Vienna may look back on a long tradition of biogenic waste management and utilisation: already in 1991, the separate collection of this waste fraction was established comprehensively for the entire municipal territory. Right from the beginning, the main objective of biowaste management in Vienna was not the disposal of this type of waste but rather the generation of high-quality compost. Today, the City of Vienna operates a composting plant for garden trimmings and similar as well as a utility producing biogas from food scraps and a biomass power plant. Compost is e.g. used as a substitute for soil enrichment and to replace chemical fertiliser. Instead of fossil energy carriers, biomass and biogas serve to generate high-quality, climate-neutral energy. Hence Vienna’s organic recycling system contributes significantly to environmental and climate protection.

**Biomass incineration**

As a natural material, wood is suitable for the direct generation of energy by incineration. Since 2006, Wien Energie has been operating the Vienna-Simmering biomass power plant in co-operation with Österreichische Bundesforste AG (Austrian Federal Forest Authority). This type of energy generation is clean and safe, as biomass is available in the direct vicinity of the plant and does not need to be imported like fossil fuels.

The Vienna-Simmering biomass power plant is fed by untreated wood biomass provided by the Austrian Federal Forest Authority to an extent of approx. 245,000 solid cubic metres or 190,000 tonnes annually. This corresponds to roughly 600,000 loose cubic metres with a calorific value of approx. 9.8 MJ/kg. The plant supplies around 48,000 Viennese households with electricity and 12,000 households with district heating and moreover helps to cut down on fossil fuels to the amount of approx. 72,000 tonnes of coal, approx. 47,000 tonnes of fuel oil or approx. 40,000 tonnes of natural gas. Compared to a conventional thermal power plant, the Vienna-Simmering biomass plant helps to avoid approx. 144,000 tonnes of carbon dioxide annually. Highly efficient cogeneration techniques make optimised use of the input fuel, wood.

**Biogas Wien plant for kitchen & food scraps**

To minimise the risk of a transmission of diseases such as BSE from animals to humans, food scraps may not be fed to animals in Austria since 31 October 2006 (EU Food Hygiene Regulation). Before that date, it was common practice to feed food leftovers from canteen kitchens to animals. To offer an alternative in conformity with this statutory provision for Vienna’s municipal territory, MA 48 took the municipal Biogas Wien plant into operation in September 2007 after only a short construction
phase and set up its own collection system for food scraps from catering businesses and canteen kitchens. At the same time, the collection logistics of organic waste collection bins (“green bins”) and the input material for composting were optimised: the material from green bins installed in the inner districts is also utilised at the biogas plant, while the material from the outer districts with their larger gardens is composted.

Collection of kitchen scraps
The collection of kitchen scraps was conceived for enterprises that regularly need to dispose of larger quantities of food scraps, e.g. catering businesses, hotels or trade outfits. In addition to food scraps, other types of fermentable waste are likewise collected, such as spoiled foodstuffs including their packaging (e.g. tins) or used cooking fat.

Four special collection vehicles as well as 2,200 hermetically sealable kitchen containers are available to store this sort of wet and pulpy waste. The special containers hold 120 litres and are automatically cleaned every time after emptying. If required, any remaining residues can be removed manually. Moreover, it is also possible to empty filled tanks by pumping.

Due to its high moisture content, the material from the public green bins in the inner districts
is also optimally suited for anaerobic treatment (fermentation) at the biogas plant. In condensed urban areas, approx. 4,000 public green bins are installed on sidewalks and in parking lanes. In this way, 9,000 tonnes of household kitchen scraps are collected annually and transported to the biogas plant.

**Energy generation from biogas**

Every year, the biogas plant processes a total of 22,000 tonnes of kitchen scraps: about half of this material originates in inner-city green bins; the rest is collected from catering businesses, hotels or food-producing factories. The biogas plant employs a single-stage, mesophilic wet process with a fermentation reactor temperature of approx. 37 degrees centigrade. In the course of treatment, microorganism activity results in close to 2 million cubic metres of mixed gas. This gas contains 40 to 70 percent methane and is used to generate heat. The thermal energy generated is fed directly into Vienna’s district heating system and supplies 1,100 households in the city. The extracted air, which equals approx. 25,000 cubic metres per hour, is transported to an exhaust air purification unit.

Food scraps are utilised at the Biogas Wien plant on the basis of the best available technology at the cutting edge of engineering and eco-awareness: total encapsulation of emission sources, exhaust air purification across the entire plant by means of bio filters (operation at zero odour emission), incineration of fermentation residues and protection of groundwater resources. Biogas Wien boasts excellent connections to the transport and traffic network and a high efficiency rate in excess of 80%.

