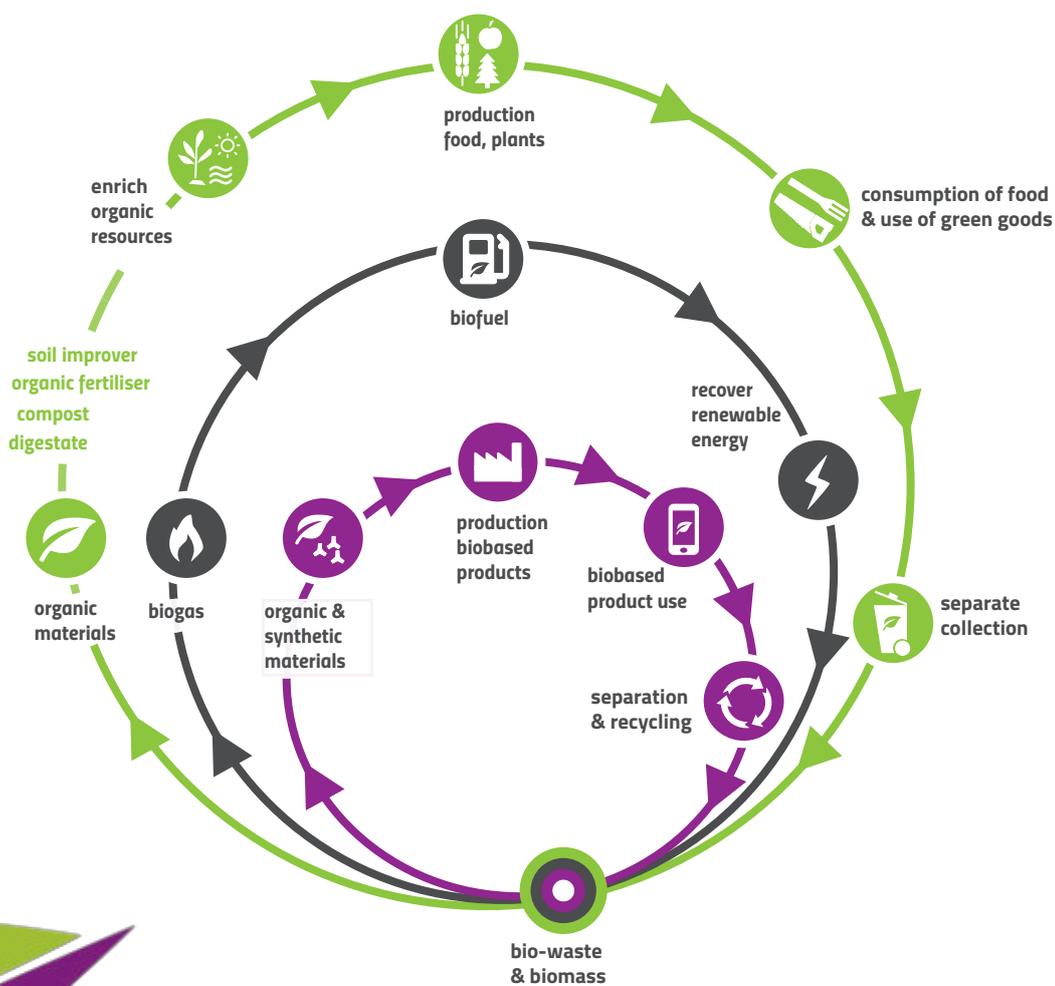
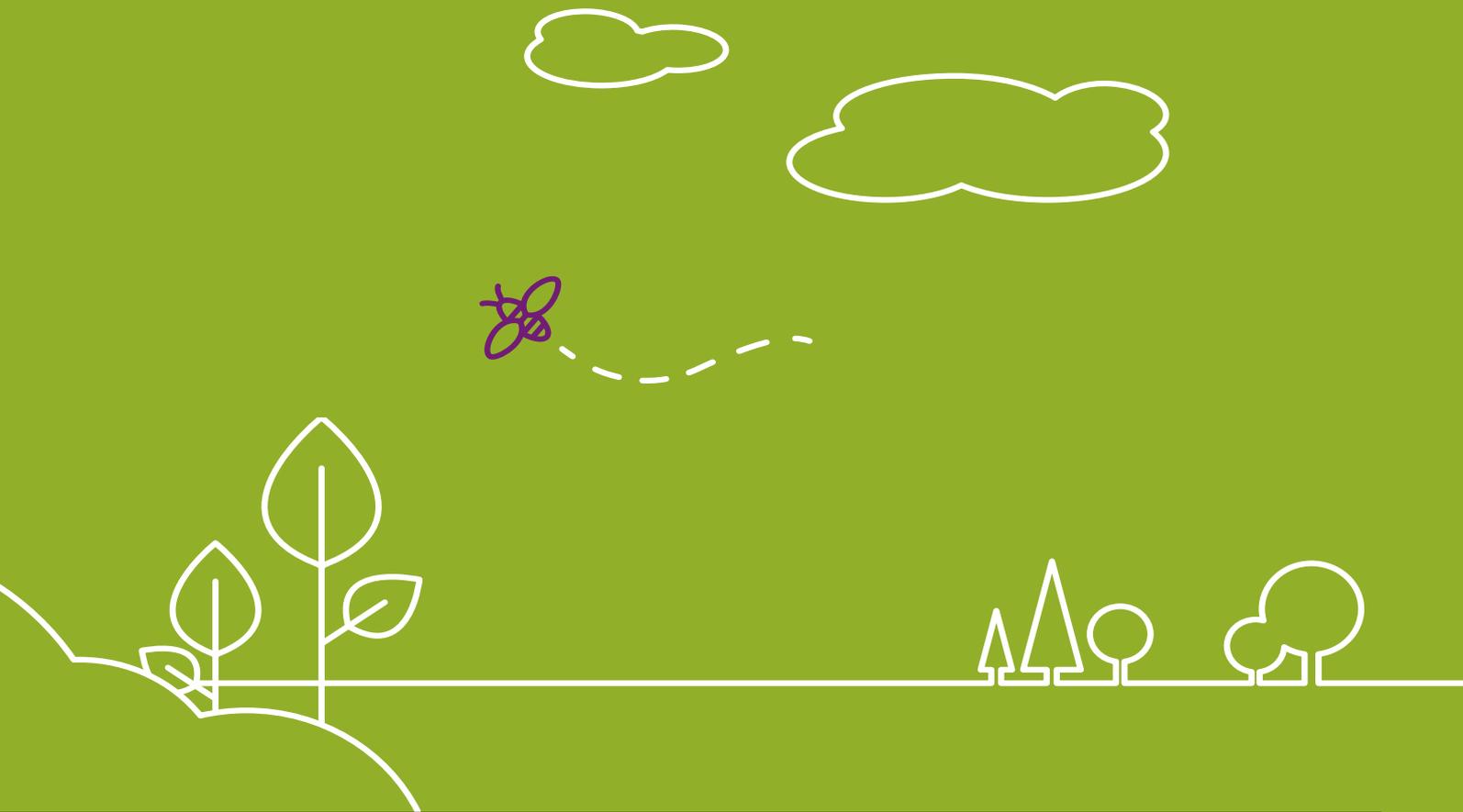


ECN STATUS REPORT 2019

EUROPEAN BIO-WASTE MANAGEMENT

Overview of Bio-Waste Collection, Treatment & Markets Across Europe





Compost from biowaste – moving “greening” forward

The recycling of bio-waste into compost makes a valuable contribution to conserving natural resources, improving soil fertility and preventing climate change - the top priorities for the future. RETERRA shows in practice how this can be done. We provide the full range of services: operating state-of-the-art composting/fermentation plants, managing of organic waste streams, carrying out quality management of processes and products as well as marketing of compost products for conventional and organic farming, landscaping, professional and hobby gardening.

RETERRA – we transfer know-how and experiences.

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ISBN 978-3-9820825-1-6

PDF Version



FOREWORD

DEAR READER, WELCOME TO THE FIRST EDITION of the European Compost Network's (ECN) Status Report on European Bio-Waste Management, summarising the extent to which eighteen European countries collect bio-waste, process it in biological treatment plants and market the various compost and digestate products.

Publication of this report is timely, following recent developments to implement Europe's circular economy strategy. As bio-waste accounts for between 20-60% (average 37%) of the municipal solid waste stream, its sustainable management will play a key role in making the circular economy happen.

We are proud that ECN is recognised as an authoritative voice for Europe's biological waste management sector through supporting separate collection and high-quality recycling of organic resources. With the adoption of Europe's Circular Economy Package, including revisions to the waste directives and the expected adoption of the new European Fertilising Product Regulation, the framework for a viable circular bioeconomy has been set.

Today, ECN represents 4.500 biological waste treatments plants (composting and anaerobic digestion) with a treatment capacity of over 45 million tonnes of bio-waste per year. With EU member states now obliged to collect bio-waste separately (or recycle it at source) by 31 December 2023, the bio-waste community in Europe is set to grow. Although several countries will need to start



from relatively low levels, all countries can strive for improvements. ECN looks forward to supporting new initiatives addressing enhanced separate collection and sustainable bio-waste management. ECN aims to maximise the recycling of organic matter and nutrients to produce high quality products that will be used to improve soil quality.

As the newly elected chair of ECN, I would like to thank Mr Henrik Lystad from Avfall Norge, who is the initiator of this report. Henrik has recently stepped down after eight years of voluntary work with the ECN Board. During his four years as Chair, ECN has become recognised as the voice of the biological treatment sector in Brussels and across Europe with achievements in the revised waste directives. This is a solid foundation for us to continue working on.

I fully believe in ECN, and together with Massimo Centemero as Vice-Chair, and with the other Board members, we will further strengthen the position of ECN. I believe ECN has an important role to play in the future management of Europe's bio-waste.

This report is based on a co-operation between ECN and the Working Group on Biological Treatment of Waste of the International Solid Waste Association (ISWA WG BTW), establishing a joint survey in 2017 and 2018. Therefore, I would like to thank Mr Marco Ricci-Jürgensen, as Chair of ISWA WG BTW, and Dr Stefanie Siebert, as Executive Director of ECN, for their work and contribution.

I would also like to take the opportunity to thank Dr Jane Gilbert, representing Carbon Clarity in ECN, for her hard work, compiling the bio-waste data and information from the different countries and for editing this report.

I would like to say a very special thank you to those companies and organisations who made this publication possible by placing advertisements.

Above all, I want to take the opportunity to thank you, our Members, for your support and trust in our Network. I wish you a successful bio-waste future within a circular Europe; please share this report within your organisations, networks and all interested parties.

If you aren't yet on board, please join us to make Europe's Circular Bioeconomy happen and we look forward to supporting you setting up separate collection of bio-waste in your municipalities and cities and by placing high quality compost and digestate-based products on the market.

Enjoy the report.

**KRISTEL VANDENBROEK
CHAIR OF THE EUROPEAN COMPOST NETWORK**

ABOUT ECN

THE EUROPEAN COMPOST NETWORK (ECN) is the leading European membership organisation promoting sustainable recycling practices in composting, anaerobic digestion and other biological treatment processes of organic resources. Its purpose is to work with practitioners, researchers, technicians and policy makers to deliver integrated organic waste recycling solutions that generate high quality products for the benefit of the environment and the users of the recycled products. It serves as central resource and network for the organic waste recycling sector in Europe, as well as the emerging bio-based economy.

ECN'S VISION

ECN's vision is living well within the limited resources of the planet respecting the organic cycle.

ECN'S OBJECTIVES

The objective and the main focus of ECN is to promote knowledge about best practices throughout Europe for the establishment of sustainable systems for organic waste management through integration of policies and strategies, technological development and improvement of operations.

ECN'S ACTIVITIES

- Providing information of all aspects within the field of activity of the network to policy and decision makers on national and European level.
- Exchange knowledge and experiences in the practice of collection, treatment, recycling, application and marketing of organic wastes including the management of environmental side effects.
- Promoting scientific research and development activities and their co-ordination between the European countries and making available the results, especially the related practical aspects.
- Supporting and establishing systems and tools needed for a qualified recycling of organic resources (such as the European Quality Assurance Scheme for Organic Resources - ECN-QAS)
- Organising conferences, workshops, seminars, education and training courses etc. on an international or regional level and supporting such events organised by other associations active in the range of biological waste.
- Establishing and maintaining relations with other international or national organisations whose activities are related to organic waste management.

WWW.COMPOSTNETWORK.INFO



THE ECN-QAS

THE EUROPEAN COMPOST NETWORK'S QUALITY ASSURANCE SCHEME (ECN-QAS), was launched in 2010 and amended with quality criteria for digestate in 2014. It sets out requirements for national quality assurance organisations, covering process management, compost and digestate quality criteria. Its aim is to establish a common platform for existing national quality assurance schemes for composts and digestate in Europe, as well as to support member states develop their own standards and quality assurance schemes. At present, four national quality assurance organisations (in Austria - KBVÖ, Belgium - Vlaco, Germany -BGK and Italy - CIC) have been approved.

AIMS

The ECN-QAS has supported European policy initiatives setting end-of-waste criteria for compost and digestate within the Waste Framework Directive and was cited in the JRC-IPTS report on end-of-waste criteria for compost and digestate.

The ECN-QAS provides a European-wide independent quality assurance scheme for national quality assurance organisations. It operates in accordance with the ISO/IEC standard "Conformity assessment for bodies certifying products, processes and services" (ISO/IEC 17065) and has been based on knowledge of, and experience in, existing quality assurance organisations.

REQUIREMENTS

- A conformity assessment of the national quality assurance schemes by ECN.
- Regular assessment of compost and digestate production in the plants by the national quality assurance organisation.
- Regular sample taking and analysis of the final product for relevant quality parameters from independent, acknowledged laboratories, coupled with evaluation of the results by the national quality assurance organisation.
- Documentation by the national quality assurance organisation with information about the quality properties of the product, legal requirements, the necessary compost and digestate declaration and information about use and application rates according to good practice.
- Awarding of the ECN-QAS Quality Label to composting or digestion plants by the certified national quality assurance organisation.

WWW.ECN-QAS.EU



INTRODUCTION

SINCE ITS FORMATION IN 2002, ECN has regularly published national status reports submitted by member country representatives. Although the information contained in these reports provided a useful snapshot of the state of bio-waste management in each individual country, they contained data presented in different ways, making like-for-like comparisons difficult. This presented challenges for ECN, whose advocacy work relies upon reliable and up-to-date information.

