Inventory of good practices regarding (bio-)waste minimization in Europe

www.miniwaste.eu

TABLE OF CONTENTS

INTRODUCTION

Project context and objectives

ACR+, as a partner in the European LIFE+ project Mini-Waste, is in charge to undertake an 'Inventory of knowledge inside and outside of the consortium and therefore identified and described good practices regarding waste minimization in Europe outside the partners' context.

Each partner contributed to this inventory by providing information on the base of their respective experience in the domain, and suggested good practices regarding waste prevention in Europe at local and regional levels and provided some models of indicators and assessment schemes used by public authorities.

The initial objective was to get a broad picture of waste prevention strategies and identify relevant actions for duplication to Mini-waste project. However, at a steering committee meeting held in Rennes it was decided to focus as much as possible on bio-waste, being the overall project topic for further implementation.

This report is the requested technical report describing the identified good practices that will serve as a basis for discussion with the partners and its content will be used:

- to design the database (action 2.2);
- to identify speakers for the 2 dissemination events, and;
- to illustrate the content of the final report with other examples outside the project partners experience.

Methodology

ACR+ took advantage of its extensive network of members and contacts which are mainly local and regional authorities in charge of waste management. ACR+ also benefited from the external advisory of the Expert Committee appointed by Rennes Metropolitan area (according to action 1.1 of the Mini-Waste project), in order to specify the methodology and analyze the results together.

ACR+ based the work on its accumulated expertise in the field of waste prevention through its European Campaign for waste reduction concentrating on the different project relevant issues such as actions against food waste, awareness actions, composting programmes and techniques, training, …

Even though the questionnaire was identified as the preferred option to gather information for the report the meeting (SC meeting) agreed to leave the methodology to ACR+. ACR+ experienced in other projects that questionnaires are not longer and necessarily the most appropriate tools to get (detailed) information from project implementers. Therefore ACR+ concentrated on concrete readily available information amongst its members and others by searching in its own database of waste prevention projects, it undertook additional website searches and finally requested information by mail and telephone calls from the project implementers.

The 10 fact sheets, providing the body of the project report, were written in batches and handed over for review to the project members and experts. The comments and suggestions were studied and where necessary additional information was requested to the project implementers. That information was then either incorporated in the fact sheets or described in detail in the annexes of the report.

Results

The final report comprises ten fact sheets and a number of annexes. Nine fact sheets cover the subject of bio-waste prevention while one sheet covers the issue of re-use centers. One fact sheet has been provided by a project participant (LIPOR) while all others are European examples covering subjects as home composting, community composting, farm (proximity) composting, fight against food waste and closed loop gardening.

The ten fact sheets are the following:

1. Home composting - Italy (Piemonte)
2. Home composting - UK (Kent)
3. Home composting - Portugal (LIPOR)
4. Home composting - France (Chambery)
5. Community composting - Flanders
6. Community composting - Switserland (Zürich)
7. Farm proximity composting - Austria (Freistadt)
8. Fight against food waste - UK (WRAP)
9. Closed Loop gardening - Flanders
10. Reuse centers - Flanders

For each of the 10 available fact sheets, the following aspects/ issues are described in a varying matter of detail depending on the availability of information and willingness of the project implementers to provide information or review it:

1. An overall summary
2. The general characteristics of the implementing body
3. The local context
4. The strategy including the objectives, approach and methodology
5. The instruments
6. Stakeholders and roles
7. Means/ actions (including communication)
8. Legislative aspects
9. Financial modalities
10. Results
11. Indicators
12. Challenges and success factors
13. More information
14. Annexes

Different annexes were written in order to accommodate specific requests by partners and experts during project implementation. These annexes cover mainly topics about measurement techniques and methodologies (quality, greenhouse gas emissions,…). Most annexes have been translated (from German and Dutch) and summarized. References are provided to the full documents.

The following annexes have been added:
Annex 1 - Environmental relevance (Greenhouse gases) of decentralized composting in Switserland (Zürich)
Annex 2 - Flanders

- Annex 2.1 – Survey prevention kitchen and garden waste, small hazardous waste and e-waste in Flanders households
- Annex 2.2 – How has bio-waste been quantified as a percentage of the overall waste
- Annex 2.3 – Compost quality at community composting parks (CCparks) in Flanders
- Annex 2.4 – Compost quality at community composting parks in Flanders
- Annex 2.5 – The quality of home composting in Flanders

Annex 3 - Environmental relevance of decentralized composting - Climate relevant gas emissions, volatile emissions and mass balance
Annex 4 - Visual check compost quality (France)
Annex 5 – UK

- Annex 5.1 - Details of calculation to estimate household food and drink waste in the UK
- Annex 5.2 – Home composting & climate change issues (research)

Finally this technical report will be published and disseminated at European scale through the ACR+ and Mini-waste websites. The final objective of this report is to help developing the waste management tools and to improve the database fields and finally complete a set of indicators.

Bio-waste prevention put in context

Bio-degradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises and comparable waste from processing plants (= bio-waste) accounts for 88 million tons of municipal waste each year and has major potential impacts on the environment.
The first priority must be to prevent / reduce waste, thereby deriving major environmental and economic benefits. Prevention should be interpreted in its wider sense, meaning that the best waste is the one that does not exist or will not become one.

Bio-waste generation and impacts

Depending on local conditions such as food and drink habits, type of plant growth, seasons and climate, living standard and degree of economic development, bio-waste accounts for 30% to 40% by weight and volume of municipal solid waste. This proportion is much larger (up to 80%) in Mediterranean countries, due to a larger consumption of vegetables and fruits in the daily diet, as well as to the effects of tourism. Bio-waste can be further subdivided in food waste and green waste.

The environmental impact of bio-waste is significant. Because of the energy and resources used to produce, transform and transport food from producer and supplier to the home, and subsequently to landfill, there is a major carbon impact. Moreover, different studies about energy use indicate that food is the second most energy demanding product group after housing. The amount of food thrown away is a waste of resources as energy, water and packaging used for food production, transportation and storage. All this goes to waste when we throw away edible food.
During the season millions of tonnes of green waste materials are hauled away, buried, or burned each day from households, landscaping and similar operations—trees, shrubs, brush, lumber, to name but a few. The costs of managing this waste—both economic and environmental—can be easily reduced or eliminated with updated landscaping methods including reduce, reuse and recycle strategies.

The fact sheets provided in this report offer an excellent overview of ways in which local and regional authorities have been able, in a decentralised way, to optimise the management of their bio-waste thereby focussing on maximising the environmental benefits while keeping the costs down.

FACT SHEET 1

Promotion of home composting and less packaging consumption, in North-east of Turin, Piemonte, Italy

Summary

Title of project/ good practice/ campaign:	Promotion of home composting and less packaging consumption, in North-east of Turin, Piemonte, Italy
Type of prevention measure	Home composting, food prevention
Country	IT
Geographical level of implementation	19 communities in Piedmont region
Scale	Roll out
Target audience	Households
Number and/or units	
Date of implementation	Since 2004
Objectives	Reduce food waste
Type of bio-waste	Food waste

General characteristics

Demography and habitat (IT)	
Population:	253 083 inh
Number of households :	-
Housing type	-
Area size :	363,19 Km^2
Population density :	695,68 inh/Km^2
Waste (2008 data)	
Waste generation (kg/inh/y) :	446,4
Selectively collected waste (kg/inh/y) :	197
Bio-waste separately collected (kg/inh/y):	80,8
Residual waste (kg/inh/y):	168,6
Annual fixed and /or variable fees for waste collection: residual waste, garden waste, selective collection, civic amenity centers	-

Context

COVAR 14 is a public institution (consortium) that coordinates the waste management in 19 municipalities in the north-east of the Province of Turin, Italy.

The 19 municipalities have a total population of 253.083 inhabitants, with a density varying between 75 and 2693 Hab/km^2. In 2009, over 111,420 tonnes were collected and treated. 62% of this waste was collected separately corresponding to more than 63000 tons. The amount of bio-waste selectively collected was 20.500 tons.

In 2004 the consortium started a campaign (repeated in 2006) to collect the waste from door-to-door, a system that has proven effective for waste reduction and increased selective collection[1]. The objectives were amongst others to introduce a Pay-As-You-Throw (PAYT) system.

This campaign was motivated by the coming into force of a new law (art. 49, D.lgs. 05 February 1997, n. 22 e D.P.R. 27 April 1999, n. 159), that aims at establishing PAYT schemes.

This new collection system was accompanied by a wide range of prevention activities. The activities aimed to involve all inhabitants and local municipalities in creating awareness on waste reduction and promoting waste prevention good practices.

[1] *Implementazione ed ottimizzazione di sistemi innnovativi di racolta diferenziata: Prevenzione, start-up e comunicazione, Roberto Cavallo, President of the International Association of Environmental Communication (AICA). Ottobre 2008, Vitterbo, Italy*

Strategy

Approach

In 2004, a first campaign was launched aimed at reducing the amount of waste generated by promoting the concept of 'integrated waste management'. The consortium was supported by the company Pegaso 03.

A second campaign was launched in 2006 whereby it was decided to sensitize citizens about waste prevention. This campaign took part in 10 municipalities out of the 19. The slogans of the campaign were "Scegli tu!" (You choose!") and "Fai la differenza" (make the difference!). These municipalities were divided in two groups, considering the differences in terms of 'rural' of 'urban' characteristics. In the municipalities of the 'urban' group, representing 126000 citizens (Beinasco, Moncalieri, Orbassano, Rivalta di Torino, Trofarello), a campaign was launched to reduce the consumption of packaging.

In the municipalities of the 'rural' group, representing 25800 citizens (Bruino, Candiolo, La Loggia, Villastellone, Virle P.te), the campaign aimed at promoting home composting.

The following aspects were taken into account by COVARI 14 to ensure a successful door-to-door collection system for as well as a home composting and consumption packaging reduction program.

- Clearly explaining the overall objectives, namely a campaign to move towards a door-to-door collection system as a measure to improve the waste collection, to reduce waste generation and as a way to possibly reduce the waste fees for citizens.
- Involvement of stakeholders: The consortium informed through several meetings the mayors, the local municipality representatives and other relevant community stakeholders on the characteristics of the new system.
- The promotional activities, including road exhibitions, were targeting different stakeholders including local municipality representatives, local communities/ organisations, schools, families Information was provided at local level on the state of the art of the campaign. The Pegaso 03 magazine collected and presented information for each local municipality, informing, for example, where the promotional activities would be held in each municipality emphasizing the proximity character of the campaign.

Specific targets & objectives

The initiative aimed at reaching all citizens of the 10 municipalities, including the municipal administrations.

The specific objectives were:

Selective collection

- 45% selectively collected waste in 2008
- 65% selectively collected waste in 2012
- Awareness raising of the citizens on how to decrease their waste generation and good practices to follow in order to achieve these waste reduction;
- Random audits on the use of the containers for selective waste collection

Unfortunately there were no specific targets set for home composting activities and packaging waste reduction.

Methodology

The following steps were followed to promote home composting and reduce packaging consumption:

Publicity:

- COVAR 14 adopted a promotional plan that involved a visual slogan, common for all the communities.
- PEGASOS 03 created a promotional newsletter showing all the actions taken in promoting home composting, including information related on how to become a successful composter
- Press conference to promote the start of the campaign.
- Promotional mails were sent to all the residents in the communities, including a letter and information leaflet.

Schools:

An educational project explaining the new collection system and the campaign to reduce packaging and promote home composting was carried out in approximately 40 schools, reaching up to 800 children.

Exhibition unit:

In 2006, 22 exhibition units were subsidized in 2006, 12 focus on promote home composting and 10 in reduce packaging consumption; these exhibitions were used from 2006 to 2007. The main activities of the exhibitions were:

- To provided general information about the campaign
- To involve children
- To provide forms to the citizens to register in the home composting scheme and pay less waste collection taxes (-20%, see paragraph on tax incentives)
- Distribution of promotional material.

Awareness raising on home composting

Raising awareness on home composting requires more time, space and a formal request by the municipalities. The main supporting activities were:

- Providing general information about the campaign
- 125 spot checks (25 for each municipality) as information points for citizens that started home composting in order to assist and monitor the progress made by citizens
- A play to involve children.
- Technical courses for adults in home composting practices.
- Providing advice and support to home composters that face difficulties
- Providing technical documentation and instructions to future home composters, including the free distribution of home composting manual

Example of information point

Example of products distributed

Fig 1. "Ecovariando" Second edition, April 2007

- Tax incentives:
  Citizens in rural areas are offered the possibility to adhere to the campaign byfilling in and signing a form in which they engage to compost at home
  The action is managed by PEGASO 03, the company in charge of waste taxation. Citizens adhering to home composting are granted a discount of 20% calculated on the variable part of their due tariff.

> ***Calculation of the fees paid by households and non domestic activities***
>
> Families
> The amount is related to the surface of the property and the number of people occupying it. The surface, adapted by factors that increase progressively with the number of household members, determine the fixed part. The number of persons per household determines the variable part.
>
> Non-domestic activities
>
> The amount is related to the surface of the property and production activity carried out. The fixed part of the property is proportional with the size adjusted with coefficients that give different weights depending on the type of economic activity (durable goods shop, supermarket, pizzeria, restaurant, office, warehouse, etc.). The variable part is proportional to the estimated production of waste, obtained by applying to the surface of the property potential productivity coefficients. These coefficients vary with the type of business carried on.

- Eco volunteers (Ecovoluntariado)
  The network of eco-volunteers promoted by COVAR 14, aimed at promoting environmentally friendly actions, not solely home composting activities. Eco-volunteers were established in all local municipalities.

- Website information:
  The information on all actions throughout the duration of the campaign were available on the PEGASO 03 web site but also on most of the local municipality websites.
  The magazine edited by Pegasus 03 was also available on the web site.

Instruments

The instruments used to get results in home composting and reducing packaging waste were:

- Pay-as-you throw scheme for door-to-door collection:
  Bins labelled with electronic microchips were distributed to each family. Bags used were those with the dimensions and colours established by the consortium. The tax system for waste collection changed from a universal fee, to differentiated fees for each home (similar to water or electricity bills). Avoiding packaging consumption and compost the bio-waste at household level allowed for fewer expenses for households for the collection of waste through bins and plastic bags.

- Information:
  The information was managed mainly by PEGASO 03. They edited a biannual magazine, and designed and managed a web site. The information involved technical, and also practical information to reduce packaging and undertake home composting.

Means/Actions

The stakeholders implement the following actions:

Covari 14

- Public Authority governance actions;
- Liaison between local councils/ municipalities and Pegaso 03
- Managing waste data statistics

Pegaso 03

- All the administrative task related with tax issues;
- Offer information and news and advertise on the campaign events;
- Management and problem solving during the activities;

Local Councils/ Municipalities

- Provided assistance to Pegaso 03
- Decide on the frequency and days of collection
- Liaise between inhabitants and PEGASO 03.
- Activate and support to the volunteer network
- Organise promotion activities, plays, information stands etc...

Eco-volunteers

- Carried out discussion and initiatives to raise awareness in the communities regarding the benefits of the home composting scheme, and using less

packaging.

Schools

- Train children on how to reduce packaging waste and how to set up (home) composting activities.

Animation personnel

- Assist people in the art of home composting
- Knowledgeable of the campaign objectives in order to be able to answer to possible questions by citizens.

Legislative/Policy framework

The main regulation and normative that incentivised the project are:

- Ronchi Decree (Il decreto Ronchi 22/97),
  Law that transposes the 91/156/CEE waste directive and the 91/689/CEE packaging directive into national legislation.

- Legislative decree (Decreto legislativo 152/06)
  This decree specifies for the Piemonte Region the selective waste collection objectives (from 45% in 2008 to 65% in 2012).

Financial modalities

The process of implement the door-to-door collection is studied in price per habitant, and itemized in: (pre)feasibility study, delivery actions, and communication actions.

- (Pre)feasibility study.
  Involve all the actions to change from the preliminary project to the executive project. It is estimated in 2,65 – 3,15 €/hab.
- Delivery actions
  Establishing the new collection pathways, 1,82 – 2,75€/hab.
- Communication actions
  Promotion, information and cooperation activities related to the campaign, 1,85€/hab.

Finally the process to change from traditional collection to door-to-door one cost approximately **8,95€/hab.**

Results

The results to change from the classical residual waste collection to the door-to-door collection scheme can be summarised as follows:

- In 2006, 63% of the waste was collected selectively, in average of each comunity. This amount increased up to 80% in some of the rural communities
- Fast of the new initiatives: as an example, The municipality of *Candiolo* decreased the residual waste collection from 178 tons of waste to 35 tons in only 2 months;
- Overall 3000 citizens participated in the promotional activities, such as exhibitions units or information points.
- 300 manuals of home composting were distributed
- Approximately 100 persons showed interest in home composting activities
- In 2008 there were 9890 families (8,94 of total families of the Consortium) that practiced home composting, corresponding to 24.000 inhabitants of the total population of COVAR 14 (250.000 inhabitants ca.).
- The theatre show for children was performed in 40 schools, reaching 800 children.
- At the latest quality check in 2008, 40% of the citizens visited use a container given by the consortium and 90% of the home composters practised this activity properly. The quality check consists in a number of direct controls on home composters with one operator and a compilation of an aftercare.
- Significant reduction in the tax of waste collection

Challenges and opportunities

The following challenges and opportunities have to be considered when promoting home composting and reduce packaging waste.

- The mechanism to keep households abiding to the waste disposal prescriptions may be ephemeral and inefficient. Therefore, a budget for continuous promotional activities and awareness raising is required.
- The home composting network and results could be increased by implementing community composting in urban areas.
- The pay-as-you throw system may create problems when labels become obsolete.
- Monitoring of home composters including auditing the possible failures and reasons for failure.
- The eco-volunteer program needs incentives to remain active and useful to the community.
- To introduce the geographical evaluation (GIS) of the amounts of waste diverted in order to identify possible communities/ municipalities where additional promotional activities and awareness raising activities need to be undertaken.
- To assure access to bins, garbage bags, and other relevant material in all the communities/ municipalities at all time, and not only during the initial roll-out of the project.

- To survey the households perception especially regarding packaging consumption in order to evaluate changes in their habitudes and assess whether additional aware-raising in reduce packaging is required.

Output, outcome and impact indicators

The following indicators can possibly be applied

Output indicators

- Number of bins distributed, and number of bins replaced
- Number of volunteers participating in 'ecovolunteers';
- Number of planned activities
- Number of implemented activities and kind of activities
- Number of theatre shows, exhibitions units and people involved in them
- Number of newsletters edited

Outcome indicators

- Number of residents (or %) that compost at home
- Number of compost bins sold
- Number of districts requesting the exhibition unit to come to their place.

Impact indicators

- Evolution quantities of bio-waste; quantities of bio-waste in rest fraction.

Further information

COVARI 14: http://www.covar14.it/index.html

PEGASO 03: http://www.pegaso03.it/chisiamo.html

COPERICA: http://www.cooperica.it/

FACT SHEET 2

Home composting promotion in Kent County (UK)

Summary

Title of project/ good practice/ campaign:	Home Composting promotion in Kent County
Type of prevention measure	Reduction at source
Country	United Kingdom
Geographical level of implementation	County
Name of county	Kent
Scale	Roll out
Target audience	Households
Number and/or units	95.000 Households
Date of implementation/ duration	Since 1996
Objectives	1. Reduce - Avoiding food waste through purchasing, storage and preparation. Target: 4,700 tonnes from 95,000 households. 2. Reuse - Reducing food waste through home composting. Target: 18,500 tonnes from 103,000 bins sold. Minimum 250 active compost advisors 3. Residual waste[2] - 2009/10 = 733kg per household 2010/11 = 704kg per household
Type of waste	Bio-waste and more specifically the Vegetable, fruit and (small) garden waste fraction of households

[2] *Data on the reduction of residual waste including the used methodology (Page 11) and analysis (as from page 13) are well described in the following document:.*
http://www.kent.gov.uk/environment_and_planning/recycling_and_waste/the_future_for_kents_waste/kent_waste_partnership/presentations_and_reports.aspx

General characteristics

Demography and habitat (2009 figures)	
Population :	1.410.000
Number of households :	95.000
Area size (km2) :	3.736
Population density (inh/km2):	373,026
Waste [3] (2007 data)	
Waste generated (kg/inh/y) :	791
Recycling rate (including composting) %	36
Selectively collected waste (kg/inh/y) :	282.6
Residual waste (kg/inh/y):	508

[3] *Data available in Kent Councils Waste Composition Study, edited by Kent County Council October 2007 ; Report – Final*

Context

Kent is a large county situated in the south east of England (UK) and known as the gateway to Europe. The total population is estimated at around 1.3 millions habitants and is spread over 18 local councils. In 2006, over 800,000 tons of household waste had to be collected and disposed of in Kent. Over 30%[4] of this resource was vegetable and garden material which could have been composted. The number of households with gardens includes detached, semi-detached or terraced properties, resulting in 84% of properties considered to have gardens. The following table summarizes the potential quantities of bio-waste that can be composted:

Household waste (HHW) generation	Bio-waste (BW) generation (30% of HHW)	% of residences that can compost (84% in Kent council)
800.000 tons	240.000 tons	+/- 200.000 tons

In 2003 the Kent council started to develop the basis of their waste strategy by establishing the Kent Waste Open Forum (KWOF). During that time several workshops and meeting were held to trace the general objectives and targets for waste management in general, including waste prevention, for the following 20 years. The objectives were agreed upon in common agreement with all stakeholders and adopted and published in the Kent Household Waste Strategy.

The following waste prevention programmes were agreed upon: promotion of home composting, promotion of waste aware shopping, reduction of junk mail through the mailing preference scheme, promotion of reusable nappies, diversion of trade waste, promotion of business services that encourage the hiring and leasing of products and finally support for re-use of items, local waste exchanges and charity stores.

The initiative to start a home composting program was largely induced by the 1996 Landfill tax regulation. This regulation made provision for a considerable landfill tax increase: from the 8 Euro/ton in 1996 to 40 Euro/ton in 2009, in other words a fivefold increase in 14

[4] *Most figures in the context have been extracted from the following reports link: http://www.kent.gov.uk/environment_and_planning/recycling_and_rubbish/managing_kents_waste/waste_strategy_documents.aspx. Unfortunately, those reports do not provide the methodology on how those figures were obtained. The Kent Council responsible person for the waste prevention programme (including home composting) was not able to provide more detailed data on the methodology other than the reports referred to (see link above).*

years. Home composting will also help to achieve the Landfill Allowance Trading Scheme (LATS) targets. The UK government wants at least 50% of households home composting[5].

Since the first strategy report came out (2003), several monitoring and evaluation reports were carried out by the KWOF and the strategy redefined. The latest strategy report[6] was published in June 2008. In this report waste minimisation has been specifically defined as a priority area for the Kent Waste Partnership (KWP) through the Kent Waste Strategy.

Strategy

Approach

Bio-waste (food and garden waste) has to be handled and managed as close as possible to the place where it has been generated, namely the household level. This practice avoids transport costs for the collection as well as treatment costs for centralised composting, anaerobic digestion and/or landfilling. Home composting, when taking into account prerequisites such as space, backyards and garden, is regarded as the most effective and economically beneficial activity in the waste prevention strategy.

The following aspects made the Kent home composting scheme a success:

- Involving all the stakeholders from the earliest status of the project has been crucial in the success of the waste prevention strategy. Thanks to this process residents and local councils felt owners of the measures, welcoming them, rather than taken them as administrative burdens.
- The urban network in Kent, with the number of households considered to have gardens being 84%, was a propitious environment to promote home composting.
- Schools were identified as a target group. Schools have the space and gardens to undertake composting activities. It is also considered as an educational activity which might influence the children's attitudes and behaviour towards waste in general and bio-waste more in particular.
- The compost advisors: The training was done in collaboration with the British Trust for Conservation Volunteers (BTCV), a well know association of environmental volunteers.
- The collaboration with national networks such as *recycling.org* or *WRAP (love food hates waste)*. This reduces the costs of creating own websites and provides the assurance for local councils that, when recommending these links the information offered is reliable.
- Establishment of realistic and different targets in each community.

[5] *National Resource and Waste Forum (2004) Household Waste Prevention Toolkit. Part B/ specific waste prevention activities*

[6] *The recommended strategy and action plan 2008 to March 2011.*

- The monitoring of the programme including aspects such as: increase in compost production, waste data and surveys of the citizen's perception of the waste scheme.

The initial (short, medium and long term) targets set for home composting (2005) were as follows[7]:

Year	No. of households in County with gardens	Households provided with a compost bin	Target no. bins distributed (cumulative)	No. of additional bins required (cumulative)	Potential for additional diversion/yr (at 150 kg/hhld) at 70% participation
2005/06	481,789	5%	24,100	24,100	3,600
2006/07	498,234	20%	99,600	75,600	14,900
2010/11	518,790	35%	181,600	81,900	27,200
2019/20	539,346	50%	269,700	88,100	40,500

It is assumed that if 50% of the households participate in home composting, by 2019/ 2020, 4% of the total MSW arising can be reduced. In theory, over 60% of household waste (by weight) can be composted[8]. However in practice, over 30% of household waste can be composted easily at home, or in the community – equating to approximately 360kg per household. The home composting promotion is considered as one of the actions with the highest potential for waste minimisation. It is estimated that home composting can divert 150 kg/household/year.

In 2008 Kent Waste Partnership published a new report analysing the targets achieved and setting up the new targets (2011/2012) for waste prevention, including home composting.

The following 2011/2012 quantitative prevention targets regarding bio-waste have been set:

- Overall waste reduction target: 704kg of residual waste per household (forecast at 791kg/hh as at 2007/08);
- Reduce - Avoiding food waste through purchasing, storage and preparation. Target: 4,700 tonnes from 95,000 households
- Reuse - Reducing food waste through home composting. The assumption is that home composting of fruit and vegetables and soft garden waste is composted in participating homes. Target: 18,500 tonnes from 103,000 bins sold. The Kent Waste Partnership

[7] *Source: Waste Minimisation Options Appraisal Annexe 3, March 2006, Page 5*

[8] *Strategy unit report – Waste not Want not.*

(KWP) would need to remain a WRAP home composting partner to achieve this potential reduction.

- The role of volunteers is key in delivering bin sales and maintaining composting behaviour. It is estimated that across Kent a minimum of 250 'active' Volunteers will be needed to support the work programme.

Methodology

The following steps were followed to promote home composting:

- Publicity:

The population was made aware of the project by

- Radio advertisers
- Road shows.

All 12 Districts and Borough Council's signed up the home composting program

The social and institutional participation in Kent forum

- Schools:

  The Waste Reduction Theatre Workshops have proved very successful in Primary Schools with officers from the District Councils, KCC and a theatre group visiting schools to promote an understanding of waste issues through drama.

  - A theatre company visited ten schools in each district in one week, in 2005, 400 schools were visited and provided with compost bin.
  - Schools were monitored regarding the implementation of composting activities

- Exhibition unit:

  An exhibition unit visited all districts and boroughs, promoting home composting. The functions and activities of the exhibition unit were

  - To perform workshops for children,
  - To give away samples of compost,
  - To offer leaflets and recycled products

- Subsidized compost bins:

  Subsidized compost bins have been made available to Kent residents as from 2003. The aim of which is a financial incentive for households to start home composting.

Example of subsidized compost bin, 330L	Home composting – a family activity	Kent schools Pumpkin challenge using own compost
		

- Composer Advisor Scheme

  A network of Compost Advisors, in partnership with the BTCV and funded by the Kent council, was established in 2001. The Compost Advisor Project aims to appoint volunteers, who will advise people on composting issues and help promote the need for waste reduction. Since the project began in 2001, the BTCV has recruited over 200 advisors across Kent, each one receiving free training, a compost bin to get them started, access to the documentation of the BTCV offices and introduction in the Compost Advisors network. As volunteers they can decide how much time they spend being a Compost Advisor and where their particular interest lies. For example some may prefer to offer telephone support to composters or be able to promote the scheme at local events.

There are plenty of rewards from being a Compost Advisor - not just the free bin and book! You will benefit from assisting others and meeting like-minded people. Great satisfaction can be gained by helping people with their difficulties in home composting, advising first-time composters or re-assuring someone who was going to give up. Volunteers are never on their own as there is an excellent network of advisors to help with any problems or to support your ideas for local events. All Compost Advisors are invited to an annual "Get Together". This gives everyone the chance to meet over lunch and chat about their experiences. Exchanging and sharing information is very important and helpful! To keep advisors updated with recent ideas and events, Kent BTCV's Compost Advisor Project Officer produces a quarterly newsletter - Rotter's Ramblings.

- Website information:
  There is large amount of information available on websites that advises on home composting practices. During the project three official websites were promoted with local composting information:

    - Kent local council web site including home composting guidelines and links to the official information;
    - BTCV website including information about compost advisors (contact details) , compost advisor training programs, tips for composting, and other relevant activities in the Kent County.
    - Recycling now Web site as an external web site providing tips, information on subsidized compost bins, and guidelines on how to compost at home

Instruments

To successfully involve population in home composting, the instruments used in Kent were the following:

- Restrictions in collection facilities:
  The green waste was not longer collected and has as such to be composted at home or brought, for free, to one of the 18 recycling centres in the Kent council.

- Subsides:
  Composter advisor program training, in collaboration with BCTV, provided 48 hours training, access to the biography, newsletters…

  Subsided compost bins for residents and free for schools

- On the job training:
  The composter advisor provides response to residents' questions. Their tasks involve advising first-time composters, re-assuring someone who was going to give up, and even visit homes where residents compost. The composer advisor network, supports the composer advisor at all times, and also organizes meetings between composters to share experiences.

- Information:
  Provided during the plan conception and implementation. Distribution of facts sheets, emails invitation, advertisers and *'recycling now'* and *'BTCV'* web site collaboration.

Supports instruments, Monitoring

The Kent council and the KWOF carried out several monitoring reports in order to evaluate the state of the projects, the most recent reports are:

- Waste and recycling perceptions attitudes and behaviours survey 2007
- Waste Prevention Behaviour Change Program 2008
- In addition the recycling centres are constantly monitoring to check the environmental standards required by legislation

Means/Actions

The different stakeholders implement the following actions during the implementation:

Kent Council personnel

- All administrative and financial issues regarding the implementation of the home composting scheme;
- Liaison between: publicity activities, animation companies for road shows and schools theater sessions, BTCV agreement for compost advisor training,…;
- Solve problems.

BTCV

- Offer training to compost advisors;
- Offer information and news update to the compost advisors;
- Maintain the compost advisors network, and the "Get together" annual day meeting of compost advisors;

Composter Advisors

- Attend the training course and finish it successfully;
- Define the number of hours per week being active as compost advisor;
- Help residents with their difficulties in home composting;
- Advise first-time home composters ;
- Re-assuring someone who was going to give up;
- Active in the advisors network.

Recycling now web site

- Incorporate on the website Kent council information regarding bin distribution or recycling centers

Schools

- Compost bio-waste;
- Train children in improved bio-waste handling and managing (composting).

Animation personnel

- Assist people in the art of home composting
- Be aware of projects aim and objectives to reply possible questions

Legislative/Policy framework

There are several regulations laws and normative valid in England that regulates the home composting and waste minimisation activities at council level[9]. The most relevant are:

- Landfill Tax Regulations 1996
  An increase of the tax of £7 per tonne introduced on 1 October 1996 to a Landfill Tax of £35 per tonne in 2009.

- Waste Minimisation Act 1998
  This Act enabled waste collection authorities, or waste disposal authorities, to make arrangements to minimise the generation of controlled waste in their area (i.e. household, commercial or industrial waste). The Act also authorised the relevant authority to contribute towards the expense of making such arrangements for controlled waste generated in its area.

[9] *Kent's Municipal and Solid Waste Baseline Report, Annexe1, Dec 2005*

Financial modalities

Home composting schemes may be eligible for WRAP and Community Composting Network support.

In 2003 the council of Kent received the total amount of 400,000 from DEFRA (UK Environmental administration) to fund the project 230.000 Euro was addressed to promote home composting, 171.000 Euro to subsidise home compost bins to residents, and 57.000 Euro to promote the scheme.

An appraisal carried out in 2006[10] highlighted the net benefit between expenses for the home composting scheme and the savings achieved such as less (bio-)waste management costs (collection and centralised treatment), reduced need for peat-based composts, reduced resource/ energy use and avoidance of LATS penalties.

The expenses include the two program managers at the council, plus animation at schools, subsidised bins, volunteers training, and publicity.

The annual financial benefits were estimated at 750.000 Euro in 2009/10 and could be up to 2 million Euros in 2019/20.

[10] *Waste Minimisation Options appraisal Annexe 3 published by ERW in March 2006*

Results

The Kent County has since 1996 been largely involved in promoting home composting with successful results.

The results[11] can be summarised as follows:

- 34% of the Kent residents carry out home composting, mostly garden waste 40%, but also food waste (35%);
- Participation in home composting activity is higher amongst households with two to four occupants (35%) than either single-occupant (30%) or large (five or more occupant – 29%) households[12]. Of those respondents that carry out home composting, the largest proportions feed in general garden waste, food waste, and/or 'green' waste into this compost;
- Overall, 66% of respondents do not undertake any home composting. In all, two-thirds of those who do not engage in any composting activity (67%) do highlight one or more strategies or factors that might encourage them to participate in the future. The largest proportion mentions the availability of free composting bins. Behind this however, over one-quarter do highlight a notable potential future barrier to participation in terms of their garden size;
- In 2008 200 Compost advisors have been accredited, higher than the targeted 150 (*no additional data on the accreditation scheme were provided*);
- The theatre show for children's was performed in 400 schools, reaching 36000 children;
- Nearly 70,000 composting bins have been sold;
- All districts and Borough Council's signed up to the home composting programme;
- The waste management exhibition unit visits towns and villages across Kent throughout the year, giving advice to the public on waste reduction, reuse (including home composting) and recycling.

[11] *The methodologies used for the figures presented in the chapter results are partly described in the annexes to the main report.*

[12] *Kent Waste & Recycling Perceptions, Attitudes & Behaviours Survey 2007: http://www.kent.gov.uk/environment_and_planning/recycling_and_waste/the_future_for_kents_waste/kent_waste_partnership/presentations_and_reports.aspx , BMG Research 2007 Page 24*

Challenges and success factors

Challenges

The following challenges and opportunities have to be considered when promoting home composting.

