Biological Waste Treatment Survey

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An Initiative of the ISWA Working Group on Biological Treatment of Waste

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Published in Vienna 2006
The course of evolution has led to the development of a natural eco-system in which all secondary or final products of biological and chemical activities are deposited, decomposed or re-used without negative effects on the environment. In the beginning, humankind formed part of this cycle. Yet already from an early date, the development of human cultures entailed the emergence of economic models that stood outside the natural system, which in due course began to draw attention to the production of unwanted substances (wastes). However, the principle should still be the same. What happens everywhere in nature in the form of innumerable small-scale cycles should be intelligently used to advantage by humankind.

The development of technology and the effects of economic progress generated a positive input for many areas - life became easier. Today, we know that natural cycles can be put to practical use. Thus, our task is to utilize the enormous potentials of science and research to create and further develop processes that in the long run could safeguard an ecological form of waste management.

ISWA (International Solid Waste Association) is in a position to fulfil an important task in this context. ISWA is a professional organization free of commercial and political constraints, and its more than 1 000 members in over 70 countries are called upon, within its sphere of activity, to create frame conditions for sustainable development.

ISWA-Austria is the Austrian national member of ISWA. In addition to organizational tasks related to ISWA membership, ISWA-Austria also plays the important role of a mediator: on the one hand, experiences from others must be made available to the Austrian public; on the other hand, Austrian know-how should be popularized abroad.

The tireless efforts of the Austrian ISWA members engaged in several working groups, their participation in numerous events and, last but not least, their technical and financial contribution to technical articles and publications have ensured a small but definite and noticeable step towards sustainability in waste management.

The present booklet fulfills all requirements demanded by ISWA. It is the outcome of a co-operation project involving experts from thirteen countries who have come together to describe the state of the art and the latest trends in biological waste treatment in the individual countries involved within the context of the ISWA Working Group "Biological Treatment of Waste".

I would like to express my gratitude to all collaborators for the efforts invested into preparing this book and to all authors for their interesting contributions. My special thanks go to the head of the Municipal Department 48 of the City of Vienna, SR Dipl.-Ing. Josef Thon, and to the head of the Waste Management of the City of Vienna, SR Dipl.-Ing. Reinhard Siebenhandl for their assistance and support in the preparation of this ISWA-contribution.

This publication was made possible through the support of the City of Vienna and of the Association of Austrian Cities and Towns (Österreichischer Städtebund).

I am very happy to be able to present it.

SR Dr. Helmut Stadler
President of the association "ISWA-Austria"
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1 Country Details

1.1 Population

The total area is 83,871 km² and the population is about 8.1 million inhabitants.

41 % (34,382 km²) of the land area is farmland area. The area of 9,462 km² is used to grow crops.

1.2 Climate

The western region of Austria is determined by the mountain range of the Eastern Alps. The main Alpine ridge also creates several climatic zones. East of Vienna, the Pannonian climatic zone with its dry, hot summers and moderate winters stretches far into Hungary. The average annual precipitation is 602 mm in Vienna, and 1,148 mm in Vorarlberg. The western and south-western regions belong to the moderate continental climatic zone. The Alpine mountain range causes precipitation levels in the west to be much higher than in the eastern part of the country, thereby reaching over 1,000 mm per year. The south of Austria enjoys a mild, moderate Central European climate with precipitation levels around 850 mm per year.

<table>
<thead>
<tr>
<th>Average temperature (summer)</th>
<th>17.2° C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average temperature (winter)</td>
<td>-1.4° C</td>
</tr>
<tr>
<td>Average rainfall (summer)</td>
<td>100 mm</td>
</tr>
<tr>
<td>Average rainfall (winter)</td>
<td>42 mm</td>
</tr>
<tr>
<td>Wind regime</td>
<td>variable</td>
</tr>
</tbody>
</table>

2 Political and Legislative Background

2.1 Governmental and regulatory structure

Austria is a parliamentary republic, a federal state consisting of nine independent federal provinces. Each federal province has its own provincial government and parliament.

2.2 Regulatory bodies

Legal provisions on the subject of waste management were enacted both on the federal and provincial levels. Waste treatment, waste collection and levying of charges are competences of the communities. To cover the tasks of waste management, many communities have joined to form associations in order to increase their organisational efficiency. The associations mostly are built at the level of political districts which involve mostly a number of 30,000 to 100,000 inhabitants.

3 Site Planning, Licensing and Legislation

3.1 Requirements

Problems with old dumps and incineration plants and the resulting public discussion of ecological issues have largely contributed to raise the level of general environmental awareness - in particular, waste management has become a topic of interest for the population. A multitude of regulations on environmental protection and waste legislation have been enacted in the 1990’s.
In particular, every federal province has passed a waste management act in addition to federal provisions. Each of these acts authorises the appropriate administrative authorities to take measures to avoid and reduce waste production and to treat wastes. The treatment of individual critical types of wastes has been regulated by the Federal Ministry of Environment by means of ordinances.

As per January 1st, 1995, the so-called "Organic Wastes Ordinance" came into force. According to this ordinance, organic wastes must be prepared for separate collection or taken to a suitable collection point. Thus, the collection of organic wastes became mandatory for Austria as of January 1st, 1995.

Furthermore, a Landfill Ordinance took into effect with the year 2004. According to this ordinance waste is not allowed to be landfilled without stabilisation before. The ordinance prohibits dumping wastes with organic carbon content in excess of five per cent of their mass but has an exception clause for biological treated waste.

The landfill ordinance is accompanied by the act on dump decontamination. According to this act a tax is to be paid for landfilling waste. The height of the tax depends on the waste composition.

In view of these ordinances, most of the communities have already introduced the separate collection of organic wastes (the so-called "Biotonne" system). Apart from this, many Austrian households also compost their organic wastes themselves (individual composting). It is estimated that the share of individually composting households is about 30 % to 50 % depending on the region.

According to the local development of the collection system, the number of households connected to the "Biotonne" system varies.

The need for plants to treat bush cuttings, lawn cuttings and the like increased simultaneously with the introduction of collection activities for these wastes in the 1990’s. Composting plants are operated by three parties: communities, commercial enterprises and farmers. Agricultural enterprises often find it easier to obtain permits and have been under fewer legal requirements than commercial plants which in their turn mostly have larger capacities.

The construction of new composting plants has reached an advanced phase. Planning work has already attained a final stage, and the newly planned units are in their project phase. Most of these new plants have already been constructed in the last years.

**Federal regulations:**

- Waste Management Act
- Ordinance on the Separate Collection of Organic Wastes
- Ordinance on the Avoidance and Recycling of Packaging Wastes and Certain Residues of Goods ("VerpackVO", or Packaging Ordinance)
- Ordinance on the Right to Return and the Limitation of Pollution Caused by Batteries and Accumulators
- Ordinance on the Separation of Building and Related Materials
- Ordinance on the Determination of Problem Wastes
- Ordinance on the Definition of Hazardous Wastes
- Ordinance Requiring a Statement on the Origin of Wastes
- Old Dump and Landfill Cleanup Act
- Landfill ordinance
- Guideline for MBT-plants

**Provincial regulations:**

- Burgenland Waste Act
- Carinthian Waste Code and related ordinances
- Lower Austrian Waste Management Act
- Lower Austrian Sewage Sludge - Waste Composting Ordinance
- Lower Austrian Waste Management Plan and Waste Separation Ordinance
- Upper Austrian Waste Management Act
- Salzburg Waste Act and related ordinances
- Styrian Waste Management Act
- Tyrolean Waste Management Act and Tyrolean Waste Management Concept
- Vorarlberg Waste Act and related ordinances
- Viennese Waste Management Act
Federal Standards (ÖNORMEN)

- **ÖNORM S 2020** „Biofiltermaterialien auf Kompostbasis“, Ausgabe 1. August, 1996 (§ 3 Z 14 Kompostverordnung)
- **ÖNORM S 2100** „Abfallkatalog“, Ausgabe März 1990 (§ 3 Abs. 1 Z 1 Abfallnachweisverordnung; § 2 Abs. 2 Deponieverordnung)
- **ÖNORM S 2100** „Abfallkatalog“, Ausgabe 1. September 1997 (§ 3 Abs. 1 Festsetzungsverordnung 1997, § 17 Abs. 2a und § 18 Abs. 1 Salzburger Abfallwirtschaftsgesetz, § 3 Z 2, 4 und 5 § 4 Abs. 1 Z 1 Verbrennungsverordnung für gefährliche Abfälle, § 5 Abs. 1 Z 1 Verbrennungsverordnung für gefährliche Abfälle, § 3 Z 3.1, 4. und 5. der Verbrennungsverordnung für gefährliche Abfälle in gewerblichen Betriebsanlagen; § 1 Z 3 und 4 Verordnung mobile Anlagen zur Behandlung von Abfällen)
- **ÖNORM S 2110** „Analytische Beurteilung von Abfällen“, Ausgabe 1. Oktober 1991 (§ 6 Abs 2 und Abs 4 Verbrennungs- verordnung für gefährliche Abfälle; Anlage 4 Festsetzungsverordnung 1997; Anlage 5 Deponieverordnung; § 6 Abs 5 und 6 Abfallverbrennungsverordnung)

3.2 Permit/Licence to operate

In Austria it depends on the type of the enterprise and on the number of employees.

3.3 Regulatory body

The regulatory body is the state authority (a.o. Ministry for Agriculture, Forestry, Environment and Water Management) and also the regional authorities.

3.4 Specific provisions for meat or catering waste

Austria has specific provisions for meat or catering waste.

4 MSW – Economic aspects

Landfilling of unstabilised residual MSW is forbidden by the landfill ordinance since the year 2004. A transitional period which ends by the end of 2008 exists for some regions. For landfilling of not stabilised MSW it is to be paid a fee of 87 €/t from the year 2006.

4.1 Average prices of disposal / treatment processes for MSW

- Composting / AD 40 - 100 €/t
- Landfilling: not longer permitted for unstabilised waste
- Incineration: 120 - 140 €/t + 7 €/t fee from 2006

4.2 Type of tax

Landfill tax – AlllastensanierungsGesetz (AlsaG). It is a tax which has to be paid for landfilling waste. The height of the tax depends on the characteristics of the waste landfilled on the one hand and on the other hand on the equipment of the landfill.

The income from the tax is to be used for the decontamination of old burdens. In the past the tax has started as a tool for financing the decontamination of old landfills. Then the height of the fee has been increased dramatically and the fee became a strong tool to steer residual MSW away from landfills to stabilisation processes. The real steering effect had to be monitored with a height of more than 60 €/t of landfilling unstabilised residual MSW.

From 2006 incineration is strained as well with a fee of 7 €/t.
5 Future evolution of biological treatment and MBT

The main capacities, needed for composting of biowaste as well as MBT facilities are already existent. Only few additional capacities will be built in the near future.

6 Composting

6.1 Quantity

In Austria a quantity of 3,420,000 t of municipal solid waste was expected for the year 2004. About 18% of this, that are more than 600,000 tons, are expected to be separately collected biowaste.

6.2 Material Input

Communities/Households

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biowaste/Organic fraction of MSW</td>
<td>400,000</td>
</tr>
<tr>
<td>Garden waste and Kitchen waste</td>
<td>500,000</td>
</tr>
<tr>
<td>Sewage sludge</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

6.3 Composting facilities

Facilities for treatment of separate collected biowaste:

<table>
<thead>
<tr>
<th>Country</th>
<th>Number</th>
<th>t/y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burgenland</td>
<td>3</td>
<td>10,000</td>
</tr>
<tr>
<td>Carinthia</td>
<td>21</td>
<td>53,000</td>
</tr>
<tr>
<td>Lower Austria</td>
<td>87</td>
<td>156,000</td>
</tr>
<tr>
<td>Salzburg</td>
<td>7</td>
<td>204,000</td>
</tr>
<tr>
<td>Styria</td>
<td>104</td>
<td>104,000</td>
</tr>
<tr>
<td>Tirol</td>
<td>57</td>
<td>60,000</td>
</tr>
<tr>
<td>Upper Austria</td>
<td>237</td>
<td>220,000</td>
</tr>
<tr>
<td>Vorarlberg</td>
<td>5</td>
<td>29,000</td>
</tr>
<tr>
<td>Vienna</td>
<td>5</td>
<td>221,000</td>
</tr>
<tr>
<td>Austria</td>
<td>526</td>
<td>~1,1 m</td>
</tr>
</tbody>
</table>

6.4 Trends

In future no relevant growths in the quantity of composted biowaste are expected.

But the demand for high quality compost for application in organic farming is rising. Since conventional farming reached its limit, farmers recognize a chance for the future in organic farming.

Even communities go the same way. The municipality of Vienna spreads 30,000 t/a of compost on its own biologically cultivated agricultures. The compost is produced from 80,000 t/a of separately collected biowaste.

6.5 Economic aspects

The average gate fee at a composting facility amounts 40 - 100 €/t.

The products derived from "Biotonne" containers, lawn cuttings and bush cuttings are generally within the limit values laid down by the compost ordinance. In addition to covering one’s own compost requirements in agricultural enterprises and gardening establishments, the compost may also be used in municipal gardens and parks or given for free (in small quantities) to private households. On the market, the compost is sold for 3 to 30 €/m³, depending on its quality.

7 Anaerobic Digestion

Anaerobic digestion is a technology which is used in very few cases in Austria for biowaste. Recently some small plants started operation mainly treating manure and different types of wet biowaste like kitchen waste and food residues. In total about 40 plants are in operation.
Recently the economic situation of biogas-facilities has become more advantageous due to a higher price paid for the produced "green electricity" and by considering the EC hygiene directive.

Three large plants which treat material collected in the Biotonne are in operation. These plants are located in Lustenau (Vorarlberg), near the city of Salzburg and in the city of Wels. A further large plant is planned to be built in the city of Vienna.

### 7.1 Quantity

The total amount of organic waste anaerobically digested in 2004 is more than 150,000 tonnes. This figure does not include manure and does not include crop waste from the agriculture sector.

#### Agriculture

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manure</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

#### Communities/Households

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSW mixed collection – amount to AD</td>
<td>30,000</td>
</tr>
<tr>
<td>Kitchen waste</td>
<td>~100,000</td>
</tr>
</tbody>
</table>

#### Industrial/Trade

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slaughterhouse/rendering plant (fish slaughter waste)</td>
<td>&lt; 5,000</td>
</tr>
<tr>
<td>waste from food industry</td>
<td>~10,000</td>
</tr>
</tbody>
</table>

### 7.2 Anaerobic digestion facilities

During the last years the number of anaerobic digestion facilities increased rapidly to some hundred in Austria. Most of the plants use agriculture products with the aim of producing biogas and 'green' electricity. Most of the plants are operated by farmers.

Some plants treat biowaste too, mostly kitchen waste, leftovers and residues from the food industry.

The digestate is mainly used directly (without drying) on agricultural soil.

### 7.3 Trends

The capacities needed are still existent or construction is in progress. Only few additional plants treating waste will be built in the near future.

### 8 Mechanical-biological treatment (MBT)

#### 8.1 Quantity

The total amount of residual MSW treated in MBT in 2004 was about 320,000 tonnes which is about one quarter of residual MSW in Austria.

In the year 2004 about 12 % of residual MSW have been landfilled without stabilisation. This share will decrease in the next years and has to be zero from 2009.

#### 8.2 Material Input

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSW (mixed collection) including commercial waste</td>
<td>600,000</td>
</tr>
</tbody>
</table>

The given figure for the treated quantity is the mechanical treated quantity of which only parts are further treated by biological means.

#### 8.3 MBT facilities

<table>
<thead>
<tr>
<th>Type of MBT facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed/Unspecified process technologies</td>
<td>15</td>
</tr>
</tbody>
</table>
9 Existing Outlets (The market for products from...)

9.1 Compost

Market Sector:

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amateur gardening</td>
<td>n.s.</td>
</tr>
<tr>
<td>Agriculture</td>
<td>n.s.</td>
</tr>
<tr>
<td>Horticulture</td>
<td>n.s.</td>
</tr>
<tr>
<td>Other uses (Internal use)</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

9.2 Digestate

Market Sector:

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>nearly all</td>
</tr>
<tr>
<td>Landfill – restoration</td>
<td>nearly zero</td>
</tr>
</tbody>
</table>

10 Comments and relevant information

10.1 Other aspects

Problems, Difficulties:

Depending on the respective locations and distance from residential areas, there may be odour problems in the surrounding of composting plants. These are, however, limited. For example, dozens of new locations for composting plants were found and implemented in the past few years, others are under construction.

Composts derived from "Biotonne" containers in urban areas are partly characterised by high heavy metal contents precluding agricultural use. Research on the specific causes of heavy metal sources has been carried out.

The Austrian compost ordinance requires very low limits for the content of heavy metals. In some cases the limits are lower than the natural content in soil.

Because of restrictive criteria for the input material for producing so called "quality compost" often a separate collection and treatment of similar materials (from the view of heavy metal content and other quality criteria) is needed. So there is a need for composting leaves and grass collected alongside main roads separately from similar material from other roads if the compost is supposed to be used on agricultural land.

Research Projects:

The following research projects are in a realization or preparation phase:

- Utilisation of organic masses in fertiliser production
- Recycling and re-utilisation of wastes and fertilisers
- Recycling and re-utilisation of vegetable wastes
- Recycling of fungus mycelia and sewage sludge as special fertilisers
- Utilisation of sewage sludge as organic fertiliser for mountain pastures
- Investigation of percolating water emission and nutrient balance, process optimisation for stable manure composting
- Numerous projects to implement comprehensive composting in Styria
- Utilisation of radial paper chromatography for decomposition and humification processes
- Individual composting as an essential element of waste management - comparative study of different methods
- Study on the composting of organic wastes and its utilisation in agriculture and effects on the soil
- Analyses of residual municipal solid waste
- Use of compost as material for „filtering“ methane from landfills
- Building of humic acids and mineralization in different composting technologies like stack composting and box- or tunnel-composting.
11 Respondent – Key contact

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12 References, other sources of information

12.1 Addresses

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Stubenring 1
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Tel.: +43 1 58817-0
Fax: +43 1 58817 99 96128
post@m48.magwien.gv.at
www.wien.gv.at/ma48/

12.2 Links

Burgenland:
www.burgenland.at
www.ris.bka.gv.at/lr-burgenland/
Carinthia:
www.ktn.gv.at/index.html
www.ris.bka.gv.at/lr-kaernten/
www.umwelt-barrierefrei.ktn.gv.at/HOME_BLINDE/Abfall/the menbereich_abfall.htm

Lower Austria:
www.noegv.at/Umwelt/Abfall.htm
www.noegv.at/service/RU/RU3/Abfallwirtschaftsbericht.htm
www.ris.bka.gv.at/lr-niederoesterreich

Upper Austria:
www.land-oberoesterreich.gv.at/cps/rde/xchg/SID-3DCFCFC3-50372D1A/coe/hs.xsl/651_DEU_HTML.htm
www.bioabfalltrennen.at
www.ris.bka.gv.at/lr-oberoesterreich/

Salzburg:
www.salzburg.gv.at/themen/nuw/umwelt/abfall.htm

Styria:
www.abfallwirtschaft.steiermark.at
www.abfallwirtschaft.steiermark.at/cms/beitrag/10093869/46445/

Tyrol:
www.tirol.gv.at/themen/umwelt/abfall/index.shtml
www.tirol.gv.at/themen/umwelt/abfall/ufw_mappe_kompostieranlagen.shtml
www.ris.bka.gv.at/lr-tirol

Vorarlberg:
www.vorarlberg.gv.at/vorarlberg/umwelt_zukunft/umwelt/abfallwirtschaft/start.htm
http://www.vorarlberg.gv.at/vorarlberg/umwelt_zukunft/umwelt/abfallwirtschaft/neuigkeiten/abfallverzeichnisverordnu.htm

Vienna:

Federal Environment Agency Austria:
www.umweltbundesamt.at/umwelt/abfall/abfall_datenbanken

Federal Ministry for Agriculture, Forestry, Environment and Water Management:
www.lebensministerium.at/umwelt
www.ris.bka.gv.at/bundesrecht

Statistics Austria:
www.statistik.at
1 Country Details

1.1 Population

The total area is 44,000 km² and the population is about 5.4 million inhabitants.

65.9 % (29,000 km²) of the land area is farmland area. The area of 26,000 km² is used to grow crops.

1.2 Climate

<table>
<thead>
<tr>
<th>Average temperature</th>
<th>15.2 °C (June - August)</th>
<th>1.2 °C (Dec. - Feb.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average rainfall</td>
<td>63 mm/month (June – Aug.)</td>
<td>54 mm/month (Dec. - Feb.)</td>
</tr>
<tr>
<td>Wind regime</td>
<td>very windy</td>
<td></td>
</tr>
</tbody>
</table>

2 Political and Legislative Background

2.1 Governmental and regulatory structure

National decisions are taken by the government which releases a waste strategy every 4 year, for the next 4 to 12 years. The municipalities are then obliged to follow the strategy often supported by legislation and economic instruments such as fees (and earlier by funding as well – but this is history now).


The Statutory Order Regarding the Application of Waste Products for Agricultural Purposes, (Ministry of Environment and Energy, No. 49, January 2000) regulates the agricultural reuse of the main types of biodegradable wastes (e.g. sewage sludge, compost) and gives limit values for the content of heavy metals and organic pollutants. This order is supplemented by the Statutory Order Regarding Fertilisers and Soil Improvers, No.612, of 1993 (Ministry of Agriculture and Fisheries) which establishes standards for declaration and certification regarding fertilisers and soil improvers.

Standards for sample taking and analysis of sewage sludge and compost are laid down in the Statutory Order for the Control of the Quality of Sewage Sludge and Compost for Agricultural Purposes (Plant Directorate/Ministry of Agriculture and Fisheries, 1997).