Recent publication of the European Union's Circular Economy Package and the bio-waste targets set in the revised Framework Directive on Waste, have intensified the need for an improved overview of the state of bio-waste management across Europe. This

report is a first step towards providing a pan-European status summary. Not only does it establish a baseline against which future development can be assessed, it can also be used by policy makers and practitioners to determine what interventions and future developments are necessary.

ECN worked with the International Solid Waste Association's Working Group on Biological Treatment of Waste (ISWA WGBTW) to initiate a survey of European members and relevant stakeholders during 2017/18. The overall aim was to update the data in the ECN country reports, so that both organisations were able to produce a consolidated overview of the state of play of bio-waste management across Europe.

Data from a total of 18 European countries were obtained and analysed as shown on the map below. Surveys of this sort are always beset with challenges, as different countries collect data in different ways, and, in some cases, data simply do not exist. Some of the estimates have been derived from official data, whilst some have been based on local knowledge provided by national experts.

The data principally relate to the calendar years 2016 or 2017, depending upon the source, although they all relate to a 12-month (one year) period. Bio-waste treatment data have been compared with data released by EUROSTAT, benchmarked to the year 2016. Although data for subsequent years have been released by Eurostat, it was felt that 2016 provided the most appropriate comparator.



INTRODUCTION

In addition, data for anaerobic digestion facilities processing bio-waste have been difficult to find, as many facilities co-digest bio-wastes alongside sewage sludges, manures, agricultural residues or energy crops. Official datasets also often only publish energy outputs, rather than bio-waste inputs. We have endeavoured to dig into these data and identify as many facilities as possible; however, readers should bear in mind these challenges when drawing conclusions.

Calculations about compost/digestate production, carbon and nutrients are theoretical. They have been based on published data and a conservative assumption has been made about metabolic and reject losses during processing. Nonetheless, they

provide an important indicator about the extent of carbon and nutrient recycling and the contribution the bio-waste management sector is playing in Europe's nascent circular economy.

We hope you find the report interesting and informative!

KEY DATA SOURCES

Eurostat data - for 2016 (unless otherwise specified)

Country-specific statistics, published by government or industry organisations

ECN/ISWA member updates

A more detailed description is provided on p 58.

Your efficient provider for aerobic treatment technology!
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EUROPEAN SUMMARY

GEOGRAPHICAL

Population



407 million

Countries

18 EUROPEAN COUNTRIES WERE SURVEYED

Austria (AT), Belgium (BE), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany (DE), Hungary (HU), Ireland (IE), Italy (IT), Lithuania (LT), Netherlands (NL), Norway (NO), Poland (PL), Portugal (PT), Slovenia (SI), Sweden (SE) and the United Kingdom (UK).



WASTE MANAGEMENT

208

Million tonnes of municipal waste per year in total

507 kg

Municipal waste per capita per year on average

45%

Average recycling rate



MSW GENERATION RATES PER CAPITA

varied considerably:

LOW RATES: 3 countries (EE, HU & PL)

MEDIUM RATES: 7 COUNTRIES (BE, IT, LT, PT, SI, SE & UK)

HIGH RATES: 8 COUNTRIES (AU, DE, DK, FI, FR, IE, NL & NO)

Low = <400 kg/capita/year
Medium = 400 – <500 kg/capita/year
High = ≥500 kg/capita/year

BIO-WASTE MANAGEMENT

A **TOTAL** of **47.5 MILLION TONNES** of **BIO-WASTE** is treated every year.

On average, this equates to **117 kg BIO-WASTE PER CAPITA PER YEAR**.

This corresponds to **23% of TOTAL MSW** arisings amongst the 18 countries surveyed.

There is a **GOOD NETWORK** of bio-waste treatment (composting/anaerobic digestion) plants, with an **AVERAGE FACILITY DENSITY** of **1 plant per 95 THOUSAND PEOPLE**.

EUROPEAN SUMMARY

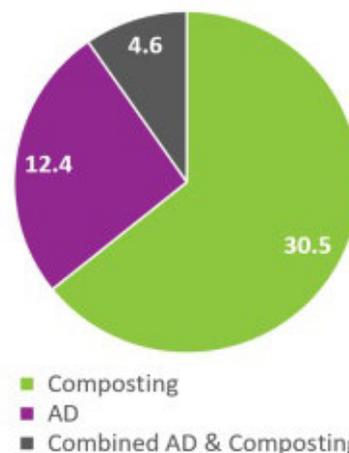
4274

Composting & AD bio-waste processing plants



47.5 million tonnes

bio-waste composted / digested



COMPOST & DIGESTATE



11.7

Million tonnes of compost



4.1

Million tonnes of digestate

Nutrients



129

Thousand tonnes of
NITROGEN RECYCLED



42

Thousand tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

3.5

Million tonnes
(dry mass) organic
carbon recycled

1.8

Million tonnes
(dry mass) humic
substances recycled

Markets

15.8 million tonnes of compost & digestate. If spread at 30 t/ha this would cover **528 thousand hectares** of land or **0.7%** of the total arable land across all 18 countries.

Agriculture is the main market sector for compost and digestate.

There is a total of **74.3 million hectares of arable land**, demonstrating that there is an adequate landbank.

Quality Assurance

16 COUNTRIES have **NATIONAL STANDARDS for COMPOST QUALITY**. These are either set in legislation or are standalone standards. Information about digestate quality standards is incomplete, although they do exist in some countries such as DE, SE and the UK. Only two countries (LT and PL) do not have any quality standards.

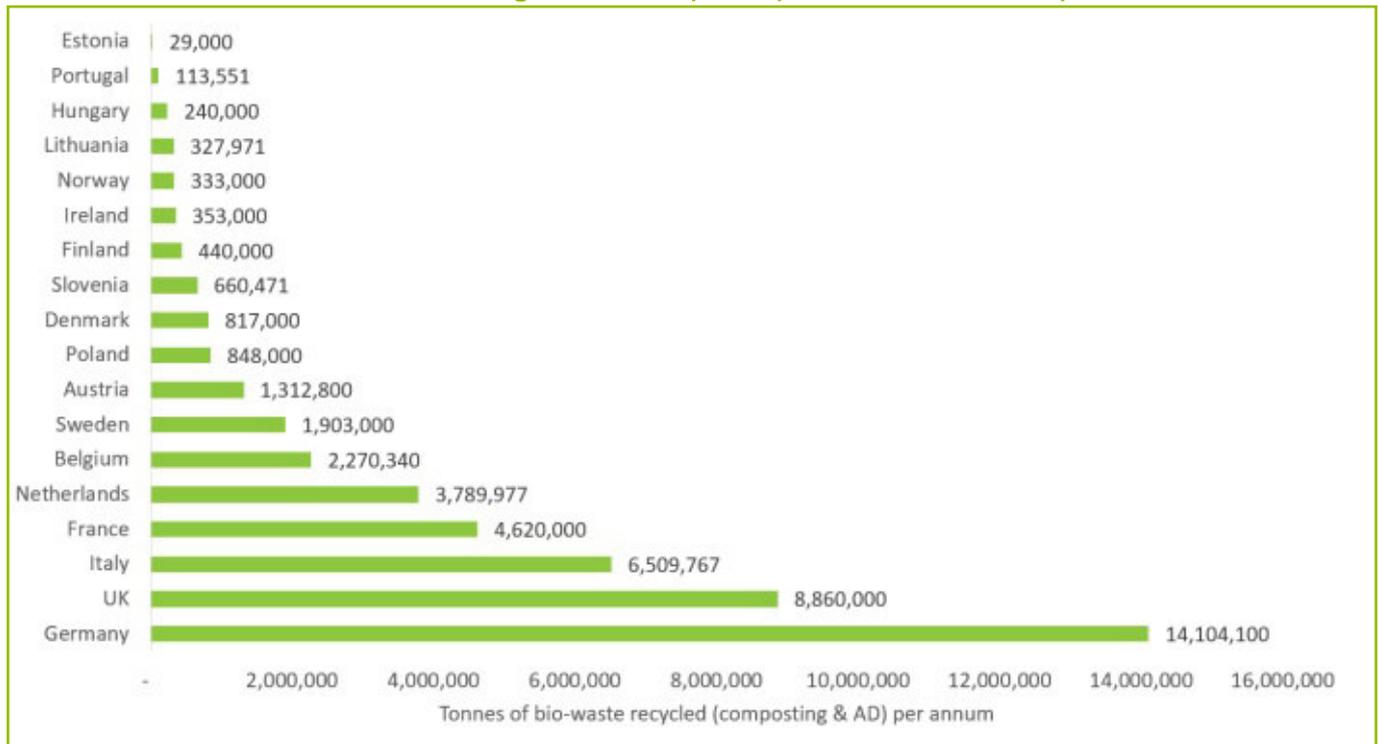
10 COUNTRIES have a compost quality assurance scheme. Some countries, such as EE, FI and IE, have based their schemes on the ECN-QAS.

4 COUNTRIES (AT, BE, DE & IT) have their national quality assurance schemes certified by ECN to the **ECN-QAS**.

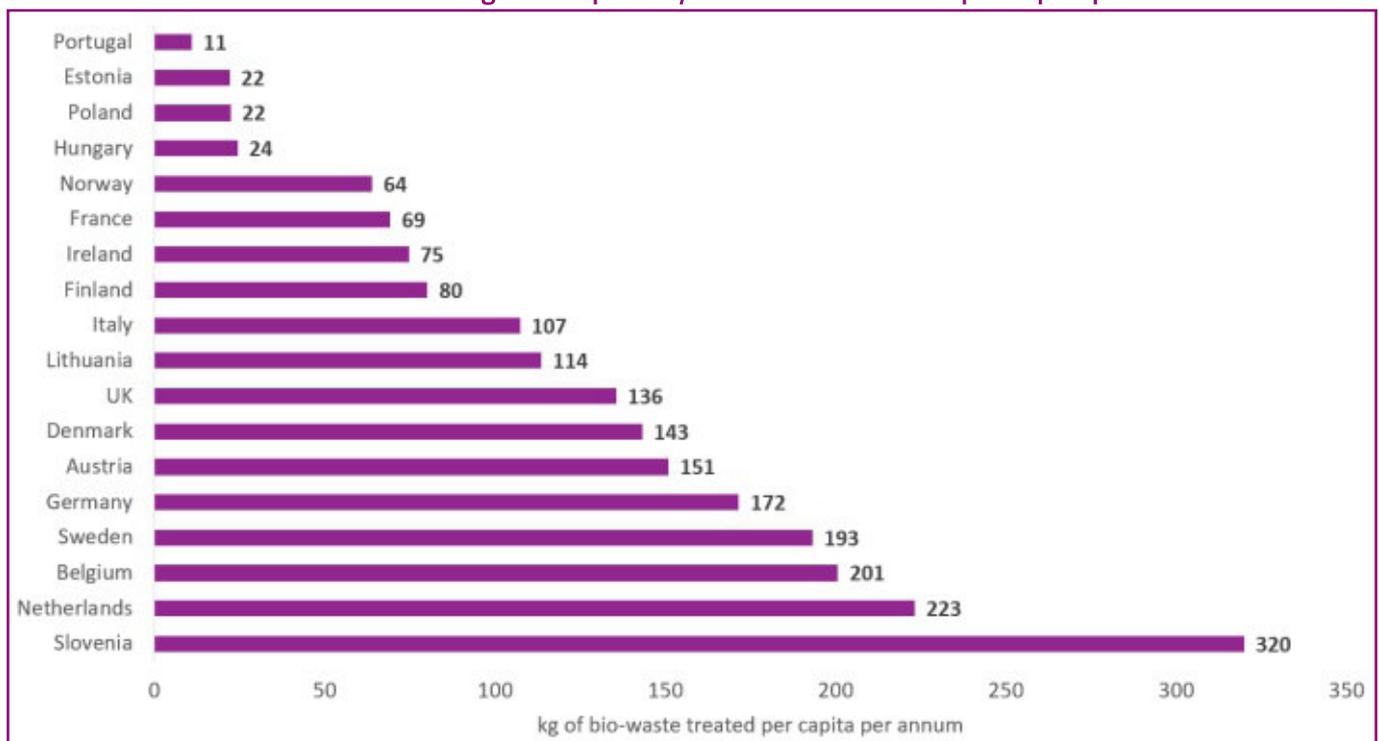
BIO-WASTE PROCESSING

IT COMES AS NO SURPRISE that those countries who pioneered bio-waste recycling in the 1990s remain **leaders today**. Germany leads the way in terms of total tonnes of bio-waste recycled through composting and anaerobic digestion, with the UK, Italy, France, the Netherlands and Belgium following suit. However, when these figures are adjusted to reflect the amount of bio-waste processed per head of population (per capita), Slovenia comes out on top with a staggering 320 kg bio-waste per person.