**BIOGAS WIEN**

**Operation start-up:**
September 2007

**Input:**
22,000 tonnes/year of kitchen scraps

**Output:**
1.9 million cubic metres of gas
8,500 megawatt hours of energy
Supplies 1,100 households with district heating

**Lobau composting plant – collection and treatment of garden trimmings and garden waste**

A key aspect of Vienna’s compost management strategy lies in its integration into the local recycling system. However, not all biodegradable substances are collected separately. The objective is the production of high-grade compost from suitable input materials, not waste disposal. The cycle is fed exclusively with high-quality residual plant matter: trimmings and scraps from gardens, households and kitchens. Bones, cooked and liquid food scraps as well
as residues from milk products are excluded from the public collection of organic waste and hence from composting.

**Collection of garden waste and trimmings**
Biogenic waste is collected from green bins and skips located at Vienna’s 19 waste collection centres as well as via green waste collection (trees and shrubs). About 80,000 green bins with their typical brown covers and brown labels are installed across Vienna’s less densely inhabited zones with numerous gardens, usually directly on the properties. During the vegetation phase, these containers are emptied every week free of charge by 27 collection vehicles; in the winter months, the vehicles pass every other week. Every year, a total of approx. 60,000 tonnes of biogenic material are collected from green bins; this is complemented by 30,000 tonnes originating from waste collection centres and green waste collection. Only plant matter is collected: tree and shrub cuttings, leaves, lawn clippings, windfall fruit and plants. Waste of animal origin such as meat products, eggs, bones or food scraps are disposed of as residual waste (in case of households) or as the contents of specially designated kitchen waste bins (catering industry).

**Compost and soil from green bins**
Since 1991, biogenic waste is recycled by means of open composting at the Lobau composting
Biowaste Management

Lobau composting plant. This plant has an approved annual capacity of approx. 150,000 tonnes and produces compost of the highest quality class "A+" (according to the Compost Ordinance), which is good enough to be used in organic farming.

The material collected is shredded and sieved in the mechanical treatment unit, which also removes all contaminations and metals. Then it is mixed with pre-comminuted structural material (wood) and moistened with water. The thus treated raw compost fraction (approx. 100,000 tonnes) is spread across the composting surface in clamps (heaps). During the entire rotting phase, the material is moved and irrigated with compost turning machines. This safeguards a level of aeration that is essential for optimum processing while maintaining an ideal moisture content. During the rotting period, the material to be composted is subjected to several quality checks. After eight to ten weeks, it is sufficiently mature, and 40,000 to 50,000 tonnes of compost can be sieved off for subsequent utilisation.

The Lobau composting plant is composed of two absolutely waterproof and paved composting surfaces of 2.6 hectares each. All runoff and precipitation is collected in a system of gutters and sewers. A reinforced-concrete underground collector impermeable to water and with a capacity of 1,300 cubic metres retains
the water, which is then discharged into the sewer. In case of heavy precipitation, the rainwater is stored in two rainwater reservoirs as well as in an open and sealed retaining basin. This prevents leakage of contaminated water into the soil. All wastewater from the plant is introduced into the public sewer system.

The compost clamps are not irrigated with seepage water but exclusively with service water from the plant's own well. Thus the metal salts dissolved in the seepage water cannot contaminate the compost with heavy metals, and the compost attains the highest quality level, class “A+.”

In summer 2008, the company filling station of the Lobau composting plant was changed over to biodiesel. Thus all machinery and vehicles of the plant now run on biodiesel manufactured from used cooking oils collected by the City of Vienna, which has considerably reduced carbon dioxide emissions.

**Compost quality seal**
In 2002, MA 48 was awarded the Austrian compost quality seal. This is a trademark protected under patent law in keeping with the Austrian Quality Seal Ordinance and awarded by Kompostgüteverband Österreich (Austrian Compost Quality Society, KGVÖ). The quality seal distinguishes high-quality products, whose manufacturers work according to the principles of ecological and sustainable waste recycling and reutilisation.

**Compost utilisation**
The compost thus produced is available for all citizens of Vienna free of charge. More than 6,000 tonnes annually are picked up by the population at the city’s waste collection centres. After prior registration and payment of the transport expense, the compost can also be driven by lorry to allotment garden colonies or private garden owners.

