on site" is prohibited unless this is necessary for technical reasons. As far as possible, electrical equipment containing PCBs (capsitors and transformers) are to be prepared for further treatment in suitable transfer stations.

- With regard to the treatment at transfer stations, all the work is to be performed in a separate, isolated zone. Appropriate measures are to be taken to ensure that PCBs are not released to the environment via the exhaust air of the isolated zone (e.g. activated carbon filters or equivalent measures). The floor of the isolated zone has to be an oil- and solvent-resistant trough.

- The staff is to be protected against PCB contamination by appropriate protective clothing.

- Suitable measures are to be taken to ensure that PCBs are not carried out of the isolated zone (e.g. decontamination chamber).

If electrical equipment is to be processed for the recovery of metal, it has to be adequately decontami-

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1 Other wastes containing PCBs (e.g. sealing material containing PCBs) belong the code number 54111.
nated. As PCBs tend to form PCDDs/PCDFs even at relatively low temperatures, thorough decontamination is indispensable before recovery proper. It is not sufficient to simply rinse electrical equipment containing PCBs with solvents and subsequently treat them using a shredder, as experiences made in the retro-filling of transformers show that significant amounts of oils containing PCBs are left in coils (transformer coils, transformer sheets, capacitor plates) and in insulating material, which may result in the formation of dioxins during shredding. Due to the considerably higher toxicity of dioxins, even minimal PCB residues give rise to the risk of environmental contamination. Before metal parts of electrical equipment containing PCBs may be recovered, it is therefore necessary to completely dismantle (uncoiling copper wires, removing transformer sheets, eliminating oil-soaked insulating paper, etc.) and decontaminate the metal parts. Like the pre-treatment before disposal, this work has to be performed in a secure isolated area at a suitable plant. Due to the significantly more extensive manipulations, dismantling before recovery requires special precautionary measures, in particular with regard to the containment of PCBs (decontamination chamber, exhaust air treatment, etc.). Material, such as paper and wooden cores, are to be submitted to thermal treatment or stored underground.


This Directive requires that, also in the field of waste, reports are prepared on the basis of a questionnaire every three years. Within nine months of receipt of the national reports, the Commission publishes a Community report. The first report had to be prepared on the period 1995-1997. In accordance with the Commission Decision of 24 October 1994, questionnaires were prepared on the Directive on hazardous waste, the Packaging Directive and the Directive on the incineration of hazardous waste. The PCB/PCT Directive obliges the Member States to submit inventories of equipment containing PCBs and plans on the decontamination of such equipment.

Additionally, the Directive on hazardous waste makes it mandatory to notify plants or enterprises that dispose of and/or recover hazardous waste primarily on behalf of third parties and that are likely to form part of the integrated network mentioned in the Framework Directive. The Directive on the incineration of hazardous waste, the Waste Shipment Regulation and the Directive on packaging and packaging waste also include the duty to report on necessary implementation measures. The Member States have to inform the Commission about any changes in the data once a year.

The Directive on packaging and packaging waste additionally stipulates that data on the volume, properties and development of packaging and packaging waste have to be reported using harmonised data bases. Under the Basel Convention, an annual report is to be submitted to the Basel Secretariat and a copy thereof to the Commission.

In order to comply with the requirements of mandatory reporting to the European Commission and to implement the data collection and control concept, a working group was set up to establish a waste information system in Austria.


The IPPC Directive, being a “general Directive”, also applies to waste treatment plants (landfills and incineration plants). It contains the following essential elements:

- explicit and comprehensive anchoring of the integrated approach (to be achieved by avoiding or reducing emissions into the environmental media of air, water and soil as much as possible);
- public participation in permit procedures;
• determination of emission limit values on the basis of the best available technologies (BAT)/state of the art;
• renewal of permits — upgrading to the state of the art;
• exchange of information on the available technologies with a view to the integrated approach;
• operator duties.


The EIA Directive stipulates that the potential environmental impact of a project on humans, flora, fauna, soil, water, air, climate and landscape, material assets and cultural heritage as well as the inter-relationship between these factors are assessed in a comprehensive, integral way before a decision on the project is taken with the involvement of the broad public.

The scope of this Directive also includes large-scale waste treatment plants.

Legislation proposed by the European Commission

Draft Regulation on Waste Management Statistics:

This Regulation is to serve as the basis for the preparation of statistics on waste production, collection and treatment.

Apart from the adoption of Directives, the European Commission has pursued a new approach in the Priority Waste Streams project with regard to the development of uniform standards that are prepared with the involvement of experts from the relevant economic quarters as well as the authorities. In this context, objectives and programmes were established for waste prevention, re-use, recovery and environmentally sound disposal. The project covers the following waste types:

• used tyres (included in the proposed Landfill Directive),
• chlorinated solvents,
• medical waste,
• end-of-life vehicles (Directive),
• demolition waste,
• waste electric and electronic equipment (proposal for a Directive),
• chemicals of concern (proposal for a Directive).

The results are to serve as a basis for decision-making by the European Commission on the need for, and the contents of, future Directives.

Commission Communication on Environmental Agreements

Environmental agreements are essentially considered to be a sensible tool of environmental policy, in addition to legislation. Their potential benefits, however, are to be examined on a case-by-case basis.

In the Communication, the Commission presents general guidelines for environmental agreements in order to ensure their transparency and efficiency. Its proposals include, in particular:

• prior consultation with the stakeholders,
• binding form,
• quantified, phased objectives,
• monitoring of results achieved,
• publication of both the agreement and its results,
• sanctions if the objectives are not achieved.

5.4.2. Measures related to products and wastes

5.4.2.1. Demolition waste and excavated soil

The potential mass of demolition waste and excavated soil is estimated to total almost 27.5 million tonnes. Thus, this group accounts for around 57% of the total waste volume of approximately 48.6 million tonnes per year. The share of mineral demolition and construction waste included in the total waste volume can be placed at around 7.5 million tonnes per year.

The figure of 20 million tonnes of excavated soil (Code 31411) is a mean value calculated on the ba-
sis of estimates from various data sources. This estimated volume only includes the share of excavated soil that is landfilled or used in terrain redevelopment. The portion used for specific construction purposes at the site of excavation (e.g. backfilling, banking) is not taken into account.

The Waste Classification Ordinance 1997 introduced quality assurance measures for soil excavated at potentially contaminated sites in the form of preliminary investigations and examinations for exemptions.

With regard to the utilisation of excavated soil as fill material, the Association of Construction Industry made a first step towards comprehensive quality control in this field by preparing a code of practice on the utilisation of soil as fill material.

A working group established by the Federal Ministry of Agriculture and Forestry, Environment and Water Management performed further basic work on general principles that define rules for the utilisation of excavated soil both for backfilling and the production of re-cultivation layers. These utilisation principles to be included in the Supplement to the Federal Waste Management Plan include quality criteria for excavated soil and the basic requirements to be met by utilisation.

Separately collected demolition waste may be treated either on site or in treatment plants.

The significant increase in the treatment of mineral construction waste from 1994 is due to new applications for recycled construction materials in accordance with the guidelines for construction materials recycled from building demolition waste issued by the Austrian Association for Construction Materials (ÖBRV). Asphalt is increasingly recycled by asphalt hobbing on site. Only small quantities of asphalt are still landfilled. The recycling rate of road demolition waste is around 80 %.

Construction waste contains a high percentage of combustible materials. Taking into account the requirements to be met by the landfilling of residual waste in the future, the thermal treatment of around 500,000 tonnes will be necessary per year.

According to the Offices of the Land Governments, 867 landfills for excavated soil and demolition waste were available all over Austria in 1998. In line with the amendment to the Water Act, demolition waste landfills (and landfills for excavated soil) had to be upgraded to the state of the art defined in the Landfill Ordinance by 1 July 1999. In this context, it is of special importance that the installation of bottom sealing systems (including collection of leachate) was mandatory for demolition waste landfills.

In the field of demolition waste, qualitative waste prevention measures address, in particular, the production of building materials; however, only medium- to long-term effects can be expected.

In order to be able to properly recover unavoidable demolition wastes, they have to be collected separately. The Ordinance on the separate collection of waste generated by construction activities (Federal Gazette 1991/259), which entered into force on 1 January 1993, stipulates that, if certain quantitative thresholds are exceeded, different waste categories have to be collected separately (mineral construction debris, excavated soil, broken-up concrete, torn-up asphalt, wood, metal, synthetic and construction waste).

Mandatory separate collection and recovery is to contribute to the achievement of the following objectives:

- Recovery of sorted construction materials as secondary raw materials and/or backfill material
- Reduction of residual waste disposal resulting in a lower need for landfill space
- Minimisation of costs by reducing the amount of waste to be eventually disposed of
- Proper disposal of residual waste at suitable landfills with incoming inspection
- Conservation of natural primary resources (landscape protection due to lower extraction of resources and improved groundwater protection)

If the preliminary separation is performed well already at the construction site, the quality of recyc-
led building materials will be higher. Especially construction wastes are increasingly separated from mineral construction waste on site.

In order to boost the recycling of construction materials, a Recycling Exchange for the Construction Industry was set up on the Internet in 1997 and will be further expanded. Its objective is to improve information on demand and supply of demolition waste and recycled construction materials.

Moreover, the ban on mixing of non-hazardous waste that is stipulated by the Landfill Ordinance and particularly affects the construction sector can be better complied with if recoverable materials are recycled in an economical way.

In order to live up to precautionary environmental protection and to the standards defined by the Landfill Ordinance (landfills for demolition waste) also in the field of recovery, a working group set up by the Federal Ministry of Agriculture and Forestry, Environment and Water Management is drawing up recovery principles for demolition waste. In cooperation with ÖBRV, this group is to elaborate detailed specifications with regard to quality requirements related to environmental hygiene, quality control and applications.

While the existing guidelines of the Construction Materials Recycling Association mainly focus on the materials' suitability for construction purposes, ecological aspects have to be defined in line with the current legal situation. As the material in question is produced at demolition and tear-up sites, the analyses to be performed need to take account of the specific nature of this origin (possible contamination, etc.).

Therefore, the Federal Environment Agency was commissioned with the specification of relevant parameters, related limit values and analysis plans for various technical fractions. The objectives also include the definition of product grades that are eligible for a Waste End Ordinance. In a first step, the loads of recycled construction materials actually traded on the market were determined so that sound proposals can be made for the individual fractions.

5.4.2.2. Packaging


The Packaging Directive requires that, no later than five years from the date by which this Directive must be implemented in national law (i.e. 2001), the following recovery targets have to be reached: between 50 % and 65 % as a maximum by weight of the packaging waste has to be recovered; between 25 % and 45 % as a maximum by weight of the packaging waste must be recycled (at least 15 % for each packaging material).

If the maximum percentages are exceeded, the Directive states that Member States that provide to this effect appropriate capacities for recycling and recovery are permitted to pursue these targets in the interest of a high level of environmental protection.

The Directive also includes provisions on limit values for the concentration level of heavy metals present in packaging, essential requirements on the composition and the reusable and recoverable nature of packaging, the establishment of databases on packaging and reporting obligations.

In accordance with the notification procedure under the Packaging Directive and Directive 83/189/EEC laying down a procedure for the provision of information in the field of technical standards and regulations, Austria has notified to the Commission the Packaging Ordinance (Federal Gazette 1999/648 as amended in Federal Gazette II 1997/232) and the Packaging Target Ordinance (Federal Gazette 1992/646 as amended in Federal Gazette II 2000/426). Additionally, the Commission was informed that the maximum percentage for recovery and recycling is expected to be slightly exceeded in Austria. Documentation was submitted to corroborate the availability of sufficient recovery capacities. The Commission formally acknowledged the fact that the percentages will be exceeded.

The Federal Ministry of Agriculture and Forestry, Environment and Water Management is represented on the committee set up under Article 21 of the Directive for adapting it to scientific and technical progress (packaging committee). Within the frame-
work of the committee procedure, the Commission already adopted Decisions

- on an identification system for packaging materials,
- on a format for the databases,
- establishing the conditions for a derogation for plastic crates and plastic pallets in relation to the heavy metal concentration levels established in Directive 94/62/EC on packaging and packaging waste,
- establishing the conditions for a derogation for glass packaging in relation to the heavy metal concentration levels established in Directive 94/62/EC on packaging and packaging waste.

Plans for the implementation of Directive 94/62/EC on packaging and packaging waste

In accordance with Art. 14 of Directive 94/62/EC on packaging and packaging waste, a specific chapter on the management of packaging and packaging waste, including measures stipulated by the Directive or programmes on waste prevention and re-use, is to be included in the waste management plans. The following measures and targets have to be complied with:

- measures to prevent waste,
- promotion of re-use,
- 5-year targets on the recovery of packaging waste,
- establishment of return, collection and recovery systems,
- compliance with, or introduction of, labelling and identification systems,
- compliance with qualitative requirements on packaging that still have to be defined,
- establishment of databases
- data on packaging to be submitted in accordance with Annex III of Directive 94/62/EC (packaging produced, packaging imported and exported, packaging consumption, percentages reused, recovered, etc.).

The measures taken in Austria to implement the Directive are described in the following chapters. Due to these measures, Austria already achieved or even surpassed all the targets defined for the year 2001.

Other obligations (e.g. identification, data bases) are implemented in line with the requirements (Decisions) complementing the Directive.


The Packaging Ordinance was adopted on the basis of provisions introduced or modified by the 1996 amendment to the AWG.

The amended Ordinance takes over the basic obligations set out in the Packaging Ordinance (Federal Gazette 1992/645) that entered into force on
1 October 1993. This applies especially to the take-back and recovery obligations for sales and transport packaging and re-packaging materials. Packaging materials taken back either have to be re-used or recovered in compliance with recycling rates defined for the individual packaging materials.

The Packaging Ordinance 1996 includes provisions on the following issues:

- definition of primary responsible parties (mainly the packaging or importing operators) who, first of all, are to use the licensing option and have to fulfill reporting duties (in particular with a view to improved control and imposition of sanctions),
- principle of major waste generation points,
- regulation on parties delivering minor quantities,
- promotion of re-usable packaging systems,
- requirements on collection and recovery systems (definition of tasks and duties, such as assurance of recovery, coverage, submission of information on cost factors),
- complementary quantity licensing,
- requirements on packaging.