- Quantities of waste diverted may not reach expected levels due to low demand/participation rate resulting from lack of knowledge, cost of bins and lack of space;
- Motivation of compost advisors by keeping meetings, and supporting the network;
- Optimise the targeting potential and communications of home composting through the use of GIS mapping;
- Analyse the applications of home compost bins to target more effectively;
- Clarify the factors impacting upon comparison of responses to surveys and home compost bin sales, i.e.
  - Postcodes between bin sales and responses are matched to see if the same peoplewere surveyed as bin applications, albeit, there may be very few correlations;
  - Time series data are correlated, i.e. dates of bin applications versus date survey conducted;

- Keep in mind and strategise on the motivators to start home composting by residents, in rank order: bigger garden, free home compost bin and advice on how to make compost;
- Coordinate in-house policies on grass cycling and composting;
- Hold in-house composting events to promote uptake of bins and home composting by Council employees;

Success factors

- Involve all stakeholders from the earliest status of the project;
- The urban characteristics (84% of the households having a garden);
- Trained compost advisors;
- Collaboration with national networks on specific sub-themes;
- Municipal financing schemes: received funding from national government and provided subsidies to households;
- Realistic and different targets per community;
- Monitoring of the program allowing for redirection.

Output, outcome and impact indicators

The following challenges and opportunities have to be considered when promoting home composting.

Output indicators

- Number of districts and Borough Councils participating: signed up to the home composting scheme
- Number of volunteers participating in the composter advisor program;
- Number of theatre shows performed in schools
- Number of children reached through the theatre show

Outcome indicators

- Number of residents (or %) that compost at home
- Number of compost bins sold
- Number of districts requesting the exhibition unit to come to their place.

Impact indicators

- Evolution quantities of bio-waste; quantities of bio-waste in rest fraction; Number of active compost advisors

Further information

Kent County Council

Recycle for Kent:

Tel: 0044 (0)845 345 0210

E-mail: kentwaste@kent.gov.uk

Website:http://www.kent.gov.uk/

Kent main documents and reports:
http://www.kent.gov.uk/environment_and_planning/recycling_and_rubbish/managing_kents_waste/waste_strategy_documents.aspx

BTCV, British Trust for Conservation Volunteers Kent
http://www2.btcv.org.uk/display/btcv_kent

http://www2.btcv.org.uk/display/kent_compost

Recycling now

http://www.recyclenow.com/home_composting/index.html

FACT SHEET 3

Terra à Terra – Home Composting Project

Summary

Title of project/ good practice/ campaign:	Terra à Terra – Home Composting Project
Type of prevention measure	Reduction at source
Country	Portugal
Geographical level of implementation	Inter-municipality
Name of inter-municipality	LIPOR (Porto)
Scale	Pilot project extended
Target audience	Households, schools, institutions with garden
Number and/or units	10.000 composting bins
Date of implementation	Since 2007
Objectives	• Distribute 10.000 composting bins • Promote waste reduction and life quality
Type of bio-waste	Kitchen and green waste

General characteristics

Demography and habitat (LIPOR)	
Population:	1 million inhabitants
Number of households :	414.170 (2005 data)
Housing type	Detached houses and buildings
Area size :	650 km^2
Inhabitants/ km2	1538
Waste (2009 figures)	
Municipal Waste generation (tons and kg/inh/y) :	+/- 500.000 tons or +/- 500 kg/inh/y
Waste prevention programme	
Home composting programme	
Number of composting bins targeted	10.000
Number of composting bins distributed	2.500
Targeted/equipped	25%
Bio-waste separately collected (ton/y)	39.428[13]
Residual waste (ton/y)	393.390[14]
Selectively collected waste (ton/y) Via civic amenity centers Eco-containers (streets) and other	 11.558 48.471
Number of civic amenity centers	22
Annual fixed and /or variable fees for waste collection: residual waste, garden waste, selective collection, civic amenity centers	For the general public: residual waste: the fee is paid on the invoice of water consumption and it depends on the company responsible for water management; there is a pilot project of PAYT; Garden waste: free in civic amenity centres; Selective collection: free; Civic amenity centers: free

[13] *It is not possible to associate the population to the biowaste separately collected (this value is related with the organic waste collected in canteens, restaurants, market places, farming enterprises and other similar establishments, and green waste from parks, gardens and cemeteries, that goes to the composting plant); Depending on the structure, the frequency of collection can be different.*

[14] *= waste brought to incineration plant*

Context

Since Lipor's constitution, in 1982, the organic waste management has represented a critical factor in Lipor's strategy. Through centralised composting, Lipor has promoted the recovery of the organic fraction present in the Municipal Solid Waste (about 40%, in weight, of its composition) and the production of a natural compost with beneficial properties for the soils, poor in organic matter.

Currently, and taking into account the National and European policies, Lipor developed a sustainable management of its municipal solid waste (MSW) produced by its associated municipalities. Preventing of waste generation is considered as the starting point. The Home Composting Project assumes a privileged position, as it represents a method of preventing source waste production and it reduces significantly the economic and environmental costs associated to the collection, transportation, treatment and final deposition of this waste. By this LIPOR reduces the organic waste landfilled and consequently the greenhouse gases emissions, improving the life quality of the population involved.

Strategy

Approach & objectives

LIPOR is promoting home composting, makes available subsidised composting bins, provides compost training as well as other ways of managing bio-waste including on-site composting in schools, companies and other institutions. This program is targeting the placement of 10.000 composting bins.

The Terra à Terra - Home Composting Project aims to promote the organic waste reduction at households, schools, institutions and companies of Lipor's Municipalities. With this project LIPOR will distribute 10.000 composting bins to households, schools, institutions and companies with gardens located in Lipor's Municipalities. It is estimated that the home composting project allows for a reduction of more than 300Kg/compost bin/year[15] of bio-waste per compositing bin. With this project LIPOR has a potential reduction of about 3.000 ton bio-waste/year, assumed that 10.000 compost bins are distributed and properly used. This corresponds to 0.6% of the total waste generation in the LIPOR area or 3% of the bio-waste (assuming the bio-waste represents 35% of the total municipal waste generated). As this waste will no longer have to be treated at the energy recovery plant, LIPOR might prevent the emission of 528 ton CO2/year (1 ton bio-waste incinerated = 0,170 ton CO2).

[15] *this amount was measured in LIPOR's monitoring of the project – no more details were received regarding the measurement methodology*

Methodology

Home composting programme (Terra à Terra)

Those interested in receiving a free composting bin, must fill in a registration form, be over 18 years old and live in a house with a garden or work in a company, institution or school with a garden located in one of the Municipalities of Lipor. The 10.000 composting bins will be given to the participants after attending a 3 hour free Composting Session, carried out in Lipor Facilities or locally. Lipor commits itself to provide continuous assistance to the participants through answering the phone (for technical or other questions) or giving assistance and information on home composting at the residences of the participants. One compost bin per household is provided, but an additional compost bin may be provided in certain conditions (more than 5 people or more than 300 m2 of land). In schools, there is the possibility to organize local animation on composting with the class responsible for the composting bin and composting process.

Instruments

Goal seeking instruments

Application form: 1 responsible per house or per school, institution or company, must fill in an application form to register to the project.

Subsidies: 10.000 compost bins are provided for free to the participating citizens under certain conditions (see further). The real cost of a compost bin is around 40 € and is financed partly by the cohesion fund and partly by Lipor.

Training courses for interested participants: The 3 hour hands-on composting course is organized by technicians of Lipor (Master Composters) and is mandatory for every responsible who wants a composting bin. The courses are scheduled according to the registrations received, and it can take place from Mondays to Saturdays. The trainees evaluate at the end of the session the structure of the course and the trainer. If stakeholders have at least 15 registrations in the project, LIPOR organizes a local hands-on composting course.

Communication/ Awareness:
Awareness raising of the population on composting is achieved through LIPOR's website[16] www.hortadaformiga.com, brochures about Horta da Formiga and leaflets about composting process, promoting events (such as presentations) and stands.

Support instruments

Monitoring and research
The participant's commitment is assumed to be voluntary and implementation is evaluated through monitoring visits to the composting bins. At least 30% of the participants receive 1 visit, to monitor the process, compost and other factors. Anyone can receive a visit if requested, and to receive the 2nd composting bin or more a visit is mandatory.

Stakeholders and roles
The following stakeholders are involved:

- Local authorities: they can be partners and promote this project to the population
- Other companies (Gardens Stores, Municipal Companies…)

Lipor organizes implements and manages the project and usually contacts above stakeholders in order to improve the promotion of this project.

[16] *The website is mastered by the Organic Valorization Department of LIPOR. The website is updated continuously and currently there are 17 visitors/hour to the website.*

Means/ Actions

The core activities undertaken or planned by all stakeholders are as follows:

- Implementing an awareness programme taking into account the characteristics of the population
- Promotion of the project and explaining the project to all interested parties
- Helping the organization responsible for the hands-on composting courses, for example, by making available a conference room for the theoretical session and a garden for the practical session of the course and a store room to keep the composting bins before delivering it to the participants

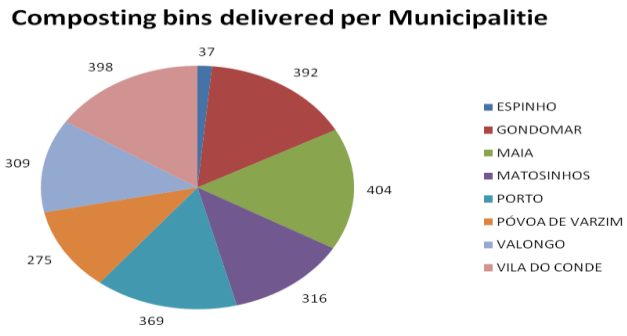
Legislative/ policy framework

According to the waste framework directive waste prevention has to be promoted and waste prevention programmes will have to established by end 2013PERSU II (The Strategic Plan for the MSW approved by a Portuguese Law on the 28 December of 2006 makes provision for waste prevention programmes).

Results

Terra à Terra

At the end of 2009, LIPOR had distributed more than 2.500 composting bins and 11 sites of community composting were running.



According to the monitoring visits, the participants produce around 300 kg/year per composting bin and the quality of compost is good (no additional data on the methodology to measure the quantity and quality of the compost were received).

Challenges and success factors

Challenges

Implementing home composting, especially in the urban areas of Lipors' Municipalities, is a challenge, considering that home composting is new for them and thus a environmental behaviour that is not very common. Lipor will have to continue to implement awareness campaigns to show to the population the advantages of home composting, in order to increase the number of composting bins distributed and evaluate the results as to the quantity of waste received in LIPOR incineration plant.

By better promoting the project, LIPOR will also spread the concept of home composting and although some people do not have the possibilities to register (not fulfilling the criteria) to the project they will acknowledge the home composting impacts on the municipal solid waste management and its benefits to the environment.

Success factors

- There is no similar project in Lipor's Area.
- Although there are lots of constraints, we can see increased awareness of the population regarding environmental issues.
- The hands-on composting course is very important, because it gives all the tools to the the participants not to be "afraid" about the process and to control all the variables, and so the probability of giving up is much lower.
- The possibility of receiving a monitoring visit or getting telephone assistance eases the implementation process.
- 4 technicians/master composters work full-time and organize several courses, visits and awareness campaigns. It is assumed that in the future additional volunteer 'Master Composters' will assist in the programme.

Output, outcome and impact indicators

The following indicators can be applied for the Terra à Terra (Home composting) project:

- Number of composting bins distributed
- Reduced quantity of bio-waste collected and treated through home composting
- Quality of compost (through visual indicators)
- Doubts and difficulties of the participants

The following indicators can be applied for the Horta na Escola (School composting) project:

- Number of composting bins distributed
- Number of vegetable gardens
- Number of active composting bins
- Number of active vegetable gardens

Further information:

LIPOR
Telephone: +351229770100
Email: geral@hortadaformiga.com

Websites
http://www.lipor.pt/
www.hortadaformiga.com

FACT SHEET 4

Community & on-site composting in Chambery Métropolitan Area (France)

Summary

Title of project/ good practice/ campaign:	Decentralised composting in Chambery Metropolitan Area (MA) (France)
Type of prevention measure	Home & community composting
Country	France
Geographical level of implementation	District
Name of region/ municipality	Rhones-Alpes/ Chambery
Scale	Roll out (24 Municipalities)
Target audience	Households
Number and/or units	54.520 households
Date of implementation/ duration	Since 2003 up till today
Objectives	• By 2010 20% of the households should be equipped and the bio-waste to be treated reduced with 40 kg/inh/y. • Decrease waste generation by 7% by 2014 (as compared to 2010 figures).
Type of bio-waste	Kitchen and green waste

General characteristics

Demography and habitat	
Population Chambery MA:	125.250
Number of households :	54.520
Housing type	50% individual
Area size :	26 307 hectares
Population density :	235,35 hab/km²
Waste	
Waste generation (kg/inh/y)	Household waste = 350kg/inh/y (France =354 kg/inh/y – ADEME, 2009b)
Waste prevention programme	Local waste prevention programme 2010-2014 (signed with ADEME)
Composting program	
Number of households targeted	54.520
Number of households equipped	5.000 (end of 2009) composters
Targeted/ equipped	9% (composters distributed by Chambery Metropolitan area), 27% households practicing composting according to survey (ADEME/ LH2/ Indigo 2008). 42% of the equipped households composted already before.
Selectively collected waste – incl. bio-waste (kg/inh/y):	Green waste is collected in certain parts of the city between March and November. Max: 6 bags of 100l or 3 bags and 3 bundles of 50cm diameter and 1m long.
Bio-waste separately collected (kg/inh/y):	36 kg/hab./an (green waste only, town of Chambery only)
Residual waste (kg/inh/y):	262 kg/hab/an
Number of civic amenity centers	4
Annual fixed and /or variable fees for waste collection: residual waste, garden waste, selective collection, civic amenity centers	Rates are different according to the rental value and the zones in the MA (on average 130 to 140 Euro's/ year). As from 2014 only one rate will apply for the whole MA. This harmonization should allow covering all waste management costs.

Context

Overall waste prevention program of the Chambery MA

Chambery Metropolitan area has recently renewed its engagement to strive for a comprehensive waste prevention programme. Therefore it signed an agreement with ADEME, including the following ambitious target: reduce the waste generation by 7% by 2014 (as compared to 2009 figures). This objective corresponds to the national objectives as set in 'La Grenelle 1' (law of 3/08/2009). Chambery MA is one of the 10 local authorities in the Rhônes-Alpes region to receive an annual funding for the implementation of a local waste prevention programme. Depending on the performances and results the contract should allow for a financial contribution of 700.000 Euros for 5 years.

Chambery MA is implementing since 10 years the follwoing waste prevention activities in order to reduce waste at the source including actions such as: proximity composting, special tariffs for producers of large waste quantities, no junk mail stickers, sensitization regarding eco consumption...

Bio-waste as the prioritized waste stream to tackle

Most of the municipalities are questioning the possibility of improved management of the bio-waste fraction. Households, schools and other establishments producing bio-waste can be targeted and involved in comprehensive bio-waste prevention, re-use and recycling activities.

The recovery of bio-waste has become one of main objectives by the municipalities in France. Proximity composting can contribute considerably to achieve the national bio-waste recovery targets (50% collection with a view of material or organic recovery (circular of 28 April 1998).

The legislative context aims at a progressive implementation of solutions keeping in mind the 'right for differences' between regions and departments. The importance of a bio-waste management might differ as such from sector to sector taking into account amongst other issues, the habitat, use of compost prospects, …

Chambery metropolitan area has been withheld by ADEME (French Agency for Environment and Energy control) amongst 41 exemplary municipalities regarding home composting in order to implement the national support plan for home composting (national objective of involving 100.000 new households in 3 years (2005-2008).

Strategy

Objectives

The following concrete objectives have been set:

- 11.000 households (or 20%) practice composting in 3 years time (diverting at least 1100 tons of bio-waste from being incinerated);
- Renewed target: decrease waste generation by 7% by 2014 (as compared to 2010 figures).

Approach

The Chambery metropolitan area is promoting shredding (hire system), mulching, making available subsidised compost boxes, promoting composting in heaps as well as other ways of managing bio-waste including on-site composting in schools as well as proximity composting of green public spaces. This program is targeting urban and rural areas, the system being adapted accordingly. An association of master composters is in the process of being created as well as an active blog.

Summarising the Chambéry Metropolitan area is promoting the following:

Composting methods	Composting equipment	Bio-waste management techniques
Home composting	Boxes	Shredding
Community composting	Heaps	Mulching
School composting	Wormeries	Grass cycling/ slow growing plants
Proximity composting in green public spaces		Composting

Methodology

Green waste proximity composting is implemented in rural mountainous municipalities whereby the green waste is normally burned (according to a survey done in 2009). This scheme is not intended to impact on the voluntary bring system of green waste to civic amenity centers but has the ultimate aim to reduce burning of it.
The schemes makes provision for shredding of branches as well as follow up activities such as turning the green waste 3x/ year. The scheme will be expanded to 15 new sites in 2010 of which 3 on OPAC (Office Public d'Aménagement et de Construction). A survey is underway for the inhabitants of the Municipalities of 'Thoiry', 'Puygros', 'La Thuile Curienne' and 'Les déserts' in order to find out the needs.

Roadmap for implementing a Community Composting (CC) park:

- Availability of a 15 to 20m2 space (grass or soil);
- Identification of one or more reference persons amongst the future users of the CC park;
- Validation of the project by the housing company;
- Training of the reference persons to become Master Composters;
- Sensitization of the residents by the Master Composters (support of Chambery MA if needed);
- Installation of the CC park (ideally the CC park is constituted of 3 compost boxes (1000l each): one for bio-waste to be composted, one for the compost in process of maturation and a last one for the storage of aerating or structuring material (leaves, shredded wood provided by the Chambery MA);
- Monitoring of the process by the Master Composters (turning of the bio-waste, adding structuring materials,…)
- Information about the project at general assembly meeting of the housing company.

Instruments

Goal seeking instruments

Cooperation agreement: agreement to be signed for the establishment of the Master Composter Association = association compost'action[17]. The agreement states that by 2014 18000 households should practice composting.

Subsidies: composters and other equipment in different sizes (wood from 300 liters to 600 liters or plastic from 320 to 620 liters sold for 15 Euro including a bioton) are made available for the households. 15 Euro is representing 40% of the real costs (+/- 40 Euro), the remaining being financed by the municipality (25 Euro).

Training, courses to become a 'Guide composteur': Training is subdivided in a theoretical and practical part, taking 3h30 each if done in two days. However a training course can also be offered for a full day (most on Saturdays). Trainings are offered from March to October.
'Trièves Compostage' , the institution that trains Master Composters provided up till now 8 training sessions and 7 more sessions are foreseen in 2010. 61 Master Composters have been trained since 2008 of which 40 are active. The training is offered by a person recognized by ADEME. Chambery MA is paying for his services. The training is a susch free of charge for participants.

[17] Agreement for the coordination of a network of Master composters and the management of composting activities at multi-layer houses.

Communication/ sensitization:

- Sensitization of municipal 'green' services: project of implementing sensitization actions towards the municipalities in order to achieve self management of their green waste (public spaces) including shredding, mulching, grass cycling, slow growing plants;
- Dedicated communication : blog for Master Composters (http://www.jecomposte.fr) +, dedicated page on internet site (http://www.chambery-metropole.fr), stands and « kakémonos pour animation » (like a flag with images or text related to the subject and hang on street (lightning) poles);
- Master Composters are present at various events such as fairs (Salon habitat et Jardin, Foire bio, la quinzaine écocitoyenneté) and celebrations (fête du pain,…)

Support instruments

Monitoring and research

The Chambery MA through its agents (and interns) undertakes the following monitoring activities:

- Evaluation of the visual quality of the compost;
- Self-weighting of the waste brought to the community composting systems by 20 households during 3 months (foreseen in 2011).
- Survey done amongst the inhabitants of the 'Municipality of Curienne' (700 inhabitants) in 2008 and of 'La Thuile' (109 households) in 2009 regarding compost practices.

*A **survey** (89 households) allowed to check the reasons for composting or not, the quality of the compost activities as well as the communication aspects. The following questions/ visual checks were foreseen:*

- *Green and biowaste management issues such as way of disposal, own management,…*
- *Reasons for not composting, incentives that could help to decide for composting,…*
- *Parameters important for making good compost? Multiple choice/ answers such as balance between dry waste and wet waste, turning the compost, mixing, watering,…;*
- *On the spot (compost area) check: position of the composter, state of use, filling of the composter, odors, content, humidity and use of the compost;*
- *Communication issues: on the information available on composting, what information is missing, would you like to participate at a public meeting in your municipality*
- *…*

Results are shown in the chapter results

Stakeholders and roles

The following stakeholders are involved

- Municipality: one Full Time Equivalent (FTE) + 1 proximity agent.
- Networking partners:
    - 'Jardiniers de France (Gardeners of France)' providing technical assistance on the spot regarding community composting and practical sessions in municipalities regarding shredding, mulching and composting.
    - 'Master Composter Association' for the coordination of the network of Master Composters and animations all kind (cooperation agreement with Chambery MA).
    - 'Trièves composting' for the training of Master Composters. Search of partners for the implementation of composting projects in schools as well as the monitoring of the projects (should be effective as from may 2010 so as to be able to start up this activity for the school year 2010/2011);
- Elected personnel: identify and train one relay per municipality including the creation of a steering committee and validated action plan 2010.
- The tasks performed by Master Composters are the following:
    - Offer on a voluntary basis part of his/her time to explain to other people what and how to compost;
    - Assisting and stimulating the neighborhood, his district to compost;
    - Implement composting at apartments;
    - Keep a stall at fairs.

Terminologie – distinction between 'Guide' and 'Maître' Composteur.
In France a distinction has been made between 'Guide' et 'Maître Composteur' as compared to the English terminology of Master Composters.

- *a '**guide-composteur**' is a volunteer citizen capable, in his neighborhood, to assist households practicing home composting. The' guide-composteur' has followed training on the subject and assists the 'maître composteur' in his networking activities. He might be asked to participate at organizing events on home composting initiated by the municipality.*
- *A' **maître-composteur**' is a technical reference person on composting with a solid training background, capable to answer to all kinds of practical problems, make a diagnostic survey, train, advice and animate a groupe of 'guide-composteurs'. It's his job. The 'maître-composteur' is paid by the municipality or other structured relay, consultant,… He/she comes in as a support on home composting operations as well as communicty and other small scale centralised initiatives.*

Means/ Actions

To achieve this target of less 7% waste generation by 2014, the following actions have been retained:

- Continue to put composting boxes at apartments (20 apartments made a request). Residents are encouraged to ask their housing company to install a composter;
- Testing wormeries: 60 wormeries (for kitchen waste) distributed to households in 2008;
- Start school composting in 2 pilot schools;
- Expand the development of the Master Composter network by offering new trainings;
- A test of making available shredders to citizens (shredders bought by the municipality of Chambery, deposited at the Municipal stores and hired to interested citizens);
- Cooperated with garden entrepreneurs and the green space service (sharing of experiences, managing of green waste on the spot (mulching,…)
- Continue to sensitize the general public (practical workshops, sessions public, informations,…)

The core activities undertaken or planned by all stakeholders are as follows:

- Setting up demonstration places (2010/2011);
- Research:
    - Testing of 60 wormeries (finalized in april 2009). Tests results not yet available. Wormeries are recommended when community composting is not possible. Proposal to provide to the citizens a webpage for the 'self-construction' of a wormerie rather than buying it from the retailers/ producers as less expensive.
    - Shredding test in 2 municipalities in 2010.
- Home visits realized: 556 between 2004 and 2009 – yearly surveys.
- Promotion of composting in heaps.
- Shared garden project as a result of a community composting project (2010).


Photographs showing the setting and displays used at a community composting park.


Photographs showing the 3 compost box system at a CC Park and a stall with a Master Composter explaining to interested people the way to manage bio-waste properly.

Planned activities

A bio-fermenter project is envisaged in a high school (college de Boigne) for canteen and green waste (foreseen in September 2010). At this point only a prefeasibility study on dimensioning has been realized. Currently one bio-fermenter is in use at college Cote Rousse and educational modules being developed by CPIE (Association Savoie Vivante).
Another project to treat cooked food waste in 4 schools using bio-fermenters, electro mechanical composters or classic composters (as from February 2010) + pedagogical workshop modules by the CPIE is in the process of being created.

Legislative/ policy framework

No specific legislation has yet been developed for decentralized composting activities. Decentralized composting activities, seen the scale, operate under the limits of the existing legislation for composting installations (ICPE). The only applicable legislation refers to the departmental sanitary reglementation (réglement sanitaire départemental), art. 158. This article is applicable to biodegradable materials (but not adapted to the needs). Discussions are underway at the ministry to cope with the problem (lack of legislation).

Financial modalities

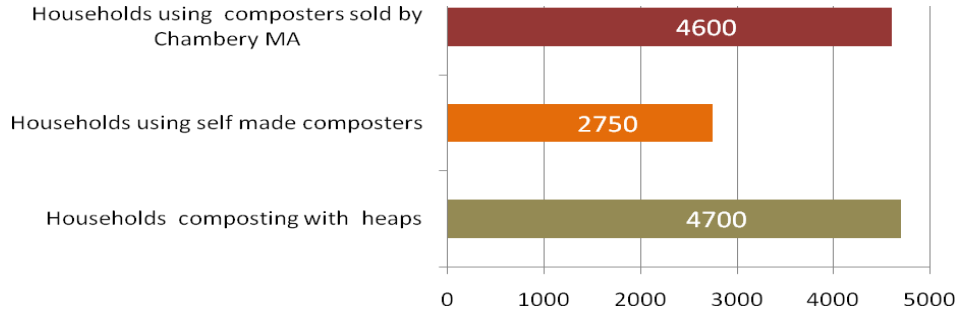
Financial plan (in Euro's)

Nature	2010	2011	2012
Self financing	118000	118000	212000
ADEME program local prevention	140000	140000	140000
Regional council Savoie	64000	64000	64000
Total	**322000**	**322000**	**416000**

Results

Currently 12000 households (17800 by 2014 objective), or 27% are practicing composting at home or in the community. 5800 households (or 1160 new ones per year) will have to be found to compost so as to reach 40% of the households practicing composting.

At the end of 2009 (in 5 years time – ADEME program started in 2005) 4360 had compost equipment representing more or less 9% of the households. 27% households practiced composting according to survey (ADEME/ LH2/ Indigo 2008). 42% of the equipped households composted already before.



Compost quality:

- homogenous compost in 56% of the cases;
- poorly mixed bio-waste in 33% of the cases;
- appropriate humidity in 68% of the cases;
- Presence of compost worms (or earthworms??) in 49% of the cases.

A 2006 survey amongst 91 households revealed that:

- 90% of households equipped with a composter use it;
- 79% of the households noted a reduction in waste generation and waste offered for collection;
- All users compost kitchen as well as garden waste;
- 96% of the users noted that no odors were released;
- 97% are satisfied with the compost produced, using it for their garden and flower pots;
- 98% judged the communication was clear and sufficient.

School composting is functioning in 4 preprimary schools, 8 primary schools, 6 secondary schools and 2 high schools. A survey was done in April 2009 in 19 schools equipped with composting revealing the following:

- lack of motivation of maintenance and kitchen personnel, specifically in the secondary schools;
- problems arise when the teacher carrying the project is transferred;
- often a lack of balance between kitchen and green waste
- le brassage n'est pas forcément effectué

Challenges and success factors

Challenges

- Find a solution for (the lack of) shredded material
- Sensitize the elected
- Problem of the sustainability of the reference persons and Master Composters (guide composteurs) at the buildings and in the neighbourhoods

Success factors

- Clear objectives/ targets and indicators set
- Involvement of different stakeholders and the networking between them
- Imbedded in a larger waste prevention program
- Direct and indirect support of regional department and national authorities
- Designation of two full time equivalents at the metropolitan area level
- Strong emphasis on school composting programs including concrete composting activities
- Regular surveying (including visual checks), research and monitoring
- Drafting clear and binding cooperation agreements

- Establishment of a network of Master composters as a structural engagement to recruit, motivate and keep volunteers

Output, outcome and impact indicators

	Unit	Value foreseen	By when
Waste reduction	%	7	2014
Sensitisation of elected	N° of information meetings	24	2011
% of people sensitised in waste prevention	%	100	2014
Waste production (residual + selectively collected)	Kg/inh/y	313	2014
Evolution waste production	%	-1.5%/y	2009
Financial savings of waste deviated from incineration	Euro/ton	228	2008
Budget allocated to the operation	Euro/ inhabitant	3	2010-2014
Subsidies received for the operation	Euro/ inhabitant	1.44	2010-2014
Training 'guide composteurs'	Guides composteurs	80	2014
Training 'Maître composteurs'	Maîtres composteurs	4	2014
Sensitization public (organic waste management)	N° of days with stand/ year	11	2009
Sensitization public (organic waste management)	N° of people sensitized orally	500	2009
Sensitizing children	N° of children sensitised/ year	3000	2010
Community composting units	%	12	2014
Quantity of kitchen waste deviated from incineration	Kg/inh/y	40	2009
Quantity of kitchen waste deviated from incineration	Tons	1930	2013
Quantity of waste deviated to civic amenity centres	Kg/inh/y	185 (155 in 2010)	2014
Quantity of waste deviated to civic amenity centres	Tons	12400	2014
New composters	N° of households	5800	2014
% of post boxes with a stop mail sticker	%	30	2014

Further information:

Chambery Metropolitan Area

Gaëlle DOURNEAU - Responsable ingénierie des filières de tri et prévention des déchets
Chambéry métropole - direction de la gestion des déchets
Tél. 04 79 96 86 20 - poste 1324
Mail : gaelle.dourneau@chambery-metropole.fr _ www.chambery-metropole.fr

FACT SHEET 5

Community composting in Flanders

Summary

Title of project/ good practice/ campaign:	Community composting in Flanders
Type of prevention measure	Reduction at source
Country	Belgium
Geographical level of implementation	Regional
Name of region	Flanders
Scale	Roll out
Target audience	Households
Number and/or units	2.195.487 households
Date of implementation/ duration	Since 1996 up till today
Objectives	No specific objectives at regional level. Local authorities objectives: • Provide residents without gardens an alternative for VFG collection; • Social development and cohesion of a district;
Type of waste	Bio-waste

General characteristics Flanders

Demography and habitat	
Population Flanders:	6.160.600
Number of households :	2.195.487
Area size :	13.522 km2
Population density :	455 inh/km2
Waste	
Waste generation (kg/inh/y) :	545
Selectively collected waste – incl. bio-waste (kg/inh/y):	391
Residual waste (kg/inh/y):	153
Fixed and/or variable fees	Most municipalities and inter-municipalities apply a PAYT system. The rates vary per inter-municipality.

Definition

Community composting (CC) is defined as a place where residents from a neighbouring district can present their VFG waste for composting in bins, boxes, heaps or pavilions.

Context

In 2008 69 active CC parks are in place in Flanders spread over 46 local authorities[18]. Most CC projects are worn by volunteers. Initiatives originate either from residents themselves or from the local authority, seldom from real estate project developers and are situated either on public or private property

These initiatives (CC) have never been promoted at regional level, nor by the Flanders Public Waste Agency (OVAM), neither by the Flemish Compost Association (VLACO vzw). They consider community composting not as waste prevention but rather as bio-waste recycling[19]. In that sense, a community composting program accepting more than 10m2 of Vegetable, Fruit and Garden (VFG) waste a year will be subject to specific legislation including in principal a construction and an environmental permit. Therefore the legislation has been adapted taking into account these small scale operations (class 3 – only - up to 25m3) Community composting is regarded as an intermediate form between home composting and centralised composting. It is not stimulated but recognized including specific provision in the legislation (see chapter 7 – legislative framework). Two comprehensive studies have been carried out on community composting in Flanders: 'Het wel en wee van wijkcomposteren (October 2001)' and 'Inventarisatie en doorlichting van de wijkcompostering in Vlaanderen (2008 as a follow up study on the 2001 study)'.

Strategy

Approach (2008-2013)

Flanders

It is recognised that citizens living in apartments or small houses with no gardens do not have the possibility to compost at home. This is true specifically in urban areas or urbanised centres in rural areas. Most urban areas offer VFG collection. However, in order to allow residents with no gardens to have alternatives for the collection of this waste fraction (for which they have to pay), community composting parks can be a solution.

[18] Inventarisatie en doorlichting van de wijkcompostering in Vlaanderen – 2008 study (Arcadis)

[19] The resident discards his/her bio-waste by bringing it to a CC park. He/she is not longer responsible for the bio-waste.

In order for a CC scheme to be successful the following strategy has to be followed:

- CC can only be initiated if environmental benefits can be achieved. In districts whereby home composting exists or whereby a successful VFG collection system is in place, a CC scheme will not provide any added value. CC schemes can be implemented in districts with apartments, social districts (with no or small gardens) or districts with high population density.
- Only the targeted residents (a demarcated district) can offer VFG at a CC park. Supply under supervision and registration are a must. Scale and VFG supply have to be adjusted.
- Participation of the neighborhood and a suitable implantation place are a good start for a CC project. Sufficient volunteers are a prerequisite for keeping the CC Park open as well as for the successful treatment of the VFG waste.
- Master composters are in charge in the first place to promote home composting. They can assist in CC parks but not on a continuous base.
- The control and follow up of the composting process should be intense. Seen that the original material (fruit and vegetable waste) is wet an external supplement of structure material has to be foreseen. In order to close the loop the compost is made available to the residents, for the beautification of the CC Park or for the green service of the municipality.

Methodology/ procedure

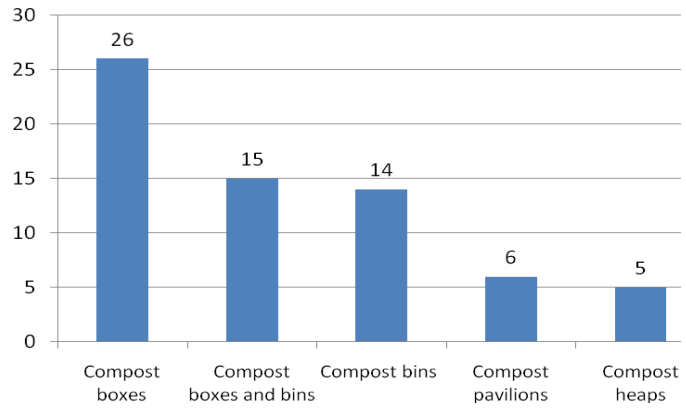
CC Parks exist in all forms and sizes: from small initiatives with a few participating families to larger scale initiatives whereby more than 100 families participate.

The following categories of community composting in Flanders can be distinguished:

- Management:
  - Local authority provides paid workforce
  - Local authority has a supporting role (providing wood chips, communication, purchase of compost boxes and material,…)
  - Private initiatives (no interference LA)
- Number of participating families:
  - Small (most private initiatives): less than 50 families (compost bins solely or combined with compost boxes)
  - Medium: 50 to 100 families (compost pavilion, compost heaps, a number of compost boxes in series or a combination)
  - Large: more than 100 families (compost pavilions)
- District type
  - Normal district
  - Social district

Most CC projects combine VFG waste with a limited amount of garden waste (grass, leaves, wood chips,…).