2.2 Regulatory bodies

The Danish EPA proposes the legislation (on behalf of the government) and edits guidelines and makes decisions regarding complaints. The counties are also involved (permits, supervision of groundwater and NATURA-2000-areas / general protection of nature), as well as the municipalities (supervision of land use of products) and the Danish Plant Directorate (supervising the quality of products from public plants).

The regulatory bodies perform other functions as well as regulation:

EPA: All legislation on protection of the environment (groundwater, soil, air etc.)

Counties: Spatial planning at regional level, protection of groundwater, habitats etc. Large part of their work concerns hospitals and education/social aspects.
Municipalities: Spatial planning (local level), waste management, social care and cultural aspects.

Danish Plant Directorate: Supervises all in- and outputs to and from the agricultural industry (synthetic fertilisers, foodstuffs etc.).

3 Site Planning, Licensing and Legislation

3.1 Requirements

First of all, a reservation for the particular type of plant must be obtained in the spatial planning at the regional level (County). Besides, there should also be a specific reservation in the local spatial planning (Municipality).

At the same time the County would assess whether an Environmental Impact Assessment is needed and if so, this procedure must be followed before spatial planning is finalised. Also at the same time, a site-specific permission is drafted to evaluate whether it is possible to specify requirements which will ensure adequate environmental protection and whether it will be possible for the owner to actually meet the requirements.

3.2 Problems with obtaining permission

The distance to neighbours should be at least 500 meters, which is quite difficult in Denmark (high population density).

Besides, the fear of odours often starts off a NYMBy-syndrome in the neighbourhood.

3.3 Permit/Licence to operate

In Denmark a site permit / licence is required to operate.

3.4 Regulatory body

The regulatory body are the country authorities.

3.5 Monitoring of Compost facilities

Compost facilities are required to monitor:

- leachate
- odour
- dust
- noise and
- composition of waste

3.6 Regulatory standards and Controlling procedures for odour management

Odour regulation and controlling procedures are varying from one county (or municipality) to the other due to the fact that sensitivity of the area and the focus put on odour is different.

There is a national guidance on odours from industry and enterprises in general. The guideline states that composting plants should preferably be situated 500 meters from the nearest neighbour. However the distance can seldom be achieved. Often a threshold value of 5 OU at the nearest neighbour is fixed in the authorization together with a demand that authorities can ask for odour measuring by olfactometry to be carried out at the expense of the facility, if odour problems occur. When odour problems are occurring, a panel of evaluators from authorities, neighbours and the company would be settled to evaluate and continuously follow the situation.

3.7 Problems of meeting the requirements

Odour is the most frequent problem.

One plant even had to be closed due to odour problems.
3.8 Voluntary/Statutory Requirements

Voluntary:
- Standards scheme – Quality criteria (The voluntary DAKOFA standard)

Statutory:
- Technical regulations
- Environmental Impact Assessment
- Government policies – waste management plans
- Order regarding the application of waste products for the agricultural purposes (No. 49, Ministry of Environment and Energy - Jan. 2000)

3.9 Standards - Regulations

Voluntary:
- Limits for plastics
- Limits for physical contaminants (e.g. stones, glass)
- Organic matter
- Moisture
- Other agronomic properties (e.g. conductivity, humification)

Statutory:
- Limits for heavy metals
- Limits for pathogens
- Limits for organic contaminants e.g. pesticides (please state: LAS, DEHP, PAH, NPE)
- Nutrients
- Standard Operating Procedure (for sanitation)

3.10 Specific provisions for meat or catering waste

The material must meet the requirements of the regulation on animal by-products.

3.11 Other special requirements for wastes

Wastes should in general be source separated.

4 MSW – Economic aspects

4.1 Average prices of disposal / treatment processes for MSW

<table>
<thead>
<tr>
<th>Process</th>
<th>€ / t</th>
<th>plus tax (in €)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incineration</td>
<td>44</td>
<td>44</td>
</tr>
<tr>
<td>Landfill</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

4.2 Type of tax

There is a landfill or incineration tax. No tax on recycling processes levied.

4.3 Average price of MSW landfilling or of MSW incineration

MSW incineration: 95 to 107 € /tonne

Landfilling: It is not allowed to landfill MSW in Denmark, as the energy content must be recovered before landfilling.

There is also a ban on the burning of yard waste in the open air.

5 Future evolution of biological treatment and MBT

There are absolutely no drivers at the moment in Denmark: any developments that take place do so as "con amore"!

MBT is not accepted as an option at all in Denmark.

6 Composting

6.1 Quantity

The total amount of organic material composted in 2003 is 1,100,000 tonnes (excluding manure).
6.2 Material Input

Communities/Households

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden waste</td>
<td>700,000</td>
</tr>
<tr>
<td>Kitchen waste</td>
<td>18,000</td>
</tr>
<tr>
<td>Sewage sludge</td>
<td>336,000</td>
</tr>
</tbody>
</table>

Industrial/Trade

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Organic waste</td>
<td>48,000</td>
</tr>
</tbody>
</table>

6.3 Composting facilities

<table>
<thead>
<tr>
<th>Type of composting facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanically turned windrow</td>
<td>131</td>
</tr>
<tr>
<td>Static pile with passive aeration</td>
<td>8</td>
</tr>
<tr>
<td>Vermicomposting</td>
<td>2</td>
</tr>
<tr>
<td>In-vessel</td>
<td>1</td>
</tr>
<tr>
<td>Combination of biogas and composting plant (as of 2003)</td>
<td>1</td>
</tr>
</tbody>
</table>

The number of facilities has been constant during the last 5 years.

For the future, no further increase in the amount of organic waste composted is expected.

6.4 Economic aspects

Most facilities are for garden waste only. The gate fee for garden waste is about 15.5 to 45.8 €/t (130 - 340 DKK/t). The gate fee for other biowaste (food waste etc) is about 60.6 to 107.7 €/t (450 – 800 DKK/t) but energy rich waste (e.g. fat, etc.) that would give a yield at the farmers co-digestion plants are often accepted for much less.

The average selling price of compost in:

- Agriculture: 0.0 €/t
- Landscaping: 6.7 to 9.4 €/t
- Hobby gardening: 0 to 8.0 €/t

7 Anaerobic Digestion

7.1 Quantity

The total amount of organic material anaerobically digested in 2003 was 2,000,000 tonnes (incl. manure).

Agriculture

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manure</td>
<td>1,800,000</td>
</tr>
</tbody>
</table>

Communities/Households

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitchen waste</td>
<td>20,000</td>
</tr>
<tr>
<td>Sewage sludge</td>
<td>70,000</td>
</tr>
</tbody>
</table>

Industrial/Trade

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Organic waste (mostly slaughterhouse waste)</td>
<td>200,000</td>
</tr>
</tbody>
</table>

7.2 Anaerobic digestion facilities

There exist 21 plants serving more than one farmer and 50 plants serving just one farm.

No statistics on technology available.

The digestate is mostly used directly except for the one plant co-digesting sludge and MSW. The government has just decided to accept incineration of the dry part (approx 20 % TS!) of the digest without any taxation.

7.3 Trends

There is no increase expected in the amount of organic waste digested, except for manure.

7.4 Economic aspects

The average gate fee amounts between 67 and 100 €/t and the selling price of the digestate is between 16 and 27 €/t.
8 Mechanical-biological Treatment (MBT)

MBT refers only to MSW stabilisation processes before final disposal. In Denmark MBT is NOT practiced at all.

9 Existing Outlets (The market for products from...)

9.1 Compost

The total amount of compost produced in Denmark in 2003 was 312,000 tonnes.

Market Sector:

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horticulture</td>
<td>5.0</td>
</tr>
<tr>
<td>Amateur gardening</td>
<td>44.5</td>
</tr>
<tr>
<td>Agriculture</td>
<td>18.5</td>
</tr>
<tr>
<td>Grounds maintenance</td>
<td>10.3</td>
</tr>
<tr>
<td>Forestry</td>
<td>0.4</td>
</tr>
<tr>
<td>Landfill - cell fill</td>
<td>1.3</td>
</tr>
<tr>
<td>Landfill - restoration</td>
<td>5.1</td>
</tr>
<tr>
<td>Landfill - daily cover</td>
<td>0.8</td>
</tr>
<tr>
<td>Other uses (Specific.: unknown)</td>
<td>14.1</td>
</tr>
</tbody>
</table>

9.2 Digestate

The total amount of digestate produced in Denmark in 2003 was 1,500,000 tonnes (incl. manure).

Market Sector:

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>100</td>
</tr>
</tbody>
</table>

10 Comments and relevant information

10.1 The voluntary DAKOFA standard

There is no labelling or certification for any kind of compost at the moment in Denmark. However, as it was felt that the existing regulations in the statutory standards were insufficient to satisfy the end-user’s requirements for information about the compost product - users want to know more than the heavy metal content of the compost that they buy; they need application recommendations for example.

DAKOFA (the Danish Waste Management Association) developed a product data sheet as a voluntary measurement to improve the quality, use and sale of, as well as consumer confidence in compost in 1999. The Product Sheet includes the regulations of the statutory order No. 49 regarding the application of waste products in agriculture. It differs from the statutory standard including additional information, and it applies to composts both from household and from parks and garden waste.

It consists of two pages: The front page covers basic information about the compost and the producer, such as

- place of production and name of the person responsible;
- raw materials;
- suggested use, reference to specific user guides;
- nutrients;
- soil improving properties;
- physical properties;
- sample taking and quality control.

The second page of the Product Sheet works as a declaration form and shows ‘guarantee parameters’ (those which the producer has to guarantee, for product liability reasons, to consumers for each gram of compost sold). These include weeds seeds, visible impurities, degree of stability, heavy metals, sanitary treatment and organic pollutants.

11 Respondent – Key contact

DAKOFA
(Danish Waste Management Association)
Mr. Henrik WEJDLING, Technical manager

Vesterbrogade 73, 3.
DK 1620 Copenhagen V

Telephone: +45 32 96 90 22
Fax: +45 32 96 19
Email: hw@dakofa.dk
12 References, other sources of information

12.1 Addresses

**Danish EPA waste divisions:**
Industrial and Commercial Waste Division
or Household WASTE Division
Strandgade 29, 1201 København K
Tel. + 45 32 66 01 00
Fax + 45 32 66 04 79
e-mail: mst@mst.dk

Ministry of the environment:
Miljø- og Energiministeriet
Højbro Plads 4, 1200 København K
Tel.: + 45 33 92 76 00
E-mail: mem@mem.dk

12.2 Links

**Danish EPA** (statistics – also in English):
www.mst.dk

http://www.compostnetwork.info/countries/denmark.htm

**Review of Compost Standards in Denmark,**
This very valuable report describes in detail the regulations regarding composting and the voluntary standards introduced by DAKOFA.
1 Country Details

1.1 Population and Area

The total area is 357,000 km² and the population is 80 million inhabitants.

54 % (193,000 km²) of the land area is farmland area - 30 % (107,000 km²) is farmland area, which is used to grow crops.

1.2 Climate

Germany's climate is moderate and generally without sustained periods of cold or heat.

Northwestern and coastal Germany has a maritime climate caused by warm westerly winds from the North Sea; the climate is characterized by warm summers and mild cloudy winters. Further inland, the climate is continental, marked by greater diurnal and seasonal variations in temperature, with warmer summers and colder winters.

<table>
<thead>
<tr>
<th></th>
<th>Average temperature (July)</th>
<th>Average temperature (January)</th>
<th>Average temperature (annual)</th>
<th>Average rainfall (annual)</th>
<th>Wind regime</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16° C (North) 9° C (South)</td>
<td>1,6° C(North) -2° C (South)</td>
<td>9° C (overall)</td>
<td>600 – 800 mm</td>
<td>variable</td>
</tr>
</tbody>
</table>

2 Political and Legislative Background

2.1 Governmental and regulatory structure

Federal Law:

The 1998 Biowaste Ordinance (Bioabfall- verordnung - BioAbfV) covers the application of treated and untreated biowastes and mixtures that are applied on agricultural, forest and horticultural land, as well as the suitable raw materials, the quality and hygiene requirements, the treatment processes and analyses of such biowastes and mixtures. Suitable raw materials are listed in annex 1, heavy metal contents, harmful substances, hygiene aspects in § 4 and annex 2 and sampling and analyses in annex 3.

The Biowaste Ordinance regulates - with a precautionary intention - the waste side (e.g. heavy metals) of the application, whereas the Fertiliser Law (Düngemittelverordnung – DüMV) regulates the nutrient part.

2.2 Regulatory bodies

The federal ministry: Bundesministerium für Umwelt, Natur und Reaktorsicherheit.
3 Site Planning, Licensing and Legislation

3.1 Voluntary/Statutory Requirements

Voluntary:
• Standards scheme – quality criteria: (RAL-GZ 251 and RAL-GZ 251/1)

Statutory:
• Technical Regulations (specify: 1998 Biowaste Ordinance – BioAbfV)

3.2 Standards - Regulations

Voluntary:
• Standard Operating Procedure

Statutory:
• Limits for heavy metals
• Limits for pathogens
• Limits for plastics
• Limits for physical contaminants eg. Stones, glass (Bio AbfV, § 4: max. 0.5 % of DW for total glass; stones and plastics (paricle size > 2mm); total stones/p.s. > 5 mm, max. 5 % DW)
• Nutrients (Düngemittelverordnung – DüMV)

4 Composting

4.1 Quantity

The total amount of organic material composted in 2003 is 9,600,000 tonnes.

There are nearly 810 compost plants in Germany. 431 of these plants participate in the quality assurance system of the “Bündesgütegemeinschaft Kompost” (BGK)

• Total capacity of the 431 plants: 6,600,000 tonnes
• Effective input in 2003: 5,260,000 tonnes

4.2 Material Input

Agriculture:

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/ year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manure</td>
<td>2,000</td>
</tr>
</tbody>
</table>

Communities/Households

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biowaste/organic fraction of MSW</td>
<td>3,200,000</td>
</tr>
<tr>
<td>Garden waste</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Kitchen waste</td>
<td>6,500</td>
</tr>
</tbody>
</table>

Industrial/Trade

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forestry Products/woods</td>
<td>1,500</td>
</tr>
<tr>
<td>Other Organic waste</td>
<td>50,000</td>
</tr>
</tbody>
</table>

4.3 Composting facilities

<table>
<thead>
<tr>
<th>Type of composting facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanically turned windrow</td>
<td>10</td>
</tr>
<tr>
<td>Static pile with passive aeration</td>
<td>250</td>
</tr>
<tr>
<td>Static pile with forced aeration</td>
<td>70</td>
</tr>
<tr>
<td>In-vessel</td>
<td>60</td>
</tr>
<tr>
<td>Mixed/Unspecified process technologies</td>
<td>30</td>
</tr>
<tr>
<td>Other</td>
<td>10</td>
</tr>
</tbody>
</table>

4.4 Trends

The amount of organic material composted will not increase.

4.5 Economic aspects

The average gate fee at a composting facility amounts about 50 – 90 €/t.

The average selling price of compost in:
• Agriculture: 0 – 5 €/t
• Hobby gardening: 15 – 30 €/t
5 Anaerobic Digestion

5.1 Quantity

The total amount of organic material anaerobically digested in 2003 is 2,400,000 tonnes. There are more than 2,000 biogas plants in Germany. Most are located on farms and treat manure or renewable primary products. Some 75 treat biowaste or a mixture of biowaste and manure for a total of 2,400,000 tonnes input. 36 of these plants take part in the quality assurance of the BGK.

6 Existing Outlets (The market for products from...)

6.1 Compost

The total amount of compost produced in Germany 2003 is 5,000,000 tonnes.

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horticulture</td>
<td>3.7</td>
</tr>
<tr>
<td>Amateur gardening</td>
<td>11.4</td>
</tr>
<tr>
<td>Agriculture</td>
<td>50.3</td>
</tr>
<tr>
<td>Landscaping</td>
<td>16.6</td>
</tr>
<tr>
<td>Culture media</td>
<td>12.5</td>
</tr>
<tr>
<td>Others</td>
<td>5.5</td>
</tr>
</tbody>
</table>

6.2 Digestate

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>100</td>
</tr>
</tbody>
</table>

7 Other comments and relevant information

Voluntary Standards RAL Quality Assurance System

On account of the very bad image compost from mixed waste acquired in the late eighties, the German recycling industry started a quality initiative in composting which led to the foundation of the German Compost Quality Assurance Organisation (Bundesgütegemeinschaft Kompost, BGK) in 1989. In 1991 a quality standard, a quality label and the RAL quality monitoring system for the composting of source separated organic residues from households and gardens was established.

This BGK organisation is the carrier of the RAL compost quality label. It is recognised by the RAL, the German Institute for Quality Assurance and Certification, as being the organisation to handle monitoring and controlling of the quality of compost in Germany. In 2000, an additional quality assurance system for digestion residuals was introduced.

Quality assurance system for compost, RAL- GZ 251

The standard RAL-GZ 251 contains regulations of the German Compost Quality Assurance Organisation BGK concerning quality criteria and the quality assurance of compost. This is a private, voluntary agreement for a quality assurance system by the composting industry. Several of the RAL-GZ 251 aspects can be found in the a.m. laws and regulations.

Quality assurance system for products of anaerobic digestion, RAL- GZ 256/1

Since August 2000, the standard RAL-GZ 256/1 contains regulations of the German Compost Quality Assurance Organisation BGK concerning quality criteria and the quality assurance of solid and liquid digestion residuals. This is a private, voluntary agreement of the anaerobic digestion industry.

The new Biowaste Ordinance (BioAbfV) of October 1998 introduced a multitude of obligations which must be carried out by the compost/digestion plants, to demonstrate control and validation of processes and products. The long-standing activities of the BGK for the standardisation, monitoring and declaration of high-quality humus products lead to an acknowledgement of these measures by the legislator as “auto-regulation by the industry”. In addition, the legislative body recognized that biowaste which is submitted to such continuous monitoring by an independent organisation is not a product but “similar to a product”. So members of the Quality Assurance Organisation which subject voluntarily to quality monitoring are widely exempted from the controls (max. 12 instead of max. 24 analysis/year) and from proof obligation by regional authorities as laid down by the Biowaste Ordinance.
8 Respondent – Key contact

Bundesgütegemeinschaft Kompost e.V. (BGK)
Mrs. Thelen-Jungling

Tel.: +49 22 03 358 37 0
Fax: +49 22 03 358 37 12

9 References, other sources of information

9.1 Addresses

Bundesgütegemeinschaft Kompost e.V. (BGK)
Von-der-Wettern Str. 25
D-51149 Köln
Tel.: +49 22 03 358 370
Fax: +49 22 03 358 37-12
info@bgkev.de
www.bgkev.de

EUROPEAN COMPOST NETWORK
ECN/ORBIT e.V.
Josef Barth, Managing Director
Postbox 22 29, D-99403 Weimar
Tel.: +49 25 22-96 03 41
Fax: +49 25 22-96 03 43
info@compostnetwork.info
www.compostnetwork.info

9.2 Links

Bundesgütegemeinschaft Kompost e.V. (BGK)
www.bgkev.de

Knoten Weimar – Internationale Transferstelle Umwelttechnologien
www.bionet.net

European Compost Network
www.compostnetwork.info
1 Country Details

1.1 Population

The total area is 132,000 km² and the population is about 11.5 million inhabitants.

1.2 Climate

| Average temperature (summer) | 23 °C |
| Average temperature (winter) | 11 °C |
| Average rainfall             | 400 – 700 mm |
| Wind regime                  | windy |

2 Political and Legislative Background

2.1 Governmental and regulatory structure

Main Government

Ministry of Environment, Physical Planning and Public Works (MEPPPW):

It is the sole ministry responsible for introducing and harmonizing EU environmental law, and for applying environmental laws in Greece.

Environmental legislation, including legislation related to solid waste management, is based on the directives issued by the EU (harmonization procedure). In general, all environmental EU directives are mandatory for Greece. Usually EU directives are implemented Greek legislation. For example, the main Greek solid waste law, namely the “National Solid Waste Management Plan” issued on 1997 was based on the 91/156/EU directive.

Ministry of Development:

Responsible for the siting approval of new industrial sites and parks, designation of industrial areas, as well as the co-authorization of environmental impact studies related to industrial facilities.

Regional Governments:

There are 13 Regional Governments in Greece mainly responsible for supervising local governments and for ensuring that laws (including environmental laws) are correctly practised by local governments, namely prefectures and municipalities. They are also responsible for pursuing EU programs and initiatives that can potentially fund environmental studies or structures.

The Regions have no legislative authority. They are controlled by the Ministry of the Interior and usually follow guidelines set by other Ministries too. The Regions are responsible for the management of the European Community Support Framework funds. An adequate fraction of these funds is directed to environmental applications (particularly construction of wastewater treatment plants, landfills, material recovery facilities and composting plants). According to the current legislation, solid waste management plans are being developed by the regions. Up to autumn 2004, 10 out of the 13 regional solid waste management plans had been developed.

Local Authority

Prefectures:

Each Regional Government supervises at least two prefectures. Prefectures are elected by the
public in non-parliamentary elections and are not governmental agencies. Prefectures are responsible for providing permits to solid waste management facilities.

Municipalities:

These are the smallest bodies of local government elected by the public. Despite that the solid waste management plan – which includes landfill siting – is a responsibility of the prefecture, municipalities actively take place in that process. After several years of objection expressed by the municipalities to new landfill sites – due to an exacerbated NIMBY syndrome – an alternative procedure has been introduced in some cases. Prefectures usually ask municipal authorities to suggest at least two sites within their legal territories that would be adequate as the main landfill sites. The proposed sites are further examined according to various financial and environmental criteria. The regional solid waste management strategic plan may finally propose completely different sites for landfilling than the ones suggested by the municipalities, based on scientific and financial evaluations. However, the aforementioned procedure aims to reduce the public opposition to landfill siting.