**Major waste generation points**

An establishment may be registered as a major waste generation point by the Federal Ministry of Agriculture and Forestry, Environment and Water Management if at least one of the following annual quantities of packaging is exceeded: 80 tonnes of paper, cardboard, paperboard and corrugated cardboard, 300 tonnes of glass, 100 tonnes of metal and 30 tonnes of plastics.

The owners of such establishments are themselves responsible for the collection and re-use or recovery of the packaging materials. Suppliers delivering goods to a major waste generation point need not join a nation-wide collection and recovery system. Unless packaging is re-used, as a rule, it has to be recycled by major waste generation points. The owners of the establishments have to report the quantities of packaging produced and recycled to the Federal Ministry of Agriculture and Forestry, Environment and Water Management.

All the major waste generation points are included in a public register that may be accessed at the Federal Ministry of Agriculture and Forestry, Environment and Water Management or on the Internet. Up to now, a total of 24 applications have been received for registration as major waste generation points. Out of these, 23 applications were approved. Meanwhile, four enterprises have requested that they be deleted from the register, which also has been done. One company was removed from the register. Thus, a total of 18 enterprises were registered as major waste generation points on 1 June 2001.

**Promotion of re-usable packaging systems**

Support is granted for re-usable containers on which a deposit has demonstrably been paid. These containers as well as their labels and lids (unless their weight exceeds 5%) are exempted from the obligation to furnish proof of take-back or recovery.

**Complementary quantity licensing**

In order to reduce problems with free riders, complementary quantity licensing was included in the Ordinance. If parties obliged to do so should not furnish proof of take-back nor fulfill the re-use or recovery duties (always for one calendar year), they have to retroactively join an appropriate existing collection and recovery system (a small allowance is granted if at least 50% of a packaging material was taken back by the parties themselves). This participation is to be notified to the Federal Ministry of Agriculture and Forestry, Environment and Water Management by 31 March of the following year.

**Collection and recovery systems for packaging**

The primary responsible parties (mainly producers of service packaging, packaging operators and importers) may make use of a collection and recovery system for fulfilling the take-back and recovery obligations (including recording and reporting duties). The basic requirements and tasks of collection and recovery systems have been re-defined with a view to the following aspects:

- ensuring collection and recovery,
- obligation to accept contracts,
- generally applicable tariffs based on transparent cost calculations (no cross-subsidies),
- establishment of collection centres with sufficient capacity at a reasonable distance to the points of waste generation,
• provision of collection capacities taking into account population density or the distribution of waste generation points, packaging waste volumes, possibilities of energy recovery and optimisation with regard to recycling,
• maintenance of a list of industrial waste generation points,
• recording of packaging quantities received by packaging materials,
• utilisation of funds in line with the principles of economy, efficiency and expediency.

The administrative order authorising a collection and recovery system stipulates specific collection and recovery rates for each packaging material. These rates have to be set with due consideration of the economic proportionality of the costs of collection and recovery. In this context, a significant factor are the expenses for separate collection and sorting. However, the collection rate may also include the share of packaging that is collected together with residual waste and incinerated for energy recovery. As waste incineration capacities are expected to rise due to the Landfill Ordinance, the collection rate can be raised proportionately. This is tantamount to greater producer responsibility. Comprehensive reporting duties ensure the adequate control of the systems.
## Table 26: Collection and recycling systems:

<table>
<thead>
<tr>
<th>SYSTEM OPERATOR</th>
<th>ADDRESS</th>
<th>PACKAGING MATERIALS</th>
<th>SPECIFIC AREA OF ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.V.A. Erfassen und Verwerten von Altstoffen GmbH</td>
<td>Ungargasse 35/III, 1030 Vienna</td>
<td>Paper, cardboard, paperboard, corrugated cardboard, wood, metal (excl. blackplate barrels), plastics and composite materials</td>
<td>Fulfilment of obligations under the Packaging Ordinance related to packaging waste in the <strong>industrial sector</strong></td>
</tr>
<tr>
<td>Bonus Holosystem Gesellschaft m.b.H. &amp; Co KG</td>
<td>Prof.-Sinwel-Weg 1, 6330 Kufstein</td>
<td>Paper, cardboard, paperboard, corrugated cardboard, wood, metal, plastics, textile fibres (especially jute bags)</td>
<td>Fulfilment of obligations under the Packaging Ordinance related to packaging waste in the <strong>industrial sector</strong></td>
</tr>
</tbody>
</table>
| Dr. Klaus Galle Umwelttechnik und Ökoconsulting           | Josefsteig 13, 3400 Klosterneuburg | Paper, cardboard, paperboard, corrugated cardboard, wood, metal, plastics, composite materials, metal glass, wood and biogenic packaging | Fulfilment of obligations under the Packaging Ordinance related to packaging waste, including disposable tableware, in the **industrial sector**  
a) packaging waste, including disposable tableware, in the **industrial sector**  
b) McDonald’s restaurants: packaging, including disposable tableware in the **industrial and household-related sectors** |
| ÖKK Österreichische Kunststoff Kreislauf AG               | Handelskai 388 Top 841, 1020 Vienna | Plastics and textile fibres                                                         | Collection and recycling of packaging in the **industrial sector** |
| ÖKK Österreichische Kunststoff Kreislauf AG               | Handelskai 388 Top 841, 1020 Vienna | Plastics and textile fibres                                                         | Collection and recycling of packaging in the **household sector** |
| Pape Entsorgungs- und VerwertungsgesmbH&Co KG            | Kreisstraße 30, D-30629 Hanover     | Paper, cardboard, paperboard and corrugated cardboard as well as plastics and wood | Collection and recycling of packaging used for branded automotive spare parts in the **industrial sector** |

The Packaging Target Ordinance essentially combines the following requirements:

• re-filling or recovery rate of 80% for the packaging of all types of beverages from 2001 on,
• maximum remaining quantities of other packaging that may be landfilled from 2001 on,
• recycling rates corresponding to the Packaging Ordinance in relation to the total quantity of each packaging material placed on the market.

Amendment to the Packaging Target Ordinance and voluntary commitment by industry

The amendment to the Packaging Target Ordinance combines the previously separate rates for different types of beverages and stipulates an overall rate of 80%. Hence, the modification essentially means that these values do not have to be calculated by beverage type. This involves administrative advantages as analyses of the recyclables collected and the recovered beverage containers need not be related to specific beverages and their market shares. Thereby, legal certainty is raised with regard to data collection and calculations to assess whether targets have been met.
At the same time, the beverage industry and trade voluntarily committed, *inter alia*, to the maintenance of existing re-usable packaging systems. According to the unanimous opinion of experts, a deposit to be paid on disposable containers, which is demanded by many parties, does not guarantee the maintenance of re-usable packaging systems.

The amendment to the Packaging Target Ordinance does not result in any direct changes for the citizens. However, it has to be pointed out that the maintenance of re-usable packaging systems is decisively influenced by the purchasing decisions of each and every consumer in Austria. The retail chains naturally also play an important role. Within the framework of the voluntary commitment, key representatives assured that they will offer the consumers freedom of choice and, hence, maintain re-usable packaging systems.

If, nevertheless, many consumers opt for disposable PET bottles, these should be separately collected in a form minimising their volume. For these bottles, recycling is possible. The target of raising the PET recycling rate to 50% of the quantity input into the market has also been included in the voluntary commitment and assured by the enterprises involved.

**Effects of the Packaging and the Packaging Target Ordinances**

The regulations in the packaging sector serve to achieve the objectives of conservation of natural resources and sparing use of landfill capacities, anchored in the AWG, by applying the principles of waste prevention and recovery.

The packaging regulations give substantial impetus to preventive measures. In a general perspective, trends have changed insofar as the packaging quantity no longer increases at the same rate as the GDP in real terms. The input of primary raw materials for packaging stagnates due to a rise in recycling. Large quantities could be saved by the increased use of re-usable transport packaging, in particular in the corporate sector. The optimisation of packaging also allows for a reduction of the consumption of primary raw materials. In total, packaging performance (material used per product unit) improved significantly.

Additionally, the recovery of packaging has become easier as the obligations mentioned above resulted in a shift to the production of packing made of one material. The establishment and expansion of markets for recyclables also leads to innovative developments in the field of recovery.

The quantities of recyclables collected increased. Due to measures in the field of packaging, increased quantities of recyclables reduced the amount of household waste to be treated or landfilled.

For seven types of beverages, the Packaging Target Ordinance stipulates that 80% of the packaging must be re-filled, recycled or used for energy recovery.

The investigation on compliance with the targets for re-filling, collection and recovery of packaging defined by beverage type until 31 December 1997 showed the following result:

The targets were achieved for all types of beverages. The re-filling and recovery rate is highest for wine (95.6%), water (95.1%), beer (94.3%) and sparkling wine/spirits (92.1%). The rates are clearly lower for non-alcoholic refreshments (85.0%), juice (82.7%) and milk (72.1%).

When comparing these data with the previous survey performed at the end of 1994, the most marked development is a trend towards disposable packaging. Its share rose from 34.5% to 40.0% as an average for all types of beverages. At the same time, a considerable increase was observed in the collection and recovery rates of disposable packaging made of glass and composite materials. For cans, plastic bottles and tubs, the rates remained almost constant.

Fundamental reviews and monitoring of the targets with regard to compliance with the remaining quantity of waste from other packaging according to Art. 3 of the Packaging Target Ordinance yield the following picture for 1998:

The Packaging Target Ordinance defines the maximum quantity of other packaging that may be landfilled in the year 1998. “Other packaging” under the terms of the Packaging Target Ordinance includes any packaging (also long-life and household packaging) except for beverage packaging, to which special provisions apply.
The quantity of other packaging (excluding beverage packaging) contained in household waste was more than halved from 1991 to 1998 (from around 480,000 tonnes to around 220,000 tonnes).

The amount of other packaging contained in industrial bulk waste (excluding beverage packaging) decreased to one fifth (from around 280,000 tonnes to around 53,000 tonnes).

Packaging waste contains product residues and substances adhering to it. Previously, these residues were included in the weight of packaging waste. But now the net packaging weight is determined. This means that, for the first time, the amount of packaging waste can be compared with the amount placed on the market.

The results show that, depending on the packaging material, the share of product residues ranges from...
3% for glass to 28% for plastic packaging. The net packaging material mass is used to measure the level to which the objectives are achieved.

The amount of other packaging contained in wastes is not completely landfilled. Proportionately to the amount of household waste incinerated, the quantity of packaging waste landfilled is reduced for paper, plastic and composite materials.

Moreover, metals are separated from waste during treatment by means of magnetic separators and submitted to recycling. This applies to both waste incineration plants (recovery from slag) and rotting and other plants for the treatment of residual waste.

In 1998, around 8,000 tonnes of other packaging made of ferrous metals was separated from residual waste and recycled.

Residual quantities include those other packing wastes that are landfilled. The following table shows these amounts for the year 1998:

The residual quantities for all packaging materials were below the targets defined for 1998. The materials paper, glass, composite materials and metal are even clearly lower than the targets set for 2001.

<table>
<thead>
<tr>
<th>Packaging material</th>
<th>Residual quantity landfilled in 1998 Range in tonnes</th>
<th>1998 target max. quantity landfilled in tonnes</th>
<th>2001 target max. quantity landfilled in tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper, cardboard, paperboard</td>
<td>63,000–71,000</td>
<td>140,000</td>
<td>99,000</td>
</tr>
<tr>
<td>corrugated cardboard</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glass</td>
<td>12,400–15,300</td>
<td>54,000</td>
<td>38,000</td>
</tr>
<tr>
<td>Plastic materials</td>
<td>63,000–70,000</td>
<td>90,000</td>
<td>60,000</td>
</tr>
<tr>
<td>Composite materials</td>
<td>4,700–7,000</td>
<td>50,000</td>
<td>30,000</td>
</tr>
<tr>
<td>Metal</td>
<td>12,000–14,000</td>
<td>36,000</td>
<td>17,000</td>
</tr>
</tbody>
</table>

Figure 22: Targets for residual quantities, amount of other packaging waste and net mass of packaging waste landfilled (i.e. packaging waste minus product residues)
Every year, around 200,000 end-of-life vehicles (ELVs) have to be recovered and disposed of in Austria. They contain numerous hazardous substances (fuels, operating fluids, batteries, etc.) and, as long as these substances remain therein, they must be considered hazardous waste.

On the basis of a voluntary agreement between the sectors of the automotive industry represented in the Austrian Chamber of Commerce, the then Federal Ministry of Economic Affairs and the then Federal Ministry of Environment, Youth and Family Affairs, ELV are taken back by automotive dealers all over Austria free of charge if a new or used vehicle is bought at the same time.

This agreement, which was concluded in September 1992 and expired at the end of 1995, was prolonged for an indefinite period of time and further expanded to include significant provisions to ensure proper disposal and to provide effective incentives for the implementation of controlled collection and environmentally sound recovery in order to achieve qualitative improvements in the disposal of ELVs. This expansion particularly includes the assessment of the agreement’s effectiveness, the definition of “minimum requirements for the recovery of ELVs” and the issuance of a recovery certificate for the final vehicle owner.

Every year, a report on the implementation of this voluntary agreement and on development perspectives is submitted to the Federal Ministry of Agriculture and Forestry, Environment and Water Management.

The data published in these reports show that the number of new vehicle registrations increases roug-
hly at the same rate as the number of vehicles de-
registered in Austria. In contrast thereto, the num-
ber of vehicles that have demonstrably been deli-
ered to shredding plants tends to decline.

At present, the new, additional provisions of the ag-
reement have not yet or not fully been implemented
and/or documented.

Under the 5th Environmental Action Programme of
the EU, ELVs were identified as a priority waste
stream. On the basis of a policy paper issued in
1994, a draft was prepared for a Council Directive
on end-of-life vehicles that was submitted to the
Council on 9 July 1997 (COM(97) 358 final). After
the approval of the text by the Conciliation Commit-
tee in May 2000, the Directive 2000/53/EC of the
European Parliament and of the Council of
18 September 2000 was published.