Figure 1: The number of CC Parks using different kinds of recipients (total is 66 CC Parks):



Compost boxes	Compost bins	Compost pavilion	Compost heaps




The following two characteristics can be highlighted for a CC Park:

- The participating families have no possibility to compost themselves their VFG waste (no or very small garden);
- CC Park do not have in the first place an educative or 'demo' function, but rather an ecological (= waste recycling) and social (= social contact and cohesion) function. Educative function is possible but not as a primary objective.

Preconditions to start a CC Park:

Buy-in by involved stakeholders, a dedicated environmental officer at (inter)-municipal level with time to set up, implement and monitor a CC scheme (if medium to large scale on public grounds), Master composter willing to participate and support the initiative, Key-holders (volunteers) identified with the commitment to volunteer for a longer period of time and of course residents willing to participate.

Procedure

The following roadmap is mostly used when implementing a CC Park.

- Municipality agrees on the principal to set up CC parks on its territory;
- A dedicated municipal officer (environmental or sustainability officer is designated) for the planning and implementation process;
- Identify suitable areas for implementing a CC park (either by the municipality's own research or on demand by residents);
- Determine whether a planning and/or environmental permission is required;
- A Master composter is designated as from the beginning as he/ she might be involved in the first months of operation at the CC park;
- If the CC park is earmarked to target residents living in a social district, the social services of the municipality and/or the social NGO involved in the district might be involved in order to get a better understanding of the socio-economic situation in the district/ area;
- Organize a participatory meeting (or meetings) with potentially involved residents and assess the attitude towards a CC park;
- Identify participants (offering bio-waste) and volunteers (commitment to engage and assist) for the CC park;
- Determine the area of participation (only bio-waste from this area may be accepted);
- Determine the investment and operational costs. Check how the municipal technical services can assist in building a fence, compost boxes and other equipment;
- Construction of the CC Park with emphasis on functionality and enough room for compost operations;
- Official launch of the project (special event co-organized by the municipality, NGOs and the residents);
- Monitoring and evaluation of the CC Park and provide feedback to all stakeholders.

Instruments

It is often though that running a community composting is easy. This is only partly true. Community composting should be part of a tailored mix of instruments in order to achieve the desired results. A considerable number of preconditions have to be fulfilled and community composting requires continuous follow up.

Goal seeking instruments:

1. Subsidies
   Subsidies are provided mostly by municipalities to purchase the necessary compost infrastructure and equipment - see §7 (financial modalities).

2. On the job training is offered to the key-holders by the Master Composter of the district regarding technical aspects and by trained professionals regarding the daily management of a CC park including aspects as keeping a diary, problem solving, etc.
3. The Flemish Compost Organisation (VLACO) has started offering training for LA wanting to start community composting.
4. Information provided during preparation time and implementation includes: invitation letters for meetings, district (feedback) meetings, posters (hall of apartments), brochures, information newsletters, information billboards, guidelines rules on small boards,… at the CC Park.

Support instruments

- Monitoring is done by the key-holders, the Master Composter (technical support to the key-holders on demand), the environmental officer of the LA (most of the time on a 6-monthly basis).
- Research is carried out by the Flanders Public Waste Agency - OVAM (2001 and 2008).
- Service of offering structure material

Means/ Actions

The stakeholders implement the following **actions** during the set up, implementation and monitoring of a CC Park: LA (Environmental officers, personnel technical/ green services), Master Composters, key-holders/ volunteers and residents.

Key-holders (volunteer):

- Attend a compost course or receive on the job training;
- Permanence during opening hours;
- Accepting and emptying the 5 to 10 l VFG box;
- Inform residents about the sorting rules (if impurities found);
- Adding structure material during opening hours;
- Turning the compost when necessary (or aerate – for compost bins);
- Inform the LA, if involved, for the supply of structure material;
- Make notes in the diary (number of residents passing by, problems encountered, estimates of quantities temperature measurements, turning the pile,…);
- Regular (informal) meetings with LA responsible person (if the LA person is involved).

Residents:

- Bring their VFG waste at regular times to the CC park;
- Abide to the sorting rules (can be put on the bucket, at the entrance of the CC Park, on flyers distributed to participating residents).

Master Composter (if involved)

- Technical training (on the job) to the key-holders;
- Technical support
- Stand by once the CC Park is up and running (on demand).

LA personnel

Environmental officer

- All administrative/ financial issues regarding the preparation and implementation of the project;
- Monitoring and evaluation;
- Problem solving.

Technical personnel

- Maintenance of the CC Park (fence, infrastructure and equipment)
- Supply structure material;
- Harvest compost and use the remaining (part not used by residents themselves)

Legislative/ policy framework

The 'organic-biological waste plan' for Flanders stipulates conditions for compost pavilions. No conditions however have been set for the other forms of community composting. A CC Park is exempted from a building permit if the following conditions are met: the CC Park is situated in a licensed building block, the total volume is not exceeding 10m3/y and is not visible from the road. Most CC Parks abide to these rules.

The environmental permit (VLAREM II) foresees the following requirements for CC Parks (class 3 – less than 10m3):

- compost diary should be kept by the operator including data such as temperature measurements, dates of turning the pile and harvesting of the compost;
- the produced compost is only to be used by the registered residents or municipal services;
- no weight bridge, green screen of waste register are required;
- the CC park has to be closed (not accessible) for unauthorized people outside opening hours. Storage of kitchen and garden waste outside the composting area is prohibited;
- the aerobic composting management process should ensure;
- a homogenous composting process throughout the compost heap;
- optimal compost process duration in order to have a usable end product;
- sufficient watering is assured when setting up a pile to ensure a proper composting process; Regular turning is done in order to maintain aerobic conditions in the pile. Equipment to aerate or turning should be available;
- Intermediate storage of compost should happen dust-proof;
- If the CC park has a space capacity of more than 10M3 a water-proof floor is required. The percolate has to be captured and if necessary treated and stored and possibly used as watering during the composting process.

Financial modalities

The costs for running a CC Park can be subdivided in investment costs and running costs. The following chapter indicates that costs vary dramatically according to the composting system chosen, the involvement of the LA and whether or not volunteers are managing the CC Park.

- Investment costs for infrastructure and equipment relate to fences, compost system, shelter, compost equipment, compost buckets for participants (facultative), information boards, information and communication supports… and is most of the times supported by the LA. Parts of this investment costs like a fence or a shelter can be obtained via local subsidies. The costs of the CC Parks in Flanders vary according to the composting system chosen and the possibility for the LA to provide technical assistance. In some cases the LA will construct part of the composting infrastructure and equipment such as the fence, wooden compost boxes... itself, in other cases the LA will purchase the infrastructure and equipment and make it available for the operator. A study (2007) carried out for the Brussels Institute of Environment revealed that the investment costs for CC Parks in Flanders vary from 350 Euro (compost bins/ boxes) to 15.000 Euro (compost pavilion).
- Running costs vary according to the involvement of LA personnel or volunteers or a combination of both. The following preparation costs (translated in time commitment) by LA personnel have to be taken into account: carrying out an 'approval' file for the municipal council, consultation with real estate developers (if on private property), study and abide to possible legislative requirements, design of the park (in consultation with other stakeholders), making and printing of information materials, organising of a district meeting,…

  Implementation costs will, as for the preparation costs, vary according to the commitment the LA wants to one has to consider personnel costs of LA personnel for maintenance, coordination of the management of the CC parks, supply of wood chips.

Results

In general

The success of the CC parks is mixed. Some CC parks have been in place since more than a decade and are still up and running while others have closed down. The reasons are varying but the following.

Results compared as to the objectives

Environmental benefits

Diversion from bio-waste

Benefits arise from the diversion of bio-waste from further treatment. As such the bio-waste does not have to be collected and treated. The quantities, varying from 2 to 15 tons/year are however low. But these results have to be seen in combination with the home composting activities in Flanders. It is namely assumed that more than 100.000 tons[20] of bio-waste is not longer presented for collection due to home and community composting activities.

Compost quality

In both studies mentioned above (chapter 2) research was carried out on the composting process and the compost itself in selected CC Parks. This research in the 2001 study was a combination of surveys and a visual appreciation using a review fact sheet. Temperature measures were taken as well as samples (6 CC Parks) for analysis. The research in the 2008 study was similar even though more samples were taken (10)

The **2001 study** (Annex 2) showed the following results:

The temperature rise (preferably > 50°C), necessary for achieving the killing of the seed weeds is achieved in the compost pavilions but not in the compost boxes and bins. All samples were within the following recommended VLACO parameters: conductivity, pH, Organic matter, Kj-N, NH4-N, P, K, Ca, Mg and stability. The following parameters were exceeded for a number of samples: humidity (all 6 varying from 54 to 76%), NO3 (2 -

[20] *This figure has been used by OVAM/ VLACO in presentations. However, we could not retrieve the way this figure was calculated.*

compost pavilions), germinable seeds (1), impurities (1), heavy metals (3) and phytotoxicity. Because of the wet end product (compost) and the possible leaching of nutrients it was recommended to cover the mature compost.

The **2008 study** (Annex 2) showed the following results:

The compost quality was measured according to the 'compendium for sampling and analyses by VLACO' and compared to the set standards. Sub samples were taken at 5 different places in the (mature) compost. The total quantity taken for analysis per sample was 20l.

Results

All compost samples were characterized by a high humidity. Half of the samples had a humidity of >70%. Most of the measurements were corresponding to the 2001 results. The following measurements improved: phytotoxicity, heavy metals,… Some measurements however confirmed what had been observed in the 2001 study: high humidity (up to 70%) and presence of germinable seeds (4).

Financial benefits[21]

All residents in Flanders have to pay for the collection of their bio-waste. On average the residents pay an amount of 1.5 Euro/ 40l container. As most residents do not want to keep the bio-waste too long on their property it can be assumed, depending on the collection scheme (collection once a week or two-weekly), that the financial gains for the residents participating at the CC scheme vary from 40 to 80 Euro/ year. The benefits of using compost in small gardens or houseplants are not considered.

Social benefits

Some CC Parks have proven to allow for socialising. The restricted opening hours (1 to 1.5 hours two to three times a week) require the residents to come at the same time and thus provide the opportunity to socialise with each other. In some cases the CC Parks makes provision for seating (benches) at the CC Park. The key-holder and his enthusiasm, openness, friendliness,… plays a crucial role in socialising.

[21] Vergelijkende analyse van de projecten rond buurtcomposteren, BIM 2007

Challenges and success factors

Challenges

The following challenges and opportunities have to be considered when running a CC Park:

- Most CC Parks are run by volunteers. LA has to take responsibility if problems occur (in example, no key-holders/ volunteers anymore to run the CC Park);
- CC parks without fences and opening hours (few only) have problems with contaminants;
- Control (by the key-holder) on the incoming materials (VFG waste) is important in order to avoid contamination;
- Visibility of the CC Park is important for social control;
- Recruit, motivate and keep volunteers (key-holders);
- Turning a compost pile is heavy labour putting a burden to older volunteers;
- Nuisance for local residents (pests,…)
- Insufficient structure material such as wooden chips,…;
- Disputes between residents/ key-holders or between key-holders.

Success factors

- Mix of goal-seeking and supporting instruments
- Intense control and monitoring of the composting process
- Pre-conditions to be fulfilled before planning
- Clear roadmap on how to set up a CC park
- A variety of stakeholders involved including specific roles and responsibilities
- Good communication and cooperation between concerned municipal services increases support;
- Increase social cohesion
- Small scale and thus manageable
- Proximity solution
- Master Composters important actors at the start of the project (first 6 months)
- Up to 80% of kitchen waste from participating families not longer offered for collection
- Easily reproducible
- Reduces illegal dumping
- Compost used by participants or in community gardens/ apartment gardens

Output, outcome and impact indicators

The following indicators can possibly be applied for community composting projects at regional level:

Output indicators

- Number of municipalities participating in the community composting program
- Number of municipalities making efforts to promote and support community composting to its citizens
- Quantity of information measurable via periodicals, brochures, waste journal, website,…
- Number of courses, training, workshops,…
- Number of participants at courses, training, workshops and other activities
- Number of municipalities supporting actively Community composting schemes

Outcome indicators

- Quality of the information provided (news value, responding to the actuality, demand, target group oriented, region specific (rural/ urban),…
- Quality of the training, workshops, activities… to be measured by satisfaction survey

Impact indicators

- Evolution quantities of bio-waste; quantities of bio-waste in rest fraction (participating residents);
- Number of community composting projects that apply bio-waste prevention in a qualitative way.

Further information

OVAM (Flemish Public Waste Agency)

Kathleen Schelfhout
OVAM | Stationsstraat 110 - 2800 MECHELEN
T 015 284 209
E kathleen.schelfhout@ovam.be | www.ovam.be

VLACO vzw (Flemish Compost Organisation)

Gerrit Van Dale

Kan. De Deckerstraat 37 - 2800 Mechelen
Tel : 015 451 370
E gerrit.van.dale@vlaco.be - http://www.vlaco.be

FACT SHEET 6

Community composting in Zürich

Summary

Title of project/ good practice/ campaign:	Community composting Zürich
Type of prevention measure	Reduction at source
Country	Switzerland
Geographical level of implementation	City
Name of city	Zürich
Scale	Roll out
Target audience	Households/ schools/ retailers
Number and/or units	21.500 households
Date of implementation/ duration	Since 1992
Objectives	Divert kitchen waste as much as possible from incineration. Improve social cohesion in districts
Type of waste	Bio-waste and more specifically the Vegetable, fruit and (small) garden waste fraction of households

General characteristics Zürich

Demography and habitat	
Population :	370.000
Number of households :	190.000
Area size (km2) :	93
Population density (inh/km2):	3957,6
Waste	
Waste generation (kg/inh/y) :	415
Selectively collected waste – incl. bio-waste (kg/inh/y):	210
Residual waste (kg/inh/y):	205
Number of community composting projects	+/- 900
Number of participants per CC park	24
Fee for 60l plastic bag (residual waste)	2.8 Euro

Context

Zürich has 370.000 inhabitants, corresponding to more or less 190.000 households, and has a high population density (3957 inhabitants/km2). Zürich does not provide up till now to its residents a separate collection system for kitchen waste. The green waste is collected and treated in a centralised composting plant at the vicinity of the city centre. In 2008 the city of Zürich commissioned a comprehensive LCA study in order to find out the environmental, financial and social benefits of different bio-waste treatment options including: separate collection with centralised treatment (incl. anaerobic digestion), mixed collection with incineration (current situation) and community composting as a complementary action to either centralised composting or incineration. It is expected that as from 2013 the kitchen waste will be collected separately and treated anaerobically. This plant will replace the current open composting plant for green waste.

The LCA revealed a number of interesting issues regarding the community composting program in Zürich.The city of Zürich started in the 1992 with a comprehensive Community Composting (CC) program.

Currently (2008) more than 900 active CC Parks are up and running in the city of Zürich. The city of Zürich considers home and community composting of kitchen waste as a suitable solution providing environmental as well as social and financial benefits. Initiatives originate mostly by the residents themselves. Housing companies play an important role in the set up of CC Parks as most CC Parks (infrastructure and equipment) in Zürich are financed by them (up to 70%). Each CC Park is run by one or more volunteers. The city of Zürich has a database with all volunteers participating in the CC Parks program. The number of large CC Parks is diminishing and new CC Parks are either replaced by smaller ones or not replaced at all. Besides community composting, a considerable number of residents practice home composting.

Strategy

Approach

CC Parks program in Zürich aims at diverting kitchen waste as much as possible from the rest fraction of the waste, the latter one being brought to the incinerator. Besides environmental beneficial aspects social and educational benefits are worthwhile mentioning, however difficult to quantify. CC Parks connect people, ethnic groups (+ / -30% foreigners in Zurich), generations and promotes social cohesion. The CC Parks enhance the feeling of safety, increase the relationship with nature and promote environmental awareness.

Every CC Park, small or great, has one or more responsible residents (volunteers). The compost advisor of the city has a database in which all volunteers are registered. Those volunteers can ask for advice or help to the compost advisor. The compost advisor of the city gives support in the planning of the CC Park, takes care of the training and does a follow up as far as possible. He's also the person to contact for the supply of wood chips.

The concept of CC Parks is simple and consists of the following infrastructure/ equipment: an area of +/- 40m2 mostly situated in a green area in the immediate vicinity of apartments, a fence (free access however for the residents) not higher than 1.2 m surrounded by indigenous shrubs and plants, compost boxes with rigid plastic covers in different colours, a trunk (1.5 m long, 0.8 m high and 0.6 m deep) with equipment, a bench, water supply and flat stones (0.5m by 0.5m) as groundcover. The covers of the boxes have different colours. The ones with the green colour are designated for the kitchen waste. The others are used for the (semi)-mature compost and the wood chips used as structure material for an optimised composting process.

Not all the CC Parks look alike. Another possible application is: 1 or 2 small containers made from plastic wire including a plastic sheet inside (with small holes for aeration) and finally a wooden cover. Once the container is full, the waste is transfered to a heap covered with Toptex foil (respiration possible while protected from the rain) for further maturation. In general several such a heaps are required to allow for compost maturation.

Zürich pays a lot of attention to the design as to the tidiness of the place. Indigenous shrubs and plants should be used to make the place attractive. For this purpose fact sheets have been drafted including information on the kind of plants and shrubs to be used in CC Parks.

Methodology/ procedure

CC Parks exist in all forms and sizes: from small initiatives with a few participating families (2 to 10) to larger scale initiatives whereby more than 100 families participate.

The number of CC Parks according to number of participating households is as follows:

- 570 CC Parks for up to 10 households
- 150 CC Parks up to 30 households
- 90 CC Parks up to 100 households
- 70 CC Parks for more than 100 Households

The most common CC Parks are those with 2 to 15 families participating. On average 33 households are connected to a CC Park.

The following compost systems are used in Zürich according to the number of households participating:

Compost silos (*For 1 to 15 households)*	Compost boxes (*For more than 15 households)*	Compost heaps (*For in between 20 to 400 households)*



Residents bring their kitchen waste either in a closed bucket of 5l (up to 15l) or in plastic bags. Estimates[22] indicate that participating households bring more or less 100 kg of kitchen waste to the CC Park per year. The residents will bring only bring pre-consumer kitchen waste. Cooked food including meat, fish and bread are not accepted. For certain fractions of the kitchen waste such as citrus, egg shells and flower bouquets residents are asked to reduce the size of it. The balance between structure material and kitchen waste is 1 to 2, this is to say 1 part of wood chips for two parts of kitchen waste. The compost produced represents 1/3 of the input material.

600 silos-, 120 box- and 80 heap CC parks are in place in Zürich.

Roadmap

The following roadmap is mostly used when implementing a CC Park.

- Identify sufficient volunteers for the CC Park;
- Determine the area of participation. The size of the CC park can be determined from an estimate of the number of households targeted. The (visual) control of the area and the quality of the kitchen waste will be enhanced. If more than 100 households live in a targeted area it is recommended to have 2 CC Parks;
- The required space and suitable location (preferably partially shaded). The size will amongst other depend on whether green waste will also be composted. The distance for the residents to bring their kitchen waste shouldn't exceed 200m;
- Figure out the position of the housing companies regarding a CC Park;

[22] *No information could be traced on how these estimates have been calculated*

- Assess how residents face a CC park using a standard questionnaire. This survey should allow to find out if sufficient residents are willing to participate actively (volunteering). Ideally, 10% of the residents of the targeted area should be prepared to volunteer. The survey should also allow finding out how much household are ready to participate in the program. This number should however not be used to calculate the size or system. It is only of importance to prove the need of such a CC Park towards the housing company.
- Collection of arguments and counterarguments for community composting (prejudices such as odors and rats often serve as arguments to be refuted) in order to persuade the housing company and residents to accept;
- Presenting the project to the residents. Involve the caretaker (syndic) of the building block. The presentation should include the following information:
    - Arguments for possible critical questions;
    - Area for the planned CC Park;
    - 1 or 2 site suggestions;
    - Information and photographs of the compost system(s). Pros and contras of the system(s);
    - Presentation of the financial, organizational and administrative support of the CC park;
    - Use of the compost;
    - Further actions to proceed for the realization of a CC park.
- Clear the financing and operational costs for the project including investment costs for the CC park and the equipment, operational costs such as wood chips supply and possibly compensation for the work done by the volunteers;
- Construction of the CC Park with emphasis on functionality and enough room for compost operations;
- (Official) opening of the CC Park;
- Monitoring and evaluation of the CC Park (compost advisor) and provide feedback.

The following subjects have been presented in 2 page fact sheets and made available (also on the website) for potential interested residents when setting up a CC park: How to attract volunteers?; Compost equipment required; What is compostable?; The need for structure material (wood chips); Guidelines for silo compost for 1 to 15 households; Guidelines for heap composting for 20 to 400 households; Guidelines for box composting for more than 15 households; Guidelines for heap composting for more than 30 households; What happens during the compost process?; Guiding and controlling the compost process; How to use compost?

A quarterly 4 page 'compost news' is published and distributed to all registered volunteers. 52% of the volunteers read the 'Compost news' always. 8% read it never.

The easiest and most successful way to attract more participants is the mouth to ear publicity.

Information/ communication

The responsible person for the program has the availability of brochures, CDs [23](illustration on how to compost), website,…

At the CC Parks large boards can be placed containing, in example, the following information:

- An A3 page indicating the rules;
- An A4 page with pictograms providing guidelines on what can be put in the boxes and what not, in what box the kitchen waste has to be thrown in and that some materials have to be reduced in size before thrown away.
- The contact details of the responsible person for the CC Park (resident) and the volunteers as well as (when possible), the monthly work plan (who does what when) and finally the residents allowed to bring their kitchen waste to the specific CC park (zoning).

[23] *CDs were requested but were unfortunately not received*

Pictograms indicating that the following kitchen waste is not allowed	No bread and please do not leave your plastic bags behind	Contact details of the responsible person

Instruments

It is often though that running a community composting is easy. This is only partly true. Community composting should be part of a tailored mix of instruments in order to achieve the desired results. A considerable number of preconditions have to be fulfilled and community composting requires continuous follow up.

Goal seeking instruments:

1. Pay As You Throw (PAYT) system in place

The current amount paid for the residual fraction is high as compared to other European cities (2.8 Euro for a 60l bag). Participating in a CC Parks scheme allow households to make considerable savings per year.

2. Subsidies

The community compost scheme (including the compost advisor at the city) is paid through the waste taxes paid by the citizens.

3. On the job training is offered to the volunteers by the compost advisor. He provides 4 to 6 training courses per year (90 to 120 volunteers trained), the necessary information to set up a CC Park and is available for individual advice (at the spot or by the hotline). The quality of the training is regarded as good to very good by more than 90% of the participants.
4. Information provided during preparation time and implementation includes: invitation letters for meetings, district (feedback) meetings, posters (hall of apartments), fact sheets, 'Compost news' newsletter (2x/ year to 2500 addressees), information billboards at the CC Park, guidelines and rules on small boards at the compost box, on the collection bucket,...

Support instruments

- Monitoring is done by the volunteers and the compost advisor of Zürich. The compost advisors collects and treats interesting data using specific indicators (see results and chapter 10);
- Research is carried out by the waste department (ERZ) of the city of Zürich (2008 research in the framework of the LCA study).

Means/ Actions

The stakeholders implement the following **actions** during the set up, implementation and monitoring of a CC Park:

Volunteers:

The volunteers, registered by the Zürich CC Park compost advisor, are in charge of the CC Park and are supposed to carry out the following tasks:

- Attend a training session;
- Mix the compost at regular times;
- Transfer (turning) the compost from one box to another;
- Keep the place tidy; and,
- Inform the program manager when wood chips should be supplied.

75% of the volunteers are 50 years and older.

The number of volunteers according to the number of participating households:

- 10 Households: 1 to 3 Volunteers
- 30 Households: 2 to 5 Volunteers
- 100 Households: 5 to 12 Volunteers
- More than 100 Households: 8 to 20 Volunteers

Residents:

- Bring their kitchen waste at regular times to the CC park;
- Abide to the sorting rules (rules either put on the bucket and/or on a board at the entrance of the CC Park plus on flyers distributed to the residents).

Zürich compost advisor in charge of the CC Park

Environmental officer (1FT for the city of Zürich)

- Promoting CC Park
- Support with the starting up of the CC park (specifically training of the volunteers);
- Monitoring and evaluation;
- Problem solving.

Technical personnel

- Supply structure material.

Housing company

- Approve project;
- Make a suitable place available;
- Provides infrastructure and equipment;
- Finances infrastructure;
- Support regarding communication at the CC Parks;
- Possibly a small fee for the work done by the volunteers

Legislative/ policy framework

The CC Parks do not require a building permit nor an environmental permit.

Financial modalities

Residents in Zürich pay an amount of 2.8 Euro for the 60 l residual waste collection bag. Residents pay also an amount of 27 Euro per acre and per year if they offer their green waste for collection.

In order to offer residents alternatives for the kitchen waste collection, the city of Zürich provides them with the possibility to participate in the home or community composting program. Contrary to most other CC Park schemes the costs for the CC Parks in Zürich are born mostly by the housing companies (in +/- 70% of the cases). It is assumed that housing companies pass the costs on in the rent to the tenants.The yearly budget for the Zürich waste department was more or less 50.000 Euro in 2006 and can be subdivided as follows:

- 15.000 for the service 'provision of wood chips' to CC Parks;
- 7.000 Euros for other services;
- 1.000 Euros for chemical analyses and sampling;
- 21.000 Euros for training, information and sensitization programs;
- 6.000 Euros for the acquisition of equipment.

The costs for the various CC Parks differ according to the size and system in place (see above). The following costs for a typical medium sized CC Park with compost boxes can be estimated as follows:

- Information board (30 Euro);
- 6 composting boxes (see picture above) with wood and rigid plastic covers (3200 Euro);
- Fence in wood, steel wire and plantations (250 Euro);
- Wooden trunk for the storage of equipment + equipment (200 Euro);
- Flat stones (200 Euro);
- Sieve (75 Euro)

which gives a total of more or less 4000 Euro.

Wood chips are provided by the city services on demand. The price differs according to the volume:

- Bulk: 25 Euro per m3
- Bags (50l): 3.5 Euro

Transport costs are charged at 18 Euro per delivery.

In some cases (15%) volunteers are paid for the services they offer (mixing, turning, adding wood chips, maintenance of the area (keeping it tidy). Residents can be asked to contribute in example 1.5 Euro per month. These costs are in general included in the rental cost.

Results

In general

The success of the CC Parks is mixed. The number of CC Parks is decreasing year after year. The larger ones are either closed or replaced by smaller entities. In 2008 a comprehensive LCA study on bio-waste treatment was carried out in Zürich whereby community composting was compared to incineration and centralised composting/ anaerobic digestion. This study allowed for comparative results between nine CC Parks.

Results compared as to the objectives

Environmental benefits

Diversion from bio-waste

Benefits arise from the diversion of bio-waste for further treatment. As such the bio-waste does not have to be collected and treated. Volunteers treated in 2006 on average the kitchen waste of 8.1 households producing so 660litre compost. In 2008 the amounts dropped to 7.7 households and 510litre (0.5m3) compost. The kitchen waste brought by participating residents dropped from 3.1 kg/hhld/week to 2.5 kg/hhld/week.

In total 21500 households participate in the CC Parks scheme in Zürich corresponding to 24 households per CC park on average[24]

Compost quality

In 30% of the cases the mature compost is exposed to the rain. In 13% of the cases the compost piles are not turned. At smaller CC Parks the willingness to turn the pile several times is more present. 62% of the CC Parks use the compost after 9 to 12 months. Other CC Parks use the compost too early or too late. 45% of the CC Parks use the compost in the gardens. In order to improve the quality at CC Parks the idea was launched to put a certification scheme in place for CC Parks. This idea, according to the survey, would be acceptable for 30% of the households participating in CC Parks. Specifically the age group between 40 and 60 years support this idea. A certification scheme would have to set certain standards. The following possible quality standards could be introduced: professional set up, cleanness and maintenance, no smell, the quantities of kitchen waste and compost produced in a certain time period and where the compost was used.

Research carried out by the waste department of the city of Zürich in 2008 measured, as part of the LCA study, gas emissions from 9 CC Parks and compared the results to set standards (**Annex 1**). It revealed that the CH4 and N2O values were high above the standard values. N2O is produced in oxygen scarce environment while CH4 is produced in oxygen free environments. These emissions can easily be avoided using standard practices as aeration (layers and turning piles). As a result the waste department and recycling Zürich (ERZ) launched a pilot project 'Quality compost with little greenhouse gases' with 6 team supervisors for different composting systems and various mixtures. The objective is to reduce the greenhouse gas emissions, create quality parameters, set standards for mature compost and assess time required for producing a low greenhouse gas quality compost. ERZ[25] will establish at the end of the project guidelines for a GHG free composting process.

<u>Financial benefits</u>

Between 1800 and 2500 volunteers (2 to 3 per CC Park) worked 19200 hours for the 900 CC Parks. Household's contribution amount to two hours/ year. This contribution decreases for larger CC parks. Thousands of hours are invested free of charge in the composting activities at the CC parks. The added value for the 900 CC Parks in Zürich account for more or less 150.000 Euro/ year.

[24] *More information on the method used of monitoring, the duration, the number of households participating,… were not available*

[25] *Not yet published*

Social benefits

Beautifully-designed, well-kept places and professionally managed CC Parks provide a positive image. This attracts households to participate and others to volunteer. As such, it appears that community composting can contribute to a longer life of its (participating) tenants and contributes to greater satisfaction in general.

Challenges and success factors

The following challenges and success factors have to be considered when running a CC Park:

Challenges

- Finding volunteers;
- Maintain the motivation and enthusiasm amongst volunteers and residents;
- Politicians in Zürich are looking for alternatives ways of treating the kitchen waste. What will be the future for the CC program;
- Support to the program: in 2000 four FTE compost advisors were in charge of the CC Parks program. Today only one FTE compost advisor is in charge;
- Every year a considerable number of CC parks are closing down (mostly bigger ones). How to stop to this tendency?
- Need to bring a new impetus to get back to the initial drive;
- Supply of wood chips.

Success factors

- A full time employed compost advisor at the city of Zürich;
- The support of the waste department for studies and technical, logistical support;
- Well designed, simple and neat CC parks;
- Flexibility regarding the number of participants, the CC parks size and the design of the CC parks;
- A clear roadmap for planning, implementing and monitoring the CC park initiatives;
- Information support through fact sheets, website, at the CC parks (guidelines, responsible residents, work plan for activities,…);
- Fees for the collection of residual waste are high making it more attractive for residents to participate in a CC park initiative.
- Clear responsibilities for all stakeholders: compost advisor, volunteers, residents and housing company;
- Wood chips (to be paid) provided on demand.

Output, outcome and impact indicators

The following indicators can possibly be applied for CC parks at Zürich:

Output indicators

- Number of CC Parks in Zürich;
- Number of CC Parks according to size;
- Number of volunteers;
- Number of volunteers per CC Park;
- Number of volunteers according to the size of the park;
- Number of residents participating
- Number of residents participating per CC park (average);
- Number of residents participating according to the size of the CC parks;
- Quantity of information measurable via periodicals, brochures, waste journal, website,…
- Number of trainings offered by the responsible person;
- Number of participants at these trainings;

Outcome indicators

- Quality of the information provided (news value, responding to the actuality, demand, target group oriented, region specific (rural/ urban),…
- Quality of the training to be measured by satisfaction survey.

Impact indicators

- Evolution quantities of bio-waste; quantities of bio-waste in rest fraction[26] (participating residents);
- Number of CC parks that apply bio-waste prevention in a qualitative way;

[26] *No information available on how the quantities of bio-waste in the residual fraction will be measured.*

Further information

Waste department Zürich:

Theo Röösli

Compost advisor

Tel: +41 (0)44/ 645 78 79

E-mail: theo.roeoesli@zuerich.ch

www.erz.ch

Compost counseling Switzerland:

Ms. Egenolf

E-mail: egenolf@umwelt-ressourcen.ch

www.kompostberatung.ch

FACT SHEET 7

Proximity (farm) composting in Austria

Summary

Title of project/ good practice/ campaign:	20 farmers as full scale partners in bio-waste collection and farm composting
Type of prevention measure	Proximity (farm) composting
Country	Austria
Geographical level of implementation	District
Name of region/ municipality	Upper Austria/ Freistadt district
Scale	Roll out (all 27 municipalities)
Target audience	Households
Number and/or units	7950 households
Date of implementation/ duration	Since 1992 up till today
Objectives	Remove bio-waste from residual waste, use of compost as a valuable fertilizer and soil conditioners, development of a new source of income for farmers through community activities in the services sector, promotion of awareness in the public process and strengthening of regional employment situation.
Type of bio-waste	Kitchen and green waste

General characteristics

Demography and habitat	
Population district Freistadt:	64.779
Number of households :	27160
Number of households having a bioton:	8391 (35%)
Area size :	99389 ha or 993km2
Population density :	64 inh/km2
Waste (Upper Austria – 2004 figures)	
Waste generation (kg/inh/y) :	542.5
Selectively collected dry waste without bulky and hazardous waste (kg/inh/y) :	316
Bulky and hazardous waste selectively collected (kg/inh/y):	30.5
Bio-waste separately collected (kg/inh/y):	74
Residual waste (kg/inh/y):	122
Annual fixed fees for waste collection: Variable fees: Domestic waste Garden waste Containers (90l to 1100l)	90 to 110€/hhld/y 3,8 Euro / 60l bag 1,2 Euro/ 60l bag 5,7 to 68,1 Euro
Number of Farm Composting plants:	20

Context

In Austria the bio-waste from households is partly collected and partly composted at home. It is estimated that 800.000 tons of bio-waste is composted at household level[27].The separately collected biogenic waste is recovered through agricultural composting, composting in municipal facilities, commercial composting facilities commissioned by the waste management associations, by the municipalities, or others, or by means of biogas plants. Most of the compost from the numerous (small scale) composting facilities is spread out on farmland. Compost is given by the municipalities to the local population, forestry offices and allotment associations and used in local public green areas (gardens, parks, cemeteries, sports facilities, etc.). Non-recoverable residues from separate collection or sorting of biogenic waste is burned or and/or deposited in landfills. Other bio-waste such as green waste from public and private domains as well as kitchen and canteen waste are also collected and treated in the same facilities as for the collected household bio-waste.

[27] **Self-Composting in Home Gardens:** The level of volumes generated is estimated on the basis of:

- *Calculations on the number of existing "households with gardens per Federal Province";*
- *Expert opinions;*
- *Data from the provincial government offices;*
- *Calculations of the Federal Environment Agency.*

Strategy

Austria implemented successfully the proximity principle in bio-waste management. The strategy for bio-waste management followed the premise: *"As much home-composting as possible – brown-bin offered wherever home-composting is not possible – as much decentralised agricultural (on-farm) composting as possible."*

Austrian approach regarding decentralised composting of bio-waste

Whereas decentralized is sometimes thought to be associated purely with on-site treatment of organic waste (home composting, community composting, composting of organic residues within municipal departments responsible for maintaining public parks), centralized is defined as any activity where the waste is systematically collected from the producer's place and sent to a 'central' treatment facility. This does not take into account any differentiation in size (treatment capacity) or distance.