Funds for the construction of MSW facilities usually come from the national budget and European structural funds. It should be noted that the construction of most sanitary landfills present in Greece today was mainly financed by funds from the European Union Support Framework in addition to national funds. The operation (not construction) of a landfill and other solid waste management facilities is currently a responsibility of the prefecture and the municipality or an association of municipalities.

Sewage sludge is probably the only material of organic origin that is anaerobically treated in Greece to produce biogas. Anaerobic digestion takes place in a few of the current wastewater treatment facilities. Following treatment, digested sludge is usually disposed to a landfill.

In contrast to MSW, small amounts of certain types of agricultural wastes are sometimes composted by the private sector in Greece. No inventory of such facilities exists.

Conclusively, there are no well organised data on the total amount of solid waste produced, treated and disposed of in Greece nowadays.

2.2 Regulatory bodies

Ministry of Environment, Physical Planning and Public Works (MEPPPW)

3 Site Planning, Licensing and Legislation

3.1 Requirements

The national and regional plan for MSW management in Greece is described in the relatively recent law (Ministerial Decision 50910/2727 December 2003 and 14312/1302 June 2000). The above laws include some basic definitions as well as the basic goals and principles of the Hellenic solid waste management plan. There are four principles, namely:

a) Principle of “waste-production prevention, through reuse, material and energy recovery and recycling”

b) “The Polluter pays” principle

c) The principle of vicinity, which states that “Wastes should be directed from their production centre to the nearest treatment or disposal facility”

d) Principle of “remediating environmental damages”

The national plan should be reviewed every 5 years by the MEPPPW. There are 13 regional solid waste management plans in Greece, one for each Regional Authority, which is for developing this plan and revising it every five years. The regional plan should be developed in cooperation with the prefectures and municipalities within each Region as well as in cooperation with the MEPPPW.

The collection and transportation of solid wastes is responsibility of the Municipalities. The treatment and disposal of solid wastes should be practiced by an organised Solid Waste Management Body (SWMB). The SWMB should receive operation permission from several public agencies in order to properly treat and dispose of wastes. The SWMB is responsible for the proper operation of all treatment and disposal facilities, as well as for the remediation and post-closure monitoring of all landfill sites. The permission / authorization procedure for a solid waste treatment facility is briefly described as follows:
The permit depends on whether the facility is included in the national of regional solid waste management plan or if it is a private facility. In the former case, the location of the site has been (usually) predefined and is included in the regional plan. Funding usually comes partially from European funds and the national budget. Environmental impact assessment reports and environmental authorization of Ministry of Environment, Physical Planning and Public Works (MEPPPW). Studies are required. These are evaluated and approved by either the Regional Authority of the Prefectural Authority, depending on the size of the facility. Construction permits are also approved by the prefecture.

The exact steps in obtaining authorization are as follows:
1. The Regional Solid Waste Management Plan describes the number, types of facilities as well as other critical data related to solid waste management in the region.
2. An initial study (Environmental Impact Prestudy or Environmental Report) is required, describing the siting and the major technical characteristics of the facility. This is submitted by the SWMB to either the Ministry of Environment, the region or the prefecture depending on the relative environmental disturbance and according to the type and size of a facility. In certain relatively small facilities, this initial study is submitted to the Municipality, which is the smallest body of local government in Greece. Along with this initial environmental study, technical facility construction studies are also submitted, accordingly, to the above bodies.
3. Waste disposal and waste utilization permits, as issued by the Prefecture. This permission is valid for 5 years and should be revised after this period. This permit is based on a construction and operational study, as developed and submitted by the SWMB.
4. Prior to granting authorization, the Prefecture evaluates the construction and proper operation of the solid waste facility. Operation permit is then granted.

3.2 Problems with obtaining permission

After submission of a technical study, there is usually a significant delay within public bodies (Ministries, Regions, Prefectures) to evaluate these studies. This is partly attributable to the lack of scientific personnel present in these public bodies. After permission has been granted, significant delays can however occur due to the lack of funding as well as due to bureaucratic procedures to obtain European funding. On some occasions several permits have been granted, but no funding has been obtained to finally construct and operate a MSW composting facility. Last, but not least, a significant delay occurs due to the fact that municipalities have not been able to form a solid waste management body, due to lack of information and to an exacerbated social opposition to waste related issues.

In Greece a site permit/licence is required to operate.

3.3 Regulatory body

- Ministry of Environment, Physical, Planning and Public Works (MEPPPW)
- Regional authorities
- Prefectures
- The municipalities themselves

3.4 Monitoring of Compost facilities

The monitoring of compost facilities depends on the requirements of the Prefecture that is to grant the operational permit.

3.5 Regulatory standards and Controlling procedures for odour management

The minimum requirements for odour management are roughly described in the 1997 Hellenic Law on Solid Wastes (based on the 91/156/EEC European legislation). According to that law, filtration units should exist (usually biofilters) preceded by moisture traps. The type of filtration is not clearly described and the use of biofilters is simply included as a possible alternative.
3.6 Problems of requirements

The sole MSW composting facility operated in Greece (Kalamata - South Greece) is currently out of operation due to odour problems and lack of compost marketing. The odours generated in the Kalamata plant were partially attributed to the relatively short composting retention time (10 days), the lack of curing and improper aeration. The plant end-product of the plant was not mature.

Composting is planned in the large mechanical separation and biological treatment plant of Ano Liosia (west Attica) serving the city of Athens and the Attica region. The plant has a 1200 t/d design capacity and is intended to accept commingled municipal solid waste. Currently the plant accepts 200 t/d of commingled MSW, separating and recovering certain materials. However, operation data are not available, while the plant has been highly criticised for its unsuccessful operation so far, despite its huge construction cost.

No other MSW composting plant is currently in operation in Greece. However, MSW management plans for some of the 13 regions in Greece include the construction and operation of composting plants in the future.

Currently, a union of municipalities of the Attica prefecture (UMAP) is responsible for the landfilling of MSW. The collection and transfer of MSW to the sole MSW landfill in the Attica region is the responsibility of the municipalities. The UMAP charges the Attica municipalities a tipping fee, which is a percentage of the annual (state) aid provided by the government to each municipality. Therefore, the fee is not a function of the amount of waste disposed of by the municipality to the landfill site, as it should be. So this charging practise does not provide an incentive for municipalities to practice recycling and composting in order to reduce amounts of waste directed to the landfill.

3.7 Voluntary / Statutory Requirements

Statutory:
- Technical Regulations
- Standards scheme – Quality criteria
- Environmental Impact Assessment
- Government policies – waste management plans

3.8 Standards - Regulations

Statutory:
- Limits for heavy metals (There are standards and limits for compost derived from sewage sludge)
- Limits for pathogens (There are standards and limits for sewage sludge derived compost)
- Limits for plastics (There are standards and limits for sewage sludge derived compost)
- Limits for physical contaminants eg. stones, glass
- Moisture
- Standard Operating Procedure

The standards for MSW-derived compost are the following (114218/1997 Hellenic Ministerial Decision):

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cd</td>
<td>10 mg/kg</td>
</tr>
<tr>
<td>Cu</td>
<td>500 mg/kg</td>
</tr>
<tr>
<td>Ni</td>
<td>200 mg/kg</td>
</tr>
<tr>
<td>Pb</td>
<td>500 mg/kg</td>
</tr>
<tr>
<td>Cr³⁺</td>
<td>500 mg/kg</td>
</tr>
<tr>
<td>Cr⁶⁺</td>
<td>10 mg/kg</td>
</tr>
<tr>
<td>Zn</td>
<td>2,000 mg/kg</td>
</tr>
<tr>
<td>As</td>
<td>15 mg/kg</td>
</tr>
<tr>
<td>Hg</td>
<td>5 mg/kg</td>
</tr>
<tr>
<td>pH</td>
<td>6 – 8</td>
</tr>
<tr>
<td>E-Coli</td>
<td>0</td>
</tr>
<tr>
<td>Plastic content</td>
<td>&lt; 0,3 % d.w.</td>
</tr>
<tr>
<td>Glass content</td>
<td>&lt; 0,5 % d.w.</td>
</tr>
<tr>
<td>Moisture</td>
<td>&lt; 40 % w.w.</td>
</tr>
<tr>
<td>90 % by weight of particles less than</td>
<td>&lt; 10 mm</td>
</tr>
</tbody>
</table>

Upper limits for amounts of heavy metals disposed of annually in agricultural land (kg/ha/year)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Kg/ha/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cd</td>
<td>0,15</td>
</tr>
<tr>
<td>Cu</td>
<td>12</td>
</tr>
<tr>
<td>Ni</td>
<td>3</td>
</tr>
<tr>
<td>Pb</td>
<td>15</td>
</tr>
<tr>
<td>Zn</td>
<td>30</td>
</tr>
<tr>
<td>Cr</td>
<td>5</td>
</tr>
<tr>
<td>Hg</td>
<td>0,1</td>
</tr>
</tbody>
</table>

Standards exist for certain design aspects of the composting facility. For example, requirements exist for odour treatment units, the treatment of wastewater produced within the composting facility, type of compost aeration, minimum curing periods, size
4 MSW – Economic aspects

4.1 Average prices of disposal / treatment processes for MSW

- Collection/Transportation: 18 – 141 €/t
- Disposal (Landfilling): 0 – 22 €/t
- Total MSW Management: 21 – 155 €/t

The ranges shown above were based on data collected and analysed from only 25 municipalities in Greece with permanent population ranging from 2,430 to 130,000 residents. Data analysis was based on the same methodology. The data were based on assumptions concerning the capital cost of equipment, while the operational costs were provided by the municipalities. Results give an approximate idea of MSW management cost in Greece, as practised by several municipalities, some of which still illegally dump wastes. Therefore, the above shown estimated cost ranges have a relative, rather than, an absolute significance.

4.2 Type of tax

In Greece, MSW management cost is derived from taxes charged to the residents by municipalities. This tax is based on an arbitrary coefficient expressed in €/m² (residence area). This charge coefficient is an arbitrary cost, as a result of the fact that municipalities are hardly aware of the amount of wastes produced neither of the actual municipal solid waste management cost.

4.3 Average price of MSW landfilling of MSW incineration

The price of disposal (landfilling) is 0 – 22 €/t. Landfilling is the only type of MSW final disposal technique currently practised in Greece; no incineration is practiced.

5 Future evolution of biological treatment and MBT

The driving forces for the evolution of biological treatment in Greece were legislation and promotion of renewable energy sources.

It is worth noting that MSW incineration is not considered an option for MSW management in Greece. A public opposition to incineration has been “cultivated” in the past years, presenting incineration as an unhealthy and “dirty” MSW disposal technique. During the past 2 years, a few conferences organised in Greece aimed to present incineration as a possible environmentally viable option for MSW management in Greece. Scientists argue that the high moisture of Greek MSW may create operational problems in MSW incineration units. However, this has not been proven in full scale.

The driving force for the evolution of MBT in Greece is legislation.

6 Composting

6.1 Quantity

Approximately 200 tonnes/day of MSW currently enter the sole Greek commingled waste mechanical separation facility, located near Athens. The facility aims to produce RDF, separated organics for further composting and some recyclables from commingled wastes. The design capacity of the facility (constructed since 2001) is approximately 1,200 t/d and its potential to achieve its initial goals of separation has been often doubted.

A MSW composting facility in Southern Greece (Kalamata) unsuccessfully operated for 3 - 4 years. It treated approximately 80 t/d of commingled MSW using an in-vessel aeration technology (SECIT type bioreactor). However, final compost was not stabilised and anaerobic fermentation occurred extensively. The plant also included:

- an electromagnet
- trommel screen
- mixer (sewage sludge mixed with MSW)
- bioreactor
- vibrating screen
- manual separation stages
- odour control system (biofilters)
The average retention time within the digester ranged between 10 – 15 days. The plant lacked continuous monitoring of basic composting parameters such as pH, temperature and oxygen content. Despite immature final compost, the final product had metal contents below legal limits.

Currently, the plant is out of operation.

### 6.2 Material Input

**Communities/Households**

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal Solid Waste (MSW)</td>
<td>No data available</td>
</tr>
</tbody>
</table>

### 6.3 Composting facilities

<table>
<thead>
<tr>
<th>Type of composting facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-vessel</td>
<td>n.s.</td>
</tr>
</tbody>
</table>

### 6.4 Trends

The amount of organic material composted will increase.

### 7 Other comments and relevant information

#### 7.1 Public awareness and lobbying

The average Greece is not aware of the potential to utilize solid wastes. However, in rural Greece, people utilize solid wastes, as they did hundreds of years ago, by providing food to animals, burning in fire place etc.

Only recently the generic term “Waste recycling” has started to gain attention, especially in large cities.

Composting is not a popular treatment technique in Greece, neither is a waste treatment method known to the average population. Average Greeks only recently have become aware of the necessity to sanitarly dispose of wastes in properly designed landfills. Waste treatment (composting, recycling, incineration) is rarely practised in Greece.

#### 7.2 Home Composting

In Greece home composting is not practised.

#### 7.3 Other aspects

Currently, facilities with the goal to utilize several types of industrial and agricultural solid wastes (MSW not included) have been approved to be partially funded by the Hellenic Government (Ministry of Development).

The funding mechanism will support 29 Solid Waste Enterpreneur Plans to manage (with the goal to recycle and recover materials) various recycling and material recovery facilities. Two out of the 29 facilities aim to compost agricultural and other organic (non MSW) wastes to produce material for agricultural applications and landscaping.

The funding comes from European resources (3rd Community Support Framework) and private sources (40 % and 60 %, respectively).

### 8 Respondent – Key contact

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dkomilis@yahoo.com
9 References, other sources of information

9.1 Links

Ministry of Development, General Secretariat for Industry
www.ggb.gr

Ministry of Environment, Physical Planning and Public Works
www.minenv.gr

Hellenic Solid Waste Association
http://eedsa.duth.gr/

Ministry of Development; Sustainable Development in Greece
www.axiosvios.gr
1 Country Details

1.1 Population

The total area is 93,030 km² and the population is about 10.1 millions inhabitants.

64.5 % (60,000 km²) of the land area is farmland area – 53.7 % (50,000 km²) is farmland area, which is used to grow corps.

1.2 Climate

<table>
<thead>
<tr>
<th>Average temperature (summer)</th>
<th>20 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average temperature (winter)</td>
<td>1 °C</td>
</tr>
<tr>
<td>Average rainfall (summer)</td>
<td>60 mm/month</td>
</tr>
<tr>
<td>Average rainfall (winter)</td>
<td>40 mm/month</td>
</tr>
<tr>
<td>Average rainfall per year</td>
<td>600 mm</td>
</tr>
<tr>
<td>Wind regime</td>
<td>still</td>
</tr>
</tbody>
</table>

2 Political and Legislative Background

2.1 Governmental and regulatory structure

The authority is centralized. The most important laws of biowaste treatment are:

- Environmental protection act NR. LIII/1995
- Waste Management Act NR: XLIII/2000
- Ministerial decree NR. 23/2003 specifies the technical parameters and requirements of a composting plant
- Ministerial decree NR. 15/2003 contains the regional waste management plans of 7 statistical regions of Hungary
- Every Municipality has its own decree about the separate collection of green waste (garden waste)

2.2 Regulatory bodies

Legislation and decision: Ministry of Environment and water

Supervision, authorization: 12 local competent environmental inspectorates

3 Site Planning, Licensing and Legislation

3.1 Requirements

1. The building permit includes technology, concrete overlay, soil isolation, leachate collection, buildings, drainage ditch, electricity supply, groundwater controlling pump, etc. of the planned composting plant. This permission is given out by a local competent Building Authority and made with contributions from the National Social Health and Medical Officer Service, the Plant and Soil Conservation Service, the Environmental Inspectorate, Water casing Supervision, and others which the environmental inspectorate request. If animal waste is to be treated some in the composting plant, you need the contribution of the County Animal Health and Food Controlling Station, if hazardous waste is to be treated some in the composting plant, you need the contribution of the Disaster Recovery Captaincy as well.

2. After this permission process and building completed an operating permit must be obtained which is delivered by the local
competent Building Authority. To obtain this permission an audit by the above mentioned associations is required.

3. The waste treatment permit is delivered by the Environmental Inspectorate and made with contributions from the National Social Health and Medical Officer Service, the Plant and Soil Conservation Service, the Water casing Supervision, and others that the Environmental Inspectorate request. To obtain this permission it is necessary to have an environmental safety plan for the different processes in the composting plant.

4. The organic waste plant operating permit is delivered by the local government after the above- mentioned associations and the Fire Service Captaincy have given their agreement.

5. A composting plant has to administrate the annual amounts of incoming organic waste and the data must be sent yearly to the Environmental Inspectorate. The same obligation refers to the results of the controls. Use of chemical against rodent and insects must be reported to the National Social Health and Medical Officer Service.

6. For the sale of compost a marketing permit is required. This is delivered by the Ministry of Agriculture and Development of Rural Areas. The marketing permit is based on the analysis of samples of the compost products and is valid for 10 years.

3.2 Problems with obtaining permission

Sometimes the different authorities define orders on different ways.

3.3 Monitoring of Compost facilities

Leachate: Separate collection of leachate is obligatory. The analysis the leachate is mandatory if it is transported to a sewage treatment plant.

Odour: Odour measurement may be ordered if there are complaints from the community.

Dust: The limit value for emission of dust from the different operations on the plant is stated in the environmental safety plan of the plant. Its measurement may be ordered if there are complaints from the community.

Bio-aerosols: The limit value for emission of bio-aerosols is stated in the environmental safety plan.

Vermin: is neither declared nor controlled.

Noise: The limit value for emission of noise from the different operations on the plant is stated in the environmental safety plan of the plant. Its measurement may be ordered if there are complaints from the community.

Composition of waste: the regulation is in preparation.

3.4 Regulatory standards and Controlling procedures for odour management

There is a protection distance according to order Nr. 21/2001, which states a minimum required distance between a settlement and a waste treatment plant. The standard distance is 500 - 1000 meter when only non hazardous waste is treated.

The governmental decree Nr. 14/2001 determines the limits values for exposure to different volatile pollutants such as SO2, NO2, dust, etc.

In case of a public complaint, an independent organisation will makes measurement to detect presence and levels of odorous gases and suggest modifications in the methodology, technology or processes that will help to solve the odour problems.

3.5 Problems of requirements

Some problems have been encountered meeting the requirements.
3.6 Voluntary/Statutory Requirements

**Statutory:**
- **Technical Regulations** (The ministerial decree Nr. 23/2003 specifies the technical parameters and requirements of a composting plant)
- **Standards scheme – Quality criteria** (A certain number of process parameters and administrative data are required of organic waste composting plants e.g. temperature measurements, heap diary, etc. The marketing permission includes the quality criteria for the compost produced.
- **Environmental Impact Assessment** (Above a determined amount of waste treated: 2,000 t/y for hazardous waste and 10,000 t/y for non-hazardous waste)
- **Government policies – waste management plans** (Every statistical region and every municipality has to make a waste management plan in accordance with the National Waste Management Plan).

3.7 Standards - Regulations

**Voluntary:**
- **Standard Operating Procedure**

**Statutory:**
- **Limits for heavy metals** (Regulated in the governmental decree Nr. 50/2001 for compost from sewage sludge, and in the governmental decree Nr. 8/2001 for comports destined for sale).
- **Limits for pathogens** (Regulated in the governmental decree Nr. 50/2001 for compost from sewage sludge, and in the governmental decree Nr. 8/2001 for comports destined for sale)
- **Limits for plastics** (Regulated in the governmental decree Nr. 8/2001 - as inert matter).
- **Limits for organic contaminants e.g. pesticides** (Regulated in the governmental decree Nr. 8/2001 as PAH, TPH, PCB, etc.).
- **Limits for physical contaminants e.g. stones, glass** (Regulated in the governmental decree Nr. 8/2001).
- **Nutrients** (Minimum values sated in the governmental decree Nr. 8/2001).
- **Organic matter** (Minimum values sated in the governmental decree Nr. 8/2001).
- **Moisture** (Minimum values stated in the governmental decree Nr. 8/2001).
- **Other agronomic properties e.g. conductivity, humification** (Limit values for pH, bulk density, fraction size distribution, germination and growth inhibition, weed seeds, micro- and macro-organisms that are harmful and infectious for humans, animals or plants, poisonous, pollutant, and radioactive substances are listed in the governmental decree Nr. 8/2001).

Specific provisions for meat or catering waste:
The ministerial decree Nr. 71/2003 includes the requirements for treatment of meat and catering waste, which is based on the 1774/2003 EC regulation.

4 MSW – Economic aspects

4.1 Average prices of disposal / treatment processes for MSW

- **Landfilling:** 20 - 32 €/t
- **Incineration:** 44 - 52 €/t

4.2 Type of tax

Up till now no tax on landfilling or incineration exists.

A draft decree on the introduction of a landfill tax is in preparation, but hasn’t been implemented yet.

4.3 Average price of MSW landfilling of MSW incineration

The average price of landfilling is 20 – 32 €/t. Landfilling is the most widely used disposal process for MSW (there is only one MSW incineration plant in Hungary).
5 Future evolution of biological treatment and MBT

The driving forces for the evolution of biological treatment in Hungary were legislation, public awareness – lobbying and marketing incentives.

The most important driving force is the EU membership, because Hungary has to comply with the EU regulations in the field of waste management as well. Thus, in the close future we expect a rapid growth.

The driving force for the evolution of MBT in Hungary is public awareness-lobbying.

6 Composting

6.1 Quantity

The total amount of organic material composted in 2003 is ~100,000 tonnes.

