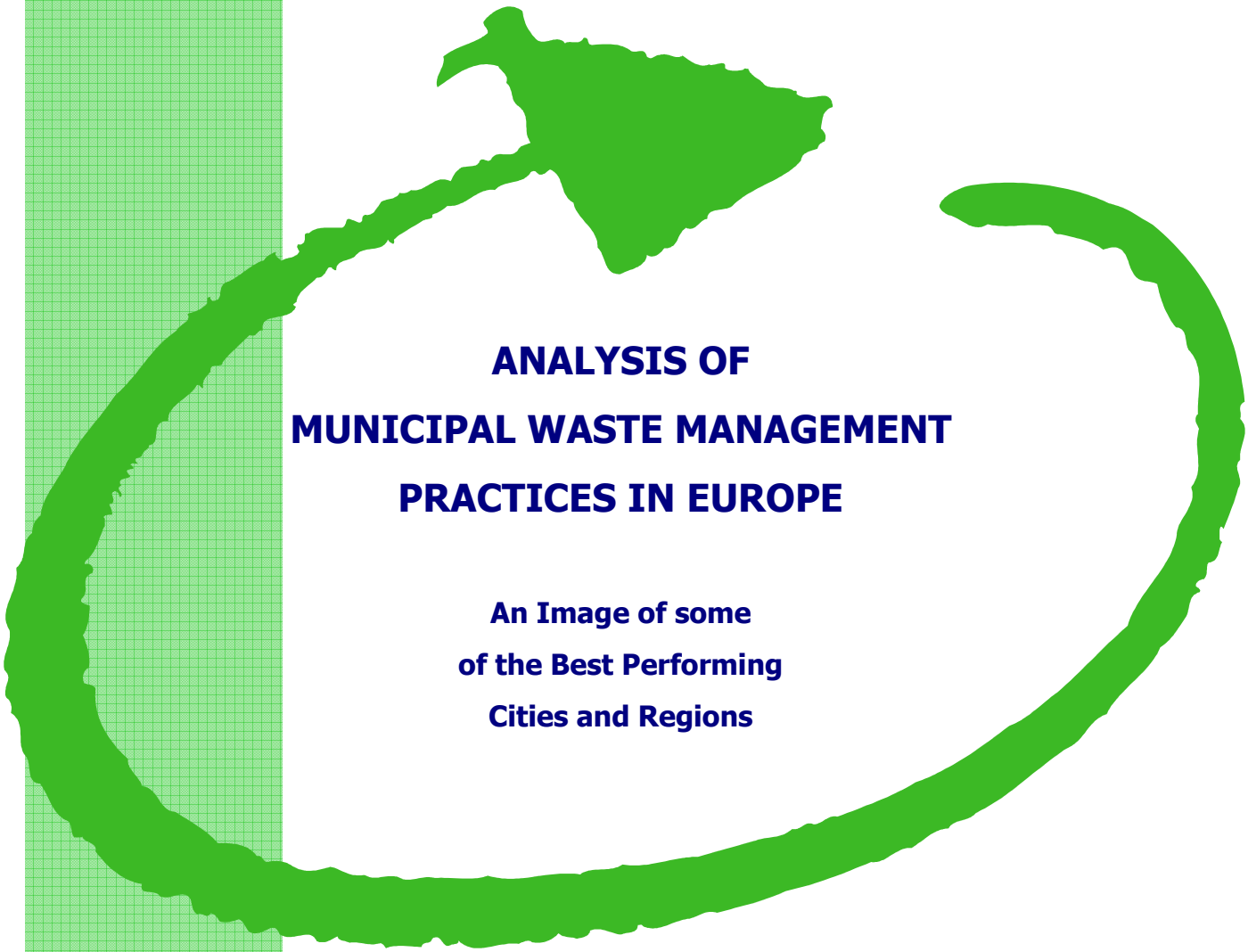

ANALYSIS OF MUNICIPAL WASTE MANAGEMENT PRACTICES IN EUROPE

An Image of some of the Best Performing Cities and Regions

ACR+ Study

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Executive summary

Waste management has evolved during the last decade towards more and more recycling. This shift confronts municipalities with crucial questions such as:

- What is the quantity of waste actually produced in my municipality?
- What will be the evolution of those quantities in time?
- What is the composition of municipal waste?
- Is it possible to reduce waste production? For which waste fractions?
- Which are the waste fractions that can be recycled?
- How much of the various waste materials is it possible to collect selectively?
- What are the achievable selective collection and recycling rates?
- What are the disposal/treatment capacities which will be necessary in the future?
- How to organise selective collections, in how many separate fluxes and with which technical (notably selective collection) infrastructure?
- How to ensure citizens participation?

1. Objective of the study

The objective of this report is to provide an image of a virtual "optimal" scenario for waste prevention and selective collection which could be chosen as a target in an established horizon of time for one regional or local administration in Europe.

This study also aims to give an insight into instruments and strategies developed by those municipalities identified as already achieving good performances in waste prevention and recycling.

2. Difficulties and constraints

Providing information on best performing municipalities and regions in the field of waste prevention and recycling is made difficult by the fact that:

- There is no systematic collection of data's and information at the local and regional levels. Official data's on waste management and recycling performances in Europe – mainly provided by OECD or the EEA – concern national averages which, consequently do not allow to identify best local performers.
- Where they exist, figures provide an image of waste **management** activities at the local level. Data's on actual waste **production** are almost non existent.
- Existing local or regional data's on municipal waste production and management are determined by the scope of activities of the municipalities and by monitoring methods which vary on an individual basis.
- This report provides a snapshot at a time. No municipality may pretend to have achieved the ultimate and optimal goal.

3. Findings

3.1. Municipal waste production

In the framework of this study, ACR+ has studied in details 23 European municipalities and regions. Their actual municipal waste production approaches 500kg/inh per year varying from 330kg to 650kg. This range corresponds to the actual average national figures provided by OECD, Eurostat or the European Environment Agency. Those organisms estimate that municipal waste generation continues to grow in Europe with an average of approximately 2% per year.

3.2. What is the composition of municipal waste?

This study has tried to estimate the amount of waste from different recyclable materials in municipal waste. The table below provides estimated ranges of compositional percentage and quantities for main categories of recyclables.

Estimated amounts of different recyclable materials in municipal waste		
	bracket considered (in %)	Estimated quantities brackets (in kg/inh)
Paper/card	20-40	120-250
Beverage cartons	3-5	15-25
Glass	4-7	20-40
Plastics	7-12	40-70
Metals	3-7	20-40
Organics	29-40	170-250
		385 -675

3.2. What is the optimal waste management scenario at the local level?

An optimal scenario for waste management would consist in a set of instruments targeting:

1. The development of waste prevention initiatives
2. The development of selective collection schemes for a wide range of recyclables
3. The encouragement of citizens participation to above initiatives by the implementation of a set of regulatory, economic and voluntary instruments

3.2.1. Waste prevention

Waste prevention is still at an infancy stage in Europe. However, more and more LRA's are engaged in one form or another of waste prevention initiatives targeting one or several specific waste streams. No one encompasses the global spectrum of waste prevention initiatives but ACR+ estimates that it is possible to reduce at source by between 80 and 100 kg/inh/year the amount of waste. Such reduction may be achieved by developing a series of initiatives targeting most important municipal waste streams of which:

- biodegradable waste
- paper waste
- packaging waste
- products/waste with high reuse potential:

3.2.2. Selective collection

Selective collection is most commonly organized for main streams of recyclables i.e.:

- organic waste
- Paper
- Glass
- Light packaging
- Textiles
- WEEE

Besides, container parks or collection on demand exist for various fraction of waste and notably for:

- inert waste
- wood
- furniture
- various small fractions easy to collect

3.2.2.1. Organic waste

Selective collection of organics is sometimes separated in two different scenarios for:

- Garden waste
- Kitchen waste

This distinction is justified by the fact that garden waste has characteristics which makes it very different from food waste.

Kerbside collection of kitchen waste seems to be the collection method ensuring the best performances in terms of both quantities and qualities whereas for garden waste, collection via container parks will allow to ensure rather good results. This collection may be supplemented by a kerbside collection during summer months in some areas.

3.2.2.2. Paper

With an average of nearly 80kg/inh selective collection, it forms a considerable element of typical 'dry' collection. Kerbside collection appears to be the collection method with the best performances ahead of collection with neighbourhood bank. A combination of two collection modalities may allow to increase capture rates.

3.2.2.3. Glass

Glass also makes up a considerable element of selective collection systems and is long-established in recycling collections. It seems that collection via neighbourhood banks is an efficient collection method. Glass can be further separated at source according to colour, with individual banks being provided for clear and coloured glass.

3.2.2.4. Light packaging

As already stated kerbside collection appears to be the most convenient collection system for citizens therefore ensuring good performances in terms of quantities. However, in order to limit the number of fractions to be selectively collected, many

authorities have introduced 'multi-material' or 'co-mingled' collections, most frequently mixing:

- Plastics
- Metals
- composite packaging.

They are usually referred to as PMC or lightweight packaging.

However, other combinations of materials are possible for lightweight packaging such as:

- PMC and glass
- PMC, paper/card and glass
- paper/card, plastic, metal, glass
- Paper/card and composites; plastic and metal
- composites and plastic

3.2.2.5. Textiles

Textiles are traditionally collected for recycling, however not always by the authorities themselves. Collection at neighbourhood banks or kerbside appear as the most frequent and best performing methods.

3.2.2.6. Waste electrical and electronic equipment ('WEEE')

The WEEE directive will make selective collection mandatory in Europe with an initial target of separate collection of 4 kg per person by 31 December 2006. For local authorities, the collection of WEEE requires space for the storage of the products, and so it is not a surprise to see that most authorities collect WEEE at civic amenity sites.

A much more recent development is the introduction of small home electrical appliances (such as shavers, electric toothbrushes, etc.) into kerbside collection schemes. Such option is not yet well documented but should be worth further analysis is the future.

3.2.2.7. Other recyclables

Besides the "traditional" recyclable waste, there remains other waste fraction such as wood, bulky, inert, tires, oils, plastic films, which may constitute rather important quantities in some municipalities. Some of them have developed selective collection schemes mainly through container parks or via collection on demand.

Separate collection of these fractions allows to direct them towards specific treatment options and with the progressive increase of quantities, outlets are developing for their recycling. It thus appears that a substantial potential of recycling exist from all those categories of waste which actually are collected selectively in civic amenity sites.

Available quantities vary significantly according to the actual local policy of acceptation at the civic amenity sites (for instance as regards the authorisation of access for craftsmen, SME's, shops,….) and number of waste streams considered.

The most important fractions in terms of weight appear to be wood, inert waste, and other bully waste such as furniture. The average weight/inh for these waste fractions is 80 kg in municipalities considered in the survey but some of them collect more than 200kg/inh.

Besides, recycling opportunities exist as well for a great diversity of waste fractions which are produced in rather small quantities but which may be collected selectively very easily ar civic amenity sites. Those fractions are for instance tyres, food and mineral oil, plastic films, flat glass, batteries, toner cartridges, solvents,…

Remark : the case of batteries
Let's mention that for batteries, the adoption of the Batteries directive will prompt their selective collection. The range of options for battery collection is large and includes kerbside collection; postal systems; bring systems (where members of the public bring used batteries to municipal waste collection points); and battery collections points in locations such as retail outlets, schools and other public buildings.

All of the schemes in Europe use a variety of these collection routes, with collection points in retail outlets and schools, and at municipal waste sites, particularly prominent. Kerbside collection is used by fewer existing systems.

3.3. What are the achievable collection rates for selectively collected waste fractions?

On the basis of best practices identified in Europe, it can be estimated that optimal collection scenarios may achieve following collection results:

	Estimated quantities brackets (in kg/inh)	Potential selective collection results (low estimates)
Organics	170-250	100
Paper/card	120-250	80 kg
Glass	20-40	30 kg
Beverage cartons	15-25	30kg
Metals	20-40	
Plastics	40-70	
Other recyclables	80-200	80
	465 -875	320

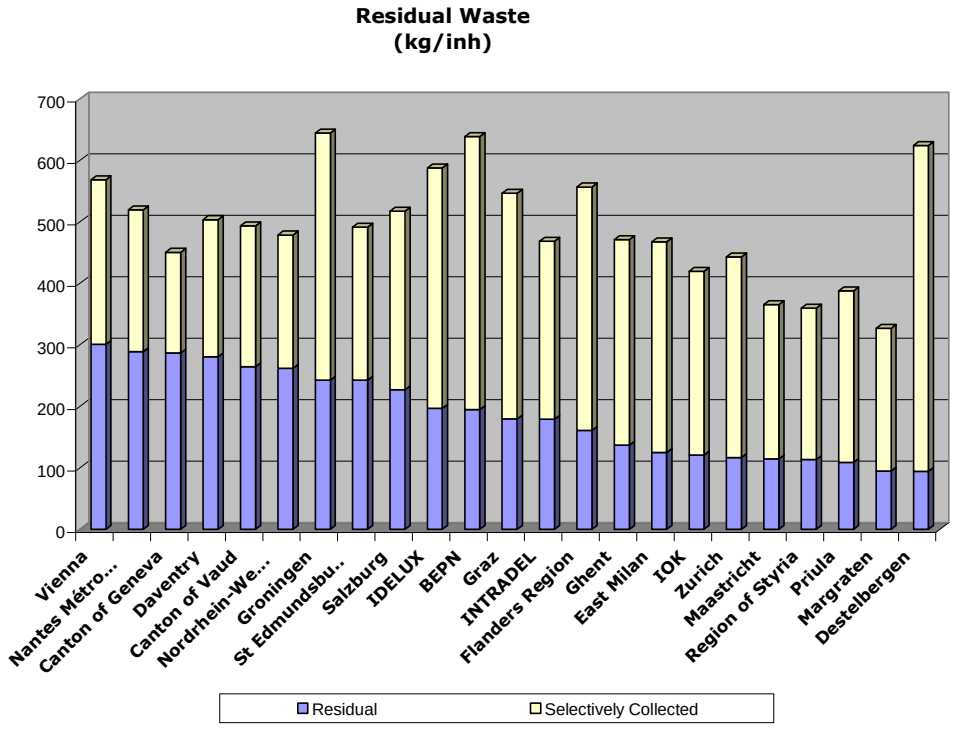
Those estimates have been made on the basis of better performing cities identified in this survey. It must be emphasised however that "better" does not mean "best". Data's presented here may thus not be considered either as the potential results achievable nowadays for a significant amount of local authorities. We remain convinced that there remain considerable room for improvement in the field of municipal waste recycling.

3.4. What is the recycling potential and what are the disposal treatment capacities which will be necessary in the future?

It is obvious that the potential amount of waste fraction for recycling will vary considerably in proportion to the municipal waste production. Therefore it is difficult to provide absolute figures. However, the survey realised in the framework of this study shows that - considering all recyclable fractions managed at by municipalities -

it is possible to achieve global recycling rates between 60 and 80% which would result in a residual waste production varying between 100 and 200 kg/inh/year.

The graph below presents for the cities considered in this study, the amounts of residual waste in comparison to global municipal waste production.



3.5 How to ensure citizens participation?

Beyond structural and technical infrastructure which provide convenience to citizens for selective collection, municipalities and regions have a large series of instruments at their disposal to influence citizens behaviour and encourage their commitment to waste prevention and to selective collection.

Of course, the diversity is very large and each local context requires specific solutions. But, with experience, it becomes clear that waste management is a multi-faceted issue and that it requires a combination of various and different instruments to reach the optimal balance.

The present report describes main instruments available at the local and regional levels of which:

- Regulatory instruments
  - Planning
  - Targets setting
  - Landfill or incineration bans
  - Take back obligations
  - Mandatory separate collection

- Economic instruments
  - Landfill taxes, fees and charges
  - Landfill Allowance Trading Scheme (UK)
  - Producer responsibility and extended producer responsibility
  - Waste collection fees (Pay As You Throw system)
  - Subsidies
  - Markets developments for products
- Voluntary instruments
  - Voluntary agreements
  - Environmental information and awareness.

1. Introduction

Waste management has evolved during the last decade from waste disposal to waste recycling. Some municipalities have even fixed a "zero waste target" with the aim to develop waste prevention and recycling to the point where zero waste remains to be disposed of.
Without going that far, municipalities in their quest for more recycling, have to shift from one single waste stream for disposal to multi-waste streams for multi dedicated recycling and treatment options. This shift confronts municipalities with crucial questions such as:

- What is the quantity of waste actually produced in my municipality?
- What will be the evolution of those quantities in time?
- What is the composition of municipal waste?
- Is it possible to reduce waste production? For which waste fractions?
- Which are the waste fractions that can be recycled?
- How much of the various waste materials is it possible to collect selectively?
- What are the achievable selective collection and recycling rates?
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- How to organise selective collections, in how many separate fluxes and with which technical (notably selective collection) infrastructure?
- How to ensure citizens participation?

1.1. Objective of the study

The objective of this report is to provide an image of a virtual "optimal" scenario for waste prevention and selective collection which could be chosen as a target in an established horizon of time for one regional or local administration in Europe.
This study also aims to give an insight into instruments and strategies developed by those municipalities identified as already achieving good performances in waste prevention and recycling. For those municipalities, we have tried to provide elements of answers to crucial questions listed above.

1.2. Methodology

Even when "virtual", a scenario must be grounded on reality. In order to sketch this "optimal scenario" or more precisely "a set of potential optimal scenarios", ACR+ has looked in the existing literature and in its extensive information library (and data base of experiences of its members) to identify best practices and results achieved to date at the local or regional level in Europe. Existing information providing both national regional and local figures have been compiled and analysed.
We have tried to complete available figures by further data gathering through literature review and internet search. This collection of complementary data's has focused on countries identified by OECD and the EU as achieving best average performances i.e. the Netherlands, Germany, Austria, Belgium and Switzerland.

1.3. Difficulties and constraints

Providing information on best performing municipalities and regions in the field of waste prevention and recycling is made difficult by the fact that:

- It is local and regional authorities which are the main actors in waste management. It is at this level that decisions are taken for waste planning, infrastructure building, organization of waste collection, definition of main legal, economic and voluntary instruments. It this thus necessary to get information at this level to identify best performers
- There is no systematic collection of data's and information at the local and regional levels. Official data's on waste management and recycling performances in Europe – mainly provided by OECD or the EEA – concern national averages which, consequently do not allow to identify best local performers.
- Where they exist, figures provide an image of waste **management** activities at the local level. Data's on actual waste **production** are almost non existent.
- Existing local or regional data's on municipal waste production and management are determined by the scope of activities of the municipalities and by monitoring methods which vary on an individual basis.
- These scope of activities and strategies depend notably on local waste quantities and composition which vary according to the local geographical, physical and sociological characteristics such as, for example:
- the population density which determines the urban or rural character of a city and for instance its production of garden and organic waste
- the climate which has influence on the frequency of waste collection
- the lifestyles and consumption patterns which have a direct influence on waste production
- This report provides a snapshot at a time. **No municipality may pretend to have achieved the ultimate and optimal goal.** We remain convinced, that the recent developments towards more recycling represent only the first step of a process which will expand and develop in the future as a response to increasing pressures on natural resources and the environment.

There are more than 100.000 municipalities in Europe. This study therefore thus does not ambition to be exhaustive nor to pretend having identified the "ultimate" best performing cities. Besides, due to time constraints, it has not been possible to realise an intensive inquiry nor interviews with local representatives.
However, as the only network of local and regional authorities, focusing its activities for more than 12 years on local waste management and recycling in Europe and beyond, ACR+ appears well positioned to provide a realistic image based on existing literature and reports on local waste management practices.

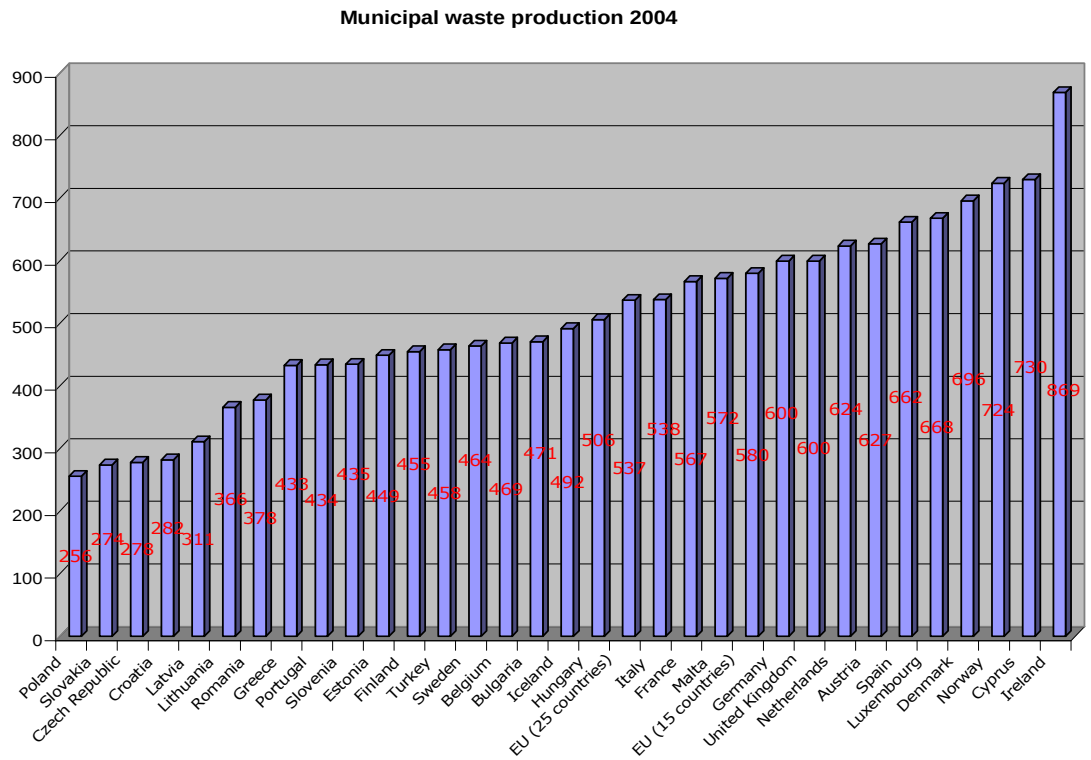
2. What is the quantity of municipal waste production?

2.1. Municipal waste production

2.1.1. National averages

Eurostat publishes average national figures for municipal waste production in EU25[1]. The latest data available concern the year 2004. Those figures are given in the graph 1 here below. It shows significant differences between countries ranging from 256 kg/inh/a in Poland to more than 3 times this amount in Iceland with 870 kg/inh/a. The average for EU 15 is 580 kg/inh/a. New member states have municipal waste production significantly lower. They contribute to reduce EU 25 average to 537 kg/inh/a.

2.1.1.1 Graph 1 : Municipal waste production in EU 25 in 2004



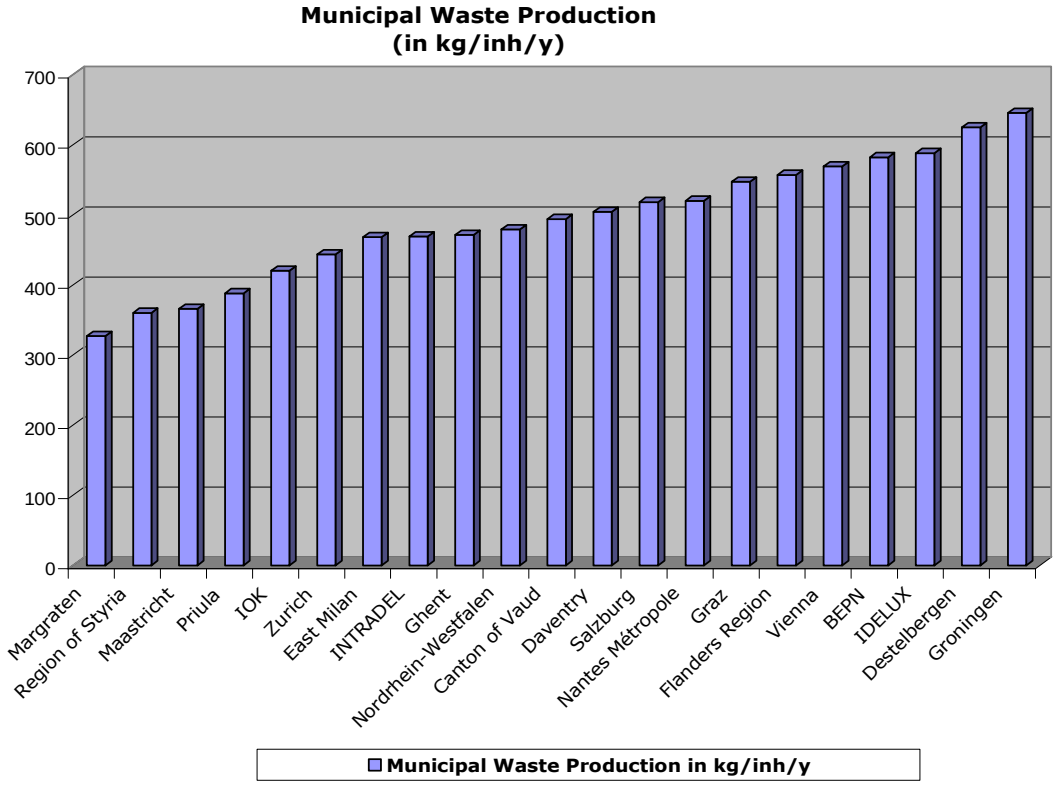
[1] This indicator presents the amount of municipal waste generated. It consists of waste collected by or on behalf of municipal authorities and disposed of through the waste management system. The bulk of this waste stream is from households, though "similar" wastes from sources such as commerce, offices and public institutions are included. For areas not covered by a municipal waste scheme, an estimation has been made of the amount of waste generated.

Those data's are only provided to give an estimate of the range of municipal waste production in Europe. These are official statistics usually referred to by official international organisations such as OECD, Eurostat, the European Commission or the European Environment Agency. However, their meaning is blurred by the fact that:

- they represent national averages. They thus do not allow to identify local variations nor variations according to the urban or rural character of the city, the households consumption patterns, etc
- they do not cover similar scope of waste (cf the discussion below on the definition of household and municipal waste)
- they are not estimated standardised calculation method common for all countries

In the framework of this study, ACR+ has studied in details 23 European municipalities and regions. Their actual municipal waste production is given here below.