However, a common definition or scale of decentralized composting does not exist. It is rather a convention which developed in a practical implementation of source separation and composting schemes, perhaps most prominently adopted and rolled out, e.g. in Austria and the UK, and comprises of a number of structural (socio-economic) features. Therefore, there is no single (quantitative) parameter which would distinctly identify a situation as decentralized.

The following scheme types or attributes to the term decentralized can be allocated seen the Austrian situation:

1. Home composting in private gardens;
2. On-site composting at agricultural, public or commercial entities;
3. Community composting: small-scale 5 to approximately 100 m³ composting initiative of local communities;
4. Green waste composting on behalf of the municipal administration;
5. Agricultural composting: integrate farmers in the system of bio-waste management. Besides composting, it may as well comprise the (household) collection service (brown bin, food-waste bucket-system, and garden/park waste) in rural areas, and
6. Any regional collection and composting scheme which respects the proximity principle in the way in which the maximum distance between the point of collection and the composting site should not exceed 30 km; this figure is an approximation. In sparely populated areas whit distance of more than 30 km from the next settlement this would mean that it should consider to install its own small-scale composting plant. Even in a densely populated urban situation like Dublin City with a total area of 117 km², this value could be possibly achieved if a suitable site in an industrial zone can be found.

Classical home-composting or in a wider interpretation also community composting is considered to be categorized as waste prevention measure since there is no intention of the waste producer of discarding the organic residues and it is recycled within the closest possible loop.

Approach of the district of Freistadt

In the late 1980's landfill sites became rare and costs rose significantly. Therefore, the Municipalities founded a Municipal Waste Association (MWA) and decided to start a comprehensive recycling/ composting program.

A key goal was the diversion of biodegradable/compostable waste from residual waste in order to reduce disposal costs, mitigate gas emissions and leachates from landfills and produce quality compost as a sustainable soil improver in agriculture aiming for a nearly 100% recycling/ composting rate.

The key elements of the waste management plan included the establishment of 24 Recycling centers (Civic amenity sites – CAS) in nearly every Municipality for the disposal of 40 different waste types (including green waste), easily accessible for the population, and 20 decentralised farm composting plants (proximity principle).

Following figures show some photographs of the collection of the bio-waste to the on-farm composting site.


Figure 1. Food waste containers and paper bags to collect bio-waste

Figure 2. Collection container attached to the back of a tractor


Figure 3. Garden/park waste dropped off at a recycling centre

Figure 4. Typical on-farm composting site in Austria using open windrow technology with a cover/fleece

The following targets were set:

Reduction of residual waste by 40 percent by weight[28].
Assumptions: it was assumed that the bio-waste would be collected separately, that a sufficient number of farm composting plants would be created, covering the whole surface of the district and that no industrial waste management company or any composting facility may settle in the area.

Objectives of the project:

• The removal of compostable waste from residual waste makes sense from an economic (= lower landfill costs) and environmental point of view (compostable waste is the main cause for landfill problems such as leachate, odor, gas, ..)
• use of compost as a valuable fertilizer and soil conditioners to create sustainable land management;
• development of a new source of income for farmers through community activities;
• Promotion of awareness to citizens. Farm composting can illustrate that waste, disposable, and energy problems can be solved via closed economic circuits;
• Strengthening of the regional employment situation

[28] *No information available on the way this reduction was measured*

Methodology

Chronological steps in the implementation of the project (as from October 1991)

- Programming phase specifying global objectives, financial envelopes as well as specific objectives;
- Identification process including stakeholder consultation meetings to determine the specific way to go regarding bio-waste management with a special focus on local solutions for local problems (proximity principle). Identify interested parties (farmers) to enter into the program;
- Appraisal including investigations as may be required such as technical, contractual and financial aspects with a special focus on the feasibility and sustainability of the project. Beneficiaries and other stakeholders participate in the detailed specification of the program that is then assessed for its feasibility (whether it is likely to succeed) and sustainability (whether it is likely to generate long-term benefits). This includes intensive negotiations on the contract and tariffs between all concerned stakeholders;
- Training and demonstration sessions for interested farmers identified as potential composters
- Financing mechanism
- Approval of the project in July 1992: vote by the district State Government and presentation of the program to political bodies. Model contracts signed between municipalities and assigned farmers of the respective municipalities;
- Implementation of the project: June 1992: common purchase of 16 compost turning machines, two homemade machines and a shredder (funding: see cost for construction of farm composting in the district of Freistadt). arallel to the above methodological steps a pilot experiment was introduced (beginning of 1992) for bio-waste collection (50 households) using a bio-waste container. The main characteristics[29] of the pilot experiment were the following:
- Information sessions for participating households. Invitations to attend were made personally;
- 7l, 23l and 46l containers to choose from were made available to households;
- The containers had the name and address of the household on it (not anonymous);
- The container was emptied every week, no matter if the buckets were full or not (hygiene reasons);
- Farmers themselves emptied the buckets and monitored compliance to the sorting rules;
- No separate fee (apart from the existing general waste fee) was charged ;
- The cost for the farmers are paid by the municipalities and covered by the general waste charge.

[29] *No information could be provided on duration of the composting process, how often the compost wats turned, etc..)*

As from 1993, after the successful implementation test phase the program was expanded to the whole town Freistadt. 15 public information events were organised whereby the program was elaborated upon, containers distributed to the participants and the proper handling/ sorting rules of the bio-waste explained. For this 4 farm composting plants were built in the vicinity of the town of Freistadt. In 1993 and 1994 additional 'rural communities' were added to the program as well as farm composting plants built. Between 1995 and 2001 the collection of bio-waste was achieved in 24 out of the 27 municipalities. Some of the composting plants had to be expanded due to rising amounts of bio-waste collection. Throughout the implementation of the project special collection vehicles and various equipments for professional composting were purchased. An own marketing platform for compost and compost substrates was established promoting the compost as a regional natural product.

Instruments

Agreements/ contracts

There exist several cooperation models between an Agricultural Composting Plant (ACP) and the communities or the Municipal Waste Association (MWA). In most cases, the ACP has a contract with the MWA and is obliged to take over a certain quantity of biowaste and/or green waste whereby an agreed upon proportion of impurities (2%) may not be exceeded[30]. In some cases, 2 to 5 ACPs are contracted within one collection district. The delivery follows then a regular distribution key (e.g. one ACP (1) is supplied every 3 months for the duration of 4 weeks, followed by ACP (2) and (ACP (3) and so forth).

Subsidies

Subsidies are provided by the Waste management association and the provincial government for the set up of the composting plants, the windrow turners and the shredders and screening machines.

Courses, training

The public authority decided to hire and train a compost consultant for the support of area composting. In 1992, a one-week intensive compost training course was organised for 28 participants (farmers). The training course was mandatory and an essential condition for signing a contract with the local municipalities. The content of the training course was as follows: humus structure and determination, composting, microbiology, setting up a compost pile in theory and practice and getting to know different rapid tests such as pH, CO2, O2 and temperature. The same year additional training/ demonstrations were given on compost turning machines and shredders.

Communication/ sensitization

Numerous meetings took place with all stakeholders at the start of the project (1992) whereby the following issues were discussed: machinery equipment, presentation of the compost training program, determining which farmers will compost,

[30] *This is an orientation value laid down in an Austrian Standard and based on long term experience in separate collection of organic household waste. In the starting phase of source separation schemes especially with brown-bin systems in urban areas this value eventually is too tight to be met on a regular basis. Source: OENORM S 2201 Compostable waste – Quality requirements. From 01 September 2002; www.on-norm.at/ [20/11/2001)*

Support instruments

Monitoring and research

The services offered by the Austrian Compost and Biogas Association (ACBA) is covered via a registration fee (€400) and a variable yearly fee of €0.15 per ton treated bio-waste. In the ACBA database all relevant data of the ACPs are recorded including licensing data, data from the regular compost quality analyses[31], inspection reports and eventual sanctions.
On behalf of the ACBA, inspections with sampling for external full compost analyses by an acknowledged laboratory take place 1 to 4 times per year depending on size and complexity of the composting facility. All obligatory records and documents are checked. These inspections by an external expert cover two aspects: *controlling* and *advisory work*.

Controlling covers:

- Check of obligatory records and documentation (quantity and origin of materials; process control
- Obligations towards the Austrian Compost Ordinance
- Changes of management and process
- Compost use and marketing

The advisory work covers:

- Technical equipment and logistics
- Process control (water management, odour control, temperature regime etc.)
- Quality management
- Recommendations for the compost use (legal limitations and options)

Stakeholders and roles

District Waste Management Association

- Establish an enabling environment for farmers to adhere to the scheme
- Provide subsidies for the composting plants;
- Liaise with other government institutions for additional subsidies;
- Introduce the bio-waste collection system to households through information events;

[31] *No additional information on the compost quality analysis could be obtained.*

Farmers

- Run the agricultural composting plant according to the rules and regulations (quality assurance scheme);
- Collect the bio-waste (presented in biotins or bags) from households;
- Monitor the purity of the input material and apply corrective measures if required;
- Pack and sell the compost

Participating households

- Adhere to the (sorting) rules of selective bio-waste collection;
- Pay the annual general waste fee;

Actions/ features of the scheme

The key features of the recycling programme in Freistadt are summarized in the table hereunder.

Key features of the Freistadt project	Remark
Information events personally addressed to every household	15 events create commitment with the new system. Bio-buckets/ tons are distributed to every household.
Small buckets (7l, 23 l or 46 l) per household	Small buckets are easy to handle for the family as well as for the collection staff Keeps most of the garden waste on site for home composting.
Every bucket designated with name and address	This breaks anonymity: problems with impurities can be followed on a personal level; Educational effect: purity → 99.9%.
Weekly emptying	Gives a regular rhythm and hinders any nuisance by odors or flies, esthetical problems.
Collection is done by farmers	If proportion of impurities is too high, he contacts the family directly. He is the best person to motivate the households for improved source separation performance.
General waste fee per household and year	90.– to 110.– €/household/y This is considered as a *solidarity charge principle* in contrast to a *pay-as-you-throw* system).
No additional fee for bio-waste collection	This follows the solidarity principle "*we all are responsible for a cost effective waste management in the district*" → cost optimisation is gained by maximum reduction of residual waste for disposal (the most expensive option).

Legislative/ policy framework

Whenever organic waste is to be collected, it enters a *waste regime* and has to be handled according to existing legal and waste strategic frameworks. The Austrian Compost Ordinance (2001), applicable for farm composting plants too, has become the central and comprehensive legal instrument laying down standardised, nationwide rules concerning the production, marketing and labeling of compost as a product.

It defines different quality classes of compost and includes detailed rules on the raw materials that are introduced into the product, exact specifications on safeguarding the quality of the finished product and labeling requirements for compost ensuring that the consumer is provided with specific information on how to use the compost in a safe and environmentally sound way.
The ordinance defines three different quality classes[32] for compost based on the contaminant content (see attached details):

- Class A+ (top quality, suitable for use in organic production of agricultural products)
- Class A (high quality produced from separately collected organic waste; suitable for use in agriculture) for food production areas
- Class B (minimum quality; suitable for non-agricultural use) for non-food areas

A key objective is the production of a high quality compost product used as soil improver or growing media constituent with many beneficial effects to the environment and soil. This is achieved by a recently developed quality assurance scheme which includes the entire material loop. A series of standards and technical guidelines have been published which establish common requirements for an external quality assurance scheme. These are:

- NORM S 2201: compostable waste – quality requirements
- NORM S 2206-1: Requirements for a quality assurance scheme for the production of composts - Part 1: Principles for quality assurance of a company and of the internal technical processes;
- NORM S 2206-1: Requirements for a quality assurance scheme for composts - Part 2: Determination of tasks and conditions for a quality assurance organization;
- ONR 192206: Technical Guideline: Implementation of quality assurance on composting plants

The types of waste for biological recovery listed in the list of the Waste Ordinance, and applicable for farm composting make a distinction, amongst other between the following groups:

- 921: high value waste of exclusively vegetable origin for biological recovery;
- 924: high value wastes containing animal substances for biological recovery

[32] *No information on the origin of the materials for class A+ and B could be obtained.*

In each case, a differentiation is made between materials exclusively of vegetable origin and those containing animal substances as defined by the Animal By-Product Regulation (EC) N° 1774/2002. A table describing materials which are suitable for the production of high quality composts (high grade compost and high-grade compost for organic farming) is, presented in annex 1.1.

The 'Agricultural composting associations (ACA)' was in a first step founded with the aim to establishing the decentralised composting of separately collected bio-waste in cooperation with the agricultural sector (on-farm composting) and representing the interests vis-à-vis involved parties, responsible authorities and the public. Nowadays the association has grown towards a full-scale 'Quality Assurance Organisation' on the basis of the above mentioned common Austrian standards.
The certification schemes comprise both, operational process and quality management and final product approval. Thereby the most important reference is the requirements set by the Austrian Compost Ordinance which provides for a comprehensive documentation and monitoring programme.

The scheme for the quality assurance consists of measures established by the 'Austrian Compost Ordinance' as well as the 'Austrian Guideline State of the Art of Composting' issued by the Ministry of Environment. The external sample taking and approval of the compost product is performed by an independent authorized or accredited laboratory which must comply with the requirements of the Austrian Compost Ordinance regarding its competence and experience in compost analyses and sampling procedures. Above all, the composting plants are undergoing a regular inspection on behalf of the Quality Assurance Organisation QAO. The control system is based on several levels:

All the members are obliged to maintain their own records (operations book). The book should contain:

- type and quantities of the material received
- quantity of sorted waste (impurities) that is excluded from composting during the input control and after screening
- exact documentation of the rotting process (temperature, moisture etc.) - measurements to be taken at least once a week
- amount of compost produced
- quantities of compost as applied on single plots of the agricultural land

Apart from the above described legislation to comply with, the 'Agricultural Composting Plants' will have to abide to the requirements of the following federal legislations: water act, provincial nature and landscape protection act, provincial waste management act, construction laws and the planning and rural development act.

Financial modalities

The issue has been raised (EPA, 2008) that in rural areas collection and treatment costs may be proportionately higher. Therefore, it would be difficult for small-scale decentralized collection and composting plants to realize economies of scale. The composting technology required by way of waste licensing in these situations is a crucial element.

Farmers implementing proximity (farm) composting will receive subsidies for investment costs such as:

- composting plants (1/3 from the waste management association + 1/3 from the provincial government)
- windrow turners from the waste management association
- shredder and screening machine from the waste management association

Results

Results at the level of Austria

From the very beginning the agricultural sector in Austria was the strategic partner in separate collection and composting projects of regions and provinces. As a result, today 280 to 300 professionally trained farmers treat about 300,000 t of the collected organic waste. The mean throughput is 1,000 t per year. It is estimated that >35% of the entire compost produced in Austria is used in agriculture. For Agricultural Composting Plants the use of compost on their own agricultural land is estimated with 70 to 90%.

Small ACPs (ca < 1000 t/a) use all the compost on their agricultural land. Only small quantities are sold, mainly to private gardeners. The bigger ones (with up to 5000 t/a capacity) produce sometimes several products e.g. at fine (10mm) and coarse (25 mm) grade or substrate blends for different market sectors. Prices for the quality assured compost rank between €5 (fresh compost in large quantities in agriculture) and €30/t (fine mature compost in small volumes).

Figure 1: Volumes of bio-waste, according to their origin and characteristics, collected and home composted[33] in Austria (2004)

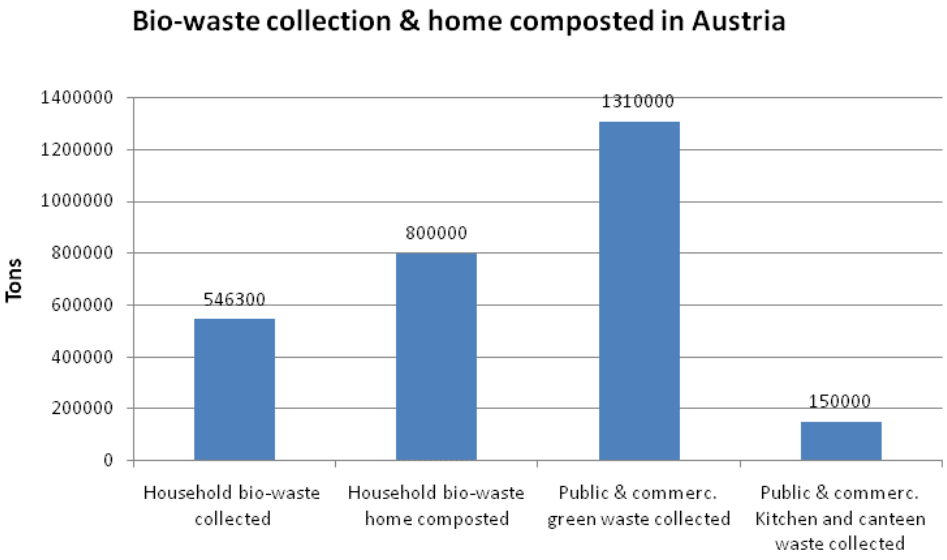
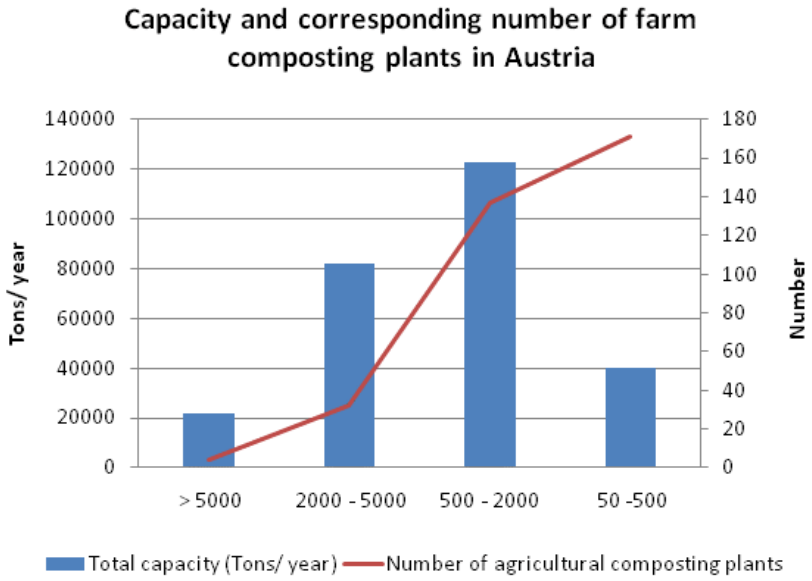


Figure 2: Capacity/ size of farm composting plants in Austria and numbers per capacity/ size (2004)



[33] *No information on whether the 800.000 tons of household waste home composted is based on estimations or real measurements.*

Nearly 50% of the total throughput of the household bio-waste is treated in Agricultural composting plants. The following table illustrates the role of agricultural composting through a few key data (2008 figures). It shows that most agricultural compost plants have capacities varying from 500 to 2000 tons (+/- 140) or 50 to 500 tons (170) treating 60000 tons more (160000 tons) than the larger plants (100.000 tons).

Number of composting plants	284
Number of biogas plant	161
Total throughput (composting) t / y	300,000
Mean throughput (composting) t / y	1000
Compost produced	ca. 110,000

The 'Kompost-entwicklung & beratung' office conducted on behalf of federal and regional authorities a study on the 'Environmental relevance of decentralized composting' including aspects such as climate relevant emissions[34], VOC, mass balances and hygiene performances (**Annex 3**).

Results at the level of the district of Freistadt

Performance data of source separation and composting in the district of Freistadt are summarised in the following table:

Treated material	Tons/y	kg /inh/y
Kitchen Waste	2,293	36 (24%)
Garden/park Waste [fine]	4,795	75
Garden/park Waste [bulky]	2,461	38
Sub-total Garden/park waste	7,256	113 (76%)
Total bio (Kitchen) and Garden/park waste	9,549	149 (100%)

80% of the compost produced is used in agriculture. 20% is sold to private customers.

The development of the district rural composting program and related collection of bio-waste from the households resulted in the full employment of about 12 jobs in the district of Freistadt.

[34] *Presented in Annex 3 of the main report*

Benefits, challenges & success factors

Benefits

Employment:

- Composting can be implemented on the spot and therefore increases the quality of work of farmers and the social relations of rural families. The majority of the compost farmers of the district are financially supported by the composting activity as a sole activity without having to rely on additional agricultural activities.

Environment:

- Sustainable improvement of the humus state of soils, good compost enriches the soil with nutrients and humus duration. It activates soil life;
- Compost improves the air-water balance of soils;
- Reduction of soil erosion;
- Improved resistance of plants to pests and diseases;
- Replacement of synthetic commercial fertilizers and pesticides;
- Active, healthy soils by using compost is essential for the production of high quality and healthy food.

Benefits for the Austrian agriculture:

- Improving soil health;
- Production of high quality manure - the replacement of commercial fertilizer;
- Contribution to facilitate conversion to organic farming;
- Active contribution to environmental protection - improved image;
- Agriculture is 'closing the biocycle';
- Simple technology, synergy in the use of existing agricultural machinery and minimum efforts for compost marketing significantly reduced costs for compost production

Benefit to consumers or for society:

- Lowest cost option to reduce the residual waste by 40 percent by weight;
- Due to lower investment costs than central "high tech" equipment less need for public funds;
- Lower waste fees for consumers than in other districts;
- High level of transparency and traceability of the organic loop in the region increased the overall confidence and identification in the system within the population.

Other positive impacts:

- Rapid implementation of the main objectives of waste management: reduction of the residual waste by 40 percent by weight;
- High operational and safety procedures through small systems and the abolition of anonymity creates confidence in the system;
- No sales problems for compost - compared to many large scale - the opposite is the case;
- Low traffic volumes of compost as decentralized - no "tourism" of bio-waste;
- No "high tech" required, lower costs;
- Raising awareness for sustainable soil management, soil protection and the importance of soil organic matter.

Challenges

Austria may serve as an example for the integrative implementation of decentralised bio-waste collection and composting which is mainly based on the cooperation with the agricultural sector.
In this respect, the Municipalities and regions agricultural chamber, the provincial Governments and the agricultural schools started a consistent cooperation in order to guarantee:

- Full scale training programmes in composting for farmers;
- Information campaigns for the population;
- Development of financing models for collection and composting investment.

The main challenges are:

- Good cooperation between farmer representatives, local government and the competent authority for waste management;
- Professional supervision of the project regarding legal, organizational and technical issues;
- Consistent commitment in the decision-making bodies and the public for decentralized rural composting, instead of a commercial-scale plant;
- Good conditions, regions with livestock (due to the higher density of organic farmers and the availability of manure)
- Consistency in the implementation of the necessary steps

Success factors

The successful introduction and maintenance of separate collection systems of organic waste depend on many features. An important aspect is the understanding and acceptance of the system by all involved parties. For instance, for inhabitants, separate collection must be convenient to handle and any odour nuisance or hygiene impacts must be avoided by means of best practice of collection schemes. This includes for example:

- Collection frequency;
- Type and size / volume of collection tools and receptacles (e.g., small buckets and/or bio-based and compostable bags for food waste collection; ca. 100 litre bags for fine garden and park organic waste ….), and
- Special offers for delivery and collection of bulky garden waste (e.g. collection campaigns and easily accessible Civic Amenity sites).

Output, outcome and impact indicators

No indicators were formulated.

Further information

Kompostgüteverband Österreich KGVO

Tel.: +43-7732-2091-0*
E-Mail1: office@tb-mueller.at, E-Mail2:horst.mueller@tb-mueller.at

Kompost - Entwicklung & Beratung
Dipl.Ing. Florian Amlinger
Tel.: +43 (0) 1 8656084
Mobil: +43 (0) 664 5308550
Email: f.amlinger@kabsi.at

ARGE Kompost & Biogas Österreich (Austrian Compost & Biogas Association)

Mr. Tulnik Robert
Tel.: +43 664 5433 440
Email: buero@kompost-biogas.info
Internet: www.kompost-biogas.info
Internet: www.biogas.klimaaktiv.at

www.land-oberoesterreich.gv.at

FACT SHEET 8

'Love Food, Hate Waste' campaign, UK (WRAP)

Summary

Title of project/ good practice/ campaign:	Love Food Hate Waste
Type of prevention measure	Food waste prevention
Country	UK
Geographical level of implementation	Nation wide
Scale	Roll out
Target audience	Households + strategic partners (local authorities, retailers, Women's Institute,…)
Date of implementation	Since 2007
Objectives	Reduce the amount of food the nation's householders throw away by 155,000 tonnes by 2010, against a 2007 baseline or more or less 5kg/household/year
Type of bio-waste	Food waste

General characteristics

Demography and habitat (UK)	
Population:	51.633.986 inhabitants
Number of households :	25.550.660
Area size :	244.820 Km^2
Population density :	240 inh/Km^2
Waste (UK – 2008 figures – total population)	
Municipal Waste generation (kg/inh/y) and tonnes:	542 or +/- 28.000.000 tons
Selectively collected waste – excl. bio-waste (kg/inh/y):	135,4 or +/- 7.930.000.000 tons
Bio-waste selectively collected and tonnes	82,6 or +/- 4.270.000.000 tons
Residual waste (kg/inh/y) and tonnes:	306 or +/- 15.800.000 tons
Annual fixed and /or variable fees for waste collection: residual waste, garden waste, selective collection, civic amenity centers	?

Context

WRAP is an organisation funded by the United Kingdom environmental ministry (DEFRA) which has three main priorities: reduce packaging, prevent food waste and design costs collection systems. It aims at diverting 8 million tons of waste materials from landfill, save 5 million tons of CO2 equivalent emissions and generate 1.3 billion Euro's of economic benefits to business, local authorities and consumers. (pour quand?)

WRAP undertook one year of food waste research[35] to identify the causes, the scale of the problem, to understand the sociological factors involved, and to develop a strategy to fight against it, concluding that around 6.7 million tonnes of food waste was produced by households yearly, having a cost of 9,6 billion Euro's. In addition, a typical household's families wasted in food the equivalent of 300 – 480 Euro's yearly.

To reduce and improve the potential food waste resources WRAP launched three campaigns with a specific focus on individuals: "recycling now", "home composting" and "Love Food, Hate Waste".

Strategy

The 'Love Food, Hate Waste (LFHW) 'campaign was launched in 2007. The main objective was to change the food cooking and shopping habits of British households. The campaign, as shown in the image below has two pillars: on the one hand awareness raising of individuals/ households directly through WRAP actions and on the other hand, by involving relevant stake holders in the campaign.

35 *All research documents can be found on the WRAP website http://www.WRAP.org.uk*

Approach

It is recognised that changing cooking, shopping and consuming habits requires strategic actions that rather than obliging, inform and suggest better ways to handle food. The challenge to overcome is the fact that these actions might require people spending more time preparing food. In order to encourage people with lack of time to waste less food, an information and sensitization campaign as 'LFHW' could be a solution.

To decrease food wastages the following strategic scheme can be followed:

- Raise awareness of the problem: Individuals are wasting food and leftovers that could still be eaten. This is becoming a real problem and they must be aware of that. This message has to be understood right from the beginning since it is the first step to get people involved and committed. It has to be made clear that food waste is causing serious environmental problems: on the one hand as it is a loss of natural resources and on the other hand as processing, packaging, and cooking of the food is emitting considerable amounts of CO2.

- Encourage/ enable actions: the message of change has to be positive and show solutions. It has to be able to change habits easily once they understand how to do it, and it should indicate the benefits. The information is classified in:
    - How to know the right amount of food: this involves information about the rations of rice, pasta, and also the distribution of fancy kitchen utensils to measure portions, as shown in the picture below;
    - How to take advantage of leftovers: this involves recipes and tips to freeze properly the food.
    -

Example of spaghetti measurements and mugs for rice

Target groups

Choosing the target groups to whom the campaign is directed was essential in the strategy. On the one side, the preliminary studies showed that young couples & families were the most appropriate groups to focus the campaign on. The project identified amongst them two different groups for which actions could be undertaken:

- the first group, the committed people were around 3.5 million people. To obtain the maximum out of them, the information campaign comprises activities that go beyond assisting them at the information points, but tries to involve them actively such as become "champion of love food". The objectives are: maintaining their enthusiasm and encourage them advocating the campaign;
- The second group are the so-called concerned. They are the ones the campaign is trying to convince. The objectives are to change their behaviours and also their perception on food. Most of them are busy couples and families.
  The characteristics they share are

- They lack the time to cook;
- They are not concerned about healthy food;
- They spend a lot of money on food, due to poor planning;
- They have difficulties in managing money

Most of the activities were focused on them, as they are the potential force to change the statistics regarding food waste

Methodology

The following steps are followed to implement a food savings and reduce waste food campaign:

- Positive media coverage: the launch of the campaign was reported in newspapers, magazines, radio, advertising... They also named the results of the previous report, and they encouraged people to know more;
- Advertising: brochures, panels, notice boards:
- Website: the site collects all the information concerning tips, advices, and recipes for food waste. The site design is user friendly and interactive, and has a private space for local authorities and retailers;
- Involve retailers and branch organisations: the large retailers are aware of the campaign and are been invited to participate in the promotions, some examples of support are:
- Tesco: clarifies and informs individuals about the meaning of the labels.
- Waitrose: provides guidance in improved storage of food, recipes and food portions in their web site;
- Involve local authorities: local authorities received the tools and the funds to implement the 'LFHW' campaigns;
- Love food champions pilot projects: the program, held with the support of '*The women's institute',* aims to bring the message of 'LFHW' into the homes, by means of encouraging people to change their behaviour and offering advice. This pilot project initially trained (train the trainers) a group of 20 volunteers (the institute staff). They were called "food love champions". The trained champions organised meetings with other interested individuals in learning best food practices. Once a month during four months meetings were held to share tips, advice, improve best practices.

Love Food Hate Waste course outline (1 day course)

Aim:

Find out everything you need to know about running campaigns to reduce food waste. This course covers how to plan and deliver communication activities including face to face communications, school programmes, community events, partnership communications and generating media coverage for your campaign.

Suitable for:

People with a sustainability, recycling or education role who want to run their own food waste minimisation campaign, especially community groups and local authorities.

Learning outcomes:

- How to encourage the public, schools and community groups to reduce food waste
- How to tailor food waste reduction messages to different audiences
- Different ways to engage the public around the topic of food waste
- The different components of a food waste minimisation campaign or programme and the likely impacts in relation to tonnage

Contents:

- How to plan and develop your campaign or programme; How to tailor your message to your audience and overcome the issues they feel prevent them from changing their behaviour;
- What we can learn from previous and ongoing case studies;
- How to maximise the impact of your campaign by linking with the national Love Food Hate Waste campaign;
- How to avoid common pitfalls; and
- Monitoring and evaluating the success of your programme.

Instruments

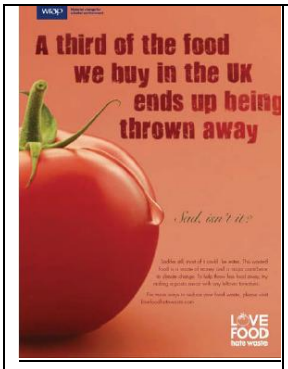
The instruments used to get involvement and results were:

Information

The love food hate waste web site covers all the information to introduce best practices; it also provided information to local authorities.

Publicity

Publicity was a core issue from the beginning of the campaign: TV, radio advertising, panels, information stands, are some of the examples that were used.



Financing and guidance for local authorities

Personalised advice from WRAP is given to local authorities in the first steps when implementing the campaign. After this, the local authorities have an intranet on the WRAP website to monitor and ask advice during the campaigns.

Means/Actions

The key stakeholders implemented the following actions:

WRAP

- Design the strategy
- Design the campaign
- Funding
- Involve local authorities

Involve local retailers

'The Women's institute'

- Recruit chair of food volunteers
- Follow up the pilot project

Local authorities

- Support and implementation of the campaign in their communities.

Retailers

- Inform and support the campaign
- 'Do not stand on the way of the campaign'

Champions of love food

- Participate in the pilot project
- Follow up on the courses
- Prepare meetings with the individuals

Legislative/Policy framework

This campaign is part of the waste strategy for the UK (2007). This strategy elaborates on objectives, actions for different parts of society, the policy approach, and indicators and targets. The LFHW campaign is categorised in the reduce objective and involves businesses, retailers, consumers and local authorities. The policies refer to informing the different target groups, set up voluntary agreements and incentivise producers, retailers and consumers. If incentives are insufficient, regulation, both upstream (materials) and downstream (landfill) will be considered. The overall indicator to which the LFHW campaign can contribute is related to the household residual waste targets and indicators have been set: 2010: 29% reduction, 2015: 35% reduction, 2020: 45% reduction from 2000 levels.

Financial modalities

WRAP is funded by the UK government. The cost of the campaigns is estimated in 4.8 million € and it took 18 months to develop. This amount includes research and implementation.

Local authorities (LAs)

They are funded by WRAP after having completed an application form. LAs however are expected to contribute to the campaign with own funding. The amount of money available to local communities is not public.

'The Women's Institute'

They are funded by WRAP. There is no information available about the cost of the pilot experience undertaken by the Women's Institute.

Results

The pilot experience showed that people that assisted to the meetings reduced avoidable food by 2.2 kg/household/week (before the meetings, the participants threw away on average 4,7 kg/household food per week), and also become increasingly conscious on the amount of good food they throw away. The group of food lovers provided a positive feedback and some of them meet at regular times to share experiences.

The continuous monitoring research undertook by WRAP showed that in January 2009, two years after the campaign was launched, 1,8 millions households were taking steps to reduce food waste, resulting in an overall saving of £296 million a year, avoiding 137,000 tonnes of food being thrown away.

How were these figures measured?

The Food We Waste research was commissioned by WRAP and carried out by Exodus Research and WastesWork to obtain more detail about the types of food and drink collected by, or on behalf of, Local Authorities. The fieldwork for the research was carried out in multiple areas of 11 Local Authorities in England and Wales – comprising over 2000 households – in autumn 2007. It included two elements:

- a questionnaire relating to attitudes and claimed behaviours relating to the generation of food and drink waste; and

- compositional analysis of food and drink waste collected by Local Authorities.