Countries ranked according to the total quantity of bio-waste treated per annum

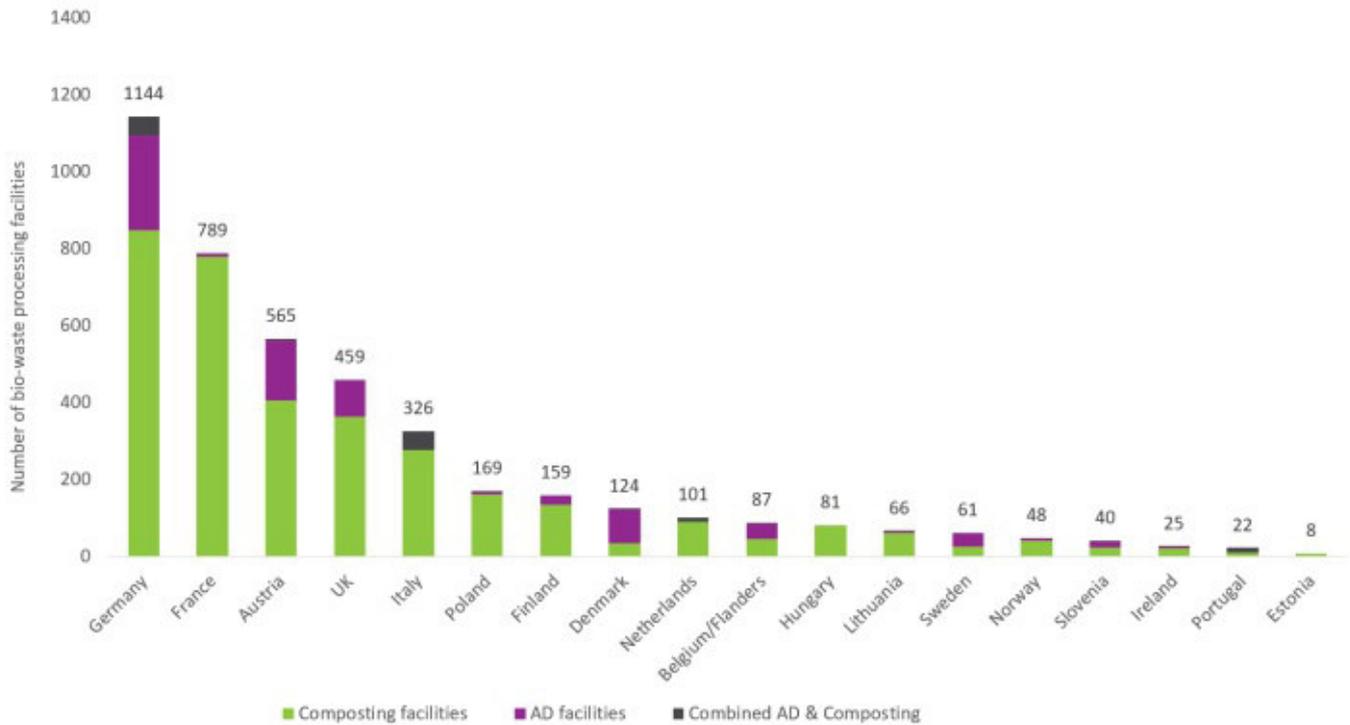


Countries ranked according to the quantity of bio-waste treated per capita per annum



BIO-WASTE PROCESSING

Number of bio-waste treatment facilities in each country



TENCATE
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- › diverts rainfall away from the surface and protects from drying by sun and wind
- › ensures proper aerobic decomposition
- › allows the necessary gas exchange and ensures more optimal temperatures throughout the outer layers of the piles
- › minimizes leachate and nutrient losses
- › diverts rainfall away from the windrows and therefore minimizes the incidence of leachate
- › reduces odour emission
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for a perfect composition of valuable compost!

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TENCATE
INDUSTRIAL FABRICS

NUTRIENT RECYCLING

CONSERVATIVE ESTIMATES OF THE MACRONUTRIENTS (N and P) present in the 15.8 million tonnes of compost and digestate manufactured in the 18 countries, suggest that they have potential to partially offset the use of inorganic fertilisers and contribute towards the circular economy.

Digestate, in particular, is considered to be a useful organic fertiliser as the nutrients are present in a form that is readily available for plants to use. The nutrients in compost are less readily available and are released slowly over time in the soil, meaning that they contribute to long term soil fertility.

NITROGEN

A total of 129 thousand tonnes of nitrogen was recycled, which is similar to the total consumption of inorganic nitrogen used in Austria (132 thousand tonnes) and Slovakia (126 thousand tonnes) in 2016. Overall, this is equivalent to 1.5% of the total inorganic nitrogen consumed by the 18 countries (8.7 million tonnes) in 2016.

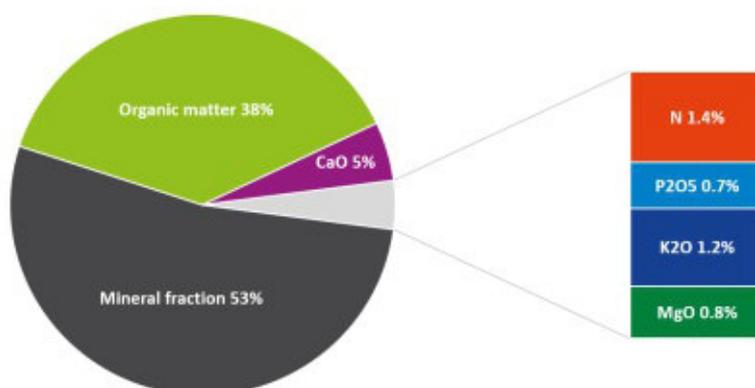
As an estimated 1% of total global greenhouse gas (GHG) emissions is thought to come from the manufacture of inorganic nitrogen fertilisers (and up to 2.5% if nitrous oxide emissions associated with application are taken into account), this represents an important step in the fight to reduce GHG emissions and move towards increasing agricultural sustainability.

PHOSPHORUS

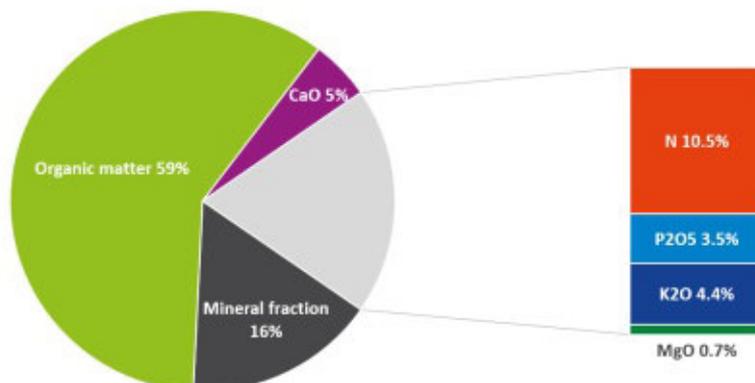
By comparison, an estimated 42 thousand tonnes of phosphate (as P_2O_5) were recycled, equivalent to the consumption of inorganic phosphorus in Hungary (40 thousand tonnes) in 2016. This amounts to 4.3% of the total inorganic phosphorus consumed by the 18 countries (973 thousand tonnes) in 2016.

As phosphorus is classified as a Critical Raw Material by the European Union and almost all of Europe's agricultural use of mineral phosphate fertilisers is imported, recycling P in compost and digestate contributes towards the developing circular economy.

Compost
Typical Composition
(% dry matter)



Digestate
Typical Composition
(% dry matter)



RÉSEAU Compostplus

Compostplus is a national network of French local authorities involved in separate collection of household biowaste.

Since 2007, our work aims to promote this sector at local and national level, and to help its development by sharing feedback from the field, encouraging good quality compost and collaborating with all the stakeholders.

> 10
millions of
inhabitants

12
years of
experience

ASQA
quality
assurance

CARBON RECYCLING

EUROPE'S SOILS ARE LOSING ORGANIC MATTER at an unsustainable rate due to land use changes, modern agricultural practices and climate change. It is estimated that almost half of European soils have low organic matter content, which reduces their ability to retain water and nutrients, and store carbon. Crucially, it reduces the productivity of the land and ability of farmers to grow crops.

Compost has been shown to be a useful source of stable organic matter due to the way in which the composting process transforms bio-waste. This process is called 'humification' and results in a mixture of organic carbon compounds that contribute towards the soil's carbon pool.

Studies have shown that repeated applications of quality compost can increase soil organic matter content and help improve soil function, such as microbial diversity, water holding capacity and soil structure. These factors are important in both the long and short term.

Estimates of organic matter and humic substances presented in this report have been calculated for compost only, as the carbon present in digestate is in a more labile form and has undergone little, if any, humification.

ORGANIC MATTER

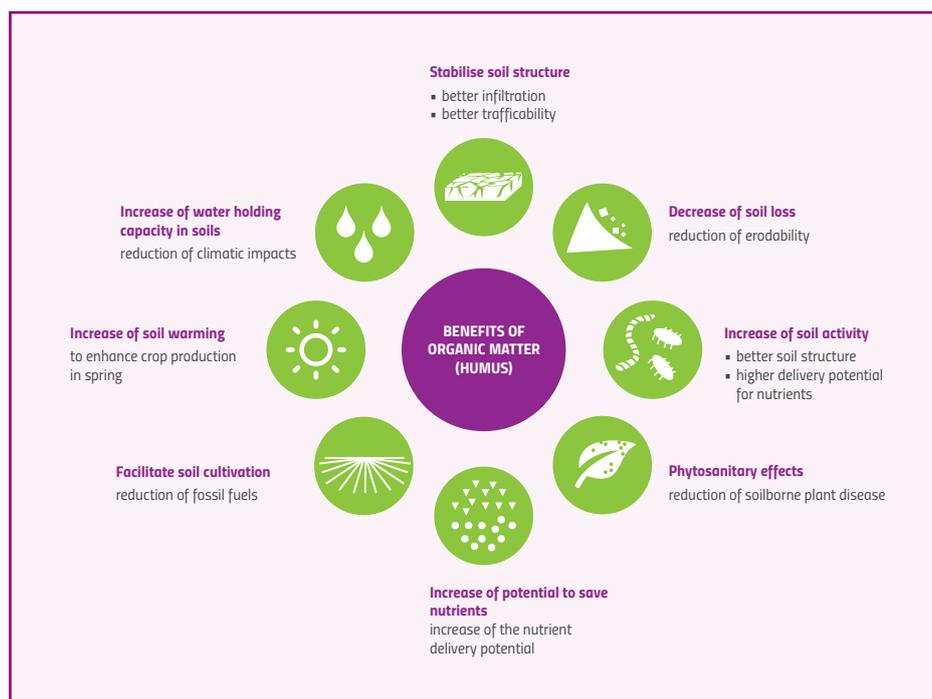
Of the 11.7 million tonnes of compost produced (on a fresh mass basis) in the 18 countries every year, about 3.5 million tonnes of this is organic matter measured on a dry matter basis.

Put another way, for every tonne of fresh compost applied to land, about 300 kg of this is organic matter. When applied at a rate of 30 tonnes per hectare of fresh compost, about 9 tonnes of organic matter is added to the soil.

HUMIC SUBSTANCES

Humic substances are the 'stable' carbon in compost and include humic and fulvic acids, and contribute towards the long-term carbon pool in soils. As these organic compounds tend to stay in soils for long periods of time, they help store carbon that would otherwise be released into the atmosphere.

An estimated 1.8 million tonnes of humic substances are applied to soils in the 18 European countries annually.



MARKETS

AGRICULTURE IS THE LARGEST MARKET SECTOR for both compost and digestate and is thought to account for almost 50% of the compost produced. Given the loss of organic matter from arable soils, this represents a significant contribution towards helping improve Europe's soils.

If the estimated 15.8 million tonnes of compost and digestate were to be spread onto agricultural land at a typical rate of 30 tonnes per hectare this would cover 528 thousand hectares of land or 0.7% of the total arable land across all 18 countries. As there is a total of 74.3 million hectares of arable land across these 18 countries, this demonstrates that there is an adequate landbank available.

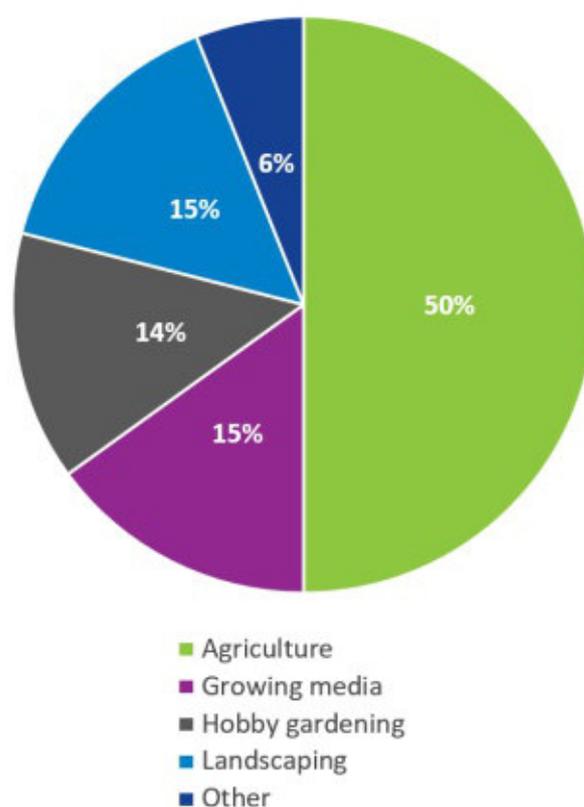
Across Europe, there is also growing awareness about the negative effects of peat extraction and its use in horticultural growing media. Norway has recently set a national target to phase out the use of peat in amateur growing media by 2025 and professional horticulture by 2030. As mature, quality compost can be used at between 20-40% (v/v) in growing media mixes, this presents a valuable marketing opportunity for compost manufacturers. ECN has published its 'Specification for the Use of Quality Compost in Growing Media' as part of its Quality Assurance Scheme (the ECN-QAS), to assist manufacturers and producers specify and manufacture peat free/reduced growing media blends.

Of the 18 countries surveyed, 16 have national standards for compost quality, which are either set in legislation or are standalone standards. Information about digestate quality standards is incomplete, although they do exist in some countries such as DE, SE and the UK.

Ten countries have a compost quality assurance scheme, with some countries, such as EE, FI and IE, having based their schemes on the ECN-QAS. Four countries (AT, BE, DE & IT) have their national quality assurance schemes certified by ECN to the ECN-QAS.



European Compost Markets



AUSTRIA

GEOGRAPHICAL

Population



8.7 million

Degree of Urbanisation



- Population cities
- Population towns & suburbs
- Population rural



WASTE MANAGEMENT

4,928

Thousand tonnes
of municipal
waste per year

564 kg

Municipal waste
per capita per year

58%

Recycling rate



Austria has one of the
HIGHEST RATES OF RECYCLING
across Europe.

It also has one of the
HIGHEST PER CAPITA
rates of municipal waste
GENERATION.

The nine Austrian federal provinces take responsibility for the separate collection of municipal waste and have their own legal structures.

BIO-WASTE MANAGEMENT

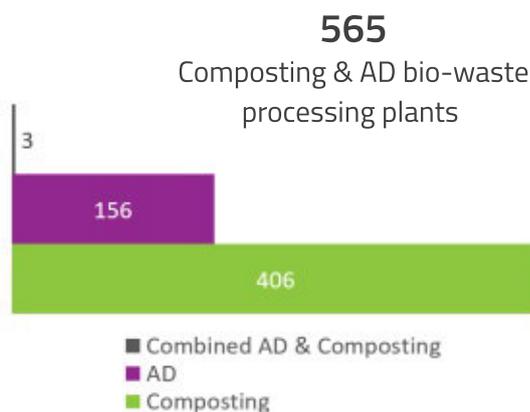
The Federal Ordinance on the Separate Collection of Biogenic Waste mandates the separate collection of bio-waste when it cannot be recovered at home or through business operations.

Austria is characterised by a large number of
SMALL-SCALE DECENTRALISED
composting facilities.