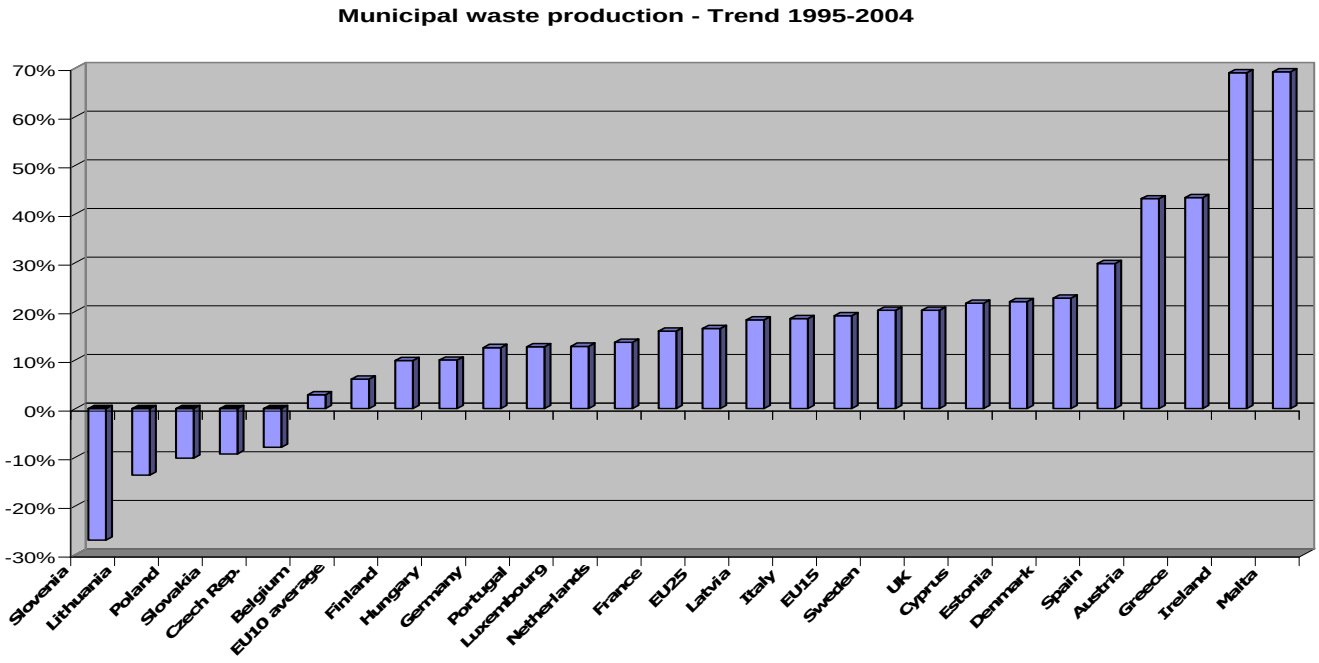
# :	21
Minimum	327kg/inh
Maximum :	645 kg/inh
Average :	492 kg/inh



3. What will be the evolution of this waste production in time?

Waste generation continues to grow. Between 1990 and 1995, total waste generation in the EU and EFTA increased by 10% whilst GDP increased by 6.5%. Municipal solid waste generation has been contributing significantly to this increase and is coupled to the level of economic activity as both MSW generation and GDP in EU-25 increased by 19% between 1995 and 2003[2]. This represents a growth of approximately 2% per year.
The graph 3 here below provides trend of national municipal waste collected for EU25 countries[3] between 1995 and 2004.
It is worth to mention however that despite a globally increasing trend, data's available in some countries show a local trend of stabilization or even of a light decrease more specifically for what concerns the production of packaging waste.

3.1. Graph 3: Trends in municipal waste production in EU 25



It is significant that the amount of municipal waste has decreased in five of Eastern countries. This decrease most probably does not originate in the actual reduction of production of waste by households but echoes a reduction of the scope of activities of public companies in waste management.
Such kind of surprising data's opens the question of the representativeness and reliability of international official data's. This question is discussed in more details here below.

[2] Communication from the Commission COM(2005) 666 final, Taking sustainable use of resources forward: A Thematic Strategy on the prevention and recycling of waste
[3] Source : Eurostat Cronos, 2006

3.2. Discriminating between 'household' and 'municipal' waste

According to definitions by official institutions such as OECD, Eurostat and EEA, **municipal waste** usually refers to wastes collected by municipalities or by order of them whereas **household waste** encompass waste generated by the domestic activity of households
However, in practice municipal waste quantities and composition vary from municipality to municipality. According to EEA, data and information on municipal waste is **in**comparable by nature since it is based on at least three separate concepts:

1. the scope of municipal waste management activities :

Municipal collection encompasses traditional collection methods i.e :

- bagged waste collected door-to-door (as well mixed waste collected in bulk as separately collected fractions)
- waste collected through street containers and igloos
- waste collected from container parks or civic amenity sites

However, differences occur as regards:

- the range of waste flows municipalities include in their statistics for municipal : some of them – and more frequently in Austria, Germany and Switzerland - do not include waste collected selectively for recycling
- the authorization of access to containers parks (since possibilities for traders and small companies to access those facilities varies on a case by case basis)
- the understanding of the "on behalf" concepts since in some countries, municipal waste also include waste selectively collected (for recycling) for their own account by other operators such as non-profit organizations, charities and the private sectors
- the origin of waste collection figures which may be calculated either at the collection stage (in which case it is rather simple to identify waste collected "on behalf" of municipalities) either at the treatment plants (in which case the data do not necessarily excludes waste collected by operators not working for municipalities).

2. the origin of waste reported :

Municipal waste generally includes a large proportion of waste from households. However, inconsistencies occur as regards:

- the extent to which municipalities (or they subcontractors) collect waste from commerce and trade, small businesses, office buildings and institutions such as schools, hospitals, government buildings, etc.
- the inclusion or not of waste from selected municipal services i.e. waste from parks and garden maintenance, from street cleaning services (street sweepings, content of litter containers, market cleansing, …)

3. the categories of waste analysed :

Generally speaking municipal waste tend to exclude *"all those wastes requiring treatment other than municipal waste"* and thus to include all wastes, which because of their nature or composition, are similar to wastes from households. For instance, where a municipality collects waste from hospitals, it will focus on waste from hospital administration and catering but will exclude infectious waste from medical services.

Generally speaking the definition of municipal waste excludes:

- waste from municipal sewage network and treatment
- construction and demolition waste even though it is not always clear what is done with construction and demolition waste from the activities of municipalities e.g. building maintenance, construction, roads, etc…or with inert waste collection via container parks..
- Vehicles (abandoned or otherwise)

Status is not clear for some waste such as:

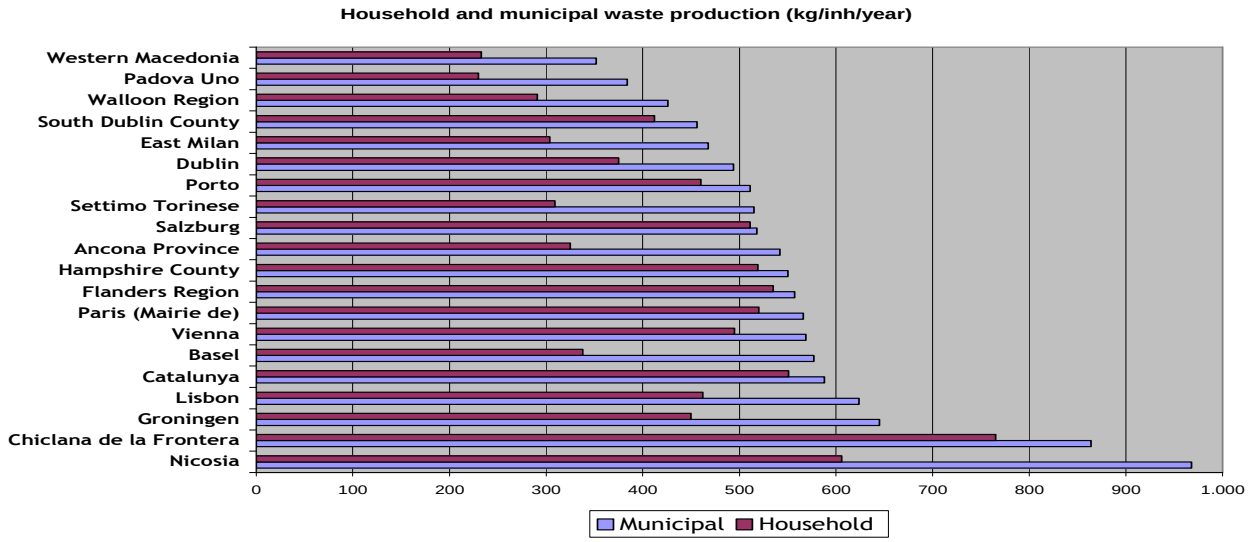
- Reused waste materials
- Incineration residues
- Clearance of fly-tipped waste

The scope of the concept of **household waste** appears more simple since it is linked specifically to the origin of waste, consisting of waste from a unique type of source: households. However, in practice, waste collected from households will often be collected and mixed with waste from other sources such as offices, restaurants, commercial establishments,… This means, that even though, the concept of household waste looks rather simpler to apprehend, it actually is much more complicated to measure on the ground since it requires the realization of sample and analysis campaigns of those municipal waste (that is the sum of bagged mixed waste, of selectively collected waste and of waste collected in container parks) which actually are produced by the normal activity of households.
Such samples and analysis campaigns are rather time consuming and expensive operations and are therefore seldom and irregularly performed by local authorities. They should ideally follow well defined and standardized protocols which are actually still lacking at the European level. In 1998, ADEME published the REMECOM project report. This initiative funded by the EU carried out household waste characterization campaigns in 17 communities from 10 countries. Those campaigns used a standardized methodology and assessed the amounts of 13 household waste categories which have been measured 6 times in the period 1995-1998. Such an exercise has –unfortunately – not been repeated since then.

3.3. The ratio "households"/municipal waste

ACR+ performs regularly among its members a survey of practices and performances of municipal waste management. Most recent surveys have been realized in 2000 and 2005. ACR+ members are requested to provide data's and information on the amount of waste collected and treated by municipalities as well as on the amount of waste from households.
Figure 3 here below, extracted from the 2005 ACR+ survey, provides an image of the kg/inhabitant waste production for household and municipal waste. It shows that among local authorities surveyed, the proportion of household waste as an element of municipal waste range from 59% to 96%, with an average of 77%.

3.3.1.1 Figure 3: household and municipal waste production (kg/inhabitant)



In practice, since data's are collected mainly at the management stage rather than at the production one, all figures provided in this report will concern municipal waste.

4. What is the composition of municipal waste?

Having a good knowledge of the quantity and types of waste which are produced on its territory is crucial for a municipality not only to assess the collection and treatment capacities to be made available but also to estimate the performances of selective collection and to assess, for each material, the stock of waste which remains to be captured by selective collections.
However, securing a good knowledge of municipal and household waste composition remains an objective very difficult to attain. Indeed, there are mainly two possibilities for a municipality to get an insight of municipal waste to be collected and treated per type:

- one is to sum the amounts of waste selectively collected (to add amounts of all the materials which are selectively collected for recycled be it through kerbside collection, via bring containers or in container parks).
- the second is to perform sampling and analysis campaigns of the residual municipal waste

When combined, those two methods contribute to provide a good insight of waste stocks for each material but they are not sufficient to provide a complete picture of the municipal waste stock since they address two different waste stocks. Indeed:

- the first method (based on selective collection results) usually encompasses all municipal waste (that is from households and from other sources)
- the second one (based on analysis of residual waste) usually focuses on waste from households only

Having a thorough and complete picture of the composition of municipal waste would thus require sampling and analysis of all those municipal wastes not from household origin (that is from sources such as offices, restaurants, commerce,….).
Samples and analysis campaigns of residual waste are time-consuming and expensive operations which explains that municipalities are seldom able to provide detailed composition data.
Table 1 below provides compositional data's of municipal waste for some European countries given in an OECD 2003 study, of municipal waste in Switzerland provided by the federal ministry of Environment and of the average municipal composition data's calculated by ACR+ in its 2005 survey.

Table 1. Municipal waste composition (in %)

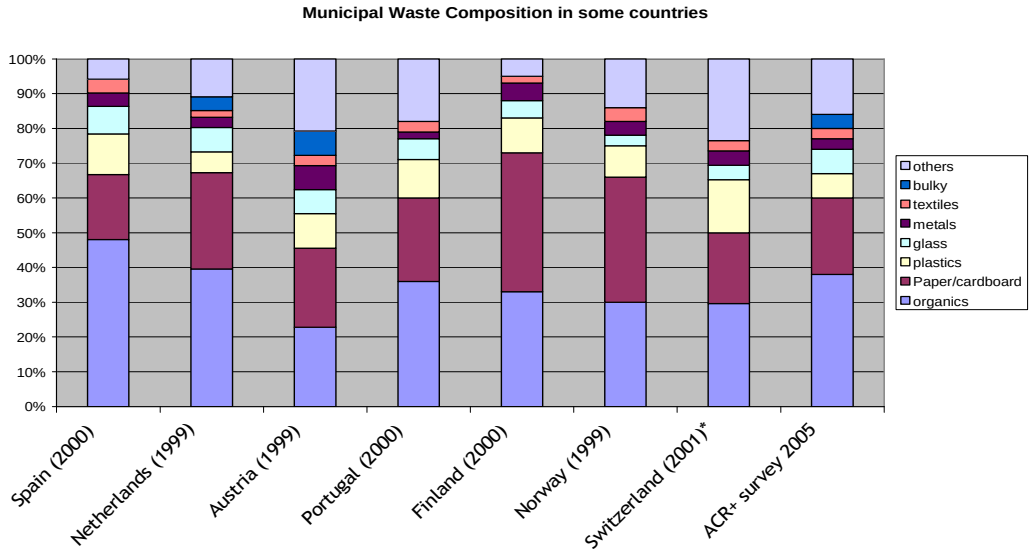
Sources	OECD 2003 [4]						OFEFP 2003	ACR+ 2005
Countries/year	Spain 2000	Netherlands 1999	Austria 1999	Portugal 2000	Finland 2000	Norway 1999	Switzerland[5] 2001	EU[6]
Paper/card	19	28	23	24	40	36	20	22
Beverage cartons							4	1
Glass	8	7	7	6	5	3	4	7
Plastics	12	6	10	11	10	9	15	7
Metals	4	3	7	2	5	4	4	3

[4] Source : Waste generated and treated in Europe 1990-2001, Eurostat 2003
[5] Analyse de la composition des ordures 2001/2002, Office fédéral de l'environnement, des forêts et du paysage, 2003
[6] Data from present ACR+ survey

Organics	49	40	23	36	33	30	29	38
Textiles							3	3
Nappies, napkins, etc.								1
Wood								1
Bulky		4	7					4
electronics							0.6	1
Hazardous waste							0.2	1
Others	6	11	21	18	5	14	20	10

Graph 4 below provides an illustration of the average composition made up from table 1.

4.1.1.1 Graph 4: Average municipal waste composition for some countries



The table below gives an estimate of the amount of waste from different recyclable materials in municipal waste. It provides estimated ranges of compositional percentage and quantities for "classic" categories of recyclables.

Table 2 : Estimated amounts of different recyclable materials in municipal waste

	bracket considered (in %)	Estimated quantities brackets (in kg/inh)
Paper/card	20-40	120-250
Beverage cartons	1-2	6-12
Glass	4-7	20-40
Plastics	7-12	40-70
Metals	3-7	20-40
Organics	29-40	170-250
		375 -660

5. What is the potential of waste prevention?

Waste growth continues to be an issue for local and regional authorities. In consequence, some municipalities in Europe have developed waste prevention campaigns. Those campaigns are fundamental because they contribute to raise citizens awareness on the consequences of their consumption patterns and on waste production. They constitute logical and natural extension of campaigns aiming to motivate citizens to participate to selective collection.
If those prevention campaigns constitute a crucial element of contemporary local waste management policy, there is unfortunately a lack of data's and information as regards their concrete results.
This lack of data's is easily understandable. Indeed, it is difficult to measure waste that does not exist. This lack of information should not however deter municipalities to develop waste prevention campaigns since when successful they are of great interest for them:

- Waste prevention campaigns require money and investments but, when successful, they generate recurrent savings for the authority
- Waste prevention campaign may prolong efforts invested in the promotion of selective collection

ACR+ is preparing a European Campaign on prevention aiming to help local authorities to assess the best options to achieve a 100kg/person reduction of municipal waste and to identify:

- priority waste streams
- potential waste prevention activities
- best performing measures for reducing municipal waste to be collected, treated, etc.
- indicators of waste prevention

Waste Prevention objectives in the Flemish Region.
In its Waste management Plan 2003-2007, OVAM (the public Waste management Agency for the Flemish Region) has drafted 4 scenarios with increasingly ambitious objectives. Within the Sustainability scenario (ranked 3 of 4 in terms of ambition) the Plan defines for the period cumulative percentages for waste prevention and reuse for household and bulky waste. The estimated objectives of reduction of waste production (in kg/inh/a) share as follows:

(in kg/inh)

	Households	**Bulky**
Organics (total)	18,2	11,6
Paper	10,3	0,2
Glass	3,4	0,1
Metals	1	1,7
Plastics	2	0,5
Textiles	1	0,8
Tetrabricks	0.2	-
Nappies	1,2	-
Wood		4,8
WEEE		3,7
Others	1,4	-
Inerts:	0,5	8,8
Small haz.waste	0,3	-
Total	**39,5**	**32,2**

According to this potential, the Flemish Region foresees to devote 60% of the 15-16M° € annual budget to waste prevention initiatives. The 40% remaining devoted respectively to selective collection and recycling (39%) and to final disposal (1%).
50 out of the 130 actions foreseen in the plan concern waste prevention.
While leaving each city or region the freedom to determine the content of the preventive actions they will put in place, ACR+ has identified the following four priority waste streams and set of initiatives which could help municipalities to achieve to reduce municipal waste by between 70 and 140kg/inh/year.

5.1. Concerning biodegradable waste

5.1.1. Promotion of home composting and community composting

- Waste stock: 170 - 250 kg/inh
- Prevention potential: 30 kg/inh
- Some examples:
    - The county of Landkreis Schweinfurt (G) estimates that home composting allowed to reduce organic waste collection by 60 kgs/inh in the
    - Wrap estimates that the potential of organic waste reduction for households who perform home composting may reduce waste by 100 – 340 kg/household /year (between 40 and 150 kg/inh)
    - Milton-Keynes County Council (UK) estimates that households performing home composting reduce their production of waste by approximately 100kg each year
    - In the Flanders Region 35% of households perform home composting

5.1.2. Promotion of composting at source for green spaces

- Waste stock: 20 - 80 kg/inh
- Prevention potential: 8 kg/inh

5.1.3. Fight against food wastage from household and trade

- Waste stock: 40 – 60 kg/inh
- Prevention potential: 10 kg/inh
- Some examples:
    - Brussels Region estimates a potential reduction of between 4 and 7 kg/inh/year of food waste from households and of about 30kg/inh/year of food waste from trade
    - Vienna estimates a reduction potential of food waste from commerce of about 40kg/commerce/day

5.2. Concerning paper waste

5.2.1. Action against unaddressed mail and/or free advertising

- Waste stock : 20 – 30 kg/inh
- Prevention potential : 5 kg/inh

- Example:
    - Brussels Region achieved to reduce unaddressed mail and advertising by about 5 kg/inh

5.2.2. Promotion of dematerialization in schools and offices

- Waste stock: 150 kg/office employee/year
- Prevention potential: 5 kg/inh
- Example:
    - Brussels Region estimates a potential reduction of 20kg/employee/year

5.3. Concerning packaging waste

5.3.1. Actions against unnecessary packaging

- Waste stock: 20 – 30 kg/inh
- Prevention potential: 5 kg/inh

5.3.2. Promotion of returnable products

- Prevention potential: 20 kg/inh
- Example:
    - Denmark estimates that deposit-return systems for beverage packaging allowed a reduction of 70kgpackaging waste/inh.

5.3.3. Promotion of tap water

- Waste stock: 8 kg/inh
- Prevention potential: 2 kg/inh

5.3.4. Promotion of reusable shopping bags

- Waste stock: 2Kg/inh
- Prevention potential: 1kg.inh

5.4. Concerning the products/waste with high reuse potential

5.4.1. Repair and reuse of bulky waste

- Waste stock: 20-60 kg/inh/year
- Prevention potential: 5kg/inh

5.4.2. Promotion of second hand trade

- Waste stock: 20kg/nh/year
- Prevention potential: 5kg/inh
- Examples:

- Munich organise every year with great success the "Repairwork day" where people may bring back appliances to repair
- Vienna has develop a repertory of 2nd hand shops

5.4.3. Reusable nappies

- Waste stock: 5-10kg/nh/year
- Prevention potential: 2 kg/inh
- Examples:
  - Promotion of reusable nappies (along with the introduction of PAYT system) allowed the county of Landkreis Schweinfurt (G) to reduce nappies from 9.4kg to 7kg/inh

6. What are the waste fractions which can be recycled ?

This question is one of the most important question of interest for local authorities. With the evolution of municipal waste towards more recycling, waste management has evolved from one single waste stream to be disposed of to a multiple waste streams strategy where each material has to be collected separately and conveyed to a dedicated facility.
This leaves local authorities with crucial questions as regards the prognosis of necessary capacities of various treatment facilities to be made available as well on the composition and quality of waste fraction which will be obtained.
Beside quality and quantity of selectively collected waste, the regularity of supplies of recyclables (both in terms of quality and quantity) is a crucial factor which will ultimately determine the selling price of recyclable materials.
Forecasting the results of selective collection schemes is particularly challenging since they will depend on the citizens individual commitment and participation to selective collection schemes.
This section aims to identify what level of recycling/composting municipalities can reasonably be expected to achieve. It is based on the detailed analysis of the achievement of **some** of the better performing local authorities be it at local or regional level.
It must be emphasised however that "better" does not mean "best". We have only selected some authorities with recycling performances above the average and for whom available information was sufficient. Data's presented here may thus not be considered either as the best results achieved to date nor as the optimal results achievable. We remain convinced that there remain considerable room for improvement in the field of municipal waste recycling.

6.1. Methodology

To identify those among the tenth of thousands local authorities in Europe, we have adopted a combination of several approaches:

- A survey of existing literature which is actually relative scarce on an international basis and is restricted to:
  - The Resource Recovery Forum report: "High Diversion of municipal waste: is it achievable?"
    Published in 2003, this report is based on an extensive review of literature completed by an in depth survey of a selection of local authorities in Austria (City of Vienna, City of Graz, and state of Styria), in Germany (region of Nordrhein-Westfalen, cities of Bonn and Munster), in Belgium (Flanders Region and city of Ghent), in The Netherlands and in Switzerland (Cities of Zurich and Geneva).
  - The ACR+ 2005 survey : "Municipal waste management an image from local and regional authorities in Europe"
    This survey is based on an in depths analysis of waste strategies and instruments developed by 35 municipalities in various countries. The research has been performed in 2005 through a detailed questionnaire completed by direct interviews with local experts and document analysis. This survey is more comprehensive and provides more detailed figures but it only gives a snapshot of waste management options at the local level. Unlike the RRF report, it does not aim to

target specifically "best performers". Therefore, a selection of municipalities has been made in the context of the present study.

- A survey of OECD, EEA and EC reports which provide figures on waste production and recycling at the national level. This has allowed to identify countries where selective collection and recycling schemes are more mature.
- For those countries identified, a review of literature available at national, regional and provincial levels has been made to identify local and regional "frontrunners".
- Finally, a research of data's available at the local and regional levels through internet research and interviews.

6.2. Comments

Information and data's collected have not always the same level of accuracy and exhaustiveness. Some authorities only provide details for some categories of waste. They regroup them together in different ways. Therefore, figures presented in this report may not be considered as totally comparable. We have had to group or discriminate some of them on the basis of available information. In any case, we have taken the necessary precautions to ensure a coherent image of current municipal collection achievements. We remain confident that data's presented in this report give a realistic estimate of actual municipal achievement.

6.3. Results

6.3.1. National figures

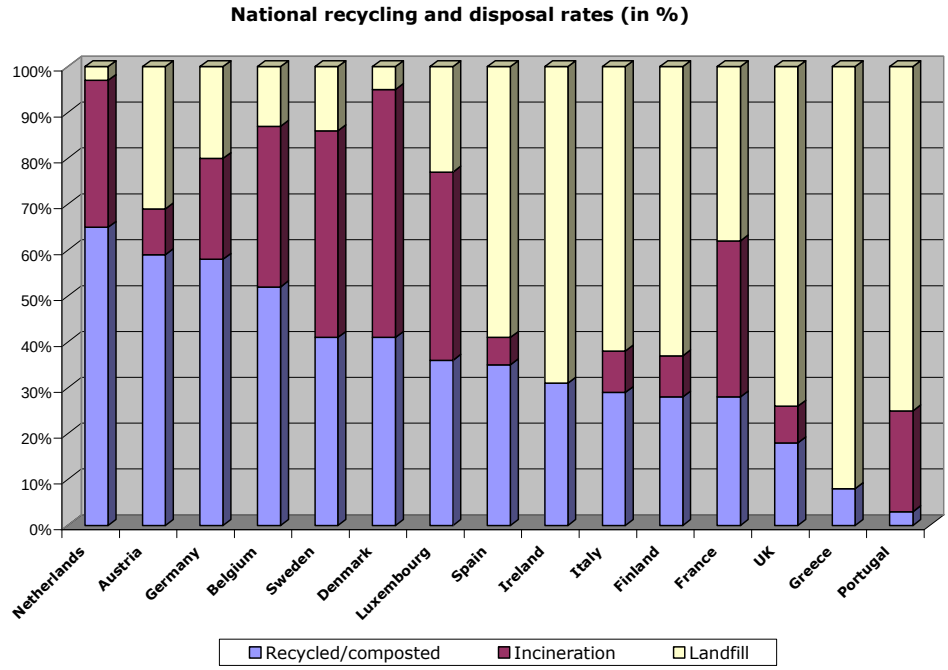
The European Commission estimates that, at present, 33% of municipal waste in the EU is recycled and composted. Remainder is disposed of through landfill (49%) and incineration (18%)[7].

A new report from the Institute for Public Policy Research (ippr) and Green Alliance to be published this autumn, provides an overview of recycling achievements at the national level in European countries. Based on figures from 2003/4 OECD statistics for municipal waste management, the report identifies four European countries which achieve average recycling rates above 50% with The Netherlands as the best performing country with 65% of municipal waste being recycled or composted.[8] Complete results are given in the graph 5 here below.

[7] Communication from the Commission COM(2005) 666 final, Taking sustainable use of resources forward: A Thematic Strategy on the prevention and recycling of waste

[8] http://www.ippr.org/pressreleases/?id=2283, accessed on 12/09/06.