The compositional analysis focused on the food and drink waste in collections of residual waste and, where applicable, food-waste collections (including schemes where food waste is accepted in the garden waste receptacle). Food waste was separated from other waste, categorised into food type, preparation state and weighed. Other information, include the presence of packaging was also recorded *(**Annex 5**).*

Challenges and success factors

Challenges

- To involve more local authorities
- Human resources at local authority level to monitor the campaign
- To encourage highest participation of large retails company but also small / traditional retailer's shops.
- To introduce financial instruments and reward the LFHW savers
- Being creative in getting and keeping the consumers and other stakeholder's involvement

Success factors

- Aggressive/strong advertising campaign using divers media
- Involve retailers and local authorities
- Target different audiences (committed and the so-called concerned) in a different way
- Provide large amount of information through different channels

Indicators

- Decrease in organic waste
- Increase in web site visits
- Increase in inhabitants perception about food waste

Local authorities approach

Local authorities play as local actors a very important role in spreading the message at local level. WRAP covers part of the cost of the campaign and offers support and guidance for those municipalities that are interested. The community of Dorset (400 000 inhabitants) is one of the examples of a LA having implemented the program.

The campaign was carried out in 2009. The campaign is incorporated in the framework of action 1 of 'The Waste Strategic Plan for Dorset 2009, waste prevention'.

*The **actions** that took place during the campaign were:*

<u>General Promotion</u>

Display equipment

Road shows

General leaflets

Mugs for rice and spaghetti measurements

Radio announcement of events

<u>Food reduce recipes promotion:</u>

The objective is to inform people on how to reduce food waste and encourage them to change their habits. Two different actions took place:

to print and promote the book edited by WRAP, 'Food lovers cook book'. Copies were distributed during the promotional acts and they had and incredible success, the previsions were underestimated to launch a competition of 'recipes for leftovers'. The competitions claimed for recipes to use leftovers. The winning 'recipes' were photographed, exhibited in a laminated sheet and promoted.

Local retailer's involvement

They supported the events by offering promotion of the campaign and logistical support for events.

Financial issues

The cost of the events carried out during one year was around £40,000

Item	***Costs***
Cook Book	*19,063 €*
Radio promotion	*13,100 €*
Promoti□ns (disp□ay, freebies)	*8340 €*
Events	*2382 €*
Other media	*2382 €*
Staff	*2382 €*
Total costs	***47,659 €***

Results

The municipality did not undertake a monitoring survey as recommended by WRAP to follow up on the campaign. However, the following results can be highlighted:

Love Food Hate Waste Road shows

N° of road shows: 32

People reached: 16,562

Cook book distributed: 15,131

Radio advertising

An estimated 10% of road show visitors had heard about the campaign

Disappointments: due to staff resources Dorset Municipality was unable to promote the campaign through as many community groups as first wished e.g. Women's Institute Only 65 entries to leftovers competition

Further information

WRAP

Project Manager

Julia falcon

Tel: +44/ (0)1295 819671

E-mail: julia.falcon@wrap.org.uk

Love Food Hate Waste Helpline

Tel: + 44/ (0)8081 002040;

Local Authority Enquiries

Local Government Services;

Tel: +44/ (0)1295 819663

E-mail: LAartwork@WRAP.org.uk

Marketing & Event Enquiries

Alana Godley, Love Food Hate Waste Marketing Officer

Tel: +44/ (0)1295 819926

E-mail: alana.godley@WRAP.org.uk

Advertising Enquiries

Josie Saville, Mediaedge

Tel: +44/ (0)1619 309000

E-mail: josie.Saville@mecglobal.com

Press Enquiries

WRAP Press Office

Tel: +44/ (0)1295 819677/819695

E-mail: press.office@WRAP.org.uk

Interesting websites

WRAP: http://www.WRAP.org.uk/

Love food hate waste: http://www.lovefoodhatewaste.com/

Institute of Women's: http://www.thewi.org.uk/

Tesco: http://www.tesco.net/

Waitrose: http://www.waitrose.com/

Dorset: http://www.thedorsetpage.com/

FACT SHEET 9

Closed Loop Gardening (CLG) including home composting in Flanders

Summary

Title of project/ good practice/ campaign:	Closed Loop Gardening (CLG)
Type of prevention measure	Strict avoidance and reduction at source
Country	Belgium
Geographical level of implementation	Regional
Name of region	Flanders
Scale	Roll out
Target audience	Households
Number and/or units	2.195.487 households
Date of implementation/ duration	Since 1992 up till today
Objectives	• 42% of citizens participate actively in home composting • 25% of skilled citizens practising home composting in Flanders treating at least half of their bio-waste
Type of waste	Bio-waste

General characteristics Flanders

Demography and habitat	
Population Flanders:	6.160.600
Number of households :	2.195.487
Area size :	13.522 km2
Population density :	455 inh/km2
Waste	
Waste generation (kg/inh/y) :	545
Selectively collected waste – incl. bio-waste (kg/inh/y):	391
Residual waste (kg/inh/y):	153
Fixed and/or variable fees	Most municipalities and inter-municipalities apply a PAYT system. The rates vary per inter-municipality.

Context

The system of Home Composting (HC) originated in Canada and was imported to Flanders in the early 1990s. Flanders has since 1992 gradually, through renewed Household Waste Management Plans (HWMP), implemented a comprehensive HC programme. In this plans HC is considered as waste prevention and the first priority in the Flemish waste policy. More recently new and additional aspects of bio-waste prevention have been introduced and adopted such as grass cycling, greenscaping,… Since then the program terminology has (HWMP 2008) changed from HC program into 'kringlooptuinieren' = 'Closed Loop Gardening (CLG)' program. HC is since only one aspect of the new CLG program. This program focuses citizens in urban and rural areas and provides the necessary tools and instruments to make CLG possible. Apart from the beneficial environmental aspects of CLG, financial and social aspects account too. The name 'Master Composter (MC)' refers to a trained volunteer in the field of CLG that assists the Municipality by promoting CLG. The MC is part of a team supported by the environmental officer of the municipality.

Strategy

Approach (2008-2013)

Support to Master Composters and active home composters, under the coordination of VLACO vzw and the (inter-)municipalities, will allow for maintaining and improving the **yet achieved results:**

- Through continuous information and sensitisation programs citizens will continue to practise CLG activities and for every citizen that drops off a new citizen will be attracted;
- The continuous support to MC and active home composters should allow improving the quality of the composting process and subsequently the compost itself;
- Bio-waste will as much as possible be prevented at the source through in example 'waste poor' plantations. After that the accent should be put at maximal product reuse via other CLG activities such as greenscaping, grass cycling, keeping chickens or home composting;
- A new equilibrium should be sought after introducing Pay as you throw (PAYT for bio-waste. PAYT on bio-waste will lead to increased waste prevention.

The following quantitative objectives have been set for 2015:

- 42% of citizens participate actively in home composting
- 25% of skilled citizens practising home composting in Flanders treating at least half of their bio-waste – new objective in place since 2008 only

Methodology

The following logical steps will be taken when starting up a Municipal Home Composting program at (inter)-municipal level:

- Preconditions: buy-in by the municipal council, a dedicated environmental officer at (inter)-municipal level with time to set up, implement and monitor a CLG program, the basic level of the voluntary agreement signed and subsidized compost bins and boxes (in the process of being) ordered.
- Activities
    - Make publicity for a composting course being offered.;
    - Implement the training course and identify, after the course candidates to become Master Composter (between 15 and 20% of the course attendees in Flanders);
    - Subsidized bins or boxes are sold (on request) to the course participants (those who do not have one yet) including a leaflet, and information on how and where to get additional information and assistance if necessary;
    - Send identified course trainees to the next Master Composter Training program (once a year depending on the number of candidates) after a 6 months practice period (in another bordering municipality where a MC program/team is in place);
    - Set up a Master Composter municipal team under the responsibility of the municipal environmental officer and make a year planning including team meetings, activity program (see hereunder §5 for typical activities undertaken by Master Composters);
    - Set up a (inter-) municipal HC/ CLG demonstration place as an information & sensitization tool for citizens (often in the immediate surroundings of a civic amenity center);
    - Start up municipal CLG activities in order to assist the citizens in their efforts to implement CLG activities;
    - Yearly monitor the activities undertaken and assess whether all was implemented as according to plan.

Instruments

Goal seeking instruments set in the latest 'Household Waste Management Plan (2008-2013):

1. Cooperation agreement with municipalities and provinces

Flanders has initiated a cooperation agreement allowing municipalities to implement concrete actions in all kind of environmental issues. The agreement has two levels of participation: basic and distinction level. In the basic level the municipality should provide, amongst other things, the citizens with tools to compost at home. In the distinction level municipalities can opt for designing, implementing and follow up a demonstration place on home composting. 88.6% of the municipalities choose either the basic of distinction level of the agreement.

2. Pay As You Throw (PAYT) system in place

Introducing PAYT (including for bio-waste) encourages citizens to decrease the amount of (bio) waste given for collection if at the same time citizens are given the necessary tools and incentives to participate in a CLG program and as such avoid the payment of additional taxes through the PAYT system. Collection of VFG waste (excluding large garden waste) is practiced in (semi-) urban areas whereas no such collection is undertaken in rural areas. Even though home composting is practiced and promoted in both areas, rural areas are more home composting oriented.

3. Subsidies

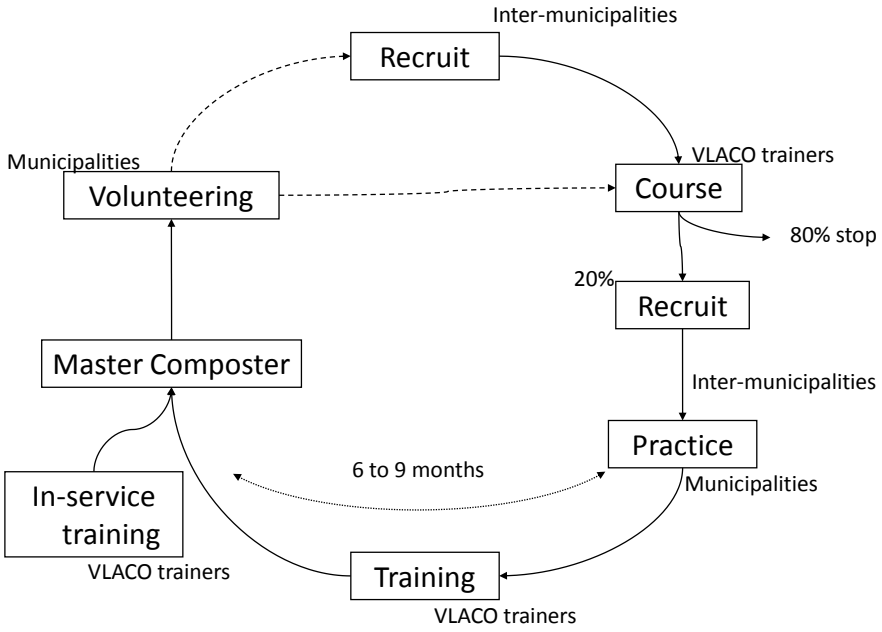
Subsidies are provided to municipalities to purchase (in large quantities) compost bins or boxes, and/or other tools for CLG. Subsidized compost bins (250l) are normally sold at between 12 to 15 Euros, compost boxes (1m3 wooden or recycled plastic boxes) between 35 and 50 Euros.

4. Contribution to VLACO (Flemish Compost Organization) – see §7 (financial modalities).

5. Transform the division of 'home composting' at VLACO into the division of CLG .

6. Provide courses, training,… to public green services, training institutes, citizens,… that want to start composting at home/ school. VLACO has set a comprehensive 3 half day module course program for citizens (min 10 persons, max 15 persons) that can be offered at (inter-) municipal level twice a year (from May till June and from September till October). Trainees interested in becoming a MC get the opportunity to follow after the 3 module course the 6 half day module MC training. Before being accepted for the MC training the trainees will volunteer for 6 months in an existing MC team to allow for gaining practice. After the training they will become Master

Composters of the existing (inter)-municipal MC team. On a regular basis (2x/ year) in service training courses are offered (list of possible subjects, up to 30) to all interested MCs on different CLG techniques, very often practical oriented. As more and more (in service) training sessions regarding CLG are offered for MC most of the MC can be considered as experts in home composting with additional skills in CLG. VLACO has throughout the years trained 40 trainers (train the trainer program), most of them MC, who are all capable to offer at least a composting course.



7. Communication/ sensitization (waste calendars, brochures, newsletters, June Compost month) to MCs, garden entrepreneurs and housholds. VLACO and OVAM as well as some (inter)-municipalities develop information (brochures, posters, fact sheets,…) and educational material regarding (blue compost box) CLG as shown in the pictures hereunder.




Support instruments

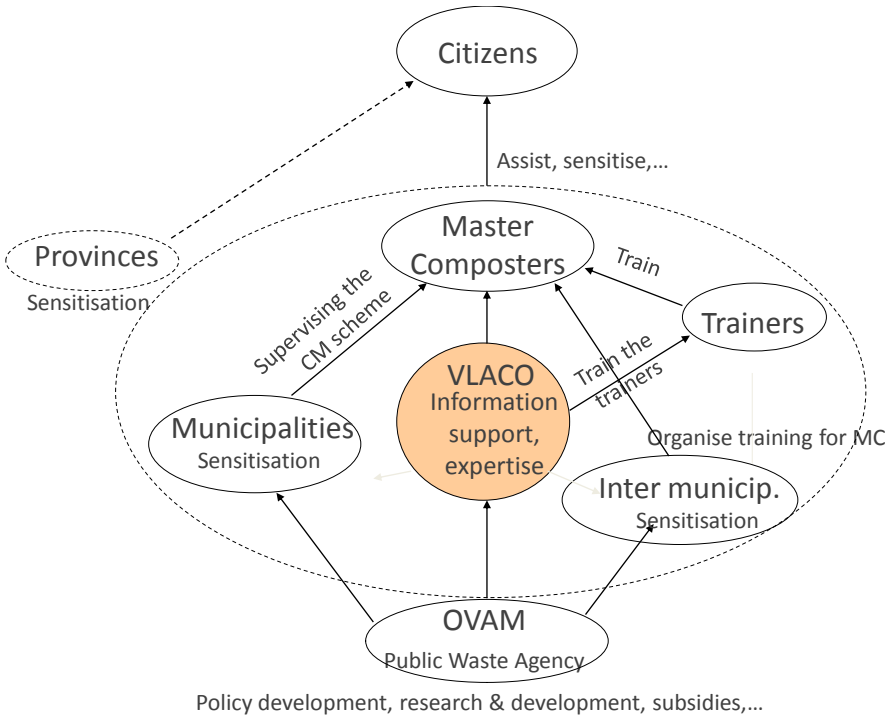
- Monitoring and research
  Monitoring is done through yearly activity programs delivered by all stakeholders in order to track all developments and make sure objectives and indicators are abided to. Research focuses on new CLG techniques, quality of home compost, possibility to roll out community composting in Flanders, improved demonstration places,…

- Five yearly prevention evaluation research of citizen targeting the quality of smart gardening, home composting and community composting in Flanders.

The used instruments should have a retention as well as a recruitment effect. The drop off rate of home composters is estimated at 3%. In the first place this percentage should be reduced. As more and more citizens will drop off (through family reasons, move,…) an active recruitment policy will remain necessary. Apart from this and even more important is the emphasis on improving the way people compost (quality aspects). Nog belangrijker dan het aantal composteerders volgens ons huidige beleid, is dat ze het kwalitatief doen (wat nu soms te wensen overlaat)

Stakeholders and roles

OVAM, Municipalities, Inter-municipalities, Provinces, VLACO (Flemish Compost Organization), Trainers, Master Composters and citizens have all a distinct role in the implementation of the CLG program.



The efficiency and impact of the CLG program relies on the different actors taking responsibility, including assigning dedicated staff for implementing the different tasks they have been requested to carry out.

Typically the role of Master Composter team (between 5 and 25 MC per (inter-) municipal can be summarised as follow:

- Design, setup and assist in the activities of a municipal CLG demonstration place;
- Design and implement school educational programs on school composting;
- Develop educational materials;
- Writing articles for the municipal newsletter;
- Organise meetings and workshops
- House visits on request and/or telephonic advice;
- Give theoretical and practical presentation to interested parties;
- Attend in service training programs offered by the pool of trainers from VLACO;
- Set up activities for the yearly event 'June Compost Month'.

Means/ Actions

The core activities by all stakeholders:

- Actions for optimising the quality of the home compost: strive for custom solutions according to regions (urban versus rural);
- Actions to promote and stimulate closed loop gardening;
- Actions to stimulate CLG regarding bio-waste through schools, professional training schools (garden institutes), citizens;
- actions to stimulate the CLG of bio-waste in public domains;
- yearly organisation of 'June Compost month'
- Support to the Master Composters and two yearly the Master composter congress (happening for all MC and their family including lectures, animation, visits,…)

Legislative/ policy framework

As composting of bio-waste at household level is not considered as an incommodious establishment and therefore does not fall under the current Flanders waste legislation (Waste decree, VLAREA,…). The following provisions however regarding home composting have been set:

- Art 5 of the 'Flanders Waste decree': reduce the harmfulness of waste and the waste of resources and energy by in the first place prevention and minimization of the production of waste, as well as preventing or reduce as much as possible the harmfulness of it;
- 'Organic-biological waste plan' for Flanders: promotion of prevention, including home composting;
- Environmental management plan for household waste
- The 'Flanders Environmental and Nature Plan 3' formulates the promotion of home composting as one way to decrease the household waste fraction.

Financial modalities

All stakeholders: VLACO, Provinces, (Inter)-municipalities, Master composters and citizens benefit in a direct or indirect way of the financial means set aside to promote CLG in Flanders. The following financial instruments are available:

- Cooperation agreement: the basic level provides the municipalities /provinces yearly with 1.7 Euro/ inhabitant and 1.4 Euro/ ha to carry out, amongst other activities, actions in the field of CLG including actions such as setting up a home composting (or CLG) team, a budget for the municipal composting team, development of educational materials,… The distinction level gives the (inter)-municipalities the possibility to finance a home composting (or CLG) demonstration place.
- Yearly contribution to the CLG division of VLACO. OVAM sets aside yearly a budget to allow VLACO to employ three FTE, to develop new (training) tools and instruments, to organise yearly June Compost Month and a two yearly Master Composter congress,…
- Subsidies for compost bins and compost boxes: (inter)-municipalities can apply for subsidies to purchase compost bins or boxes. This allows them to sell the bins and boxes at market competitive prices. Some municipalities' give an additional discount using own financial means allowing for even cheaper selling prices. Citizens can, in some municipalities, exchange free of charge their wheeled bio-waste collection bin for a compost bin/box.

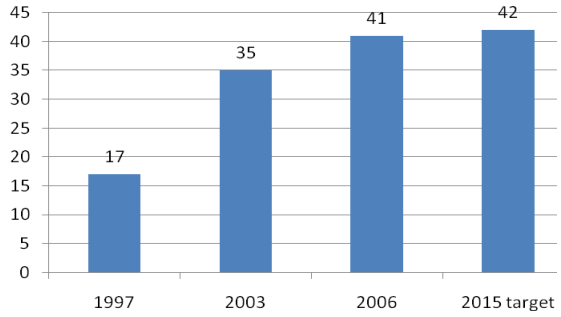
Results

The following results show the current performances measured against the set objectives mentioned above (see also **Annex 2** for methodological approach).

The amount of bio-waste in the residual fraction dropped dramatically since 1995: from 104kg/inh/y to 46kg/inh/y in 2006. The decrease of bio-waste in the residual waste fraction is due to a combined effort of selective collection and bio-waste prevention.

The % of citizens composting at home has nearly reached the 2015 objective of 42%, namely 41% of which 34% compost in a qualitative way. Flanders does not want to increase continuously the % of citizens practising HC. Rather than augmenting the amounts Flanders now seeks to improve qualitative aspects of HC.

Figure 2: % of citizens participating actively in preventing bio-waste



68% of the citizens in Flanders practice one or another form of CLG (HC, shredding, mulching, hold chicken, branch walls,…).

The number of active Master Composter is estimated at 2800 (in 2009) 2709 (2007 figures) in Flanders. Taking into consideration that Flanders has 6 million inhabitants this amount of MC represents more or less 4.4 MC per 10.000 inhabitants.

Compost quality (survey/ research 2002)

- compostable materials: citizens know fairly well what is compostable and what not
- compost techniques: turning and/or building up a pile are well understood and abided to
- compost: home compost (bins specifically) is often too wet, insufficiently digested & mature
- compost use in (own) garden is done by 77% of the residents

Quantities of bio-waste diverted from collection.

It is estimated that in Flanders +/- 100.000 ton[36] of VFG (Vegetable, Food and (small) garden waste) is diverted from landfill or in between 20 – 80 kg/inh/y through waste prevention (home composting). Apart from the FVG waste diverted another 50.000 ton of municipal green waste is diverted from landfill.

Compost systems used by the citizens composting at home (2002 figures).

Three compost systems are used: compost bin (used by 42% of the citizens), compost boxes (26%) and compost heaps (32%).

Challenges and success factors

Challenges

The following challenges and opportunities can be considered:

- Continuous recruitment of MC;
- Support, motivate and keep MC volunteers;
- New and more trainers to be trained (train the trainers) in the field of CLG;
- MC volunteers move their expertise from HC to CLG;
- Continuous information & sensitization of citizens in order to keep the current levels of participation and improved quality of composting;
- Motivated environmental officer at (inter-) municipal level in charge (part time, few hours a week) of the MC team;
- Research in the field of CLG in order to constantly improve CLG techniques.

Success factors

- Mix of goal-seeking and supporting instruments;
- Continuous information and sensitisation programs;
- Continuous support to MC and active home composters allows for improving the quality of the composting process and subsequently the compost itself;
- Pay as you throw (PAYT for bio-waste) leads to increased waste prevention;
- Clear roadmap on how to set up a CLG scheme;

[36] *This figure has been used by OVAM/ VLACO in presentations. However, we could not retrieve the way this figure was calculated.*

- A variety of stakeholders involved including specific roles and responsibilities;
- Provide regular technical, financial and moral support towards volunteers is indispensable to keep them;
- Financial subsidies at different levels (well coordinated between the different levels);
- Continuous monitoring and quality control allows for redirection and programme improvement;
- Feedback on results to all stakeholders is key for motivation.

Output, outcome and impact indicators

The following indicators can possibly be applied:

Output indicators

- Number of municipalities participating in the smart gardening/ home composting program
- Number of municipalities making efforts to promote and support HC and LCG to its citizens
- Quantity of information measurable via periodicals, brochures, waste journal, website,…
- Number of courses, training, workshops,…
- Number of participants at courses, training, workshops and other activities (JCM, CC)
- Number of municipalities supporting actively the Master Composter schemes

Outcome indicators

- Number of inhabitants that compost at home, have chicken, have a compost bin or –box
- Number of municipalities that achieve the mission of the cooperation agreement
- Quality of the information provided (news value, responding to the actuality, demand, target group oriented, region specific (rural/ urban),…
- Quality of the training, workshops, activities… to be measured by satisfaction survey
- Behaviour change through subsidies for activities regarding bio-waste prevention

Impact indicators

- Evolution quantities of bio-waste; quantities of bio-waste in rest fraction; citizens keeping their bio-waste container
- Number of citizens that apply bio-waste prevention in a qualitative way
- Number of active Master Composters per 10.000 inhabitants per Inter municipality

Further information

OVAM (Flemish Public Waste Agency)

Kathleen Schelfhout
OVAM | Stationsstraat 110 - 2800 MECHELEN
T 015 284 209
E kathleen.schelfhout@ovam.be | www.ovam.be

VLACO vzw (Flemish Compost Organisation)

Gerrit Van Dale

Kan. De Deckerstraat 37 - 2800 Mechelen
Tel : 015 451 370
E gerrit.van.dale@vlaco.be - http://www.vlaco.be

FACT SHEET 10

Re-use centres Flanders

Summary

Title of project/ good practice/ campaign:	Re-use centers Flanders
Type of prevention measure	Re-use
Country	Belgium
Geographical level of implementation	Regional
Name of region	Flanders
Scale	Roll out
Target audience	Households
Number and/or units	2.195.487 households
Date of implementation/ duration	Since 1990 up till today
Objectives	10 kg/inh/y collection & at least 50% re-used by 2015
Type of waste	Clothing, appliances, furniture, kitchenware, books, records, and bicycles

General characteristics Flanders

Demography and habitat	
Population Flanders:	6.160.600
Number of households :	2.195.487
Area size :	13.522 km2
Population density :	455 inh/km2
Waste	
Waste generation (kg/inh/y) :	545
Selectively collected waste – incl. bio-waste (kg/inh/y):	391
Bulky waste separately collected (kg/inh/y):	8
Bulky waste re-used (kg/inh/y):	3.61
Residual waste (kg/inh/y):	153
Fixed and/or variable fees	Most municipalities and inter-municipalities apply a PAYT system. The rates vary per inter-municipality.

Context

The system of Re-use Centres originated in the Netherlands and was imported to Flanders in the early 1990s. Re-use is the second priority in the Flemish waste policy, following prevention. Re-use Centres collect, sort, repair and resell discarded products, extending the useful lives of a wide range of products. Types of goods include clothing, appliances, furniture, kitchenware, books, records, and bicycles. The focus lies on quality, professionalism and sustainability. Apart from the beneficial environmental aspects of product re-use, economic effects account too as social employment (and training).

Strategy

Objectives

In addition to protecting the environment by reusing discarded goods, Re-use centres assume employment and social functions as well. Re-use centres:

- Make sure products are reused and resources recycled;
- Develop guarantees for employment for long-term unemployed people including on the job training;
- Increase the purchasing power of less financially well-off people by offering usable goods at affordable prices
- Raise awareness and increase environmental consciousness amongst the population

The following quantitative objectives have been set for 2015:

- annual collection rate of 10 kg per inhabitant of which at least 50% is effectively re-used or 5 kg per inhabitant;
- move towards 3000 FTE employment;
- 4.000.000 paying customers;
- Increased participation and satisfaction of inhabitants regarding the service offered by the re-use centres
- Increased role of the re-use centres in the promotion of prolonging the lifetime and sustainability of products

Approach

Support to re-use centres, under the coordination of the Flanders Public Waste Agency (OVAM), the provinces and the municipalities, allows for a network, anno 2010, of re-use centres covering the whole surface of Flanders.

Re-use centers committed themselves from the beginning to support social economy and employment. They offer jobs open for people who for some reasons have difficulties in finding a normal employment. As such they offer for those people training and work experience which, after a period of time, may allow them to return in the regular employment market. Many re-use centers also call on volunteers. Especially in the sorting department and the stores they are always short of hands.

All re-use centres have a similar identity including quality criteria. The re-use centres use a common name 'Kringwinkel (Re-use shop)' and have a standard house style. However, the determination of target groups to be reached and the development and implementation of actions and campaigns solely relies on the individual re-use centres.

The network of re-use centres, the Koepel Van Kringloopcentra (KVK), developed two quality assurance projects. The first one works with the EFQM-model (systematic improvement of the organisational structure), the second one with ISO 9001:2000 (the ISO quality standard translated for re-use centres). Both systems are used by all the re-use centres as a basis for constant improved business practices.

This increased qualitative approach will allow for further quantitative growth. Now that the network of re-use centers is complete and the Flanders fully covered by re-use centers, a further step of improved coordination and collaboration (and benchmarking) between different re-use centers is required.
To achieve this, however, a number of standards and best practices (eg on logistics, marketing, communication, management ...) have to be generated and implemented. This is perhaps the biggest challenge for the sector in the years to come. If this qualitative growth will evolve positively, it is likely also that the quantitative growth will continue. The Network of Re-use centers and OVAM contribute to the professionalization of the sector through their regulatory, coordinating and directing role. OVAM particularly contributes to a further embedding of the sector in Flemish (Waste) Policy.

Methodology

Before starting up a re-use centre at municipal level a situational analysis including identifying existing initiatives will have to be carried out. Often NGOs and charity organizations offer already a similar 're-use like' service. Six stages are typically identified in the project cycle of setting up a re-use centre. They are:

1. Identification: generation of the initial project idea and preliminary design
2. Preparation: detailed design of the project addressing technical and operational aspects
3. Appraisal: analysis of the project from technical, financial, economic, gender, social, institutional and environmental perspectives
4. Proposal preparation, approval and financing: writing the project proposal, securing approval for implementation and arranging sources of finance
5. Implementation and monitoring: implementation of project activities, with on-going checks on progress and feedback
6. Evaluation: periodic review of project with feedback for next project cycle.

Means/ Actions

The core re-use activities can be de defined as follows:

- Re-use centres: systematic collection, sorting and sale of goods in order to sell: The collection of goods is organised as follows:
    - Pick-up at home
    - Delivery to a Reuse Centre
    - Delivery to a municipal waste collection point

  The collected goods are then sorted (into saleable and non-saleable items), thoroughly checked, repaired or refurbished, and finally sold;

- Repair centres: specialised test and repair workplace for WEEE (Waste from Electrical and Electronical Equipment)
- Regional transfer station: collects systematically WEEE at civic amenity centres directly or indirectly on behalf of RECUPEL (EPR body in Belgium);
- Sorting centres: collection and sorting of textiles (from containers or door-to-door collection)

The activities within a re-use center are very labor intensive. There are drivers who collect the goods, warehouse responsible persons sorting the material, shop clerks who sell the products and keep the shop in order, a coordinator and administrative staff for the paperwork and phone calls and finally technical staff for the repair workshop.

Apart from the usable activities some re-use centres develop additional activities such as:

- Bicycle repair services
- Social restaurants
- Ironing workshop
- Green service
- Carpentry
- Energy cutters
- Cleaning service
- Sewing workshop
- …

Quality control: 80% of the re-use centres comply with the quality label 'Kringwinkel (re-use shop)'. The quality aspects relate to the sold products, shop infrastructure, service to customers and house style. 'Revisie', as an initiative of the 're-use' sector, provides clients with a guarantee label (up to 6 months) for second hand EEE.

Regulatory framework

A juridical description of the term 're-use centres' in Flanders has been anchored in the waste decree (B.S. 31 December 2003) as well as the basis laid down for a recognition and subsidy decision to allow for a structural growth of re-use centres. The following articles are of importance:

Article 14 § 9 - The persons who operate a re-use center, where discarded goods are collected, stored, sorted, cleaned and / or rehabilitated and sold, are subject to a grant recognition by the Flemish government. The Flemish Government specifies the rules concerning the recognition.
Article 16 § 8 - Within the limits of available budgetary provisions, the Flemish government can attribute to legally recognized re-use centers, as stipulated in Article 14, § 9, a financial contribution to the cost of operation, investment and/ or staff borne through the Prevention and Remediation Fund regarding Environment and Nature. The Flemish Government determines the conditions for the granting of these financial contributions. The new VLAREA, in force since June 1, 2004, strengthened the accreditation requirements for re-use centers (Article 3.5.2 § 3).

Financial

As from 2005, the Flemish government foresees yearly 930.000 euro for the re-use centres in Flanders. The subsidies are distributed to the re-use centres according to a number of criteria such as: number of inhabitants, surface area and re-use figures. In order to control these figures, company commissioners have been designated. Apart from regional subsidies the re-use centres can also receive (financial) support from the provinces, the local authorities for communication (free publicity in municipal publications), a re-use subsidy or project support.

Re-use centres are subject to reduced environmental charges and can claim reduced VAT rates (federal competency).

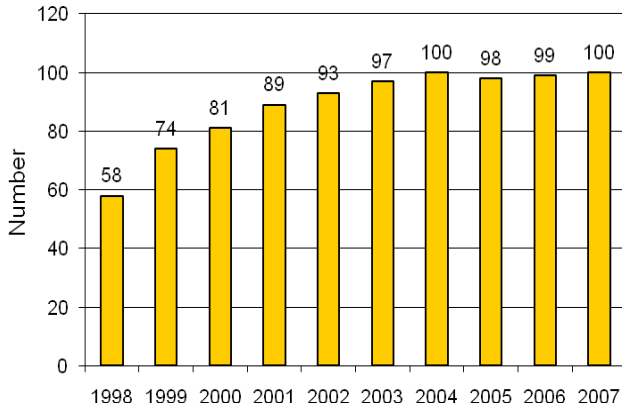
Results

Methodology for data collection

Yearly a survey is done. Up till 2009 an online system provided the re-use centers via a log-in the possibility to fill in some figures. The auditor controls and provides a certificate for the purpose of their registration and accounting system. At OVAM the figures are then collected and put in tables before treatment in report for internal analysis and follow-up. Since 2010 however, the system has changed. A new surveying system, targeting the main activities, has been designed using the spreadsheet application called 'KRISS (Kringloop Inventarisatie SyStem). This system has been designed in cooperation with the auditor, Komosie (network of re-use centers in Flanders) and OVAM. This new system allows for simplification and efficiency.

Infrastructure

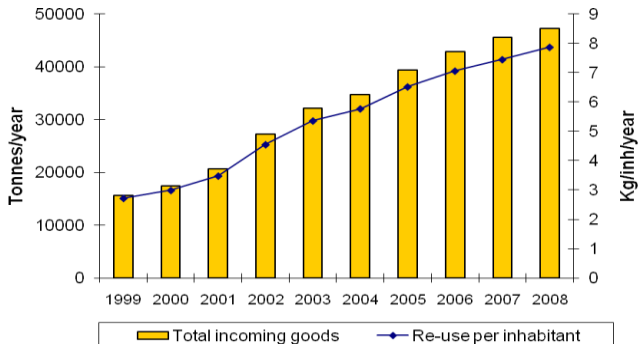
Figure 1: Evolution in the number of re-use centres in Flanders (1998-2007)



An important increase of re-use centres was achieved from 1998 to 2003 stagnating since at a level of 100 centres covering the total surface of the Flanders region. It is unlikely that a lot of new re-use centres will be added.

Incoming goods

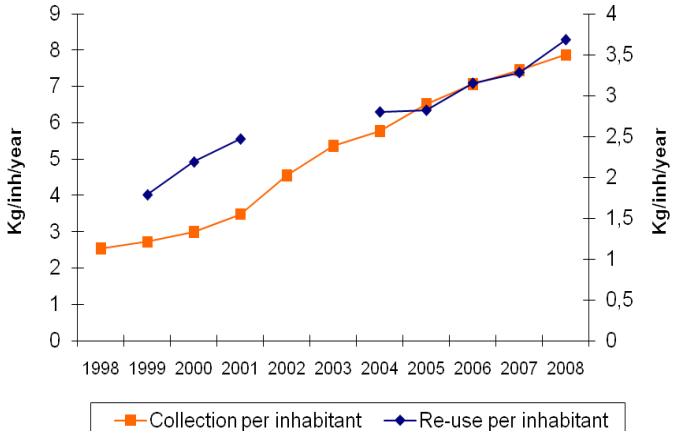
Figure 2: Evolution total incoming goods in tonnes and in kg/inh/year



In 2008, the total collection of reusable goods reached 47.218 tonnes, a ten percent increase as compared to 2007. The quantities of potentially re-usable goods per capita increased by six percent to 7.87 kg in 2008 as compared to 2007. The three most important collected product groups are furniture, EEE and textiles representing 82% of the collected goods.