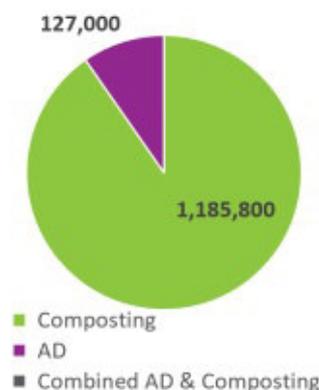
There are also a large number of AD plants, treating both waste and agricultural feedstocks.

Austria has the
HIGHEST FACILITY DENSITY
in Europe, with
1 plant per 15 THOUSAND PEOPLE.

AUSTRIA



1.3 million tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



395

Thousand tonnes of
compost



42

Thousand tonnes of
digestate

Nutrients



3.9

Thousand tonnes of
NITROGEN RECYCLED



1.4

Thousand tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

119

Thousand tonnes
(dry mass) organic
carbon recycled

59

Thousand tonnes
(dry mass) humic
substances recycled

Markets

438 thousand tonnes of compost & digestate. If spread at 30 t/ha this would cover **15** thousand hectares of land or **1.1%** of Austria's arable land.

Quality Assurance

The Federal Compost Ordinance regulates the quality of compost.

The KBVÖ (Kompost & Biogas Association Austria) is the umbrella organisation of five provincial organisations and represents more than 460 compost and biogas plants covering all provinces of Austria.

It provides certification to the two Austrian compost standards.

KBVÖ is certified to ECN's quality assurance scheme for compost.

In 2018, there were 139 certified composting facilities.



CONTACT DETAILS

Kompost & Biogas Verband Österreich
Schwedenplatz 2/20-21, 1010 Wien, AT
E: buero@kompost-biogas.info www.kompost-biogas.info



BELGIUM

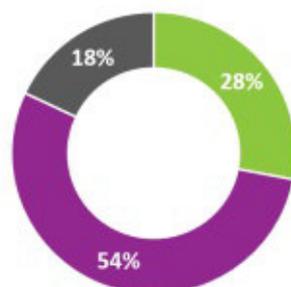
GEOGRAPHICAL

Population



11.3 million

Degree of Urbanisation



■ Population cities
■ Population towns & suburbs
■ Population rural



WASTE MANAGEMENT

4,746

Thousand tonnes
of municipal
waste per year

419 kg

Municipal waste
per capita per year

54%

Recycling rate

Belgium is made up of three regions:
FLANDERS, BRUSSELS and WALLONIA,
with waste legislation being a competency of the
individual regions.

Flanders contributes 60%, and Wallonia 31%, of
Belgium's MSW.

Overall, Belgium has one of the
HIGHEST RATES OF RECYCLING
across Europe.



BIO-WASTE MANAGEMENT

In Flanders, the Flemish Regulation on Sustainable Materials Management and Waste (VLAREMA) specifies the requirements for separate collection and extended producer responsibility, including compost and digestate quality.

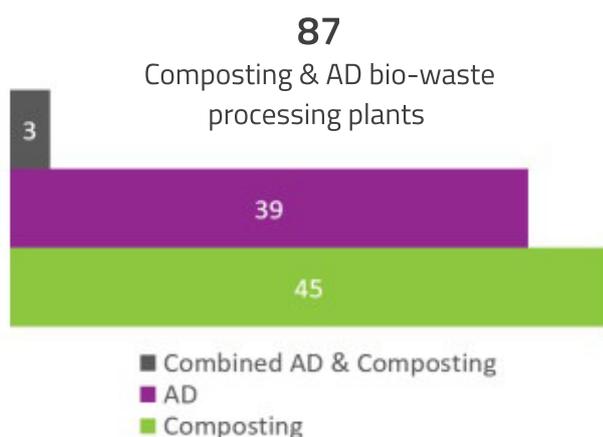
The Public Waste Agency of Flanders (OVAM) has introduced policies on bio-waste recycling, including treatment and the sustainable use of compost and digestate.

SEPARATE COLLECTION SCHEMES for green waste or vegetable, fruit and garden (VFG) waste from households have been in place since the 1990s.

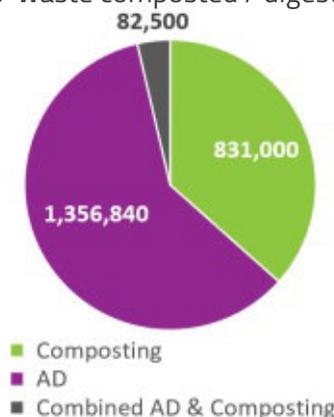
There are also a large number of AD plants, treating both waste and agricultural feedstocks.

There is an **ESTABLISHED NETWORK** of composting and AD plants, with
1 plant per 130 THOUSAND PEOPLE.

BELGIUM



2.3 million tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



305

Thousand tonnes of
compost



452

Thousand tonnes of
digestate

Nutrients



5.1

Thousand tonnes of
NITROGEN RECYCLED



1.3

Thousand tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

91

Thousand tonnes
(dry mass) organic
carbon recycled

46

Thousand tonnes
(dry mass) humic
substances recycled

Markets

757 thousand tonnes of compost & digestate. If spread at 30 t/ha this would cover **25** thousand hectares of land or **3.2%** of Belgium's arable land.

In 2017, 45% of compost was used in landscaping, public green and private gardens, 15% as an ingredient for substrates/fertilisers/soil improvers, 29% in agriculture/horticulture and 11% for export. In total, about 500,000 tonnes of compost was produced and certified.

Quality Assurance

VLACO is the Flemish membership organisation that supports and implements bio-waste policies in the region. VLACO has been acknowledged by the Flemish minister of Environment as a certification body for compost and digestate products across Flanders according to the Quality Assurance Scheme set in the VLAREMA regulation.

Vlaco has been granted the ECN-QAS Conformity Label for compost and digestate products. In 2017, there were 92 certified facilities with about 200 certificates for different compost and digestate-based products.

In 2017, in total 1,200,000 tonnes of digestate products were produced and certified. Almost all digestate products were used in agriculture, although small amounts were used for landscaping purposes.



CONTACT DETAILS

Vlaco npo,
Stationsstraat 110, 2800 Mechelen, BE
E: info@vlaco.be www.vlaco.be



DENMARK

GEOGRAPHICAL

Population



5.7 million

Degree of Urbanisation



■ Population cities
■ Population towns & suburbs
■ Population rural



WASTE MANAGEMENT

4,484

Thousand tonnes
of municipal
waste per year

783 kg

Municipal waste
per capita per year

47%

Recycling rate



Denmark has a strong track record in generating energy from waste, with a target to use 25% of green waste as a fuel.

The 2013 strategy, 'Denmark without Waste', set a target of recycling 55% MSW by 2022, which can only be reached by recycling bio-waste.

Municipalities are required to publish waste plans every four years.

Denmark has a **GOOD RECYCLING RATE**, but the **HIGHEST PER CAPITA** rate of MSW generation in Europe.

BIO-WASTE MANAGEMENT

Anaerobic Digestion has a long tradition in Denmark in particularly for pig slurry, manure and sewage. Targets for 'green energy' seem likely to be met only by including food waste.

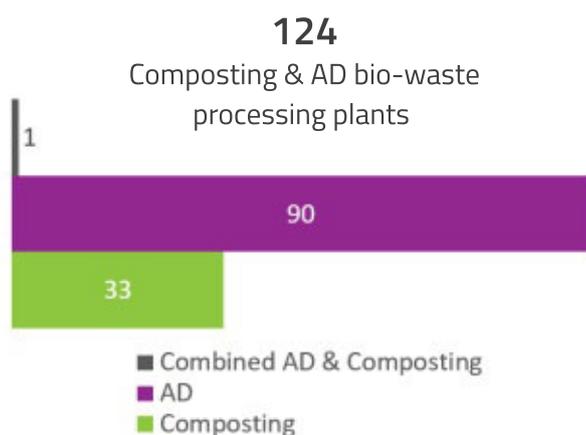
At present, 28 out of 98 municipalities collect food waste separately, which is mostly treated at AD plants.

CO-DIGESTION of municipal bio-waste and agricultural manures is common.

Nearly all households are served by a separate green waste collection scheme.

There is an **ESTABLISHED NETWORK** of composting and AD plants, with **1 plant per 46 THOUSAND PEOPLE**.

DENMARK



817 thousand tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



180

Thousand tonnes of
compost



92

Thousand tonnes of
digestate

Nutrients

2.1

Thousand tonnes of
NITROGEN RECYCLED



0.7

Thousand tonnes of
PHOSPHATE RECYCLED



(Theoretical estimates)

Carbon

54

Thousand tonnes
(dry mass) organic
carbon recycled

27

Thousand tonnes
(dry mass) humic
substances recycled

Markets

272 thousand tonnes of compost & digestate. If spread at 30 t/ha this would cover 9 thousand hectares of land or **0.4%** of Denmark's arable land.

Agriculture is the largest sector for digestate and compost, due primarily to co-digestion of food wastes and manures, where it is sold at up to €6/tonne.

There is a specific focus on recycling phosphorus, which includes compost.

Quality Assurance

The Statutory Order (2017) regarding the application of waste products for the agricultural purposes regulates the agricultural re-use of compost and sets limit values for PTEs and organic pollutants. Rules for the sales of fertilisers and soil improvers such as compost are laid down in the Statutory Order (2008).

There is no national compost quality certification scheme except through legislation (Affald til Jord bekendtgørelsen).

CONTACT DETAILS

Danish Biomass Recycling Association
www.genanvendbiomasse.dk



Solum Gruppen
www.solum.com



ESTONIA

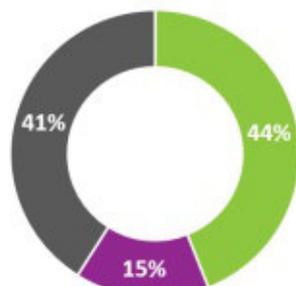
GEOGRAPHICAL

Population



1.3 million

Degree of Urbanisation



■ Population cities
■ Population towns & suburbs
■ Population rural



WASTE MANAGEMENT

494

Thousand tonnes
of municipal
waste per year

376 kg

Municipal waste
per capita per year

28%

Recycling rate



Estonia is developing its MSW treatment capacity, but currently relies heavily on incineration. MBT is only used to produce a fuel for the cement industry.

The national waste management plan 2014-2020 set targets for recycling, including 13% bio-waste to be recycled (of total MSW), and to reduce by 20% (of total MSW) the proportion of bio-waste disposed of.

There is a national funding system in place to support recycling and composting.

Estonia has a **LOW RATE OF RECYCLING**
but also a
LOW PER CAPITA
rate of MSW generation.

BIO-WASTE MANAGEMENT

Bio-waste treatment capacity in Estonia is in its infancy.

Anaerobic digestion is not used to treat municipal bio-wastes at present.

Open windrow composting is the dominant method, although some sites use semi-permeable membranes or tunnels (for animal by-product material).

SEPARATE COLLECTION SCHEMES for household bio-waste are in place in some urban areas from large apartments (e.g. >10 flats).

Green waste from city parks and green areas is also collected separately.

End-of-waste criteria for compost are in place.

There are only a **FEW COMPOSTING** plants,
with

1 plant per 164 THOUSAND PEOPLE.

ESTONIA



29 thousand tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



10
Thousand tonnes of
compost



89
Tonnes of
NITROGEN RECYCLED



33
Tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

2.9
Thousand tonnes
(dry mass) organic
carbon recycled

1.5
Thousand tonnes
(dry mass) humic
substances recycled

Markets

10 thousand tonnes of compost & digestate.
If spread at 30 t/ha, this would cover **0.3** thousand hectares of land or
0.1% of Estonia's arable land.

Markets for compost exist, but they are small. Bio-waste compost is used in private farming and city-greening rather than agriculture.

Quality Assurance

Requirements for producing compost from biodegradable waste and end-of-waste criteria for compost are set out in a 2013 regulation. This sets requirements for the production site, production technology and limit values for various parameters.

Compost quality is overseen by the **ESTONIAN CERTIFICATION CENTRE OF RECYCLED MATERIALS**, which is accredited by the National Accreditation Centre. It was supported by a Recycling Cluster who carried out technical research on compost quality. The Estonian Quality Assurance System was developed in accordance with the ECN Quality Assurance Scheme for compost.

The first official certification was granted in December 2015 to the composting site at the Väätsa landfill. There were four certified facilities in 2018.

CONTACT DETAILS

Estonian University of Life Sciences
<http://mi.emu.ee/enk>

EJKL kompetentsikeskus
www.recycling.ee



FINLAND

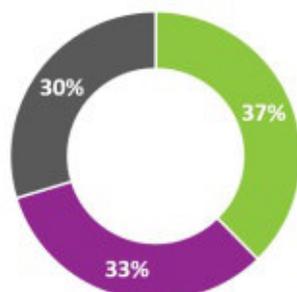
GEOGRAPHICAL

Population



5.5 million

Degree of Urbanisation



■ Population cities
■ Population towns & suburbs
■ Population rural



WASTE MANAGEMENT

2,768

Thousand tonnes
of municipal
waste per year

504 kg

Municipal waste
per capita per year

42%

Recycling rate



The Finnish waste management strategy promotes the separate collection of bio-waste and incineration of residual waste.

Municipally owned local waste management companies are mainly responsible for the collection and treatment of MSW.

Waste containing more than 10% organics is banned from landfill and there is also a landfill tax.

Finland has a **GOOD RECYCLING RATE**.

BIO-WASTE MANAGEMENT

Bio-waste collection depends upon population density. Out of 450 municipalities, 108 collect household kitchen waste, commercial bio-waste and catering waste.

It is normally obligatory to collect bio-waste from buildings with more than five apartments.

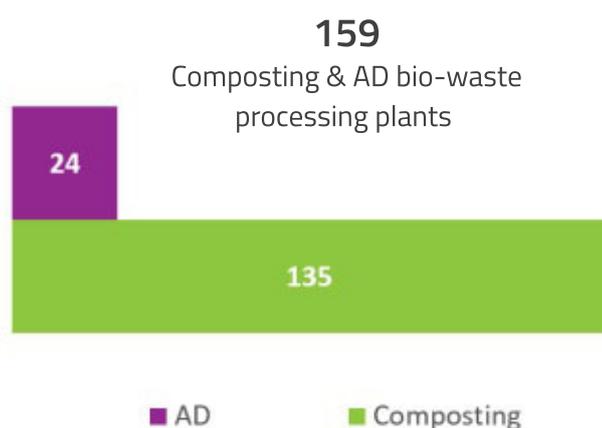
Garden waste is usually collected at bring (drop off) sites.