The Directive applies to vehicles designated as ca-
tegory M1 or N1 and to three-wheel motor vehicles.
Key issues covered by the Directive are:

- With a view to waste prevention, vehicles placed
  on the market after 1 July 2003 must not contain
  lead, mercury, cadmium or hexavalent chromium
  except for the cases and components specifical-
- The adequate availability of collection facilities
  for ELVs has to be ensured all over Austria, and
  the delivery to treatment facilities has to be pos-
  sible free of charge for the last owner.
- The treatment of ELVs has to comply with the mi-
  nimum standards defined in Annex I that also in-
  cludes requirements to be met by the sites for
  storage (including temporary storage) and the si-
  tes for treatment with regard to surface design
  and spillage collection facilities.
- From 2006 on, the recovery rate has to amount
  to a minimum of 85 % on average, with the con-
  tribution of recycling reaching a minimum of
  80 %.

Certain provisions of the Directive may also be im-
plemented through voluntary agreements:
• the minimisation of the use of hazardous substances from the conception of the vehicle onwards,
• design of vehicles to facilitate recycling,
• increased use of secondary raw materials,
• the maximisation of the utilisation of re-usable components as used spare parts,
• compliance with coding standards for components and materials to facilitate recovery,
• publication of dismantling information,
• dissemination of information to the consumers about the vehicle’s design with a view to recyclability, the environmentally sound treatment of ELVs, the optimisation of recovery and the reduction of the waste to be deposed of (the share that cannot be recovered).

The following provisions contained in the present agreement, however, have to be regulated in a legally binding way:
• definition of mandatory treatment and recovery standards in accordance with Annex I of the Directive,
• definition of mandatory recovery rates,
• obligation of taking back ELVs free of charge,
• obligatory issuance of a recovery certificate to the last vehicle owner.

5.4.2.4. Waste electric and electronic equipment

Waste electric and electronic equipment (WEEE) constitutes a waste stream the significance of which is not yet fully reflected by waste management in Austria as well as in its neighbouring countries. Its heterogeneous and complex nature still requires much manual labour, which results in relatively high costs, in order to achieve the waste management objective of proper and environmentally sound treatment. Therefore, the logistical and financial framework as well as technical processing requirements have to be defined.

With regard to electronic scrap, the Federal Ministry of Agriculture and Forestry, Environment and Water Management pursues the following objectives:
• collection of pollutants from electric and electronic equipment and components and utilisation of low-pollutant, recoverable materials,
• prevention of waste by ease of repair and dismantling (prolonging the life of equipment) and re-use of old equipment,
• maximisation of the recovery of valuable materials (e.g. NF metals),
• recovery of the energy contained in residual material that cannot be recycled under economically reasonable conditions,
• preventing the disposal of untreated WEEE.

To this end, the following measures have to be taken:
• Ensuring the separate collection of WEEE all over Austria by
  • establishing and developing a nation-wide collection system,
  • return and take-back obligations,
  • Ensuring the proper, environmentally sound recovery and treatment of WEEE.

Waste stream coverage

The volume of WEEE is expected to amount to around 100,000 tonnes with a tendency to rise. This volume is distributed at a ratio of roughly 55:45 to households (consumer goods) and other sectors, such as trade and industry (investment goods). Almost all devices of this waste category include components containing pollutants, such as printed boards, electrolyte capacitors, mercury switches, batteries and back-lit LCDs, and many of them also contain valuable materials, e.g. ferrous, non-ferrous and precious metals. Therefore, separate collection is a must in accordance with the objectives and principles of modern waste and materials management (pollutant collection, recovery).

Collection system

It will make sense to use existing and well-proven structures, such as municipal collection facilities or retail trade, for the collection of WEEE. The involvement of trade will ease the burden of municipal authorities which currently bear the responsibility. Nation-wide coverage is another important criterion to be met by the collection system. This requirement could be fulfilled by involving the collection centres in more than 2,000 cities and towns with their fully developed logistics and the Austrian-wide network of 5,000 electric retailers. Several projects
are already testing this collection system in practice in Lower Austria, Salzburg, Styria, Tyrol, Upper Austria and Vorarlberg. This means that WEEE is collected by municipal collection and recycling centres and, in part, by electric retailers.

The study “Review of approaches to collection and recovery systems for end-of-life equipment” examined concrete models for their impact on defined ecological and economic parameters (e.g. return rate, manufacturer responsibility) using objective criteria. The resulting alternatives as well as their advantages and disadvantages are:

- **Municipal system**: Municipal authorities collect and recover waste and bear all the related costs. This system is funded through the waste charge. **Advantages**: cost-efficient system, no distortions of competition. **Disadvantages**: no direct incentives for ecological design.

- **Brand system**: Waste is collected by brands by retailers, and the costs are borne by the manufacturer / importer. This system is funded through a surcharge on the sales prices of new products. **Advantage**: incentives for ecological design if all manufacturers are covered. **Disadvantages**: massive distortions of competition on the domestic market (problems with free riders as it will be impossible to cover all manufacturers / importers) and on foreign (neighbouring) markets; environmental pollution due to numerous transport trips at low capacity utilisation, discontinued brands are a burden on the municipalities; eight times the costs of the municipal system.

- **Retailer system**: Retailers collect the waste and bear the costs. This system is funded through a surcharge on the sales prices of new products. **Disadvantage**: distortion of competition with regard to foreign (neighbouring) markets; no direct incentives for ecological design, no provision for the disposal of equipment if no comparable new equipment is purchased at the time of return; four times as expensive as the municipal system.

- **Pooling system-municipalities**: Responsibility is shared for collection and recovery as well as organisation and funding. The municipal authorities are responsible for collection, transport to the recovery/disposal site and bear the related costs. A pool company bears the costs of recovery/disposal. Funding is provided through the waste charge (costs of the municipality) and the pool charge (costs of the pool) that has to be paid by the parties placing the equipment on the market. **Advantage**: simple to establish. **Disadvantages**: distortion of competition, no direct incentives for ecological design; twice as expensive as the municipal system.

- **Pooling system-retailers**: Responsibility is shared for collection and funding. Retailers are responsible for collecting the waste and notify the pool when the storage space is full, and the pool organises the transport to the recovery/disposal site. All the costs are borne by the pool. This system is funded through a pool charge to be paid by the parties placing the equipment on the market or by energy suppliers. **Disadvantages**: massive distortion of competition, no direct incentives for ecological design, very complex, requiring extensive supervision resulting in high costs; more than three times as expensive as the municipal system.

For reasons of practicality, control, reflection of true costs, cost efficiency and fairness, a system of burden sharing is desirable. To this effect, future considerations on systems should give special attention to parallel goods and financial flows, i.e. those responsible for a specific step in the logistics chain should also be responsible for funding. This means that all the parties involved have to bear part of the responsibility and costs:

- **Manufacturers**: are responsible for recovery and environmentally sound treatment of WEEE as well as for environmental- and recycling-friendly product design.

- **Retailers**: are responsible for advising consumers on ecological aspects when they buy a device and for taking back WEEE when new equipment is bought (1:1 take-back obligation).

- **Final consumers**: the users of electric and electronic equipment are responsible for handing over WEEE to the collection system. They ultimately bear the costs of WEEE collection and treatment, either directly or indirectly through va-
rious systems (e.g. sales price, municipal waste charge).

- **Municipalities**: they or their waste management organisations are responsible for ensuring collection close to the consumers as well as for informing and advising the population.

- **Recovery/disposal operators**: are responsible for environmentally sound recovery and disposal of WEEE in line with legislation.

**State-of-the-art treatment and recovery**

Due to the complexity of WEEE, its treatment is complicated and relatively cost-intensive. Previous practices, in particular WEEE landfilling, must be rejected or only continued for a limited period of time as they no longer live up to the state of the art. The central requirement to be met by WEEE treatment is the elimination of pollutants. Components containing pollutants have to be removed before further treatment and handled separately as hazardous waste in line with the state of the art. Since 1998, standards have been available to assure the quality of WEEE processing. These are ÖNORM S 2106 “Recycling and disposal of electrical and electronic appliances” and ÖNORM S 2107 “Requirements to be met by firms collecting and treating electrical and electronic equipment.”

The Federal Ministry of Agriculture and Forestry, Environment and Water Management published “Guidelines on the collection and treatment of electrical and electronic appliances.” Their aim is to provide guidance to all parties involved in the handling of this waste type on the basis of existing collection systems and legislation by linking the most important experiences made in pilot projects with the treatment principles of ÖNORM S 2106.

At any rate, the proper recovery and disposal of WEEE is to be ensured.


To facilitate compliance with legislation and to provide concrete assistance for identifying pollutants and removing contaminated components, the Federal Ministry of Agriculture and Forestry, Environment and Water Management also published “Guidelines for the treatment of waste electrical and electronic appliances.”

A scientific study carried out by the University of Agricultural Sciences compared the mechanical treatment of WEEE and, in particular, small appliances, with thermal treatment.

Using a representative sample of treatment plants, a survey was prepared on achievable fractions, including costs of re-working, and on the impact of WEEE on operations and the properties of combustion residues. Given the ferrous and non-ferrous metals content of this waste stream, it is recommended to mechanically dismantle small appliances, subsequently remove ferrous and non-ferrous metals and subject the remaining materials to targeted thermal treatment with a view to resource conservation. The co-incineration of larger quantities of small appliances would also have effects on plant operation and combustion residues. Ferrous metals can only be recovered in part and at a lower quality. Non-ferrous metals are, in part, lost via ashes and are mainly embedded in slag.
European Directive

The European Commission has realised the need for a harmonised, European solution in order to cope with the Europe-wide problems of WEEE that are also due to numerous divergent national developments and initiatives. In mid-2000, proposals for two Directives were presented that are under discussion in the Council and the European Parliament. Another Directive on the ecological design ("eco-design") of electrical appliances is being drafted.

Due to the relatively ample data available and the experiences made in pilot projects, Austria will be able to make valuable contributions to a European solution.

The key issues of the draft Directives are:

• From 1 January 2008 on: substitution of lead, mercury, cadmium, hexavalent chromium, certain brominated flame retardants in electrical and electronic equipment by other substances, with some exemptions and adaptations.

• Basically all waste electrical and electronic equipment falls under the scope of the Directive. Exemptions are provided for specific product categories that are almost exclusively used in the business sector (e.g. beverage dispensers) in order to prevent that such equipment is subject to the same collection and funding schemes as appliances from private households.

• Collection systems have to be set up that allow for the free return of equipment by private households (in Austria it would make sense to maintain the well-proven and cost-efficient system of municipal collection centres).

• When a customer buys a new device, retailers are obliged to take back a waste appliance of the same type free of charge (1:1 rule).

• The collection of equipment from other sources than households has to be ensured by the producers and importers.

• The target for separate collection is 4 kg per inhabitant per year.

• The manufacturers and importers are responsible for the environmentally sound recovery and treatment of the WEEE collected. Components that constitute a danger to the environment, e.g. batteries, cathode ray tubes and capacitors containing PCBs, have to be submitted to special treatment. Ambitious recovery rates are indicated for the main equipment categories. For example, monitors have to be recovered by 75%, i.e. re-introduced into the material and energy cycle.

• Producers or importers are responsible for funding the transport of household WEEE from collection centres, their recovery and environmentally sound treatment ("producer responsibility").

• These provisions are complemented by labelling, information and reporting requirements.

• These Directives will have to be transposed into national law within 18 months.

5.4.2.5. Refrigeration equipment

The Ordinance on the take-back of refrigeration equipment, Federal Gazette 1992/408 as amended in Federal Gazette 1995/168, stipulates a take-back and deposit payment requirement for waste refrigeration equipment in order to ensure recycling and the proper disposal of any residual material. The deposit may be waived if a nation-wide disposal system ensures proper collection and treatment and if a voucher over a minimum of ATS 100 is given to the final consumer for disposal at the time of purchase. The voucher has to be permanently fixed on the new equipment. When at least 30 appliances are bought at the same time (bulk buyers), the obligation to pay a deposit or to issue a voucher is waived under certain conditions (bulk buyer regulation).

As, in practice, all manufacturers and importers participate in a nation-wide system deposits are not collected at present. Five such systems exist. Meanwhile, the number of retailers has grown who take back waste refrigeration equipment even if consumers do not buy new appliances. In mid-2001, the number of take-back sites amounted to around 730 so that nation-wide collection has been further expanded.

Since 1997, about 350,000 refrigeration appliances under the terms of the Refrigeration Equipment Ordinance (including air-conditioning systems with up
to 1 kg of refrigerant) have been placed on the market with vouchers per year. The percentage of appliances taken back and treated increased from around 9% in 1997 to around 13% in 1999. The difference between appliances sold and disposed of is due to the fact that the purchase of a new one does not automatically entail that an old one has to be disposed of (e.g. establishment of a household, continued use, re-use or sale of the old unit, trend towards two refrigeration appliances and single-person households). Therefore, the majority of the vouchers is expected to be redeemed only in a few years since refrigeration equipment are consumer goods with a long life.

The Ordinance on the labelling, take-back and deposit payment for certain lamps, Federal Gazette 1992/144, stipulates that a deposit has to be paid upon the sale of certain types of lamps (e.g. fluorescent lamps, sodium discharge lamps, mercury discharge lamps, neon lamps) for use in Austria, obliges retailers to take back waste lamps and defines pollutant limits for fluorescent tubes and similar lamps. Payment of the deposit is to be evidenced by labelling the lamps or by vouchers. If proof for the payment of the deposit is furnished when waste lamps are returned, the deposit has to be refunded to the consumer. Retailers are obliged to take back waste lamps free of charge:
- in case of transactions requiring simultaneous performance (no vouchers are needed), and
- when up to three waste lamps are returned, if vouchers of the same issuing establishment are presented for them.

The obligation to pay a deposit of ATS 10 plus VAT may be waived under the following conditions:
- the number of waste lamps returned corresponds to the number of new lamps purchased;
- in case of bulk buyers (min. 50 lamps, including delivery by instalments within a maximum period of four weeks) if the seller participates in a national disposal system and reports the consumer and the number of lamps sold to him/her,

5.4.2.6. Lamps

The Ordinance on the labelling, take-back and deposit payment for certain lamps, Federal Gazette 1992/144, stipulates that a deposit has to be paid upon the sale of certain types of lamps (e.g. fluorescent lamps, sodium discharge lamps, mercury discharge lamps, neon lamps) for use in Austria, obliges retailers to take back waste lamps and defines pollutant limits for fluorescent tubes and similar lamps. Payment of the deposit is to be evidenced by labelling the lamps or by vouchers. If proof for the payment of the deposit is furnished when waste lamps are returned, the deposit has to be refunded to the consumer. Retailers are obliged to take back waste lamps free of charge:
- in case of transactions requiring simultaneous performance (no vouchers are needed), and
- when up to three waste lamps are returned, if vouchers of the same issuing establishment are presented for them.