Incoming and outgoing goods

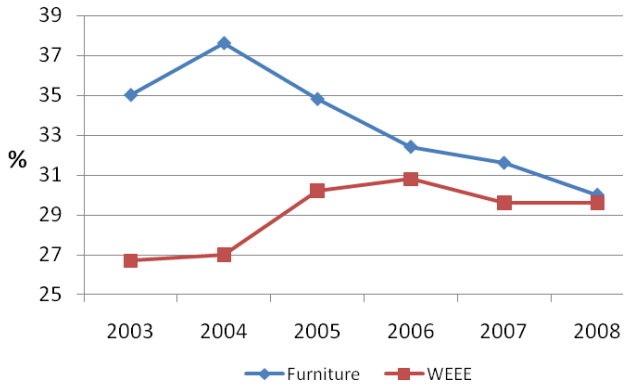
Figure 3: Evolution incoming goods and re-used goods sold



The collection of potentially re-usable goods per inhabitant increased at a rate of nearly 0,6 kg/ year throughout the years. The quantities of actual re-use (incoming goods diminished

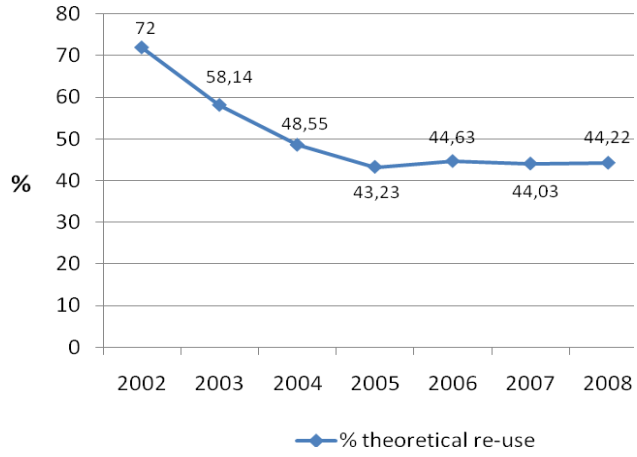
with goods that can not be re-used) per capita per year increased by ten percent, to 3.68 kg (or a little bit less than 50% of the incoming goods) in 2008 as compared to 2007.

Figure 4: Evolution collection of furniture and WEEE



The decline in the importance of both furniture and electrical equipment (more recently) is to the benefit of textiles, leisure and household articles. The increase in textile group can be associated with the increase in the textile collection containers at recycling centers.

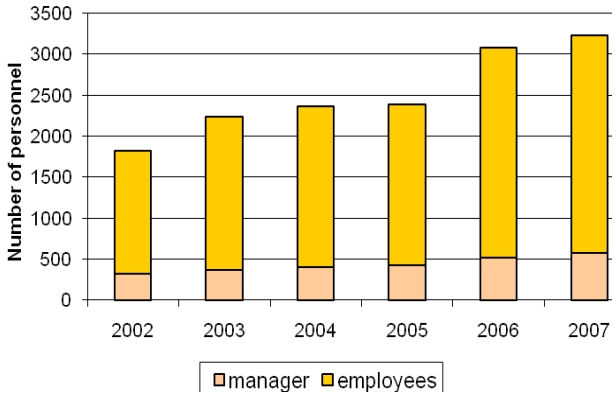
Figure 5: Theoretical re-use of all incoming goods



The theoretical re-use increased in absolute figures but decreased as a percentage of the total incoming goods. Of the 47.218 tons collected goods in 2008, 21.637 tons found a new user. Theoretical is used as changes in 'stock' are not accounted for and as the incoming goods are not measured by weight as compared to the outgoing waste and recyclables measured in real weight.

Personnel

Figure 6: Evolution numbers of persons employed in re-use centers



Personnel have kept pace with the increase of the number of re-use centers.

The workforce in the re-use sector grew from 238 in 1995 to 3 312 persons in 2008. The number of employees vary greatly per re-use center: the center with the smallest occupation employs seven people while the largest center has over 250 employees. On average, there are 107 full-time jobs per recycling center.

Finances

The operating income of the company is more or less 50% sales and 50% subsidies. The re-use centres are dependent on subsidies for 95% of the 'executive' personnel and 80% of the 'cadre' employed.

Challenges & success factors

Challenges

The following challenges and success factors can be considered:

- Side activities are more implemented in the larger 're-use centres'. However, offering different types of services such as bike rental, cleaning, ironing and others could encourage citizens to approach reuse centres more often;
- The total surface area (shop + business area) of re-use centres combined with an increased collection rate puts pressure on the available surface;
- Training for long term unemployed persons to be considered as an ongoing activity within reuse centres;
- Allow for more repair and creative workshops will allow an increase in the quantity of bulky material that can be reused;
- A strong image & communication strategy including a clean, tidy and well arranged shop with specific sections for groups of products and clear prices, developing a website, organizing promotional actions, fashion shows, using a loyalty card system, etc, will attract clients;
- Inventory management is complex to implement as re-use centers do not have a standard offer of products, sales management by subdividing the sales according to groups of articles;
- Client registration and follow up is non existing (might be useful for special customer tailored actions);

Success factors

- The combination of volunteers, social & regular employment make the scheme socially and economically viable;
- Creation of a network of reuse centers as a basis for harmonization, monitoring and quality control;
- Re-use being only one of the activities amongst others at re-use centers;
- Quality control and guarantee labels improve trustworthy and seriousness of the scheme;
- Low prices attract citizens;
- Clear anchoring of the term 're-use centers' in legislation;
- Funding possibilities are divers and complementary (region, provinces, local authorities.

Output, outcome and impact indicators

The following indicators can possibly be applied for re-use centers:

Infrastructure

- Re-use centres and location
- Shop surface
- Business area surface
- Vehicle park

Incoming goods

- Total incoming goods
- Collection per collection method
- Collection per product group
- Collection per inhabitant
- Collection (treatment) per m2

Outgoing goods

- Re-use and re-use percentage
- Re-use per inhabitant
- Shop sales per product group
- Re-use per product group

Personnel

- Employment in number of persons and FTE
- Status of the employed personnel
- Education level of the employed personnel

Further information

Kringloopcentra Vlaanderen – Komosie vzw
Uitbreidingstraat 470
2600 Berchem
Tel: +32 (0)3 281 03 30
info@komosie.be
http://kringloop.net

OVAM

Veroniek Mahieu

Stationsstraat 110

2800 Mechelen

Tel: +32 (0)15 284 315

Email: vlemahieu@ovam.be

www.ovam.be

CONCLUSIONS & RECOMMENDATIONS

There is no 'magic' formula to implement bio-waste prevention programmes. Numerous initiatives are taken, most of them at local and regional level in the European Union. However, very little detailed information on decentralized bio-waste strategies, approaches and results are available and when available, very often fragmented and incomplete.

This report has tried to investigate more in depth some of the most successful bio-waste prevention strategies in Europe. It has become clear that fundamental behavior changes regarding optimized bio-waste management options, one of the most important issues when implementing such strategies, are not self-evident. The barriers are numerous. The consumption behavior of consumers is embedded in complex social and institutional context.

Conclusions

The survey describes several **bio-waste reduction techniques** making a distinction between separate green or food waste management techniques as green scaping, smart gardening and fight against food waste as well as combined green & food waste strategies as home-, community- and on-site composting. The techniques are described hereunder.

Greenscaping allows to avoid and reduce green waste generation through greenscaping techniques such as (1) put the right plants, preferably native and adapted plants, in the right places taking into consideration their growing potential, (2) use slow growing grasses where possible, (3) allowing for "meadow areas", where a field vegetated primarily by grass is left to grow wild, and (4) install low maintenance design features such as lawn edgings and hard surfaces between landscape features reducing weeds, trimming and use of herbicides. This differentiated management not only implies less green waste generation to be collected and treated (eventually disposed) but also favours and supports a richer biodiversity.

Smart gardening minimizes the green waste when applying techniques such as (1) leaving grass clippings on the lawn, also called grass cycling, after cutting rather than bagging and setting them out for collection, (2) use grass, woodchips, compost as mulching materials in between bushes and trees, and (3) removing leaves only when necessary; reuse branches as wattle work; wall of branches; insect walls, etc.

Act against food wastage avoids and reduces food waste generation and redistributes edible food to people in need via organisations by applying the following possible measures:
for consumers (1) improved purchasing behaviour taking into account the real needs and the life time of products, (2) improved storage techniques allowing for less food waste and (3) food preparation techniques. Commercial establishments as distributors, HORECA can themselves also influence their clients behaviour by (1) preparing the right portions, (2) charge a supplement when food is left on the plate, and (3) selling food close to "use by" or "best before" dates at reduced prices.

Home and Community composting**,** not always regarded as prevention, recycles kitchen and garden waste (resource) into a most valuable products called compost. Home and community composting are, since many years now, amongst the most popular techniques to reduce bio-waste at a decentralised level. Programmes include outreach, bin subsidization, and educational workshops. Many municipalities organize training programs. In these programs, a compost specialist trains a group of volunteers, who themselves become master composters. They in turn train others in the community on proper composting techniques. Other municipalities produce show-and-tell programs. These programs include demonstration gardens and composting education in local school science curricula, which allows children to learn about composting in the classroom and then bring the knowledge home to teach to their families. Staff needs for a successful home & community composting program depend on the size of the community and on whether bins are being distributed.

On-site institutional composting such as universities, schools, hospitals, correctional facilities, green spaces managed by public authorities and farms, are uniquely suited to composting because they typically generate large quantities of bio-waste materials and have land available for composting. Institutional composting can reduce disposal costs or provide opportunities for research and development on new compost technologies.

All 10 fact sheets highlighted a number of **challenges and success factors** experienced by the different studied bio-waste prevention programmes. The most important challenges and success factors are summarised hereunder providing the reader with at the same time warnings, pitfalls to take into consideration as well as the good practices to keep in mind when designing a bio-waste prevention programme.

Challenges

The following challenges have been identified:

- Home, community and proximity composting should be seen as complementary schemes that should run in parallel with centralised composting schemes;
- SMART (Simple, Measurable, Achievable, Reproducible and Timely) targets (preferably as part of an overall waste prevention programme) are seldom set, a prerequisite though for successful implementation;
- How to involve residents by providing, amongst other, financial incentives;
- Quantities of waste diverted may not reach expected levels due to low demand/participation rate resulting from lack of knowledge, cost of bins and lack of space;
- Budgets to run the bio-waste prevention schemes are often underestimated and do not take into account all aspects such as promotional activities and awareness raising actions, subsidies for bins & boxes, personnel, training of Master Composters and residents, monitoring,…;
- Information & sensitization of residents is often ad hoc or only at the start up phase (or pilot phase) of the programme;
- Moving from a pilot project scheme to full roll out requires proper planning including access to bins, garbage bags, and other relevant material in all the communities/ municipalities at all time;
- How to find, recruit, motivate and keep volunteers (Master Composters);
- Keep in mind and strategise on the 'motivators' to start home composting by residents, in rank order: bigger garden, free home compost bin and advice on how to make compost;
- Be creative in getting and keeping the residents and other stakeholder's involvement;
- Very few bio-waste prevention programmes are properly monitored. As a result limited information is available on qualitative and quantitative results of the schemes;
- Local authorities need to give the example: sensitising them, hold in-house composting events to promote uptake of bins by Council employees will make the programme more credible, accessible for all;
- Motivated environmental officers at (inter-) municipal level in charge (part time, few hours a week) of the programme is indispensable;
- Community composting parks have particular challenges:
    - Most CC Parks are run by volunteers. LA has to take responsibility if problems occur (in example, no key-holders/ volunteers anymore to run the CC Park);
    - CC parks without fences and opening hours (few only) may have problems with contaminants;

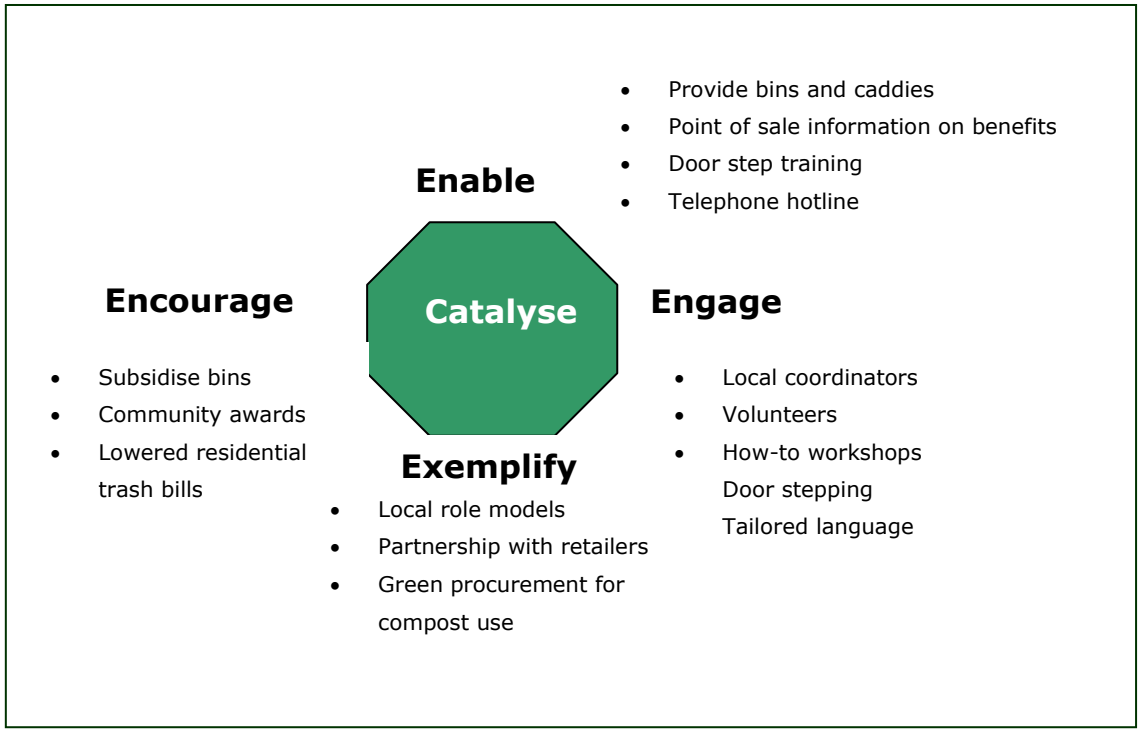
- Control (by the key-holder) on the incoming materials is important in order to avoid contamination;
- Visibility of the CC Park is important for social control;
- Finding and recruit volunteers (key-holders);
- Maintain the motivation and enthusiasm amongst volunteers and residents;
- Turning a compost pile is heavy labour putting a burden to older volunteers;
- Nuisance for local residents (pests,…)
- Insufficient structure material such as wood chips,…;
- Disputes between residents/ key-holders or between key-holders.

Success factor

- Know your municipality (bio-waste generation, environmental awareness, cultural behaviours, willingness to participate in community projects,…)
- Get, apart from municipal financing, direct and indirect support of regional department and national authorities
- Cooperate with national networks on specific sub-themes;
- Imbed the bio-waste prevention program in a larger waste prevention program
- Set SMART targets as they will allow for improved monitoring;
- Involve all stakeholders from the earliest status of the project;
- Have a team of trained compost advisors (Master Composters) and provide regular technical, financial and moral support towards volunteers;
- Establishment of a network of Master composters as a structural engagement to recruit, motivate and keep volunteers;
- Drafting clear and binding cooperation agreements between different stakeholders;
- Target different audiences (committed and the so-called concerned) in a different way when communicating;
- Provide large amount of information through different channels and do it on a continuous basis;
- Good communication and cooperation between concerned municipal services increases support;
- Regular surveying (including visual checks), research and monitoring of the composting process
- Make sure the participants know the full cycle of the composting process, including the use of compost;
- Pay as you throw (PAYT for bio-waste) leads to increased (bio-) waste prevention;
- Continuous monitoring and quality control allows for redirection and programme improvement;
- Feedback on results to all stakeholders is 'key' for motivation.
- Success factors related to community composting parks:
    - Pre-conditions to be fulfilled before planning;
    - Clear roadmap on how to set up a CC park;
    - The support of the waste department for studies and technical, logistical support;
    - Well designed, simple and neat CC parks;
    - Flexibility regarding the number of participants, the CC parks size and the design of the CC parks;
    - Information support through fact sheets, website, at the CC parks (guidelines, responsible residents, work plan for activities,…);
    - Fees for the collection of residual waste are high making it more attractive for residents to participate in a CC park initiative.
    - Clear responsibilities for all stakeholders: compost advisor, volunteers, residents and housing company;
    - Wood chips (to be paid) provided on demand.

Recommendations

Whatever decentralized program on bio-waste prevention, one should always have an approach that considers to provide stakeholders with instruments and tools (enable), to provide financial incentives (encourage), to involve as much as possible stakeholders (engage) and finally give, as a local or regional authority the example (exemplify). In the UK they developed a model, called 4 'E's'. This model is the most complete change model ever implemented. Sustainable solutions require not only supportive communities, inclusive rather than egoistic societies but also policies targeting behavior changes, a green fiscal scheme and adapted convincing instruments. In other words, in order to solve complex problems a plural policy with hard (enable and encourage) as soft (exemplify and engage) instruments need to be deployed.



- *Enable* - help people make responsible choices by providing them with education, skills and information, and by making those choices easier with easily accessible alternatives and suitable infrastructure.
- *Encourage* - government can look at the most effective techniques to encourage and, where necessary, enforce behavior (e.g. through price signals, peer pressure, league tables, funding, or regulation).

- *Engage* - strategies will work best if individuals are involved at an early stage. Remote messages from the government are often not the best way to do this; face-to face contact is often considered more appropriate. Deliberative Forums are an option as they allow more in-depth discussion about options, and allow discussion between people who have strong and conflicting views or are experts in their field. Research shows that communications campaigns work best when part of a larger strategy.
- *Exemplify* - government needs to lead by example in demonstrating the importance of considering waste prevention.
- *Catalyse breaking habits* - there is a need to view all of the strategies and policies together with a view to long-term behaviour change, which may take time.

Ideally this 4 'E's' model is coupled to a detailed (ecological) segmentation model of the population. The objective is to come to a specific target group policy. As such a right mix of instruments is tuned to different segments of society. Several studies have highlighted that different segments can be identified in society. This work shows also that the first E (Enable) is crucial for all segments. Offering accessible, affordable and attractive sustainable alternatives is the first and most important step towards sustainable behavior.

According to the literature there is, apart from an enabling policy (make sustainable alternatives widely available), only one method that can change the behavior of people, namely touch them in their purse (dis)encourage. Via a review of the pricing mechanisms unsustainable choices can be financially discouraged, whilst making on the other hand sustainable, green choices cheaper.

Road map for implementing (bio-waste) prevention programmes

The different phases hereunder are part of a road map on how to implement efficient and effective bio-waste prevention programs. The example is taken for a Community Composting park (CC Park) but could easily be adapted for any other (bio-) waste programme.

PHASE 1 - Planning

1. Visit projects
2. Collect ideas
    a. Keep a brainstorm session
    b. Think lateral
3. Be realistic
4. Ook at finances
5. Surch for advice

PHASE 2 – GROUP FORMATION

1. Establish working groups and comites
2. Determine statute of volunteers
3. Insurance(s)

PHASE 3 – WRITE A BUSINESS PLAN

1. Develop a business plan
2. Theme's
    a. Summary
    b. Background information
    c. Project description
    d. Budget
    e. Risk analysis
    f. Project (expected) results
    g. Sustainability of the project
    h. Financial faisability

PHASE 4 – SITE AND APPROVAL

1. Find a place
2. Factos influencing the choice
3. Stedebouwkundige vergunning
4. Environmental permit

PHASE 5 – DESIGN & MANAGEMENT OF THE PROJECT

1. Design the CC park
2. Safety
3. Management of the CC park
4. Shredders
5. Sieves
6. Monitoring and quality control

PHASE 6 – HEALTH AND SAFETY

1. Points of attention
2. Health and safety policy

PHASE 7 – USE OF COMPOST

1. Use of compost products

PHASE 8 – PROMOTIONAL ACTIVITIES

1. Promotion of the CC park
    a. Attract new volunteers
    b. React on possible negative information
2. Open days
3. Training at different times

PHASE 9 – KEEP VOLUNTEERS

1. Number of volunteers
2. Keep volunteers
3. Flexibility

PHASE 10 – SOCIAL INCLUSION

1. What is meant by social inclusion?
2. Nature therapies
3. Employ people
4. Protect vulnerbal groups

ANNEX

Annex 1 - Environmental relevance of decentralized composting in Switzerland (Zürich)

The information hereunder is taken of a study commissioned by the Zürich 'Entsorgung + Recycling service (disposal and recycling services)' and undertaken by the 'Umwelt- und Kompostberatung (Environment and compost advising)' in 2008.

Introduction

Greenhouses gases (CH4, CO2, O2 & H2S) were measured in CC parks in Zürich and compared to measurements done in Basel and in literature.
With portable gas measurement equipment the following gases were measured:

- Methane (CH4)
- Carbon dioxide (CO2)
- Oxygen (02)
- Hydrogen sulphide (H2S)

The methane (CH4) compared to the volatile carbon matter (CH4 + CO2) or (CH4/ CH4+CO2) is of particular interest when measuring carbon reduction.

Materials and methodology

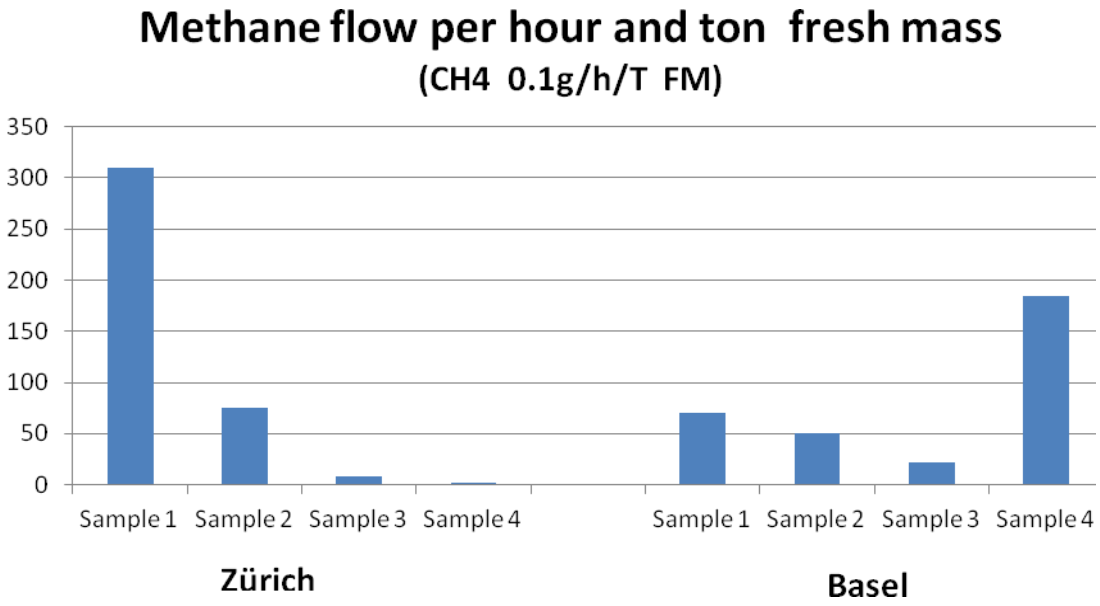
In Zürich 10 CC parks each comprising 5 compost boxes and 5 compost heaps were selected for measurement. As measuring tool a closed box was superficially put in the compost box or heap in order to avoid false air entering the box. Then, using a small hose the gas concentrations were sucked and measured every 30 seconds using 4 different sensors (CO2 with infrared, CH4 catalytic and O2 and H2S electrochemically). Before every measurement the temperature was measured using a second thermometer.

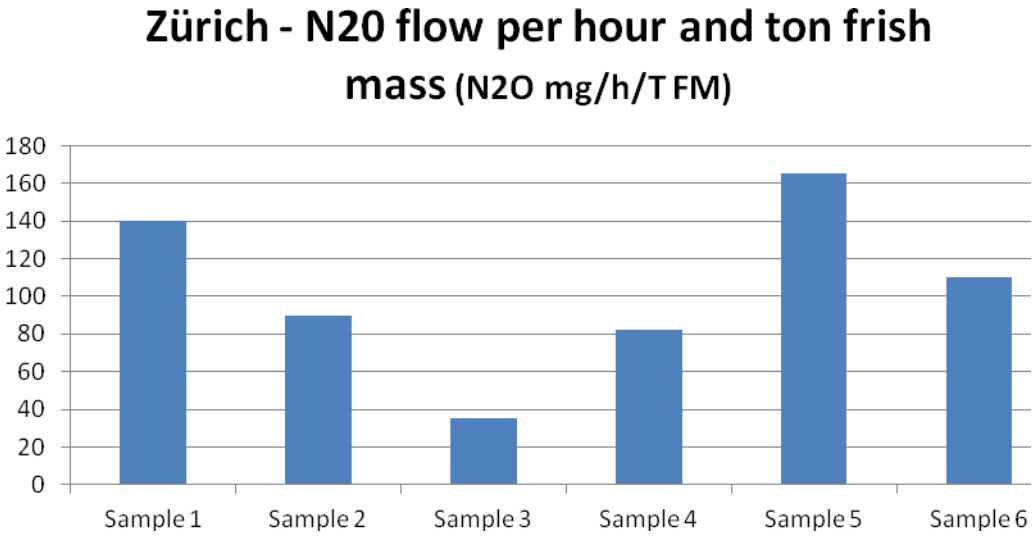
The gas measurements were carried out with a specifically for this purpose designed measurement tool: the 'Drager Xam 7000'. The following sensors were installed: methane 0-5%, CO2 0-100%, O2 0-25% and H2S 0-100ppm. Once per monthe the measuring tool was calibrated.

More information on the measurement equipment is available on:
www.draeger.com/STms/internet/site/MS/internet/CH-de/ms/Branchen/Bergbau/Entsorgung/Abfall/Tragbar/Xam7000/aw_Xam7000.jsp

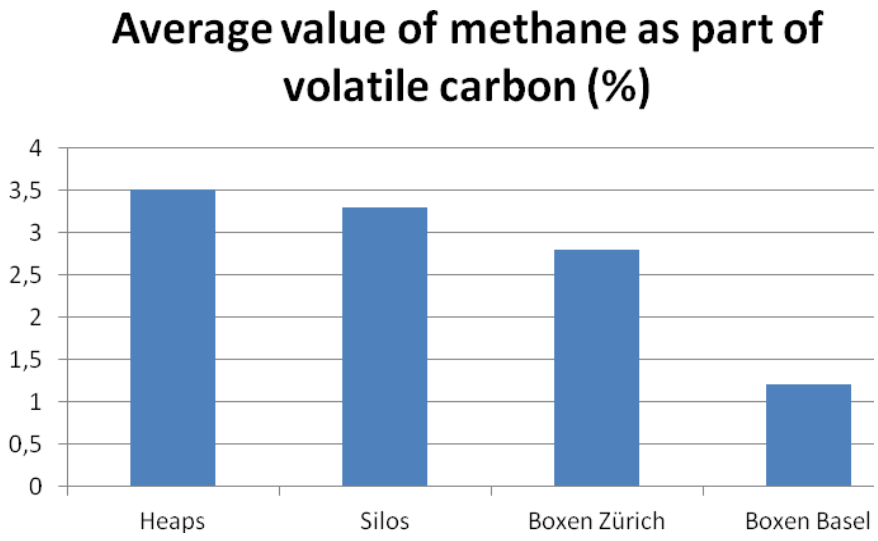
Results

The methane flow is directly related to the measured concentration. Is the concentration high then the flow will be high. Therefore the methan part can be clearly distinguished of the volatile CO2, as only the equation 'methane to CO2' has to be calculated.

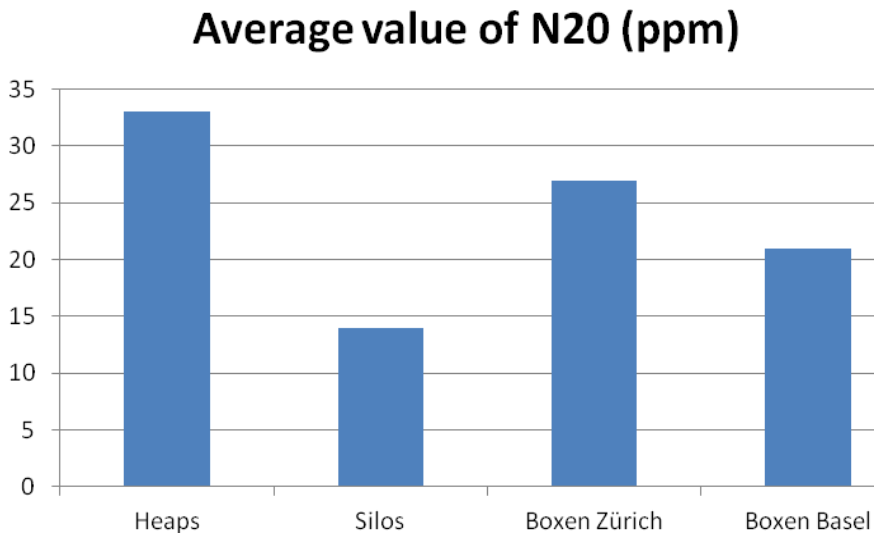




The large differences between measuring values is visible for CH4 as well as N20. There is also no correlation between the different gases in one sample.



The CH4 emissions are much higher when measured in heaps but below what was found in literature (literature previously indicated factors of up to 10% of the total carbon emissions). This proportion in this research was around 2 - 3.6%.



The difference between Basel and Zurich is that next to the boxes, heaps and silos measurements were also carried out in Zürich. There are sites with generally low values, but others where only the value of nitrous oxide is very high. In addition, in Basel measurements were carried out several times on the same site.

The greenhouse effect lies, with values between 0.38 and 0.62 t CO2-eq t 1 OTS-1 clearly under recent literature values. Compared to similar materials used in heap composting with regular turning, the home composting however has to be classified as unfavorable with a factor of 1.5 to 7.

As a measure of the effectiveness of aerobic conversion, the relationship between the emission factors for CO2 to CO2 eq is proposed. Values significantly higher than from 0.3 to 0.5 tend to indicate unfavorable composting conditions down. The home garden composting rate was in between 0.55 and 0.87. These higher values must be attributed to the lack of regular mixing and aeration in the compost pile.

Measurement tool at a box using the portable equipment and a filled gas bag in Basel.

Annex 2 - Flanders

The annexes presented here below have been drafted in order to accommodate question on the Flanders facts sheets on 'community composting' and 'closed loop gardening including home composting'.

Annexe 2.1 – Survey prevention kitchen and garden waste, small hazardous waste and e-waste in Flanders households

This annex is based on the OVAM study: 'Preventie-evaluatieonderzoek voor GFT-en groenafval, KGA en AEEA (Prevention-evaluation research for Kitchen and garden waste, small hazardous waste and e-waste'.

The telephonic survey targeted three different waste streams. The questions presented here below only refer to the section home composting.

Home composting questions

1 Are you composting at home?

- Yes
- No, but I'm planning to do so in the future (go to question 18)
- No (go to question 17)

2 What is the percentage of kitchen and garden waste you compost at home? Is this…

- Less than 25%
- 25-50%
- 50%-75%
- More than 75%

3 What is the percentage of kitchen waste you compost at home? Is this…

- Less than 25%
- 25-50%
- 50%-75%
- More than 75%

4 How do you compost at home? *(Different answers possible)*

- Compost heap
- Several compost heaps
- Compost box with 1 section
- Compost box with many sections
- Compost bin (or silo)
- Worm bin
- Other……

5 Are your regularly mixing of turning your compost?

- Yes,
- No,
- Never heard about, I don't know about it, didn't know it was recommended

6 Are you considering adding mix of greens (grass, kitchen waste,…) and browns (leaves, small branches, woodchips)?

- Yes,
- No,
- Never heard about, I don't know about it, didn't know it was recommended

7 Do you have in your garden sufficient greens and browns?

- Yes (got to question 9)
- No, too little browns
- No, too little greens

8 How often do you collect browns (structure material, woody materials) at the civic amenity center or elsewhere (family, friends, ….) for use in your compost?

- Never
- Seldom
- Sometimes
- Often

9 Do you experience problems with home composting or with the quality of the compost?

- No
- To wet
- To dry
- To rough
- To little variation regarding the input materials
- Bad odors
- Too little information on what can be composted and what not
- Vermin
- Other……

10 What are you doing with your compost? *(Different answers possible)*

- I do not have compost yet
- Use in own garden/ vegetable garden
- Use in garden/ vegetable garden others
- Use in flower beds
- Gardener takes it with him
- Put for collection of kitchen and garden waste
- Not yet used (harvested)
- Other……

11 Did you experience at using your own compost?

- Yes, please specify……..
- No

12 Do you buy extra compost?

- Yes
- No

13 For how long have you been composting at home?

Number of years

14 Will you continue to compost in the future?

- Yes (go to question 16)
- No

15 Why are you planning to stop composting at home? *(Different answers possible)*

- Too difficult
- Lack of space
- Lack of time
- Odor problems
- Hinder of vermin
- Esthetical reasons (sight)
- Too little knowledge
- Selectively collection of kitchen and garden recently in place
- Too little material
- Not enough structure material (browns)
- Other…..

16 Why are you composting? *(Different answers possible)*

- Ecology, environment, contribution to sustainable world
- For ease
- Financial gains/ Cost of waste bags/ cheaper than (selective) collection
- For the compost (as soil conditioner)
- Recycling idea, closed loop thinking
- Because of information received at information sessions, brochures,…
- Convinced by family, friends, neighbours,…
- Convinced by Master Composter
- No idea
- Other…….

17 Are you planning to start composting in the future?

- Yes (go to question 18)
- No (go to question 19)

18 Why are you planning to start home composting? *(Different answers possible)*

- Ecology, environment, contribution to sustainable world
- For ease
- Financial gains/ Cost of waste bags/ cheaper than (selective) collection
- For the compost (as soil conditioner)
- Recycling idea, closed loop thinking
- I move to a house with a garden
- Because of information received at information sessions, brochures,…
- Convinced by family, friends, neighbours,…
- Convinced by Master Composter
- No idea
- Other…….

Go to question 20

19 Why do you not consider starting home composting?

- Too difficult
- Lack of space
- Lack of time
- Odor problems
- Hinder of vermin
- Esthetical reasons (sight)
- Too little knowledge
- Selectively collection of kitchen and garden recently in place
- Too little material
- I have no garden
- The municipality collects the kitchen and garden waste anyway
- Gardening isn't my hobby
- Friends, family have a garden where I can bring my kitchen waste
- I do not need compost
- Never thought about it
- No idea
- Other…..