Composting is the predominant bio-waste treatment method.

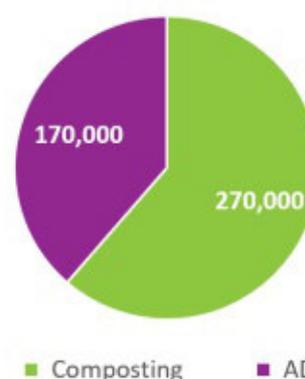
There are a **LARGE NUMBER OF COMPOSTING PLANTS**, with **1 plant per 35 THOUSAND PEOPLE**.

The anaerobic digestion sector is actively investing in new infrastructure.

FINLAND



440 thousand tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



90
Thousand tonnes of
compost



57
Thousand tonnes of
digestate

Nutrients



1.1
Thousand tonnes of
NITROGEN RECYCLED



0.3
Thousand tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

27
Thousand tonnes
(dry mass) organic
carbon recycled

14
Thousand tonnes
(dry mass) humic
substances recycled

Markets

147 thousand tonnes of compost & digestate. If spread at 30 t/ha, this would cover **4.9 thousand hectares** of land or **0.2%** of Finland's arable land.

Compost is used primarily in agriculture, or, when mixed with other components, as a soil improver for parks, private gardens and landscaping. Digestate is used as a fertiliser in agriculture; however, due to the long winter period, large digestate storage tanks are required.

Quality Assurance

Products from organic waste are sold as fertilisers for agriculture or landscaping applications under the supervision of the Finnish Plant Production Inspection Centre.

Finnish legislation mandates that only certified products may be marketed. This is carried out by the Finnish authorities, and includes monitoring of pathogens, heavy metals and nutrients. A voluntary quality assurance system was published in March 2019, based on the European Quality Assurance Scheme for compost and digestate 'ECN-QAS'.

CONTACT DETAILS

Biolaitosyhdistys
Anttilantie 4, 31600 Jokioinen, FI
www.biolaitosyhdistys.fi



FRANCE

GEOGRAPHICAL

Population



66.7 million

Degree of Urbanisation



■ Population cities
■ Population towns & suburbs
■ Population rural



WASTE MANAGEMENT

34,339

Thousand tonnes
of municipal
waste per year

514 kg

Municipal waste
per capita per year

42%

Recycling rate



In France, waste is regulated at both the national and regional level, so there are large differences in performance between the regions.

France has a **GOOD RECYCLING RATE**.

In July 2016 single use carrier bags were banned in shops. On 1 January 2017 only **HOME COMPOSTABLE BAGS** with a minimum of 30% **BIO-BASED CONTENT** may be distributed.

BIO-WASTE MANAGEMENT

In the past, France has focussed on treating mixed MSW, but is now moving towards separate door-to-door bio-waste collections.

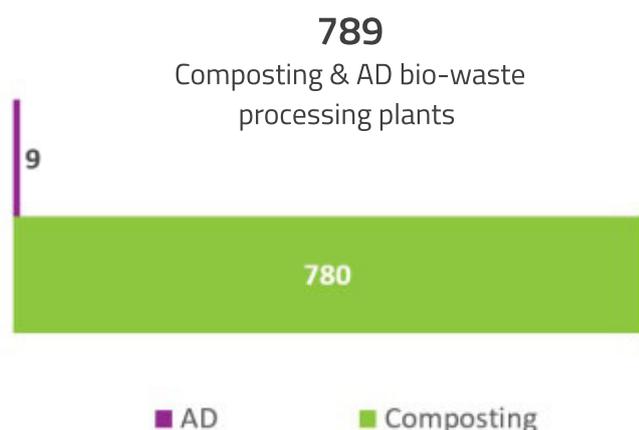
The Waste Reduction and Recovery Plan 2014-2020 requires every household to have access to a separate bio-waste collection service or home/community composting by 2025.

The majority of bio-waste is **GREEN WASTE** collected at **RECYCLING CENTRES**.

Door-to-door collections of food waste are increasing.

There is a **DEVELOPING NETWORK** of composting and AD plants, with **1 plant per 85 THOUSAND PEOPLE**.

FRANCE



4.6 million tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



1.5
Million tonnes of
compost



18
Thousand tonnes of
digestate

Nutrients



14
Thousand tonnes of
NITROGEN RECYCLED



5
Thousand tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

457
Thousand tonnes
(dry mass) organic
carbon recycled

228
Thousand tonnes
(dry mass) humic
substances recycled

Markets

1.5 million tonnes of compost & digestate.

If spread at 30 t/ha, this would cover **51** thousand hectares of land or **0.3%** of France's arable land.

Quality Assurance

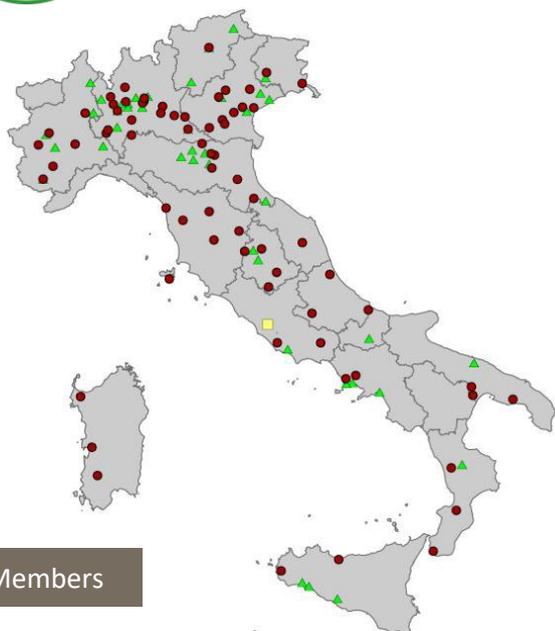
ASQA (Certified Selected Quality Amendment) is the French compost quality label managed by Réseau Compostplus and was developed on the basis of the European Quality Assurance Scheme for compost and digestate 'ECN-QAS'. It is the only compost quality assurance scheme recognised by the agricultural profession.

It was created to meet the needs of farmers in terms of quality, traceability and transparency, and goes beyond the national regulations. Compliance is monitored annually by a third party.

CONTACT DETAILS

Réseau Compostplus
Route de Canet BP29, 34 800 Aspiran, FR
www.compostplus.org

RÉSEAU
Compostplus



CIC Members

- Ordinary Members
- ▲ Associated Members
- General Association Members

The Italian Composting and Biogas Association is the unique association in Italy for recovery and recycling of the organic waste.

Since 25 years, CIC's mission is to promote recycling and prevention of biowaste, enhance compost quality and market, organise technical training for the composting sector and assist government bodies in improving biowaste recycling.

Among 125 Members of CIC there are public and private compost producers, local authorities and others involved in compost productions, such as machinery and equipment constructors, growing media producers, research institutes.

CIC & Italy key data

125 MEMBERS **326 FACILITIES**
8.7 Mtons recycling of biowaste per year

41,2% Biowaste from **Source Separated Collection** of Municipal solid Waste **10%** average increase per year of the **biowaste** collected (in the last 10 years)

1.8 billion euro the turnover of the biowaste recycling sector **1.9 million tons of compost** produced every year

3.5 million tons of **CO₂ equivalent saved** as avoided disposal in landfill **36,5%** of the Italian total compost production awarded the **CIC Quality Compost Label**

24 million tons of **compost produced** in the last 25 years **More than 7 million tons** of **organic matter** stored into the soil in the last 25 years

0,1% increase of **organic matter into the soil** to reset the **national transport CO₂** **65 million tons** recycled and 100 million cubic meters **avoided in landfill** in 25 years

44 million tons of **CO₂ equivalent** avoided in 25 years **80%** of **waste collection vehicles** could be fuelled by **biomethane from biowaste**

Consorzio Italiano Compostatori

P.zza San Bernardo, 109 - 00187 ROMA Tel. 06 485 238

Sede Operativa: Via Dalmazia, 2 – 24047 Treviso (BG) Tel. 0363 301503 - Fax 0363 1801012

cic@compost.it

www.compost.it

www.compostabile.com



CIC's labels

CERTIFICATION OF COMPOSTABLE ISSUES

QUALITY ASSURANCE SYSTEM OF COMPOST

CERTIFIED PRODUCTS

63



AWARDED PRODUCTS

58



20

LICENSED COMPANIES

PLANTS IN THE QAS

51

SOS soil

"Save Organics in Soil"

Campaign to increase organic matter into the soil

Soil is a vital, non-renewable resource for ecosystems, playing an essential role in services such as water purification and food production. It is also a major global carbon sink, with significant potential to remove climate-changing gases from the atmosphere. However, the ability of soil to deliver ecosystem services — in terms of food production, as a biodiversity pool and as a regulator of gasses, water and nutrients — is under severe pressure

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cic@compost.it

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www.compostabile.com



@consorzioCIC

GERMANY

GEOGRAPHICAL

Population



82.2 million

Degree of Urbanisation



■ Population cities
■ Population towns & suburbs
■ Population rural



WASTE MANAGEMENT

52,133

Thousand tonnes
of municipal
waste per year

633 kg

Municipal waste
per capita per year

67%

Recycling rate



Germany has the
HIGHEST RATE OF RECYCLING in Europe.

It also has one of the **HIGHEST PER CAPITA**
rates of municipal waste **GENERATION**.

The Federal Circular Economy Act (2012) sets an
overall re-use and recycling target of 65% of MSW
by 2020.

Each of the 16 Federal States adopts its own
waste management act containing supplementary
regulations.

BIO-WASTE MANAGEMENT

The Federal Circular Economy Act obligates all waste producers and mandated waste management authorities to collect bio-waste separately as of January 2015.

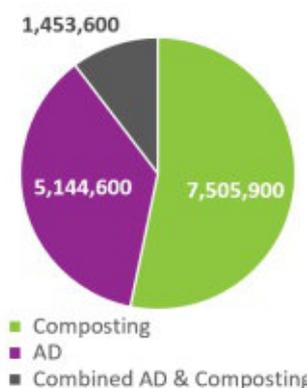
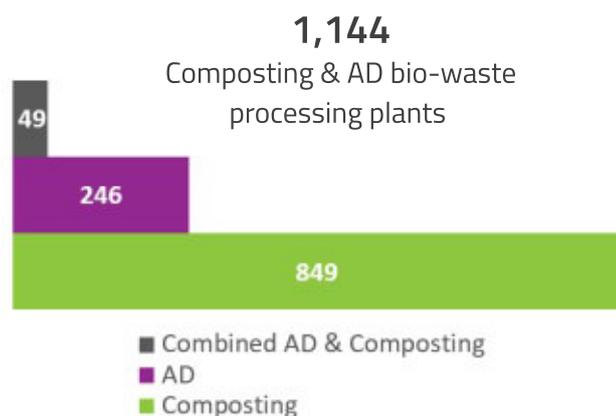
There are a growing number of AD plants,
treating both bio-waste and agricultural
feedstocks.

GERMANY has an established bio-waste
treatment sector and is characterised by a
large number of **LARGE-SCALE** composting
facilities,
with

1 plant per 72 THOUSAND PEOPLE.

GERMANY

14.1 million tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



3.0
Million tonnes of
compost



1.7
Million tonnes of
digestate

Nutrients



36
Thousand tonnes of
NITROGEN RECYCLED



11
Thousand tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

896
Thousand tonnes
(dry mass) organic
carbon recycled

448
Thousand tonnes
(dry mass) humic
substances recycled

Markets

4.7 million tonnes of compost & digestate. If spread at 30 t/ha, this would cover **157 thousand hectares** of land or **1.3%** of Germany's arable land.

The Federal Biowaste Ordinance regulates the types of waste, process requirements and quality criteria for the use of treated bio-waste used on agricultural, silvicultural and horticultural land, whereas the fertiliser law regulates the declaration of nutrients and additional environmental criteria for placing compost and digestate on the market.

In 2018, 58% of compost went to agriculture, 20% for soil manufacture and 8% to landscaping/re-cultivation.

Quality Assurance

The German Compost Quality Assurance Organisation (Bundesgütegemeinschaft Kompost; BGK) awards quality labels for compost, digestate and sewage sludge compost, and is recognised by the German Institute for Quality Assurance and Certification (RAL).



There are two standards for digestate depending on the input feedstocks (bio-wastes and energy crops). In 2018, there were 556 certified composting facilities and 130 anaerobic digestion bio-waste processing plants.

The BGK is certified to ECN's quality assurance scheme for compost and digestate, 'ECN-QAS'.

CONTACT DETAILS

Bundesgütegemeinschaft Kompost
Von der Wettern Str. 25, D-51149 Cologne, DE
E: info@kompost.de www.kompost.de



HUNGARY

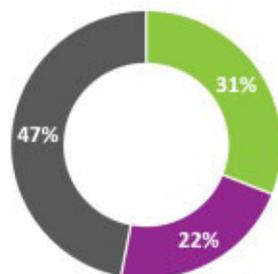
GEOGRAPHICAL

Population



9.8 million

Degree of Urbanisation



■ Population cities
■ Population towns & suburbs
■ Population rural



WASTE MANAGEMENT

3,721

Thousand tonnes
of municipal
waste per year

379 kg

Municipal waste
per capita per year

35%

Recycling rate



The Hungarian Waste Act (2012) promotes recycling and specifies that door-to-door collections for as many waste types as possible is the preferred collection option.

The act also introduced a landfill tax and calls for the separate collection of bio-waste.

Hungary has a **LOW RECYCLING RATE**, although it also has a **LOW PER CAPITA** rate of municipal waste **GENERATION**.

BIO-WASTE MANAGEMENT

There is a separate Bio-Waste Regulation (2003) that covers suitable input materials, hygiene requirements and the technical specifications of composting/anaerobic digestion plants. Although it defines compost, it does not cover product quality or quality assurance.

Separately collected bio-waste accounts for about 5% of all wastes produced.

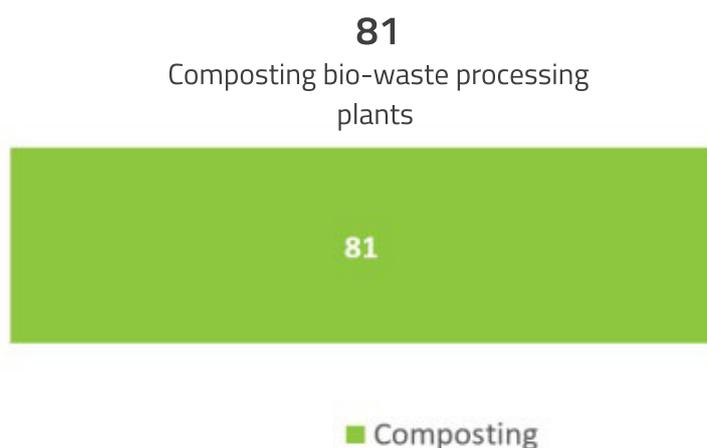
It is collected in 'green waste bags' or at recycling centres.