The obligation to pay a deposit of ATS 10 plus VAT may be waived under the following conditions:
- the number of waste lamps returned corresponds to the number of new lamps purchased;
- in case of bulk buyers (min. 50 lamps, including delivery by instalments within a maximum period of four weeks) if the seller participates in a national disposal system and reports the consumer and the number of lamps sold to him/her,
and if a corresponding disposal contract has been concluded between the consumer and a collection or treatment operator authorised to handle waste lamps.

The quantity of waste lamps collected is recorded and documented in the Waste Data Network of the Federal Environment Agency. The analysis of consignment notes from 1996, including a plausibility check, shows a coverage of around 60 %.

5.4.2.7. Batteries and accumulators

Background:

In Austria, around 2,000 tonnes of consumer batteries are bought per year, i.e. about 55 million alkaline manganese and zinc carbon batteries, 1.5 million button cells and 3.5 million nickel-cadmium accumulators. Low-pollutant alkaline manganese and zinc carbon batteries account for the vast majority of batteries bought and used (91 %).

In accordance with Article 6 of Council Directive 91/157/EEC of 18 March 1991 on batteries and accumulators containing certain dangerous substances, the Member States have to draw up programmes in order to achieve the following objectives:

- reduction of the heavy-metal content of batteries and accumulators,
- promotion of marketing of batteries and accumulators containing smaller quantities of dangerous substances and/or less polluting substances,
- gradual reduction, in household waste, of spent batteries and accumulators covered by Annex I,
- promotion of research aimed at reducing the dangerous-substance content and favouring the use of less polluting substitute substances in batteries and accumulators, and research into methods of recycling,
- separate disposal of spent batteries and accumulators covered by Annex I.
Pursuant to Article 8 of the Directive, the Member States have to take the necessary steps in the context of the programmes referred to in Article 6 to ensure that consumers are fully informed of:

a) the dangers of uncontrolled disposal of spent batteries and accumulators,

b) the marking of batteries, accumulators and appliances with permanently incorporated batteries and accumulators,

c) the method of removing batteries and accumulators which are permanently incorporated into appliances.

PROGRAMS
Legislative measures

1. European Union


The main focus of the Battery Directive is to limit the pollutant content of alkaline manganese batteries, in particular with regard to mercury. Directive 93/86/EEC introduced a marking system for batteries indicating the heavy-metal content and a symbol providing information on disposal that is to serve the purposes of separate collection.

In accordance with Directive 91/157/EEC, batteries and accumulators may only be incorporated into appliances if they can be easily removed by the consumer when they are spent.

The following types of appliances are exempted from this requirement:

1. Those appliances whose batteries are soldered, welded or otherwise permanently attached to terminals to ensure continuity of power supply in demanding industrial usage and to preserve the memory and data functions of information technology and business equipment, where the use of batteries and accumulators referred to in Annex I is technically necessary.

2. Reference cells in scientific and professional equipment, and batteries and accumulators placed in medical devices designed to maintain vital functions and in heart pacemakers, where uninterrupted functioning is essential and the batteries and accumulators can be removed only by qualified personnel.

3. Portable appliances, where the replacement of the batteries by unqualified personnel could present safety hazards to the user or could affect the operation of the appliance and professional equipment intended for use in highly sensitive surroundings, for example in the presence of volatile substances.

Those appliances the batteries and accumulators of which cannot be readily replaced by the user have to be accompanied by instructions informing the user of the content of environmentally hazardous batteries and accumulators and showing how they can be removed safely.


This Directive limits the maximum mercury content to 0.0005 % by weight — also for batteries other than alkaline manganese ones.

2. Austria

Waste Management Act, Federal Gazette 1999/325 as amended in Federal Gazette II 2000/90

Many of the objectives identified in the Directive, such as the reduction of the heavy-metal content, separate collection and proper treatment of batteries and accumulators, are covered by general provisions in the Waste Management Act (separate collection of hazardous wastes, mandatory authorisation of collection and treatment operators, etc.).
Environmental Subsidy Act, Federal Gazette 1993/185 as amended in Federal Gazette I 1997/96

The promotion of research on new technologies in the fields identified is ensured within the framework of the Environmental Subsidy Act. In particular, treatment plants for spent batteries are also eligible for funding.

Ordinance on the take-back of batteries and the limitation of their pollutant content, Federal Gazette 1990/514, as amended in Federal Gazette 1991/3

This Ordinance, which was adopted on the basis of Art. 7 (2) (3) and Art. 8 of the AWG and entered into force on 1 July 1991, obliges retailers to take back batteries in order to ensure that all batteries and accumulators are collected separately from household waste. It also limits the mercury and cadmium content of certain batteries.

Ordinance of the Federal Minister of Environment, Youth and Family Affairs amending the Ordinance of 19 July 1990 on the take-back of batteries and the limitation of their pollutant content (Battery Ordinance), Federal Gazette II 1999/495

In the Act of Accession to the EU (Art. 69), Austria was given the right to maintain a lower mercury content of alkaline manganese batteries for a 4-year transition period. At the same time, a process was agreed on for the review of these provisions with a view to the adaptation of EU legislation. As a result of this review process, the maximum mercury content was limited to 0.0005 % by weight — also for batteries other than alkaline manganese ones — by Directive 98/101/EC (cf. above).

Adaptations were also made with regard to the obligation of integrating batteries and accumulators into appliances in such a way that they can be easily removed when they are spent. These provisions are in line with Article 5 and Annex II of Council Directive 91/157/EEC and Annex I of Commission Directive 98/101/EC. Batteries and accumulators containing no pollutants are excluded from the scope of Article 4 (removability).

For further information, please refer to the Supplement to the Federal Waste Management Plan 2001, “Guidelines for Waste Shipment and Treatment Principles” (Chapter 3.5).

Measures taken by the Länder, cities and towns

Under Art. 12 of the AWG, cities and towns (associations of cities and towns) are obliged to collect chemicals of concern (hazardous wastes from private households).

On the basis of relevant Land legislation, Länder and municipalities have to comprehensively inform the population within the framework of their domain.

Therefore municipal notices and publications disseminated to all households regularly inform on the correct handling of spent batteries and accumulators (comprehensive consumer information).

Measures taken by industry (Environmental Forum for Batteries)

(1) The following objectives are to achieved by taking measures:

- Establishment and maintenance of an efficient collection system for batteries that is simple for consumers,
- support for all retailers selling batteries — these are obliged to take back spent batteries under the Battery Ordinance — with regard to battery collection,
- ensuring the simple and consumer-friendly take-back of spent batteries all over Austria,
- maintaining high collection rates and raising them as much as possible,
- proper and environmentally sound disposal,
• optimal consideration of the ecological design of batteries in internal cost calculations in the future.

(2) Implementation
With regard to the implementation of the Battery Ordinance, battery manufacturers and importers set up a voluntary association, the Environmental Forum for Batteries, in 1989.

The Forum provides retailers with free collection boxes for spent batteries that are regularly emptied and submitted to disposal by authorised collection operators. On the basis of agreements with Länder governments, collection of batteries from municipalities is also ensured by the Environmental Forum for Batteries. In this context, battery collection bags (around 4 million bags), on which instructions for the consumers are printed, are distributed to all households twice a year.

The batteries are sorted by:
• button cells,
• Ni-Cd accumulators (rechargeable),
• alkaline manganese and zinc carbon batteries.

Button cells and Ni-Cd batteries are transported to and recycled in other countries as recovery facilities do not exist in Austria at present. Alkaline manganese batteries (around 90% of spent batteries and accumulators) are delivered to authorised treatment operators for recycling.

In addition to advertising and extensive public awareness campaigns, a design competition and a school competition were carried out in the year 2000 (battery collection competition for students from the fifth grade on in order to further raise the awareness of young people for “correct” battery collection and to provide an additional incentive for collecting batteries).

In 1999, 1,282 tonnes of batteries were collected. This means that Austria’s collection results are high by international comparisons and still continue to increase slightly. The collection rate currently is above 50% (quantity collected in relation to domestic consumption taking into account battery life — spent battery potential). This figure, however, does not include the batteries collected in households (frequently over several years) nor batteries permanently installed in appliances.

Measures taken by industry in the field of starter batteries (Environmental Forum for Starter Batteries, UFS)

(1) The following objectives are to be achieved by taking measures:
• Establishment and maintenance of an efficient collection system for spent batteries and accumulators that is simple for consumers,
• support for all retailers selling batteries — these are obliged to take back spent batteries under the Battery Ordinance — with regard to battery collection,
• ensuring the simple and consumer-friendly take-back of spent batteries all over Austria,
• maintaining high collection rates and raising them as much as possible,
• proper and environmentally sound disposal.

(2) Implementation
UFS organises the take-back of starter batteries for disposal in Austria. Enterprises placing starter batteries on the Austrian market for the first time (manufacturers/importers) apply for a license in writing. As members of UFS, they pay a collection fee to UFS-GmbH.

Every manufacturer/importer submits a monthly report to UFS on the batteries placed on the market. Companies rendering logistical services within the UFS system are refunded their expenses.

The recycling company authorised by UFS is BMG Metallgesellschaft mbH at Arnoldstein.

In order to check the completeness and accuracy of the reports submitted and the payments effected by the system’s members, UFS has controls performed by a certified auditor.

Companies that do not have their own collection logistics for the take-back of spent starter batteries may have these services performed by secondary raw material dealers. A list of these dealers is available upon request from UFS.
• Number of starter batteries placed on the market within the framework of UFS:
  1998: around 698,000 batteries
  1999: around 703,000 batteries

• Amount taken back through UFS:
  1998: around 15,000 tonnes, corresponding to a return rate of 105.42 % with regard to the amount placed on the market within the framework of UFS.
  1999: around 16,000 tonnes, corresponding to a return rate of 120.17 % with regard to the amount placed on the market within the framework of UFS.

The return rate of above 100 % is due to the fact that some manufacturers and importers did not join UFS.

Further measures

In co-operation with representatives of industry (Austrian Chamber of Commerce), Environmental Forum for Batteries, Environmental Forum for Starter Batteries, Länderei, cities and towns (Association of Austrian Cities and Towns), the following objectives are pursued on the basis of the legal situation:

• measures improving the offer of batteries and accumulators containing less dangerous substances or more environmental-friendly substances,

• measures improving collection rates going beyond existing legislation, in particular by raising the number of collection points: the aim is to achieve a collection rate of 65 % by 2005.

• Activities within the framework of research on how to reduce the concentration level of dangerous substances in batteries and accumulators are to be supported as much as possible. The action line “Promotion of the environment in Austria and abroad” also aims at the reduction or prevention of wastes. As a result, research funds of this action line may also be used to support measures pursuing these objectives of environmental promotion in Austria and abroad, such as the reduction of dangerous pollutants in batteries.

• Comprehensive information of the population on the measures taken in the domain of the relevant regional and local authorities or by industrial organisations.

Review of the programme

The data and measures included in the Federal Waste Management Plan are updated at least every three years.

5.4.2.8. Biogenous wastes

Ordinance on the separate collection of biogenous wastes (Biogenous Waste Ordinance, Federal Gazette 1992/68)

This Ordinance, which entered into force on 1 January 1995, defines the biodegradable wastes that have to be collected separately unless they are recovered (composted) directly at households or establishments.

The amount of biogenous waste collected in municipal bio-waste containers was raised from 182,000 tonnes in 1993 to approximately 478,000 tonnes in 1999. The amount collected per capita (through bio-waste containers) reached an average of around 60 kg in Austria. This corresponds to a coverage around 65 % for collection through bio-waste containers with regard to the share of biogenous wastes from households and similar establishments (745,000 tonnes).

Furthermore, biogenous (organic) material is recovered by private composting. Its quantity is assumed to exceed 500,000 tonnes at any rate. Thus, when taking into account private composting, the coverage and recovery level for biogenous material is significantly higher. In part, garden waste from allotment gardens and private homes (e.g. bulky tree and brush cuttings) is collected through other systems (shredder service, direct delivery to treatment plants or waste collection centres) rather than bio-waste containers, and thus is included in other municipal wastes.

The volume collected in regions which introduced bio-waste containers a longer time ago shows that the long-term target of 80 % coverage (of biogenous wastes from households and similar establishments) can well be achieved under optimum framework conditions at a regional level.
When assessing the nation-wide coverage, you have to bear in mind that food waste only has to be collected together with other biogenous wastes if it can be recovered in a suitable plant. Otherwise, food waste is to be disposed of together with residual waste. Therefore, the scope of separate collection differs from Land to Land. Moreover, a high quality of input materials is a requirement of intensive bio-waste collection in order to ensure adequate compost grades.

Draft Ordinance of the Federal Minister of Agriculture and Forestry, Environment and Water Management on quality requirements for compost produced from waste

Biogenous wastes offer a great potential for the implementation of a well-functioning cyclic economy. The Ordinance on the separate collection of biogenous wastes, Federal Gazette 1992/68, takes this fact into account. In order to ensure the recovery cycle in this field, it is also important to define conditions under which recovered wastes can become products and marketed widely.

The Federal Ministry of Agriculture and Forestry, Environment and Water Management prepared a draft Ordinance on quality requirements for compost produced from waste in accordance with Article 2 (3a) of the Waste Management Act. The EU notification procedure was already performed and did not result in any objections.

The Ordinance defines the conditions under which compost becomes a product. Compost generated from waste may only be placed on the market if it meets the requirements defined in the Ordinance. Exemptions are granted for certain small quantities and for compost produced under certain provisions of Land legislation. However, these compost types are not considered to be products.

The Ordinance contains provisions on:
- the production of compost (input and obligations to keep records),
- quality requirements as a function of permitted utilisation, and
- labelling of compost.

The Ordinance defines the input materials that may be used for producing compost in line with the various fields of application of the final product. In addition to biogenous waste, low-pollutant sewage sludge may also be used under the Compost Ordinance. In particular, the labelling of composts produced from especially clean sewage sludge may provide an incentive for the improvement of sewage sludge quality.

To a very limited extent, residual waste may also be used in the production of compost. This is necessary, in particular, in the context of the rules of free trade. Due to the generally higher risk involved in the application of compost from residual waste, it may only be used in special cases, such as the re-cultivation of landfills where no plants are cultivated for consumption and biofilter production. Such compost may only be passed on by direct sales under a written contract.