6.2 Material Input

Agriculture

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest remains</td>
<td>10,000</td>
</tr>
</tbody>
</table>

Communities/Households

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biowaste/ Organic fraction of MSW</td>
<td>10,000</td>
</tr>
<tr>
<td>Garden waste</td>
<td>25,000</td>
</tr>
<tr>
<td>Sewage sludge</td>
<td>35,000</td>
</tr>
</tbody>
</table>

Industrial/Trade

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forestry products</td>
<td>5,000</td>
</tr>
<tr>
<td>Other organic waste</td>
<td>15,000</td>
</tr>
</tbody>
</table>

6.3 Composting facilities

<table>
<thead>
<tr>
<th>Type of composting facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanically turned windrow</td>
<td>13</td>
</tr>
<tr>
<td>Static pile with passive aeration</td>
<td>4</td>
</tr>
<tr>
<td>In-vessel</td>
<td>3</td>
</tr>
<tr>
<td>Other (compost pile covered with semi-permeable membrane with forced aeration)</td>
<td>10</td>
</tr>
</tbody>
</table>

6.4 Trends

The amount of organic material composted per year will increase to approx. 40,000 – 50,000 tonnes.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household</td>
<td>30,000 – 35,000</td>
</tr>
<tr>
<td>Industrial/trade</td>
<td>10,000 – 15,000</td>
</tr>
</tbody>
</table>

5 – 10 new composting facilities are planned.

6.5 Economic aspects

The average gate fee at a composting facility amounts to 13 – 18 € /tonne.

The average selling price of compost in:

- Agriculture: 14 - 16 €/t
- Landscaping: 17 - 18 €/t
- Hobby gardening: 20 €/t

7 Anaerobic Digestion

7.1 Quantity

The total amount of organic material anaerobically digested in 2003 is 15,428 tonnes.

There is only one anaerobic digestion plant in Hungary in Nyírbátor.

7.2 Material input

Agriculture

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manure</td>
<td>8,130</td>
</tr>
<tr>
<td>Harvest remains</td>
<td>1,843</td>
</tr>
</tbody>
</table>
Communities/Households

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitchen waste</td>
<td>33 t/y</td>
</tr>
<tr>
<td>Other (Sewage from chicken breeding)</td>
<td>83,501 m³</td>
</tr>
</tbody>
</table>

Industrial/Trade

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and beverage processing waste</td>
<td>14</td>
</tr>
<tr>
<td>Starch/sugar</td>
<td>1,196</td>
</tr>
<tr>
<td>Slaughterhouse/rendering plant</td>
<td>3,861</td>
</tr>
<tr>
<td>Other (sterilised liquid residue of meat processing)</td>
<td>351</td>
</tr>
</tbody>
</table>

7.3 Anaerobic digestion facilities

At the moment there is only 1 facility (continuous vertical tank) but new facilities are used directly.

7.4 Trends

The amount of organic material digested per year will increase to approx. 10,000 tonnes.

8 Mechanical-biological treatment (MBT)

The use of MBT technology in Hungary is only just beginning. There is only one functioning MBT plant, where experiments have been taking place since 2001.

Several ISPA projects including the use of MBT are under implementation.

9 Existing Outlets (The market for products from...)

9.1 Compost

The total amount of compost produced in Hungary 2003 is 70,000 tonnes.

9.2 Digestate

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>95</td>
</tr>
<tr>
<td>Forestry</td>
<td>5</td>
</tr>
</tbody>
</table>

10 Respondent – Key contact

Mrs. Zsuzsanna Pfeiffer
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11 References, other sources of information

11.1 Addresses

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Email: info@profikomp.hu

Alsó-Duna-völgyi Környezetvédelmi
Felügyelőség
Kövágó József igazgató
6500 Baja, Bajcsy Zs. u. 10.
6501 Baja Pf. 113.
Tel.: +36 79 425-385
Fax: +36 79 421-153
E-mail: adukvf@ktm.x400gw.itb.hu
1 Country Details

1.1 Population

The total area is 301,230 km² and the population is about 58 millions inhabitants.

36 % (109,728 km²) of the land area is farmland area.

1.2 Climate

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average temperature</td>
<td>16 to 24 °C</td>
</tr>
<tr>
<td>(summer)</td>
<td></td>
</tr>
<tr>
<td>Average temperature</td>
<td>-4 to 8 °C</td>
</tr>
<tr>
<td>(winter)</td>
<td></td>
</tr>
<tr>
<td>Average rainfall</td>
<td>15 mm per month</td>
</tr>
<tr>
<td>(summer)</td>
<td></td>
</tr>
<tr>
<td>Average rainfall</td>
<td>129 mm per month</td>
</tr>
<tr>
<td>(winter)</td>
<td></td>
</tr>
<tr>
<td>Wind regime</td>
<td>still in the Northern flatlands, variable in Central-Southern Europe</td>
</tr>
</tbody>
</table>

2 Political and Legislative Background

2.1 Governmental and regulatory structure

- The state establishes frame legislation for waste management, and issues acts and regulations.
- The 20 Regions issue regional laws on waste management in line with national legislation (Regional laws are mostly related to concepts and procedures for waste planning).
- Most of times, the 108 Provinces are mandated by regional laws to draw the waste management plans, to issue permits for MSW and carry out controls on facilities.

2.2 Regulatory bodies

Basically, the regulatory body concerning Waste Management is the Ministry of environment and the regional departments for the environment.

In fact this regulatory organisation does not perform other functions as well as regulation in the waste management sector.

3 Site Planning, Licensing and Legislation

3.1 Requirements

The procedure required to obtain approval to develop a new biological treatment facility is like the following:

- Application is usually submitted to Provinces (rarely to Regions);
- The project audit includes assessment of various planning and environmental background conditions (including consistency with current local urban and waste planning), the procedure must be kept accessible to the public throughout.
- The final step is a “conference” (hearing) of all interested/involved public bodies and authorities (province, municipalities, health authority, managing boards of protected areas, if hosting the site or bordering the site, etc.).
The Province finally releases or denies the permit, considering (non-binding) opinions of interested parties. In case the site is designed by urban planning for a different land use, the permit also constitutes an automatic modification of local planning (i.e. it implicitly includes the planning permit).

The most frequent problems with obtaining the permission are: Local opponents; appeals at regional courts against the procedure / its end decision; this usually slows down the procedure; is frequently reverses the final decision. As far as biological treatment is concerned, there is a high sensitivity to odour issues, given the comparatively high population density, above all in Northern Regions.

3.2 Permit/Licence to operate

In Italy there is a requirement of a site permit/license to operate.

3.3 Regulatory body

The regulatory body is usually the province.

3.4 Monitoring of composting facilities

Depending on the content of the permit (this is still a comparatively varied range of requirements, given there is no national technical regulation on compost sites; a decree now in draft form is to be issued soon):

**Statutory:**
- Input-output / type of materials (according to the European Waste Catalogue),
- Final quality of the product (has to fulfil requirements of the reference legislation → Act on fertilisers in case of quality compost from source separated materials, to be used/marketed as a product ;
- Time/temperature regime for sanitation.

**On many sites:**
- Odours (more and more authorities adopting olfactometry; some old approaches refer to VOCs)
- Wastewaters (some regions/provinces having established guidelines for proper design of tanks in order to ensure conservative management).

3.5 Regulatory standards and control procedures for odour management

No common nationwide standards. Most Regions/Provinces have introduced olfactometry, with limit values of exhaust air of 300 OU/m³.

Others are still misleadingly relying upon VOCs (usually thresholds at 5 or 10 mg/m³). Control is carried out by both - Provinces (as the regulatory body issuing the permit) and health authorities (as far as “public health and well being” are concerned).

3.6 Difficulties in meeting requirements

Most facilities meet the standards. Ring tests among labs performing olfactometry promoted by CIC, the Italian Composting Association, have confirmed practicability of thresholds – albeit with very careful design and management of the air treatment system. Nevertheless, at many sites fulfilling requirements, nuisance may be detected, from so-called “secondary sources” (e.g. tipping area, leachate puddles, storage of the product, outdoor maturation, etc.)

3.7 Standards - Regulations

- Technical Regulations (time/temperature for sanitation; odour and wastewater standards in many Regions)
- Standards scheme – Quality criteria (thresholds of the national Act on Fertilisers in order for the compost to be considered a “product” and to be used with no further licensing procedure)
- Environmental Impact Assessment
- Government policies – waste management plans (private initiatives anyway allowed, even if they go beyond the boundaries of local waste planning)
Those standards and regulations have:

- Limits for heavy metals
- Limits for pathogens
- Limits for plastics
- Limits for organic contaminants (The draft decree includes some POPs for compost, including sludge)
- Limits for physical contaminants (glass and total inert materials)
- Organic matter
- Moisture
- Other agronomic properties (Humic/Fulvic Acids; C/N; pH; Organic N)

### 3.8 Specific provisions for meat or catering waste

Animal by-products are subject to provisions of European Reg EC 1774/2003.

### 3.9 Other special requirements for wastes

Sludge is admitted as an input material for quality compost, up to 35 % w/w of the mixture.

Mixed MSW compost is not considered as a product according to the Act on Fertilisers. Restricted application possible (also in agriculture, but with limit loads) following an authorization procedure based on an old regulation (dating back to 1984) and with control of the state of soils. Provisions concerning application of mixed MSW compost on farmlands are likely to be repealed with the forthcoming legislation (only restricted non-food applications possible, e.g. for re-vegetation of old landfill sites).

### 4 MSW – Economic aspects

#### 4.1 Average prices of disposal / treatment processes for MSW

<table>
<thead>
<tr>
<th>Process</th>
<th>€ / t</th>
<th>What part of this price is tax %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfilling</td>
<td>70 (50 -100+)</td>
<td>20 €/t</td>
</tr>
<tr>
<td>MBT + landfilling</td>
<td>40 €/t (MBT) + 50-70 €/t (only the landfilled material, i.e. 25 to 60 % of the input material to MBT)</td>
<td>20 €/t (landfilled material) frequently cut by Regions by 80 % (considered a &quot;pre-treated&quot; material)</td>
</tr>
<tr>
<td>Incineration</td>
<td>75 (50-100+)</td>
<td>NET COST (includes high subsidies for the energy produced: 170 €/MWh on 100 % of the energy produced, including non-renewable materials)</td>
</tr>
<tr>
<td>Composting</td>
<td>20 green waste 50-70 food waste, sludge</td>
<td></td>
</tr>
</tbody>
</table>

#### 4.2 Type of tax

There is a landfill tax in Italy. (see 4.1.)

#### 4.3 Average price of MSW landfilling of MSW incineration

The average price of MSW landfilling of MSW incineration is 70 €/tonne. Fees vary widely depending on Regions – usually highest in northern Regions, but also those southern regions where there is a lack of disposal capacities. For incineration, see 4.1.

### 5 Future evolution of biological treatment and MBT

The driving forces for the evolution of biological treatment in Italy are:

- Legislation
- public awareness – lobbying
- marketing incentives
The national target for recycling (35%) has been the main driver, thus far, for the growth of composting. Local campaigns for recycling, such as those launched by NGOs, are also pushing decision makers to consider a high rate of composting. As a consequence, separate collection of garden and food waste is widespread (above all in Northern and Central Italy). 2 Regions have established subsidies for farmers (between 150 and 230 €/ha) to promote the use of compost in the context of Rural Development Plans, in order to restore fertility in depleted areas and prevent contamination by mineral N fertilisers.

Is soil strategy likely to play a further role, in the near future? Promotion of renewable energies has been detrimental, thus far, given the high-subsidy schemes for incineration. Level of subsidies is not able to overturn the higher costs of AD, as yet.

The driving forces for the evolution of MBT in Italy are:

- legislation
- public awareness – lobbying

Enforcement of the Landfill Directive is promoting systems for diversion/reduction of biowaste. MBT is being regarded as a "flexible" alternative to incineration. NGOs often show support to MBT as an alternative to mass-burn incinerators.

### 6 Composting

#### 6.1 Quantities

The total amount of organic material composted in 2003 was 2,724,000 tonnes.

This figure refers ONLY to source separated materials. Furthermore, 7,480,000 tonnes were treated in mixed MSW composting/MBT sites.

#### 6.2 Material Input

**Communities/Households**

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden waste</td>
<td>828,238</td>
</tr>
<tr>
<td>Kitchen waste</td>
<td>967,891</td>
</tr>
<tr>
<td>Sewage sludge</td>
<td>601,018</td>
</tr>
</tbody>
</table>

Other unspecified Input Feedstocks (in total) 327,449 tonnes

#### 6.3 Composting facilities

<table>
<thead>
<tr>
<th>Type of composting facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanically turned windrow</td>
<td>26</td>
</tr>
<tr>
<td>Static pile with passive aeration</td>
<td>32</td>
</tr>
<tr>
<td>Static pile with forced aeration</td>
<td>43</td>
</tr>
<tr>
<td>In-vessel</td>
<td>35</td>
</tr>
<tr>
<td>Mixed/Unspecified process technologies</td>
<td>122</td>
</tr>
</tbody>
</table>

Of these 258 plants, a total of 203 were active in 2003.

- 151 treated > 1,000 t/y,
- 40 between 100 and 1,000 t/yr (mostly small-scale sites for plain garden waste)

#### 6.4 Future growth

The amount of organic material composted will increase in the future: E.g. the increase in the amount of organic waste composted between 2001 and 2002 was from 2,539,000 to 2,823,000 tonnes.

This increase of household quantities is calculated on the basis of a planned capacity – as typically adopted by most Local Waste Management Plans – of 100 kg/inh./year (food and garden waste). An overall population finally covered by schemes of respectively 30 Mill. and 40 Mill. is assumed (out of a total population in Italy of 58 Mill.)

Concerning the increase in quantities from Trade and industry: The development is mostly dependent on future strategies for sludge and ABPs – guesses affected by too many affecting factors.

Also, it must be noted that the National Strategy for Reduction of Biodegradables from Landfills (notified to the EC in 2005, COM (2005) 105 final of 30.3.2005) foresees an increase of capacities to 8 Mt by 2008. This to our opinion cannot be fully trusted. It is likely to also include sludge (which should not be included in the calculations of diversion targets coming from the Landfill Directive).
From a regulatory standpoint, sludge may anyway be used alongside biodegradable household waste in input mixtures for compost (only sludge with low contamination, given the need to fulfil quality requirements of the National Act on Fertilisers). In any case, the percentage of sludge cannot exceed 35%.

6.5 Economic aspects

The average gate fee at a composting facility amounts to 20 €/t for garden waste; 60 €/t for food waste (50 - 70).

The average selling price of compost in:

- Agriculture: 3 €/t
- Landscaping (bulk sale): 10 €/t
- Landscaping (retailers): 20 – 40 €/t
- Hobby gardening: up to 200 €/t

*This is the value given to growth substrates, when compost is blended with sand, peat, etc. and bagged. Compost is used in blends in percentages from 30 (professional pot cultivation) to almost 100 % (amateur gardening). Bulk sale of compost to blenders (growing media producers who then blend/bag it) fetches up to 10-15 €/t.

7 Anaerobic Digestion

In Italy, no separate statistics are available for anaerobic digestion (AD): In the National Report on Waste Management figures for AD are included in those on composting. AD is very little used for MSW treatment (whether separately collected bio waste or mixed MSW), and – as fare as known - only 3 sites are currently in (full-scale) operation (for bio waste and MSW), for a total capacity of less than 100,000 t/yr. Many digesters may be found in WWTPs to treat sludge, or at farm sites for the treatment of manure, and other agricultural waste slurries. Background reasons for the slow implementation of AD are to be found in the comparatively higher investment and O&M costs (which are not compensated by high subsidies for renewable energy), and the poor integration between MSW and wastewater management, which implies that in most cases a fee is charged to AD managers for the disposal of their wastewaters to WWTPs (whereas this would not be the case for digesters at WWTPs themselves and run by same owners, in which case, of course, no fee is charged for wastewaters).

In Italy digestate is considered as sludge. It may be used directly on farmlands only as sludge, therefore following an authorization procedure. Otherwise, it may be post-composted and, if requirements of the Act on Fertilisers are met, it may be used and marketed free of license.

7.1 Economic aspects

The same prices apply to composted digestate as for compost. Non-composted digestate may not be sold and usually incurs a “disposal fee” for controlled application as a sludge onto farmland.

8 Mechanical-biological treatment (MBT)

The total amount of residual MSW treated in MBT-plants in Italy was 7,500,000 t in year 2003.

8.1 Material Input

<table>
<thead>
<tr>
<th>Communities/Households</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of waste</strong></td>
</tr>
<tr>
<td>MSW (mixed collection)</td>
</tr>
</tbody>
</table>

8.2 MBT facilities

<table>
<thead>
<tr>
<th>Type of MBT facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanically turned windrow</td>
<td>8</td>
</tr>
<tr>
<td>Static pile with passive aeration</td>
<td>12</td>
</tr>
<tr>
<td>Static pile with forced aeration</td>
<td>18</td>
</tr>
<tr>
<td>In-vessel</td>
<td>25</td>
</tr>
<tr>
<td>Mixed/Unspecified process technologies</td>
<td>55</td>
</tr>
</tbody>
</table>

Of the 118 plants, 94 were active in 2003.

Normally, biostabilisation is prior to landfill and production or refuse-derived fuel (RDF). The Treatment is carried out by means of so-called "splitting" (primary screening prior to stabilisation) or by dry-stabilisation system (separation after biological treatment)
8.3 Trend

There was an increase of MBT throughput from 3,791,000 to 5,639,000 tonnes to 7,500,000 tonnes in 2003.

8.4 Economic aspects

The average gate fee at the MBT facility is about 80 - 120 €/tonne. This fee is intended to cover total costs (calculated with full-cost accounting).

MBT Fees mainly depend on:
- local landfill fees (for rejects)
- fees (or revenues) for RDF
- public grants for the construction of plants (typical in Central-Southern Italy)

The average disposal price of the stabilised material or revenue from sale of RDF dry stabilate is:
- Rejects to landfill (incl. stabilised material): typically 50 to 70 €/tonne
- RDF to energy recovery (co-incineration or fluidised bed incinerators): 0 to 100 €/tonne
- Low-grade compost (mixed MSW compost) to application in land reclamation or as a daily cover: 0 to 20 €/tonne

9 Existing Outlets (The market for products from...)

9.1 The market for products from compost

A total of 900,000 tonnes of compost was produced in Italy in 2003.

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amateur gardening</td>
<td>27</td>
</tr>
<tr>
<td>Agriculture</td>
<td>51</td>
</tr>
<tr>
<td>Landscaping</td>
<td>6</td>
</tr>
<tr>
<td>Land restoration improving land quality</td>
<td>2</td>
</tr>
<tr>
<td>Landfill cover</td>
<td>10</td>
</tr>
<tr>
<td>Biofilters</td>
<td>4</td>
</tr>
</tbody>
</table>

9.2 The market for products from digestate

There are no separate statistics available for digestate (used in a controlled way, as sludge).

10 Comments and relevant information

10.1 Public awareness and lobbying

Many Municipalities offer tax rebates (10 - 30% of the waste tax) to households carrying out home composting. Other Municipalities (a few hundreds out of about 8,000) have already implemented pay-as-you-throw policies.

Since 1994, a major environmental NGO (Legambiente) has run a National Award (“Comuni Ricicloni”) ranking municipalities performing best as to separate collection and recycling rates. This has been shown to be a key instrument to diffuse “good practice” in waste management, and to show the leading role biowaste and composting plays to achieve highest recycling rates.

10.2 Training

The Italian Composting Association (CIC) carries out training courses on a regular basis.

10.3 Marketing and promotional schemes

1. Two regions (Emilia Romagna and Piemonte) implemented subsidy programmes (in the frame of Rural Development Plans, EC Reg. 2078) for reduced use of mineral fertilisers and application of organic soil improvers in soils with low organic matter.

2. MoE Decree 203/2003 mandates public bodies to include at least 30% (on total expenses) of “green purchases” (mostly recycled products). Compost is a key item in sectorial purchases for public gardening and landscaping.
10.4 Research and Development

R & D is particularly active in sectors pertaining to odour management and testing, and in assessment of stability (respirometry); also many research programmes on optimised applications of compost are promoted.

10.5 OTHER ASPECTS

Quality assurance system by CIC
CIC (Consorzio Italiano Compostatori, the Association of Compost Producers) is a non-profit organisation which at present represents over 70% of the Italian composting operators, with nearly 100 members. All the major waste companies in Italy belong to the association including those that are not yet producing compost but intend to do so. The Technical Committee assists members but also central government and regional authorities.

CIC is currently working on two basic objectives:

1. Promote the development of source separation of organic waste.
2. Promote the development of application and marketing of quality compost.

Recently CIC has carried out a survey for the development of a national Quality Assurance System (QAS) for compost plants and compost products; this would be aimed, over the next years, at identifying controlled operational conditions at facilities and types of product suitable for each application. A stepwise Working Plan has been set out to allow within 2 to 3 years, the start-up, pilot application and gradual diffusion of a Compost Quality Label within a wider Quality Assurance System (QAS).

Pending the implementation of a QAS, along the lines of those established in Central Europe, a simplified quality scheme is being run by CIC, basically testing compliance with National Regulations + other end-product standards. Some 20 sites have already been awarded the Quality Label.

11 Respondent – Key contact

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Fax: + 39 039 2327676
Email address: favoinomail@tin.it

12 References, other sources of information

12.1 Links

Relevant websites:

CIC: http://www.compost.it/www/index.html


Ministry of Environment: http://www.minambiente.it/Sito/home.asp

APAT (National EPA): http://www.apat.gov.it/site/it-IT/

ONR (Osservatorio Nazionale Rifiuti, National Monitoring and Reporting Center on Waste): http://www.osservatorionazionalerifiuti.it/home.asp
The Netherlands

1 Country Details

1.1 Population

The total area is 41,526 km² and the population is about 16.5 millions inhabitants. 48 % (20,000 km²) of the land area is farmland area. The area of 8,250 km² is used for agriculture, 1,150 km² are used for horticulture and 105 km² are used for horticulture glasshouses.