The Waste Act (2012) set a target of 9% of all waste collected to be bio-waste by 2020.

The number of bio-waste composting plants has increased in the past few years, although AD is currently limited to sewage sludge and agricultural waste.

HUNGARY has a **DEVELOPING** established bio-waste treatment sector, with **1 plant per 121 THOUSAND PEOPLE**.

HUNGARY



240 thousand tonnes
bio-waste composted



COMPOST & DIGESTATE



80
Thousand tonnes of
compost



740
tonnes of
NITROGEN RECYCLED



272
tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

24
Thousand tonnes
(dry mass) organic
carbon recycled

12
Thousand tonnes
(dry mass) humic
substances recycled

Markets

80 thousand tonnes of compost & digestate. If spread at 30 t/ha, this would cover **3** thousand hectares of land or **0.1%** of Hungary's arable land.

The majority of compost is applied to agricultural land, and there are more than 60 products in the market being sold, with prices varying between 12-15€/t.

Quality Assurance

Compost is regulated under the Fertiliser Regulation (2006), which defines compost as a product and sets out product specifications, including limit values for trace elements and contaminants. The regulation, however, is not aligned with the Bio-Waste Regulation.

Revisions to the Bio-Waste Regulation are expected to include end-of-waste criteria.

The Hungarian Quality Compost Association is developing a compost assurance scheme.

CONTACT DETAILS

Hungarian Quality Compost Association
Páter Károly u. 1, H-2100 GÖDÖLLŐ, HU
E: info@komposzt.hu www.komposzt.hu



IRELAND

GEOGRAPHICAL

Population



4.7 million

Degree of Urbanisation



■ Population cities
■ Population towns & suburbs
■ Population rural



WASTE MANAGEMENT

2,763

Thousand tonnes
of municipal
waste per year

581 kg

Municipal waste
per capita per year

41%

Recycling rate

Ireland has a
GOOD RECYCLING RATE.

It also has one of the
HIGHEST PER CAPITA
rates of municipal waste
GENERATION.



Waste legislation has been transposed into national law and there are three regional waste plans.

BIO-WASTE MANAGEMENT

The Waste Management (Food Waste) Regulations 2009 and the European Union (Household Food Waste and Bio-Waste) Regulations 2015 place obligations on both commercial organisations and households to collect food waste separately.

These are referred to as 'brown bin' collections.

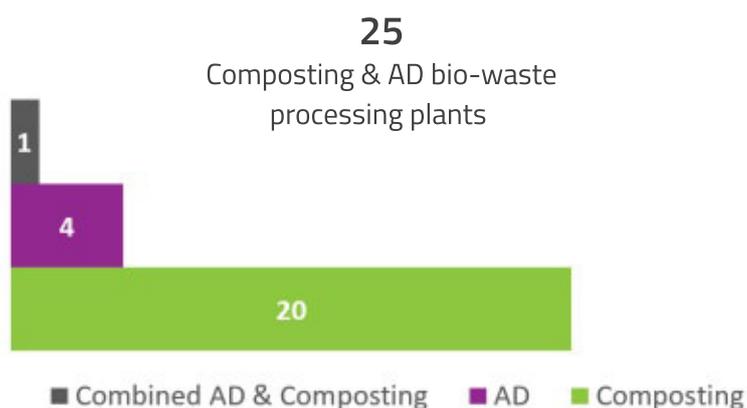
If implemented in full, an estimated 600,000 tonnes of bio-waste could be collected annually.

Currently about one third of this potential is collected.

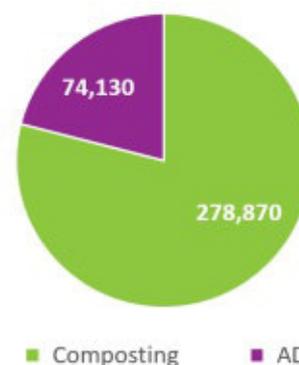
There is a developed network of composting and anaerobic digestion facilities.

IRELAND has
1 plant per 189 THOUSAND PEOPLE.

IRELAND



353 thousand tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



93

Thousand tonnes of
compost



25

Thousand tonnes of
digestate

Nutrients



983

Tonnes of
NITROGEN RECYCLED



328

Tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

28

Thousand tonnes
(dry mass) organic
carbon recycled

14

Thousand tonnes
(dry mass) humic
substances recycled

Markets

118 thousand tonnes of compost & digestate. If spread at 30 t/ha, this would cover 4 thousand hectares of land or 0.4% of Ireland's arable land.

The majority of compost manufactured out of brown bin collected material in Ireland is spread onto agricultural and horticultural land (95%), as well as landscaping projects (5%).

Digestate is landspread in Ireland.

Quality Assurance

In Ireland, all composting sites must test compost to ensure it meets a compost quality standard and is fit for use.

The National Standards Authority of Ireland published a standard in 2011 (I.S. 441) which is based on the European Quality Assurance Scheme for compost and digestate 'ECN-QAS'.

CONTACT DETAILS

Cré - Composting and Anaerobic Digestion Association of Ireland
PO Box 135, Enfield, Co. Meath, IE
E: info@cre.ie www.cre.ie



ITALY

GEOGRAPHICAL

Population



60.7 million

Degree of Urbanisation



■ Population cities
■ Population towns & suburbs
■ Population rural



WASTE MANAGEMENT

30,112

Thousand tonnes
of municipal
waste per year

497 kg

Municipal waste
per capita per year

46%

Recycling rate



Italy has a **GOOD RECYCLING RATE**.

It has a **MEDIUM PER CAPITA** rate of
municipal waste **GENERATION**.

National legislation introduced in 2006 set a target of 65% source separation and recycling for each municipality.

In 2011, Italy introduced a ban on the use of single use plastic bags in shops, except those certified as compostable whose use in separate food waste collections is encouraged.

BIO-WASTE MANAGEMENT

Italy has led the way in separate food waste collections, especially in large cities such as Milan. Door-to-door collections of food waste using vented kitchen caddies and compostable liners are commonplace.

Italy is one of the few countries where AD and composting are integrated, as digestate must be aerobically composted prior to end use as a product.

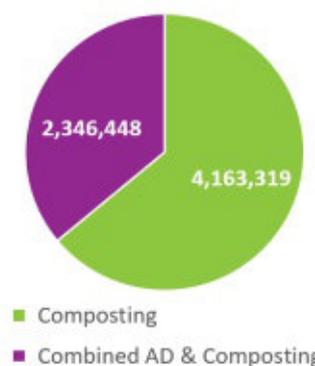
Italy has an established bio-waste treatment sector and is characterised by a large number of large-scale AD and composting facilities, with

1 plant per 186 THOUSAND PEOPLE.

ITALY



6.5 million tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



2.2
Million tonnes of
compost



20
Thousand tonnes of
NITROGEN RECYCLED



7
Thousand tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

651
Thousand tonnes
(dry mass) organic
carbon recycled

325
Thousand tonnes
(dry mass) humic
substances recycled

Markets

2.2 million tonnes of compost. If spread at 30 t/ha, this would cover **72 thousand hectares** of land or **1.1%** of Italy's arable land.

According to Italian legislation, compost is defined as a soil improver. Compost derived from the separate collection of organic waste has end-of-waste status, whilst digestate remains a waste unless it has been post-composted.

The Italian standards for end-of-waste compost are set by the national Law on Fertilisers (75/2010 and subsequent amendments).

Around 70% of compost produced is used in agriculture, whilst the remaining 30% is sold for gardening or landscaping products.

Quality Assurance

The Italian Composting and Biogas Association (Consorzio Italiano Compostatori; CIC) oversees the compost certification scheme (the 'CIC Quality Label' for compost), as well as the 'Compostable CIC' Label, for biodegradable products according to the compostable standard EN:13432.

In 2015, there were 64 composting facilities and 21 AD plants (most combined with composting) certified by CIC.

The CIC is certified to ECN's quality assurance scheme for compost.

CONTACT DETAILS

Consorzio Italiano Compostatori (CIC)
Piazza San Bernardo, 109 - IT-00187 Rome, IT
E: cic@compost.it www.compost.it



LITHUANIA

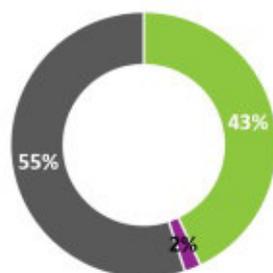
GEOGRAPHICAL

Population



2.9 million

Degree of Urbanisation



■ Population cities
■ Population towns & suburbs
■ Population rural



WASTE MANAGEMENT

1,272

Thousand tonnes
of municipal
waste per year

444 kg

Municipal waste
per capita per year

48%

Recycling rate



The Waste Management Act (2014) sets out the principles of the waste hierarchy, whilst the National Strategic Waste Management Plan for 2014-2020 (2014) sets overall recycling targets.

There are 10 regional waste management plans, which set out how MSW is managed.

The landfilling of green waste is banned.

Lithuania has a **GOOD RECYCLING RATE**, and a **LOW PER CAPITA** rate of municipal waste **GENERATION**.

BIO-WASTE MANAGEMENT

The 10 regional waste management centres, three private companies and one regional waste management centre are responsible for bio-waste management.

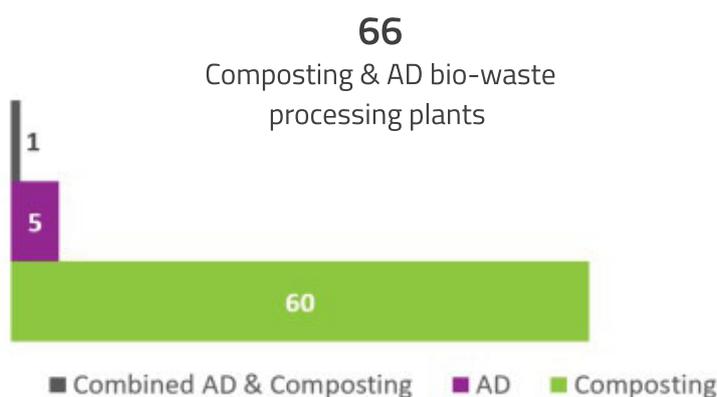
From 2019, all cities with a population over 50,000 people must separately collect food waste.

Pilot separate food waste collection schemes started in 2017. Full-scale kitchen and green waste collection schemes are being extended during 2019 in regions with the largest cities, including the capital, Vilnius.

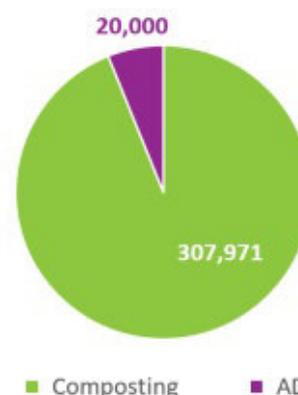
Bio-waste treatment infrastructure has developed over the past decade, starting with green waste composting.

Lithuania has a **GOOD NETWORK** of small-scale green waste processing plants operated by regional waste management centres, with **1 plant per 44 THOUSAND PEOPLE**.

LITHUANIA



328 thousand tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



103

Thousand tonnes of
compost



7

Thousand tonnes of
digestate

Nutrients



983

Tonnes of
NITROGEN RECYCLED



352

Tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

31

Thousand tonnes
(dry mass) organic
carbon recycled

15

Thousand tonnes
(dry mass) humic
substances recycled

Markets

109 thousand tonnes of compost & digestate. If spread at 30 t/ha, this would cover **3.6** thousand hectares of land or **0.2%** of Lithuania's arable land.

Green waste compost is used by hobby gardeners, farmers and landscapers.

The use of sewage sludge/green waste compost is limited to farming and landscaping.

Quality Assurance

Composting standards are under development and will probably be based on the EU Fertiliser Regulation.

CONTACT DETAILS

Biastra plus Ltd
Zadeikos g. 20-1, LT-06321, Vilnius, LT
E: info@biastrapius.lt www.biastrapius.lt



NETHERLANDS

GEOGRAPHICAL

Population



17.0 million

Degree of Urbanisation



- Population cities
- Population towns & suburbs
- Population rural



WASTE MANAGEMENT

8,858

Thousand tonnes
of municipal
waste per year

520 kg

Municipal waste
per capita per year

53%

Recycling rate

The National Waste Management Plan (2018) sets recovery and recycling targets, as well as minimum standards for the treatment of specific waste streams, including bio-waste.

The Netherlands has a
HIGH RATE OF RECYCLING.

It also has a
HIGH PER CAPITA RATE
of municipal waste **GENERATION.**



BIO-WASTE MANAGEMENT

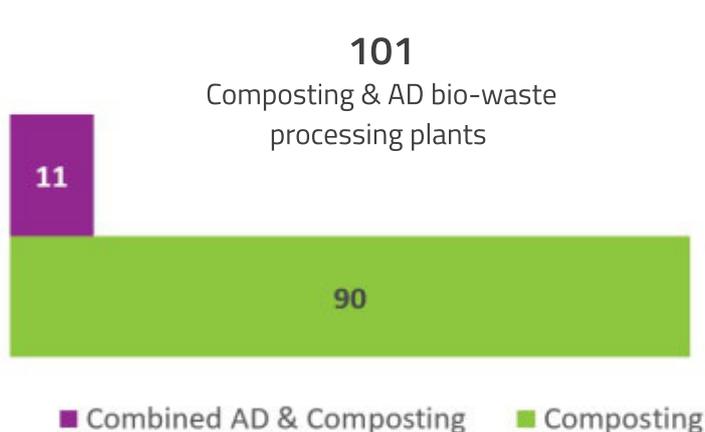
There are two separate bio-waste categories: green waste (organic residues from agriculture and green public spaces) and household VGF (vegetable, green and fruit) waste.

The National Waste Management Plan specifies composting as the minimum standard for both green and VGF wastes, alongside options such as anaerobic digestion.

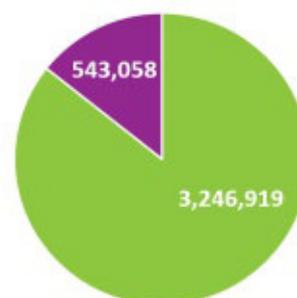
The separate collection of household bio-waste has been mandatory since 1993.