6.3.1.1 Graph 5 – National recycling and disposal rates in 2003



6.3.2. Local and regional figures

Best performing local authorities usually perform selective collection and recycling for the following main streams:
A dry fraction composed of:

- Packaging waste :
  - Paper (usually mixed with other paper fraction such as newspapers, magazines,…)
  - Glass
  - Light packaging which gather packaging materials most often collected together:
    - Plastics : most often restricted to clean and large containers and bottles of beverages and detergent
    - Metals : steel and aluminium
    - Beverage cartons : whose commercial name are tetrapack
- Textiles
- WEEE

A Wet (or organic fraction) which is sometimes further subdivided in:

- Kichen waste
- Garden waste

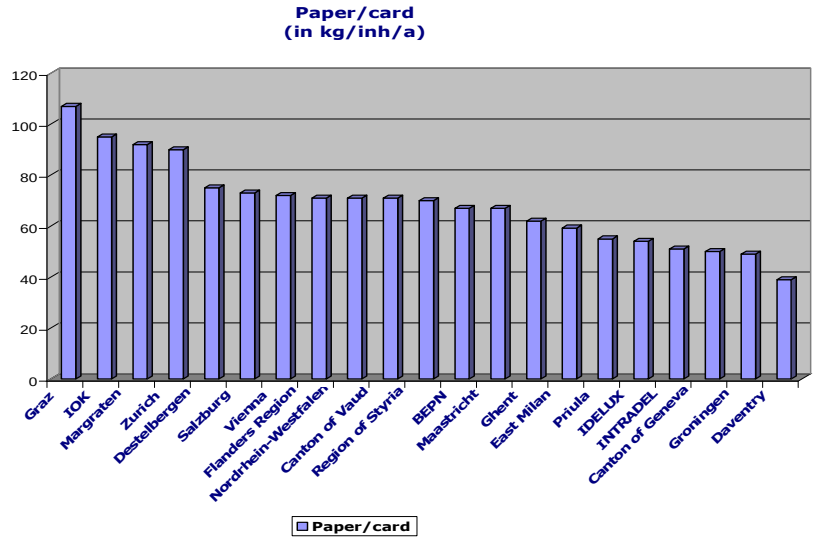
The following section will analyse the selective collection results for those "classic" recyclable materials.

6.3.2.1 PAPER

The graph below shows that quantities of paper collected selectively in reviewed areas vary as follows:

# :	21
Average :	68 kg/inh
Maximum :	107 kg/inh

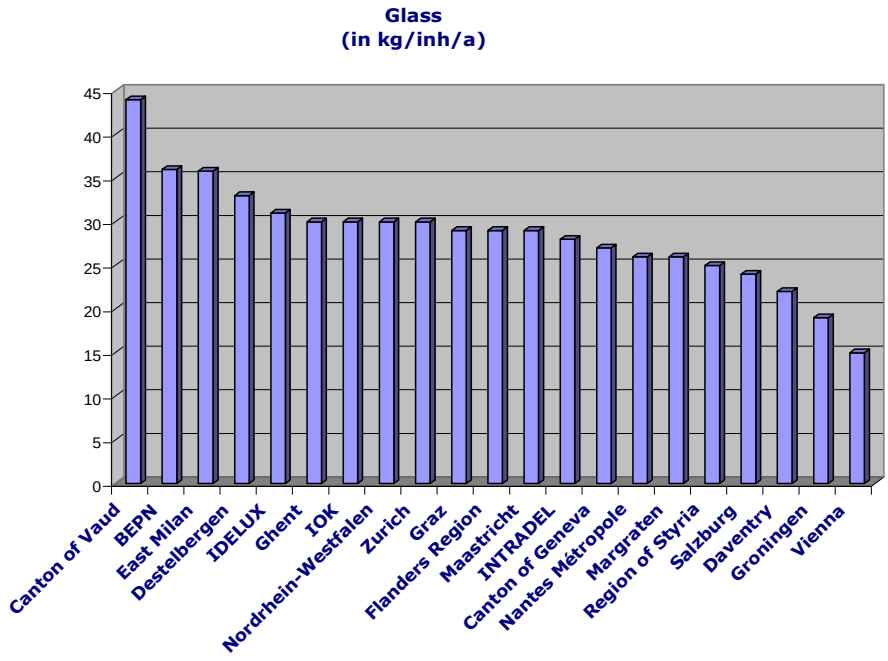
14 cities exceed the limit of 60 kgs while 4 are above the 80kg. This 80 kg threshold appears quite clearly as a reasonable objective for recycling.



6.3.2.2 GLASS

# :	21
Average :	30 kg/inh
Maximum :	48 kg/inh

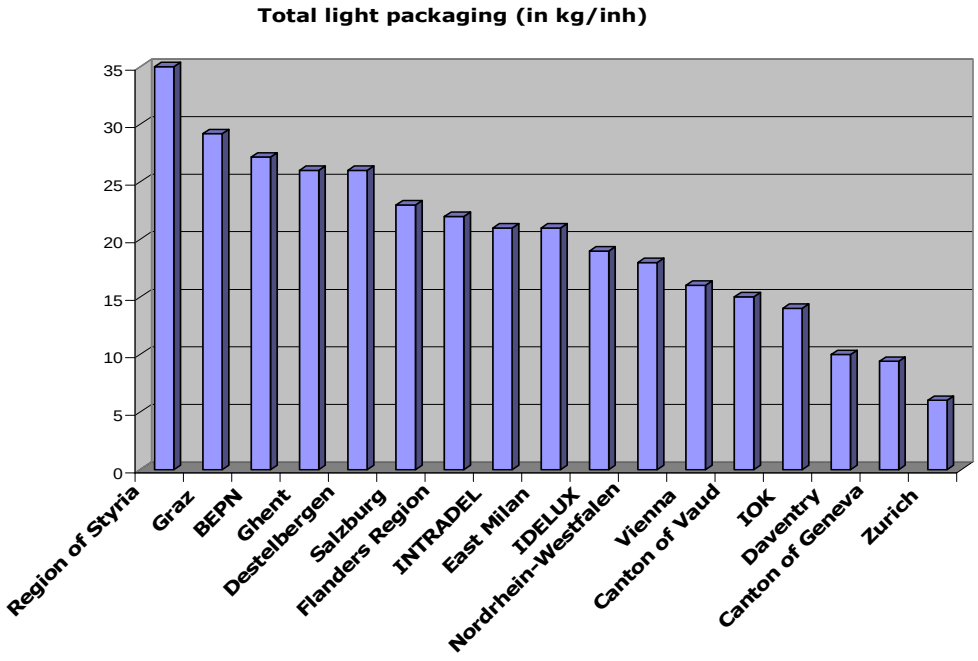
Nearly half of authorities studied achieve or exceed the threshold of 30 kg of glass selectively collected per person while three of them exceed 35 kg. It seems reasonable for authorities to target between 30 and 40 kg of glass/inh/year.



6.3.2.3 LIGHT PACKAGING

Many authorities have introduced **'multi-material' or 'co-mingled' collections**, most frequently mixing plastics, metals and composite packaging - what we have called 'beverage cartons. Francophone authorities call this 'PMC' (plastics, metals and cartons) and Spanish authorities use the term 'light packaging'. In some cases, light packaging is collected altogether with other materials such as paper and/or glass.
It is rather frequent that the local authority does not provide data's for the various materials inside light packaging. This is particularly the case where sorting activities for those packaging waste are not performed by the local authority itself or when it is sent to a sorting centre which mixes waste from various origin. This practice impedes the authority to get precise figures on the actual composition of commingled light packaging material.
The graph presented here below is based on available figures for light packaging material and for their components.

# :	18
Average :	20 kg/inh
Maximum :	35 kg/inh



The graph here above shows that 6 out of the 18 best performing authorities collect 25kg and more of light packaging material per inhabitant.
It must be emphasised however that there are great variations in the collection performances for light packaging. This may be due to differences in maturities of the systems or to differing attention addressed on those materials. For instance, in the Netherlands, the selective collection of dry materials mainly focus on glass and paper and in the selected Dutch cities provide no data's for light packaging materials.

6.3.2.4 PLASTICS

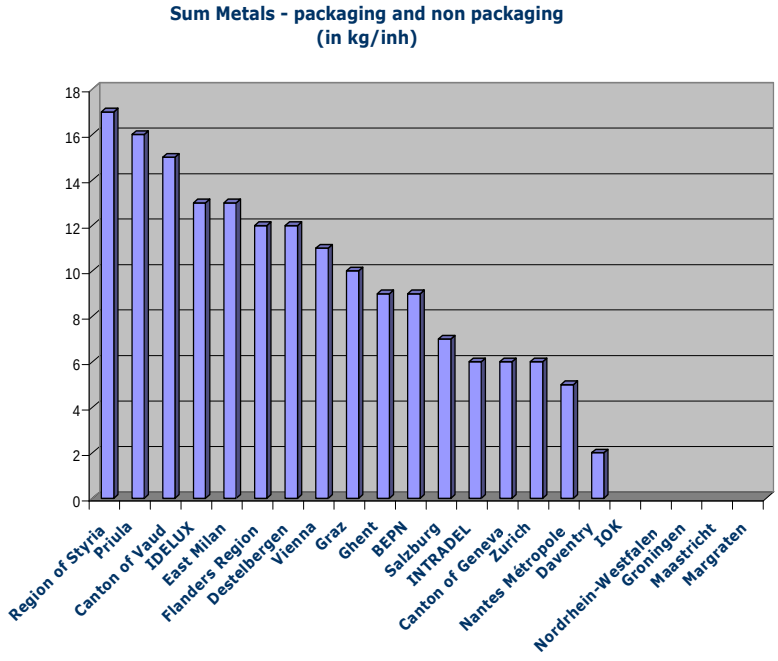
# :	6
Average :	6 kg/inh
Maximum :	8 kg/inh

Only six cities provide separate figures for plastics ranging from 3 to 8kg/inh with an average (calculated for those cities) of 6 kg.
Let's also mention that 4 municipalities collect other fractions of plastic waste through container parks and other systems with quantities ranging from 1 to 5 kg/inh. This is mainly the result of selective collection for big plastic films from households and agriculture.

6.3.2.5 METALS

Among the authorities studied, none makes the distinction between steel and aluminium. Besides, most authorities provide merged data's for packaging metal and non packaging metals. Graph below, shows that 9 cities on 16 collect 10 or more kg of metals/inh.

# :	16
Average :	10 kg/inh
Maximum :	16 kg/inh



6.3.2.6 BEVERAGE CARTONS

No data were provided for beverage cartons. Collected quantities between local authorities should vary significantly in line with the success of such type of packaging which varies a lot between European countries.
For instance, the Perchards study in 2005[9] gives a market share of carbonated soft drinks by main container type in 2001. It shows that Germany has 16% of soft drinks sold in tetrapack whereas Scandinavian countries by far prefer refillable (glass and PET) packaging.
The ACR+ 2005 survey gave an average amount of 6 kg per inhabitant for beverage cartons with great local variations (up to 19 kg in one case).

[9] Study on the progress of the implementation and impact of Directive 94/62/EC on the functioning of the internal market : final report, May 2005

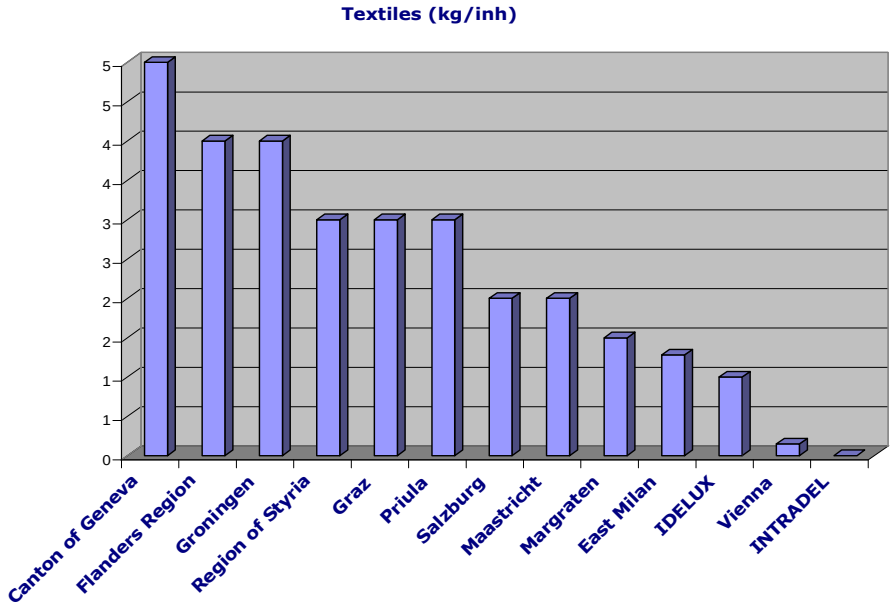
Table 36: MARKET SHARE OF CARBONATED SOFT DRINKS BY MAIN CONTAINER TYPE, 2001

% of total	Refillable glass	Refillable PET	Non-ref glass	Non-ref PET	Cans	Postmix	Cartons
Finland [115]	88		-	-	1.3	11	
Germany [116]	45	14	6	17	2		16
Norway [117]	1	90	*not specified*	*not specified*	1	5	
Sweden	21	33	1	20	11	13	

Source: WAPG (Germany), national brewers' associations (other countries)

6.3.2.7 TEXTILES

# :	13
Maximum :	5 kg/inh
Average :	2 kg/inh



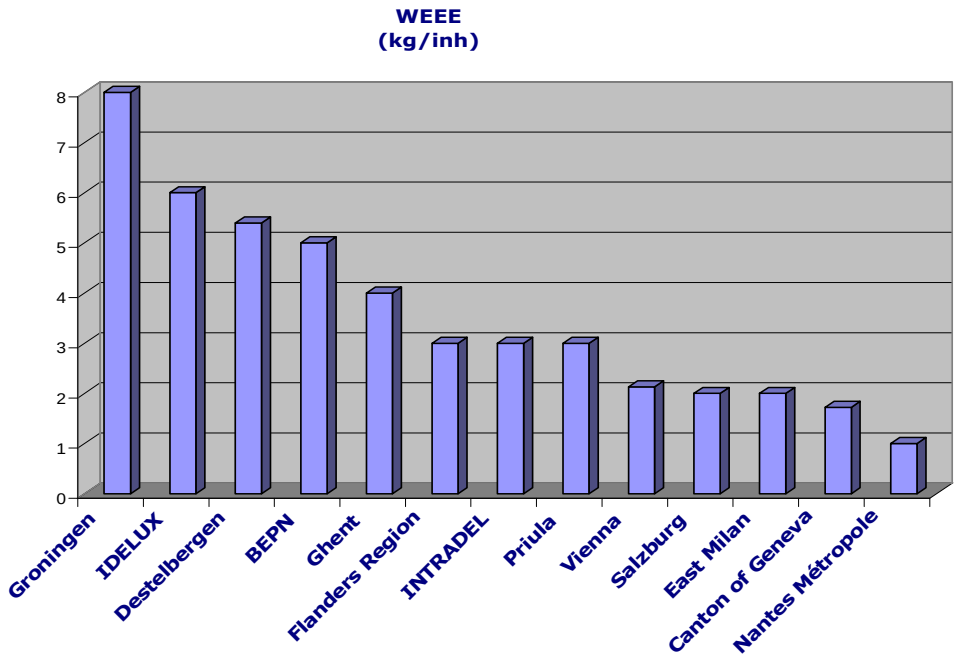
13 cities collect between 0 and 5 kg/inh of textiles with a maximum of 5 kilos in Geneva. 6 out of 13 authorities collect 3 or more kg/inh of waste textiles.

6.3.2.8 WEEE

# :	13
Average :	4 kg/inh
Maximum :	8 kg/inh

The 13 authorities which provide data's for WEEE collect between 1 and 8 kg/inh with an average reaching the European directive target of 4 kg.

Those figures are to be compared with the national results for countries which have the more mature WEEE collection systems sucha as the Netherlands, Sweden and Norway which respectively achieve more than 4, 8 and 13 kg/inh.
It is recognised that some member states are having difficulty implementing the directive, in particular in determining the share of responsibilities between private and public actors for organising and financing the collection of appliances. But, in the view of results achieved today in some regions and countries, there is little doubts that European targets may be achieved quite rapidly.



6.3.2.9 ORGANIC WASTE

# :	23
Average :	95 kg/inh
Maximum :	227 kg/inh

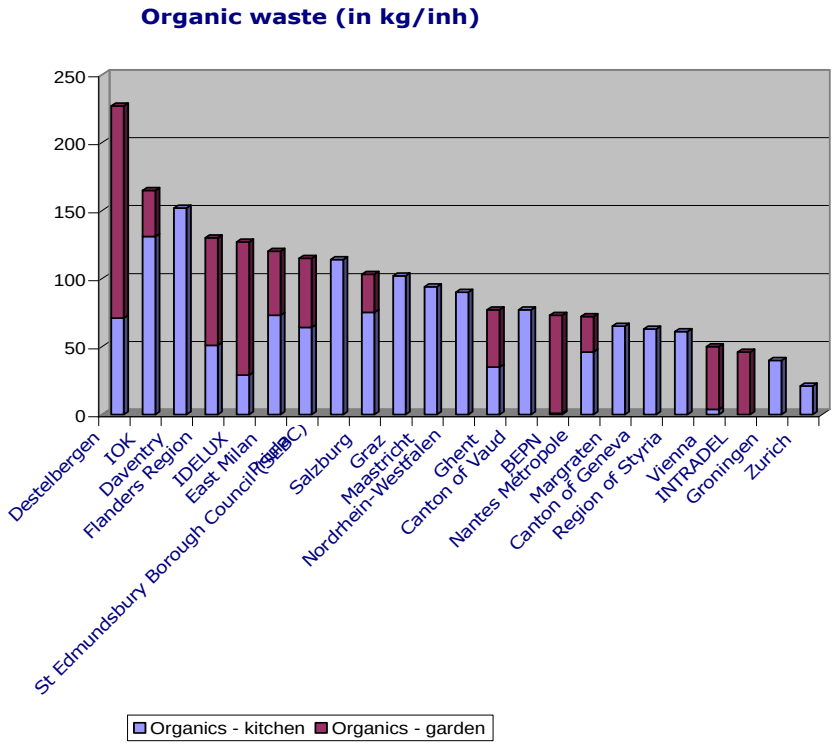
The graph below shows selective collection results for organic waste in considered cities. Organic waste collection varies from 21 to 227 kg/inh with an average of 95 kg. 10 out of 23 municipalities collect more than 100kg/inh. Five collect more than 125 kg.
The graph also illustrates the share between organic waste from garden and from kitchen for certain cities.
Where there is no separate data's, it is not possible to estimate whether this organic fraction is made of kitchen waste or of garden waste. Where separate data's are provided for garden and for kitchen organic waste, it shows that quantities are quite comparable with averages of 58 kg/inh for organic waste and 64 kg/inh for garden waste.

KITCHEN ORGANIC WASTE

# :	13
Average :	58 kg/inh
Maximum :	131 kg/inh

GARDEN ORGANIC WASTE

# :	12
Average :	64 kg/inh
Maximum :	156 kg/inh



Whereas kitchen waste represent a rather constant fraction, garden waste production and collection will vary significantly according to:

- the rural or urban character of the city considered
- the organization of a kerbside collection or not
- the promotion of home composting
- the period of the year considered

Besides those variations, the actual amount of municipal organic waste will depend as well of the inclusion or not in municipal waste collection of waste from other origin such as:

- green waste from parks
- waste from agricultural industries
- waste from restaurants and services
- urban sewage sludge
- ….

Table : Estimations of different fractions of biodegradable waste in France[10]

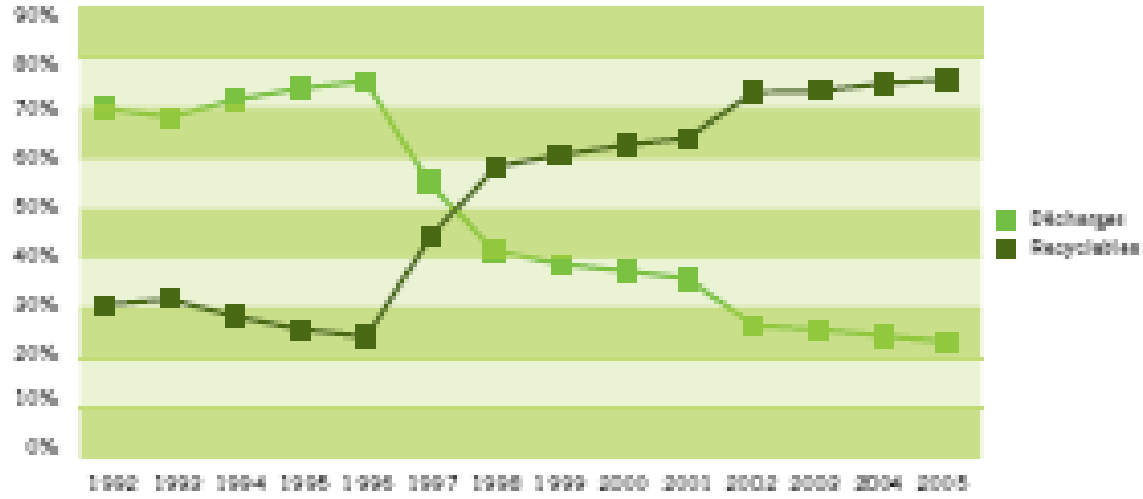
	Total arisings/inh
Household waste	135 Kg
Green waste	135 - 200 kg / person
Urban sewage sludge	165 kg / person
Organic waste from services	25 kg / person
Problematic' organic wastes from agricultural industries	50 kg / person
Organic wastes from the paper industry	30 kg / person
Organic wastes from other industries	13.5 kg / person

Those variations explain that some local authorities collect selectively up to 220 kg or organic waste/inh/year. However, the bulk of analysed cities collect between 100 and 150 kg of organic waste /inh/year.

6.3.2.10 OTHER WASTE SELECTIVELY COLLECTED

Besides the "traditional" recyclable waste, most municipalities collect selectively other waste fractions such as wood, bulky, inert, tires, hazardous, food oil, plastic, reusable, flat glass.
This collection is made mainly through container parks or via collection on demand.
Separate collection allows to orient them towards specific treatment options for instance for hazardous waste. Those waste are not systematically recycled but a substantial and increasing amount of it is actually recycled.
For instance, Intradel provides figures showing the evolution in time of recycling of waste collected at civic amenity sites. Flanders region estimates that 80% of waste collected in civic amenity sites is recycled.

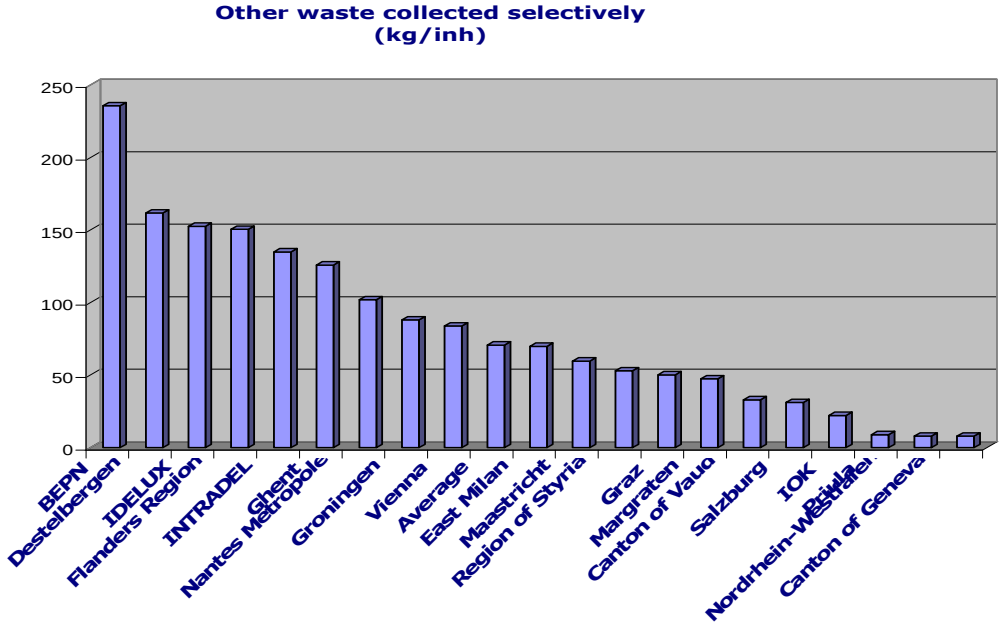
Graph 6: Evolution in time of treatment methods for waste collected in civic amenity sites in Intradel (BE)



[10] Source : Estimations ADEME (F) 2004 dans Projet de Guide pratique à l'attention des élus locaux "Valorisation des déchets organiques : comment mettre en place vos debouches ? », AMORCE

Since they are not considered as common recyclables, not all municipalities provide data's for those waste fractions even though they collect them. That is why the set of data's presented for those fractions may be considered as a conservative minima.
Those fractions represent significant amounts since the average for the 21 municipalities studied is of 81kg/inh with a maximum of 236 kg/inh for the Province of Namur.

# :	21
Average :	81 kg/inh
Maximum :	236 kg/inh



The table 3 below present the selective collection results for those "other" waste selectively collected. It must be mentioned that – in order to keep things simple – it only presents waste categories for which collection results are above 1 kg/inh. Most local authorities also collect specific waste such as batteries, toner cartridges, solvents,.. but they have been considered out of the scope of this report because not significant in terms of weight. It must be mentioned as well that this table is certainly not complete since it is highly probable that municipalities studied also collect some of those fractions but do not report on them or classify them in an "other" category.

Table 3: Amounts of other waste categories collected in studied cities

	BEPN	Destelbergen	IDELUX	Flanders Region	INTRADEL	Ghent	Nantes Métropole	Groningen	Vienna	East Milan	Maastricht	Region of Styria	Graz	Margraten	Canton of Vaud	Salzburg	IOK	Priula	Nordrhein-Westfalen	Canton of Geneva
Total	236	162	153	151	135	126	102	88	84	70	60	53	50	48	33	31	22	9	8	8
Wood	27	27	37	23		23			17	22		10	23			10	14			8
bulky	59	43	12	36	53	36	45	87	20	30	59	39		45	33	20		9		
inert	120	82	97	85	80	59	55		45	16			26							
tires				0					1	0			1			0				
hazardous		2	2	3	1	2		1	1	1	1	4		3		1	3			
food oil	1		1		1								0							0
plastic	1		4														5			
reusable				4																
flat glass										1							1			
others	28	7				6	2												8	

6.3.2.11 COMPOSITION OF "OTHER SELECTIVELY COLLECTED WASTE"

The 3 most important fractions are wood, bulky and inert waste. The number of occurrences, maximum and average for each of them are given below.