1.2 Climate

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Average temperature (summer)</td>
<td>16.6 °C</td>
</tr>
<tr>
<td>Average temperature (winter)</td>
<td>3.3 °C</td>
</tr>
<tr>
<td>Average rainfall (summer)</td>
<td>114 mm</td>
</tr>
<tr>
<td>Average rainfall (winter)</td>
<td>184 mm</td>
</tr>
<tr>
<td>Average rainfall per year</td>
<td>750 mm</td>
</tr>
<tr>
<td>Wind regime (summer)</td>
<td>3 m/s</td>
</tr>
<tr>
<td>Wind regime (winter)</td>
<td>4 m/s</td>
</tr>
</tbody>
</table>

2 Political and Legislative Background

2.1 Governmental and regulatory structure

The Central government is involved in planning and legislation. By law there is a ban on landfill for organic (containing) waste.

2.2 Regulatory bodies

The central government, provincial government and the municipalities have an advisory body: “Afval Overleg Orgaan”. The municipalities are contractors for organic waste treatment plants.

The regulatory organisation performs other functions as well as regulation. The central government is also responsible for the national waste plan, a six year forecast on environmental targets, policy and instruments for changing the waste infrastructure or realization of new treatment technologies.

3 Site Planning, Licensing and Legislation

3.1 Requirements

Obtaining a license is dependant on an environmental impact report (traffic, nuisance, emissions, Noise, odour, etc.) and the acceptance in a local development plan.

The regional governments of the twelve provinces in The Netherlands are in charge of the regulatory body.

3.2 Problems with obtaining permission

The most frequent problems with obtaining permission are odours and traffic and it is necessary to have a permit/licence to operate.
3.3 Monitoring of Compost facilities

The license owner has to keep a record of all in- and output.

3.4 Regulatory standards and Controlling procedures for odour management

Yearly check by an independent odour panel and the exposure is limited to 3 odour units for in for inhabited areas.

3.5 Problems of requirements

Odour control: the compost sector has improved the aeration and maintenance of the bio filters.

3.6 Voluntary / Statutory Requirements

Voluntary:
- Technical Regulations
- Standards scheme – Quality criteria (KIWA assessment guidelines BRL-K256/03)
- Government policies – waste management plans

Statutory:
- Standards scheme – Quality criteria (“BOOM” Decree on application of compost)
- Environmental Impact Assessment

3.7 Standards - Regulations

Voluntary:
- Limits for pathogens
- Limits for plastics
- Limits for physical contaminants e.g. stones, glass
- Nutrients
- Moisture
- Other agronomic properties (e.g. conductivity, humification)
- Standard Operating Procedure

Statutory:
- Limits for heavy metals
- Organic matter

3.8 Specific provisions for meat or catering waste

The Netherlands have no specific provisions for meat or catering waste but it will probably be obliged to implement the animal by-products directive; the main problem are the required standards for processing catering waste containing organic waste from households.

4 MSW – Economic aspects

4.1 Average prices of disposal / treatment processes for MSW

- Landfilling: 120 €/t (70 % is tax)
- Incineration: 100 €/t
- Composting (vegetable, fruits and garden waste) 50 €/t
- Composting (garden waste) 35 €/t

4.2 Type of tax

The landfill tax is applied on light (reusable or combustible waste) and heavy (inert materials, non organic sludges, soil, demolition, etc.) waste.

The tax on light waste, lower density than 1,100 kg/m³ is 83 €/t.

The tax on heavy waste, higher density than 1,100 kg/m³ is 13 €/t.

4.3 Average price of MSW landfilling of MSW incineration

The average price of MSW landfilling is 110 – 130 €/t and the average price of MSW incineration is 80 - 140 €/t ex VAT.
5 Future evolution of biological treatment and MBT

In the Netherlands MBT is momentarily a not chosen alternative for composting or incineration. A couple of mechanical separation plants coupled to a digester for the separated organic fraction is fully operational.

6 Composting

6.1 Quantity

The total amount of organic material composted in 2003 is 3,100,000 tonnes.

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable, fruits, garden waste</td>
<td>1,450,000</td>
</tr>
<tr>
<td>Garden waste</td>
<td>1,100,000</td>
</tr>
<tr>
<td>Residue from mushroom culture</td>
<td>500,000</td>
</tr>
</tbody>
</table>

6.2 Material Input

The Netherlands differentiates between green waste and VGF-waste (vegetables, fruit and garden waste – in Dutch: GFT = groente, fruit-en tuinavfall). The latter contains the organic waste from separate collection of the municipal solid waste MSW. Green waste – which means the organic residues from gardens and parks – is collected and treated separately. Since 1999 the organic residues from non-household sources are given special mention and included in the official regulations. (source – WRAP report Review of Compost Standards in the Netherlands.

Communities/Households

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden waste</td>
<td>1,100,000</td>
</tr>
<tr>
<td>Kitchen Waste (VGF)</td>
<td>1,450,000</td>
</tr>
<tr>
<td>Sewage sludge</td>
<td>50,000 (Dry matter)</td>
</tr>
</tbody>
</table>

Industrial/Trade

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other (residue from mushroom culture)</td>
<td>500,000</td>
</tr>
</tbody>
</table>

6.3 Composting facilities

<table>
<thead>
<tr>
<th>Type of composting facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanically turned windrow</td>
<td>7</td>
</tr>
<tr>
<td>Static pile with passive aeration</td>
<td>45 for garden waste</td>
</tr>
<tr>
<td>Static pile with forced aeration</td>
<td>5</td>
</tr>
<tr>
<td>Digester</td>
<td>1</td>
</tr>
<tr>
<td>In-vessel</td>
<td>1</td>
</tr>
<tr>
<td>Tunnelcomposting</td>
<td>9</td>
</tr>
</tbody>
</table>

6.4 Trends

The amount of organic material composted per year will not increase.

The organic waste from household is stable. No new plants are foreseen.

6.5 Economic aspects

The average gate fee at a composting facility amounts to 50 €/t.

The average selling price of compost in:
- Agriculture: 5 €/t
- Landscaping: 10 €/t
- Hobby gardening: 15 €/t

7 Anaerobic Digestion

7.1 Quantity

The total amount of organic material anaerobically digested in 2003 is 215,000 tonnes.

2 plants handle the organic fraction from mechanical separation and 1 plant for 35,000 tonnes VGF (vegetable, fruit and garden waste).

7.2 Anaerobic digestion facilities

At the moment there are 1 batch and 2 continuous vertical tanks in operation.
After treatment by aerobic composting the digestate can be used.

7.3 Trends

The amount of organic material digested per year will not increase.

7.4 Economic aspects

The average gate fee at a facility amounts to 45 €/t.

It is not allowed to use digestate from mechanically separated organic fraction for agricultural application because of heavy metal contamination. The digestate from separately collected and treated material is usable as compost “after aeration”.

8 Mechanical-biological treatment (MBT)

In the Netherlands MBT is not applicable.

9 Existing Outlets (The market for products from...)

9.1 Compost

The total amount of compost produced in the Netherlands 2003 is 600,000 tonnes (compost from VGF).

<table>
<thead>
<tr>
<th>Market Sector (compost from VGF):</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Horticulture</td>
<td>30</td>
</tr>
<tr>
<td>Amateur gardening</td>
<td>5</td>
</tr>
<tr>
<td>Agriculture</td>
<td>60</td>
</tr>
<tr>
<td>Landscaping</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Garden waste compost</th>
<th>t/y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horticulture</td>
<td>200,000</td>
</tr>
<tr>
<td>Agriculture</td>
<td>200,000</td>
</tr>
</tbody>
</table>

10 Respondent – Key contact

NVRD
Mr. Gijs van Bezooijen (Deputy director)
Postbox 1218
6801 BE, Arnhem
Tel.: +31 26 3771333
Fax: +31 26 4450155
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11 References, other sources of information

11.1 Addresses

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Agro Business Park 38
6708 PW Wageningen
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Tel.: +31 317-426755
Fax: +31 317-417963
Email: info@bvor.nl

11.2 Links

VERENIGING AFVALBEDRIJVEN
www.verenigingafvalbedrijven.nl

Country report on organic waste management in The Netherlands
www.compostnetwork.info

www.wrap.org.uk
1 Country Details

1.1 Population

The total area is 324,000 km² and the population is about 4.5 million inhabitants.

3.2 % (10,223 km²) of the land area is farmland area. The area of 3,796 km² is used to grow crops.

1.2 Climate

The climate and weather of Norway are very much influenced by Atlantic weather disturbances so that the weather is changeable throughout the year. Gales, rain, and cloud are the dominant features of this coast and rainfall is frequent and heavy. The interior highlands have an Arctic climate in winter, but during summer the daytime temperatures rise quite high with long hours of sunshine. By contrast the coastal areas have comparatively mild conditions in winter, because the warm Atlantic water of the Gulf Stream reaches to the extreme north of Norway.

<table>
<thead>
<tr>
<th>Average temperature (July)</th>
<th>17 °C (South)</th>
<th>15 °C (North)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average temperature (January)</td>
<td>0 °C (South)</td>
<td>-5 °C (North)</td>
</tr>
<tr>
<td>Average rainfall (annual)</td>
<td>300 – 3600 mm</td>
<td></td>
</tr>
<tr>
<td>Wind regime</td>
<td>variable</td>
<td></td>
</tr>
</tbody>
</table>

2 Political and Legislative Background

2.1 Governmental and regulatory structure

The State (Parliament and government) issues laws.

The Government agencies do the follow-up. 18 regional environmental agencies are involved in some actions (such as planning permissions).

The State Food Agency (under the ministry of Agriculture) follows up the Fertilizer Act with product licensing and auditing/inspections. Part of this work is delegated to regional offices.

2.2 Regulatory bodies

- **Permissions**: The Norwegian Pollution Control Authority (SFT).
- **At regional level**: County Governors (Fylkes Mannens)
- **Licensing of products**: State Food Agency

The regulatory organisation performs other functions as well as regulation.

The Norwegian Pollution Control Authority (SFT) is responsible for providing the professional basis for decisions for the Ministry in connection with pollution issues. In addition, the Pollution Control Authority has an executive responsibility with regard to:
• instructions and control relating to measures to combat industrial pollution
• acute pollution
• chemical substances and products
• monitoring pollution in air and water.

The Pollution Control Authority is authorized to issue instructions to the County Departments of Environmental Affairs concerning e.g. pollution, waste and products.

### 3 Site Planning, Licensing and Legislation

#### 3.1 Requirements

- **Building**: Standard procedures for building permission – land use regulation
- **Pollution**: permit from SFT and County Governors (Offices of Environmental Affairs)
- **Compost**: Product registration according to national quality criteria by Food safety Authority

#### 3.2 Problems with obtaining permission

The most frequent problem is odour management.

#### 3.3 Permit/Licence to operate

In Norway it is necessary to have a permit or licence to operate.

#### 3.4 Regulatory body

The regulatory body is SFT, delegated to Country Governors Environmental Offices.

### 3.5 Monitoring of Compost facilities

- **Product quality control**: Composition of waste, treatment temperature, sanitary quality, heavy metals, impurities
- **Pollution permission**: odours (site specific), waste quantity and type, leachate (site specific), noise (site specific)

### 3.6 Regulatory standards and Controlling procedures for odour management

No standards, limits are site specific. Facilities must have odour cleansing equipment and thresholds (OU) are set at the nearest neighbour.

### 3.7 Problems of requirements

- The permit is not specific enough (such as: "there shall be no odour nuisance")
- Problems to determine whether it is a nuisance or not.
- Threshold is below the measurable limit.

### 3.8 Standards - Regulations

**Voluntary**:
- Nutrients
- Organic matter
- Moisture
- Other agronomic properties (e.g. conductivity, humification)

**Statutory**:
- Limits for heavy metals
- Limits for pathogens
- Limits for plastics
- Limits for physical contaminants e.g. (absence of such contaminants is required, but no limit is actually set)
- Limits for physical contaminants e.g. stones, glass (impurities, incl. plastics: max 0,5 % DW)
3.9 Specific provisions for meat or catering waste

Norway has no specific provisions for meat or catering waste.

4 MSW – Economic aspects

4.1 Average prices of disposal / treatment processes for MSW

- Composting / AD: 100 €/t
- Landfilling: 125 €/t (40 % tax)
- Incineration: 125 €/t

4.2 Type of tax

Landfill tax: 50 – 65.25 €/t (depending on landfill type)

Incineration tax: related to external costs of emissions (particles, SOx, NOx, CO2, dioxines, heavy metals, etc.)

5 Future evolution of biological treatment and MBT

The driving force for the evolution of biological treatment in Norway is the legislation (Landfill ban on biowaste).

The driving force for the evolution of MBT is also the legislation. EU Landfill directive and national landfill act & strategies (prohibition of degradables to landfill from 2009 on). But there is no great focus on this today.

6 Composting

6.1 Quantity

The total amount of organic material composted in 2003 is 439,000 tonnes.

6.2 Material Input

<table>
<thead>
<tr>
<th>Communities/Households</th>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biowaste/ Organic fraction of MSW</td>
<td>150,000</td>
<td></td>
</tr>
<tr>
<td>Garden waste and Kitchen waste</td>
<td>50,000</td>
<td></td>
</tr>
<tr>
<td>Sewage sludge</td>
<td>150,000</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Industrial/Trade</th>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digestate from AD facilities (for OFMSW)</td>
<td>14,000</td>
<td></td>
</tr>
</tbody>
</table>

6.3 Composting facilities

<table>
<thead>
<tr>
<th>Type of composting facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanically turned windrow</td>
<td>20</td>
</tr>
<tr>
<td>Static pile with forced aeration</td>
<td>10</td>
</tr>
<tr>
<td>In-vessel</td>
<td>11</td>
</tr>
</tbody>
</table>

6.4 Trends

The amount of organic material composted per year will not increase.

6.5 Economic aspects

The average gate fee at a composting facility amounts to € 100,-/t.

The average selling price of compost in:

- Agriculture: 0 €/t
- Landscaping: 0 €/t
- Hobby gardening: 1,9 €/t

7 Anaerobic Digestion

7.1 Quantity

The total amount of organic material anaerobically digested in 2003 is 20,000 tonnes.
Agriculture

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manure</td>
<td>5,000</td>
</tr>
</tbody>
</table>

Communities/Households

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSW mixed collection – amount to AD</td>
<td>20,000 t/y</td>
</tr>
<tr>
<td>Kitchen waste</td>
<td>included in MSW</td>
</tr>
</tbody>
</table>

Industrial/Trade

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slaughterhouse/rendering plant (fish slaughter waste)</td>
<td>2,000</td>
</tr>
</tbody>
</table>

7.2 Anaerobic digestion facilities

In Norway there are 20 anaerobic digestion facilities.

The digestate from sewage sludge facilities is used directly or dried. The digestate form MSW is either used directly or post-composted (14,000 t).

7.3 Trends

Estimated increase in amount of organic waste digested to 100,000 tonnes by communities and households.

3 new anaerobic digestion facilities are planned.

8 Mechanical-biological treatment (MBT)

8.1 Quantity

The total amount of material treated in 2003 is 10,000 tonnes.

The share of stabilisation before landfiling amounts to 10,000 tonnes.

8.2 Material Input

8.3 MBT facilities

The destiny of the stabilised waste is landfill cover.

9 Existing Outlets (The market for products from...)

9.1 Compost

Market Sector:

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amateur gardening</td>
<td>40</td>
</tr>
<tr>
<td>Agriculture</td>
<td>13</td>
</tr>
<tr>
<td>Horticulture</td>
<td>33</td>
</tr>
<tr>
<td>Other uses (Internal use)</td>
<td>14</td>
</tr>
</tbody>
</table>

9.2 Digestate

Market Sector:

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>60</td>
</tr>
<tr>
<td>Landfill – restoration</td>
<td>40</td>
</tr>
</tbody>
</table>
10 Comments and relevant information

10.1 Source separation

In Norway the source separation of biowaste started in the 1990s motivated by a landfill ban and a state tax on end disposal of waste. Source separation of biowaste has been introduced for 61 % of the population (2.8 Mio.) and about 140,000 tonnes were collected (2002). Biowaste in Norway consists in most regions of 90 - 100 % kitchen waste, including kitchen waste of animal origin. Only 25 % of the population have a collection system for garden waste, among the rest many may deliver it at the local recycling station. About 84,000 tonnes of garden waste from households was registered in 2002. (Quoted from the Norwegian national report on www.compostnetwork.info).

10.2 Home composting

Many municipalities allow their citizens to compost their own organic waste in home composters. In return for not having to collect the waste, the municipality may grant the household a reduction in the waste collection fee and/or a reduced price for certified compost bins. The Nordic Eco-Labeling has set up criteria for compost bins. There are no national statistics on the use of home composting in Norway, but in many municipalities about 5 - 10 % of the households have a home composting contract with their municipality. (Quoted from the Norwegian national report on www.compostnetwork.info).

10.3 Other aspects

Regulations concerning organic fertilizers and soil improvers etc. (Quoted from the Norwegian national report on www.compostnetwork.info).

Since 1996 production and marketing of products based on organic waste is regulated under the “Regulations concerning fertilisers and soil improvers, etc.”. Sewage sludge has been regulated under a separate regulation. From July 20, 2003 a new regulation is valid that unites the regulations concerning all kinds of organic waste including sewage sludge and manure. The new regulation, called “Regulations concerning organic fertilisers and soil improvers etc.” is basically product oriented and all products must be registered before they can be traded. Demands are set up for a quality assurance system to ensure the compliance with the regulations. Product quality demands are set up for heavy metals and other toxic substances, hygienic parameters, impurities etc.

The products are classified after their concentrations of heavy metals according to the table below. Certain user restrictions are linked to the quality classes as shown in the table.

<table>
<thead>
<tr>
<th>Quality classes (mg/kg dry matter)</th>
<th>0</th>
<th>I</th>
<th>II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cd</td>
<td>0.4</td>
<td>0.8</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Pb</td>
<td>40</td>
<td>60</td>
<td>80</td>
<td>200</td>
</tr>
<tr>
<td>Hg</td>
<td>0.2</td>
<td>0.6</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Ni</td>
<td>20</td>
<td>30</td>
<td>50</td>
<td>80</td>
</tr>
<tr>
<td>Zn</td>
<td>150</td>
<td>400</td>
<td>800</td>
<td>1,500</td>
</tr>
<tr>
<td>Cu</td>
<td>50</td>
<td>150</td>
<td>650</td>
<td>1,000</td>
</tr>
<tr>
<td>Cr</td>
<td>50</td>
<td>60</td>
<td>100</td>
<td>150</td>
</tr>
</tbody>
</table>

User restrictions:

- **Quality class O:**
  - no specific restrictions
- **Quality class I:**
  - Maximum 4 t DM/da*10a, use on agricultural land and green areas permitted
- **Quality class II:**
  - Maximum 2 t DM/da*10a, use on agricultural land and green areas permitted
- **Quality class III:**
  - Use on green areas permitted. Maximum 5 cm/10a

11 Respondent – Key contact

NRF – The Norwegian Association of Solid Waste Management
Mr. Henrik Lystad

Nedere Vollgt. 3
N-0158 Oslo Norway
Tel.: +47 24146600
Fax: +47 24146601
henrik.lystad@nrfo.no
12 References, other sources of information

12.1 Addresses

The Norwegian Agricultural Inspection Service (Landbrukstilsynet)
P.O. Box 3
N-1431 Ås
Tel +47 64 94 44 00
Fax +47 64 94 44 10
postmottak@landbrukstilsynet.dep.no
www.landbrukstilsynet.no

The Norwegian Pollution Control Authority (SFT)
P.O. Box 8100 dep.
N-0032 Oslo
Tel.: +47 22 57 34 00
Fax.: +47 22 67 67 06
postmottak@sft.no
www.sft.no

12.2 Links

European Compost Network
Norwegian National Report
www.compostnetwork.info

The Norwegian Association of Solid Waste Management
www.nrfo.no

Lovdata - Current Norwegian legislation can be downloaded
www.lovdata.no

Nordic Swan Label (Nordic Eco-Labelling)
www.ecolabel.no

Criteria for homecomposters
www.svanen.nu/DocEng/019e.PDF
1 County Details

1.1 Population

The total area is 312,685 km² and the population is about 38.7 millions inhabitants.

59 % of the land area is agricultural land and according to demographic prognosis this will not be changing significantly in the next 10 years.

2 Political and Legislative Background

2.1 Governmental and regulatory structure

Regulations on composts use are specified by decrees of Ministry of Agriculture and Rural Development. It is allowed to produce compost from municipal wastes; however composts for sale as organic fertilizers must have ministerial approval based on chemical analyses, sanitary tests and assessment of its usefulness and environmental safety. Limit values for trace elements (zinc, chromium, cadmium, copper, nickel, lead, mercury) concentrations in organic fertilizers are specified. Sanitary test include presence of parasites and Salmonella bacteria.

Sewage sludge might be applied to soil for agricultural purposes at amount of 10 t dry matter/hectare during 5 years, if it meets all requirements specified in the order Ministry of Environment (on municipal sewage sludge use; 1.08.2002) – metals concentration limits, sanitary tests. The amount of sludge applied for soil reclamation purposes might be greater.

2.2 Regulatory bodies

Regulations on composts use are specified by decrees of Ministry of Agriculture and Rural Development.

3 Site Planning, Licensing and Legislation

3.1 Permit/Licence to operate

In Poland a site permit / licence is required to operate.

4 Composting Plants and Capacities

The total number of composting plants that produce compost from degradable municipal wastes was 54 in year 2000. They used various technologies from simple pile methods to dynamic composting in reactors.

These composting plants recycled 0.25 million tons of wastes which was 2 % of total amount of all wastes produced a year but 10 % of biodegradable wastes. Biodegradable household wastes were a significant part of total amount of municipal wastes – 2.49 million tons including 2.16 million tons from urban communities.