There is an established composting sector, coupled with a growing AD sector, with
1 plant per 168 THOUSAND PEOPLE.

NETHERLANDS



3.8 million tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



1.3
Million tonnes of
compost



11.7
Thousand tonnes of
NITROGEN RECYCLED



4.3
Thousand tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

379
Thousand tonnes
(dry mass) organic
carbon recycled

189
Thousand tonnes
(dry mass) humic
substances recycled

Markets

1.3 million tonnes of compost & digestate. If spread at 30 t/ha, this would cover **42 thousand hectares** of land or **4.1%** of the Netherlands' arable land.

Compost is classed as a product under the Fertiliser Decree. It must have a minimum organic matter content of 10% and be 'biologically stable'.

The majority of compost is used in agriculture (>60%), followed by growing media (16%).

Quality Assurance

Compost in the Netherlands is certified under the Keurcompost standard, which is a voluntary industry initiative. It covers processing requirements (time-temperature) and contaminant limit values. It is enforced by independent third-party audits and accredited auditors.



CONTACT DETAILS

Branche Vereniging Organische Reststoffen (BVOR)
Bronland 12-B, 6708 WH Wageningen, NL
E: info@bvor.nl www.bvor.nl



NORWAY

GEOGRAPHICAL

Population



5.2 million

Degree of Urbanisation



■ Population cities
■ Population towns & suburbs
■ Population rural



WASTE MANAGEMENT

3,946

Thousand tonnes
of municipal
waste per year

754 kg

Municipal waste
per capita per year

38%

Recycling rate



Municipalities have responsibility for household waste, whereas all other waste remains the responsibility of the waste owner.

As of 2009, the landfilling of biodegradable waste with a total organic carbon content > 10 % or organic matter content > 20 % is banned.

Norway has a **LOW RECYCLING RATE**
and a **HIGH PER CAPITA RATE**
of MSW **GENERATION**.

BIO-WASTE MANAGEMENT

Separate household bio-waste collections started in the 1990s.

About 70% of the population is served with a door-to-door food waste collection service.

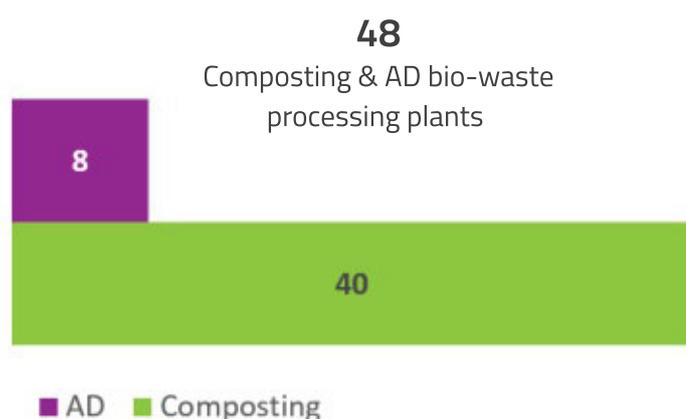
In 2018, the Norwegian parliament decided to introduce mandatory source separation of bio-waste from households and similar wastes (municipal waste).

In 2016, approximately 45% of collected household bio-waste was garden waste and 55% was food and other organic waste.

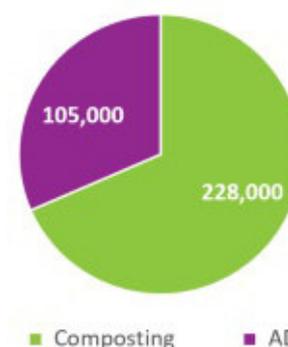
Garden waste is mainly collected at recycling centres (bring sites), although there are some door-to-door collections.

There is an established composting and AD sector,
with
1 plant per 109 THOUSAND PEOPLE.

NORWAY



333 thousand tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



76
Thousand tonnes of
compost



35
Thousand tonnes of
digestate

Nutrients



878
Tonnes of
NITROGEN RECYCLED



276
Tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

23
Thousand tonnes
(dry mass) organic
carbon recycled

11
Thousand tonnes
(dry mass) humic
substances recycled

Markets

111 thousand tonnes of compost & digestate. If spread at 30 t/ha, this would cover **4** thousand hectares of land or **0.5%** of Norway's arable land.

Compost, sewage sludge, digestate and manures are covered by the Regulation for Organic Fertilisers (2003), which requires all products to be registered before they can be sold. The regulation sets contaminant limit levels and requires facilities to have internal quality control systems in place.

In 2018, the Norwegian Environment Directorate committed to the phased elimination of peat in growing media for amateur users by 2025 and professional horticulturalists by 2030.

Demand for compost-based products has increased steadily in recent years.

Quality Assurance

At present there is no quality assurance scheme in place.

CONTACT DETAILS

Avfall Norge
Øvre Vollgate 6, N-0158 Oslo, NO
E: post@avfallnorge.no www.avfallnorge.no



POLAND

GEOGRAPHICAL

Population



38.0 million

Degree of Urbanisation



■ Population cities
■ Population towns & suburbs
■ Population rural



WASTE MANAGEMENT

11,654

Thousand tonnes
of municipal
waste per year

307 kg

Municipal waste
per capita per year

35%

Recycling rate

The National Waste Management Plan (2014) sets recycling targets and aims to generate energy from biomass, including bio-waste. Each commune is responsible for managing waste in its own area.

Poland has a **LOW RECYCLING RATE**, but also a **LOW PER CAPITA RATE** of MSW GENERATION.

MSW generation has decreased in recent years due to a decreasing population.



BIO-WASTE MANAGEMENT

It is predicted that the share of biodegradable fraction in municipal waste stream will increase on average by 0.5% per annum.

The separate collection of bio-waste is uncommon, so it is mainly co-mingled with residual waste.

Home composting is often promoted as the preferred option.

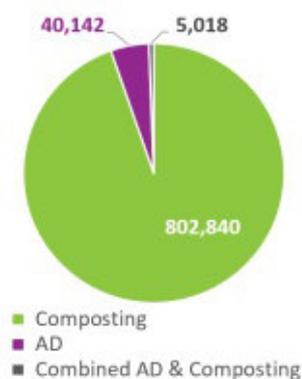
Green waste is collected separately in some rural areas.

There is a developing composting and AD sector, with
1 plant per 225 THOUSAND PEOPLE.

POLAND



848 thousand tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



269
Thousand tonnes of
compost



13
Thousand tonnes of
digestate

Nutrients



2.6
Thousand tonnes of
NITROGEN RECYCLED



922
Tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

81
Thousand tonnes
(dry mass) organic
carbon recycled

40
Thousand tonnes
(dry mass) humic
substances recycled

Markets

283 thousand tonnes of compost & digestate.

If spread at 30 t/ha, this would cover
9 thousand hectares of land or **0.1%** of Poland's arable land.

Compost and digestate quality standards are yet to be developed.

Quality Assurance

At present there is no quality assurance scheme in place.

CONTACT DETAILS

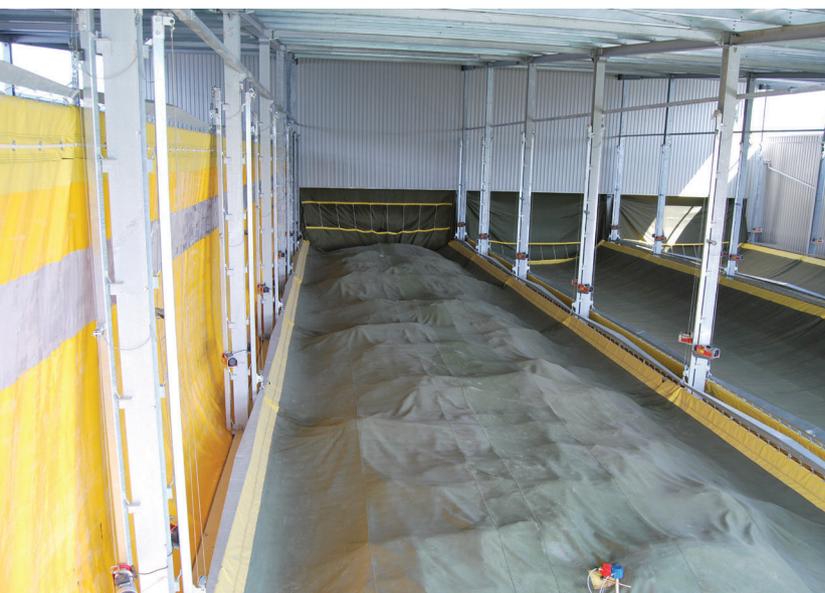
GWDA sp. z o. o.
ul. Na Leszkowie 4, 64-920 Piła, PL
E- mail: biuro@gwda.pl www.gwda.pl



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a product by
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PORTUGAL

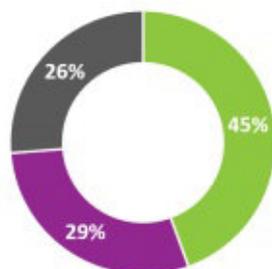
GEOGRAPHICAL

Population



10.3 million

Degree of Urbanisation



■ Population cities
■ Population towns & suburbs
■ Population rural



WASTE MANAGEMENT

4,897

Thousand tonnes
of municipal
waste per year

474 kg

Municipal waste
per capita per year

31%

Recycling rate



Portugal has historically relied on disposal and MBT of mixed waste, although this is starting to change.

The Strategic Plan for Municipal Solid Waste, requires that waste generation per person be reduced to 10% by weight of 2012 values by December 2020.

In 2017, there were 23 Municipal Waste Management Systems covering the entire mainland territory.

Portugal has a **LOW RECYCLING RATE**. It also has a **LOW PER CAPITA RATE** of MSW GENERATION.

BIO-WASTE MANAGEMENT

The Waste Decree requires the National Waste Authority to encourage the separate collection of bio-waste for composting and AD.

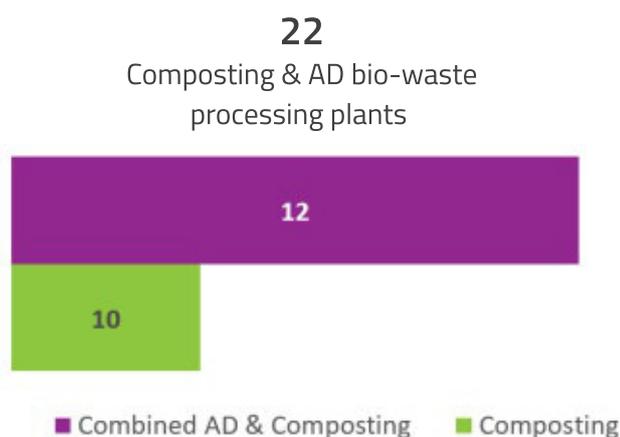
To date, there has been a reliance on mixed waste composting (MBT).

In the Portuguese mainland there are a few pilot projects collecting bio-waste from both residential areas and the HORECA sector for composting/anaerobic digestion.

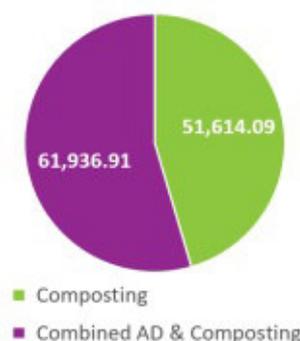
Anaerobic digestion is used in conjunction with composting.

There is a developing composting and AD sector, with
1 plant per 470 THOUSAND PEOPLE.

PORTUGAL



114 thousand tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



38
Thousand tonnes of
compost



350
Tonnes of
NITROGEN RECYCLED



129
Tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

11
Thousand tonnes
(dry mass) organic
carbon recycled

6
Thousand tonnes
(dry mass) humic
substances recycled

Markets

38 thousand tonnes of compost & digestate.

If spread at 30 t/ha, this would cover
1 thousand hectares of land or **0.1%** of Portugal's arable land.

In 2017, about 96% of compost produced was used in agriculture.

The Decree-Law 103/2015 lays down the rules governing the placing on the market of fertilisers, namely compost.

Quality Assurance

There are three classes of compost (Class I, Class II and Class IIA).

At present there is no quality assurance scheme in place.

CONTACT DETAILS

LIPOR
Apartado 1510, 4435 996 Baguim do Monte, PT
E: info@lipor.pt www.lipor.pt



SLOVENIA

GEOGRAPHICAL

Population



2.1 million

Degree of Urbanisation



■ Population cities
■ Population towns & suburbs
■ Population rural



WASTE MANAGEMENT

943

Thousand tonnes
of municipal
waste per year

457 kg

Municipal waste
per capita per year

56%

Recycling rate



Slovenia has a **HIGH RECYCLING RATE** and a **LOW RATE** of **WASTE GENERATION PER CAPITA**.

Recyclable waste is collected in separate bins through door-to-door collections; bring schemes are less common.

The composition of municipal waste in Slovenia was re-examined in 2014. It is used to project bio-waste arisings up to 2030 as part of the programme for management of waste and the waste prevention programme.

BIO-WASTE MANAGEMENT

The decree on the management of biodegradable kitchen waste and green garden waste mandates that bio-waste from households and catering businesses be collected separately for treatment.

The decree on the processing of biodegradable waste and the use of compost or digestate sets out permitting requirements for composting and anaerobic digestion plants.

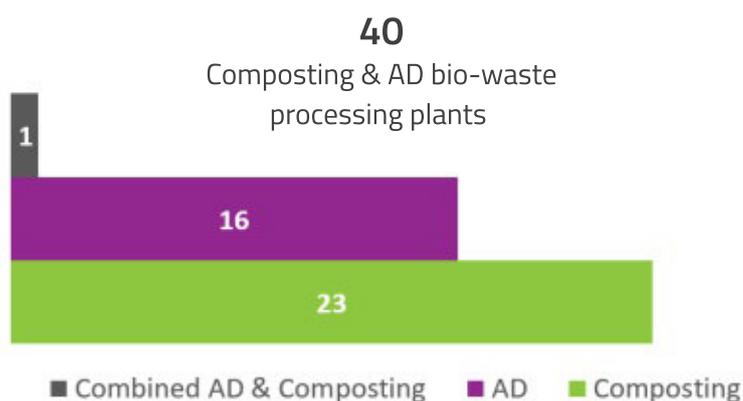
The decree on biodegradable kitchen waste and garden waste management specifies 'minimum requirements for proper home composting'.

Only bio-waste from households can be home composted.