Depending on the intended utilisation, compost has to comply with certain limit values (compost classes A+, A and B). In line with the input materials used, the following compost types are defined:
- compost,
- high-grade compost (also has to comply with the limit values of Class A),
- high-grade sewage sludge compost (also has to comply with the limit values of Class A),
- compost from waste.

Compliance with the limit values is to be documented by a certificate of an authorised external expert or technical institute that is to be commissioned by the compost producer (compost assessment).

The Ordinance provides for various fields of compost application:
- agriculture (soil improvement, fertilisation and agricultural re-cultivation and erosion protection measures in the applications of arable land, pastures, vegetable cultivation, viticulture, hop cultivation, orchards, horticulture),
- landscaping and landscape care (only land not used for food and feed production for the production and maintenance of re-cultivation layers),
• re-cultivation layers on landfills,
• biofilter production,
• soil production (compost as an ingredient).

Anybody placing compost on the market, including importers, have to make sure that the compost meets the requirements of the Compost Ordinance. They also have to see to it that the labelling provisions are complied with to provide comprehensive information to the users with regard to the useful, permitted and safe application of the product and prevent that users are deceived. The labelling provisions include mandatory and optional information (if the requirements are not met, compost must not be placed on the market). In particular, data on the manufacturer, production process, product grade and recommendations for use are to be provided.

5.4.3. Plant-related measures (state of the art)

Wastes that cannot be recovered are to be subjected — according to their properties — to treatment using biological, thermal or chemico-physical processes. Solid residual matter is to be stored after conditioning in a state of minimised reaction (Art. 2 (3) of the Waste Management Act).

The objectives of the Waste Management Act are to be pursued in line with this principle of waste treatment and disposal. They include the prevention of adverse effects on people and the environment, the conservation of raw material resources, energy sources and landfill capacities as well as the disposal of only those types of waste not resulting in potential hazards to future generations.

The objectives and principles of the Waste Management Act are deliberately referred to several times in the present Federal Waste Management Plan as they play a crucial role in particular in considerations on the development of suitable measures for waste treatment and disposal.

According to Art. 29 (18) of the AWG, the Federal Minister of Agriculture and Forestry, Environment and Water Management may issue, by way of ordinance, more detailed provisions on the prevention of adverse effects in the sense of Art. 1 (3) of the AWG with regard to state-of-the-art equipment and operation of waste treatment plants to be licensed under the AWG, including the definition of the quality of wastes to be treated, the criteria and limit values for the allocation of wastes to these plants, the inspection and monitoring during operation as well as follow-up and the state-of-the-art emission limits to be complied with by these plants.

The AWG defines “state of the art” as the development level of advanced processes, installations or operation methods that are based on relevant scientific findings and whose functionality has been tested and proven. Specifically, comparable processes, installations or operation methods are to be used to determine the state of the art (Art. 2 (8) of the AWG).

The need to issue appropriate ordinances is primarily perceived in the field of landfills and plants for the thermal and mechanico-biological treatment of waste. Moreover, it is necessary to assess emerging processes and technologies, which are in part completely new, for the processing and recovery of special types of waste (e.g. contaminated soil, used comestible oils and fats, WEEE, dust containing heavy metals and residues from incineration plants) in order to ensure both operation in the most environmentally friendly and emission-free manner possible and to create competition equality among potential plant operators. Such assessments not only relate to the technologies used, but also include considerations of overall waste management to the greatest extent possible. The objectives to be achieved are:

• highest possible degree of recovery (material/thermal),
• greatest possible coverage of pollutants,
• lowest possible emissions during operation,
• far-reaching operational safety and accident prevention,
• sustainable residue grades.

The primary purpose of such assessments is to provide orientation both to plant operators and licensing authorities. Only later on, it will be possible to define the state of the art for sufficiently tested and applied processes, which may also be made binding by way of ordinance.

In this context, the differentiation of hazardous and non-hazardous waste is less important than the de-
development of material-related treatment principles ensuring the application of the state of the art. For information on treatment principles for individual waste classes, see the Supplement to the Federal Waste Management Plan 2001, “Guidelines for Waste Shipment and Treatment Principles”.

5.4.3.1. Waste landfills

The final stage of any treatment measures is the landfilling of residual matter. All the preceding steps are to aim at obtaining residues that are as inert and little reactive as possible in order to allow for long-term disposal without hazards to future generations as well.

In order to achieve this objective, top priority was given to the definition of the state of the art for the landfilling of waste. Landfilling is the disposal option most frequently used in Austria and, in the form currently practised, is in clear contradiction to the objectives and principles of the AWG. In total, around 43 % of household and similar waste is still landfilled without any pre-treatment.

Therefore, an ordinance on the state-of-the-art equipment and operation of plants for the disposal of waste (Landfill Ordinance) was issued in accordance with Art. 29 (18) of the AWG. The Ordinance entered into force for new plants on 1 January 1997. The gradual adaptation of old plants is performed in compliance with an amendment to the Water Act that entered into force on 1 July 1997 and an amendment to the AWG (Federal Gazette I 2000/90) and should be completed by the year 2004 (with a few exceptions until 2009). As an incentive for the more rapid upgrading of older plants to the state of the art, including suitable waste pre-treatment, and to ensure the continuation of measures for the remediation of contaminated sites, an amendment to the Act on the Remediation of Contaminated Sites was adopted in 1996. It has resulted, in part, in drastic increases in the remediation contribution to be paid for the disposal of waste at inadequately equipped landfills in 1997 and the following years. By another amendment of the Act on the Remediation of Contaminated Sites (Federal Gazette I 2000/142), the charges on the disposal of untreated organic waste have again been raised significantly as per 2004 and 2006 (ATS 900 and ATS 1,200 respectively). At present (from 1 January 2001 on), the remediation contribution on the landfilling of untreated residual waste amounts to ATS 500 per tonne.

The Landfill Ordinance defines a binding state of the art that, with a view to the objectives and principles of the AWG, particularly focuses on the quality of residual matter to be deposited and, thus, on the so-called “internal safety” of the landfills. This constitutes a substantial step towards the fulfilment of the requirement that only those substances are to be landfilled which release no emissions harmful to the environment to the media of air, water and soil. However, this naturally does not make follow-up absolutely redundant. Even landfills for the disposal of pre-treated waste require follow-up measures, but they are easier to assess and much less complex and expensive at any rate.

Another major issue dealt with in the Landfill Ordinance is the establishment of limit values for overall pollutant contents and pollutant contents in eluates with regard to waste to be deposited above ground as well as strict requirements for waste assessments and incoming inspections. Furthermore, four types of landfills are differentiated according to the type and behaviour of the waste to be deposited there (excavated soil, demolition waste, residual waste and mass waste landfills). The requirements to be met by the sites of landfills, the technical design of the landfill structures and landfill operation are mainly oriented to groundwater protection.

The scope of the Ordinance does not include underground disposal sites and temporary/interim waste storage sites.

Compliance with the required waste grades is to be ascertained by a so-called overall assessment that must be based on chemical analyses when representative sampling is possible. By means of this overall assessment, wastes that have to be classed as hazardous according to the Waste Classification Ordinance may also be exempted. As the Landfill Ordinance does not provide for aboveground landfills for hazardous wastes any more, the depositing of these waste types is only permitted after an appropriate exemption upon the implementation of Council Directive 1999/31/EC on the landfill of waste on 16 July 2001 (see Art. 17 (1) of the AWG, Federal Gazette I 2000/90). In addition to the AWG amendment already adopted, the Directive’s trans-
position also requires an amendment to the Landfill Ordinance, which is in preparation. This will not result in changes of essential requirements, in particular with regard to the ban on landfilling organic wastes.

On the one hand, the microbial degradation of landfilled organic substances results in the formation of landfill gas that has to be burnt off after proper collection, which will never be complete. On the other hand, acidic degradation products are created that substantially increase the leachability of the pollutants contained in the deposited waste via the leachate. As relatively low carbon contents can already lead to relevant microbiological degradation, the Landfill Ordinance stipulates that the share of degradable carbon be reduced as much as possible in the waste to be deposited. To this effect, limit values for TOC (total organic carbon) were introduced for each landfill type, with the maximum permitted content of organic carbon being set at 5% by weight. (Thereby, the strategy on the reduction of the landfill of biodegradable waste is already completely implemented as defined in Council Directive 1999/31/EC on the landfill of waste.) Essentially, it will only be possible to reduce the share of organic waste by means of thermal processes. In this context, the Federal Waste Management Plans of 1992, 1995 and 1998 already unmistakably stated that the thermal treatment of residual waste has to be considered a sensible and necessary form of treatment and that, if suitable technologies are used, has more favourable impacts on the environment than alternative treatment processes.

Mechanico-biological processes only are to be considered pre-treatment methods that are to be supplemented by further processes and do not serve the same objectives as thermal treatment, which, in combination with the subsequent landfill of the residual material, can be called an overall solution. The Landfill Ordinance provides for exceptions with regard to the application of alternative processes to comply with the requirements of the Landfill Ordinance, e.g. mechanico-biological treatment that would constitute an improvement of the status quo at any rate: Instead of the TOC, it is possible to use a calorific value based on the dry matter of less than 6,000 kJ/kg.

Thus, the Landfill Ordinance certainly does not result in a monopoly of a specific treatment process or the obligatory enforcement of thermal treatment of residual waste. Similarly, it should be noted, however, that the direct landfill of untreated residual waste containing releasable organic substances clearly contradicts the objectives and principles of the AWG and, therefore, only is to be considered a transitional solution for a limited period of time.

**Adaptation of older landfills**

First of all, the state of the art to be defined in the Landfill Ordinance only focused on the essential changes of existing facilities and, of course, on new installations to be licensed under the AWG. In order to allow for its analogous application to older plants, this state of the art was also made binding for the sector covered by the Water Act and, in parallel, a period was set for the adaptation of existing landfills. This procedure which may seem to be rather complicated was necessary due to the fact that older plants had mainly been licensed under the Water Act.

In order to prevent crass distortions in competition between new and old facilities, the transition periods for upgrading to the state of the art are relatively short. Landfill operators were obliged to report by the end of 1997 either the closing of their sites by no later than 1 July 1999 or, if operation was to be continued, the landfill type envisaged with regard to adaptation to the state of the art according to the Landfill Ordinance (excavated soil, demolition waste, residual matter or mass-waste landfill).

Adaptation measures are carried out in three stages to be concluded by 1 July 1998, 1 July 1999 and 1 January 2004, respectively. While the first two stages essentially focus on the implementation of requirements related to landfill engineering, the third stage is to ensure compliance with the appropriate waste grades. Landfills for excavated soil and demolition waste had to be fully adapted to the state of the art already by 1 July 1999.

In general, it should be noted that all the adaptation measures have to be reported to the authorities no later than six months prior to the deadlines identified. In the course of the further official proceedings, required measures can be stipulated or, in cases of
imminent danger, directly ordered if the measures taken are insufficient or if the obligations are not fulfilled. In this context, the authorities may temporarily restrict or suspend the operation of the landfill. However, upon request, the authorities may also permit deviations from the state of the art if these protect the public interest and desist from certain state-of-the-art requirements if compliance with them would require unreasonable efforts (except for the landfill ban in accordance with Art. 5 of the Landfill Ordinance).

The performance of adaptation measures is facilitated by the fact that they need not be licensed unless they would affect rights of third parties without their consent.

Art. 45 (a) of the AWG provides for wide-ranging consequences for the failure to meet deadlines. If reports on closing or continued operation are not submitted or if the requirements stated are not met in due time, the acceptance of waste is forbidden until the relevant measures have been taken. In the latter case, periods of grace may be granted upon request under exceptional circumstances. The responsibility borne by the implementing authorities in this connection is especially emphasised.

The state of the art according to the Landfill Ordinance is to be applied in pending licensing proceedings if these have been initiated after 1 January 1996. In proceedings initiated at an earlier date, the licensing is to be based on the stated requirements relating to the adaptation to the state of the art; related changes to projects are only considered to be new applications if the adaptations adversely affect third party rights.

Waste treatment plants to meet the requirements of the Landfill Ordinance

Although the shift of waste disposal (in particular residual waste) from direct landfills to the pre-treatment (thermal, mechanico-biological) demanded in all requirements continues to make progress, it still requires even speedier and more targeted action with a view to compliance with the deadlines laid down in legislation.

The introduction of suitable activities towards pre-treatment are not to be seen in direct dependence on, or competition with, waste prevention and recovery measures. The required plant capacities must naturally be adjusted accordingly. In parallel, precautions have to be taken to ensure the environmentally sound treatment of residual waste, which will never be completely avoidable in our highly industrialised society oriented to market economy; this is necessary not only to comply with the requirements of the AWG and to prevent future contaminated sites, but also primarily to live up to our responsibility for future generations.

It is an uncontested fact that quality improvements in waste treatment also result in higher costs which eventually have to be borne by the citizens. However, this issue must not be considered in a shortsighted manner. On the one hand, the current waste fees are still relatively low in comparison with sewage fees, and no one disputes the sensibility and purpose of proper sewage purification today. On the other hand, increased costs of waste disposal (which are certainly affordable to individual citizens in our affluent society) must be seen in relation to the much greater economic disadvantages of a remediation of contaminated sites resulting from inadequate waste disposal. Currently, old landfills must be remediated or secured at a high cost also in Austria.

Underground landfills and interim waste storage

There are two types of underground landfills: sites that are permanently sealed off from the biosphere and, thus, allow for the reversible storage of mainly hazardous wastes for which no suitable processing technologies exist at present, and sites that do not have such encapsulation and have to meet at least the same requirements as above-ground landfills with regard to the quality of residual matter. At present, binding regulations on the technical prerequisites do not exist, but are to be created in the course of the transposition of the European Directive.

Interim waste stores are available at almost every treatment plant and essentially serve as initial acceptance areas. Temporary storage sites are used for specific types of waste until they are further treated at a later date. Both interim and temporary stores basically are building structures that can be controlled at any time and where accident prevention and operational safety are given high priority.
5.4.3.2. Mechanico-biological waste treatment

In line with the objectives and principles of the AWG, the Landfill Ordinance focuses on the quality of the waste to be disposed of. According to it, waste is to be landfilled in a state of minimised reaction in order to reduce the resulting hazard potential for future generations. This is primarily achieved by the extensive reduction of the percentage of degradable carbon, which is reflected by a limit value for TOC (total organic carbon) of 5% by weight. In the case of residual waste, it will only be possible to meet this requirement by using thermal processes. Here, the favourable environmental effects are greater than those of alternative treatment processes.