Municipal sewage sludges were mainly landfill (42 %). From total amount (360,000 tons) of municipal sewage sludge produced in Poland in 2000, 14 % was utilized in agriculture. Further 7 % of sludge was composted.
The data for year 2004 show a number of 34 composting plants in Poland, that work on a larger scale. Most of them are plants for the treatment of mixed collected municipal wastes: In 18 plants a quantity of about 550,000 t/a mixed municipal waste is treated. The other 16 composting plants with a total capacity of about 70,000 t/a are specialised in the treatment of separately collected organic waste and garden waste.

4.1 Problems of meeting requirements

There are difficulties in almost all polish composting plants concerning compost quality and compost marketing. The current main problem is not the concentration of heavy metals, but the visible contamination with particles from glass and plastic.

Some polish composting plants are faced with problems concerning the plant utilisation: The mostly private collectors of wastes decide for cheaper ways of treatment / disposal than composting. One of the competitive disadvantages of the composting plants is the fact, that about 60 % of the treated quantities have to be disposed as 'residuals after treatment'.

Other difficulties concern odour problems and other immissions.

5 Future perspectives

According to prognosis the total amount of municipal wastes in Poland would be in 2010 approx. 30 % higher than in year 2002, however production of biodegradable wastes should not increase significantly.

According to current policy, one of main objectives for close future is to develop and improve the effectiveness of selective collection of municipal wastes. Biodegradable wastes are that of especial importance. The systems of waste separation for recycling and neutralizing of biodegradable wastes will be developed to meet EU standards. The policy of Polish Ministry of Environment is intended to increase the number of local composting plants.

Development of anaerobic digestion of biodegradable wastes is expected as well as mechanical–biological pre-treatment of municipal wastes.

The amount of biodegradable wastes land-filled each year must be in 2010 reduced to 75% of the amount produced in 1995 (about 4.4 Mio tons).

6 Respondent – Key contact

Sources:
1. www.compostnetwork.info
1 Country Details

1.1 Population

The total area is 505,988 km² and the population is about 40.8 million inhabitants.

1.2 Climate

<table>
<thead>
<tr>
<th>Average temperature (year)</th>
<th>14 °C in the North</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12 °C in the Centre</td>
</tr>
<tr>
<td></td>
<td>18 °C in the South</td>
</tr>
<tr>
<td>Average yearly rainfall</td>
<td>553 mm</td>
</tr>
</tbody>
</table>

2 Political and Legislative Background

2.1 Governmental and regulatory structure

According to law 10/98 on wastes, the national government is responsible for making the national plan on waste and authorising the movement of wastes from and to third countries not belonging to the European Union, as well as inspections and penalties.

The autonomous communities are in charge of elaborating the autonomous plans on waste. They have to authorise the movement of wastes from and to EU countries.

The municipalities are in charge of MSW management. It is a compulsory service for municipalities: waste collection, transport and disposal as established in the ordinances.

2.2 Regulatory bodies

The regulatory body in Spain is the Ministry of the Environment.

3 Site Planning, Licensing and Legislation

3.1 Requirements

In Spain there is no specific legal norm about the construction of composting plants or about the management and control of the composting process.

The Waste Council of Catalunya established minimum technical conditions regarding organic waste management in composting plants (technical specifications for the managing of composting plants), which include:

- descriptive analysis of the separately collected organic fraction (what is in the waste);
- there must be a minimum proportion (24–33 %) of shredded vegetable wastes in the mixture;
- there should be a minimum residence time (12–14 weeks) in non-intensive systems (turned windrows);
- parameters involved in the process (temperature in degrees centigrade; oxygen and water levels) must be monitored and recorded;
- recommendations concerning minimum external impacts should be met (odour emissions, leachates, diffusion of volatile organic compounds, etc.).

No limit values were established for these parameters. (Source: WRAP Review of Compost Standards in Spain).
3.2 Permit/Licence to operate

In Spain it is necessary to have a permit or licence to operate.

3.3 Monitoring of Compost facilities

Normally composting facilities monitor temperature, humidity and pH. After the process they control heavy metals, humidity, temperature, C/N/P, etc.

3.4 Problems of requirements

In Spain no problems have been encountered meeting the requirements.

3.5 Voluntary / Statutory Requirements

Statutory:

- Government policies – waste management plans

3.6 Standards - Regulations

Statutory:

- Limits for heavy metals
- Limits for pathogens (Salmonellae: absence in 25 g of Fresh Weight, Faecal Streptococcus: $1 \times 10^3$ MPN/g, Total Enterobacteria: $1 \times 10^3$ CFU/g)
- Nutrients
- Organic matter
- Moisture

4 MSW – Economic aspects

4.1 Average prices of disposal / treatment processes for MSW

<table>
<thead>
<tr>
<th>Process</th>
<th>€ / t</th>
<th>What part of this price is tax %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composting</td>
<td>19.7</td>
<td>0</td>
</tr>
</tbody>
</table>

4.2 Type of tax

Only two autonomous communities have a tax on waste landfilling: Catalonia (10 €/t) and Madrid (no data on the amount available).

5 Future evolution of biological treatment and MBT

The driving forces for the evolution of biological treatment in Spain are:

- legislation
- marketing incentives
- soil strategy

6 Composting

6.1 Quantity

The total amount of organic material composted in 2003 is approx. 2,750,000 tonnes.

6.2 Material Input

Agriculture

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvest remains</td>
<td>no data</td>
</tr>
</tbody>
</table>
Communities/Households

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSW (mixed collection – amounts going to composting)</td>
<td>61</td>
</tr>
<tr>
<td>Biowaste / Organic fraction of MSW (OFMSW)</td>
<td>only in Catalonia and in some other cities</td>
</tr>
<tr>
<td>Garden waste</td>
<td>no data</td>
</tr>
<tr>
<td>Sewage sludge*</td>
<td>no data</td>
</tr>
</tbody>
</table>

6.3 Composting facilities

<table>
<thead>
<tr>
<th>Type of composting facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanically turned windrow</td>
<td>n.d.</td>
</tr>
<tr>
<td>Static pile with passive aeration</td>
<td>n.d.</td>
</tr>
<tr>
<td>Static pile with forced aeration</td>
<td>n.d.</td>
</tr>
<tr>
<td>Vermicomposting</td>
<td>n.d.</td>
</tr>
<tr>
<td>In-vessel</td>
<td>n.d.</td>
</tr>
<tr>
<td>Total number of operating facilities</td>
<td>83</td>
</tr>
<tr>
<td>Total number of facilities under construction</td>
<td>14</td>
</tr>
</tbody>
</table>

6.4 Trends

The amount of organic material composted per year will increase, estimated 10 % per year.

At present 18 new composting facilities are planned.

6.5 Economic aspects

The price depends more on geographical area and local conditions than on the compost quality.

7 Existing Outlets (The market for products from…)

7.1 Compost

The total amount of compost produced in Spain 2003 is 1,000,000 tonnes.

Market Sector:

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horticulture</td>
<td>no data</td>
</tr>
<tr>
<td>Amateur gardening</td>
<td>no data</td>
</tr>
<tr>
<td>Agriculture</td>
<td>no data</td>
</tr>
<tr>
<td>Landfill – daily cover</td>
<td>no data</td>
</tr>
</tbody>
</table>

Autonomous communities with big use (+ 50 kg/inh.) are: Andalucía, Valencia, Murcia, Cataluña and la Rioja.

With medium use (10 - 50 kg/inhabitant) are Castilla, Balearic Islands, Navarra, Cantabria and Madrid.

With low use (less than 10 kg/inhabitant) are Basque Country, Aragon, Galicia and Extremadura.

8 Respondent – Key contact

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Fax: +32 94 4243854
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9 References, other sources of information

9.1 Addresses

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Tel: +34 94 4641990
Fax: +32 94 4243854
ategrus@ategrus.org
www.ategrus.org
9.2 Links

European Compost Network
Spanish National Report
www.compostnetwork.info

Specific detailed reports on Andalusia and Catalonia
www.compostandalucia.net
1 Country Details

1.1 Population

The total area is 411,000 km² and the population is about 9 million inhabitants.

1.2 Climate

<table>
<thead>
<tr>
<th>Average temperature (July)</th>
<th>16 °C (South)</th>
<th>13 °C (North)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average temperature (January)</td>
<td>1 °C (South)</td>
<td>-9 °C (North)</td>
</tr>
<tr>
<td>Average rainfall (annual)</td>
<td>500 mm</td>
<td></td>
</tr>
</tbody>
</table>

2 Political and Legislative Background

2.1 Governmental and regulatory structure

In the Waste Management Action Plan (Aktionsplan Avfall) it is stated that waste should be separated at source. The strategy of the Swedish Environmental Protection Agency (SEPA) is mainly to divert the waste streams from landfilling. SEPA will prescribe that from the year 2002 combustible waste (not yet defined) has to be collected separately and may not be landfilled. From the year 2005 no organic waste is allowed to be landfilled. The landfill tax (see below) will make the price of biological waste treatment competitive with respect to landfilling, which is very cheap in Sweden.

As part of a countrywide strategy to connect the material and energy flow between urban and rural areas in Sweden, there is general agreement on the importance of returning nutrients from urban to agricultural soil. The policy is to stimulate appropriate use of sewage sludge and treated organic waste in agriculture. Compost from source separated household waste is permitted for use in ecological farming and under certain circumstances in ecological cultivation.

In Sweden it became illegal as of January 1st, 2002 to deposit separated combustible waste in landfills. Because of the shortage of capacity for recycling through biological treatment, material recycling, or incineration, a large number of landfill owners have been granted exemptions for continued landfilling. The government reckons that these exemptions can be terminated by 2004 – 2006.

In December 2002, the government issued an ordinance and regulations on the incineration of waste. This means that the EU directive is now introduced in Swedish legislation. In June 2003 the Swedish Environmental Protection Agency presented new general recommendations for composting and digestion. These will also mean tougher environmental requirements. The Environmental Protection Agency reckons that new regulations will be ready in 2003 specifying how the landfill ban on organic waste will be applied from 2005 on.

On January 1st, 2003 the tax on landfilled waste was raised to SEK 370 (41 €) per ton. The tax has thus risen by almost 50 % since it was introduced in 2000.
2.2 Regulatory bodies

The Swedish Environmental Protection Agency (SEPA) is a central environmental authority under the Swedish Government. According to the instructions laid down by the Government, its main tasks are to co-ordinate and promote environmental work on both a national and international level.

The Agency's most important tasks are to:

- **Development of environmental work:** propose targets, measures and control instruments for environmental policy and environmental protection activities.
- **Implementation of environmental policy:** carry out environmental policy decisions on government grants, application of law etc.
- **Follow-up and assessment:** follow up and assess the environmental situation and environmental efforts.

3 Site Planning, Licensing and Legislation

3.1 Voluntary / Statutory Requirements

Voluntary:
- Standards scheme – Quality criteria (specify in course of implementation)

3.2 Standards - Regulations

For the moment Sweden has no statutory standard for treatment and quality of organic waste, but the necessity of standards is seen clearly even by the government. Producers and users are of the opinion that a sustainable recycling of organic wastes demands clear regulations regarding to what is suitable to be recycled and how it should be managed and controlled. A well-founded quality assurance programme would definitely increase sustainable recycling of organic wastes.

Thus, between 1996 and 1999 the Swedish National Association of Waste Management (RVF) and the Swedish EPA initiated a project in order to develop voluntary quality assurance systems for compost and digested residuals from organic wastes. The project is financed by Swedish Association of Waste Management RVF and the Swedish EPA. This system demands that input material should be of clean organic origin and source separated.

3.3 Specific provisions for meat or catering waste

On May 1st, 2002 the EC ordinance on animal by-products came into force. The ordinance replaces the National Board of Agriculture’s ordinance SJVFS 1998:34. The ordinance divides animal waste into three categories, each associated with a different treatment method. Category 1 includes animal waste with BSE risk, which has to be destroyed by incineration. Category 2 includes waste classed as risk material because of animal diseases or residues of medicine. The prescribed forms of treatment are digestion, composting, or landfilling preceded by sterilization, or incineration. Category 3 includes waste from healthy, inspected animals, and the prescribed treatment is digestion or composting after pasteurization. Composting and digestion plants which handle only food waste from kitchens are exempted from the ordinance, and simplified rules will be drawn up for them. Until these are ready, national legislation will apply.

4 MSW – Economic aspects

4.1 Average prices of disposal / treatment processes for MSW

<table>
<thead>
<tr>
<th>Process</th>
<th>€ / t</th>
<th>What part of this price is tax %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfilling</td>
<td>72 - 133</td>
<td>30 - 55</td>
</tr>
<tr>
<td>Incineration (waste to energy)</td>
<td>22 - 55</td>
<td></td>
</tr>
<tr>
<td>Biological treatment</td>
<td>44 - 110</td>
<td></td>
</tr>
</tbody>
</table>

4.2 Type of tax

Landfill tax (as of 2003): 41 €/t
4.3 Average price of MSW landfilling of MSW incineration

The price of incineration (waste to energy) is 22 – 25 €/t.

5 Future evolution of biological treatment and MBT

The driving force for the evolution of biological treatment in Sweden is legislation.

The national goal is that 35 % of the biowaste should be treated in biological treatment plants before 2010.

In Sweden there are no driving forces for the evolution of MBT because MBT is not practiced.

6 Composting

The total amount of organic material composted in 2003 is 373,663 tonnes.

Biowaste in Sweden consists nearly by 100 % of waste from households, with only a small amount of organic material from gardens. Park and garden waste is mainly vegetable waste resulting from the normal management of parks and large gardens. Contrary to most of the other European countries Sweden allows to use animal manure for composting and anaerobic digestion.

6.1 Material Input

Agriculture

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manure</td>
<td>29,498</td>
</tr>
</tbody>
</table>

Communities/Households

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSW (mixed collection – amounts going to composting)</td>
<td>23,787</td>
</tr>
<tr>
<td>Biowaste / Organic fraction of MSW (OFMSW)</td>
<td>88,958</td>
</tr>
<tr>
<td>Garden waste</td>
<td>205,975</td>
</tr>
<tr>
<td>Kitchen waste</td>
<td>included in biowaste</td>
</tr>
<tr>
<td>Sewage sludge</td>
<td>not available</td>
</tr>
</tbody>
</table>

6.2 Composting facilities

Most composting plants (appr. 100) are rather small (< 5,000 t/y), while only about 25 composting plants are considered to be large.

<table>
<thead>
<tr>
<th>Type of composting facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biodegma</td>
<td>5</td>
</tr>
</tbody>
</table>

6.3 Trends

The amount of organic material composted will increase mainly in the category “household”.

In 1998, the Parliament decided that landfilling of organic wastes will not be allowed after the year 2005. Also, a tax on landfilled waste was proposed by the Ministry of Finance in Sweden. Altogether, this means that recycling of organic waste is promoted and the capacity of biological treatment might be doubled by year 2005.

6.4 Economic aspects

The average gate fee at a composting facility amounts to 30 – 100 € /t.

The average selling price of compost in:

- Agriculture: farmer don’t use compost
- Hobby gardening: 20 €/Trailer
7 Anaerobic Digestion

7.1 Quantity

The total amount of organic material anaerobically digested in 2003 is 223,463 tonnes.

7 anaerobic digestion plants are in operation and several new large scale AD plants are planned.

7.2 Material Input

Agriculture

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manure</td>
<td>68,212</td>
</tr>
</tbody>
</table>

Communities/Households

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSW (mixed collection – amount to AD)</td>
<td>0</td>
</tr>
<tr>
<td>Biowaste / (Organic fraction of MSW (OFMSW)</td>
<td>14,066</td>
</tr>
</tbody>
</table>

Industrial/Trade

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and beverage processing waste</td>
<td>27,000</td>
</tr>
<tr>
<td>Slaughterhouse / rendering plant</td>
<td>100,000</td>
</tr>
</tbody>
</table>

7.3 Anaerobic digestion facilities

The digestate is used directly.

7.4 Trends

The amount of organic material digested will increase mainly in the categories “agriculture” and “industrial/trade”.

2 new anaerobic digestion facilities are planned.

8 Existing Outlets (The market for products from...)

8.1 Compost

The total amount of compost produced in 2003 is 139,981 tonnes.

Market Sector:

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horticulture</td>
<td>33</td>
</tr>
<tr>
<td>Amateur gardening</td>
<td>33</td>
</tr>
<tr>
<td>Agriculture</td>
<td>0</td>
</tr>
<tr>
<td>Landscaping</td>
<td>33</td>
</tr>
</tbody>
</table>

8.2 Digestate

The total amount of digestate produced in 2003 is 216,653 tonnes.

Market Sector:

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>100</td>
</tr>
</tbody>
</table>

9 Respondent – Key contact

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Prostgatan 2
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Fax: +46 40 35 66 26
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10 References, other sources of information

10.1 Addresses

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Fax: + 46 40-356626
office@rvf.se

Naturvårdsverket
Swedish EPA
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Fax: +46 8 20 29 25
simon.lundeberg@environ.se

10.2 Links

Report of Swedish waste management
www.rvf.se

European Compost Network
www.compostnetwork.info
1 Country Details

1.1 Population

The total area is 41,300 km² and the population is about 7.3 millions inhabitants.

25.9 % (10,700 km²) of the land area is farmland area. The area of 4,290 km² is used to grow crops.

1.2 Climate

<table>
<thead>
<tr>
<th>Average temperature (annual)</th>
<th>4.4 °C (1,500 m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 °C (450 m)</td>
<td></td>
</tr>
<tr>
<td>Average rainfall (annual)</td>
<td>700 – 2000 mm</td>
</tr>
<tr>
<td>Wind regime</td>
<td>variable: still to windy</td>
</tr>
</tbody>
</table>

2 Political and Legislative Background

2.1 Governmental and regulatory structure

Switzerland is a federal republic consisting of 26 cantons. The legislative branch of the national government is a bicameral assembly, consisting of a Council of States (Ständerat) and a National Council (Nationalrat). The executive branch is a Federal Council of seven members (Bundesrat). Each canton has its own executive (Regierungsrat) and parliament (Kantonsrat). The cantons are divided into municipalities (Gemeinden).

Legal provisions on the subject of waste management are drafted at the federal level by the Swiss Agency for Environment, Forests and Landscape (SAEFL). Any new law or modification of existing texts is subjected to a consultation procedure requiring the opinion of cantonal authorities, political parties and other interested circles, before being discussed and approved by the two chambers of Parliament.

The Federal Technical Ordinance on Waste (TOW, 1990) decrees that municipal waste clearing operations and management are the responsibility of the cantons, which must establish a plan for waste management, defining among other things the sites for waste treatment plants. Whenever possible, the Cantons shall provide for the separate collection and recovery of the recyclable fractions of municipal waste, such as glass, paper, metals and textiles. Regarding biowaste, cantons must encourage, in particular by information and advice, the individual recycling of compostable waste in private gardens or neighbourhoods (home and community composting). Where this is not possible, the Cantons shall, whenever possible, provide for the separate collection and recycling of biowaste from households. This ordinance also states basic requirements regarding the licensing of biowaste treatment plants.

Each canton then has its own waste management law and prescriptions. The majority of the cantons have delegated the practical execution of municipal waste clearing operations and treatment to the municipalities or regional consortia for waste management. All the disposal operation are subject to federal and cantonal approval. Each canton must also establish an annual inventory of the quantities of waste produced in their jurisdiction and of its destination (type of treatment, disposal or recycling) which must be communicated to the SAEFL.

2.2 Regulatory bodies

- Swiss Agency for Environment, Forests and Landscape (SAEFL): drafting of national laws and ordinances
• **Cantons and cantonal agencies:**
cantonal laws and prescriptions

The regulatory organisations perform other functions as well as regulation.

**SAEFL:**
Tasks specific to waste management: the SAEFL Waste Management Division is responsible for establishing a legal framework for environmentally sound waste disposal and for overall coordination and national statistics. The Division develops programmes and regulations for the avoidance, recycling, treatment and landfilling of wastes of all kinds, and is also responsible for issuing licences for exports of waste.

Other tasks of SAEFL:
- provide a scientific basis for environmental protection measures
- implement environmental protection measures in cooperation with cantonal authorities, industry, non-governmental organizations (NGOs) and other players
- provide aids to enforcement for cantonal and communal authorities
- inform and advise the public
- international involvement and coordination

**Cantons and cantonal agencies:**
Plant licensing and control (siting, operation, emissions, material flows), statistics, planning.

### 3 Site Planning, Licensing and Legislation

#### 3.1 Requirements

New sites require building permission, which is granted by the municipal planning authority in particular on the basis of the local land use plan. Within their area of responsibility, the Cantons must coordinate all the necessary licensing procedures for the construction or operation of waste treatment facilities, in particular the licenses for land use, forest clearing and water protection, and those required under the Labour Law.

Composting plants which treat more than 100 t of compostable waste per year are subject to the following requirements for building and operation (Art. 43 and 44 of the Technical Ordinance on Waste):
- they must not be constructed in groundwater protection areas
- they must be enclosed and the entrances must be lockable
- they must be designed in such a way to provide for wastewater collection and diversion to a sewage treatment plant or an outlet channel.

During operation, the owner of the plant must:
- check that the waste received is compostable;
- record the weight of the waste received and communicate this data annually to the authorities;
- analyse the heavy metal and nutrient content of the products (compost or solid or liquid digestate) at least once a year.

Facilities designed to treat more than 1,000 t/year are subject to an environmental impact assessment, which must be approved by the cantonal authorities, in particular the environmental and spatial planning offices.

#### 3.2 Problems with obtaining permission

One or more of the above-mentioned requirements are not satisfied. Opposition by the public (NIMBY syndrome), which at best slows down the procedure, at worst halts it completely.

#### 3.3 Permit/Licence to operate

This depends on the specific cantonal laws. In some cases the building permit is also an operation permit, in other cantons a specific operation license is required. Building permits are delivered by the municipal authorities, whereas operation permit are delivered by the cantons.