Wood	
# :	12
Average :	20 kg/inh
Maximum :	37 kg/inh

Bulky	
# :	16
Average :	39 kg/inh
Maximum :	87 kg/inh

Inert	
# :	10
Average :	67 kg/inh
Maximum :	120 kg/inh

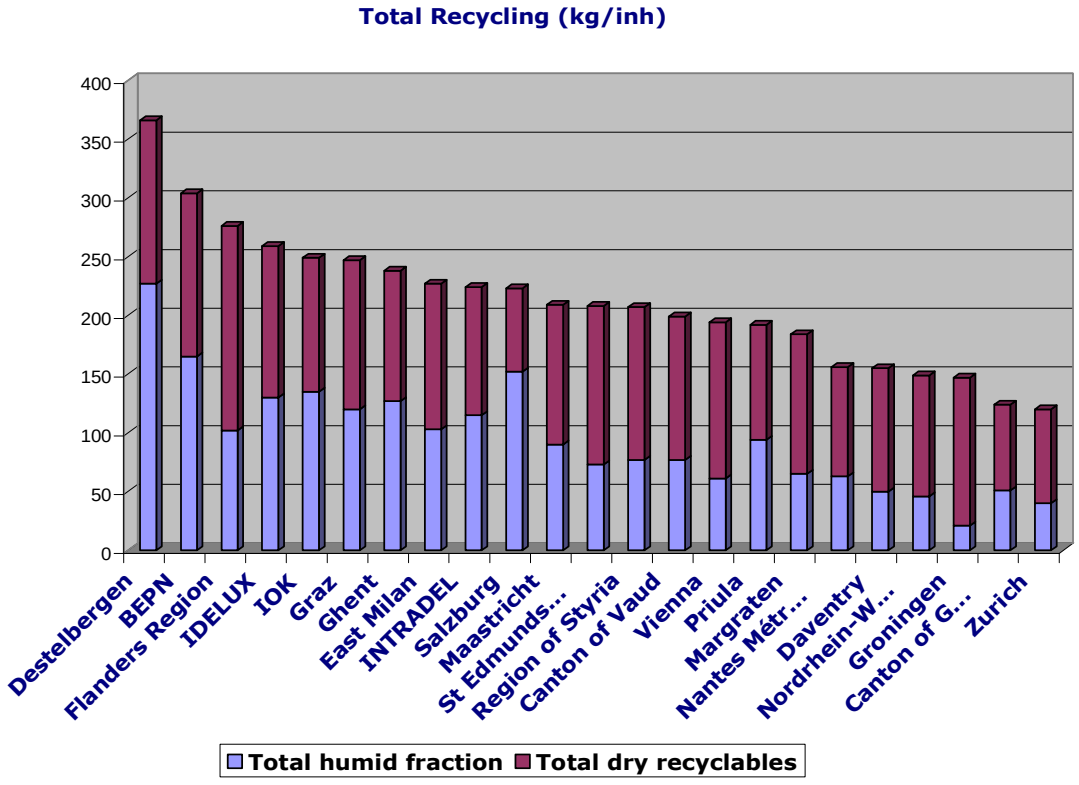
7. What are the achievable selective collection and recycling rates?

7.1. The "classic" recyclables

The graph here below gives the amounts of traditional waste selectively collected for recycling. Traditional waste means the classic dry recyclables i.e. paper, glass, light packaging, WEEE and textiles as well as organic kitchen and garden waste.

Recycling rates	
# :	23
Average :	44%
Maximum :	72%

It shows that for those traditional recyclables, an average recycling rate close to 45% with a maximum for IOK in Belgium at 72%. It is significant that nine of the 23 authorities considered are above 50%.
As far as the quantities are concerned, most municipalities collect between 200 kg and 300 kg "traditional" recyclables par person.

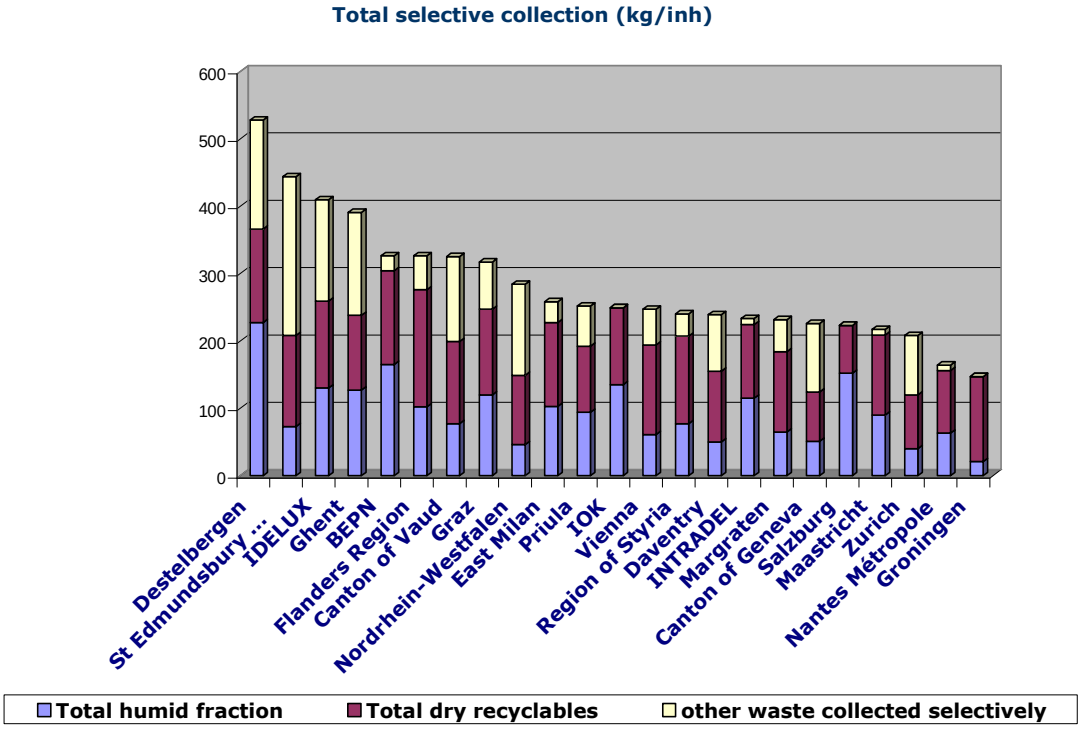


7.2. Global Recyclables

If besides, the "classic" recyclable waste, we take into account the other recyclable fractions most often collected in civic amenity sites such as wood, bulky, inert, tires, hazardous, food oil, plastic, reusable, flat glass,….we get another image of potential recycling achievements.

Recycling rates	
# :	23
Average :	57%
Maximum :	84%

The average selective collection rate attains 57% with a champion at 84%, Destelbergen in Flanders. Among the 23 municipalities considered, 13 achieve more than 60% and 10 collect selectively more than 2/3 of municipal fractions.
As far as quantities are concerned, the graph below shows that best performing authorities collect selectively between 300 and 400 kg/inh.

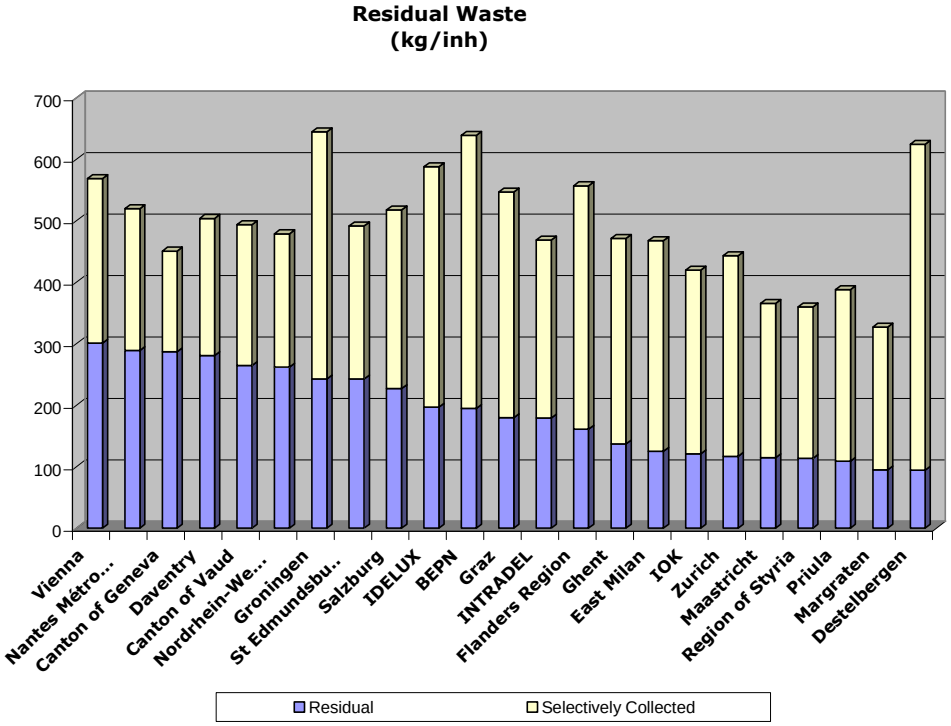


8. What remains after prevention and selective collection: residual waste

The graph below presents the amounts of residual waste announced by the authorities. The graph also provides a comparison with municipal waste production.

Residual waste	
# :	23
Average :	189kg/inh
Minimum :	94kg/inh

The average residual waste production in the cities analysed is of 189kg. Two authorities, i.e Destelbergen (Be) and Margraten (NL) are below the threshold of 100kg/inhabitants. It appears worth mentioning their rural character.
The limit of 150 kg/inh residual waste appears quite a reasonable objective since nine of the 23 municipalities already attain it. Five more cities join them under the limit of 200 kg/inh.



9. How to organise selective collections? In how many separate flows?

With the emphasis put on recycling and the obligation to achieve recycling targets for specific waste streams and materials, selective collection has become a crucial element of municipal waste management. Defining an optimum selective collection strategy is however not a simple task since it has to comply with a series of requirements which may conflict with each others. Indeed, selective collection scenarios must:

- **Be convenient and user friendly**: without citizens participation, recycling remains an illusion. Therefore, the collection scenario must be convenient for the citizen, with sorting requirements easy to understand and to apply. Commingled collection (notably for light packaging) is the results of the double needs for local authorities to keep sorting instructions simple for citizens and at the same time to control the costs of selective collection. Those last years have seen a trends in Europe of a convenience increase of selective collection by providing a kerbside service (replacing neighbourhood banks), by providing more neighbourhood banks (reducing the distance to be travelled by users to deposit materials), and/or by increasing the range of materials being collected. This trend has been driven by the need/willingness to increase quantities of waste collected and by the need to keep control of the contamination rates.
- **Be compatible with subsequent sorting processes:** first of all, selective collection must allow to achieve low rates of contamination. Besides, materials collected altogether must be easy to separate at the sorting plant. For instance, the opportunity to collect glass commingled with light packaging is often debated. Some claim that it is not possible to remove at the sorting plant some small bits of crushed glass from other fractions to be recycled (for instance plastics) and that it reduces by far the chances to resell other sorted fractions at a good price. Some municipalities continue however to collect glass and light packaging altogether without reporting any difficulties.
- **Adapted to the local context:** it appears rather obvious that selective collection must be adapted to local parameters such as:
  - Geographical and urban development: density of population, single detached houses, multi-occupancy or high rise building, the presence and size of gardens, land use based activities such as rural, urban, agricultural, residential etc.
  - Social and cultural context: population demographics, cultural and social mixes, profession and education can often affect waste arisings, recycling scheme participation and residual composition. Besides, attitudes to waste, the type of education required to encourage participants in recycling and the types of food and goods purchased, and hence disposed of, can all be influenced by culture.
  - Economic context: The level of wealth can influence consumption and disposal patterns at a fundamental level. The existence of a local market and demand for recyclables appears crucial for the design of collection as well.
  - Time, weather and climate: seasonality primarily affects growth rates of organic garden waste but can also affect consumption patterns. Seasonality is obviously of major importance in touristy areas. Weather has a similar

effect: for instance in Southern countries, residual waste collection is on average more frequent than in Northern countries and it is not rare to encounter daily kerbside collection in some Southern cities.

- **Economically affordable:** this appears rather obvious. However, the local authority is faced with an alternative to invest either in selective collection either in subsequent sorting facilities (since what is not separated at source must be separated later in a sorting plant). The financial balance of both alternatives is rather complex to compare.

The section here below, will discuss the collection scenarios for the various types of materials.

9.1. Selective collection of paper and cardboard

Paper is a material collected by all responding authorities. With an average of nearly 70kg/inh selective collection, it forms a considerable element of typical 'dry' collection systems. The market for this material is well developed, and has been so for decades.
It is a popular kerbside collection material, far ahead of second-placed neighbourhood bank and civic amenity sites
The share of collection methods for municipalities studied in the present report show a distribution as follows:

	Kerbside	Bring	CA	OD
Present study	20	7	13	0

CA : Civic Amenity Sites
OD : On demand

A recent ACR+ report, on 35 municipalities, showed the following distribution of collection methods.

	Kerbside	Bring	CA	OD
ACR+ study	24	18	16	3

By merging and comparing both reports, we end up at the following distribution

	Kerbside	Bring	CA	OD
Synthesis	35	20	22	3

It must be mentioned that considerable tonnages can be collected from non-household sources such as for instance offices and retailers. For instance, a study performed by the Brussels Capital Region estimates that paper from offices represents a potential of **140 kg/inh**. Selective collection from these sources however appear to be less widespread and their potential should be investigated further.
It seems worth mentioning that a combination of various collection methods is widespread. 17 of the 43 authorities considered in both studies combine 2 different collection methods for paper and 11 apply 3 different collection methods. In its study, ACR+ indicates that this combination of two different selective collection methods seems to allow to increase collection rates by about 50%.

9.2. Selective collection of glass

Glass shares many selective collection characteristics with paper. It is collected by all the authorities, and makes up a considerable element of selective collection systems, because it is long-established in recycling collections (some authorities introduced banks as long ago as the 1970s) and because it is a heavy material.
Glass tends to be collected separately from other materials, normally from neighbourhood banks rather than kerbside, although kerbside remains the second most popular collection style.
The share of collection methods for municipalities studied in the present report show a distribution as follows:

	Kerbside	Bring	CA	OD
Present study	10	13	10	0

CA : Civic Amenity Sites
OD : On demand

A recent ACR+ report, on 35 municipalities, showed the following distribution of collection methods.

	Kerbside	Bring	CA	OD
ACR+ study	11	26	13	1

By merging and comparing both reports, we end up at the following distribution

	Kerbside	Bring	CA	OD
Synthesis	18	31	18	1

Many authorities have taken a very strong 'separation at source' approach, particularly where green dot systems have been implemented. Here, glass is separated at source according to colour, with individual banks being provided for clear and coloured glass, collected from the banks and taken directly to recyclers.
As it is the case for paper, glass is often collected by a combination of various collection methods. 16 of the 43 authorities considered in both studies combine two different collection methods and 6 apply three different collection methods. For glass a well, the ACR+ study indicates that the combination of two different selective collection methods seems to allow to increase collection rates by about 50%.

9.3. Selective collection of light packaging

There is a rather clear geographical partition on the collection methods for light packaging with some countries such as Belgium, France, Austria, Germany and Luxembourg preferring kerbside collection for commingled materials whereas other countries mainly in the South of Europe are opting for bring systems. It must be stressed as well that selective collection of light packaging is much less widespread and intensive in Scandinavian countries which have put the emphasis on reusable packaging. The Netherlands is a specific case because the national strategy has up to now put the emphasis on selective collection of organics (with an obligation for municipality to collect those wastes separately) and has opted until 2005 on a voluntary agreement (the packaging covenant) with producers. This Covenant apparently was not considered as sufficiently incentive for local authorities to develop selective collection and has been abandoned in 2005. It is too early to assess the effects of the new regulation and the setting up of a "Green Dot"

organism on the development of selective collection schemes for light packaging materials in this country.

Packaging Reuse in Europe

Deposit systems are mandatory in some European countries. Scandinavian countries are pioneers in the introduction of those systems and a mandatory deposit for beverage packaging has been in place in Sweden since 1984. Denmark, Finland and Norway have also introduced such an obligation. The idea is gaining momentum and Germany has introduced the obligation in 2003, followed by Estonia in 2005.
This has had consequences on packaging waste production as well as on the development of selective collection of packaging waste.
Finland is the European country with the lowest packaging consumption per capita in EU 15 (~80kg inh) whereas the EU 15 averages ~180 kg. Denmark, where deposit and return systems have been established for a number of packaging types such as beer and carbonated soft drinks estimates that such a system has allowed to prevent management of some 390,000 tons of waste every year, corresponding to around 20 per cent of the total amount of domestic waste from households or to ~70 kg/inh.

Selective collection of light packaging is still in its infancy in some countries like Ireland, Greece and Portugal.
Where it is implemented, **'multi-material' or 'co-mingled' collections**, most frequently mixes plastics, metals and composite packaging - what we have called 'beverage cartons'. Francophone authorities call this 'PMC' (plastics, metals and cartons) and Spanish authorities use the term 'light packaging'.
As a general trend, it can be estimated that kerbside collection of light packaging is gaining ground in Europe and is now developing rapidly in some countries such as Italy, Ireland, Spain and UK. This is due to the fact that kerbside collection is considered as having better performances in terms of quantities collected. The impact on quality is much more controversial.
Due to limitations in time, we have not been able to make a review of the literature on the issue but we may however mention that:

- Countries which implement kerbside collection are among those who achieve higher recycling results for packaging
- The analysis of the authorities considered in this report shows that kerbside collection is the preferred option for light packaging with 13 occurrences whereas bring system is used by 4 and civic amenity sites by 7. Four authorities combine 2 collection methods.
- A study of the Independent Assessment of Kerbside Recycling in Australia11estimates that the environmental benefits of kerbside collection clearly outweigh the financial costs of providing the service
- According to another recent study3 undertaken by Nolan-ITU in 2003 for the JRG and the Publishers National Environment Bureau (PNEB), the best performing recycling systems in UK, in order of performance are:
    1. Kerbside recycling systems employing fortnightly collection of commingled containers in a mobile garbage bin (MGB) and fortnightly collection of paper/cardboard in a separate MGB.
    2. Fully commingled collection in an MGB (commingled containers and paper cardboard) collected fortnightly
    3. Separate crates – one for commingled containers and one for paper cardboard.

[11]Independent Assessment of Kerbside Recycling in Australia , Nolan-ITU Pty Ltd and Sinclair Knight Merz, January 2001

A subsequent result from the mixing of different materials is that figures for the different materials cannot be segregated. A recent ACR+ study which was based on detailed inquiries and interviews with responsible allows us to go beyond and to consider materials separately.

9.4. Selective collection of metals

Data's for metals are difficult to interpret because:

- since it is one of the 'PMC' materials, it is not necessarily presented as an individual selective collection material
- it also includes non-packaging (therefore heavy) units such as furniture (shelves, desks, etc.) which are collected through civic amenity sites or on demand. However, local authorities very rarely make a distinction between packaging and non-packaging.
- most authorities do not distinguished between ferrous and non-ferrous metals

The ACR+ study shows that the most popular collection style for this material is civic amenity sites, followed by kerbside and closely followed by neighbourhood banks.

Kerbside	Bring	CA	OD
11	8	15	1

Obviously, the two first methods are mostly dedicated to packaging metals whereas civic amenity sites focus more on bulky metal waste.

9.5. Selective collection of plastics

The second of the 'light packaging' materials, plastic is collected mostly from kerbside. This collection focuses in most countries on "clean and heavy containers" such as beverage PET bottles, HDPE detergents containers, etc…. Germany is the only country which has developed largely the commingled collection of all types of plastics be it the small yoghurt pot or plastic films. This is due to the fact that DSD (the German Green Dot company) has supported financially the development of a full automatic sorting process for light packaging materials (the SORTEC Process).
From the ACR+ study, it appears that civic amenity sites is the second most popular collection type. This one focuses on big plastic pieces such as cans, pipes, and films (from agriculture for instance).

Industrial and commercial waste plastics
Civic amenity sites appear as a particularly convenient system for the separate collection of industrial, commercial or agricultural plastic films. But some local authorities develop more active collection methods for such waste. This kind of initiative appears rather well developed notably in Switzerland and is being developed elsewhere. But it is not yet very well know nor widespread.
Specific collection systems for agricultural films exist in Switzerland, in Belgium, in France (Averyron) and in Spain (Andalucia). Other collection systems dedicated to plastic waste from construction and demolition sectors are also developed in countries such as Germany, Austria, The Netherlands and Portugal.
Examples of these include the Province of Namur (Belgium) and Porto (Portugal).

The collection of agricultural plastic films in the Province de Namur in Belgium

Since July 2002, a regional bylaw on the take-back obligation has been in force in the Wallon Region, which includes, amongst others a chapter on agricultural plastics. It obligates the retailers to take back free of charge the agricultural waste plastics. Wholesalers and importers must organise or finance this mechanism. They can also directly organise or finance collections, which must be free of charge. The bylaw imposes a recycling rate, based on the collected quantities, of 20 per cent for 2003 and of 50 per cent for 2005. The residual fraction must be energetically recovered.

Only PE films, used for the ensilage of forage material in bunker (or corridor) silo or in bales are targeted for collection, although films used for frost protection are also accepted. The typical film used for bunker silo is dark and thick, which has a positive value, while film used for forage bale is usually white, thin and stretchy and can present high levels of contamination by glue and dirt.

Collection is organised at the inter-municipal level. Throughout the municipalities collection is annual and lasts for one week. In 2002, the collection was organised in the entire Province between the 23rd and the 27th of April. Some municipalities offered a phone service for this collection. The site of collection is usually a designated place at a municipal container park, which is often managed directly by the BEP, or in a municipal deposit. Farmers must bring their waste films there and the collection is free of charge. Collection instructions specify that the accepted films are stretch silage films, frost-protective films and bunker silage films.

The films must be dry, brushed, free of contaminants (for example, beet, forage, barbed wire, rope) and conditioned in bales of up to 20 kg. The stocking of films is not advised because they adsorb humidity and the BEP pays the recycler on the base of the weight.

In the Province, the collected quantities are growing each year: 75t in 1999, 150t in 2000, 250t in 2001 and 263t in 2002. Three-quarters of all film collected are stretch films. Every year, BEP launches a call for tender to select the company to be in charge of the transformation of the collected films.

The authorities responsible for collection, which may be the municipalities or the BEP, receive a grant from the Walloon Region's Government. For each collection, they receive a subsidy of up to € 1,250, which must cover the implementation of the temporary collection point, transport and treatment costs. Usually, reception costs are considered as nil or equivalent to the renting of the container. For equivalent distances, transportation costs also vary depending on the compaction of the films. If the subsidy is not sufficient to cover those costs, the administrator of the containers park pays the difference. The new bylaw will probably modify the financing scheme.

Collection of plastic waste from construction and demolition in Porto

Lipor (Serviço intermunicipalizado de gestao de residuos do grande Porto) has developed a flexible collection scheme for plastic waste from construction and demolition industry. Collection can be adjusted to different scenarios in the C&D sector in order to be conducive to the correct management of waste.

National and international experiences were observed in order to implement the best collection scheme.

In a project financed by the European Commission and the Plastic Industry, three types of scenarios were implemented:

- civic amenity sites: this involved sites where plastic C&D waste could be deposited in 30m3 boxes; this system was accessible for all companies and was free of charge; the waste was subject to quality control;
- big bag collection: 2m3 big bags were put on the worksite and could be used for depositing plastic waste. Collection of the filled big bags by Lipor had to be

booked in advance by the C&D company concerned. The waste was subject to quality control. This system was accessible only to pre-selected companies and was free of charge.

- Ecofone collection: plastic C&D waste was deposited into 15 or 30m3 boxes. Lipor collected them free of charge and conducted quality control on the waste content. This system was accessible to pre-selected companies only. 15m3 boxes could also be used for multi-material waste.

The waste was then transported to the Lipor sorting centre where it was separated into packaging plastic waste, non-packaging plastic waste and contaminants.
The identification of different constructions, evaluation of waste production and type of waste, helped Lipor to launch an awareness campaign focusing on plastics flows. Along with this training in waste separation, a collection system with deposit points was also introduced. The aim was to create a waste separation area on the construction site where workers could deposit recyclable materials produced by their activities.
The collection scheme proposed (and implemented) was shown to be practical for the constructor and for Lipor, but process costs were not covered by material sales. Lipor estimates that completing the cycle by introducing recyclable materials on new construction sites would promote better separation and develop the market.
The extra costs varied from approximately 280 EUR/tonne to approximately 670 EUR/tonne. The high collection, sorting, supervision & transportation costs were partly compensated by a high recycling revenue.
The collection schemes presented were flexible, allowing changes to adjust to needs. Developing collection schemes was a key factor, however, other projects must follow up on this development. New regulations, separation centres and recyclable materials are an important aspect that is now being studied by Lipor. This is the only way to gain a global perspective of the system and adjust it to the sustainability being sought.

9.6. Selective collection of "beverage cartons"

Where it is collected kerbside, this type of packaging is collected commingled with "PMC" (most frequent) and sometimes altogether with papers. Most authorities can not provide individual figures for this packaging type.
Due to its light weight, it makes up a relatively small percentage (around 5%) of 'dry' collection systems.
Most of the material is collected kerbside, more than double from the next most popular collection style – neighbourhood banks.

9.7. Other collection systems for commingled light packaging materials.

"PMC" is not the only system for multi-material collections. The table 4 below presents other combinations identified in the ACR+ study. It presents the materials that are collected in a co-mingled way, giving insight into the different possible mixes for materials.