20 Have you practiced home composting in the past?

- Yes
- No

21 Why did you stop?

- Too difficult
- Lack of space
- Lack of time
- Odor problems
- Hinder of vermin
- Esthetical reasons (sight)
- Do not need compost
- Too little knowledge
- Selectively collection of kitchen and garden recently in place
- Too little material
- I have no garden
- The municipality collects the kitchen and garden waste anyway
- Gardening isn't my hobby
- Friends, family have a garden where I can bring my kitchen waste
- I do not need compost
- Never thought about it
- No idea
- I moved to a house without garden
- I have too little green and kitchen waste, I didn't have a garden
- Other…..

Annexe 2.2 – How has bio-waste been quantified as a percentage of the overall waste

Methodology

This annex is based on the OVAM study: 'Sorteeranlayse- onderzoek huisvuil 2006 (Sorting analysis – research household waste 2006)'

The sorting analysis of the household waste comprises 3 season related measurements of household waste collected from 2000 households over a representative sample. The measurements took place in winter, spring and autumn of 2006. At each household the waste was collected three times using the normal collection rounds of the collection company.

The following analyses were carried out after collection:
- Determination of the filling weight of the bags or containers;
- Sorting of the waste in different pre-determined fractions;
- Analysis of the inert rest fraction.

How was the representative sample taken?
The aim of the sample should be such that the results of the research is representative for each of the different typologies and for the Flanders region as a whole.

Typology of municipalities
The following criteria were used:
- Rural or urban
- GFT region (Kitchen and garden waste collection in place) or Green region (Green waste collection and/or bring system)

The 308 Flemish municipalities then were subdivided in 4 typologies:
- Urban – GFT region
- Urban – Green region
- Rural – GFT region
- Rural – Green region

Accuracy and reliability
For each typology 500 families were selected. Therefore the results of the sorting analysis have the same accuracy and reliability for each of the typologies.

Choice municipalities
For each of the 4 typologies of municipalities 500 households are selected. Each family is a sample point. 50 sample points per selected municipality were taken. As such 40 municipalities were involved in the sampling exercise.

Choice of sampling points
The sampling is taken over 2000 households spread over 40 municipalities divided in 4 typologies (as described above). Households are chosen at random per municipality. It is assumed that this gives a representative picture of the Flemish population in the field of composition of the household, social professional situation of the population and housing stock in the Flanders region.

Sample taking
The three samples (winter, spring and autumn) should allow for season bound differences. The collection is done on a normal collection day. A collection vehicle collected before the normal collection round the waste bags offered for collection. The bags were not compressed. The waste from the waste bins were collected with an open collection vehicle and emptied manually. Waste is collected per typology. This means that per typology the waste of 500 families is collected from 500 households over 10 municipalities. The collected waste was then brought to the sorting center of SITA recycling Services.

Sample research
Weight waste recipient

Each of the ciollected waste bags is weighted at the sorting location (accuracy up to 0.02kg) The number of waste bags is also registered.

The total amount of the waste from the waste containers is measured (accuracy up to 20kg). The number of emptied waste containers is registered in order to specify the average density.

Composition household waste
The household waste is sorted per typology. The waste from the same typology can be collected spread over different days.

Sorting
The workday after the collection the waste is sorted. The household waste is put on a round sorting table and manually sorted according to predetermined sorting rules. Each of the sorting people sorts a number of fractions out of the waste. These fractions are collected in separate recipients. In total 26 waste fractions were sorted (11 part of the plastic fraction).

The bio-waste is sorted in 3 different fractions. Two fractions (compostable organic kitchen waste and garden waste) are compostable and should in principle be collected by the separated collection of kitchen and garden waste (GFT-region) or green waste or could be composted at home. One fraction (non-compostable organic kitchen waste) is not compostable.

Weighting
Each of the 26 fractions is weighted with an accuracy of 0.02kg. The data are collected per typology. The weight of each fraction against the total amount of sorted household waste per typology is presented in weight percentages providing the relative part of the waste

fractions in the household waste. Taking into account the results of each typology the average composition of the Flemish household waste can be calculated (in weight percentages).

Chemical analysis
Based on the content of organic carbon (C), the organic matter content can be calculated.

Organic C x 1,7 = organic matter

Research done by VLACO (Flemisch Compost Organisation) shows that fresh kitchen and small garden waste has an organic matter content of 22%. Kitchen and small garden waste is comparable with the compostable organic material that is part of the household waste.

X kg Organic matter = (X x 100/22)kg compostable organic material

Based on this calculation it is possible to measure the amount of compostable organic material in this fraction of the household waste. After this the amount of inert rest fraction can be measured.

Rest fraction = compostable organic material + inert rest fraction

Results (bio-waste fraction)

Per typology and time of the year

Organic waste	Winter	Spring	Autumn	Average	Absolute weight
	Weight %	Weight %	Weight %	Weight %	In kg/inh
GFT region & urban	34.22	42.3	32.8	36.47	35.72
GFT region & rural	30.18	34.41	26.11	30.23	22.32
Green region & urban	50.92	56.8	40.6	49.29	64.00
Green region and rural	50.48	50.29	47.37	49.38	58.60

Relative composition household waste (evolution)

Sorting analysis	1995-1996	2001	2006
Fraction	Weight %	Weight %	Weight %
Organic fraction	**48.34**	**43.07**	**40.10**
Compostable organic kitchen waste	39.24	38.37	31.01
Non-compostable organic kitchen waste		1.52	4.74
Garden waste	9.10	3.17	4.35
Paper and cardboard	17.75	14.30	10.54
Glass	3.15	2.40	2.58
Metals	3.89	3.23	2.67
Plastics	7.71	11.62	15.45
Other	19.61	25.38	28.66
Total	100	100	100

Annexe 2.3 – Compost quality at community composting parks (CCparks) in Flanders

The following results have been extracted from the document: 'Het wel en Wee van Wijkcomposteren (State of the art community composting in Flanders)' - 2001.

Introduction

In order to get a better insight in the community composting 'Organic Waste System (OWS)' was commissioned by OVAM and under the supervision of VLACO to carry out a research on the quality of the composting process and the compost produced in 6 different locations in Flanders: two large scale community composting parks (Pavilions) and 4 small scale operations.

Methodology

The following research was carried out:

1. Visual control with assessment fact sheet
2. Interviews carried out with the responsible persons
3. Samples taken and analysed on different parameters
4. Temperature profile

Compost analysis

Immediately after sampling the analyses were carried out on the compost samples. In the OWS laboratory the following analysis were carried out:

- Dry matter (DM)
- Organic matter content (OM)
- Conductivity (or salt content) (EC)
- Kjeldahl nitrogen (Kj-N)
- Weeds
- Chlorine (Cl)
- Maturity
- Phytotoxicity (germination of Cresson seeds)
- Nitrate – nitrogen (NO3-N)
- Ammonium – nitrogen (NH4-N)
- Impurities and stones

The heavy metals were examined by another laboratory.

For each parameter an average was determined including the standard deviation as well as the minimum and maximum values. As a matter of comparison the under- and upper limits of values for professional composting were presented, as well as the VLACO norms (when available).

Temperature profile

Responsible persons at the CCparks were asked to measure the temperature twice a week during two months (December to February 2001). A thermometer of 1m long and temperature monitoring sheet were given to the responsible. The places and heights for measuring were determined during the site visits by OWS in order to be able to measuere the temperature in different compost stadia. The temperature at 5 cm depth was considered fresh material in the compost pavilion and the temperature at 100 cm depth corresponding to a compost of 30 days old.

The following figures show a number of CCparks that were investigated. Bottom right is a compost pavillion.

Results

The temperature profile and compost analysis are described in detail per CCpark. The results hereunder provide a number of details summarizing the results.

Compost analyses

Results of compost analyses

Translations of terms: Plaats = place, gemiddelde = average, standaard afwijking = standard deviation, ondergrens = under limit, bovengrens = upper limit,EC = conductivity, vochtgehalte = humidity, organische stof = organic matter, % op DS = % on dry matter, % op ver staal = % on fresh sample.

Results of the compost analyses : total and extractable levels of nutrients

Plaats	P_2O_5	K_2O	CaO	MgO	P_2O_5	K_2O	CaO	MgO	P	K	Ca	Mg
	% op vers	% op vers	% op vers	% op vers	% op DS	% op DS	% op DS	% op DS	mg/l	mg/l	mg/l	mg/l
Oostende	0,43	1,24	2,76	0,25	0,93	2,69	5,99	0,54	564	5200	4305	502
Dilbeek	0,57	0,92	2,57	0,24	1,56	2,52	7,03	0,66	867	4200	5890	596
Mechelen	0,40	0,99	1,39	0,20	1,32	3,26	4,57	0,66	540	3600	2595	392
4 wormen	0,18	0,08	0,96	0,11	0,59	0,26	3,15	0,36	263	348	2910	298
Scarabee	0,26	0,29	1,67	0,16	0,85	0,95	5,48	0,53	369	1380	3600	306
St-Amands	0,43	0,31	1,27	0,21	1,15	0,83	3,41	0,56	675	1520	2188	388
gemiddelde	0,38	0,64	1,77	0,20	1,07	1,75	4,94	0,55	546	2708	3581	414
standaard afwijking	0,14	0,47	0,73	0,05	0,35	1,22	1,51	0,11	215	1896	1358	116
minimum	0,18	0,08	0,96	0,11	0,59	0,26	3,15	0,36	263	348	2188	298
maximum	0,57	1,24	2,76	0,25	1,56	3,26	7,03	0,66	867	5200	5890	596
ondergrens (GFT)	0,45	0,50	1,10	0,20					400	2500	1200	300
bovengrens (GFT)	0,80	1,30	3,00	0,60					800	6000	7000	800

Translation of terms: % op ver = % on fresh material, Plaats = place, gemiddelde = average, standaard afwijking = standard deviation, ondergrens = under limit, bovengrens = upper limit

Results of compost analyses

Plaats	kiemkrachtige zaden	rijpheid	onzuiverheden	steentjes	fytotoxiciteit	
	aantal / 100 ml staal	°C	%	%	%	verdunning (*)
Oostende	0	27,5 (V)	0,40	0,00	29,3	350/1400/455
Dilbeek	0	21,0 (V)	0,00	0,00	51,1	400/1200/400
Mechelen	0	35,5 (IV)	0,20	0,00	86	350/1400/455
4 wormen	1	21,0 (V)	0,00	0,00	10,1	1600/0/160
Scarabee	0	23,0 (V)	0,80	0,40	12	1100/550/275
St-Amands	0	21,5 (V)	0,30	0,40	11	1100/550/275
gemiddelde	0		0,28	0,13	33,3	
standaard afwijking	0		0,30	0,21	30,3	
minimum	0		0,00	0,00	10,1	
maximum	1		0,80	0,40	86,0	
VLACO-NORM	**0**	**< 40**	**< 0,5**	**< 2**		
ondergrens (GFT)	0	21,0 (V)	0,00	0,00		
bovengrens (GFT)	1	42,0 (III)	0,30	1,00		

Translations of terms: Plaats = place, gemiddelde = average, standaard afwijking = standard deviation, ondergrens = under limit, bovengrens = upper limit, verdunning = dilution, staal = sample, aantal = number, Kiemkrachtige zaden = germinating seeds, rijpheid = maturity, onzuiverheden = impurities, steentjes = stones.

Results of compost analyses: heavy metals

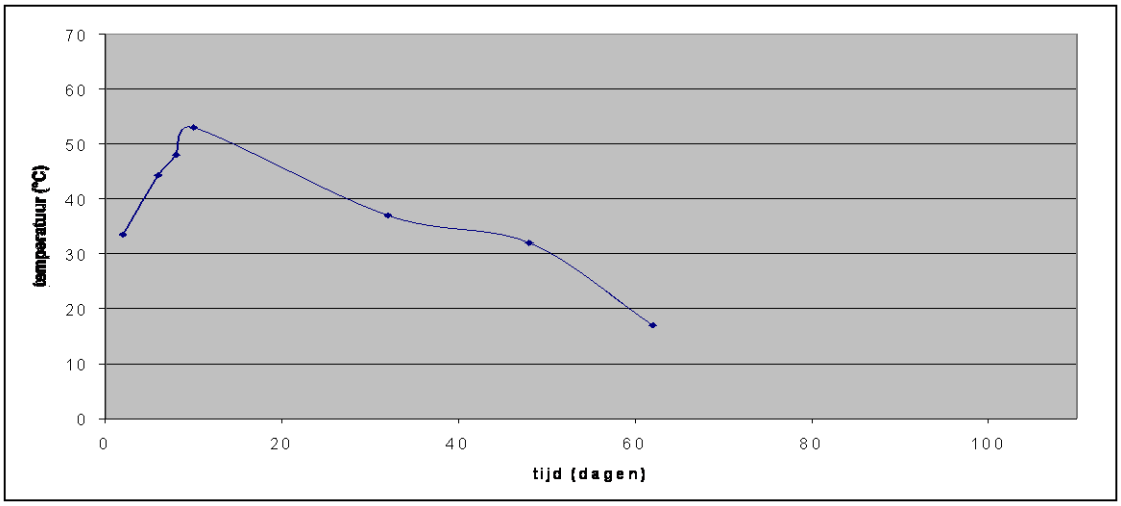
Plaats	Cd	Cr	Cu	Hg	Pb	Ni	Zn
	mg/kg DS	mg/kg DS	mg/kg DS	mg/kg DS	mg/kg DS	mg/kg DS	mg/kg DS
Oostende	0,57	11	27	0,048	29	7,6	201
Dilbeek	0,88	12	49	0,014	32	14,4	321
Mechelen	0,69	7	37	0,036	15	10,8	134
4 wormen	2,21	11	37	0,021	152	11,5	193
Scarabee	0,72	14	2436*	0,071	65	13,0	128
St-Amands	1,06	11	22	0,076	40	11,8	184
gemiddelde	1,02	11	34	0,044	55	11,5	194
standaard afwijking	0,61	2	10	0,026	50	2,3	70
minimum	0,57	7	22	0,014	15	7,6	128
maximum	2,21	14	49	0,076	152	14,4	321
VLACO-NORM	**< 1.5**	**< 70**	**< 90**	**< 1**	**< 120**	**< 20**	**< 300**
ondergrens (GFT)	0,40	1	30	0,00	40	2	170
bovengrens (GFT)	1,20	41	70	0,40	100	19	280

Used abbreviations: Cd =cadmium, CU = copper, Zn = zink, Cr = chrome, Hg =Mercury, Ni = Nickel. The grey colored boxes are values that exceed the VLACO norms.

Temperature profiles

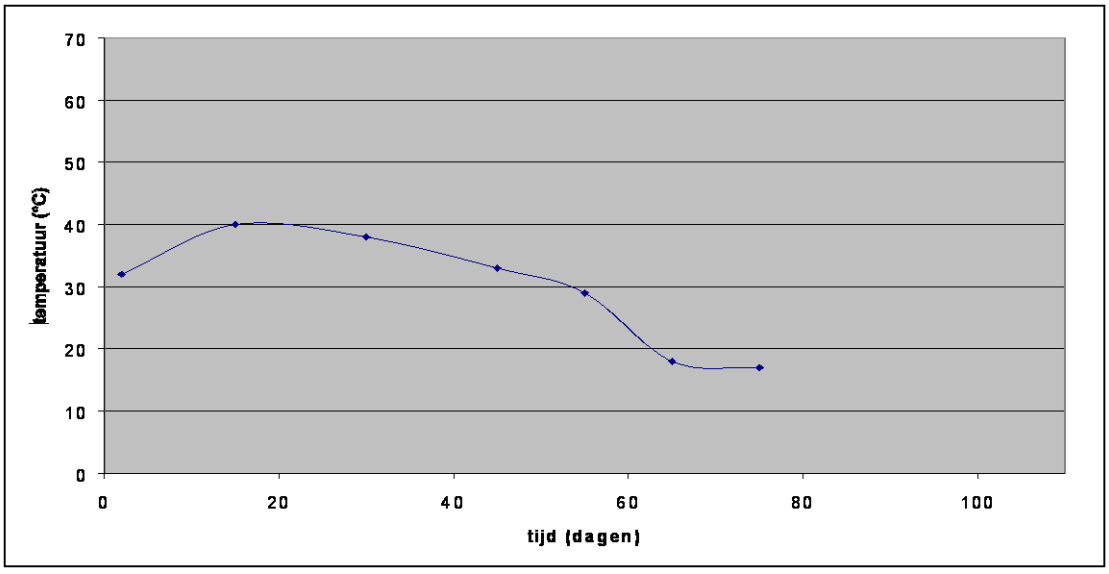
Two examples are shown (one larger CCpark and a smaller one.

Compost pavilion Dilbeek



Translation: Tijd = time, dagen = days

Scarabee Antwerp



Conclusions

Temperature profiles show higher temperatures in the compost pavilions (larger) than the smaller ones (winter conditions).

The compost analyses show the following trends:

- Conductivity and chlorine: low to normal as compared to prof. compost norms
- pH values are within VLACO norms
- Organic matter: normal to relatively high as compared to prof. compost norms
- Kj-N was from relatively low to relatively high as compared to prof. compost norms
- NH4-N was very low for all samples
- Nitrates were higher than the norms
- Only one sample had germinating seeds
- Impurities and stones were exceeded for one sample
- Phytotoxicity exceeded the VLACO norms for all samples
- All nutrient values were well normal as compared to the prof. compost norms
- VLACO norms were exceeded for heavy metals (Ca, Cu, Pb and Zn) in 3 samples

No general conclusions were taken from the above results. It was only recommended to have more samples taken in the future. The main recommendations were adding sufficient structure materials (browns) and the covering of harvested mature compost.

Annexe 2.4 – Compost quality at community composting parks in Flanders

The following results have been extracted from the document: 'Inventarisatie en doorlichting van de wijkcompostering in Vlaanderen (follow up on 2001 study) (Inventory and screening of community composting in Flanders).

Methodology

A compost sample was analyzed at each of the 10 studied community compost parks (CC Park). Sample taking, preparation and analysis were done according to the compendium for sample taking and analysis. At five different places in the mature compost a sub sample was taken. Each sub sample has on average 5 to 10l of compost. The sub samples are mixed and out of the mixture a sample of 20l is taken. The final samples are brought to the library the same day and within one day prepared for analysis.

The following parameters were analysed:

- Dry matter/ humidity
- Organic matter content
- Nutrients
    - Total nitrogen
    - Phosphorus total and extractable
    - Potassium total and extractable
    - Magnesium total and extractable
    - Sodium total and extractable
- Heavy metals (Cd, Cr, Cu, Ni, Pb and Zn)
- Acidity (Ph)
- Salt content/ chloride
- Conductivity
- Maturity
- Germinating seeds
- Phytotoxicity

Apart from this temperature measurements were taken. For this a hay pole sensor with datalogger Testo 110 (calibrated) was used and a standard template to register the data.

Results

Summary of the results

- All compost samples were too humid. 50% had a humidity of 70 to 80%.
- pH values varied between 6.3 and 8
- Low salt content (even though higher in compost bins as compared to compost boxes)
- Ammonium content low and relatively high nitrate content for most of the samples which shows a good nitrification (= good decomposition of the organic matter)
- According to the maturity test most samples were ripe/ mature, even though some samples had low nitrate content
- Most samples did not have germinating seeds
- Phytotoxicity was in between 1.5 and 10.2% which is much lower than the results of the 2001 study
- All heavy metals values were under the VLACO-norms.

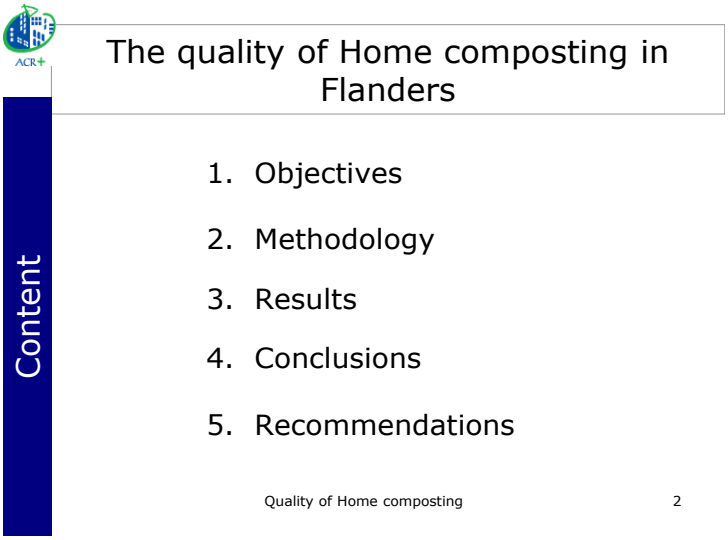
Summarising table of the results

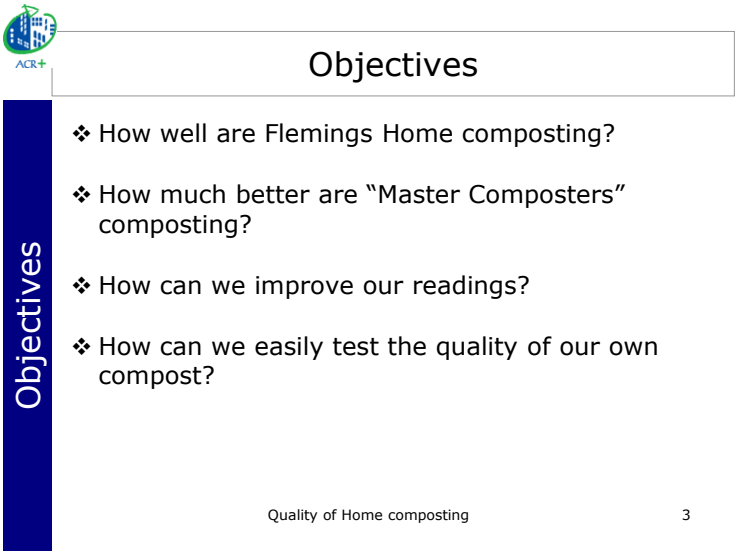
Wijkcompostering	Gemiddelde waarden professionele compost (standaard deviatie)	VLACO-norm	Londerzeel	Mol	Aalst	Dilbeek	Willebroek	Bornem	Torhout	Eeklo	Antwerpen	Assenede	Eenheid
Organische Stof (vers)	25,26 (5,36)	>18%	14,7	13,7	14,9	31,4	17,4	16,1	19,3	13,7	13,6	17,5	% / VM
Organische Stof (droog)	*37,14 (7,76)*		*34,9*	*44,6*	*48,2*	*69,2*	*64,4*	*61,7*	*72,6*	*69,2*	*66,7*	*53,2*	*%/DS*
Totaal Stikstof (%/VM)	1,1 (0,22)		0,36	0,18	0,56	0,5	0,2	0,29	0,51	0,52	0,47	0,57	% / VM
E.C. (1/5)	2493 (594)		1285	601	923	524	899	808	997	1396	1629	1231	µS / cm
pH (H2O)	8,63 (0,4)	6,5-9,5	6,3	7,3	8	6,6	7,8	7,5	7,6	7,2	7,9	7,6	-
Volumedichtheid			0,446	0,556	0,556	0,33	0,511	0,534	0,466	0,586	0,521	0,561	kg / L
Zware metalen													
Cadmium (Cd)	0,66 (0,14)	<1,5	0,6	0,3	0,2	0,3	0,9	1,3	0,3	0,3	0,8	0,6	mg/ kg DS
Chroom (Cr)	22,9 (4,3)	<70	16	2,7	6	12	12	17	8,7	8,8	8,2	23	mg / kg
Koper (Cu)	50,4 (11,2)	<90	22	8	14	26	20	25	22	40	31	26	mg / kg
Lood (Pb)	50,6 (6,2)	<120	30	7,6	11	12	13	56	9,6	12	139	40	mg / kg
Nikkel (Ni)	10,1 (1,4)	<20	9,7	1,7	3,9	18	6,8	11	5,2	5,9	5,6	12	mg / kg
Zink (Zn)	241 (44)	<300	178	59	73	37	130	177	96	143	161	154	mg / kg
Chloriden		1200-2400	425	85	197	13	232	174	355	444	543	353	mg / L
NH4-N	329,4 (114, 5)		10,8	8,4	1,2	71,5	1,3	1,3	1,3	1,3	< 1,0	< 1,0	mg / L
Vochtgehalte	31,63 (7,67)	25-40	57,9	69,3	69,1	54,6	73	73,9	73,4	80,2	79,6	67,1	%
NO3-N	28,2 (42,1)		80,8	133,5	88,2	115,2	70	< 1,3	3,4	< 1,3	< 1,3	130,5	mg / L
Totaal P2O5	0,65 (0,14)		0,218	0,066	0,397	0,147	0,226	0,22	0,251	0,178	0,257	0,293	% P2O5
Totaal K2O	0,97 (0,22)		0,424	0,078	0,245	0,239	0,422	0,316	0,557	0,457	0,583	0,604	% K2O
Totaal MgO	0,54 (0,13)		0,2	0,04	0,13	0,4	0,31	0,11	0,14	0,13	0,12	0,19	% MgO
Extraheerbaar P	713 (230)		252	447	824	22,7	311	348	268	265	450	414	mg / L
Extraheerbaar K	4471 (1285)		1670	1475	2377	439	2194	1453	2039	2654	2947	2636	mg / L
Extraheerbaar Mg	521 (90)		273	397	595	384	320	242	221	334	312	416	mg / L
Kiemkrachtige zaden	0	0	32	0	0	0	0	0	2	2	6	0	# / L
Fytotoxiciteit (Kiemremming)		-	NVT	NVT	10,2	1,5	2,5	7,6	4,8	NVT	NVT	NVT	%
Rijpheidsgraad	28,52 (9,38)	<40	23,9	29,3	25,3	24,5	23,8	23,7	24,1	26,2	26,7	22,6	°C
Vochtgehalte (inzet rijpheidsgraad)			57,7	68,5	70,7	63,9	76,9	72,5	73,5	81,1	77,7	66	%
Klasse	V		V	V	V	V	V	V	V	V	V	V	-
Extraheerbaar Na			122	33	88	3	13	14	17	22	50	16	mg / L
Totaal Na2O			0,039	0,003	0,024	0,014	0,021	0,02	0,034	0,026	0,074	0,028	% Na2O

Annexe 2.5 – The quality of home composting in Flanders

The following results have been extracted from the document: 'De kwaliteit van thuiscomposteren – resultaten van een verkennend onderzoek – 2002 (The quality of home composting – the results of a preliminary research).

A PPT synthesis was made previously and used for presentation in Spain and other countries. The PPT gives a good summary of the objectives, methodology and results of this study.





Target groups & objects

Methodology

- 100 Home composters (citizens) whereby analysed:
  - 42 compost bins
  - 26 compost boxes
  - 32 compost heaps
  - No wormeries
- 31 Master composters (60 objects)
  - 20 compost bins
  - 20 compost boxes
  - 10 compost heaps
  - 10 wormeries (incl percolate)

  during 3 seasons: Autumn (dec) 2000, spring (may) & summer (sept–oct) 2001

Quality of Home composting 4

Investigations Home Composters

Methodology

Visits to **Home composters**

- 100 samples for analysis
- Observation file
- Temperature measurement
- Questionnaires

Master Composters

- Samples for analysis (3x)
  - Dec 2000, April & Aug 2001
- Observation file (self) for input material, turnings, odour & T°
- Temperature measurement
- Questionnaire

- Dry matter
- Organic content
- Conductivity
- Ammonium & nitrate
- Total nitrogen
- Weed seeds
- Maturity
- Heavy metals
- Food elements
- Chlorides
- Phyto toxicity
- Stones & inpurities

Quality of Home composting 5

How they compost

Results

Home composters

- 86% have no problems
- 20% use starters
- 50% reduce input materials
- 19% use lime
- Less knowledgeable about composting

Master Composters

- 90% have no problems
- Don't use starters
- 94% reduce input materials
- 23% use lime
- Good knowledge about composting

The survey reveals that

Results

Home Composters (HC)

- Compost
  80% of kitchen waste
  60% of garden waste
- Input material
  bin: 64% kitchen waste
  box: 56% garden waste
  heap: 64% garden waste
- Other input materials
  Meat and sauce: 10%
  Fine prunings: 75%
  Hedge shearings: 33%
  Grass: 62%

Master Composters (MC)

- Compost
  100% of kitchen waste
  100% of garden waste
- Input material
  Bin: 58% kitchen waste
  Box: 77% garden waste
  Heap: 85% garden waste
- Other input materials
  Meat and sauce: 5%
  Fine prunings: 100%
  Hedge shearings: 100%
  Grass: 100%

The observation files reveal that

Results

The placement of the bins is done correctly (on stones)

- 50% of the Home Composters
- 86% of the Master Composters

Temperature at sampling

- ±20°C by Home Composters
- 5 à 10 °C above surrounding T°, always < 30°C
- Higher by Master Composters

Chemical analysis

Results

- In general: good quality
- Most values comparable to professional Green Compost
- No difference between seasons
- Large differences between 4 systems
- Bin: Conductivity, N and C/N comparable with professional VFG compost
- Little stones and inpurities

Conductivity (EC)

Results

	EC
	uS/cm
VFG - Prof	1950-3200
Green - Prof	750-1650
Heap	732
Bin	2065
Box	1089

What?

- Measurement for salt content
- Lots of salt in the soils hinders the moisture uptake through plant roots
- Lots of kitchen waste → high EC
- Turning and structure material → lower EC

Results

- Very high EC in bins
- Less in wormeries (salts are removed in the percolate)

Acidity (pH)

Results

	pH
VFG - Prof	7.5 – 9.0
Green - Prof	7.5 – 9.0
Heap	7.7
Bin	8.2
Box	7.4

- All values between 6,5 & 9 all averages between 7,5 & 9
- Highest values in bins & wormeries
- Compost is never pronounced acid
- Lime does not affect the pH!
- Wet material (lots of kitchen waste) leads to higher (too high) pH
- A good composting leans to a neutral pH (7,5-8)

Moisture content

Results

	Moisture
	% fresh
VFG - Prof	25-40
Green - Prof	35-50
Heap	50.81
Bin	64.19
Box	51.76

- In general high for all types of compost (higher than norm for professional composting)
- Highest values for bins and wormeries
- Lowest values when turned regularly
- Lots of kitchen waste → lots of moisture
- Hinders good digestion and nitrification
- Leads to anerobic situation → odour

Organic matter content

Results

	Organic matter
	% on DM
VFG - Prof	30-46
Green - Prof	27-45
Heap	25.79
Bin	44.79
Box	30.87

- For all systems high (on dry matter)
- Augment the content:
  - Lots of kitchen waste
  - Garden waste without soil
  - High moisture content and poor digestion!
- Diminish the content:
  - Garden waste with soil
  - Good composting!

Quality of Home composting 16

Nitrification

Results

	NO3-N
	mg N/l
VFG - Prof	0-200
Green - Prof	0-120
Heap	147
Bin	320
Box	244

- Transposition of ammonium (NH4+) to nitrate (NO3-)
- When compost is maturing
- Optimal at 25 à 30°C (at home often too cold, professional often too warm)
  - Under aerobic conditions
  - In wet environment
- Decreases the pH with 0,5 to 1 unit

Quality of Home composting 18

Germinating seeds

Results

	Germi-nation seeds
VFG - Prof	-
Green - Prof	-
Heap	4
Bin	2
Box	4

- Consequence of insuffcient T° increase
- Indication of insufficient composting
- Concerns not always weed seeds
- In bins & wormeries often vegetable seeds

Heavy metals

Results

- Analysis for Cadmium (Cd), Zinc (Zn), Cupper (Cu), Lead (Pb), Nikkel (Ni) & Chroom (Cr).
- Norms exceeded by:
  - 20% of Home Composters
  - 11% of Master Composters
- Too little measurements to draw conclusions
- Probably link with presence of soil
- Other sources possibly: chaff cutters?, poles?, wires?…

Compost in wormeries

Results

- Wormeries = 100% kitchen waste
- Moisture, conductivity & pH: very high
- Part of the salts → percolate
- Percolate: rich in K, Ca & Mg
- Persons using wormeries:
  - 71% had problems
  - 90% use the percolate

Some general conclusions

Conclusions

- No difference between the 3 seasons
- Distinctive differences between the systems
- Lime: no effect on pH
- More turnings → moisture contetn decreases
- In general compost is wet

Some general conclusions

Conclusions

- Few stones & inpurities
- Few heavy metals
- Food elements : comparable to professional composting
- Insufficient digestion/ maturity → phyto toxicity
- Considerable number of germination power seeds

Recommendations

Characteristics of a good compost

- Little or no weed seeds
- Wood soil odour
- Lots of worms (cocoons) e.o. organisms
- High temperatures several times or for a longer period

Chemical parameters	Unity	Guiding values (box/heap)	Guiding values (bin)
pH	On humid extract	6,5-8,5	6,5-8,5
Conductivity	µS/cm	500-1500	1000-2500
Humidity	%	45-60	55-70
Organic content	% on dry matter	30-45	35-50

Quality of Home composting 29

Annex 3 - Environmental relevance of decentralized composting - Climate relevant gas emissions, volatile emissions and mass balance

The information hereunder is taken of a study commissioned by the Austrian national and regional government and undertaken by Ir. Florian Amlinger with the ILUET institute (December 2003).

Introduction

This study focused on the detection of emissions of greenhouse gases and ammonia under the most realistic conditions. Improper process conditions can in principle result in anaerobic zones in windrows, and thus a potential for the emission of greenhouse gases

In the experiment the question of the qualitative performance of decentralized composting in relation to the creation of greenhouse gases and the sanitation and the quality of the final product (as defined in the Compost Ordinance) investigated under practical conditions. The assessment is based on emissions data found in literature.

Materials and methodology

The mobile emissions measurements tools developed by the ILUET institute allowed for continuous measurements of greenhouse emissions over a longer period of time under field conditions. This allowed covering the emissions of the entire composting process during the relevant phases. Three different measurements were performed (including 2 replicates). Measurements were undertaken for organic waste (M-and M-Bio1 BIO2), green waste (M-M-GS1 and GS2) and sewage sludge (M-M-KS1 and KS2). This made it possible to make a direct comparison of composting systems as a function of mixtures of raw materials. The measurements were performed 1 to 2 times per week implemented.

The detection of gas emissions was conducted in accordance with the "open-dynamic-chamber" principle for both the large (Height: 2 m, Area: 3x9 m, composting) and small (height: 0.6 m, Size: 3x6 m, garden composting) composting systems. A fan sucked air continuously at a controlled air flow rate through the measurement space. The fresh air got into the measuring chamber, enriched with the emissions and the measurement space behind the blower. The gas samples are taken alternately in the air and in the exhaust air, allowing determining the amount emitted in the measuring of gases. By multiplying with a specific coefficient emission rates can be measured. A high-resolution FTIR spectrometer analyzed the local concentrations of NH3, N2O, CH4 and CO2. Further experimental measurements of gas emissions were carried out made at intervals of of about 2-4 days, each for a period of 6-12 hours. Hourly average were collected and interpolated linearly.