#### 3.4 Regulatory body

The regulatory body are the cantonal authorities (if applicable).
3.5 Monitoring of Compost facilities

- Federal Law (TOW): Quantities and compostability of the waste
- Federal prescriptions: Compost quality: heavy metals, sanitation (temperature).

The Cantons may edict more severe prescriptions.

3.6 Regulatory standards and Controlling procedures for odour management

There are no specific limits (limit values) for odours. In the federal law (Ordinance on Air Pollution, 1983), odours are listed as atmospheric pollutants and must be limited at source (OAP, art. 11). Immissions of atmospheric pollutants must not cause nuisance or harm to the environment and populations (OAP, art. 13 & 14).

Cantonal or local authorities may fix more severe or precise prescriptions, for example minimum distances.

3.7 Problems of requirements

There is a trend towards enclosed systems equipped with biofilters due to complaints about odours (real or feared).

3.8 Voluntary/Statutory Requirements

Voluntary:
- Standards scheme – Quality criteria (VKS-ASIC-ASCP Quality guidelines, 2001)

Statutory:
- Technical Regulations (Ordinance on the treatment of waste (OTW, 1990, sr 814.600)
- Standards scheme – Quality criteria (Ordinance on substances - StoV, 1986, sr 814.013)
- Environmental Impact Assessment (for plants designed for more than 1,000 t/year)
- Government policies – waste management plans (Both national and cantonal)

3.9 Standards - Regulations

Voluntary:
- Nutrients
- Organic matter
- Moisture
- Other agronomic properties (e.g. conductivity, humification)

Statutory:
- Limits for heavy metals
- Limits for plastics
- Limits for physical contaminants e.g. stones, glass
- Nutrients
- Standard Operating Procedure (for sanitation)

Limit values for physical contaminants in compost:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Limit value</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>stones &gt; 5 mm Ø</td>
<td>50 g per kg dry weight</td>
<td>smaller stones and sand are not considered impurities</td>
</tr>
<tr>
<td>impurities such as metals, glass, plastics &gt; 2 mm Ø</td>
<td>5 g per kg dry weight</td>
<td></td>
</tr>
<tr>
<td>plastic and aluminium film &gt; 2 mm Ø</td>
<td>1 g per kg dry weight</td>
<td></td>
</tr>
</tbody>
</table>

3.10 Specific provisions for meat or catering waste

According to Art. of the Federal Ordinance on epizootic diseases (1995), catering wastes must be e.g. boiled for 20 minutes in a boiler with a system for monitoring and display the process temperatures.

The Ordinance on animal by-products (2004) classifies and regulates the disposal of meat wastes. Catering wastes are specifically excluded from this Ordinance.

3.11 Other special requirements for wastes

The addition of sewage sludge to compost or to liquid or solid digestate was banned in 2003 (Ordinance on Substances, Annex 4.5, n. 221, para. 2)
4 MSW – Economic aspects

4.1 Average prices of disposal / treatment processes for MSW

<table>
<thead>
<tr>
<th>Process</th>
<th>€ / t</th>
<th>What part of this price is tax %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incineration</td>
<td>100 - 130</td>
<td>0</td>
</tr>
<tr>
<td>Composting</td>
<td>70 - 100</td>
<td>0</td>
</tr>
<tr>
<td>Anaerobic digestion (of biowaste)</td>
<td>80 - 107</td>
<td>0</td>
</tr>
</tbody>
</table>

4.2 Type of tax

There is no national tax on waste treatment or disposal processes. Some cantonal taxes exist, e.g. on the waste incinerated (for example in the canton of Geneva). The proceeds of these taxes are then used to promote waste recycling (i.e to finance civic amenity sites, public awareness campaigns, etc.).

Taxes (advance disposal fees) are levied on some consumer goods (batteries, beverage bottles, electrical and electronic appliances) to finance collection and recycling of the waste goods.

4.3 Average price of MSW landfilling of MSW incineration

MSW incineration 100 – 130 €/tonne

NB: landfilling of combustible waste (sewage sludge, MSW and combustible construction waste has been banned in Switzerland since 1.1. 2000). At present less than 5 % of MSW is still landfilled.

5 Future evolution of biological treatment and MBT

The driving forces for the evolution of biological treatment in Switzerland are:

- legislation
- public awareness – lobbying
- marketing incentives
- promotion of renewable energy sources
- waste strategies (national and cantonal): increased separate collection/diversion goals

Comments: by "marketing incentives" we intend the effort of the professional associations to improve the image of compost as a product.

6 Composting

6.1 Quantity

The total amount of organic material composted in 2002 is 639,900 tonnes.

6.2 Material Input

<table>
<thead>
<tr>
<th>Communities/Households</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biowaste/Organic fraction of MSW (OFMSW)</td>
<td>320,000</td>
</tr>
<tr>
<td>Garden waste incl. in OFMSW</td>
<td></td>
</tr>
<tr>
<td>Kitchen waste incl. in OFMSW</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Industrial/Trade</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and beverage processing waste</td>
<td>60,000</td>
</tr>
<tr>
<td>Landscaping/ground maintenance</td>
<td>250,000</td>
</tr>
<tr>
<td>Digestate from AD facilities</td>
<td>9,900</td>
</tr>
</tbody>
</table>
6.3 Composting facilities

<table>
<thead>
<tr>
<th>Type of composting facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanically turned windrow</td>
<td>290</td>
</tr>
<tr>
<td>Static pile with passive aeration</td>
<td>7</td>
</tr>
<tr>
<td>Static pile with forced aeration</td>
<td>10</td>
</tr>
<tr>
<td>Vermicomposting</td>
<td>2</td>
</tr>
<tr>
<td>In-vessel</td>
<td>12</td>
</tr>
</tbody>
</table>

6.4 Economic aspects

The average gate fee at a composting facility amounts to 80 €/t (excl. 7.6 % sale tax)

The average selling price of compost in:
- Agriculture: -7 €/t*
- Landscaping: 27 €/t
- Hobby gardening: 40 €/t

* negative price because the composting facilities subsidize the spreading of compost

7 Anaerobic Digestion

7.1 Quantity

The total amount of organic material anaerobically digested in 2002 is 89,400 tonnes.

This amount does not include the sewage sludge stabilized by anaerobic digestion in wastewater treatment plants (total production in 2002: 200,000 t DW*). Since 2003, sewage sludge cannot be composted with other biowaste and its use as fertilizer will be banned in 2006. Only 21 % of sewage sludge was still recovered in agriculture in 2002 (circa 42,000 t DW*). The rest was mostly incinerated (153,000 t DW*).

Co-digestion of farm wastes with OFMSW, catering wastes or other biowaste is still in the development phase.

*DW: dry weight

Communities/Households

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biowaste / Organic fraction of MSW (OFMSW)</td>
<td>50,000</td>
</tr>
<tr>
<td>Garden waste</td>
<td>incl. in OFMSW</td>
</tr>
<tr>
<td>Kitchen waste</td>
<td>incl. in OFMSW</td>
</tr>
</tbody>
</table>

7.2 Anaerobic digestion facilities

<table>
<thead>
<tr>
<th>Type of facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous vertical tank</td>
<td>3</td>
</tr>
<tr>
<td>Continuous horizontal tank</td>
<td>1</td>
</tr>
<tr>
<td>Continuous plug-flow systems</td>
<td>8</td>
</tr>
<tr>
<td>Continuous multiple tank systems</td>
<td>1</td>
</tr>
<tr>
<td>Others/unspecified (co-digestion)</td>
<td>n.d.</td>
</tr>
</tbody>
</table>

These statistics refer to the number of anaerobically digestion plants which treat solid wastes, mainly OFMSW. A further 300 facilities located on wastewater treatment plants anaerobically digest the sewage sludge produced. 55 of these plants co-digest other substrates (OFSW or industrial biowastes).

There are also some 20 anaerobic digestion plants for the treatment of industrial wastewaters (e.g. food and beverage industry, papermills).

Most of the digestate is used directly. Only about 10 % is post-composted.

7.3 Trends

Estimated increase in amount of organic waste digested to 10,000 tonnes by year.
- Communities/Household: 5,000 t
- Industrial/Trade: 5,000 t

New anaerobic digestion facilities are planned:
- about 1 industrial (> 5,000 t/y)
- and/or 5 co-digestion plants (farm and other biowaste)

7.4 Economic aspects

The average gate fee amounts to 80 - 107 €/t and the average selling price of the digestate is -7 €/t (negative price because the composting facilities subsidize the spreading of compost).
8 Existing Outlets (The market for products from…)

8.1 Compost

The total amount of compost produced in Switzerland 2002 is 360,000 tonnes.

Market Sector:

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amateur gardening</td>
<td>12</td>
</tr>
<tr>
<td>Agriculture</td>
<td>50</td>
</tr>
<tr>
<td>Landscaping, grounds maintenance and horticulture (incl. potting soils)</td>
<td>38</td>
</tr>
</tbody>
</table>

8.2 Digestate

The total amount of digestate produced in Switzerland 2002 is 45,000 tonnes (50 % as solid digestate, 50 % liquid digestate/press water).

Market Sector:

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>100</td>
</tr>
</tbody>
</table>

9 Comments and relevant information

9.1 Public awareness and lobbying

Campaigns are regularly organised by local authorities to improve separate collection of biowaste. In the past years, the Kompostforum has co-ordinated several campaigns ("Compost spring", "Compost summer", "Compost autumn") to promote composting, where local authorities, compost plants and compost counsellors have organised action days around themes relating to biowaste collection and composting. In 2004, over 100 local and regional authorities took part in the campaign.

In 2005, a nationwide campaign called "Treasure hunt" is to be co-sponsored by the authorities and a large number of organisations involved in waste management, including composting organisations (ASCP and Kompostforum). This "Campaign to promote a better management of our resources, products and wastes" will culminate on the "Action days" of 27 and 28 of May 2005. It is hoped to continue the campaigns in the following years and increase its sponsoring platform (including wider support from the private economy) and its impact on the public.

Various awareness raising programs are also offered to schools by different organisations (see under Section H, the references on the SAEFL homepage).

9.2 Home composting

According to the Swiss Ordinance on Waste, encouragement of home and neighbourhood composting is to be given priority over separate collection and centralised treatment. In reality, separate collection and centralised treatment have become generalised throughout the country and the amounts treatment on a private or neighbourhood scale are estimated at about 300,000 t/year, less than half the amount separately collected in 2003 (740,000 t).

Several cities (e.g. Zürich, Bern, Basel) and regions have programs to encourage home and neighbourhood composting, offering helplines, documentation, compost counselling and free shredding services.

The organisation Kompostforum promotes home and neighbourhood composting and trains compost counsellors.

9.3 Lobbying training, marketing and promotional schemes

Promotion of compost as a quality product: the ASCP professional association, training, quality standards and plant inspectorate

Swiss waste management guidelines require that the recycling of a waste fraction be not only environmentally beneficial, but also economically sustainable. Advanced disposal fees have thus been introduced on many products (PET beverage containers, batteries, glass bottles, electrical and electronic appliances) to finance collection and recycling
schemes. This is not possible for biowaste. Nevertheless, the economic sustainability of biowaste treatment is a necessary long-term goal and can only be achieved if a real market can develop for its products. All this confirms how necessary it has become to change the image of compost in the eye of the public and users, from a waste by-product to a valuable resource.

The ASCP

It is in this context of decreasing economic sustainability and increasing demands from the food producers and consumers regarding traceability that the Association of Swiss Compost and Methanisation Plants (ASCP) was founded in 1999, with three main aims:

• close material and energy cycles in biowaste management
• encourage high professional standards in compost production
• create the conditions for a real market for compost and its by-products

The Association, which groups the plants processing more than 100 t/y of biowaste, now counts over 40 members, who together process more than 400,000 t of biowaste, 2/3 of the amount collected yearly in Switzerland.

Training, quality and monitoring are the three keywords of the ASCP strategy. Encouraged by the federal authorities, the ASCP has developed a training program, quality guidelines and a branch inspectorate and label, aimed at guaranteeing high standards of quality, both for the process management and for its products.

Training program

To produce quality compost every worker on the plant must possess some basic knowledge that enables him to understand the consequences of his actions. In practice, the driver of the front-end loader must not only know how to drive his vehicle, but must for example also be conscious that by piling up compost without the necessary precautions, the resulting compaction will cause a decrease in the quality of the product.

A modular training program has been developed and carried out by the ASCP at a national level since 2000, both in German and French. The training courses are tailored for workers on composting and anaerobic digestion plants and aim to promote best practice during compost production, but also to raise self-awareness and esteem among compost workers, by a better knowledge of their products and of their properties and qualities.

Basic module (3 days)

Participants are given a general overview of biowaste management and a grounding in the legal basics. After this introduction, the biological basics of composting are taught. In this way every participant learns what is happening in a compost pile. All the other aspects of the management of a composting plant which are then treated relate more or less directly to this biological basis: choice of treatment techniques, type of waste accepted, worksheets, quality assurance systems, etc. Site visits complete the course, so the participants get an insight into the variety of existing composting techniques and processes.

Quality module

In this module, the accent is placed on process and quality control. Simple chemical analyses and plant tests are taught, that can be used by the workers themselves after a minimal training, to monitor the quality of their compost on-site. Such analyses, in particular the plant-germination and growth tests, allow compost workers and producers to discover directly the influence of their own products on plant health and growth. This serves to promote awareness that producing high-quality compost is no mean feat and demands specific skills and careful process management.

Quality criteria for composts and digestates from biowaste

The compost and digestate quality guidelines were published in 2001 by the ASCP in collaboration with the Swiss Biogas Forum. The aims of theses guidelines are to assist producers in producing compost of consistent and reliable quality and to encourage greater consumer confidence in composts. They define the characteristics a compost must possess for its use in agriculture, in horticulture and market gardening, landscaping or in covered cultures. Covered cultures and private gardening require the highest quality and degree of maturity. Slightly lower standards suffice for commercial horticulture. The minimal
requirements set out in the Federal guidelines apply for agricultural and other use.

The guidelines are intended as complementary to the federal instructions and recommendations, and in no case do they replace them. The minimal quality requirements have been amended and the meaning of the terms "rotted" and "digestate" has been further specified. Compost complying with all the requirements of the present guidelines can be obtained from digestates which have undergone state-of-the-art aerobic post-composting.

A further novelty of these guidelines, going considerably farther than any of the standards formulated by the federal research stations, are the quality requirements for compost used in horticulture and landscaping, both for outdoor and covered cultures. Beside chemical and physical parameters, normalised biological tests are also proposed.

To obtain a high quality finished product requires not only state-of-the-art processing, but also a correct choice of feedstocks. Only materials with low levels of pollutants should be used. This excludes wastes susceptible of being highly contaminated, such as sewage sludge, or waste from street cleansing. The ASCP and Biogas Forum recommend that the feedstock and additives be declared.

The 3 quality grades defined in the ASCP Guidelines 2001 are:

- Composts and digestates for agricultural use are materials that conform to the statutory minimum quality grade. This grade defines "properly composted" wastes, stating that compost can be regarded as mature when the feedstock is no longer recognizable (except in the case of wood) and the ammonium content is less than 300 mg/kg fresh weight.

- Composts used in horticulture, market gardening and landscaping must satisfy additional requirements (over and above the minimum quality grade) with regard to biological (plant compatibility tests), chemical and physical parameters.

- Composts used in greenhouses and private gardens must satisfy more stringent requirements with regard to biological (plant compatibility tests), chemical and physical parameters.

Plant inspectorate and label

In 2003, the ASCP set up an independent and nationally recognised auditing scheme for biowaste processing plants (inspectorate), in close co-operation with the other professional associations in the field and with the regional and federal authorities. An inspectorate commission was constituted with representatives of all the parties involved: compost producers and their branch associations, federal and cantonal authorities, research institutes and end-users (agriculture, horticulture and market gardening). The audits are carried out by accredited inspectors, who are specialists of composting processes and compost quality, but are not compost producers themselves. This independence is essential to guarantee the strict conformity and quality of the inspections.

Since 2005, the inspectorate is piloted by a consortium of the three main professional organisations in the field (ARGE Inspektorat). It can now aim to be recognised by the federal and cantonal authorities as the official branch inspectorate, thus substituting itself to the controls carried out by the authorities. This is already the case in the cantons of Aargau, Solothurn and Zürich, where the authorities have given mandate to the branch inspectorate to inspect all the plants treating more than 100 t/y of biowaste. In cantons where no such mandate exist as yet, it is up to the plants themselves to ask to be inspected. In some cases the cantonal authorities then recognise the inspection as equivalent to the controls they carry out. Discussions are continuing with the cantonal authorities throughout Switzerland to extend the recognition of the branch inspectorate. In all some 100 plants were inspected in 2003 and 2004, and it is hoped to double this number in 2005.

At present, this inspectorate controls the minimal quality requirements prescribed by the law. These concern mainly environmental protection (water, air and soil protection), and compliance with the minimal quality requirements set out in the federal recommendations. In the future it is planned to extend the auditing scheme to higher quality specifications (compliance with the ASCP quality guidelines for their higher-quality products) and to develop a label for these products. Negotiations are here underway, including attempts to standardize the label requirements with those of BIO SUISSE label for organic farming.
9.4 Research and development

Compost studies

Two Swiss research projects were launched in 2003 and are due to be finished in 2006.

The first project, "Effects of Composts on the Environment, Soil Fertility and Plant Health", aim is to assess the beneficial effects of compost and digestate application on plant growth and health, on soil parameters and on the environment in general. During this research project, which will enter its main phase in 2004, the accent will be placed on determining to what degree these beneficial qualities are widespread in composts and digestates and how they can be selectively enhanced.

The second parallel national project is looking at the organic pollutants in composts. The research team of "Organic pollutants in compost and digestate in Switzerland" aim to determine the contamination level of composts and digestates by substances such as PAHs, PCBs, dioxins, phthalates, polybrominated flame retardants, chlorinated paraffins and plant treatment agents. It then intends to assess the possibilities of minimizing such contaminants and propose measures to improve quality management, risk analyses and regulation concerning biowastes from this point of view.

The composts and digestates used in these two projects were collected during a common countrywide sampling campaign carried out in 2004 and 2005. Literature studies were published in 2004 for both these projects.

10 Respondent – Key contact

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11 References, other sources of information

11.1 Addresses

ASCP: Association of Swiss Compost and Methanisation Plants
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Tel.: +41 (31) 858 22 24
Fax: +41 (31) 858 22 21
vks-asic@email.ch
www.vks-asic.ch

GCP: Groupement des compostières professionnelles romandes
(French-speaking branch of the ASCP)
Secretariat:
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Fax: +47-244442049
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www.gcp-compost.ch

Kompostforum
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Tel.: +41 (62) 213 88 78
forum@kompost.ch
www.kompost.ch

Biogas forum
Biogas Forum, Sekretariat
c/o Dr.A.Wellinger
Nova Energie
Châtelstr. 2
CH-8355 Aadorf
Tel.: +41 (52) 368 34 70
Fax: +41 (52) 365 43 20
arthur.wellinger@novaenergie.ch
www.biogas.ch
(also some pages in English)

ARGE Inspektorat
Consortium of the three above-mentioned associations for the implementation of the national plant auditing scheme
Secretariat: René Estermann
Waldhofweg 27b
CH-5034 SUHR
Switzerland
Tel.: +41 (62) 213 93 73
arge@kompost.ch
11.2 Links

**Biowaste management in Switzerland** - legislation, statistics, quality, environmental education etc., see the SAEFL Waste division pages in English: [www.environnement-suisse.ch/buwal/eng/fachgebiete/fg_abfall/zahlen/index.html](http://www.environnement-suisse.ch/buwal/eng/fachgebiete/fg_abfall/zahlen/index.html)

in particular the pages on biowaste ([www.environnement-suisse.ch/buwal/eng/fachgebiete/fg_abfall/abfallwegweiser/gruengut/index.html](http://www.environnement-suisse.ch/buwal/eng/fachgebiete/fg_abfall/abfallwegweiser/gruengut/index.html))

**Compost quality guidelines** (in English): [www.vksasic.ch/acrobatreader/vks_richtlinie_english.pdf](http://www.vksasic.ch/acrobatreader/vks_richtlinie_english.pdf)

**Compost studies:**

**Association of Swiss compost and methanisation plants:**
[www.vks-asic.ch](http://www.vks-asic.ch) (in German and French)

**Kompostforum:** small-scale, farm and home composting (in German):
[www.kompost.ch](http://www.kompost.ch)

**Compost counselling** (in German):
[www.kompostberatung.ch](http://www.kompostberatung.ch)

**Swiss association for anaerobic digestion:**
[www.biogas.ch](http://www.biogas.ch)

Energy from biomass:
[www.biomassenergie.ch](http://www.biomassenergie.ch)
[www.biomasse-schweiz.ch](http://www.biomasse-schweiz.ch)

**Other interesting websites:**

**Beneficial effects of compost**
[www.biophyt.ch](http://www.biophyt.ch)

**Studies on standards and compost quality:**
[www.kschleiss.ch](http://www.kschleiss.ch)

**Legislation:**

**Statistics:**
United Kingdom

1 Country Details

1.1 Population

The total area is 240,000 km² and the population is about 60 million inhabitants. 70.4% (169,000 km²) of the land area is farmland area. The area of 46,000 km² is used to grow crops.

1.2 Climate

<table>
<thead>
<tr>
<th>Average temperature (summer)</th>
<th>13° - 17° C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average temperature (winter)</td>
<td>4° C - 7° C</td>
</tr>
<tr>
<td>Average yearly rainfall</td>
<td>625 – 1,500 mm</td>
</tr>
<tr>
<td>Wind regime</td>
<td>variable</td>
</tr>
</tbody>
</table>

2 Political and Legislative Background

2.1 Governmental and regulatory structure

The Government of the United Kingdom

There are also separate (devolved) governments for each nation with the exception of England which is governed solely by this government:

- Scottish Parliament
- Welsh Assembly
- Northern Ireland Assembly

2.2 Regulatory bodies

- Environment Agency (England and Wales)
- Scottish Environmental Protection Agency (Scotland)
- Department of Environment - environment and heritage service (Northern Ireland)

These bodies have mainly regulatory roles but they are also involved in advising on government policy.