Table 4. Multi-material combinations and performance (kg/inhabitant)					
Multi-materials: PMC					
Authority	Country				
Catalunya	E	7.35			
Chiclana de la Frontera	E	5.36			
INTRADEL	B	21.82			
Leiria	P	2.42			
Liège	B	19.74			
Lisbon	P	4.81			
Mallorca	E	4.38			
Porto	P	2.25			
Walloon Region	B	21.31			
Average		9.94			
Multi-materials: PMC and glass					
Authority	Country				
Brussels Region	B	13.13			
Priula	I	64.37			
Average		38.75			
Multi-materials: PMC, paper/card and glass					
Nantes	F	47.72			
Paris (Mairie de)	F	25.89			
Average		36.81			
Multi-materials: paper/card, plastic, metal, glass					
Hampshire County	UK	83,04			
Multi-materials: Paper/card and composites; plastic and metal					
Authority	Country	Paper/card	Composites	Plastic	Metal
Barcelona	E	19,27		6,68	
Multi-materials: composites and plastic					
Authority	Country				
Pamplona	E	6,47			
Poitou-Charentes	F	42,54			
Average		24,51			

9.8. Selective collection of textiles

Textiles are traditionally collected for recycling, however not always by the authorities themselves. Many authorities can not provide figures for textiles collected by these 'third parties' (usually charitable organisations, but also private companies), which means that the tonnages are not being counted as part of municipal waste arising. As the materials are not being 'managed' (collected or treated) by the authority, it is understandable that they are less concerned with them.

A few authorities have collected between 3 and 5 kg per inhabitant. The materials are collected either at neighbourhood banks, either kerbside.
As for WEEE, textiles are a popular material for reuse. But in some countries, such as Belgium for instance, entrepreneurs have developed processes to recycle them (notably to produce isolation material for partitions and panels).

9.9. Selective collection of WEEE (Waste electrical and electronic equipment)

The authorities reviewed for this study collect between 1 and 8 kg/inh, averaging 4 kg/inh/year. The WEEE directive target of separate collection has to be achieved by Members States by 31 December 2006.
The collection of WEEE requires space for the storage of the products, and so it is not a surprise to see that most authorities collect WEEE at civic amenity sites. A much more recent development is the introduction of small home electrical appliances (such as shavers, electric toothbrushes, etc.) into kerbside collection schemes. This system is being applied in Paris for instance. As for commingled collection, it aims to increase the number of materials collected and the convenience for citizens without increasing the number of bags/bins and collection rounds.

9.9.1. The Reuse of WEEE

Not all WEEE is collected for recycling. There is an increasing number of municipalities and Regions who have developed partnership with social economy enterprises for the repair/refurbishment of old appliances (it is sometimes also the case for the refurbishment of old furniture).
It is notably the case of Nantes, the Flanders Region, Salsburg. For instance, the city of Salzburg (A) claims that: "The prime goal of the WEEE Directive is not only to recycle but to reuse and recover electrical and electronic equipment. This offers the opportunities that local authorities may act together with social enterprises working in this field. For this reason … Salzburg is in contact with socio-economic enterprises to establish a model where jobless people will be qualified and reintegrated into the labour market. It is not only to recover electrical equipment but also furniture and other parts of the bulky waste. These activities should also ensure that socially disadvantaged people get access to cheap, second-hand products."'
Similarly, Aalborg (Dk) stated that they "work with a social enterprise that accepts 'reusable waste' (furniture, bicycles, books, etc.) for resale, while providing long-term unemployed people with ***retraining*** *and* ***reskilling****. They have managed to reuse 100 tonnes of products which would otherwise have been waste".*

Repair and recycling of WEEE: an opportunity for social development
In the past 50 years, recycling and refurbishing have emerged as an important sector for the development and growth of social enterprises. Organised collection, sorting and resale of used clothes, household furniture or other materials (like paper) were initially undertaken by charitable organisations such as the Salvation Army.
Along with the economic crisis of the 1990s, many of these enterprises emerged from labour market integration projects, traditionally focusing on the social aspects of their enterprises rather than on economic performances.
Social enterprises often combine these entrepreneurial activities in the recycling sector with awareness raising campaigns to promote more sustainable consumption

behaviours. Such campaigns are often conducted with the financial support and co-ordination of local authorities interested in reducing the impacts of waste and consumption patterns on the environment.
The social economy brings them at once an attractive solution to several local preoccupations : prevention, collection and recycling of waste, social and professional reintegration of local long term unemployed people, creation of proximity jobs putting back the social and human dimension in the city and allowing re-establishment of close ties with difficult suburbs.
Reuse and recycling activities provide work between 20 and 40.000 people in social economy organisations throughout the EU. The most important sectors are WEEE, bulky furniture and textiles, followed by paper and glass. The number of jobs and amount of waste treated are estimated as follows:

	Number of jobs	**Quantities of waste treated (tons)**
WEEE	10.000	200.000
Bulky waste	4.500	350.000
Textile	2.000	110.000

The activities of social economy enterprises in the field of WEEE notably concern :

- **the repair / resale of electrical equipment** has a major importance since it allows forming technicians for a valued job at a time it reduces the social fracture while equipping households in difficulty. The group ENVIE in France notably counts 800 workers and 5 other projects in Europe have adopted the same model;
- **the repair / resale of PC's**, is a sector in growth which deserves to be encouraged in view of its environmental, social and educational dimensions. The English enterprise CREATE for instance, provides for years schools in Kirghizstan with PC's collected from big companies , cleaned of their data and monitored;
- **the dismantling for recycling**. This activity will increase substantially when the directives will be translated into the national laws.

In its survey of 35 authorities, ACR+ has asked authorities to estimate the proportion of reuse in waste management. The table 6 here below gives the answers received. Responses in kg/inhab range between 0.0043kg and 5.56 kg.

Table 6 . Percentage reuse as an element of waste management

Authority	Tonnes	kg/inh	% waste management
Aalborg	289	0.18	0.29
Ancona Province	654	0.14	0.26
Basel	381	0,20	060
Brussels Region	55,582	5.56	0.92
Catalunya	3,253	0.05	0.32
Chiclana de la Frontera	47	0.07	0.08
East Milan	513	0.13	0.27
Hampshire County	27,118	2.17	4.19
INTRADEL	41	0.0043	0.01
Nantes	296	0.05	0.11
Odense	354	0.19	0.28
Padova One	528	0.24	0.68
Pamplona	4,292	1.39	3.15
Poitou-Charentes	448	0.03	0.05
Priula	663	0.31	0.83
Vienna	252	0.02	0.03

Obviously, those results may be used with precaution notably because:

- there does not appear to be a clear approach to the collection of data on products or materials for reuse
- calculation methods for reuse may vary significantly
- not all authorities collect figures for the same materials

It is clear that reuse needs more analysis and consideration but it seams clear that reuse may represent a not negligible part of waste treatment options for WEEE and other bulky waste and that there is room for considerable improvement and progress in this domain.

A partnership with social economy for refurbishing electrical household appliances in Nantes (France)

In 1992, the neighbouring municipalities of Nantes and St-Herblain were confronted with excessive unemployment rates in several suburbs. An employment team was set up as an independent association to seek opportunities in creating additional employment with added value, i.e. without harming the private sector.The team had heard of the success story of ENVIE (Entreprise Nouvelle Vers l'Insertion Economique – New enterprise towards economic integration).

The activity of ENVIE

The ENVIE network in France was founded in 1984 by a few people coming from the Emmaüs association. Its main activity is to recondition equipment while allowing young people in difficulty to obtain work. The network is now made of 38 member companies located on 28 sites across France and employing 650 people (200 permanent staff and 450 salaried being trained). They collect and treat 300.000 electrical appliances annually, of which 25% can be resold at one third of the price of new equipment, with a one-year guarantee.

The Nantes project

ENVIE 44 in Nantes has been created thanks to:

1) **start up capital** covering at least 6 months rent and salaries, obtained from the state, the region, the municipality, a large endowment charity and a few gifts
2) **support from distributing companies** of large electrical appliances (Darty, Leclerc and Conforama) which agreed to give access to the equipment they were taking back (transport by professionals bringing new equipment would ensure the provision of quality products)
3) **an advertising campaign for second hand equipment** focusing on both the social and the environmental dimensions to contribute to the local economy (which worked well with youngsters customers coming from the suburbs, and with better-off people equipping their summer house).

Results achieved

The organisation collects today 16.000 electrical appliances per year and has a stable employment of around 40 people, including 10 permanent technicians and trainers.
At the end of their training, half the trainees obtain an employment either in the electrical sector, or e.g. as a lorry driver, the important being to have a first successful professional experience. The environmental function of ENVIE 44 (collection, sorting, refurbishment and treatment of WEEE) is now recognised besides its employment function, as it is now paid by appliance treated like traditional collectors. The success of the collaboration with ENVIE has even led to a review of the waste policies and other projects have now been developed regarding second hand clothing, used paper, old books and personal computers.

9.10. Collection schemes for organic waste

The amount of municipal organic waste will vary significantly according to :

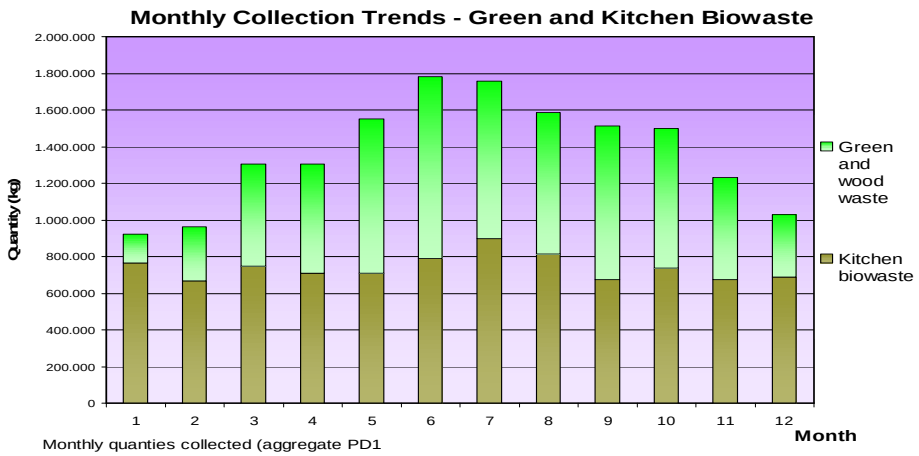
- the organization of a kerbside collection or not
- the promotion of home composting.

Indeed, some municipalities estimate that the development of home composting has allowed them to reduce the amount of organic waste by 60 kg/inh.
Every local authority considered in this study collects organic waste selectively in one form or another. Only a part of them provide differentiated data's indicating the existence of differentiated collection systems for kitchen waste on a one side and garden waste on the other side.
There are several advantages to dealing separately with food and garden waste.
Garden waste has characteristics which makes it very different from food waste:

- a low putrescence and moisture level (garden waste does not stink, does not attract pest (flies or rodents), and does not generate leachates)
- a lower density
- a production rate which varies during the year
- a production which varies geographically.

Whereas kitchen should not vary significantly around the identified average of 60 kg of waste collected/inh, it is not the same with garden waste which will for obvious reasons be produced in bigger quantities in a rural area than in an urban area.

Trends for Monthly Collection garden and kitchen biowaste in Padova (Italy)[12]



Those variations explain that some local authorities collect selectively up to 260 kg or organic waste/inh/year. However, the majority of analysed cities collect between 100 and 150 kg of organic waste/inh/year.
Here below, we will discuss separately collection systems for both fractions, on the basis of information gathered from the present survey and from the ACR+ report.

9.10.1. Selective collection of garden waste

The vast majority of authorities analysed (42) collect separately garden waste. The various collection methods distribute as follows:

Kerbside	Bring	CA	OD
25	7	22	5

Kerbside collection frequency varies from once a week to one collection per month or even every two months. Very often the kerbside collection of garden waste is organised only during the summer months whereas civic amenity sites remain open all year round. This may explain the fact that in its survey ACR+ observed that the majority of garden organics (around two-thirds) are collected at civic amenity sites whereas kerbside kerbside collection contributed for only a quarter.
12 authorities use a combination of 2 or more different collection methods. ACR+ has found that this combination has the same effect for organics garden as for glass, paper and cardboard and for metals and allows to increase collection rates by about 50%.

Collection of garden and Kitchen waste in Flanders (Belgium)
In the Flanders Region (with 6 million inhabitants), a municipality belongs either to a '**VFG**" area, where regular door-to-door collection is organised for vegetable, fruit and non-ligneous garden waste; or to a "**green**" area, where kerbside collection for garden (or green) waste only is provided regularly throughout the year (at least 4 times).

[12] Source: Presentation of G. Zanon and W. Giacetti, Rome conference (19th April 2001).

In its prevention strategy, the Flanders Region has stated as an objective that 40% of the population will have to take part in organic waste prevention initiatives by 2007, including home composting. By 2007, each municipality must have at least 6 'master composters' for each 10,000 inhabitants.
In a study undertaken by OVAM in 2001[13], it was estimated that 36% of the population was already home composting in "green" areas, while only 24% were doing so in "VFG" areas. The authors of the study explain this difference by the fact that in "green" areas, home compositing is the only way for people to recycle their kitchen waste. The study also showed that about 30% of the population was composting at home in urban areas, while only 10% were in cities.
Kerbside collection schemes for garden waste can help people who cannot or find it troublesome to go to civic amenity sites or have no time or interest to do home composting. They can also provide a solution to illegal burning practices in garden. However, some experiences tend to show that too frequent and convenient doorstep collections of garden waste may lead to an increase in the overall quantity of municipal waste to be collected and treated. In Forte dei Marmi (Tuscany, Italy) for instance, a doorstep collection for garden waste achieved a rate of 462 kg/ihab./year in 1998, but also lead to an increase of municipal waste collection (up to 850 kg/inh/year)[14]. Therefore, it seams that kerbside collection scheme for garden waste may in some cases appear as a competitor to home composting. This should not be considered as an argument against the setting up of such collection but it should be kept in mind when defining its frequency and seasonality.
Civic amenity sites are often the main collection route for garden waste. Access rights for citizens to civic amenity sites may vary. It may be restricted to household waste only or be open to a certain extent to waste from different sources. It may be accessible for free or at a cost. In the village of Londerzeel (B), delivering to civic amenity sites are now charged as the scheme had such a success that the municipality could not cope with the costs of biowaste treatment.
Garden waste are also sometimes collected with bring banks (or road-side containers). Sometimes, as in Carpi, they are locked and their access is restricted to a limited number of residents through the distribution of keys.

City of Carpi (Italy): Food waste collection using roadside containers

Roadside container collection schemes for waste are adopted by a many Italian municipalities.
Carpi, a municipality in Central-Northern Italy with 63.000 inhabitant, has adopted a separate collection scheme for food waste using locked road-containers (1,700-litres - one container per 85 inhabitants), with the aim to limit impurities.
Biowaste from restaurants, coffee-shops, canteens and small enterprises is collected two times per week door-to-door.
In order to improve separation, a small plastic bin and a set of biodegradable bags (made of modified corn-starch) are given to each household, along with a key. The key is used to open the locked road-containers for biowaste collection. These are emptied three times a week and their content is transported to the District composting plant, that also treats sewage sludge from the waste water treatment plant.
The system was successful in assuring good quality of the materials collected (impurities are about 1.5% of the collected biowaste[15]), since the locked road-

[13] De gemiddelde Vlaming and zijn keuken- en tuin- afval, OVAM, 2002
[14] E. Favoino, *Drivers, trends, strategies and experiences for proper management of biowaste in the EU*, op.cit.
[15] AIMAG Carpi, personal communication, feb. 2005

containers prevent systematic fly-tipping of commingled waste. The amount of food waste being collected separately from households is low, because participation in the scheme is not compulsory and is less of an incentive than door-to-door collection. (The authority collected about 22.5 kg/person/year of biowaste from households[16] in 2003; low results if compared with average collections from best-practise schemes in Italy ranging between 50-100 kg/person/year.)

9.10.2. Selective collection of kitchen waste

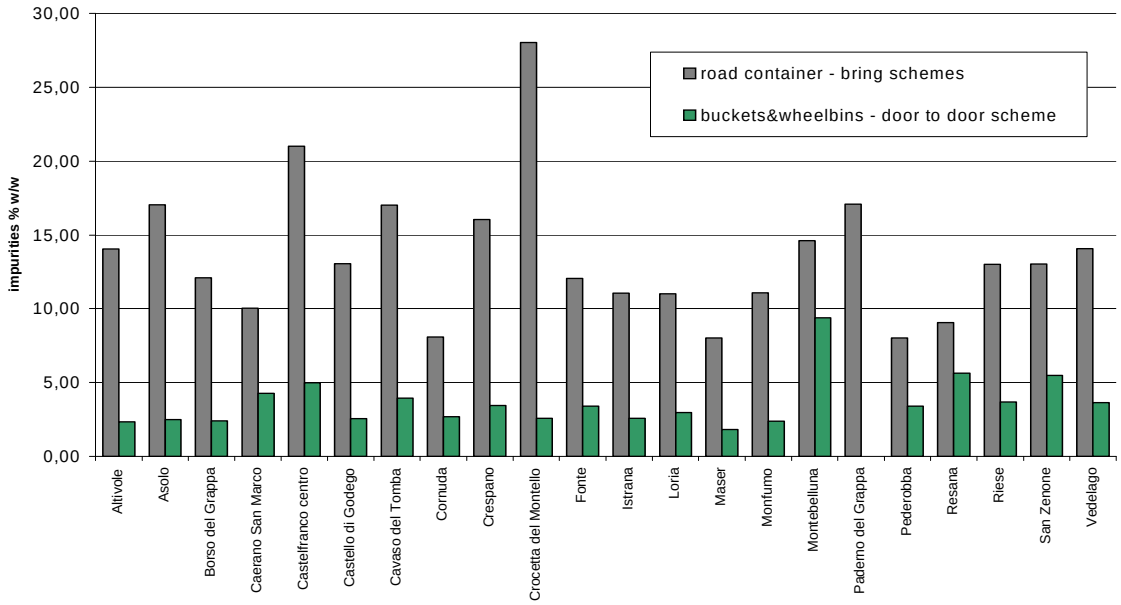
Among the 44 authorities analysed, 23 collect kitchen waste separately. The various collection methods distribute as follows:

Kerbside	Bring	CA	OD
22	3	3	0

This shows that kitchen organics are in most cases collected by kerbside collection. In its survey, ACR+ estimated than more than 90% of kitchen waste was collected this way. Collection frequency is higher than for garden waste usually ranging from 1 or 2 per week to a fortnightly collection.
Door-to-door collection of kitchen waste seems to be the system which is the most user friendly and the one which enhances the citizens' participation rates.
Collection frequency must be adapted to local conditions and climate in order to prevent odour and hygienic problems. Therefore collection frequency should be higher in in Southern areas and during summer months (some cities even organise daily collection).
A frequent collection of organic waste will over time allow to decrease the collection frequency of residual waste (which will become less problematic – especially in countries with warm climates - because of their reduced fermentable content).
Systems adopted for collection will influence the catchments rates and the quality of collected biowaste: analysis performed in Italy and Catalonia have concluded that the purity of biowaste is much better when collected through doorstep collection schemes than through containers on the road. The graph here below shows the amounts of impurities in food waste collection in Treviso. It shows that the shift from a collection by wheeled bins and road containers to a kerbside collection of food waste allowed the average contamination to reduce from about 13% to 3%.

[16] http://www.carpidiem.it/html/default/Ambiente/Rifiuti/Rapporti/index.html

Waste sorting analysis at the Treviso 3 district[17]



In areas with high population densities, where limited space is available, or in the case of multi-family dwellings, bring banks / drop-off sites / civic amenity sites are often used. Households are then often provided with bags (plastic or paper) or buckets to bring their food waste to neighborhood containers. However, road containers may present certain inconveniences as regards the limited interception of biowaste and the potential presence of contaminants.
Civic amenity sites are a much less common way for kitchen waste collection. However, in some cases, it appears to be a convenient option. The City of Camogli (Italy), for instance, in Liguria, has streets that are too narrow for even a small truck to go through. Therefore, kitchen waste is collected at the civic amenity site[18].

9.11. The selective collection of other recyclable materials

As mentioned earlier, some authorities encourage or require their residents to separate many more types of materials and products than have been considered so far in this report. At the very least, this makes their safe treatment (particularly hazardous waste) easier, while also requiring the public to engage more with the waste they produce.
Those materials are collected mostly at civic amenity sites but the case of collection trucks organised for the collection of small hazardous waste is well know. Of course batteries is another important flux collected selectively but it has not been considered in this report because it was not considered as a sufficient contributor to waste tonnages.
Those waste are not always recycled but obviously, with the development of selective collection and the increase of quantities collected, local authorities are looking for - and most of the time - finding solution for their recycling.
The table here below presents a non exhaustive list of materials collected with the treatment options most commonly reported.

[17] Source: Waste sorting analysis at the Treviso 3 district; Stefano Benazzato, Lorenzo Lazzari, Luca Mariotto – Idecom GmbH www.idecom.it, off. papers of Ricicla (2002, Rimini, I)
[18] Source: Roberto Cavallo, ERICA, Italy

Material	Treatment
Wood	Recycled or incinerated with energy recovery
Bulky	Reused, recycled, incinerated or landfilled
Inert	Recycled or landfilled
Hazardous	incinerated
Paints, solvents, pesticides	incinerated
plastic films	Recycled or incinerated
Plastic bags	Recycled
Plastics from C&D	recycled
Cooking and motor oil[19]	Recycled or incinerated with energy recovery
Corks	Recycled
Flat glass	Not indicated
Medicines	Reused/eliminated
Polystyrene	Recycled
Tyres	Recycled or energy recovery
Photographic waste	recycled
Light bulbs and neon light	recycled
batteries	recycled
Flat glass	recycled

9.12. The collection of municipal non household fraction

One important area to explore which appears prone to substantial improvements in both terms of prevention and recycling appears to be the somehow "grey zone" of municipal waste from other origins than households.
In its 2005 survey, ACR+ requested authorities to list producers of which they handled waste. The analysis of the answers is given here below. It shows that the scope of the municipal waste management authorities varies widely. In some cases, it goes much beyond normal "households" waste. Non household waste represents in some cases nearly 50% of the municipal waste quantities.

Authority	household	street cleansing, public bins	institutions, schools, administration offices, etc.	Hospitals/clinical (non-haz)	Shops and retailers	markets	SMEs	shopping malls	public parks and gardens	fairs	street gravel (winter)	drainage gullies	private gardens	cemeteries	industry	C&D
Number of occurrences	28	26	23	20	15	15	12	4	2	1	1	1	1	1	1	1

Recyclable waste collected at civic amenity sites by municipalities considered in this survey average 80 kg/inh/year but amounts may go up to more than 230 kg.
It is difficult for local authorities to make a clear distinction between waste from households and waste from other origins. For waste collected kerbside the discrimination is made on basis of the size of the bins. It is much more difficult to discriminate waste according to their origin with bring systems. Therefore, a substantial part of those "non household" waste are collected in civic amenity sites all the more when fees are to be paid on kerbside collections.

[19] These are not necessarily collected together, but their amalgamated tonnages have been presented to show how much it is possible to collect.

More and more local authorities notably in Flanders make the entry into the civic amenity sites at a cost. Price setting is sometimes made according to the number of visits (with tariff differences between cars, vans and small trucks), sometimes on the basis of the weight or volume of waste brought. The Flemish Region has issued recommendations to municipalities to ensure that the tariff systems applied are real incentives for citizens and others to effectively encourage the proper sorting of waste.
Collection schemes established for industrial and commercial sectors usually have better results than for the household waste and municipal waste (from retail, small business). There are three main reasons for this. Firstly, the waste is concentrated in a reduced number of places. Secondly, retail and industry usually produce less types of waste. Commerces or offices for instance will produce important amounts of clear paper and cardboard. Thirdly, wastes from industry are cleaner and better identified than wastes from households, which gives a better value to this waste.
Professional sectors generally use the services of private collectors with which they establish the collection modalities, the quality criteria and the price, however in certain cases, the LRA's organise collection schemes using existing facilities and expanding upon the public infrastructure.
It was said earlier that the interest to identify recycling options for waste collected in civic amenity sites is growing with time and with the amount of waste collected.
This study shows that there is considerable potential to further develop recycling for these fractions. But, there is considerable room for reduction as well. The experiences of some municipalities show that partnership and guidance to industrial producers may contribute to significantly reduce the amount of waste to be managed by the municipality. Municipalities can assist companies in reducing these wastes through active waste prevention and recycling. The main incentive for companies to participate is clearly financial savings. For municipalities, the amount of residual waste to be treated is much lower, and recycling activities may well result in job creation. The experiences of Basel and Munich highlight these opportunities.

Basel - Waste audits and cooperation agreements between the city and companies

To foster waste avoidance, Basel voted a parliamentary resolution providing for the replacement of the local waste incineration plant by one with a reduced capacity (200,000 tonnes instead of an estimated needed capacity of 320,000 tonnes). Consequently strong measures were needed to effectively reduce the amount of residual waste to be incinerated. Refuse disposal charges were introduced for the municipal solid waste (MSW) first in 1993. An increased number of neighbourhood containers to promote recycling were installed, different information and motivation campaigns took place. As a consequence of the consumer's pressure also a new packaging policy by the trade resulted, reducing altogether the household waste by 40 %.
Yet this was not enough indeed, more than 60% of the total MSW in Basel result from trade, administration and manufacture activities. A waste minimisation programme for trade and industry in the canton of Basel was then required. In 1997, a three-stage waste minimisation programme started. It was based on waste management audits followed by cooperation agreements between the public authorities and the companies and a final controlling assessment after the defined period.
To participate in the programme, 200 companies out of the 10,000 identified were selected according to criteria such as the annual amount of MSW, the waste tonnage in the recent years, and the overall recycling quota. The identification of those companies was simple because at that time already each waste deliverer to the incineration plant had to declare also the recycling efforts the data bases came from there. For each company to be visited a specific coverage sheet were prepared to reduce the inspection time and the meeting was fixed by telephone.
The audit at place together with the waste responsible of the company was useful to assess the current state of waste management, to record the collection logistics and to grasp the organisation of the company. On this basis, solutions to improve waste management were identified and agreed upon with companies. With about more than 80

companies - which produced about 50 % of the commercial MSW - such agreements were concluded.
The evaluation of the programme followed to assess the effectiveness of these measures by a second visit. The half of the agreements were completely accomplished, the rest only partly due for overestimation of the recycling potential or some few units for reorganisation reasons. As a result, a reduction of the incinerated commercial waste by prevention and recycling of about 15 % was observed. The team of advisors from the administration consisted of 2 persons only.
Between 1993 and 2000, these measures achieved a reduction from 117,000 tonnes to 89,000 tonnes of MSW to be incinerated.
In Munich, in 2000 the city employed six consultants for industrial waste who assist the companies to handle and dispose of different kinds of industrial waste. They operate via a hot-line for companies, by visiting and consulting them and publishing info-folders about new laws or tips. They also organise special environmental sessions for companies.