Under certain conditions, the Landfill Ordinance also permits the use of mechanico-biological processes. Even if the TOC limit value is exceeded, residues from such plants may be deposited in special areas of a mass-waste landfill if the combustion value (upper calorific value) based on the dry matter is less than 6,000 kJ/kg. This requires, in particular, the separation of highly calorific fractions which have to be submitted to thermal treatment at any rate.

In contrast to thermal processes, the state of the art of mechanico-biological waste treatment had not been defined. Therefore, after completion of the work on the Landfill Ordinance, the Federal Ministry of Agriculture and Forestry, Environment and Water Management has developed appropriate requirements for the environmentally sound operation of mechanico-biological waste treatment plants. Since data on the operation of such facilities may be deposited in special areas of a mass-waste landfill if the combustion value (upper calorific value) based on the dry matter is less than 6,000 kJ/kg. This requires, in particular, the separation of highly calorific fractions which have to be submitted to thermal treatment at any rate.

In this comprehensive publication based on reliable research results, it was possible for the first time to define concrete requirements for the environmentally sound operation of such facilities and, hence, to make a first, decisive step towards the orientation of all parties involved, notably planners, applicants and authorities.

As it was impossible to finally cover several essential regulatory fields, supplementary studies have been commissioned, most of which have already been concluded:

- Stability criteria for characterising the end products of mechanico-biological residual waste treatment processes [University of Agricultural Sciences, Waste Management Department, Institute for Water Conservation, Water Ecology and Waste Management]
- Technologies and concepts of exhaust air purification for mechanico-biological facilities for the pre-treatment of residual waste [Institute of Industrial Ecology, St. Pölten], including pilot tests of several processes for exhaust air purification
- Material balance of a mechanico-biological residual waste treatment plant (SEMA) [Technical University of Vienna, Institute of Water Quality and Waste Management, Waste Management Unit in co-operation with the Federal Environment Agency]
- Determination of the upper calorific value in accordance with the Landfill Ordinance [Scheidl, K.] on tests at a laboratory scale (collaborative trial of eleven laboratories), at a technical and large scale as a basis for the Austrian standard ÖNORM S 2118-1
- Exhaust air emission of the mechanico-biological waste treatment plant at Allerheiligen [Häusler, G., Angerer, T.; Federal Environment Agency]
- Exhaust air emission of the mechanico-biological waste treatment plant at Kufstein [Angerer, T., Reisenhofer, A.; Federal Environment Agency]
- Exhaust air emission of the mechanico-biological waste treatment plant at Siggerwiesen [Häusler, G., Angerer, T.; Federal Environment Agency]
- Exhaust air purification for mechanico-biological waste treatment [Angerer, T.; Federal Environment Agency]
- Pilot project on the mechanico-biological treatment of residual waste prior to landfilling in the Mürzverband — Project phase 2: Behaviour of mechanico-biologically pre-treated waste on the landfill site [Leoben University of Mining Engineering, Institute for Disposal and Landfill...
Technology (IED); in co-operation with the Office of the Styrian Government]

- Storage behaviour of mechanico-biologically pre-treated waste [Rolland, C., Federal Environment Agency]

In addition, expert working groups have been set up for the fields of exhaust air from mechanico-biological waste treatment, stability parameters and input to mechanico-biological waste treatment at the Federal Ministry of Agriculture and Forestry, Environment and Water Management.

In order to complete the data available, the Federal Environment Agency plans a pilot test to measure emissions of a mechanico-biological waste treatment plant equipped with improved thermal (regenerative) exhaust air purification systems. Moreover, the Austrian Standards Institute has drawn up a harmonised procedure for sampling, sample preparation and the determination of the upper calorific value in ÖNORM S 2118-1.

Based on the experiences made to date and taking into account current German legislation (federal orders on the ecological disposal of municipal waste, on biological waste treatment plants, concerning protection against emission and amendments to the sewage ordinance), the Federal Ministry of Agriculture and Forestry, Environment and Water Management prepared draft Guidelines for mechanico-biological waste treatment (2001) in co-operation with the Federal Environment Agency. This draft contains essential requirements with regard to the construction, characteristics and operation of mechanico-biological waste treatment plants (see Chapter 4.3.4).

The Guidelines, which are to be finalised already in 2001, are to serve as a basis for an ordinance according to Art. 29 (18) of the AWG in the medium term, which is to ensure, in particular, the adaptation of older plants to the state of the art.

5.4.3.3. Thermal waste treatment

Directive on the incineration of hazardous waste

Council Directive 94/67/EC on the incineration of hazardous waste was an important first step towards the definition of minimum standards for the thermal treatment of waste in the EU. It regulates the incineration of hazardous waste and defines requirements for permits and the technical equipment and operation of incineration plants.

The approach taken by the Directive covers all the three environmental media of air, water and soil, which is to prevent the transition of pollutants from one medium to another. A central issue of the Directive is the definition of limit values for the emission of air pollutants, including appropriate measurement techniques. In addition to provisions on the recovery and disposal of solid residues resulting from the operation of an incineration plant, specific rules are defined for waste water. Based on the Directive, the European Commission already submitted to the Council a proposal for detailed provisions on limiting waste water emissions from the cleaning of exhaust gases.

The Directive is not only applicable to plants exclusively incinerating waste, but also to installations burning hazardous waste as an additional fuel in industrial production facilities.

National implementation of the Directive


Thereby, the corresponding national legal framework for the incineration of hazardous waste has been created — both for plants specialised in the incineration of waste (waste incineration plants) and for installations using hazardous waste as an additional fuel for the generation of energy within the framework of production processes (co-incineration plants).
The Incineration Ordinance issued by the Environmental Ministry applies to all plants according to the AWG in which hazardous waste is burnt (Art. 28 and sub-paragraph 1 or 2 of Art. 29 (1)). It contains comprehensive provisions on:

- waste incineration plants (plants specialised in the incineration of waste), and
- co-incineration plants (installations using hazardous waste as an additional fuel for the generation of energy within the framework of production processes).

The objective of the Ordinance is to protect human life and health as well as the environment against harmful influences that may result from the incineration of hazardous waste.

The key element of the Ordinance is the definition of atmospheric emission limits. Strict limit values are set for waste incineration plants based on the Clean Air Act regarding boiler plants. The emission limits for co-incineration plants are to be calculated using the “mixing rule”. The mixing rule is based on the principle that emissions from waste incineration are to be dealt with separately from those resulting from the burning of other fuels. The formula ensures that the limit values applicable to co-incineration plants get closer to the relatively lower emission limits for waste incineration plants as the share of waste burnt increases.

**Delimitation of waste incineration and co-incineration plants**

A co-incineration plant is an incineration plant in which waste is used as substitute or additional fuel up to 40 % of the fuel’s actual thermal power input. Plants which exceed this 40 % threshold have to comply with the emission limits for waste incineration plants.

Additionally, the use of waste as a substitute fuel must not lead to a higher emission level nor to a build-up of pollutants in the product.

The 40 % threshold is limited to the use of hazardous waste if a positive list is issued for an incineration plant or when the Directive on the incineration of hazardous waste is implemented, but at the latest upon the deadline for the transposition.

The positive list serves for assigning wastes to specific categories of co-incineration plants. In particular, the following is defined:

- plant types for the assignment of wastes,
- waste types and quantities that may be incinerated in the individual types of plants,
- criteria and limit values for waste quality.

As a function of the flue gas cleaning performance and the process-related specifications of the plant in question, the positive list should define the permitted waste types and qualities (restriction of waste input by defining the maximum pollutant contents of the waste).

Dependent on the emission level of co-incineration plants, different criteria should apply to the type and quality of the waste input. The following criteria can be taken into account in the assessment of the emission level:

- quality of the raw material used,
- specific features of the production process,
- existence and capacity of flue gas cleaning systems, and
- the transfer of pollutants to the product.

Positive lists are to be prepared by the Federal Minister of Agriculture and Forestry, Environment and Water Management in agreement with the Federal Minister of Economic Affairs and Labour. The business quarters affected are to be involved in the lists’ preparation.

In accordance with the Ordinance, a timeframe of two years following its entry into force was set for the preparation of a positive list for the co-incineration of waste in cement producing plants. Given the recent entry into force of the Directive on the incineration of waste, an ordinance on a positive list will only be issued in conjunction with the implementation of this Directive with a view to achieving uniform regulations.

At present, the cement industry is the sector most involved in the co-incineration of waste. The Incineration Ordinance introduced provisions for cement producing plants that ensure an improvement of previous environmental standards. It is to be noted that the NOx emission levels currently permitted for existing cement works will have to be halved by
2007; a first adaptation step already has to be taken by 2002.

The Ordinance also contains comprehensive provisions on incoming inspections, equipment of the plants, operating conditions, measurement requirements, operator duties and inspections of the plants.

It entered into force on 1 February 1999 and has applied to new plants since that date. Existing plants have to comply with the Ordinance from 1 July 2000 on.

**Directive on the incineration of waste**

Provisions on the thermal treatment of non-hazardous waste are contained in Directive 2000/76/EC on the incineration of waste. It provides for a combination of the existing Directive 94/67/EC on the incineration of hazardous waste with the Directive on the incineration of waste and aims at raising the standard for waste incineration and the co-incineration of waste in production facilities and at defining it for all types of waste. The two Directives on the incineration of municipal waste that no longer correspond to the state of the art are to be repealed.

The Directive is strongly modelled on Directive 94/67/EC on the incineration of hazardous waste and defines requirements for specialised incineration plants and industrial co-incineration plants. Plants at which only the following wastes are treated are excluded from the scope of the Directive (just like experimental plants for research purposes which treat less than 50 tonnes of waste per year):

- vegetable waste from agriculture and forestry,
- vegetable waste from the food processing and paper industry, if the heat generated is recovered,
- certain types of wood waste (wood waste not containing halogenated organic compounds or heavy metals as all as wood from construction and demolition waste),
- cork waste,
- radioactive waste,
- animal carcasses as regulated by Directive 90/667/EEC.

The Directive again stipulates the “40 % restriction” to the use of hazardous waste as a substitute or additional fuel, but this quantitative limit does not apply to non-hazardous waste.

Moreover, Article 7 (4) states that “in the case of co-incineration of untreated mixed municipal waste, the limit values will be determined according to Annex V, and Annex II will not apply.” This means that plants for the co-incineration of untreated mixed municipal waste have to comply with the same limit values as specialised waste incineration plants.

On principle, the share of exhaust gas resulting from the co-incineration of waste should not lead to a pollutant emission level that is higher than the one permitted for specialised waste incineration plants. Therefore, the emission limits for co-incineration plants are to be calculated using the “mixing rule”. Cement kilns are excluded from this principle since fixed emission limit values have been defined for them.

The Directive has to be transposed into national law within two years after its entry into force.

**5.4.3.4. Plants and Sites**

Based on a detailed inventory, Chapter 4 on “Requirements for waste prevention, recovery and treatment” makes clear statements on existing and lacking treatment capacities both for hazardous and non-hazardous waste, broken down by regions. In general, it should be noted that it is not always possible to clearly differentiate between plants treating hazardous waste and those treating non-hazardous waste. Moreover, this differentiation is only of secondary importance since the focus is on compliance with the treatment principles and on the definition of the state of the art. This becomes especially clear when looking at the example of landfilling of waste. The Landfill Ordinance specifies residue qualities that only permit the landfilling of non-hazardous waste (ban on the surface depositing of hazardous waste in accordance with the amended AWG, Federal Gazette I 2000/90).

With regard to a secured disposal timeframe of at least ten years, the inventory of treatment capacities shows that sufficient landfill volumes continue
to be available for non-hazardous waste all over Austria, though regional bottlenecks may occur, in particular in relation to the required adaptation of such facilities to the state of the art. Residual waste treatment will have to be developed increasingly in the direction of pre-treatment due to the Landfill Ordinance. The resulting residual matter, which has a much lower mass and volume than untreated waste, can largely be deposited in existing landfills to be adapted to the state of the art, i.e. in compartments to be constructed for this purpose.

In order to comply with the waste qualities specified by the Landfill Ordinance, it will be absolutely necessary to build appropriate waste treatment facilities. In the context of the reduction of the share of organic waste, the Federal Ministry of Agriculture and Forestry, Environment and Water Management considers thermal waste treatment to be a particularly important process because its beneficial effects on the environment are much greater in comparison with alternative processes if suitable technologies are used. Also when mechanico-biological treatment plants are used, which may well make sense in some regions in particular for economic reasons as adaptable facilities exist, the high-calorific fractions to be separated will have to be treated in thermal plants. The need for additional thermal waste treatment capacities for non-hazardous wastes (including household and similar waste) continues to be at least 2.5 million tonnes (including plants in operation).

In spite of numerous, in part promising initiatives for the installation of appropriate plants (in particular, for thermal and mechanico-biological treatment) the efforts to meet the deadlines laid down by law have to be further intensified. This applies equally to the Länder and waste management associations as well as trade and industry. Speculations on a potential softening of the relevant provisions of the Landfill Ordinance and the implementation deadlines have to be contradicted with determination.

In comparison with the Federal Waste Management Plan 1998, the previous lack of capacity in the field of the thermal treatment of hazardous waste was practically reduced to zero as existing facilities mainly treating non-hazardous waste that meet the relevant technical requirements have applied for adjustments of their permits. Therefore, there is, at present, no direct need for setting up facilities for the exclusive thermal treatment of hazardous waste in addition to the plant of Fernwärme Wien GmbH at Simmeringer Haide. However, bottlenecks may occur, in particular when the ban on the landfill of hazardous waste will be implemented and due to the short-term treatment of waste from contaminated sites.

Chapter 4 further illustrates that adequate treatment capacities are available in the field of the treatment of special types of hazardous waste (fluorescent lighting tubes, refrigeration equipment, etc.).