3 Site Planning, Licensing and Legislation

3.1 Requirements for new facilities

New sites require planning permission, which is granted by the local planning authority. In order to be granted permission prospective sites must make a planning application. The local authority will decide whether to grant permission depending upon whether there is a requirement for the facility within the local development plan, which they are required to have by law. The will also have to adhere to planning legislation and are guided by government planning policy guidance notes.

They must also account for local factors such as sites of scientific interest, traffic, and green belt land.
3.2 Problems with obtaining permission

The most frequent problems are local objections and increased traffic.

3.3 Permit/Licence to operate

In UK it is necessary to have a permit or licence to operate. Most facilities require a Waste Management Licence. But small ones may be exempt.

3.4 Regulatory body

The regulatory body are:

- Environment Agency (England and Wales)
- Scottish Environment Protection Agency (Scotland)
- Department of Environment and Heritage Service (Northern Ireland)

3.5 Monitoring of compost facilities

Facilities may be required to monitor one or more e.g. leachate, odour, dust, bioaerosols, vermin, noise, composition of waste.

3.6 Regulatory standards and control procedures for odour management

Odours are a “statutory nuisance” under the “Environmental Protection Act 1990” a waste licence may be revoked for causing such a nuisance. Also facilities may not be built within 250 m of the nearest sensitive receptor unless accompanies by a site specific risk assessment.

3.7 Difficulties in meeting requirements

- Some facilities have been closed due to odour problems.
- It may be difficult to find sites without a receptor within the 250 m radius.

3.8 Voluntary/Statutory requirements

Technical regulations – not for green wastes but ABPR (Animal by-products regulations) for food wastes.

Voluntary:
- Standard scheme – Quality criteria
  - Publicly Available Specification for Composted materials (PAS100)
  - Henry Doubleday Research Association Standards for Landscape and Amenity Horticulture
  - Soil Association for Organic Food and Farming

Statutory:
- Environmental Impact Assessment
- Government policies – waste management plans

3.9 Standards - Regulations

Voluntary:
- Limits for heavy metals
- Limits for pathogens
- Limits for plastics
- Limits for physical contaminants e.g. stones, glass

Statutory:
- Limits for pathogens (within Animal By-Product Regulations)
- Standard Operating Procedure (required to obtain a site licence)

3.10 Specific provisions for meat or catering waste

Catering wastes must meet either the European or UK Animal By-Products Regulations.
4 MSW – Economic aspects

4.1 Average prices of disposal / treatment processes for MSW

<table>
<thead>
<tr>
<th>Process</th>
<th>€ / t</th>
<th>What part of this price is tax %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landfilling</td>
<td>38 - 57</td>
<td>37 - 56</td>
</tr>
<tr>
<td>Incineration</td>
<td>70 - 84</td>
<td></td>
</tr>
<tr>
<td>MBT</td>
<td>42 - 49</td>
<td></td>
</tr>
<tr>
<td>MBT + landfilling</td>
<td>56 - 63</td>
<td></td>
</tr>
<tr>
<td>Gas/Pyrolysis</td>
<td>91 - 105</td>
<td></td>
</tr>
<tr>
<td>Anaerobic Digestion</td>
<td>56 - 70</td>
<td></td>
</tr>
</tbody>
</table>

4.2 Type of tax

**Landfill tax:** currently 21 € per tonne - will rise after 2004 by 4.2 € per tonne every year until it reaches a maximum of 49 € per tonne.

5 Future evolution of biological treatment and MBT

In UK legislation is the main driver for the evolution of biological treatment.

MBT has not really taken off as yet. Legislation could be described as a barrier as well as a driver. While legislation is driving the diversion of organic wastes - lack of clarity about whether MBT will count towards targets has reduced its potential as an option for local authorities.

6 Composting

6.1 Quantities

A total amount of approx. 2,000,000 tonnes of organic material was composted in the UK in 2003\(^1\).

In addition, approx. 72,000 tonnes of mixed wastes were treated by MBT composting.

\(^1\) All quantitative data mentioned here is taken from a survey covering the period of April 2003 to March 2004 (see below section 9.6).

6.2 Material Input

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garden waste</td>
<td>1,379,000</td>
</tr>
<tr>
<td>Garden &amp; kitchen waste (kerbside collection)</td>
<td>49,000</td>
</tr>
<tr>
<td>Kitchen waste only</td>
<td>2,000</td>
</tr>
<tr>
<td>Other</td>
<td>13,000</td>
</tr>
<tr>
<td>Total source-separate OFMSW*</td>
<td>1,443,000</td>
</tr>
<tr>
<td>Local authorities park and garden waste</td>
<td>44,000</td>
</tr>
<tr>
<td>Food waste</td>
<td>27,000</td>
</tr>
<tr>
<td>Other municipal</td>
<td>11,000</td>
</tr>
<tr>
<td>Total municipal non-household</td>
<td>82,000</td>
</tr>
<tr>
<td>TOTAL communities/households</td>
<td>1,525,000</td>
</tr>
<tr>
<td>MSW going to MBT composting</td>
<td>71,490</td>
</tr>
</tbody>
</table>

* biowaste / organic fraction of MSW

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper and cardboard</td>
<td>2,000</td>
</tr>
<tr>
<td>Forestry Products</td>
<td>145,000</td>
</tr>
<tr>
<td>Food and beverage processing waste</td>
<td>46,000</td>
</tr>
<tr>
<td>Landscaping/ground maintenance</td>
<td>86,000</td>
</tr>
<tr>
<td>Other (including sewage sludge*)</td>
<td>168,000</td>
</tr>
<tr>
<td>TOTAL industrial/trade</td>
<td>474,000</td>
</tr>
</tbody>
</table>

* 27,000 tonnes of sewage sludge were recorded in 2002, no separate figures are available for 2003.

6.3 Composting facilities

<table>
<thead>
<tr>
<th>Type of composting facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanically turned windrow (open-air and covered)</td>
<td>284</td>
</tr>
<tr>
<td>Static pile with passive aeration</td>
<td>13</td>
</tr>
<tr>
<td>Static pile with forced aeration</td>
<td>3</td>
</tr>
<tr>
<td>In-vessel</td>
<td>22</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
</tr>
</tbody>
</table>
6.4 Trends

The amount of organic material composted per year will increase.

Composting has increased approximately 25% per annum over recent years.

6.5 Economic aspects

The average gate fee at windrow amounts to 21 - 35 €/t and at in-vessel the fee amounts to 49 - 63 €/t.

The average selling price of compost in:
- Agriculture: € 0/t
  Average price probably very low as lot compost is processed on farms then spread on the land
- Landscaping: € 7 - 14/t
- Hobby gardening: € 28 - 42/t

7 Mechanical-biological treatment (MBT)

MBT refers only to MSW stabilisation processes before final disposal.

7.1 Quantities

The material treated in 2003/2004 amounted to 71,490 tonnes.

Of the six sites that responded to the 2003/2004 survey, four sent the stabilised material to very low-value end uses (landfill or restoration), and one producer sent the material to be used in agriculture.

7.2 Material Input

Communities/Households

<table>
<thead>
<tr>
<th>Type of waste</th>
<th>Tonnes/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSW (mixed collection)</td>
<td>71,490</td>
</tr>
</tbody>
</table>

7.3 MBT facilities

<table>
<thead>
<tr>
<th>Type of MBT facilities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aerobic</td>
<td>4</td>
</tr>
<tr>
<td>Anaerobic</td>
<td>1</td>
</tr>
<tr>
<td>Other (non specified)</td>
<td>1</td>
</tr>
</tbody>
</table>

7.4 Economic aspects

The average gate fee at an MBT facility amounts to € 42 - 48/t and the average disposal price is € 14 - 28/t.

8 Existing Outlets

8.1 The market for products from compost

A total of 1,190,000 tonnes of compost was produced in the UK in 2003/2004.

<table>
<thead>
<tr>
<th>Market Sector</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horticulture</td>
<td>7.4</td>
</tr>
<tr>
<td>Amateur gardening</td>
<td>13.8</td>
</tr>
<tr>
<td>Agriculture</td>
<td>40.4</td>
</tr>
<tr>
<td>Landscaping</td>
<td>9.7</td>
</tr>
<tr>
<td>Grounds maintenance</td>
<td>4.4</td>
</tr>
<tr>
<td>Land restoration</td>
<td>4.4</td>
</tr>
<tr>
<td>Landfill – engineering and daily cover</td>
<td>19.8</td>
</tr>
</tbody>
</table>

In addition, 22,162 tonnes were obtained from the 6 MBT facilities covered in the survey. These amounts were primarily used for landfill cover or land restoration and, in the case of one facility, in agriculture.

9 Comments and relevant information

9.1 Public awareness and lobbying

Composting is promoted by a number of organisations. Primarily local authorities are charged with the task of promoting public awareness in their own region. However, there are also a number of organisations such as the Composting Association, Wastewatch,

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2 see below, section 9.6
Chartered Institution of Wastes Management, Remade, Community Composting Network etc. that are also involved in promotion on both national and regional levels. The government has also set up the Waste and Resources Action Programme (WRAP), which has recently launched a nationwide television campaign.

9.2 Home composting

Many local authorities give away free composting bins to encourage waste reduction. At present there are neither statutory targets for home composting, nor accurate data.

9.3 Training

WAMITAB is the organisation primarily responsible for training for the "certificate of technical competence" to run a composting site. Other organisations, e.g. the Composting Association, CIWM, WRAP etc, are involved in training. There are also numerous seminars and events ran by associations and event organisers, as well as numerous courses offered by universities.

9.4 Public and workers' health

Reports have been produced by the Health and Safety Executive, Environment Agency and DEFRA.

9.5 Research and development

Ongoing by consultants, universities, etc.

9.6 Origin of the data

Most of the data cited here are taken from the annual survey carried out by the Composting Association. The most recent one available covers the period of April 2003 to March 2004. Updated data from this survey will be available by mid 2006 (for references, see below section 11.2 “Statistics”).

England, Scotland, Wales and Northern Ireland carry out a separate survey available on their websites.

10 Respondent – Key contact

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  jane@compost.org.uk

11 References, other sources of information

11.1 Addresses

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helpline@defra.gsi.gov.uk

Environment and Heritage Service
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Belfast BT1 1GU
Tel.: +44 (028) 9054 6614
EP@doeni.gov.uk
www.ehsni.gov.uk

Scottish Environment Protection Agency
SEPA Corporate Office
Erskine Court
Castle Business Park
STIRLING
FK9 4TR
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Fax: +44 (01786) 446885
publicrelations@sepa.org.uk
www.sepa.org.uk
11.2 Links

The Composting Association
www.compost.org.uk
See under “Survey” for the most recent data on composting in the UK.
European Compost Network
General report on composting in the UK
www.compostnetwork.info

www.london.gov.uk/mayor/strategies/waste/docs/wastestrat_costing.pdf

A comprehensive review of compost standards
www.wrap.org.uk

The landscape institute
www.l-i.org.uk/

British Association of Landscape Industries
www.bali.co.uk/

Waste Resources and Action Programme (WRAP)
www.wrap.org.uk

National Farmers’ Union (NFU)
www.nfu.org.uk

Food Standards Agency
www.food.gov.uk

British Retail Consortium
www.brc.org.uk

Sustainable Organic Resources Partnership
www.fwr.org/sorp.pdf

ReMaDe
www.remade.org.uk

Growing Media Association (GMA)
www.peatproducers.co.uk

Environment Agency
www.environment-agency.gov.uk

State Veterinary Service
www.defra.gov.uk/corporate/contacts/ahdo.htm
#north

Community Composting Network (CCN)
www.communitycompost.org

Chartered Institution of Wastes Management (CIWM)
www.ciwm.co.uk

The Horticultural Trades Association (HTA)
www.the-hta.org.uk

Royal Agricultural Society of England
www.rase.org.uk

Waste Management Industry and Training Advisory Board (WAMITAB)
www.wamitab.org.uk

British Bedding and Plant Pot Association (BBPPA)
www.thebbpa.org.uk

The Chilled Food Association (CFA)
www.chilledfood.org

Planning Officers’ Society (POS)
www.planningofficers.org.uk

Local Authority Recycling Advisory Team (LARAC)
www.larac.org.uk

Contaminated Land – Application in Real Environments (CL:AIR)
www.claire.co.uk

Office of the Deputy Prime Minister (ODPM)
www.odpm.gov.uk

Waste Watch
www.wastewatch.org.uk

British Shellfish Association
www.shellfish.org.uk

Institute of Leisure and Amenity Management (ILAM)
www.ilam.org.uk

The Sports Turf Research Institute (STRI)
www.stri.co.uk

Local Government Association (LGA)
www.lga.gov.uk

National Trust (NT)
www.nationaltrust.org.uk/main

Royal Society for the Protection of Birds (RSPB)
www.rspb.org.uk

Women’s Environmental Network (WEN)
www.wen.org.uk

Environmental Services Association (ESA)
www.esauk.org

Greater London Authority (GLA)
www.london.gov.uk/gla/index.jsp
On Farm Composting Network
www.farmcompost.com

Legislation:

HMSO – Her Majesty’s Stationery Office
www.hmso.gov.uk/legis.htm

National Assembly for Wales
www.wales.gov.uk

Northern Ireland Assembly
www.ni-assembly.gov.uk

The Scottish Parliament
www.scottish.parliament.uk

The United Kingdom Parliament
www.parliament.uk

Statistics:

England - DEFRA

Northern Ireland - Environment and Heritage Service (EHS)
http://www.ehsni.gov.uk/environment/wasteManage/publications.shtml#data

Scotland – SEPA Scottish Environment Protection Agency
http://www.sepa.org.uk/data/index.htm

Wales – Headline Statistics Wales
http://www.wales.gov.uk/keypubstatisticsforwalesheadline/content/environment/2004/hdw200406302-e.htm

The State of Composting in the UK 2003/2004. The survey is available at:
www.compost.org.uk/dsp_survey.cfm?link=survey
# 1 Composting – Material Input (tonnes / year)

## 1.1 Agriculture

<table>
<thead>
<tr>
<th></th>
<th>Austria</th>
<th>Denmark</th>
<th>Germany</th>
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<td>Harvest remains</td>
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<td></td>
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<td>Other</td>
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## 1.2 Communities/Households

<table>
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<tr>
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<th>Hungary</th>
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<tr>
<td>MSW</td>
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<td>Biowaste- OFMSW</td>
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<td>Garden waste</td>
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<td>Kitchen waste</td>
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<tr>
<td>Sewage sludge</td>
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<td></td>
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<td>Other</td>
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*Figures for Sewage sludge include in Biowaste.*
### 1.3 Industrial/Trade

<table>
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<th>Denmark</th>
<th>Germany</th>
<th>Greece</th>
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<td>Paper and cardboard</td>
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<td>Forestry Products</td>
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</tr>
<tr>
<td>Landscaping/ground</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Digestate from AD</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14,000</td>
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<tr>
<td>facilities</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Other organic waste</td>
<td>48,000</td>
<td>50,000</td>
<td>15,000</td>
<td></td>
<td>500,000*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>42,000**</td>
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* Residue from mushroom culture  
**Mixture incl. some agricultural and industrial wastes

### 2 Composting facilities

<table>
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<tr>
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<th>Austria</th>
<th>Denmark</th>
<th>Germany</th>
<th>Greece</th>
<th>Hungary</th>
<th>Italy</th>
<th>Netherlands</th>
<th>Norway</th>
<th>Sweden</th>
<th>UK</th>
</tr>
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<tbody>
<tr>
<td>Numbers</td>
<td>526</td>
<td>141</td>
<td>810</td>
<td></td>
<td>30</td>
<td>258</td>
<td>59</td>
<td>41</td>
<td>5</td>
<td>132</td>
</tr>
<tr>
<td>tonnes/year</td>
<td>1,100,000</td>
<td>1,100,000</td>
<td>9,600,000</td>
<td>100,000</td>
<td>2,724,000</td>
<td>3,100,000</td>
<td>439,000</td>
<td>373,663</td>
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### 3 Economic aspects

<table>
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<th>Greece</th>
<th>Hungary</th>
<th>Italy</th>
<th>Netherlands</th>
<th>Norway</th>
<th>Sweden</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>the average gate fee</strong></td>
<td>40 - 100</td>
<td>15.5 – 45.8 *</td>
<td>50 - 90</td>
<td>60.6 – 107.7 ++</td>
<td>13 - 18</td>
<td>20 + 60 ***</td>
<td>50</td>
<td>100</td>
<td>30 - 100</td>
<td>21 - 35 *** 49 - 63 ****</td>
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<tr>
<td><strong>at a composting facility</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>the average selling price of compost</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(€/t) in:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>• agriculture</strong></td>
<td>0 – 30 *</td>
<td>0</td>
<td>0 - 5</td>
<td>14 - 16</td>
<td>3 - 12</td>
<td>5</td>
<td>0</td>
<td></td>
<td></td>
<td>0, -</td>
</tr>
<tr>
<td><strong>• landscaping</strong></td>
<td>6.7 – 9.4</td>
<td>17 - 18</td>
<td>10 – 20/40</td>
<td>10</td>
<td>0</td>
<td>7 - 14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>• hobby gardening</strong></td>
<td>0 - 8</td>
<td>15 - 30</td>
<td>20</td>
<td>10 - 15</td>
<td>15</td>
<td>1.9</td>
<td>20 **</td>
<td>28 - 42</td>
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</table>

* €/m³
** €/Trailer
*** the average gate fee at windrow
++++ the average gate fee at in-vessel

+ garden waste
++ other biowaste (energy rich)
+++ food waste
### 4 Anaerobic Digestion

<table>
<thead>
<tr>
<th></th>
<th>Austria</th>
<th>Denmark</th>
<th>Germany</th>
<th>Greece</th>
<th>Hungary</th>
<th>Italy</th>
<th>Netherlands</th>
<th>Norway</th>
<th>Sweden</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers</td>
<td>40</td>
<td>21 + 50</td>
<td>2,000</td>
<td></td>
<td>1</td>
<td>3</td>
<td>20</td>
<td>7</td>
<td></td>
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</tr>
<tr>
<td>tonnes/year</td>
<td>150,000</td>
<td>2,000,000</td>
<td>2,400,000</td>
<td>15,428</td>
<td>215,000</td>
<td>20,000</td>
<td>223,463</td>
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</table>

### 5 Mechanical-biological treatment (MBT)

<table>
<thead>
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<th></th>
<th>Austria</th>
<th>Denmark</th>
<th>Germany</th>
<th>Greece</th>
<th>Hungary</th>
<th>Italy</th>
<th>Netherlands</th>
<th>Norway</th>
<th>Sweden</th>
<th>UK</th>
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</thead>
<tbody>
<tr>
<td>Numbers</td>
<td>15</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>94</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tonnes/year</td>
<td>600,000</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>7,500,000</td>
<td>10,000</td>
<td></td>
<td>100,000</td>
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### 6 Existing Outlets – Compost – Market Sector (as percentage of the market sector)

<table>
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<tr>
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<th>Austria</th>
<th>Denmark</th>
<th>Germany</th>
<th>Greece</th>
<th>Hungary</th>
<th>Italy</th>
<th>Netherlands</th>
<th>Norway</th>
<th>Sweden</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total amount of compost produced 2003 (tonnes)</td>
<td>312,000</td>
<td>5,000,000</td>
<td>70,000</td>
<td>900,000</td>
<td>600,000</td>
<td></td>
<td></td>
<td>139,981</td>
<td>1,000,000</td>
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<tr>
<td>Horticulture (%)</td>
<td>5</td>
<td>3.7</td>
<td></td>
<td>15</td>
<td></td>
<td>30</td>
<td></td>
<td>33</td>
<td>33.33</td>
<td>5.1</td>
</tr>
<tr>
<td>Amateur gardening (%)</td>
<td>44.5</td>
<td>11.4</td>
<td>5</td>
<td>27</td>
<td>5</td>
<td>40</td>
<td></td>
<td>33.33</td>
<td>12.7</td>
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<tr>
<td>Agriculture (%)</td>
<td>18.5</td>
<td>50.3</td>
<td>50</td>
<td>51</td>
<td>60</td>
<td>13</td>
<td></td>
<td>28.7</td>
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<td>Landscaping (%)</td>
<td>16.6</td>
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<td>6</td>
<td>5</td>
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<td></td>
<td></td>
<td>33.33</td>
<td>10.6</td>
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<tr>
<td>Grounds maintenance (%)</td>
<td>10.3</td>
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<td></td>
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<td>7.8</td>
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</tr>
<tr>
<td>Forestry (%)</td>
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<td>0.4</td>
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<td>2</td>
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<td></td>
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<td>1.9</td>
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<tr>
<td>Landfill – cell fill (%)</td>
<td>1.3</td>
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<td>Landfill restoration (%)</td>
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<td>18.1</td>
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<td>Landfill – daily cover (%)</td>
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<td></td>
<td>15</td>
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<td>14.9</td>
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<tr>
<td>• culture media</td>
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<td></td>
<td>12.5</td>
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<tr>
<td>• others</td>
<td>14.1</td>
<td>5.5</td>
<td></td>
<td>14</td>
<td>14</td>
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### 7 Existing Outlets – Digestate – Market Sector (as percentage of the market sector)

<table>
<thead>
<tr>
<th></th>
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<th>Greece</th>
<th>7.1 Hungary</th>
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<tr>
<td>Agriculture (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
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<td>95</td>
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<td>60</td>
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<td>40</td>
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