9.13. Residual waste collection

Residual waste are collected either kerbside, either in road-side containers, this last option being more widespread in Southern European countries like Spain, Portugal and part of Italy.
Kerbside collection frequency varies significantly from one municipality to another. The variety is such that it is difficult to draw trends but it seems that the collection frequency is greater in the Southern countries (with France, Greece, Italy, Spain, for instance reporting often collection several times a week and even every day) and lower in Northern countries. It is not rare in some countries (such as Austria, Belgium, Luxembourg, Sweden, Finland, Germany) to encounter collections every fortnight. In Finland, for instance, where in some areas, households may choose their waste collection operator (be it public or private) and pay for the service provided, it is not rare to have people opting for one collection every four weeks. The most frequently reported kerbside collection frequency for residuals is however the weekly collection.
A more obvious trend appears to be the increase of collection incidence in urban areas compared to rural ones.
It may not appear necessary at first sight to address residual waste collection in a report on recycling practices and performances. However, selective collection, to be optimised must be integrated. The need to keep sorting at source convenient and simple for citizens has already been commented. But further, the development of selective collection may affect significantly the volume and composition of waste and may justify a reorganisation of residual waste collection.
Among adaptations identified, let's mention:

- The reduction of frequency of residual waste collection
- The development of multi-compartmented bins and trucks

9.13.1. The reduction of frequency of residual waste collection

Various studies conducted in Italy and Spain show that the introduction of door-to-door collection schemes for biodegradable waste does not necessarily result in an increase in costs.
Reports by the Sucola Agraria del Parco di Monza[20] present examples of a cost-competitive and integrated scheme in Spain and in Itayl where supplementary costs

[20] Source: M. Ricci, presentation at the ECN/Orbit Source Separation Workshop, Barcelona 15 – 16 December 2003

associated with the introduction of intensive kerbside collection of food waste is more than offset by savings resulting from the reduction of frequency of residual waste collection.

Table 7: Collection costs for Tiana, Catalonia (E)

Residual &and food waste collection	Residual + food waste (€/y)	Food waste collection (€/y)	Residual collection (€/y)	Cost per inhab/year (€)
Door to door collection (residual waste 2/wk + food waste 3/wk)	173.068	100.243	72.825	29.4
Road Containers (residual waste 3/wk + food waste 6/wk)	173.463	58.386	115.077	29.5

Municipalities in UK are developing some form of alternate weekly collection, particularly with wheeled bins, is becoming increasingly popular. Research figures (for England) indicate that in 2004, 77 out of 375 (21 percent) of all collection authorities used this type of service.
The key benefit to the local authority is that collecting residual waste once every two weeks, (in every other week with recyclables) allow differing waste streams to be collected without large additional investment in vehicles and staff. It is also expected that a reduction of the convenience of residual waste collection will encourage citizens to increase their participation to selection collection.
Some of the highest performing local authorities in the UK use alternate weekly schemes, such as Daventry District Council, and it can undoubtedly deliver high recycling tonnages. However, alternate collection are controversial with residents and councillors. In particular, less frequent collection of residual waste leads to complaints by householders – particularly over perceived concerns with smell, flies, maggots and health issues.

UK - public say no to alternate week collections
While the majority of people in the UK are prepared to separate their waste materials for recycling they want their bins emptied more than once a fortnight.

An independent survey conducted in August 2006 at 100 local authority recycling officers and 965 members of the public, show that public resistance to alternate week collection systems is still high. Two thirds of those surveyed wanted weekly collections for waste and recycling and only 17% were in favour of alternate week collection schemes. The survey indicated that citizens are willing to separate materials themselves, with 62% stating a preference for having different containers for different materials.

Local authorities questioned on preferred collection frequency also favoured weekly collections overall (41%) but a higher proportion than the public supported alternate week (21%) and fortnightly (35%) collections.

According to Local Authority Recycling Advisory Committee (LARAC), "*it is a difficult dilemma for local authorities between maximising material selective collection and keeping the costs of the service in balance*". Alternate week collections balance the cost in terms of provision and can encourage people to recycle due to the natural limit of what people can put in their bins. "For LARAC, negative reaction to the introduction of alternate week collections such schemes could be due to the public's resistance to change.

Both public and local authority support for fining those who refuse to recycle is high, with 58% of the public and 62% of local authorities agreeing with the approach. [21]

[21] Source : Resource Recovery Forum, e-news, 14 September 2006

9.13.2. The development of multi-compartmented bins and trucks

A potential other solution appears to be the development of multi-compartmented bins which offer the potential for more frequent collections without increasing the number of collection rounds while being cost-effective by needing fewer crews and vehicles. Those bins have two or three compartments and collect recyclables along with residual waste at once.

They are associated with multi-compartment trucks (which are adapted as well to the separate collection in bags). The system is being in use in some French municipalities and in Belgium for instance by IDELUX for the concomitant collection of the organic waste and the residual fraction.

10. How to ensure citizens participation?

Beyond structural and technical infrastructure which provide convenience to citizens for selective collection, municipalities and regions have a large series of instruments at their disposal to influence citizens behaviour and encourage their commitment to waste prevention and to selective collection.
Of course, the distribution of competences between sub-national authorities varies from country to country and not every level of power have at their disposal the complete range of tools available. Raising taxes on products put on the market for instance is widely beyond the scope of competences of local and regional authorities. However, those two levels of authorities are the main actors of municipal waste management and they have in their attribution, a wide array of tools and instruments to influence citizens behaviour.
In this section, we will try to pass under review the main legal, economic and voluntary instruments used by some local authorities. Of course, the diversity is very large and each local context requires specific solutions. But, it is worth mentioning that the OECD has emphasized the fact that, with experience, it becomes clear that waste management is a multi-faceted issue and that it requires a combination of various and different instruments to reach the optimal balance between waste management options.

10.1. Regulatory instruments

10.1.1. Planning

The drawing up of waste management plans is required by the Waste Framework Directive 75/442/EEC. To fulfill their obligation, Member States require sub-national authorities to draw periodically their own strategies. Most of the time, this obligation falls on regions, provinces or departments. Sometimes on cities.
In December 2006, the European commission has released a proposal for a Directive on waste which will clarify obligations in terms of planning. This proposal notably contains provisions that oblige Member States to develop waste prevention programmes and requires them to designate the competent authorities the *most appropriate for their effective application* and for the capture of the benefits of waste prevention.
Those provisions will most certainly have consequences for local and regional authorities.
Planning is an important instrument of waste management. A first reason for this is that waste management, in all its complexity, requires a diversity of instruments and solutions targeting all the actors of the waste chain (from products producers to waste disposers). It thus requires times and a coherent long term strategy addressing all the facets of waste management.
Scope and objectives of those strategies must evolve with time. Most authorities which today achieve best recycling performances have tackled the waste issue a long while ago (the majority of them at the end of the 80's or in the early 90'). The Flemish Region for instance is already at its 4th municipal waste management plan (each one of them valid for around a five years period). Their priorities and objectives evolving in time:

- The 1st plan (1986-1990) essentially aimed at closing and cleaning many landfill sites and to improve waste treatment options. Taxes on landfill and incineration plants were raised and selective collection was encouraged.
- The 2nd plan (1991-1995) aimed at minimising waste landfilling and to develop infrastructures of selective collections. First experiences of organic waste selective collection were launched.

- The 3rd plan (1997-2001) aimed to reinforce the objectives of the previous plan. It was the time when producer responsibility schemes were initiated and developed with, as a consequence, an extension and speeding-up of selective collection schemes. Initiatives were launched in the field of waste prevention with notably the promotion of home composting and the reuse of WEEE. Standards and taxes on disposal were reinforced.
- The 4th plan (2003-2007) puts more emphasis on waste prevention and on producers responsibility. Waste prevention is granted with 60% of the regional budget allocation whereas 39% is devoted to the reinforcement of collection and recycling infrastructure. New options for the bio-mechanical treatment of residual waste are explored.

Waste management plans not only aim:

- to ensure that the capacity and the nature of the collection and treatment systems are in line with the waste to be managed on a territory
- to identify and control the technologies allowing to eliminate or minimise waste
- to allow for stating the financial requirements for collection schemes and treatment infrastructure.

When done seriously, they also allow:

- to identify and map all the actors and stakeholders of waste management and to reinforce (or start) dialogue with them
- to consult widely a complete range of actors and to test or gain their commitment and participation to the waste management strategy
- to collect data's' and to review achievements of the past year strategies and actions
- to increase knowledge, understanding and awareness on waste management issues.

10.1.2. Setting targets

Targets setting is an important element of waste management policy. They are perceived as essential because:

- they assert and make clear the political orientations and objectives
- they give a clearer indication for all stakeholders of the scale and amount of means to be put in place
- they allow to assess and evaluate the efficiency of adopted measures
- they allow to estimate the scale of effects anticipated

Examples of targets in waste management policy are so widespread that it would make no sense to list them here. They are most of the times not mandatory but they are instruments which may encourage their enforcement. In 1991, for instance, the Walloon Region Government defined thresholds for maximum amounts of municipal waste allowed in landfill. Those maximum amounts were decreasing with time as follows:

- 270 kg/inhab from 1999
- 260 kg/inhab from 2000
- 250 kg/inhab from 2001
- 240 kg/inhab from 2002

The fact that penalty fees were defined for municipalities if waste amounts exceeded those thresholds has been an important factor in the achievement of these targets.
In the UK, the authorities are to achieve Landfill Directive targets through statutory targets aiming to achieve a combined recycling and composting rate of 33% of household waste by 2015. To ensure the realization of those objectives, the British government has introduced the landfill allowance scheme (see below).

10.1.3. Landfill or incineration bans

The Netherlands has introduced measures to restrict the landfilling of untreated waste since 1995. This ban included 32 categories of recyclable municipal and industrial waste. This ban was extended later to other categories of waste. A incineration ban was further introduced for some categories of waste. Denmark and Italy later have also introduced landfill bans for some recoverable categories of waste.
The most widespread landfill ban concern biodegradable municipal waste. Such a ban exists notably in the Netherlands, in Denmark, in Flanders (for separately collected food and garden waste and municipal waste from households).
Norway is about to implement a strategy banning all biodegradable waste from landfills by mid-2009. Paper, wood, textiles, food and sewage sludge would be covered by the ban, which is in line with the Government's target - also for 2009 – to recycle 100% of all such waste 121.
Further to bans, some countries such as Austria and Germany have introduced strict restrictions for the acceptance of waste in landfills.
In Austria, only waste with a maximum TOC content of 5% may be landfilled. This means that biodegradable waste must be pre-treated before going to landfills.
In Germany, the Ordinance on the Landfill of waste provides that by 1st June 2005, municipal waste may be disposed in landfills if the maximum TOC is not more than 3%. As this would necessitate a thermal treatment of the waste, biowaste subjected to mechanical biological treatment are allowed to be landfilled if their TOC does not exceed 18%.

10.1.4. Take back obligations

One important instrument of waste management is the implementation of producer responsibility. Most of the time, producers are obliged either to take back the waste of the products they put on the market and to manage those by themselves or to ensure the financing of the collection and recycling of those waste. Such instrument is thus at the border between legal and economic instruments. It will be further discussed under the producer responsibility section.
Flanders and the Netherlands have made an intensive use of such take back obligations.
In the Netherlands for instance, take back obligations have been introduced for packaging waste (1991), plastic piping systems (1993), batteries (1995), passenger cars (1996), car tyres (1996), agricultural/horticultural plastic films (1997), paper/cardboard waste (1997), plastic cladding units (1997), white and brown goods (1998) and sheet glass (2002).
Flanders have similar obligations for packaging waste, WEEE, batteries, medicines, end of life vehicles, paper and tires. Besides agreements with producers associated to take back obligations also exist for pictures development liquids, food oils, agricultural plastic films and mattresses.

10.1.5. Mandatory separate collection schemes

Those kinds of obligations are put on municipalities by central or regional governments. They are sometimes associated with mandatory recycling targets.
Danish municipalities for instance are obliged to collect 55% of newspapers and magazines for recycling.
But this kind of obligation mainly concern biowaste. In Denmark for instance, specific collection systems must be established for canteens and restaurants which generate more than 100kg of food waste per week, and for the biodegradable fraction arising from supermarkets. In Austria municipalities are legally required since 1995, to separately collect and treat organic waste from households. Comparable obligations exist in Catalonia (Spain) for municipalities with more than 5,000 inhabitants. In Venice (Italy),

municipalities that do not reach the minimum recycling targets (35%) defined by the National Law on Waste, are required to introduce a separate collection for food waste from households.

10.2. Economic instruments

The use of economic instruments in Environmental policy remains unusual. Their use is strongly recommended by OECD and they are considered as dynamic, effective and flexible instruments since:

- they create a continual incentive for polluters to further reduce polluting emissions
- they offer economic agents the flexibility to choose how to respond to the price signal, with the assumption that they do so at least-cost and therefore efficiently
- they may minimise control costs for achieving a given pollution target
- they may provide correct price signals, in order to directly encourage desired behaviours.

Although not yet prevalent, the use of economic instruments is gaining ground significantly in waste management policy. They pursue many objectives, most important of which are to:

- create revenues that can be used to finance activities such as waste collection and processing
- encourage waste diversion, through recycling and recovery
- reduce the demand for relevant products and processes and the associated pressure on natural resources
- affect product design in order to :
- provide incentives for technological innovations.

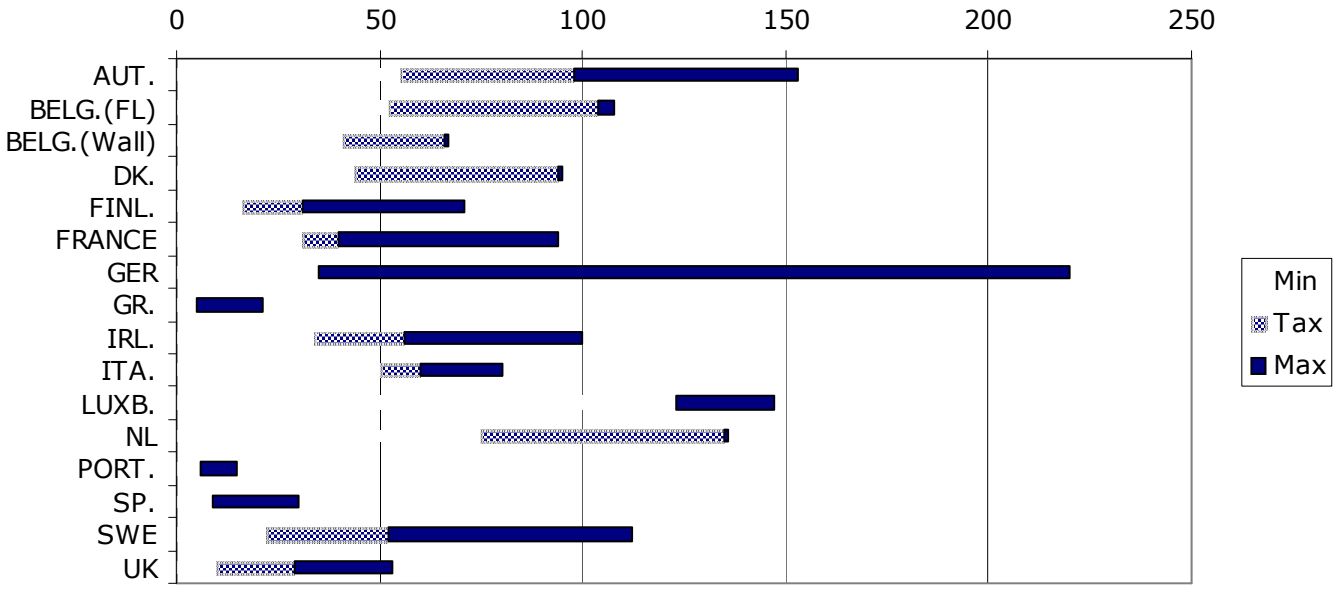
It is obvious that all taxes and fees which will affect the actors or activities along the waste production chain may have an impact on waste production – via the consequence they have on the production of products that will become waste. Such are for instance the taxes on natural resource extraction (such as the aggregate levy in UK) and taxes on products (such as taxes on batteries in Austria and on various disposable objects in Denmark, Finland or Sweden).
Deposit-refund systems are other examples of economic instruments which will affect consumption and usage behaviour of citizens are. They will not be discussed here, since they are - in most cases - not in the scope of the competences of local and regional authorities.
We will present here some examples of the main economic instruments available for local and regional authorities which will affect directly the management of waste.

10.2.1. Landfill taxes, fees and charges

The landfill taxation instrument is used to discourage the landfilling of certain waste types, the use of certain landfills, of some techniques, or to discourage the use of landfills which are not equipped to reduce their environmental impacts.
There are national or regional taxes on landfilling in Belgium, Denmark, Finland, France, Ireland, Italy, the Netherlands, Sweden and the United Kingdom. They vary significantly between countries ranging from 9 to nearly 90 €/tonne (in Austria and the Netherlands). In the United Kingdom, tariffs are increasing over time.
The tax rate varies according to the type of waste in Italy, in the Netherlands and in Austria.
In Austria, taxes vary according to the equipments used in the landfill. A tax of 43,6 €/tonne is charged for depositing waste in a high quality landfill and 101,6€/tonne if the deposit site doesn’t have a leakage prevention system.

In addition to landfill taxes, gate fees (that is the commercial prices charged by the landfill operator) vary significantly between Member States. As they are part of the total price paid, they have an impact on the landfilling of waste. In Germany for instance, there is no tax on landfilling but technical requirements and standards are strict and the gate fee of landfills is generally very high.
The table here below illustrates the range of landfill prices as well as the landfill taxes applicable to municipal solid waste. The countries with the highest maximum price (above 100 €UR/tonne) are Germany, Luxembourg, Austria, Sweden, Belgium (Flanders) and the Netherlands while the ones with the lowest price are Greece, Spain and Portugal.

10.2.1.1 Landfill prices and taxes in European 15 countries (EUR/tonne MSW)[22]



There exist tax on incineration as well in Austria, Flanders, Denmark and Italy (limited to incineration without energy recovery).

10.2.2. The Landfill Allowance Trading Scheme (UK)

Such a system has been launched in England on 1st April 2005. The scheme allocates tradable landfill allowances to each authority, at a level allowing England to meet its contribution to the UK targets under the Landfill Directive. An authority which does not have enough permits to cover the amount of Biodegradable Municipal Waste (BMW) it intends to landfill would need either to increase its rate of diversion, purchase additional allowances or borrow up to 5% of its following year's allocation. Authorities can choose to meet their targets alone or by cooperating together; should they not need their allowances, they can sell them or bank them with some restrictions.
Such system associating threshold value and financial incentives is comparable to the landfilling targets and penalty fees described above.

10.2.3. Producer responsibility and extended producer responsibility

Producer responsibility embodies the notion that the producers should be made physically or financially responsible for the environment impacts that their products have at the end

[22] Source: Eunomia Research & Consulting, Economic analysis of options for managing biodegradable municipal waste, final report to the European Commission, p. 118 (idem annex 2)

of product life. The Producer Responsibility system pursue several objectives and notably:

- Providing funds for waste collection and recycling operations
- Encourage recycling and reduce the amount of waste to be disposed of
- Encourage design for the environment:
    - Reduce of the amount of virgin material used
    - Reduce toxicity of products
    - Increase recyclability

The producer responsibility concept has taken hold in Europe where it has been prompted by the adoption of three directives on packaging and packaging waste (94/62/EC), on End-of-Life vehicles (2000/53/EC), and on WEEE (2002/96/EC). It must be mentioned however that the WEEE directive is the only one explicitly mentioning the PR principle as being at its core basis. In fact, the principal driver of those directives is the obligation for Member States to achieve mandatory recycling and recovery targets.
Those obligations have prompted most member states to apply a producer responsibility approach and to make producers responsible for achieving mandatory take-back, recycling and recovery targets. The producer responsibility is out of reach of local authorities but makes part, in some countries, of the scope of competence of regional authorities.
Packaging is the waste streams for which producer responsibility is the more mature and it is generally agreed that its global balance has been by far and wide positive.
However, the scope and extent of producers responsibility varies significantly between countries and they are many countries were producers cover only a limited portion of the total costs of packaging waste management. In Portugal for instance, regulation requires producers to cover only the difference of costs between selective collection and normal collection. This has led to many arguments and hard negotiation between producers and local authorities.
On the contrary, producers are obligated by law to cover the full costs of packaging waste collection and treatment in Austria, Belgium, Germany and the Luxembourg. In Germany, they are even made responsible for the organisation and the management of all recyclable packaging waste (in the place of local authorities).

10.2.4. Waste collection fees (Pay As You Throw system)

Behind producers, consumers have also a significant role to play in waste production and, in application of the "polluter pays" principle, various municipalities have set up systems of variable fees linked to waste production (Pay As You Throw). The aims are to:

- introduce a fairer financing system (where actual polluters pay)
- make the users of municipal waste service responsible and to encourage commitment to prevention and to selective collection

In some countries, the municipalities have been «encouraged» to implement this system through national regulations, for example in Italy, Luxembourg and Switzerland, or through regional instruments, as in Flanders and the Walloon Region. PAYT as you throw are also very commonly used in Austria, Germany, the Netherlands and Sweden.
The variable fee linked to waste production is differentiated on the basis of parameters directly linked to waste production and waste management, such as:

- the volume (pre-paid bin bags, pre-paid bins or pre-paid stickers)
- the frequency of collection (number of times bins are emptied over a given period of time)
- the weight of the waste collected (electronic weighing systems)
- a combination of above parameters.

In a survey of PAYT systems developed in EU 15 countries, ACR+ has identified the following trends:

- volume is the main criterion in all the countries concerned; generally, the cost per unit of volume is on a sliding scale, i.e. the first units are charged at a higher rate than the following. In some cases, however, the charge can be constant or indeed increase progressively. In the latter case, this is a strong incentive to produce less waste.
- frequency is a widespread parameter; the charges linked to the frequency of collection are usually on a sliding scale. In some cases, however, their progressiveness is intended to promote waste reduction.
- weight is the least used parameter. This system is based on recent weighing technologies which, according to some, could cause problems and require improvement.
- systems involving the use of bags provide for the sale of these bags (by the municipality or shops) or stickers; bags with variable volumes exist in rare cases.
- systems involving the use of bags are based on variable charges depending on the size of the bags (usually between 60 and 240 litres). Where electronic tagging devices are used, charges are based on the frequency of collection and/or the weight of waste materials.
- charges are often split into a fixed amount and a variable amount which, in most cases, correspond to coverage of fixed costs and variable costs. This division is intended to minimize perverse effects, particularly non-payment of fees.

Variable fee is mainly applied for residual waste but it is sometimes applied as well on recyclable fractions such as light packaging in the view of encouraging prevention at source or on organic waste to encourage home composting. Some municipalities also apply PAYT system for waste brought to civic amenity sites.

10.2.5. Effects of PAYT systems

There are now hundreds of experiences of PAYT systems in European countries and their effects vary on a case by case basis. There is as well an extensive literature on their effects. OECD has commissioned a detailed study on this instrument[23]. Switzerland, The Netherlands, Flanders monitor regularly the implementation of the systems and report on their consequences[24].

In the majority of cases, experiences point to the following effects:

- a reduction of some 10 to 30% in the quantity of residual household waste
- a 5 to 30% increase in selectively collected waste
- an appreciable (but rarely quantified) increase in home composting. However some experiences in Germany and Austria report a reduction up to 60 kg/inh/a of organic waste collection
- a reduction in the total volume of waste, thanks particularly to at source prevention and individual composting (3-12%). It is this latter factor which seems to play a preponderant role

[23] Impacts of Unit-based Waste Collection Charges, *Dominic Hogg, Eunomia,* ENV/EPOC/WGWPR(2005)10/FINAL, OCDE, http://www.oecd.org/dataoecd/51/28/36707069.pdf

[24] See for instance :

- Afvalstoffenheffingen 2005 / SenterNovem Uitvoering Afvalbeheer. – Utrecht : SenterNovem, 2005
- Onderzoek naar de gemeentelijke huisvuilbelasting- en retributiesystemen inclusief voor KMO's en zelfstandige ondernemers in Vlaanderen op 1 januari 2003, Openbare Afvalstoffenmaatschappij voor het Vlaamse Gewest, 2005
- Causes et effets du passage à la redevance incitative d'enlèvement des ordures ménagères, Ministère Français de l'Ecologie et du Développement Durable, Direction des études économiques, n° 05 - E09, 2006.
- La taxe au sac, vue par la population et les communes, Office fédéral de l'environnement, des forêts et du paysage, Suisse, 2003

- a reduction of waste management costs (mainly in countries with high recycling rates)
- perverse effects (illicit dumping, refuse disposal "tourism", bonfires…) are sometimes reported but rarely quantified; they can be in the order of 3-10% it seems. It is possible to attenuate them via appropriate communication campaigns. The general context at the time of introduction of variable fee systems (taxes on waste, degree of satisfaction with infrastructures and collection services, level of public awareness, level of participation in selective collections,…) also play a very important role.

One impressive example of the effect of the introduction of PAYT on waste production and management, among the authorities considered in this study, is given by Priula.

The case of Priula

In the year 2005, Priula Consortium coordinates the management schemes of 23 municipalities involving about 215.000 inhabitants. 18 municipalities out of 23 are applying PAYT charge since 2002.
Before 1999, waste management in the area was fragmented and heterogeneous with:

- different collection rules and regulations
- quality of the service varying according to motivation and availability of the municipality staff
- standard separate collection bins from 1 per 200 to 1 per 1.300 inhabitants
- different rating methodologies (by inhabitants, surface area, detailed measurement, etc….)
- costs covering through the waste tax between 75 and 100%
- separate collection ranging from 9 to 33%
- household composting reduction from 10 to 30%

The consortium started in 1999 to take over the municipal competencies about waste management. The Consortium administration substitutes completely local authorities (the single municipalities) in all tasks regarding:

- the organisation of the collection system
- the payment of MSW management services
- the introduction of a PAYT scheme.

In the year 2000 the Priula Consortium proposed all municipalities to change from road containers to kerbside collection in order to:

- rise source separation rates on district area
- optimise the quality of materials source-separated
- develop a WM scheme capable of effectively intruding a PAYT charge (tariff) for all utilities.

All materials are collected with plastic bins and containers of different colours and volume, corresponding to the specific production of utilities.
Each wheel bin assigned for residual waste to households and companies is provided with a transponder, that is automatically read during the emptying of the container, assigning the waste collected to the owner of the container. A weighting device is also installed on each compacting vehicle. Data are stored in an on-vehicle device and are transmitted to the Waste Charging Office at the end of the collection round.

Charging system (tariff) year 2004

The waste charge to be paid for the MSW management service is composed of 2 quotas: a fixed one and a variable one. The fee structure is extremely precise. For households the waste charge is as follows:

- The fixed quota is equal for all families; this quota covers all cost regarding common services, recycling collection ad business utilities, but not residual waste collection.