Results

The following conclusions can be drawn from the data obtained on gas emissions:

- A CO2 release of 96 -398 kg per t DM in the organic waste composts and 240 - 365 kg per t DM at the green waste composts.
- The CH4 emissions are at 657 -844 g per t DM in the organic waste and composts 99 - 1140 g per t DM for the green waste compost
- The proportion of CH4 emission to the total emissions of carbon is between 0.15 % and 2.46% .
- A positive relation between temperature and CO2, CH4, NH3 emissions is detected. N2O emissions occurs preferably at temperatures between <30 and 40 (50) ° C on.
- The greenhouse gas effect is with 0.027 to 0.66 t CO2-eq per t ODM, well below literature data.
- As an indicator of the effectiveness of the aerobic process, the ratio between the emission factors of CO2-eq from Methane and nitrous oxide emissions to CO2 can be used. Values well above 0.3 - 0.5 tend to indicate unfavorable decomposition conditions. The composting of organic waste material was between 0.34 and 0.36, for green waste material between 0.07 and 0.35. Measurements at home composting units are with factors varying from 0.55 and 0.87 slightly less favorable than the larger composting units.

Figure: Emission measurement set up from ILEUT with big and small measuring unit. In the back the mobile measuring office

Annex 4 - Visual check compost quality (France)

The methodology presented here below has been drafted taking into account the point of view of one of the experts, namely Denis Mazaud (mail correspondence).

Visual check of (quality) of compost

The first and simplest method to assess the quality of compost consists in a good visual control. This method will allow for immediate assessment taking into account the large diversity of situation encountered in the field: lot's of composting poorly managed, varying products to start with,…

The following criteria for mature compost (ready for use) are suggested:

Color	Aspect	Odors
☐ Uniform ☐ Heterogenic ☐ Black ☐ Brown ☐ Grayish	☐ Homogeneous ☐ Heterogeneous ☐ Stratified (layers clearly identifiable) ☐ Fragments (of waste easily identifiable) ☐ Dusty ☐Pasty ☐ Fibrous ☐ Earthy	☐ Pleasant, undergrowth ☐ Unpleasant, putrid

Of course, for compost worth the name, simple analysis using classic agricultural criteria such as , % of dry matter, organic matter content, NTK, P, K, Ca. If necessary, trace elements (metals) can also be looked at.

Annex 5 - UK surveys & research

Annex 5.1 - Details of calculation to estimate household food and drink waste in the UK

This annex is based on the WRAP study: 'Household Food and Drink Waste in the UK, WRAP (2009)'

This annex details the calculations made to estimate the household food and drink waste in the UK. For each route, the source and the data used are outlined and the methods to combine them are laid out. Assumptions within the original research or inherent within the calculations are made explicit. Furthermore, the confidence interval around the headline figures is estimated.

Estimate of total food and drink waste collected by Local Authorities

The total amount of food and drink waste collected by Local Authorities is estimated from WasteDataFlow and the material split from the Defra-commissioned Review of Municipal Waste Composition.

The WasteDataFlow figures are for the reporting period 2006-07. This time period waste chosen as it most closely matched the information from the Review of Municipal Waste Composition. For this reason, the estimates obtained are for 2006-07, and therefore similar – thought not identical – to the time period of The Food We Waste research (late 2007). The estimate of the flow of material by waste stream from WasteDataFlow relates to Unitary Authorities and Waste Disposal Authorities in the UK (Table 40, first column of data).

Table 40: UK estimates of household waste by waste stream, 2006-07

Waste Stream	Total weight of waste stream (tonnes per year)	% food and drink waste	Total food and drink waste (tonnes per year)
Kerbside collections	22,512,072	25.08%	5,646,301
HWRCs	6,576,348	1.86%	122,039
Bulky waste collections	263,381	0.07%	179
Household bring recycling	785,945	0.31%	2,444
Total	**30,137,746**	**19.1%**	**5,770,963**

Compositional analyses or waste audits were collected from Local Authorities, Defra's Local Authority Support Unit, the Waste Information Network and contractors who carry out compositional analyses. In all, 870 compositional analyses were gathered, covering all

major municipal waste streams. The number of studies collected for the important household waste streams are detailed in Table 41. To be included in the quantitative analysis of the Review of Municipal Waste, three criteria had to be fulfilled by a study:

- Compositional analysis started 2005 or later;
- Two or more phases of analysis occurring at different times of year – i.e. at least some attempt to account for seasonal variations; and
- When obtaining an estimate for whole Local Authority area, stratification of results by type of household or neighbourhood.

The number of studies meeting these criteria is also given in Table 41. Another point to note is that compositional analyses selected performed compositional analyses over the period 2005 to 2008, with the majority of analyses occurring in 2006 and 2007.
Given this and the year of WasteDataFlow information used, the information in Table 40 best described 2006-07, but has been obtained using some information from 2005 and 2008.

Table 41: Information on studies considered for Review of Municipal Waste Composition

Waste Stream	No. of Studies Collected	No. of Studies Meeting Criteria
Kerbside residual	317	120
Kerbside organics inc. garden waste and food waste	102	40
HWRCs	56	39

A relatively large number of studies were collated and selection criteria applied. Consequently, the estimates of food and drink waste in the municipal waste streams have relatively small confidence intervals and are less likely to be subject to sampling biases.

The percentage of food and drink waste within each of the major household waste streams was obtained from the Review of Municipal Waste Composition and is shown in Table 40 (second column of data). For kerbside collections, this estimate includes 70,000 tonnes per year of food waste assumed to be in the fines, 20% of total weight of fines. It should be noted that these percentages were obtained from compositional analyses in England, but have been applied to waste flow data for the UK. Information on the fraction of food and drink waste in municipal waste streams is being obtained for Scotland and Wales via a co-ordinated programme of compositional analyses across each nation. These estimates of food waste can be updated when this information reports, but they are unlikely to alter the estimates substantially.

The resulting estimate of household food and drink collected by Local Authorities in the UK is 5,770,000 tonnes per year (to 3 significant figures). The vast majority (98%) is from

kerbside collections (both residual and recycling), with a small contribution from household waste recycling centres (HWRCs). This food waste from HWRCs is found in the residual stream and is likely to have come from a range of sources, including households and small businesses33. It is not possible to divide the total HWRC between these sources, and for the purposes of this research, it has been included in the household total. Given the small amount of material associated with this route, this inclusion will not substantially alter the total. The food and drink waste found in bulky collections and household bring recycling is negligible.

One source of uncertainty is due to sampling of compositional analysis studies within the Review of Municipal Waste Composition. Not all areas of England had a compositional analysis pertaining to them. The studies that were collated were used to make an estimate for the whole of England. This leads to a 95% confidence interval of ±190,000 tonnes per year on the total household food and drink waste, or 3.2% of the total.

It should be noted that uncertainty from sources other than sampling are likely to be present, e.g. bias relating to areas chosen for compositional analyses, and the disproportionately small number of analyses over the Christmas period. It is problematic to quantify their effect, and, for this reason, are not included in the confidence intervals quoted in this report. Thus, these confidence intervals are a lower bound on the total uncertainty.

Estimate of food types collected by Local Authorities

For the reasons outlined in the previous section, information from WasteDataFlow and the Review of Municipal Waste Composition are the most appropriate sources currently available for calculating the total amount of household food and drink waste in the UK. However, these sources give very little detail about the types of food and drink waste collected by Local Authorities.

The dataset from The Food and Drink We Waste research was used to obtain estimates of the split of types of food and drink disposed of by households, and this information pertains to England and Wales. Recent research, entitled The Food and Drink We Waste in Scotland, has obtained an analogous dataset for Scotland. These two datasets have **not** yet been joined for the following reasons:

- There is no study of municipal waste analogous to the Review of Municipal Waste Composition to give a Scottish figure for total food and drink waste, therefore any use of The Food and Drink We Waste in Scotland dataset would only impact on the types of food and drink waste generated.
- Inclusion of this dataset would add another layer of complexity to the methodology.
- Given that Scotland represents around 10% of the UK's population, inclusion of the dataset is unlikely to have a substantial impact on any of the references.

In the future, WRAP will explore the possibility of combining the Scottish food waste dataset with that of England and Wales.

Weighting

To obtain an estimate of the types of food and drink wasted, The Food We Waste dataset was weighted by household size (i.e. number of occupants) to be representative of the households in the UK. Household size was used as it correlates more strongly with the amount of food and drink waste generated than any other single factor. In general, the higher the number of occupants in a household, the greater the amount of food waste generated.

Weighting the dataset by further factors was considered. To include an additional weighting factor, the factor should meet the following criteria:

- The information has been collected in the questionnaire that accompanied the compositional analysis;
- A high percentage of households supplied this information in the questionnaire;
- It is possible to obtain information on the number of UK households – e.g. from the Census or household surveys – split by both the proposed weighting factor and the household size;
- Once stratified by household size and the proposed weighting factor, the sample sizes in each group should be greater than a critical number; and
- Weighting by the proposed factor has a significant impact on the results

Table 42: Weighting factors considered for analysis of The Food We Waste dataset

Proposed Weighting Factor	Comments
Age	There is no evidence to suggest the sample of The Food We Waste under- or over represents this group, and therefore the impact of weighting by age would be negligible.
Socio-economic class	A relatively large proportion of questionnaire respondents (>10%) did not supply information about their occupation, which was used to determine their socioeconomic class. These households would have to be omitted from the analysis if calculations were weighted by socio-economic class. Furthermore, differences in the amount of food waste between socio-economic classes were minimal and therefore the impact on the results would be slight.
Home composting	Information not obtained in household surveys alongside household size.

In conclusion, it is unlikely that inclusion of further weighting factors would significantly impact the results.

Furthermore, practical problems are presented in the inclusion of many weighting factors. Therefore, weighting was performed by household size alone. As a small number of larger

households were sampled, those containing 6 or more people were grouped together for weighting purposes.

Calculations

To obtain an estimate for the amount of a food type wasted in the UK, the following method was used:

1. For each household, an estimate of the weekly waste of each food type was obtained. For households with fortnightly collections of residual or food waste, information from the compositional analysis was divided by two;
2. For each household size, the average waste generated for each food type was calculated;
3. These averages were combined in proportion to the distribution of household sizes in the UK;
4. This estimate for the UK was scaled such that the total food and drink waste collected by Local Authorities was consistent with the estimate obtained from combining information from WasteDataFlow and The Review of Municipal Waste Composition.

The same method is applicable to any other subdivision of the total food and drink waste, e.g. analysis by avoidable or reason for disposal.

It should be noted that, by applying step 4 in the above methodology, the estimate of total household food and drink waste collected by Local Authorities in the UK comes from WasteDataFlow and The Review of Municipal Waste Composition, rather than The Food We Waste. Estimates obtained from this research will have sampling uncertainty due to the number of households surveyed and the variability between households. However, there will also be non-sampling uncertainties due to the following:

- Non-participation bias – households were given the opportunity to opt out of the research. If the household waste generated from these households differed from those included in the survey, this would lead to bias.
- Very few flats were sampled due to methodological problems, namely difficulties linking waste in a communal waste receptacle to a specific household. Omission of flats is partially counteracted by weighting of the calculations, which takes into account that flats generally have fewer occupants than houses. However, this weighting does not take into account any other differences between flats and houses that impact food and drink waste generated.

It is difficult to estimate the uncertainty associated with these non-sampling errors. For this reason, the confidence intervals quoted – which take into account only sampling effects – are a lower bound of the total uncertainty.

Sewer research

The report Down the Drain research has been used to obtain estimates for the amount and types of food and drink waste disposed of via the sewer. The research consisted of diaries being kept for a week by household occupants to record disposal of any food and drink via the sink, toilet, or any other household inlet of the sewer system. Fieldwork occurred in February 2008, and 319 diaries were kept for the full research period.

The information from the diaries was used to obtain estimates for the UK. Similar to The Food We Waste, it was found that household size (number of occupants) was the most important factor relating to the amount of food and drink waste generated. For this reason, the data were weighted by household size, with households of 4 or more people grouped together.

Kitchen Diary research

The Kitchen Diary research is similar in nature to the sewer-based research, the former involving diary based research comprising 286 households, recording food and drink waste disposed of by all routes. The fieldwork occurred in February 2007. The Kitchen Diary dataset was used because it details amounts and types of food and drink waste disposed of fed to animals and composted at home.

Given these similarities, the data were treated in a similar manner. There was one methodological difference, namely the weighting of the Kitchen Diary data used 'household type' rather than household size as the latter information was not available. Household types are single occupancy, households with children, and households comprising only adults. It is unlikely that this methodological difference will have a large impact on the overall estimates of food and drink waste.

Combined confidence intervals

For each of the data sources used to calculate the total UK household food and drink waste, the 95% confidence interval was calculated. For the Local Authority collections, the variability between authorities was used to obtain the confidence intervals. For all other research, the variability in the amount of waste between households was used. Where household weighting has been applied (e.g. by household size), the confidence interval was calculated for each household-size grouping and these were combined to obtain the combined confidence interval around the overall (UK) estimate. The results of these calculations are given in Table 43. Although the distribution of waste is non-normal – the distribution is skewed with a right-hand tail – the error structure around the mean was assumed normal, invoking the central limit theorem. This approach should be valid given the number of households in each sample group (>30). These estimates from each disposal route were combined according to equation A1:

$(\delta l)2 + (\delta s)2 + (\delta h)2 = (\delta t)2$ (eq. A1)

where δl, δs, and δh are 95% confidence intervals around the estimate for the different disposal routes (respectively, Local Authority collections, sewer, and home composting & fed to animals) and δt is the 95% confidence interval around the total estimate. Thus, the confidence interval around the figure for all disposal routes is **not** the sum of the confidence intervals for each disposal route.

Table 43: 95% confidence intervals by disposal route

Disposal Route	Estimate of food waste (tonnes per year)	95% confidence interval (tonnes per year)	95% confidence interval (% of estimate)
Local Authority collection	5,800,00	190,000	±3.2%
Sewer	1,800,000	220,000	±12%
Home composting and fed to animals	690,000	140,000	±20%
All disposal routes	**8,300,000**	**320,000**	±3.9%

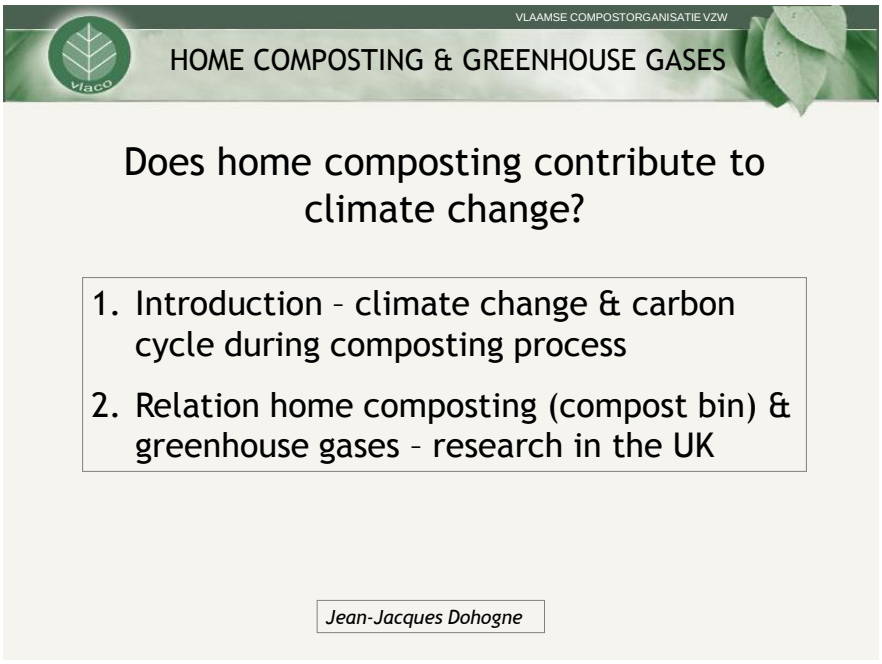
To a suitable level of precision, the amount of UK household food and drink waste generated annually is 8,300,000 ±300,000 tonnes. As mentioned previously in this appendix, the 95% confidence interval quoted includes only sampling uncertainty and is thus a lower bound on the total uncertainty.

For calculating the confidence interval for a **food type**, a similar approach was adopted to that described above. For two of the disposal routes – sewer and home composting and fed to animals – the calculations were exactly analogous to those above.

Annex 5.2 Home composting & climate change issues

This annex is based on research undertaken by the Imperial College London in 2003 and 2006 on the possible effects of home composting in bins to greenhouse gas releases.

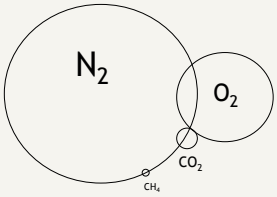
This annex illustrates the set up, the measurements and the results in a PowerPoint that was presented to Master Composter trainers in Flanders (Flemish Compost organization – VLACO). Web references to the studies are provided in the last slide.



VLAAMSE COMPOSTORGANISATIE VZW

HOME COMPOSTING & GREENHOUSE GASES

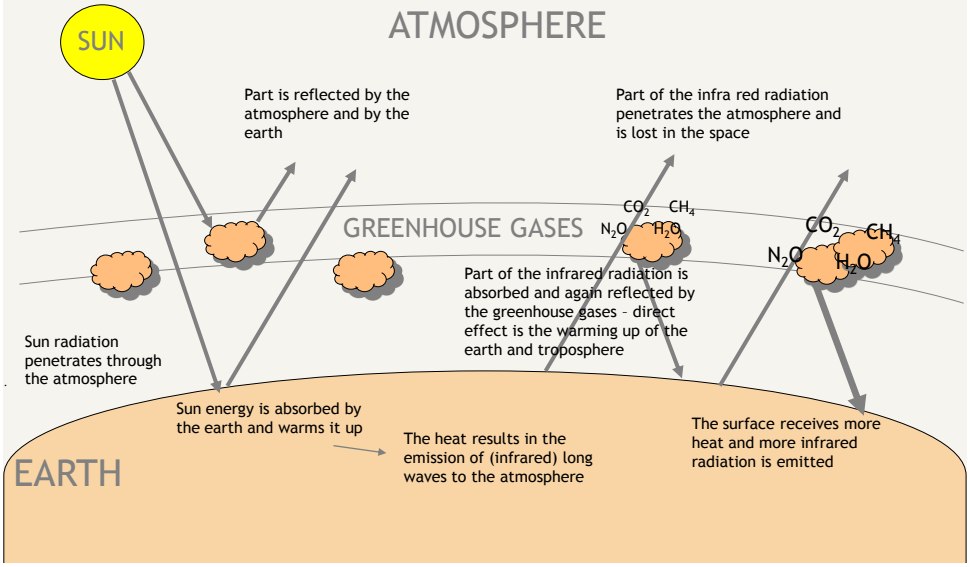
Ambient air



	% of the volume in dry air
Nitrogen (N_2)	78.09%
Oxygen (O_2)	20.94%
Carbon dioxide (CO_2)	0.03%
Methane (CH_4)	0.00022%

VLAAMSE COMPOSTORGANISATIE VZW

HOME COMPOSTING & GREENHOUSE GASES



Warming up potential of greenhouse gases

Refers to the potential of greenhouse gases to store heat

The warming up potential for 1kg CO_2 is 1 or 1kg CO_2 eq

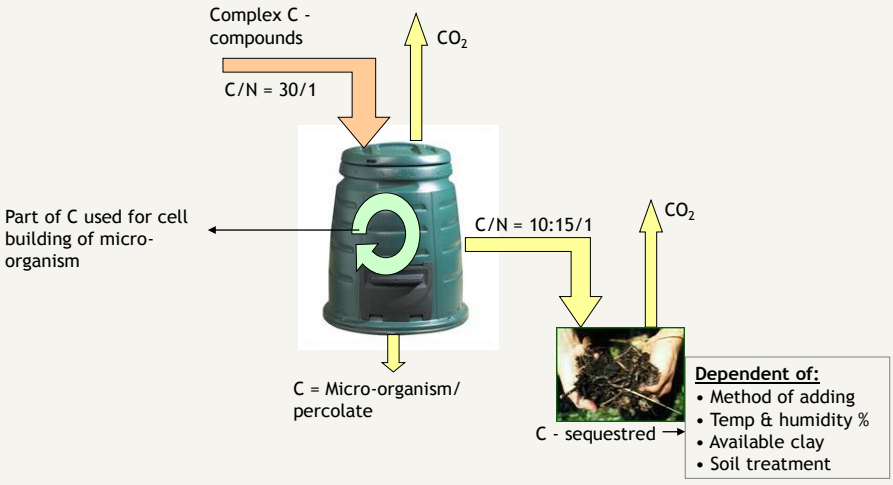
1kg CH_4 = 21kg CO_2 eq

1kg N_2O = 310kg CO_2 eq

CO_2 is the most common gas during the composting process

VLAAMSE COMPOSTORGANISATIE VZW
HOME COMPOSTING & GREENHOUSE GASES

CARBON CYCLE FLOWCHART



VLAAMSE COMPOSTORGANISATIE VZW

HOME COMPOSTING & GREENHOUSE GASES

Imperial College London UK - (2003/2006)

Research Home Composting

1. Mass streams (in and out) when home composting
2. Biological processes in compost bins
   - Temperature profiles
   - (greenhouse gas) development
3. Bio degradability of packaging waste
4. Fungi development 'Aspergillus Fumigatus'
5. Fruit flies populations around and in the compost bins
6. Effectivity of home produced compost as soil conditioner (test = growth of Petunias)

VLAAMSE COMPOSTORGANISATIE VZW

HOME COMPOSTING & GREENHOUSE GASES

Design test 1

Research at the 'Imperial College London'

- 2003 for 2 years
- Milko bins of 290 liter
- 60 households add kitchen and garden waste: part of the participants mix, part do not mix

290 l Milko bin

Green =	+/-0.2m3/ hhld/ month
Kitchen waste =	+/- 9kg/ hhld/month
Paper/cardborad =	+/- 1.2 kg/ hhld/month

VLAAMSE COMPOSTORGANISATIE VZW

HOME COMPOSTING & GREENHOUSE GASES

Design test 2

Research at the 'Imperial College London'

- from February 2005 till March 2006
- 6 treatments with different inputs of garden, kitchen and paper/ cardboard waste (added in layers + 1x completely mixed halfway the test)
- Milko bins of 290 liter

290 l Milko bin

VLAAMSE COMPOSTORGANISATIE VZW

HOME COMPOSTING & GREENHOUSE GASES

Measuring equipment for test 1 and 2

Research at the 'Imperial College London'

Measuring of gas concentration in the bin

Test 1 (2003)

- O_2, CO_2 & CH_4 **in** the bin
- at 5 different times
- at different depths of 10 cm (10, 20 ,30, 40)

Test 2 (2006)

- O_2, CO_2 & CH_4 **in** the bin for all treatments
- 12 days interval
- 30 cm depth

VLAAMSE COMPOSTORGANISATIE VZW

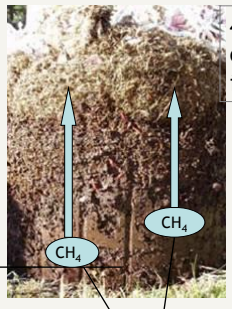
HOME COMPOSTING & GREENHOUSE GASES

Research at the 'Imperial College London'

Results

Methane (CH_4)

Average conc 0.0 - 0.2%
Max = 0.5%
When mixing the conc. decreases



46 to 98% microbiological oxidation of CH_4 in the more aerobic conditions in the upper part of the bin

Oxidation through methanotrophe bacteria ubiquitous in those places where the aerobe and anearobe zones meet

Characteristics organic material at the bottom of the bin

- compressed
- heterogene
- variations in density
- higher humidity content
- lower O2 permeability
- anaerobe conditions possible

Ambient air = 0.00022%

VLAAMSE COMPOSTORGANISATIE VZW

HOME COMPOSTING & GREENHOUSE GASES

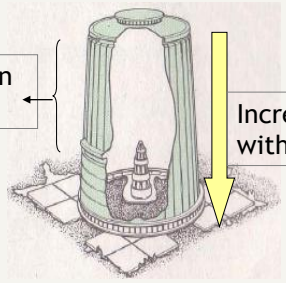
Research at the 'Imperial College London'

Results

Carbon dioxide (CO_2)

Complex C - compounds + x O_2 ⟶ x CO_2 + x H_2O + heat

Average CO_2 concentrations in the bin of 0-6%



Increased concentrations with depth – max conc. > 10%

Ambient air = 0.03%

CO_2 concentrations decrease when mixing

VLAAMSE COMPOSTORGANISATIE VZW

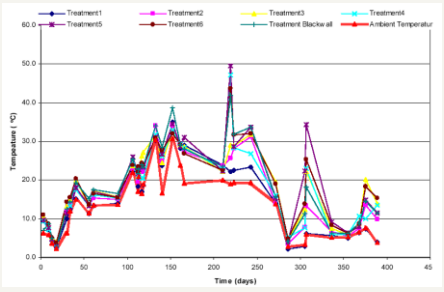
HOME COMPOSTING & GREENHOUSE GASES

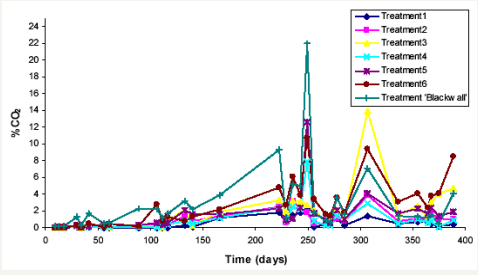
Research at the 'Imperial College London'

Results

Carbon dioxide (CO_2)

Increased CO_2 concentrations correspond to increased temperatures





VLAAMSE COMPOSTORGANISATIE VZW

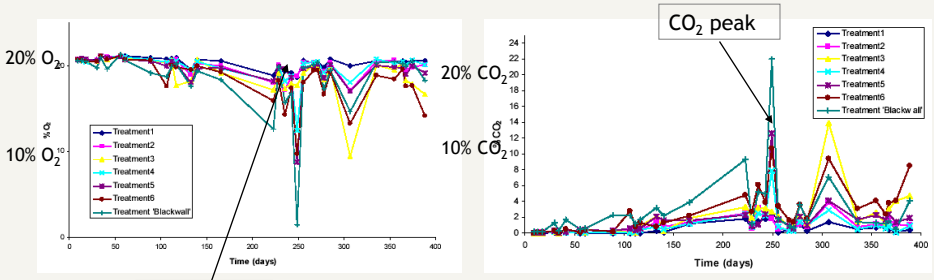
HOME COMPOSTING & GREENHOUSE GASES

Research at the 'Imperial College London'

Results

Carbon dioxide (CO_2)

High CO_2 concentrations associated with low concentrations of O_2 as a response to high microbiological activity



CO_2 peak

Pile turned

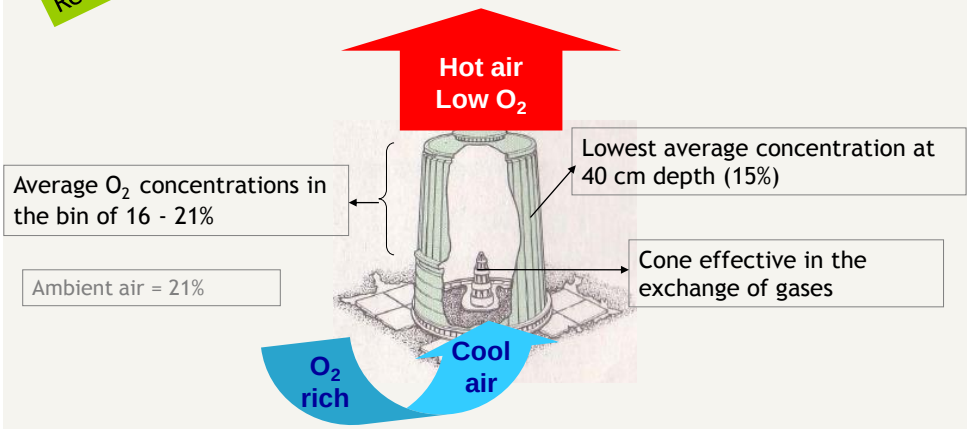
VLAAMSE COMPOSTORGANISATIE VZW

HOME COMPOSTING & GREENHOUSE GASES

Research at the‘Imperial College London’

Results

Oxygen(O_2)



Little seasonal variations/ O_2 concentrations increase considerably when mixing

VLAAMSE COMPOSTORGANISATIE VZW

HOME COMPOSTING & GREENHOUSE GASES

Research at the ‘Imperial College London’

Discussion

Oxygen(O_2)

- > 5% oxygen is required for an aerobe composting process
- optimal is 30-35% free air space between particles
- O_2 consumption is dependent on:
  - substrate characteristics as C/N ratio, humidity and particle size
  - and of surrounding factors such as temperature, humidity, O_2 concentration and pH

CONCLUSIONS RESEARCH

During the research it appeared that the average oxygen content in the compost bin is equivalent to the oxigen content in the ambient air (21%).

The methane concentrations in the bin were low referring to an aerobic process.

Concentrations of carbon dioxide in the bin varied from 0 to 6% and these concentrations increased when going deaper in the bin.

Adding on a regular basis small quantities of mixed organic waste provides a stable and well buffered environment for the degradation of the household bio-waste.

VLAAMSE COMPOSTORGANISATIE VZW

HOME COMPOSTING & GREENHOUSE GASES

GENERAL CONCLUSIONS

Home composting in bins can be further promoted for small gardens

Home composting is relatively simple, doesn't require a lot of work and requires only basic knowledge in order to produce a good, acceptable compost (with minimal environmental effects)

However, continuous information and awareness raising of the residents regarding qualitative aspects of home composting remains important

VLAAMSE COMPOSTORGANISATIE VZW

HOME COMPOSTING & GREENHOUSE GASES

Want to know more?

Imperial College London (2003/2006)

Research 2006

http://www3.imperial.ac.uk/ewre

Research 2003 updated in 2006

http://www.imperial.ac.uk/ewre-www.cv.imperial.ac.uk

Annex 6 Box calculation methods

Space requirements of the "composting boxes" - Community Composting Parks (Switserland)

System

1. Gather : gathering biowaste in a separate container (silo or equivalent)
2. Composting : Fill up boxes with the materials, maturation in boxes
3. Post-maturation and stocking substances: Regroup the materials and substances as soon as possible in boxes, or in a heap otherwise

Conditions

Box sizes : 1m3

Whole process of composting last 12 month

Maturation in boxes : 4 month

Post-maturation & storage : 8 month (only in boxes for small quantities, if quantity of materials is important, also consider the post-maturation & storage in a heap)

- up to 2430 kg of waste : 3 boxes and no heap (maximum quantity that could be treated by 3 "1m3 boxes" in one year)
- from 2430 to 3240 kg : 4 boxes and no heap (maximum quantity that could be treated by 4 "1m3 boxes" in one year)
- from 3240 kg : 4 month maturation in boxes, subsequent post-maturation in heaps (unused box capacities are used for post-maturation)

In this blueprint : calculation of only 10 135 kg of bio-waste

Minimum surface required for the boxes excl. the collections silo's: 3m2 (three boxes of 1m2 each

Round up

- Number of boxes : always round up to whole numbers (f.e. 3.1 boxes = 4 boxes)
- Supervisors: up to 0,49: rounding up / from 0,51 : rounding down

	Variables	Biowaste in kg	Space for composting needed	Space for treatment Needed	Supervisor
Households	**1**	85			
Biowaste (m2)	**0**	0			
Total of Biowaste		**85**	**see below**	**17**	**1**

Space needed for composting (calculation valid up to 10 135 kg of biowaste)

Calculation : up to 3240 kg of bio-waste	**Boxes**		**Heaps for post-treatement**	
Remark : amount of boxes rounded up	Amount of boxes	Space needed in m2	Length in meters required	Space needed in m2
	0,10	**0,10**	**0,00**	**0,00**
	0,04	0,04	0,10	0,16

Calculation : from 3240 kg to 8110 k of bio-waste	**Boxes**		**Heaps for post-treatement**	
	Amount of boxes	Space needed in m2	Length in meters required	Space needed in m2
	4,00	**4,00**	**-6,49**	**-9,74**
	0,04	0,04	0,10	0,16

Calculation : from 8110 kg to 10 135 kg of bio-waste	**Boxes**		**Heaps for post-treatement**	
	Amount of boxes	Space needed in m2	Length in meters required	Space needed in m2
	5,00	**4,00**	**-8,16**	**-12,24**
	0,04	0,04	0,10	0,16

Assumptions

Biowaste

Kitchen waste coming from a kitchen in kg per household	85
Green waste coming from a garden in kg per household	5

Boxes size/capacity

Volume in m3	1
Area needed in m2	1

Heap's size for post-treatement & storage

	in meters	Remarks
Width of the heap	1,5	Width (borders included)
Max. height of heap	0,8	
Heap form	Triangle	
Heap surface	0,6	Width x Height / 2

Remark: Put in practice, the heaps for post-treatment and storage has to be set with borders in order to pile up materials higher

Specific balance weight

Weight per m3 (in kg) when filling up the boxes (month 0)	450	
Weight per m3 (in kg) for a full box	675	1.5 m3 materials coming from a silo are put into the box

Space needed per 1000 kg of "fresh substance"

up to 4 month in boxes	1,48	1.5 m3 materials coming from a silo are put into the box
from 4 to 12 month in boxes	1,11	Volume reduction of 50% of the silo
from 4 to 12 month (in a heap)	1,11	Volume reduction of 50% of the silo

Substance drawn from 1000kg of biowaste

Number of boxes needed for composting (0-4 Mt)	0,49	1/3 year in boxes
Number of boxes needed for post-maturation and storage (4-12 Mt)	0,74	2/3 year in boxes
Number of meters for heaps in m (4-12 Mt)	1,23	2/3 year in a heap

Surface needed for treatment

Reduction of fresh weight from start to treatment (50%)	0,50
Part of dry materials (1/3) in mature compost	0,33
Persmissble dose of mature compost per m2 and per year (in kg per DM)	0,83

Number of supervisors required

Per compost park 1 supervisor	1,00	
per 1000kg of biowaste 1 supervisor	1,00	Rounding up: up to 0,49: rounding up / from 0,51 : rounding down

Author: Jean-Jacques Dohogne

Proofreading : Olivier DE CLERCQ, Philippe MICHEAUX NAUDET, Amaury DE-GUARDIA; Ana LOPES; Anne TREMIER; Annie RESSE; Benedita CHAVES; Jana VALKOVA; Nathalie GAILLARD, Laurence GALON

Lay-out : Studio Bigot

Managing editor:

Jean-Pierre Hannequart – ACR+

Avenue d'Auderghem, 63

B-1040 Brussels · Belgium

www.miniwaste.eu