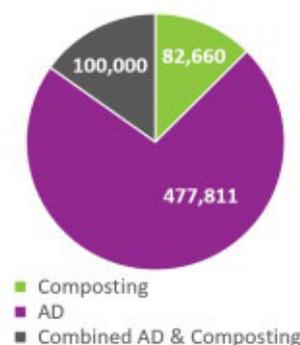
There is a good network of composting and AD facilities, with

1 plant per 52 THOUSAND PEOPLE.

SLOVENIA



660 thousand tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



61

Thousand tonnes of
compost



159

Thousand tonnes of
digestate

Nutrients

1.3

Thousand tonnes of
NITROGEN RECYCLED



287

Tonnes of
PHOSPHATE RECYCLED



(Theoretical estimates)

Carbon

18

Thousand tonnes
(dry mass) organic
carbon recycled

9

Thousand tonnes
(dry mass) humic
substances recycled

Markets

220 thousand tonnes of compost & digestate.

If spread at 30 t/ha, this would cover
7 thousand hectares of land or **4.2%** of Slovenia's arable land.

The decree on the processing of biodegradable waste and the use of compost or digestate classifies compost or digestate into grades 1 or 2.

It also sets end-of-waste criteria and conditions for the recording of compost and digestate applied to land.

Quality Assurance

At present there is no quality assurance scheme in place.

CONTACT DETAILS

Ministry of the Environment and Spatial Planning
Dunajska c. 48, SI-1000 Ljubljana, SI
E: gp.mop@gov.si www.mop.gov.si/en/



REPUBLIC OF SLOVENIA
**MINISTRY OF THE ENVIRONMENT
AND SPATIAL PLANNING**

SWEDEN

GEOGRAPHICAL

Population



9.9 million

Degree of Urbanisation



■ Population cities
■ Population towns & suburbs
■ Population rural



WASTE MANAGEMENT

4,393

Thousand tonnes
of municipal
waste per year

443 kg

Municipal waste
per capita per year

49%

Recycling rate



In Sweden, there is a ban on the disposal of organic waste to landfill and a landfill tax.

Municipalities decide, and take responsibility about how to manage their waste, relying on a combination of public and private contracts.

Sweden aims to cut emissions from the transport sector of 70 % by 2030, compared to the year 2010, which will increase demand for biogas as transport fuel.

There are no MBT plants in operation.

Sweden has a **GOOD RECYCLING RATE** and a **LOW PER CAPITA RATE** of MSW GENERATION.

BIO-WASTE MANAGEMENT

There is a national target to collect 50% of all food waste for the purpose of extracting nutrients, and 40% to be anaerobically digested for its energy content.

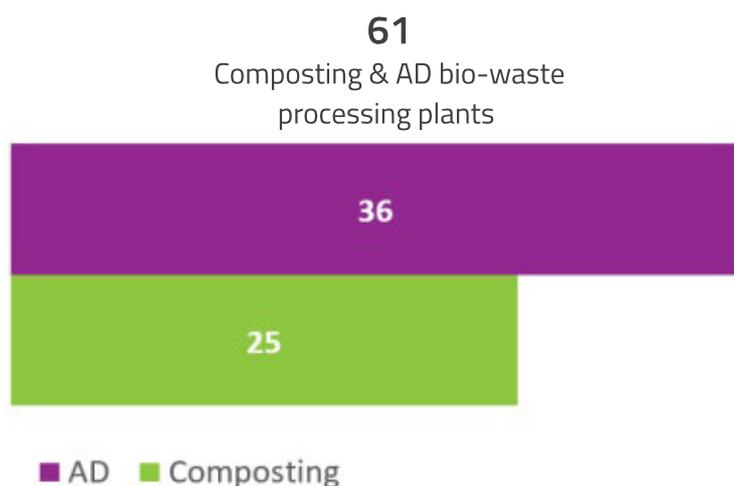
In 2018, 223 out of 290 municipalities have voluntarily introduced separate food waste collection systems. The most common system is separate bins, but optical sorting of differently coloured bags in the same bin is becoming increasingly popular. By 2021 all Swedish municipalities must offer separate collection of food waste from households.

Anaerobic digestion is the preferred bio-waste treatment method over composting, due to the use of biogas as a transport fuel.

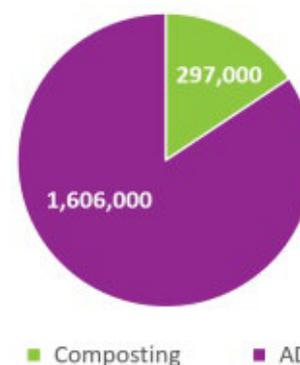
There is a good network of composting and AD facilities, with

1 plant per 161 THOUSAND PEOPLE.

SWEDEN



1.9 million tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



99

Thousand tonnes of
compost



535

Thousand tonnes of
digestate

Nutrients



3.6

Thousand tonnes of
NITROGEN RECYCLED



604

Tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

30

Thousand tonnes
(dry mass) organic
carbon recycled

15

Thousand tonnes
(dry mass) humic
substances recycled

Markets

634 thousand tonnes of compost & digestate.

If spread at 30 t/ha, this would cover

21 thousand hectares of land or **0.8%** of Sweden's arable land.

Digestate is used as an agricultural fertiliser. Compost is used in parks and green areas and is also sold to the public for use in private gardens.

Digestate can be certified and used in organic farming, where it is becoming popular.

Sweden's food strategy set a target for 30 % of all farmland to be organic by the year 2030, which means a potential increase in demand for digestate.

Quality Assurance

Sweden has a quality assurance scheme 'Certifierad återvinning (Certified Re-use)', which is owned by Avfall Sverige and externally controlled by the research institutes of Sweden (RISE).

The scheme was launched in 1999, and there is a separate standard for compost (SPCR 152) and digestate (SPCR 120).

In 2017, there were 19 co-digestion plants and one composting plant certified to the quality assurance scheme.

CONTACT DETAILS

Avfall Sverige
Baltzarsgatan 25, SE-211 36 Malmö, SE
office@avfallsverige.se www.avfallsverige.se



UNITED KINGDOM

GEOGRAPHICAL

Population



65.4 million

Degree of Urbanisation



■ Population cities
■ Population towns & suburbs
■ Population rural



WASTE MANAGEMENT

31,683

Thousand tonnes
of municipal
waste per year

483 kg

Municipal waste
per capita per year

44%

Recycling rate



The UK has four nations (England, Northern Ireland, Scotland and Wales). Each nation is responsible for setting its own waste legislation and policy.

Overall there has been a decrease in landfilling of waste over the past decade, but a sharp rise in energy from waste. The UK has a high landfill tax rate (>90€/tonne).

There is an established network of bio-waste treatment facilities.

The UK has a **GOOD RECYCLING RATE** and a **LOW** rate of **MSW GENERATION PER CAPITA**.

BIO-WASTE MANAGEMENT

Northern Ireland, Scotland and Wales each has legislation to promote food waste recycling, whilst England currently relies upon a voluntary Food Waste Recycling Action Plan.

Approximately 20% of UK households are served with a separate door-to-door food waste collection service, reaching 100% in Wales. The use of kitchen caddies is widespread.

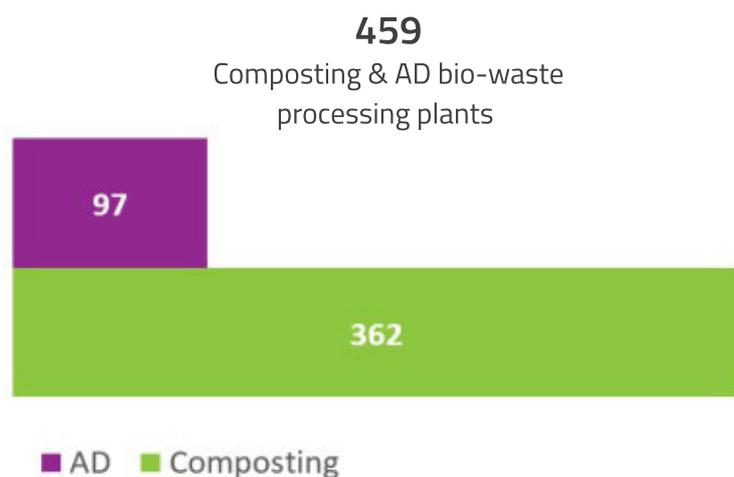
Green waste is collected from households and at recycling centres (bring sites).

The UK has an established composting industry.

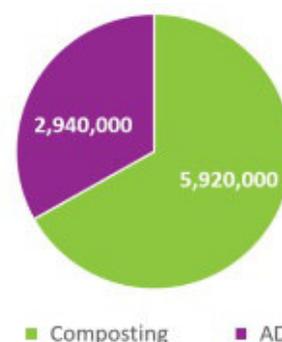
The AD sector has grown rapidly over the past 10 years, with the main growth area focussing on digestion of energy crops at agricultural sites.

There is a good network of composting and AD facilities, with
1 plant per 142 THOUSAND PEOPLE.

UNITED KINGDOM



8.9 million tonnes
bio-waste composted / digested



COMPOST & DIGESTATE



2
Million tonnes of
compost



1
Million tonnes of
digestate

Nutrients



23
Thousand tonnes of
NITROGEN RECYCLED



7
Thousand tonnes of
PHOSPHATE RECYCLED

(Theoretical estimates)

Carbon

592
Thousand tonnes
(dry mass) organic
carbon recycled

296
Thousand tonnes
(dry mass) humic
substances recycled

Markets

3 million tonnes of compost & digestate.

If spread at 30 t/ha, this would cover
98 thousand hectares of land or **1.6%** of the UK's arable land.

The majority of compost is applied to agricultural land (over 60%) followed by growing media/horticulture (about 10%).

There is a voluntary quality standard for compost (PAS 100) and digestate (PAS 110). There are also end-of-waste criteria set out in a 'Quality Protocol', which apply in England, Wales and Northern Ireland; Scotland has its own end-of-waste criteria.

Quality Assurance

There are quality assurance schemes for both the compost and digestate standards. The Compost Certification Scheme and the Biofertiliser Certification Scheme (for digestate) are both run by Renewable Energy Assurance Ltd, a subsidiary of the Renewable Energy Association.

CONTACT DETAILS

Carbon Clarity
jane@carbon-clarity.com www.carbon-clarity.com



METHODOLOGY

COMPOSTING & ANAEROBIC DIGESTION

THE INFORMATION PRESENTED IN THIS REPORT relates to the biological treatment of separately collected bio-waste in both composting and anaerobic digestion facilities. Bio-waste has been defined in accordance with the EU Directive on Waste (2018/851), as outlined below. This report does not include mixed wastes that have been treated in mechanical-biological treatment (MBT) facilities, or other types of wastes, such as sewage sludge, manures, or other agricultural wastes/residues; it also excludes energy crops.

Information about the number of plants processing bio-waste were obtained from the following sources:

- A joint survey initiated in 2017/18 with the International Solid Waste Association's Working Group on Biological Treatment of Waste (ISWA WGBTW);
- ECN country reports;
- Personal communications with experts working at ECN member organisations or national waste organisations; and
- Official data published by national environment ministries/national bodies.

Data from a total of 18 European countries were obtained. Due to the different ways in which these countries collect and publish data, the information spans a period of between 2014 – 2018. However, the vast majority relate to the calendar years 2016 or 2017, depending upon the source, although they all relate to a 12-month (one year) period. Figures quoted are therefore annual.

Information about small-scale facilities, including on-farm, community composting initiatives and home composting have not been included as they do not usually appear in official data. In addition, data for anaerobic digestion facilities processing bio-waste have been difficult to find, as many facilities co-digest bio-wastes alongside sewage sludges, manures, agricultural residues or energy crops. Official datasets also often only publish energy outputs, rather than bio-waste inputs. We have endeavoured to dig into these data and identify as many facilities as possible; however, readers should bear in mind these challenges when drawing conclusions.

EUROSTAT

Bio-waste treatment data have been compared with data released by Eurostat, benchmarked to the year 2016. Although data for subsequent years have been released by Eurostat, it was felt that 2016 provided the most appropriate comparator. Data about population, the degree of urbanisation, municipal waste and recycling rates relate to 2016. Data about arable land area relate to 2013, as this is the latest available data set.

All land areas have been quoted in hectares (equivalent to 10,000 m²).

COMPOST, DIGESTATE & NUTRIENTS

Calculations about compost/digestate production, carbon and nutrients are theoretical, as few countries hold reliable data. It was assumed that one-third (33%) of all input bio-wastes (measured on a mass basis) would be converted into either compost/digestate. This is a conservative assumption and takes into account metabolic and reject losses during processing. In practise, compost/digestate yields may well be greater than the estimates presented in this report.

All input and output data have been quoted in metric tonnes (equivalent to 1,000 kg).

TOTAL NITROGEN

Estimates of the total nitrogen content were estimated on a fresh mass basis as follows:

- Compost 9.25 kg/tonne (mean of green waste and green waste-food waste compost quoted in WRAP, 2016)
- Digestate 5 kg/tonne (food waste digestate quoted in WRAP, 2016)

PHOSPHATE

Estimates of the total phosphate (as P₂O₅) were estimated on a fresh mass basis as follows:

- Compost 3.4 kg/tonne (mean of green waste and green waste-food waste compost quoted in WRAP, 2016)
- Digestate 0.5 kg/tonne (food waste digestate quoted in WRAP, 2016)

CARBON & HUMIC SUBSTANCES

These have been based on a dry matter basis and assumed that 50% (m/m) of the dry mass was total organic carbon and 25% total humic substances. These were based on Binner *et al.*, (2011).

LANDSPREADING

Estimates about spreading compost/digestate to land have been based on an application rate of 30 tonnes/hectare, which is typically used in agriculture to meet crops' nutrient requirements and to comply with nutrient loading rates. This metric has been presented in order to provide a benchmark to assess the products' potential application on arable land. Individual application rates may vary depending upon local/national circumstances.

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GLOSSARY

AD, Anaerobic digestion

Bio-waste, Biodegradable garden and park waste, food and kitchen waste from households, offices, restaurants, wholesale, canteens, caterers and retail premises and comparable waste from food processing plants.

ECN, European Compost Network e.V.

ECN-QAS, European Compost Network Quality Assurance Scheme [for compost and digestate]

HORECA, Hotel Restaurant and Catering [relates to bio-waste collected from these establishments]

BASF

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- Clean and easy organic waste collection
- Moisture-proof
- Certified compostability
- Proven full biodegradability
- Processible in all major biogas plants with follow-up composting





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ISBN 978-3-9820825-1-6