- The Variable quota is 0.87 €/kg of waste collected and is proportional to the volume of the bin used and to the number of collection of the wheel bin. It covers the cost for the residual MSW management only.

Since the variable cost element is only linked to the amount of residual waste delivered, and therefore does not take into account the possible lower delivery of biowaste where home composting is being practiced, householders doing composting in the backyard are allowed a 30% reduction of the variable quota, depending if they are composting only garden waste, only foodwaste or both of them.

Examples:

a) Household with 3 persons in a single house, with one emptying on the wheel bin (120 l) for

residual waste in 4 weeks (medium data), excluding VAT and others local tax;

- fixed quota: 76,73 €/year
- variable quota: 11 emptying * 9.45 €/emptying = 103.95 €/year
- total charge: FQ + VQ = 76..73 + 103.95 = 180.68 €/year

b) Household with 3 persons in a block of flats with a container:

- fixed quota: 76..73 €/year
- variable quota: depending of global emptying subdivided between all the householders living in the building.

For non-domestic utilities the waste charge is the same as for households for residual waste. The main difference is the application of the PAYT principle also to recyclable collected if they exceed the standard capacities, depending on the volume and number of, containers assigned to each utility and the emptying frequencies (paper, glass, plastic-tin, organic). To promote separate collection from companies the fixed quota for different collection tools for recyclables is reduced in comparison with the containers for residual waste.

Information and participation

The PAYT charge was introduced by giving adequate information to all residents of the area; at least 50 public meetings (about 3 per each municipality) where realised before introducing the new charge. A special advertising campaign has been performed and organised and specific mailing has been performed to each utilities. A magazine on waste management is distributed twice a year. In addition, the Priula Consortium realised a network of info-desks (one in each municipality building) where households and utilities can get information about waste management services, complain about dysfunction, ask for new collection buckets or tools (ex.. biobags for food waste collection) and be informed about waste charges.

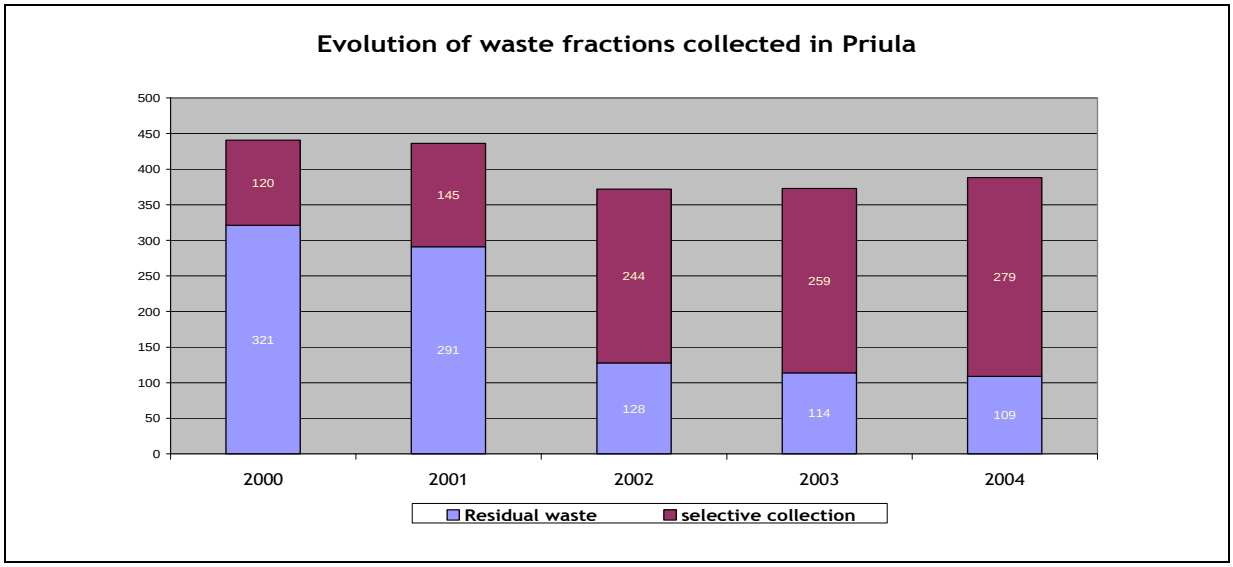
Effects on waste production

The graph below illustrates the evolution of waste fractions collected in Priula in the five years from 2000. It shows that the introduction in June/July 2001 of an integrated kerbside collection lead to a sharp rise in recycling rate, with a sensible reduction of residual waste and a reduction of the total amount of waste produced.
The PAYT scheme introduced in 2002 further increments the reduction of residual waste production and the rise of source separation but also determines a sensible reduction in waste produced.

Besides, according to Priula consortium:

- the total amount of municipal waste produced was reduced by 10 to 15% (from 54,000 tonnes in 2000 to 48,000 tonnes in 2002)
- Source separation rate homogenised between cities and increased in average from 27% in 2000 to 66% in 2002

- the environmental awareness is growing; people are more attentive and careful as they buy goods, generate and separate their waste
- illegal dumping and fly tipping was limited to maximum 1% of total amount of waste produced
- the introduction of the PAYT charge on a district level, has allowed to optimise investment cost and administration efforts in designing, testing and implementation of the scheme
- the ability to fully describe the cost breakdown of collection service is an important aspect for further optimisation of MSW management strategies.



Effects on fly-tipping

The Priula Consortium tackles fly tipping and illegal dumping, instituting a specific waste-officer "Ecovigile". Fines can be assigned in proportion to amount and kind of waste dumped. The analysis of the bags (mainly of domestic origin) indicates a large concentration of recyclable materials as food waste, glass and plastics. The result suggest that these phenomena are due to households which do not want to apply to the recycling collection schemes and are not a attempt to reduce the waste charge; the cost for the separate collection of materials are already paid by families through the fixed charge. Households with very low or zero-waste production are systematically checked and visited by the waste officer.

Cost of implementation

Collection services are provided by public company. Total operational cost for MSW management in the Priula Consortium in the year 2003 (excluding VAT and others local tax) is:
65.7 €/inhabitant/year, comparable to those of other Italian situations applying kerbside collection. Costs of specific instruments to individuate and register the emptying of bins may be estimated as follows:

- transponder for each residual-waste bin 2.10 €/unit
- on-vehicle devices (transponder reader and PC) 2,500 €/collection vehicle

The continuous support of municipalities and utilities guaranteed by the info-desks-staff ("Ecosportelli", realised in each municipalities) have a cost of about 2.5 €/inhab/year.

Owing to their effectiveness, PAYT systems are sometimes tricky to implement. Many experiences have led to a significant increase in perverse effects, such as more illicit dumping, with people taking their refuse to neighbouring areas, and a decline in the quality of selectively collected waste. In some cases, they result in a significant drop in

the tonnages collected and, consequently, to a fall in tax revenues which have to be otherwise offset in the general budget.
In order to fulfil performance potential, the introduction of variable fees should take account of pre-requisite conditions such as:

- the fee must initially be designed essentially to incite the citizen/consumer to gradually reduce the amount of waste produced. Fees must be adapted progressively to improve the chances of the system being accepted and to minimize the risks of perverse effects;
- good information of the general public;
- system transparency, particularly as regards waste management costs and anticipated revenue from the system introduced;
- the provision of an effective infrastructure and means of selective collection.

Their implementation implies:

- a gradual adaptation of charges: this is the main idea behind the splitting of fees into a fixed portion (to be gradually reduced later) and a variable portion (increasing in time);
- a choice of types and sizes of containers appropriate to the local context (size of households, type of dwelling…);
- a quantitative analysis of the impact of these systems;
- tighter controls and enforcement of a penalty system.

What must be stressed is the complexity of the issue and the importance of striking a balance between the various forms of financing for household waste collection in a context taking particular account of local, socio-economic and cultural specificities. Other economic instruments, such as deposits on refillable, eco-taxes and charges for waste disposal, are also part of the general picture.

10.2.6. Subsidies

Subsidies are widely used by regional authorities to encourage and support the efforts of local authorities towards waste prevention and recycling. Some examples are subsidies for waste prevention in Catalonia, in the Walloon Region and in Flanders. In Flanders, the amount of subsidies are progressive according to the level of commitments of local authorities. Authorities are requested to report on their initiatives and the Region has created a database of local initiatives as a source of inspiration for others.
In Mediterranean areas, LRAs are increasingly implementing programmes and subsidies to promote the use of compost as an organic improver. The main provisions relate to:

- funding to farmers for compost used per unit area
- tenders for green public areas including a specific preference for composted
- products
- funding to farmers when replacing their old machinery by a new one suitable for compost spreading.

Piedmont and Emilia Romagna Regions (Italy) for instance grant subsidies for the application of organic fertilizers and compost on depleted soils (with a minimum concentration of organic matter). These funds are created within the scope of the Rural Development Plans on sustainable agriculture.

10.2.7. Markets developments for products

The Centra Catala del Reciclatge in Catalonia or London Remade in London are typical bodies created by authorities to support the development of markets for recycled products.

VLACO in Flanders is an NGO established as a co-operation between OVAM (the Flemish Agency for Waste Management), the association of municipalities for waste management private compost producers and some cities, to develop the market for compost produced in Flanders. VLACO develops marketing activities, it supports research programmes on various applications for compost and has implemented a Quality Control System for compost with specific requirements defined for:

- the input (biowaste or green waste)
- the composting process conditions (it organises regular plant visits)
- various quality types of compost produced

10.3. Voluntary instruments

10.3.1. Voluntary agreements

Local and regional authorities, even though preponderant actors, are not the only stakeholders in the waste management chain. Waste management entails the involvement of all actors of the production and consumption chain and notably of:

- public authorities (at all levels)
- industry
- consumers
- NGO's and social economy enterprises

The local waste management strategy should include an inventory of all those actors and an analysis of their role and potential commitments to the realization of the objectives. Partnership agreements allow to make official those collaboration and synergies.
Since 1991, the Flemish Region proposes partnership agreements to municipalities. The objectives, scope and content of those agreements have evolved along time to adapt to the objectives of the regional strategy. But Flanders is not the only example, such agreements are numerous elsewhere for instance in Catalonia, in the Walloon Region or in Austria.
An example of agreement with industry is the one that the Ministry of State Development and Environmental Protection in Bavaria made with industry to support R&D projects aiming to improve the design and efficiency of electric and electronic appliances. One of these projects allowed to reduce by a factor two the energy consumption and the overall number of different materials of a vacuum cleaner. A similar initiative has been taken by Torino, where a partnership between the municipality and the Politecnico (High School of Science and Technology) aimed to organise a special degree in eco-design.
Agreements with consumers associations are important to understand the drivers of consumption patterns and organise awareness raising campaigns. That is what the Brussels Capital Regions has done by signing an agreement for the setting up of an "Observatory of sustainable consumption". In Bavaria as well, some agreements aim to identify which elements may be used in marketing strategies to create demand for "green" products, or to find out how to create product panels gathering all the actors of the waste chain in order to improve the eco-design of products.
Agreements with NGO's may allow the municipality to capitalise on their commitment, imagination and dynamism to develop specific awareness raising initiatives in the field of waste prevention and recycling. It is estimated that in UK for instance, more than 1 Million households are served with selective collection by NGO's and charities. In the Netherlands, a number of co-ordinated consumer initiatives are under way that include household waste prevention and management. 9 210 households, for example, currently participate in the Global Action Plan (GAP) and have achieved a reduction of 26% of household waste (57 kg per household in one year). Other projects are "Green Shopping" and "Consume Less". Many of these actions have been initiated and financed, by NGOs or by citizens themselves.

The advantages of the cooperation with the social economy enterprises have already been underlined above.

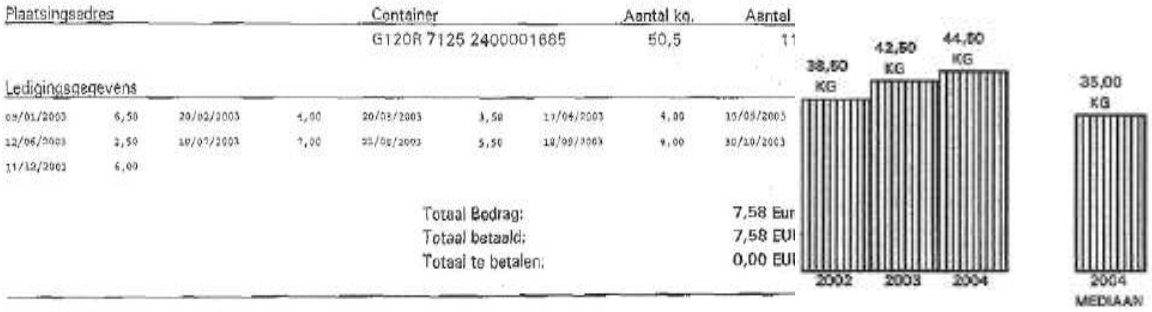
10.3.2. Environmental information and awareness

Last but not least, information campaign and awareness raising makes a crucial part of local waste management strategy nowadays. It may well be considered as the main important instrument.
It is obvious that current and future local waste management practices will be grounded on waste prevention and on selective collection. Both require the active involvement of the citizens.
Without citizens active participation both quantity and quality of collected waste remain poor. Thus, whereas in the old model it was in the citizen's interest to participate, today it is both in the citizen's and in the authorities' interest to ensure these new policies succeed. Only excellent communication, particularly if accompanied by appropriate regulations and economic instruments, can guarantee progress towards this objective.
The most important source for waste management/waste reduction information is direct communication with the citizens/consumers. In Germany, by the end of the 1980s and the beginning of the 1990s, nearly every town employed its own waste consultant. They started campaigns on waste management providing information via direct telephone lines, face to face contact on local streets and markets, as well as via presentations and actions in schools. Once people were motivated and had begun to voluntarily separate their waste, the role of the waste consultant changed from motivation and general information to answering special questions on waste and leading campaigns.
Information to citizens is such a crucial element of contemporary waste management policy that it is out of the scope of this study to enter into a description of the requirements and instruments of information campaigns. For those who want to read more on the issue, the literature is overflowing on the Internet. ACR+ has published in 2004 a "*Catalogue of voluntary actions supported by local authorities to encourage waste prevention in Europe*". It presents more than 70 categories of actions developed by local authorities to:

- increase awareness on environmental and sustainable development issues
- encourage changes in lifestyles
- supporting changes in consumption behaviour
- promoting different waste management practices

It is however important to emphasise that involvement, commitment and partnership requires the development of new form of relations with citizens based on proximity, mutual respect and trust. Citizens, if they are asked to be involved and committed, will ask for transparency, listening and even participation to the decision process.
In Milton-Keynes (UK), for instance, the municipality emphasized the provision of the new selective collection services by organizing public visits to the municipal recycling facility. The system is transparent and the MRF employs a full-time education and training officer to work mainly with schools, but also with local groups and businesses. The centre has a permanent information centre and a dedicated window gallery where visitors can observe the MRF's activities in complete safety. The effort put into communication has resulted in a high rate of voluntary participation (76% of citizens) and enables the sorting centre to work on loads of very high quality waste.
Transparency requires authorities to better monitor and report on waste management policy and results. Many authorities now have developed "waste barometers" or publish regular activity reports and leaflets which let very few shadow zone on the initiatives, concrete results and difficulties of local waste management services.
The transparency must also encompass costs and some local authorities such as the "Communauté urbaine de Nantes" publish synthesis of their activity report and annual financial balance where the costs per ton and per inhabitant of the waste public services

are clearly announced for each material flows, each collection methods and treatment plant.
A further step is to echo this transparency on costs to each citizen individually. The municipality of Mol for instance in Belgium, applies PAYT system on the basis of the weight of waste produced by households. Bimonthly invoices provide not only the total amount due for the last two months but also the quantity of waste produced, the evolution of the production compared to the previous years and the distance of the individual household production compared with the average population (see graph below).



As far as the decision process is concerned, more and more local authorities who want to develop waste management programs with ambitious objective start consultation and participation process which might last for months. This was the case in Hampshire County Council where the Integra project aiming to develop an integrated waste and resource strategy at the County level was based on an intensive consultation and dialogue process with numerous meetings and events involving the citizens.
In Milton-Keynes, the drafting of new waste management strategy for the period 2000-2010 has been developed in direct co-operation with the public, which was consulted by means of questionnaires (more than 3,000 responses have been received), meetings with neighbourhood committees and round tables bringing together local people and experts for debates.
For its last waste management plan, the Brussels Capital Region, organized a "Citizens Parliament" were the draft strategy was discussed with the populations and amendments submitted to votes.

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Data on Collection - Synthesis

Data's																							
	Region of Styria	Graz	Salzburg	Vienna	Flanders Region	Ghent	Destelbergen	BEPN	IDELUX	INTRADEL	IOK	Nordrhein-Westfalen	Nantes Métropole	East Milan	Priula	Canton of Geneva	Canton of Vaud	Zurich	Groningen	Maastricht	Margraten	Daventry	St Edmundsbury Borough Council (SEBC)
Country	A	A	A	A	BE	BE	BE	BE	BE	BE	BE	DE	FR	I	I	CH	CH	CH	NL	NL	NL	UK	UK
Source	landes Steiermark	.oekomarkt.graz.at	ACR+	ACR+	ACR+	IVAGO	IVAGO	DGRNE	ACR+	ACR+	IOK	RRF	Rapport annuel 2005	ACR+	ACR+	Geneva	SESA	RRF	ACR+	Senter Novem	Senter Novem	RRF	SEBC
Year of reference	2003	2005	2003	2003	2003	2004	2004	2005	2004	2003	2005	2000	2005	2004	2004	2004	2004	2002	2003	2003	2003	2002/03	2006
Population	1.183.303	240.278	147.000	1.644.816	6.016.024	232.961	16.979	451.060	359.219	957.699	475.400	18.000.000	576.000	400.000	210.980	438.500	650.791	343.000	180.000	121.982	13.592	72.100	99.188
Surface area (km²)			66	415	13.512					2.649		34084		45	584	246	3.212	92	8.012	60	58		650
Density	72		2.238	3.964	445	1.479	644			362		530		11.429	361	1.782	198	3.992	22	2.140	234	281	153
Municipal Waste Production in tonnes		131.515	76.082	935.819	3.351.712	108.079	10.603	262.485	211.332	449.627		8622000		187.141	80.200		321.705	152.000	116.111			36.375	
Municipal Waste Production in kg/inh/y	360	547	518	569	557	471	625	639	588	469	420	479	520	468	388		494	443	645	366	327	504	
Non selectively collected	114	180	227	301	161	137	94	195	120	179	121	262	289	125	109	287	265		243	115	95		243
TOTAL SELCTIVELY COLLECTED	194	276	227	155	259	199	366	208	238	149	304	209	124	239	224	156	207	147	120	192	184	223	249
TOTAL HUMID FRACTION	61	102	103	50	130	77	227	73	127	46	165	90	51	120	115	63	77	21	40	94	65	152	135
Organics - kitchen			75	4	51	35	71	1	29		131			73	64					94	65		
Organics - garden			28	46	79	42	156	72	98	46	34			47	51								
TOTAL DRY FRACTION	133	174	124	105	129	122	139	135	111	103	139	119	73	119	109	93	130	126	80	98	119	71	114
Paper/card	70	107	73	72	71	62	75	67	54	51	95	71	46	59	55	50	71	90	49	67	92	39	
Glass	25	35	24	15	29	30	33	36	31	28	30	30	26	36		27	44	30	19	29	26	22	
Total light packaging	35	29	23	16	22	26	26	27	19	21	14	18		21	48	9	15	6	0	0	0	10	
*Light packaging	18	19										18	in paper									8	
*Plastics			8	5	8				4					8		3							
*PMC			8		2	17	14	18	2	15	14												
*Metal packaging	12	4														1							
Other metal	5	6	7	11	12	9	12	9	13	6			5	13	16	5	15	6				2	
sum metal	17	10	7	11	12	9	12	9	13	6			5	13	16	6	15	6				2	
Textiles	3	3	2	0	4				1	0				1	3	5			4	2	2		
DEEE			2	2	3	4	5	5	6	3			1	2	3	2			8				
Data's																							

	Region of Styria	Graz	Salzburg	Vienna	Flanders Region	Ghent	Destelbergen	BEPN	IDELUX	INTRADEL	IOK	Nordrhein-Westfalen	Nantes Métropole	East Milan	Priula	Canton of Geneva	Canton of Vaud	Zurich	Groningen	Maastricht	Margraten	Daventry	St Edmundsbury Borough Council
other waste collected selectively	53	50	31	84	151	126	162	236	153	135	22	8	102	70	9	8	33	0	88	60	48	0	0
Wood	10	23	10	17	23	23	27	27	37		14			22		8							
bulky	39		20	20	36	36	43	59	12	53			45	30	9		33		87	59	45		
inert		26		45	85	59	82	120	97	80			55	16									
tires		1	0	1	0									0									
hazardous	4		1	1	3	2	2		2	1	3			1					1	1	3		
food oil		0						1	1	1						0							
plastic								1	4		5												
reusable					4																		
flat glass											1			1									
others						6	7	28				8	2										

Annexes – Summary of data's collected for each authority

Authority	
Authority	BEPN
Country	Belgium
Population	451 060
Surface area (km²)	
Density	
Reference year	2005

Waste production		
	Tonnes/year	Kg/person
Household		
Municipal	262 485	639

Residual quantity (per kg/inh/year)	195

Selective Collection

Material	**Kg/inh/y**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
organic - kitchen	0,74	0,74		
organic - garden	72,09			72,09
paper/card	67,48	49,80		17,67
glass	35,74		31,44	4,30
PMC	18,18	17,35		0,83
metal	8,97			8,97
WEEE	5,11			5,11
TOTAL	**208,31**			

Other waste collected	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
wood	27,36			27,36
bulky	58,76			58,76
inert	120,40			120,40
food oil	0,49			0,49
farm plastics	0,81			0,81
others	28,00			
TOTAL	**235,83**			

Collection design

Material	Kerbside frequency	Kerbside (%age population served by kerbside collection)	Neighbourhood banks (density - # residents per bank)	CA sites (density - # of residents per site)
kitchen organics	every week or 2 times per week			
paper/card	monthly, every 2 weeks, weekly, 2 times per week			

INTRUMENTS

Prevention

n.d.

Legal

n.d.

Economic

n.d.

Charges/taxes

n.d.

Material	Collection	Sorting	Treatment	Total

Other information

Authority	
Authority	Daventry
Country	United Kingdom
Population	72 100
Surface area (km²)	666
Density	281
Reference year	2002/03

Waste production		
	Tonnes/year	Kg/person
Household		
Municipal	36 375	504

Residual quantity (per kg/hab/year)	

Selective Collection

Material	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
organics	152,00	x		
paper/card	39,00	x		
glass	22,00	x		
light packaging	8,00	x		
other metal	2,00			
textiles		x		
TOTAL	**223,00**			

Collection design

Material	**Kerbside frequency**	**Kerbside (%age population served by kerbside collection)**	**Neighbourhood banks (density - # residents per bank)**	**CA sites (density - # of residents per site)**
n.d.	n.d.	n.d.	n.d.	n.d.

INTRUMENTS

Prevention

intensive education and promotion programme + though stance on recycling + + homecomposting kit 15 pounds + Slim your Bin campaign

Legal

n.d.

Economic

n.d.

Charges/taxes

n.d.

Material	Collection	Sorting	Treatment	Total

Other information

Authority	
Authority	Destelbergen
Country	Belgium
Population	16 979
Surface area (km²)	
Density	644
Reference year	2004

Waste production		
	Tonnes/year	Kg/person
Household		
Municipal	10 603	625

Residual quantity (per kg/hab/year)	94,4

Selective Collection

Material	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
organics kitchen (GFT)	70,50	70,50		
organics - garden	156,40	x		x
paper/card	75,40	x		x
glass	33,40	x		x
EPS (plastics)	0,30			
PMC	14,20	x		
metal	12,30			x
DEEE	5,40			x
TOTAL	**366,00**			

Other waste collected	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
wood	27,00			x
bulky	43,00			
inert	82,00			x
hazardous	2,40			x
other	7,30			
TOTAL	**161,70**			

Collection design

Material	Kerbside frequency	Kerbside (%age population served by kerbside collection)	Neighbourhood banks (density - # residents per bank)	CA sites (density - # of residents per site)
paper/card	every 4 weeks	x		x
glass	every 4 weeks	x		x
PMC	every 4 weeks	x		
GFT	every 2 weeks	x		
Grofvuil (bulky)	every 6 months	x		x
Residual waste	every 2 weeks	x		

INTRUMENTS

Prevention

n.d.

Legal

n.d.

Economic

n.d.

Charges/taxes

n.d.

Costs

n.d.

Material	Collection	Sorting	Treatment	Total

Other information

Authority	
Authority	East Milan
Country	Italy
Population	400 000
Surface area (km²)	45
Density	11 429
Reference year	2004

Waste production		
	Tonnes/year	Kg/person
Household*	121 642	304
Municipal	187 141	468

** Estimated at approximately 65% of municipal waste.*

Residual quantity (per kg/hab/year)	125

Selective Collection

Material	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
organics - kitchen	73,41	73,41	0,00	0,00
organics - garden	46,65	6,21	0,00	40,44
paper/card	59,24	30,80	0,00	28,45
glass	35,82	24,29	1,12	10,41
plastic	15,51	12,41	0,00	3,10
metal	12,99	2,11	0,00	10,88
textiles	1,28	0,00	1,28	0,00
WEEE	2,00	0,00	0,00	0,06
TOTAL	**246,90**	**149,22**	**2,40**	**93,35**

Other waste collected	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
wood	22,00			
bulky	30,00			
inert	16,00			
tires	0,00			
hazardous	1,00			
fat glass	1,00			
TOTAL	**70,00**			

Collection design

Material	Kerbside frequency	Kerbside (%age population served by kerbside collection)	Neighbourhood banks (density - # residents per bank)	CA sites (density - # of residents per site)
glass	weekly	100%	6000	
kitchen organics	weekly/twice weekly	100%		
paper/card, plastic, metal	weekly/every 2 weeks	100%		
residual waste	weekly	100%		

INTRUMENTS

Prevention

The Authority has delivered **high-visibility activities on waste prevention and sustainable consumption**, promotes **home composting**, **promotes repair and reuse,** and leads by example through green public procurement.

Legal

n.d.

Economic

n.d.

Charges/taxes

Waste management charges are based upon the number of inhabitants and the size of the dwelling, but no specific Figures were provided by the Authority.