Since April 2009, part of the compost is also transformed into the pre-mixed, peat-free soil product “Guter Grund” in co-operation with a private soil manufacturer, the terrasan company in Vienna. The soil can be purchased in bags weighing 18 or 40 litres at all waste collection centres in Vienna. In addition to compost from the green bins, this soil also contains nitrogen-stabilised bark humus and thermally pressure-impregnated wood fibres. This composition ensures a loose and lightweight consistency. Additional nutrients are exclusively introduced by way of organic fertilisers; hence this soil consists entirely of totally natural components. Since 2011, the peat-free soil also corresponds to the strict requirements of the Austrian Eco Label, continuously checked by independent experts.

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**LOBAU COMPOSTING PLANT**

**Operation start-up:**
1991

**Surface:**
10 hectares

**Input:**
100,000 tonnes of garden waste

**Output:**
40,000 – 50,000 tonnes of compost

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Peat-free soil “Guter Grund” with compost from the biowaste bin
15,000 to 20,000 tonnes of compost go to the Vienna soil manufacturing plant of the terrasan company as a base substrate for the production and distribution of a wide variety of special soils.

A specific task of Vienna’s recycling system for organic waste lies in supplying the city’s agriculture – above all its organic farmers – with compost. In addition to private customers, key clients include Municipal Department 49 of the City of Vienna (MA 49 – Forestry Office and Urban Agriculture), whose 1,000 hectares of cultivated land make it one of Austria’s biggest organic farmers, and Municipal Department 42 (MA 42 – Parks and Gardens).

**Positive aspects of organic waste recycling and reutilisation**

Organic waste management is much more than just a waste management method. Positive effects result for foodstuff production and the protection of soil, groundwater and climate. The long-term research projects on the application of compost in organic farming co-financed by the City of Vienna have entailed some truly surprising findings:

**Foodstuff production**

For example, the yield of the different compost varieties was by 7 to 10% higher on an average across 14 study years than that of the unfertilised zero option. Moreover, organic farming
comes with a high guaranteed yield. The quality of the harvested produce was mostly very high as well. Potatoes fertilised with compost presented a markedly lower nitrate content than those fertilised with chemical substances. In addition, the heavy metal content of some agricultural produce (oats, spelt, potatoes) was analysed as well. The copper and nickel content measured in oats and the cadmium content of potatoes treated with chemical fertiliser were significantly higher than with compost fertilisation.

**Soil protection and enrichment**
Contrary to chemical fertilisers, compost fertilisation improves the humus content of the soil, which strengthens its fertility, structure and water retention capacity as well as soil life. In turn, this benefits not only the quality of the harvested produce but also plant health, as the reduced mildew infestation of crops grown on compost-fertilised lots shows. The tests also demonstrated that the use of quality class “A+” compost in quantities recommended for organic farming does not harbour any danger of heavy metal accumulating in the soil.

**Groundwater protection**
Intensive conventional agriculture contributes significantly to increasing the nitrate content of groundwater resources. Organic farming (with compost fertilisation) completely avoids this
emission into groundwater. The nutrient deposit contained in compost can be optimally used by plants; as a result, no surplus of mineral nitrogen compounds ("nitrates") will leak into the groundwater.

The findings of the studies conducted since 1996 have shown that long-term fertilisation with compost at the Lobau site has not resulted in any increase of nitrogen loads and other nutrients in the groundwater. The maximum values measured for nitrate in the soil were higher for mineral (chemical) fertilisers than for the lots fertilised with compost.

**Climate protection**

The use of compost also contributes markedly to reducing climate-relevant gas emissions. Compared to conventional agriculture, organic farming (with compost fertilisation) allows to decrease this volume by up to 3.4 tonnes of CO₂ equivalent/hectare per year: the use of compost as a fertiliser and soil improver leads to the formation of “carbon sinks”, which in its turn entails long-term fixation of carbon in the soil and a reduction of CO₂ emissions. The substitution of chemical fertilisers and pesticides with compost has likewise positive effects on climate protection. Moreover, the emission of nitrous oxide is by 85% lower for organic farming (using compost as a fertiliser) than in conventional agriculture.
Contact:

City of Vienna
Municipal Department 48 - Waste Management, Street Cleaning and Vehicle Fleet

Head of Department:
Josef Thon

Einsiedlergasse 2, 1050 Vienna
Phone: (+43 1) 588 17 - 0
Fax: (+43 1) 588 17 - 99 - 480037
E-mail: post@ma48.wien.gv.at
www.abfall.wien.at
www.facebook.com/die48er