The experiences of recent years have shown that the specification of location areas and thus the regional distribution of plants for the treatment of hazardous waste throughout Austria required by sub-paragraph 4 of Art. 5 (2) is neither appropriate nor possible in every case. On the one hand, the requirements to be met by the sites of special treatment plants frequently are in opposition to aspects of regional planning. On the other hand, the centralisation of such plants closer to the place of waste generation cannot be reasonably substantiated, especially due to the smallness and narrowness of the Austrian economic area and the relatively short transport distances. Therefore, the regional distribution was not specified in detail.
5.4.3.5. Relevance of waste management to climate protection

The requirements to be met by sustainable waste and materials management go far beyond the standards of ‘classic’ disposal and also make it necessary to integrate other environmental media and factors into waste management strategies and projects. The Austrian government has repeatedly committed to the objective of a reduction of greenhouse gas emissions, for example within the framework of the scientific conference of Toronto in 1988 and the political conferences of Rio in 1992 and Kyoto in 1997. As already demonstrated by the study on the Relevance of Waste Management for the Climate (Hackl, Mauschitz; Vienna 1997), waste management and its treatment processes are affected by this to a significant extent.

Though Austria’s annual per capita rate of CO₂ emissions of around 8.1 tonnes is slightly below the EU average because 70% of electricity is generated by hydropower plants and 13% of primary energy demand is covered by biomass, several measures have to be examined and implemented in order to move towards the targets defined.

One of these measures relates to waste management and the treatment techniques it uses. Waste management is the biggest source of methane emissions in Austria. Due to the steady increase of waste volumes, emissions continuously rose to 6.2 million tonnes of CO₂ equivalent in 1990. Since 1991, the sector has recorded a significant decrease in emissions (5.3 million tonnes in 1998) in spite of a further rise in waste volumes. This favourable development is primarily due to the impact of waste management legislation. The Landfill Ordinance probably is the most important legal tool for further measures to reduce climate-relevant greenhouse gas emissions in the field of waste management. The fact that greenhouse gases are generated and released by cryogenic, biological as well as thermal waste treatment processes raises the following question: Which contribution can be made by waste management to reduce emissions of the greenhouse gases of methane and carbon dioxide in Austria and to the development of this contribution within the period of time defined in the Kyoto Protocol? In order to illustrate this development, the example of “residual waste” was chosen to calculate emission balances for the years 1990, 1996 and 2010. The balances cover emissions resulting from residual waste treatment on site and emissions released due to the non-use of the energy content of landfill gas, residual waste and its fractions, by the combustion of fossil fuels in power plants, industry and small-scale incineration plants.

A comparison of the balances for 1990 and 2010 provides information on how much waste management in the field of residual waste contributes to:• the generation of greenhouse gases in these years,• the potential reduction of greenhouse gas emissions within this period of time,• the potential reduction of greenhouse gas emissions from fossil fuels due to the recovery of energy from residual waste,• to the confirmation of the appropriateness of existing legal requirements with a view to climate protection and to the basis for decisions on further measures.

On the basis of this information, it is possible to improve previous greenhouse gas balances in qualitative and quantitative terms as well as to include sound quantifying approaches for the field of waste management in the national programme for fulfilling the Kyoto Protocol.

For the years 1990 and 1996, the waste management situation of these two years was used as a basis. For 2010, a standard scenario was used that, from today’s perspective, represents the most likely development with regard to data on waste and treatment processes. To illustrate the influence of treatment processes, additional hypothetical scenarios were developed to calculate the balances for the year 2010, if only one method is used for the treatment of residual waste, i.e. thermal disposal of residual waste (WIP) or mechanico-biological residual waste treatment (MBP).

The balances and their comparison show:

• In 1990, the emissions caused by residual waste amounted to 2.03 million tonnes of CO₂ equivalent, i.e. around 2.7 % of total CO₂ and CH₄ emissions in Austria amounting to 74.24 million tonnes of CO₂ equivalent.
The biggest potential by far to reduce greenhouse gas emissions in the field of waste management is offered by the incineration of untreated waste with a maximum utilisation of heat and electricity generation. The Landfill Ordinance will result in a further substantial decrease both in methane and CO2 emissions (due to a higher level of landfill gas capture and increased thermal treatment of waste and energy recovery).

In a comparison of the years 2010 and 1990, direct emissions of residual waste management will decrease by around 250,000 tonnes of CO2 equivalent, i.e. by around 13.3%, from 1.88 million to 1.63 million tonnes of CO2 equivalent in the standard scenario.

In the standard scenario, the total emissions of residual waste treatment will fall by 840,000 tonnes of CO2 equivalent from 2.03 million tonnes of CO2 equivalent in 1990 to 1.19 million tonnes of CO2 equivalent in 2010, i.e. a reduction by around 41.5%.

A further decrease could be achieved, if the residual waste volume was reduced and the share of waste incineration was raised as compared with the standard scenario. Maximising the utilisation of heat generated by waste incineration plants will result in a higher reduction of CO2 emissions from fossil fuels due to the provision of substitute energy.

Based on the 13% reduction in greenhouse gas emissions as compared with 1990 within the deadline of the Kyoto Protocol to which Austria has committed, it is necessary achieve a decrease by around 10 million tonnes of CO2 equivalent. But as has to be expected that emissions will further increase to around 82 million tonnes of CO2 equivalent by the Kyoto deadline, it will be necessary to take measures to reduce emissions by around 15 million tonnes of CO2 equivalent in order to achieve the objectives. The field of residual waste management can make a significant contribution to this reduction.

Since, at present, around 8 million tonnes of waste can be incinerated and used for energy recovery in Austria, the total potential of waste management to contribute to a reduction of greenhouse gas emissions is higher than the amount indicated in this study that only focused on residual waste. By 2010, considerable emission reductions by around 1 million tonnes of CO2 equivalent can be achieved in particular in the fields of industrial and trade waste as well as bulk waste by increasing thermal treatment and optimising energy recovery (Brunner/Fehringer, Vienna 1997).

The Austrian climate strategy for achieving the commitments made at the Kyoto Conference with regard to the obligatory reduction of climate-relevant gases includes special action programmes for all the key emission sectors.

The actions defined for the waste sector specifically aim at promoting and intensifying the effects resulting from the implementation of the Landfill Ordinance. In this context, it is of vital importance that thermal treatment plants ensuring an appropriate energy recovery (electricity and heat) are established soon. Additionally, efforts have to be intensified to optimise the collection of landfill gas and the recovery of energy from this gas. The following measures are planned:

- Continuation of the implementation of the Landfill Ordinance.
- Speedy decisions on the required treatment strategies for the implementation of the Landfill Ordinance.
- Preparation of action plans at the Land and municipal level.
- Accompanying measures to develop district heating networks around thermal treatment plants within the framework of regional planning.
- Promotion of an accelerated implementation of the Landfill Ordinance going beyond legal requirements, in particular by means of financial incentives for the establishment of thermal treatment plants with a minimum total efficiency of 65% as well as for the recovery of energy from landfill gases from the environmental promotion funds of the federal government; adaptation of the environmental promotion guidelines of the federal government.
• Adaptation of the ALSAG contribution (ALSAG was already amended by the Act accompanying the 2000 budget consolidation) taking into account the climate relevance of various treatment techniques.

• Support for research projects and promotion of the application of technologies for the reduction of climate relevant emissions.

5.4.4. Ordinances under the Chemicals Act 1996

Based on Art. 14 Chemicals Act (Federal Gazette 1987/326), the ordinances described below have been issued. Today, their legal basis is the Chemicals Act 1996 (Federal Gazette 1997/53) and they continue to apply to their full extent in spite of Austria’s accession to the EU. These ordinances resulted in an improved situation also in the field of waste management, in particular in the field of qualitative waste prevention.

Ordinance on the ban on fully halogenated chlorofluorocarbons as pressure gas in compressed gas packaging, Federal Gazette 1998/55

The ban on placing on the market compressed gas packaging containing fully halogenated chlorofluorocarbons became effective on 28 February 1990. This Ordinance results in a qualitative prevention of waste. As a result, more packagings with pump or atomiser mechanisms are used which allow for easier recovery in processing terms.

Formaldehyde Ordinance, Federal Gazette 1990/194

With regard to qualitative waste prevention, this Ordinance, which entered into force on 1 March 1990, eliminated formaldehyde, a dangerous chemical substance, from wood materials and derived products as well as detergents, cleaning agents and hygienic products.

Ordinance on the restriction and ban on the use, production and marketing of fully halogenated chlorofluorocarbons, Federal Gazette 1990/301

The provisions most relevant to waste management are the ban on the use of fully halogenated chlorofluorocarbons as a heat transfer medium in large-scale equipment from 1 January 1992 on and in smaller devices from 1 January 1994 on, as well as the ban on their use in the production of cellular materials from 1 January 1993 on.

This Ordinance, inter alia, simplifies the disposal of waste refrigerators since chlorofluorocarbons are
currently used as both a heat transfer medium and in insulation materials.

**Ordinance on the restriction of the placing on the market, producing and using as well as on the identification of materials, preparations and prefabricated products containing asbestos, Federal Gazette 1990/324**

Upon the entry into force of this Ordinance, the use of asbestos was banned in almost all areas, including the building construction industry (with a transition period until the end of 1993).

Special care must be taken in the disposal of asbestos dust (e.g. moistening or consolidation with cement).

In the construction industry, demolition companies must remove components and paints containing asbestos before demolition taking utmost safety precautions and consolidate asbestos fibres before landfilling.

In a decree regarding the AWG, requirements were set out for collection and treatment operators of asbestos waste.

**Ordinance on the ban on pentachlorophenol, Federal Gazette 1991/58**

Pentachlorophenol was used as preservative and disinfecting agent for wood, textiles and leather.

The general ban on this substance, which became effective on 6 February 1991 and was subject to transition periods for leather goods ending in late 1992, entails qualitative waste prevention in many fields since waste wood preserved with scumble containing pentachlorophenol is classified as hazardous waste.

**Ordinance on a ban on specific dangerous substances in underwater paint materials, Federal Gazette 1992/577**

This Ordinance covers those substances the accumulation of which in the sediment of waters is dangerous due to their eco-toxicity and which consequently would have to be handled as hazardous waste, even in the form of residual paint and swarf.

**Ban on 1,1,1-trichloroethane and carbon tetrachloride, Federal Gazette 1992/776**

Like all technically used chlorinated solvents, these chlorinated hydrocarbons that damage the ozone layer result in serious environmental problems. Thus, all measures reducing the waste quantities containing these compounds are to be welcomed.

**Ban on polychlorinated biphenyls, terphenyls, naphthalenes and diphenylmethanes, Federal Gazette 1993/210**

The ban on polychlorinated biphenyls (PCBs) applies to insulating oils in capacitors and transformers, to hydraulic fluids and numerous other applications. In particular, the marking requirements applying to electrical equipment and the mandatory determination of the PCB content of insulating oils facilitate the identification of potential sources of danger. Even small amounts of PCBs are dangerous since they are hazardous to human health and the environment and, furthermore, lead to the formation of chlorinated dioxins in uncontrolled incineration processes.

Brominated biphenyls have also been banned (use as flame retardants in plastics) so that the Ordinance also has an impact on waste quality in this field.

**Cadmium Ordinance, Federal Gazette 1993/855**

This Ordinance bans the use of cadmium in colour pigments and stabilisers for plastics as well as a metal coating, in particular with regard to electrical contacts.

Heavy metals, such as cadmium, are especially problematic in the field of synthetic waste, which particularly applies to PVC. Therefore, the burden is expected to be reduced in this field in the long term.
Ordinance on a ban on specific hydrochlorofluorocarbons (HCFC Ordinance), Federal Gazette 1995/750

This Ordinance applies to the marketing and the use of certain hydrochlorofluorocarbons and hydrobromofluorocarbons as well as methyl bromide. Specifically, it prohibits the placing on the market and the use of methyl bromide, HCFCs and HBFCs with detailed regulations on exemptions from the ban. These substances that deplete the ozone layer were mainly used as solvents, in the production of cellular material and as cooling agents.

Ordinance on the ban on halons, Federal Gazette 1990/576

This Ordinance bans the production, marketing and use of brominated, fully halogenated hydrocarbons. Halons were primarily used in fire extinguishers and fire-fighting systems. They are a major cause of the depletion of the stratospheric ozone layer.

Solvents Ordinance 1995, Federal Gazette 1995/872

On 1 January 1996, this Ordinance replaced the previous (old) solvent ordinance dating from 1991. It contains a general ban on benzene and chlorinated hydrocarbons in paints, lacquers and varnishes (wood protecting agents) and restrictions on the use of organic solvents in paints, lacquers, varnishes and medicinal products.

Due to the mandatory replacement of the above-mentioned solvents by water, alcohol, etc., this Ordinance not only results in qualitative waste prevention, but also in a reduction of waste quantities due to a change to alternative, low-waste and low-emission technologies.

EC chemicals harmonisation ordinance, Federal Gazette 1996/169

This Ordinance contains provisions concerning substances and preparations restricted or prohibited in the EU. Its scope includes the marketing or use of vinyl chloride, specific fluids in decorative objects, jokes and hoaxes, textile auxiliary agents, benzene, specific carcinogenic substances, DBB as well as mercury, arsenic and organotin compounds.

Ordinance on further bans and restrictions on the placing on the market and use of specific dangerous chemical substances and finished goods treated with them, Federal Gazette II 1998/461 as amended in Federal Gazette II 2000/258

This Ordinance contains provisions concerning substances and preparations restricted or prohibited in the EU. The scope of this Ordinance includes the placing on the market and the use of creosote and wood treated with it, hexachloroethane, certain chlorinated solvents, carcinogenic and mutagenic substances, substances toxic to reproduction as well as certain dangerous liquids, such as lamp oils.

Ordinance on the establishment of a halon bank, Federal Gazette II 2000/77

This Ordinance has the following objectives: defining applications in which halons may still be used after 1 January 2000 (“critical uses”), ensuring that the use of halons is limited to “critical uses”, inventorying halon stocks existing in Austria on 1 January 2000, ensuring that halons will be available from these stocks for “critical uses” by establishing a national halon bank and controlling and reducing emissions to the environment. These objectives are to be achieved by implementing a special halon management concept (“halon bank”).

Additional information:

The following European regulation is also of relevance in the field of chemicals legislation:


This Regulation applies to the production, importation, exportation, placing on the market, use, reco-
very, recycling and reclamation and destruction of chlorofluorocarbons, other fully halogenated chlorofluorocarbons, halons, carbon tetrachloride, 1,1,1-trichloroethane, methyl bromide, hydrobromofluorocarbons and hydrochlorofluorocarbons. It also applies to the reporting of information on these substances and to the importation, exportation, placing on the market and use of products and equipment containing those substances. According to this Regulation, the production, placing on the market and use of chlorofluorocarbons, other fully halogenated chlorofluorocarbons, halons, carbon tetrachloride, 1,1,1-trichloroethane, hydrobromofluorocarbons and hydrochlorofluorocarbons is prohibited or restricted (exemptions only for essential uses of CFCs and critical uses of halons).

Furthermore, restrictions on the production and placing on the market are defined for methyl bromide and HCFCs and the use of HCFCs for specific applications is banned. The Regulation also provides for a system for the licensing of imports and exports of the above-mentioned substances.
5.5. Securing and remediation contaminated sites

The Act on the Remediation of Contaminated Sites (ALSAG) adopted in 1989 constitutes the legal basis for surveying contaminated sites and for financing and implementing securing and remediation actions in Austria.

From the notification of suspected contaminated sites to their securing and remediation

The process of identifying former disposal or industrial sites as contaminated sites as requiring securing and remediation actions in the inventory of contaminated sites begins with the notification of suspected contaminated sites (“Verdachtsflächenmeldung”) by a Land governor. For this purpose, a special form is used that must contain minimum information in summarised form. If the suspicion is well founded, the site is included in the inventory of suspected contaminated sites, which can also be accessed on the Internet at www.bmu.gv.at.

In a preliminary assessment of the hazard potential, the Federal Environment Agency identifies the range of risk and the need for further examinations. In case of suspected sites for which a high risk potential is expected, preliminary examinations may also be commissioned by the Federal Ministry of Agriculture and Forestry, Environment and Water Management to assess the risk involved. These examinations are funded by remediation contributions.

If the risk assessment results in a registration in the inventory of contaminated sites, a priority is assigned to the site to indicate the risk level and the urgency of required securing and remediation measures. This information included in the inventory of contaminated sites may also be accessed on the Internet at www.bmu.gv.at.

By 1 January 2001,

- 37,864 former disposal and industrial sites had been registered in the data base of the Federal Environment Agency,
- 2,481 sites had been included in the inventory of suspected contaminated sites,
- 40 sites had been classified as sites to be monitored,
- 158 suspected sites had been registered in the inventory of contaminated sites,
- 57 contaminated sites are being secured or remediated, and
- 53 contaminated sites had been identified as “secured” or “remediated” in the inventory of contaminated sites.

The number of contaminated sites for which the successful completion of securing or remediation measures was proven and that have been identified as “secured” or “remediated” by the Federal Ministry of Agriculture and Forestry, Environment and Water Management has substantially increased as compared with previous years.

Figure 26: Secured/remediated contaminated sites, 1990-2000

![Figure 26: Secured/remediated contaminated sites, 1990-2000](image-url)
Amendment to the Act on the Remediation of Contaminated Sites

When the Act on the Remediation of Contaminated Sites (ALSAG) was amended in 2000, the following changes were made to increase the incentives for a timely implementation of the Landfill Ordinance and to simplify the contribution system:

- Increase in the rates applicable to the disposal of untreated wastes (other waste according to Art. 6 (1) ALSAG) to ATS 900 in 2004 and to ATS 1,200 in 2006.
- Full harmonisation of the technical requirements with those of the Landfill Ordinance (alternative sealing of the landfill’s basis).
- Clear statement of the conditions under which no contributions have to be paid on re-cultivation layers.
- Provision for the correction or amendment of the own calculations by the party owing the contributions.
- Conversion of the amounts to euros.
- Authorisation of the preliminary funding of compensations for contaminated sites from remediation contributions in the years 2001 and 2002.

Revenue from remediation contributions

Securing and remediation actions are funded through the ear-marked remediation contribution. Out of the funds available from remediation contributions, 85% are used for promoting securing and remediation actions and 15% for the performance of supplementary examinations of suspected and proven contaminated sites as well as for studies. The revenue from remediation contributions has continuously increased and total around ATS 4.4 billion (as per 31 Dec. 2000), with a rise by approximately ATS 92 million being recorded in 2000 (for further information on revenue and spending, see Table 31).

Table 29: Rates of the contributions according to ALSAG for waste disposal at landfills not yet complying with the state of the art

<table>
<thead>
<tr>
<th>In ATS per tonne or part thereof</th>
<th>Demolition waste 1 excavated soil</th>
<th>2 contaminated excavated soil</th>
<th>3, 4 Other wastes</th>
</tr>
</thead>
<tbody>
<tr>
<td>from 1 January 2001 1100 (€ 7,20)</td>
<td>100 (€ 7,20)</td>
<td>200 (€ 14,50)</td>
<td>600 (€ 43,60)</td>
</tr>
<tr>
<td>from 1 January 2001</td>
<td>300 (€ 21,80)</td>
<td>900 (€ 65,00)</td>
<td></td>
</tr>
<tr>
<td>from 1 January 2001</td>
<td>1200 (€ 87,00)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Surcharge (ATS/tonne): 1 130 (€ 2.10), 2 200 (€ 14.50), 3 400 (€ 29), if an adequate sealing system or vertical enclosure does not exist.

4 Additionally ATS 400/tonne (€ 29) for disposal in a landfill licensed for household or similar industrial waste unless the landfill has a state-of-the-art system for collecting and treating landfill gas.

Table 30: Rates of the contributions according to ALSAG for landfills conforming to the state of the art

<table>
<thead>
<tr>
<th>In ATS per tonne or part thereof for demolition waste</th>
<th>Landfill for residual waste</th>
<th>Mass waste landfill</th>
</tr>
</thead>
<tbody>
<tr>
<td>from 1 January 2001</td>
<td>80 (€ 5.80)</td>
<td>150 (€ 10.90)</td>
</tr>
<tr>
<td>from 1 January 2001</td>
<td>100 (€ 7.20)</td>
<td>200 (€ 14.50)</td>
</tr>
</tbody>
</table>
According to the current system, the implementation of the Landfill Ordinance will again result in a gradual decrease of revenues.

Study on new funding models
In order to examine alternative funding options, the Federal Ministry of Agriculture and Forestry, Environment and Water Management prepared a study on (new) charge or funding models for the remediation of contaminated sites. On the basis of various parameters, future funding models were generated, described and finally submitted to a qualitative assessment and a sensitivity analysis.

Promotion Guidelines 1997 on Securing and Remediation of Contaminated Sites
The promotion of measures for the remediation of contaminated sites is based on the Environmental Subsidy Act (Federal Gazette 1993/185 as amended) and the Promotion Guidelines on Securing and Remediation of Contaminated Sites as adopted in 1997.

Table 31: Revenues from remediation contributions, 1990-2000

<table>
<thead>
<tr>
<th>Year</th>
<th>ALSAG-contributions</th>
<th>Subsidy</th>
<th>%</th>
<th>Suppl. examinations, studies</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>142,629,541.25</td>
<td>128,366,587.13</td>
<td>90.00</td>
<td>14,262,954.12</td>
<td>10</td>
</tr>
<tr>
<td>1991</td>
<td>172,718,684.66</td>
<td>155,446,816.19</td>
<td>90.00</td>
<td>17,271,868.47</td>
<td>10</td>
</tr>
<tr>
<td>1992</td>
<td>167,274,076.79</td>
<td>150,546,669.11</td>
<td>90.00</td>
<td>16,727,407.68</td>
<td>10</td>
</tr>
<tr>
<td>1993</td>
<td>215,721,432.89</td>
<td>172,577,146.31</td>
<td>80.00</td>
<td>43,144,286.58</td>
<td>20</td>
</tr>
<tr>
<td>1994</td>
<td>211,051,498.18</td>
<td>168,841,198.54</td>
<td>80.00</td>
<td>42,210,299.64</td>
<td>20</td>
</tr>
<tr>
<td>1995</td>
<td>285,161,900.78</td>
<td>228,129,520.62</td>
<td>80.00</td>
<td>57,032,380.16</td>
<td>20</td>
</tr>
<tr>
<td>1996</td>
<td>290,446,513.30</td>
<td>246,879,536.31</td>
<td>85.00</td>
<td>43,566,976.99</td>
<td>15</td>
</tr>
<tr>
<td>1997</td>
<td>447,675,315.29</td>
<td>380,524,018.00</td>
<td>85.00</td>
<td>67,151,297.29</td>
<td>15</td>
</tr>
<tr>
<td>1998</td>
<td>597,715,810.50</td>
<td>508,058,438.92</td>
<td>85.00</td>
<td>89,657,371.58</td>
<td>15</td>
</tr>
<tr>
<td>1999</td>
<td>878,102,258.00</td>
<td>746,386,919.30</td>
<td>85.00</td>
<td>131,715,338.70</td>
<td>15</td>
</tr>
<tr>
<td>2000</td>
<td>970,597,631.62</td>
<td>825,007,986.88</td>
<td>85.00</td>
<td>145,589,644.74</td>
<td>15</td>
</tr>
<tr>
<td>Total:</td>
<td>4,379,094,663.26</td>
<td>3,710,764,837.31</td>
<td>668,329,825.95</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 27: Development of revenues 1990-2000 and revenue estimates 1997-2004 (in million ATS)
At present, the following subsidy rates apply:

Applicants competing on the market
- 15% or 25% (small and medium-sized enterprises)
- 30% or 40% (small and medium-sized enterprises) if remediation values are exceeded
- 65% if no obligations can be imposed on the polluter (individual notification)

Applicants not competing on the market
- 65%

War-time contaminated sites
- 95%

Out of the promotion funds approved to date (around ATS 5.3 billion), approximately ATS 2.1 billion have already been paid out for ongoing securing and remediation projects. Further promotion applications totalling around ATS 5.2 billion are pending with Kommunalkredit Austria AG.

Community guidelines on state aid for environmental protection

The Promotion Guidelines 1997 on Securing and Remediation of Contaminated Sites comply with the requirements laid down by the European Union in the Community guidelines on state aid for environmental protection (94/C 72/03). As a rule, Community guidelines on state aid are in force for five to six years. Thus, the European Commission adopted a revised version of the Community guidelines on state aid for environmental protection that entered into force on 3 February 2001 (2001/C 37/03).

In the context of measures to promote the securing or remediation of contaminated sites, it is of particular importance that the polluter “must finance the rehabilitation in accordance with the “polluter pays” principle, and no state aid may be given.” This means that a polluter must not receive any state aid.

The Promotion Guidelines 1997 on the Securing and Remediation of Contaminated Sites have to be brought in line with the new Community guidelines on state aid for environmental protection by 1 January 2002.

Supplementary examinations of suspected and proven contaminated sites

The Federal Ministry of Agriculture and Forestry, Environment and Water Management may use 15% of the remediation contributions for studies and supplementary examinations in order to record, assess and evaluate suspected contaminated sites and to assign priorities to contaminated sites.

On 1 January 2001, a total of 162 supplementary examinations were underway (140 related to suspected sites and 22 related to contaminated sites). Ninety-eight supplementary examinations have already been concluded, of which 74 focused on sus-

<table>
<thead>
<tr>
<th></th>
<th>Suspected contaminated sites</th>
<th>Contaminated sites</th>
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<tbody>
<tr>
<td></td>
<td>underway</td>
<td>concluded</td>
</tr>
<tr>
<td>Upper Austria</td>
<td>43</td>
<td>28</td>
</tr>
<tr>
<td>Lower Austria</td>
<td>53</td>
<td>14</td>
</tr>
<tr>
<td>Salzburg</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Styria</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>Carinthia</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Burgenland</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Tyrol</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Vienna</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Vorarlberg</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>140</strong></td>
<td><strong>74</strong></td>
</tr>
</tbody>
</table>

Note: One project may cover several suspected or proven contaminated sites.
expected sites and 24 on contaminated sites. The results of these examinations are used for risk assessments (suspected sites) and for the assignment of priorities (contaminated sites) (see Table 32).

Around ATS 493 million have been allocated to the projects listed in the above table (as per 31 Dec. 2000). In total, around ATS 160 million have already been paid out for completed and ongoing projects.

Major amendment to the Remediation of Contaminated Sites Act

The following objectives are to be achieved by a comprehensive amendment to the Remediation of Contaminated Sites Act:

- Procedure according to ecological urgency
- Protection principle instead of precautionary principle
- Licensing of “overall” projects
- Extended responsibility of the property owner

The following first steps have been taken towards a comprehensive amendment to the Act on the Remediation of Contaminated Sites:

- Preparation of a preliminary concept for a procedural act related to contaminated sites

- Study for clarifying complex legal issues and integration into the revision of the concept. On the basis of this study, meetings have been held especially with regard to funding at a federal level for the time being.

- The amendment to the AWG (Federal Gazette I 2000/90) simplified the legal situation with regard to landfills. Since 1 January 2001, Art. 138 of the Water Act no longer applies to landfills. Any administrative police order related to an abandoned or closed landfill has to be issued in accordance with Art. 32 (1a) of the Water Act, if this is necessary in the public interest; thus, the landfill's environmental impact is decisive rather than the absence of a consensus, as defined by Art. 138 of the Water Act.

- Furthermore, the authority may proceed step by step (examinations, regular sampling, submission of a securing or remediation concept, definition of securing or remediation measures).

- In many cases, delays in the remediation of contaminated sites result from the difficulty to identify who is responsible for these measures according to the provisions of the Water Act, AWG or Trade Regulation Act. To allow for a speedy and efficient clarification of the responsibility of the property owner the documents described above have been complemented by an appropriate test scheme that is to provide support.

- In order to implement other funding options, the Federal Ministry of Agriculture and Forestry, Environment and Water Management prepared a study on (new) charge or funding models for the remediation of contaminated sites.

The revision of procedural legislation in the field of contaminated sites cannot be performed in isolation from the discussions on harmonised plant legislation. In this context, the level at which related permits or administrative police orders will be issued is of special relevance.

An essential fact is that the implementation of a separate procedural act for contaminated sites only seems to be feasible if funding is secured. However, this will only be possible if — in contrast to the current dependence of funding on various parameters (waste volume) — a specific basic amount of money is allocated to the remediation of contaminated sites in the general budget. Therefore, the implementation of the funding models already available seems to be indispensable for the adoption of new provisions on the remediation of contaminated sites.
6. FIGURES

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