Costs

The following costs were detailed by the Authority. Collection costs are €/inhabitant and all other costs are €/tonne:

Material	Collection	Sorting	Treatment	Total
green organics			25,30	
kitchen organics	5,16		100,00	
glass	3,11		20,66*	
paper/card	4,40		20,00*	
metal			15,49*	
WEEE				720,00

bulky wastes			123,20	
residual waste	7,97		122,40	
plastic	3,73		149,89*	
metal packaging	0,86 €		47,76*	

** Represents the contribution paid by the Green Dot organisation, CONAI.*

Other information

Authority	
Authority	St Edmunsbury
Country	United Kingdom
Population	99 188
Surface area (km²)	650
Density	153
Reference year	2005

Waste production		
	Tonnes/year	Kg/person
Household		
Municipal	48 800	492

Residual quantity (per kg/hab/year)	243

Selective Collection

Material	**Kg/inh/y**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
organic - kitchen & garden	135,27			
dry recyclables	114,00			
TOTAL	**249,27**			

Collection design

Material	**Kerbside frequency**	**Kerbside (%age population served by kerbside collection)**	**Neighbourhood banks (density - # residents per bank)**	**CA sites (density - # of residents per site)**
n.d.	n.d.	n.d.	n.d.	n.d.

INTRUMENTS

Prevention

Education campaign

Legal

n.d.

Economic

n.d.

Charges/taxes

n.d.

Costs

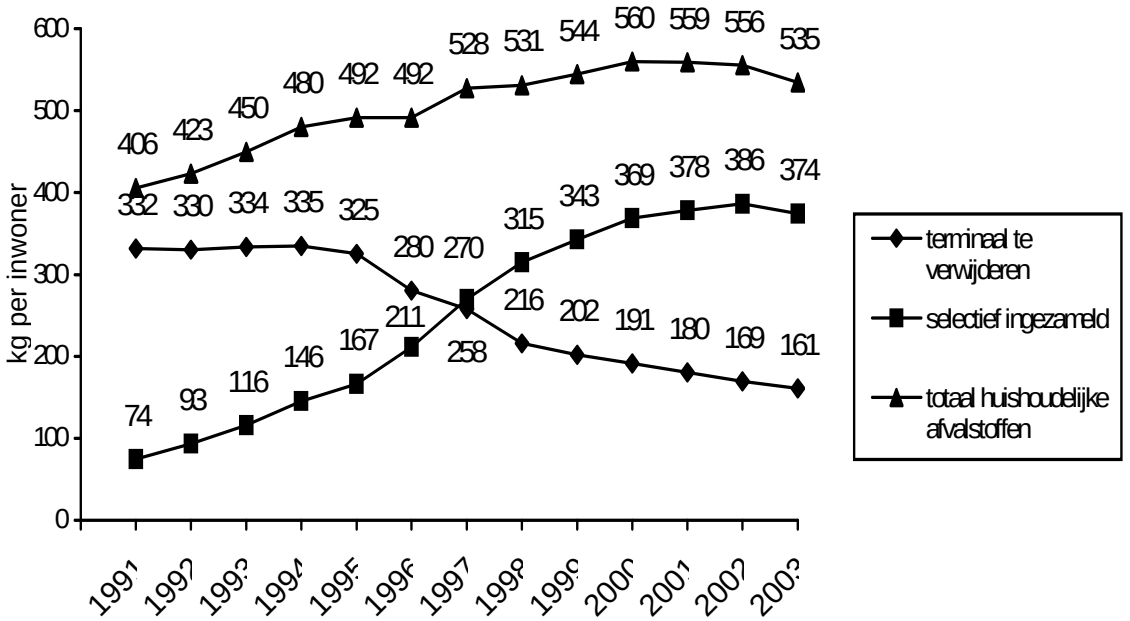
n.d.

Material	Collection	Sorting	Treatment	Total

Other information

Authority	
Authority	Flemish Region (OVAM)
Country	Belgium
Population	6 016 024
Surface area (km²)	13512
Density	445
Reference year	2003

The Region is made up of 5 Provinces, with different collection designs and activities undertaken by the 308 local authorities, therefore detailed data is not always available.



Waste production		
	Tonnes/year	Kg/person
Household	3 217 199	535
Municipal	3 351 712	557

Residual quantity (per kg/hab/year)	161

Selective Collection

Material	Kg/person	Kerbside	Neighbourhood banks	Civic amenity sites	On demand
organics - kitchen	51,39	51,39	0,00	0,00	0,00
organics - garden	78,90	8,89	1,07	66,92	2,02
paper/card	70,67	52,53	0,64	17,50	0,00
glass	29,07	4,10	20,13	4,84	0,00
plastic	7,95	4,85	0,0035	3,10	0,00
beverage cartons/PMC	1,58	1,29	0,00	0,29	0,00
metal	12,38	4,24	0,0022	8,14	0,00
textiles	4,30	1,61	2,41	0,29	0,00
WEEE	3,29	0,00	0,00	3,20	0,09
TOTAL	**259,53**	**128,89**	**24,25**	**104,27**	**2,12**

Other waste collected	Kg/person	Kerbside	Neighbourhood banks	Civic amenity sites	On demand
wood	23,00				
bulky	36,00				
inert	85,00				
tires	0,00				
hazardous	3,00				
reusable	4,00				
TOTAL	**151,00**				

Collection design

Material	Kerbside frequency	Kerbside (%age population served by kerbside collection)	Neighbourhood banks (density - # residents per bank)	CA sites (density - # of residents per site)
paper/card	monthly	100%		100
glass	monthly	10%	90 (maximum 1000)	100
plastic, metal, beverage cartons	every two weeks	90%		100
plastics - foil, plant trays, expanded polystyrene, agricultural foils, etc.	monthly	10%		80
organics (kitchen and garden)	every two weeks	63%		-
garden waste	quarterly	50%		100
textiles	quarterly	?	100 (maximum 1000)	100
WEEE	on demand	?		100
wood	two times per year	?		100
household hazardous waste	quarterly	10%		90
residual waste	weekly or every 2 weeks	100%		

INTRUMENTS

Prevention

RRF: promotion of home composting (RRF p62)

Legal

RRF: landfill bans + producer responsibility 'covenants' with key industry sector p63 + duty of acceptance (take back obligation for producers *) p64 + reduction of 6% in total household waste relative to 1995 levels, and by 10% by 2006

Economic

RRF: landfill and incineration taxes + subsidies and financial incentives + direct charging of householders (PAYT) p61,63 Net costs of MWM in FL in 2000=€386 million (p69-70)

Charges/taxes

The following charging structure information was provided:

Financing structure	Charge	Notes
Cost integrated in other local taxes		If waste or environmental tax does not cover all costs.
Household charge	€60 or €83/family	waste or environmental tax charged in 68% of municipalities
Variable charging	€1,14/60L bag or €3/120L dustbin	volume
Variable charging	€0,15/kg	weight
Variable charging	€0,5 - €1/collection	frequency; often combined with volume or weight charges
Green Dot system	€8/family	
Other	€15/family	for tyres, batteries, oil, WEEE, paper, etc.

Costs

The following costs **(€/family, or 2,5 people; or per tonne)** were provided by the Authority. In total, for all materials collected and with incomes for sale of materials included, total costs are €220/family;

Material	Collection	Sorting	Treatment	Total	Income
green organics	4/family				
kitchen organics	17/family				
glass	49/t				
paper/card	46/t				50/t
metal (ferrous)	1,3/family				100/t
beverage cartons	179/t	193/t			
bulky wastes	1,3/family	50/t	100-150/t		
residual waste	14/family				

Other information

Other materials include those in the table below. It would seem that, from the resulting figures of kgs/person, this is not all household waste:

Material	Tonnes	Kg/person
wood	137 343	22,83
tyres	1 756	0,29
flat glass	6 181	1,03
medicines	12	0,0020
cork	4	0,0007
*reusable waste**	*712 143*	*118,37*

** The Region has created reuse centres where people can take products they no longer want and these are sold to other members of the public.*

The Region has developed a very progressive waste prevention plan, supported by fiscal, regulatory and voluntary measures.
Key features of the plan are:

* a target of **13% prevention by 2007 based upon 2000 levels of waste production**
* a target of **70% selective collection and recycling/composting**
* a target of a **maximum of 150kg/inhabitant of residual waste**
* subsidies to municipalities for waste prevention activities
* financial and contractual support of **reuse organisations, including a network of 40 reuse centres**
* implementing **polluter pays principle** (for citizens - PAYT)
* support of **reusable packaging**

The Region also detailed figures for **'reusable waste'** at 22,894 t (3.8kgs/inhabitant) which are collected from households on demand or are brought to reuse centres or to civic amenity sites.

These are products such as furniture, bicycles, electrical equipment, etc.

that are made available to other inhabitants for reuse, rather than disposing of them as waste.

Authority	
Authority	Ghent
Country	Belgium
Population	232 961
Surface area (km²)	156
Density	1479
Reference year	2004

Waste production		
	Tonnes/year	Kg/person
Household		
Municipal	108 079	471

Residual quantity (per kg/hab/year)	137

Selective Collection

Material	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
organics kitchen (GFT)	34,70	34,70		
organics - garden	42,20	x		x
paper/card	61,50	x		x
glass	29,60	x		x
EPS (plastics)	0,30			
PMC	16,60	x		
metal	9,40			x
WEEE	4,20			x
TOTAL	**198,50**			

Other waste collected	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
wood	22,50			x
bulky	36,00			
inert	59,40			x
hazardous	1,60			x
other	6,30			
TOTAL	**125,80**			

Collection design

Material	Kerbside frequency	Kerbside (%age population served by kerbside collection)	Neighbourhood banks (density - # residents per bank)	CA sites (density - # of residents per site)
paper/card	every 4 weeks	x		x
glass	every 4 weeks	x		x
PMC	every 2 weeks	x		
GFT	every 2 weeks	x		
Grofvuil (bulky)	every 6 months	x		x
Residual waste	every week or 2 weeks	x		

INTRUMENTS

Prevention

RRF: sustained public information and communications programmes " Say what you are going to do, and do what you say" (p71)

Legal

RRF & IVAGO: reduction of annual financial contribution by 30%, or 7,5 million + create awarness of waste costs by direct contributions by residents - poluter pays principle (p72) + COSTS TABLE (p73)+ monthly KC free of charge by IVAGO for paper and glass

Economic

RRF & IVAGO: reduction in SC from weekly to fortnightly (key to successful high selective collection rate) (p71) + variable charges (PAYT) (p73) + fortnightly wheeled bin collections by IVAGO

Charges/taxes

n.d.

Costs

n.d.

Material	Collection	Sorting	Treatment	Total

Other information

Authority	
Authority	Canton of Geneva
Country	Switzerland
Population	438 500
Surface area (km²)	246
Density	1782
Reference year	2004

Waste production		
	Tonnes/year	Kg/person
Household		
Municipal	127 152	

Residual quantity (per kg/hab/year)	287

Selective Collection

Material	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
organics - garden & kitchen	63,30	x	x	x
paper/card	50,20	x		x
glass	26,90	x		x
PET bottles	2,59	x	x	x
metal packaging	0,63	x	x	x
metal	5,40		x	x
textiles	5,04			x
WEEE	1,68			x
TOTAL	**155,74**			

Other waste collected	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
wood	7,60			x
oil	0,36			x
TOTAL	**7,96**			

Collection design

Material	Kerbside frequency	Kerbside (%age population served by kerbside collection)	Neighbourhood banks (density - # residents per bank)	CA sites (density - # of residents per site)
n.d.	n.d.	n.d.	n.d.	n.d.

INTRUMENTS

Prevention

n.d.

Legal

n.d.

Economic

n.d.

Charges/taxes

n.d.

Costs

n.d.

Material	Collection	Sorting	Treatment	Total

Other information

Authority	
Authority	Graz
Country	Austria
Population	240 278
Surface area (km²)	128
Density	1773
Reference year	2005

Waste production		
	Tonnes/year	Kg/person
Household		
Municipal	131 515	547

Residual quantity (per tons/year)	180

Selective Collection

Material	**Kg/person/y**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
organics - kitchen & garden	101,97	x		
paper/packaging paper	107,47		x	
glass packaging	34,88		x	
light packaging	19,04		x	
metal packaging	3,87		x	
scrap metal	6,26			
textiles	2,71			
TOTAL	**276,20**			

Other waste collected	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
wood	22,92			
inert	26,33			
tire	0,85			
food oil	0,25			
TOTAL	**50,35**			

Collection design

Material	Kerbside collection	Bring sites	Civic amenity sites
organics (kitchen & gardens)	70		
paper/card		120	
glass		30	
light packaging	x	x	
residual	x		

INTRUMENTS

Prevention

n.d.

Legal

n.d.

Economic

n.d.

Charges/taxes

n.d.

Costs

n.d.

Material	Collection	Sorting	Treatment	Total

Other information

Authority	
Authority	Groningen (City)
Country	Netherlands
Population	180 000
Surface area (km²)	8012
Density	22
Reference year	2003

Waste production		
	Tonnes/year	**Kg/person**
Household	81 019	450
Municipal	116 111	645

Waste production trends

	1990	**1995**	**2000**	**2004**
household	68 000	73 000	78 000	82 500
municipal	110 000	118 000	123 000	117 500

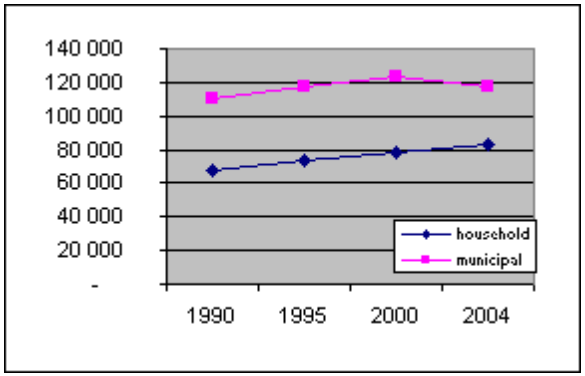
1990 figures are estimates. Between 2000 and 2004, a strong decline in commercial waste due to competition from private collectors resulted in a decline in 'municipal waste'.

Residual quantity (per kg/hab/year)	243

Selective Collection

Material	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**	**On demand**
organics - garden	39,97	39,97	0,00	0,00	0,00
paper/card	48,69	25,56	23,14	0,00	0,00
glass	18,74	0,00	18,74	0,00	0,00
metal	0,00	0,00	0,00	0,00	0,00
textiles	3,63	3,63	0,00	0,00	0,00
WEEE	8,14	0,00	0,00	6,62	1,52
TOTAL	**119,17**	**69,15**	**41,88**	**6,62**	**1,52**

Other waste collected	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**	**On demand**
bulky	87,00				
hazardous	1,00				
TOTAL	**88,00**				



Collection design

Material	Kerbside frequency	Kerbside (%age population served by kerbside collection)	Neighbourhood banks (density - # residents per bank)	CA sites (density - # of residents per site)
garden organics, paper/card	every 2 weeks	70%		
glass			1 565	
paper/card	monthly		2 168	
WEEE, bulky				90 000
residual waste	every 2 weeks		70	

INTRUMENTS

Prevention

Public communications

The authority has undertaken an **ecological footprint of the total population, promotes home composting, and repair and reuse**.promoted **leasing instead of purchasing products**, **pro home composting, repair and reuse**, and tries to lead by example in **green purchasing**.

Legal

n.d.

Economic

n.d.

Charges/taxes

€276 per household is charged for waste management.

Costs

Total costs provided, with no materials specified, are:

Collection	11 599 €
Treatment	7 354 €
Total	18 953 €
Income	19 730 €

Other

The authority is discussing the change to a **differentiated charging system**, but it is not yet clear whether this will be according to waste generated or the number of inhabitants per household.

The authority is also considering how to further promote the source separation of paper by residents as it is one of the largest fractions in residual waste that can be separated out.

Authority	
Authority	IDELUX
Country	Belgium
Population	359 219
Surface area (km²)	0
Density	0
Reference year	2004

The Province is made up of 55 local authorities, with different collection designs and activities undertaken, therefore detailed data is not available.

Waste production		
	Tonnes/year	Kg/person
Household	-	-
Municipal	211 332	588

Residual quantity (per kg/hab/year)	120

Selective Collection

Material	Kg/person	Kerbside	Neighbourhood banks	Civic amenity sites
organics - kitchen	28,80	28,80	0,00	0,00
organics - garden	98,50	0,00	0,00	98,50
paper/card	53,51	13,45	0,00	40,06
glass	30,95	0,00	17,95	13,00
plastic	4,31	0,00	0,00	4,31
PMC	2,00			
metal	13,40	0,00	0,00	13,40
textiles	0,79	0,00	0,00	0,79
WEEE	6,09	0,00	0,00	6,09
TOTAL	**238,36**	**42,26**	**17,95**	**176,15**

Other waste collected	Kg/person	Kerbside	Neighbourhood banks	Civic amenity sites
wood	37,00			
bulky	12,00			
inert	97,00			

hazardous	2,00			
food oil	1,00			
plastics	4,00			
TOTAL	**153,00**			

Collection design

Material	**Kerbside (%age population served by kerbside collection)**	**Neighbourhood banks (density - # residents per bank)**	**CA sites (density - # of residents per site)**
garden organics			6 908
kitchen organics	x		
glass		312	6 908
paper/card	x		6 908
other			6 908
Due to the very rural nature of the Authority area, there is much dependence upon CA sites for materials collection.			

Some local authorities provide kerbside collection of kitchen organics with varying frequency and paper/card 6 times per year.

INTRUMENTS

Prevention

n.d.

Legal

n.d.

Economic

n.d.

Charges/taxes

n.d.

Costs

Average costs charged by the Authority to its local authorities (according to 'equivalent resident'):

Collection	€22,40/tonne
Treatment	€7,08/tonne
CA site management	€13,63/tonne

Other relevant information

Other materials collected at civic amenity sites are:

Material	Tonnes	Kg/person	Treatment
Wood	13243	36,87	incinerated with energy recovery
Plastic bags	381	1,06	recycled
Cooking oil	216	0,60	recycled
Motor oil	146	0,41	recycled
corks	33	0,09	recycled
Polystyrene	88	0,24	recycled

The Authority is constructing an **anaerobic digestion plant** with a capacity of 30,000 tonnes per year, and a **refuse-derived fuel plant** at one landfill site for the incinerable fraction of household waste.

Authority	
Authority	INTRADEL
Country	Belgium
Population	957 699
Surface area (km²)	2648,65
Density	362
Reference year	2003

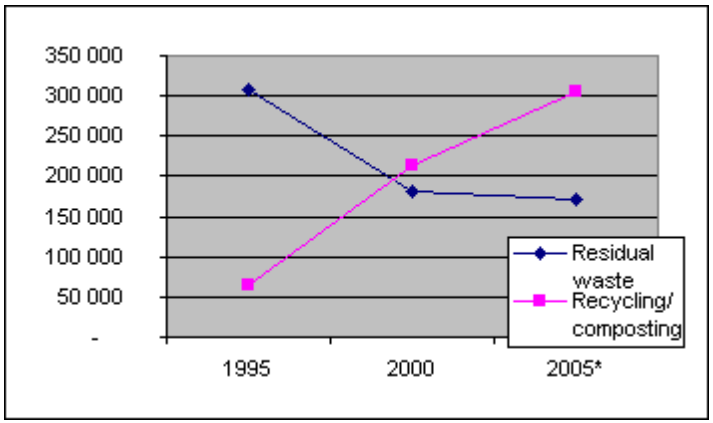
The sub-regional authority groups 72 local authorities, with different collection designs and activities undertaken, therefore detailed data is not available.

Waste production		
	Tonnes/year	Kg/person
Household	449 627	469
Municipal	-	-
Residual quantity (per kg/hab/year)		179

Waste production trends

	1995	2000	2005*
Residual waste	306 680	180 500	171 000
Recycling/composting	65 354	213 200	304 200

** Estimation*



Selective Collection

Material	Kg/person	Kerbside	Neighbourhood banks	Civic amenity sites
organics - garden	46,20	8,93		37,27
paper/card	50,59	40,47	0,00	10,12
glass	27,59	0,00	24,03	3,56
beverage cartons/PMC	15,42	14,52	0,00	0,91
metal	6,40	0,00	0,00	6,40
textiles	0,04	0,00	0,00	0,04
WEEE	3,02	0,00	0,00	3,02
TOTAL	**149,26**	**63,93**	**24,03**	**61,31**

Other waste collected	Kg/person	Kerbside	Neighbourhood banks	Civic amenity sites
bulky	53,00			
inert	80,00			
hazardous	1,00			
food oil	1,00			
TOTAL	**135,00**			

Collection design

Material	Kerbside frequency	Kerbside (%age population served by kerbside collection)	Neighbourhood banks (density - # residents per bank)	CA sites (density - # of residents per site)
glass			424	20 376
paper/card	monthly	100%		20 376
beverage cartons	every 2 weeks	100%		20 376
bulky waste	up to monthly			20 376
residual waste	weekly or every 2 weeks	100%		

INTRUMENTS

Prevention

Homecomposting

Legal

n.d.

Economic

Charges/taxes

The 72 local authorities charge their residents differently for waste management. 61 of the authorities use pay-as-you-throw bags. 1 authority has a fixed tax and provides residents with bags for free. 10 of the authorities only accept waste at civic amenity sites where residents are charged by drop-off or by weight, with a certain number of drop-offs provided for free.

Collection of packaging materials (plastic, metal, beverage containers, glass) and paper/card are paid for by the ‘green dot system’ company FOST-PLUS.

Collection of WEEE is paid for by the organisation created in Belgium to manage WEEE materials, RECUPEL.

Costs

n.d.

Other information

Other materials collected at civic amenity sites and tonnages of waste sent to recycling:

Material	Tonnes	Kg/person	Treatment
Oils	700	0,73	recycled and incinerated with energy recovery
Corks	8	0,01	recycled
Wood	12135	12,67	recycled
Expanded polystyrene	118	0,12	recycled
reusable waste’	41	0,04	such as WEEE and furniture

Specific initiatives

Communication to inhabitants on ‘sorting properly’ to improve recycling quality.

Greening’ of public events by providing biodegradable glasses at a music festival.

Future developments

Construction of a new incinerator with a 320,000 per year capacity.

Reorganisation of management of the collection systems for the 72 local authorities being done by INTRADEL.

Development of door-to-door selective collection of organics.

Completion of the network of 52 recycling centres.

Recycling and recovery targets for 2009: 60% recycling, 90% recycling and recovery.

Authority	
Authority	IOK
Country	Belgium
Population	475 400
Surface area (km²)	
Density	
Reference year	2004

Waste production		
	Tonnes/year	Kg/person
Household		
Municipal	199 668	420

Residual quantity (per tons/year)	121

Selective Collection

Material	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
organics - kitchen	131,00			
organics - garden	34,00			
paper/card	95,00			
glass	30,30			
beverage cartons	13,20			
TOTAL	**303,50**			

Other waste collected	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
wood	14,00			
hazardous	3,00			
plastic	5,00			
flat glass	1,00			
TOTAL	**23,00**			

Collection design

Material	Kerbside frequency	Kerbside (%age population served by kerbside collection)	Neighbourhood banks (density - # residents per bank)	CA sites (density - # of residents per site)
n.d.	n.d.	n.d.	n.d.	n.d.

INTRUMENTS

Prevention

Homecomposting

Legal

n.d.

Economic

Pay as you throw (Diftar system)

Charges/taxes

n.d.

Costs

n.d.

Material	Collection	Sorting	Treatment	Total

Other information

Authority	
Authority	Maastricht
Country	The Netherlands
Population	121 982
Surface area (km²)	60
Density	2140
Reference year	2003

Waste production		
	Tonnes/year	Kg/person
Household		
Municipal	44 645	366

Residual quantity (per kg/hab/year)	115

Selective Collection

Material	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
organic - kitchen	94,00	x		
paper	67,00	x		
glass	29,00			
textiles	1,90			
TOTAL	**191,90**			

Other waste collected	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
bulky	59,00			
hazardous	0,70			
TOTAL	**59,70**			

Collection design

Material	**Kerbside frequency**	**Kerbside (%age population served by kerbside collection)**	**Neighbourhood banks (density - # residents per bank)**	**CA sites (density - # of residents per site)**
n.d.	n.d.	n.d.	n.d.	n.d.

INTRUMENTS

Prevention

n.d.

Legal

n.d.

Economic

n.d.

Charges/taxes

n.d.

Costs

n.d.

Material	Collection	Sorting	Treatment	Total

Other information

Authority	
Authority	Margraten
Country	The Netherlands
Population	13 592
Surface area (km²)	58
Density	234
Reference year	2003

Waste production		
	Tonnes/year	Kg/person
Household		
Municipal	4 445	327

Residual quantity (per kg/hab/year)	95

Selective Collection

Material	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
organic - kitchen	65,00	x		
paper	92,00	x		
glass	26,00			
textiles	1,50			
TOTAL	**184,50**			

Other waste collected	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
bulky	45,00			
hazardous	2,50			
TOTAL	**47,50**			

Collection design

Material	**Kerbside frequency**	**Kerbside (%age population served by kerbside collection)**	**Neighbourhood banks (density - # residents per bank)**	**CA sites (density - # of residents per site)**
n.d.	n.d.	n.d.	n.d.	n.d.

INTRUMENTS

Prevention

n.d.

Legal

n.d.

Economic

n.d.

Charges/taxes

n.d.

Costs

n.d.

Material	Collection	Sorting	Treatment	Total

Other information

Authority	
Authority	Nantes (City)
Country	France
Population	576 000
Surface area (km²)	523
Density	1101
Reference year	2005

Waste production		
	Tonnes/year	**Kg/person**
Household		
Municipal	299 520	520

Residual quantity (per kg/hab/year)	289

Selective Collection

Material	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
organics - garden	51,27			x
paper/card	46,00	x	x	x
glass	26,00		x	
metal	5,00			
WEEE	1,00			x
TOTAL	**124,00**			

Other waste collected	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
bulky	45,00			
inert	55,00			
other	2,00			
TOTAL	**102,00**			

Collection design

Material	Kerbside frequency	Kerbside (%age population served by kerbside collection)	Neighbourhood banks (density - # residents per bank)	CA sites (density - # of residents per site)
glass			613	
garden organics, metals, bulky, WEEE			580	34 650
paper/card, beverage cartons	weekly or every 2 weeks	50,0%	1 000	
residual waste	weekly or twice weekly	100,0%		

INTRUMENTS

Prevention

Homecomposting project for 2 communes

Legal

The Authority has started to **involve its citizens in some waste management decisions, most notably in the process of redesigning its selective collection system. It also promotes home composting.**

Economic

n.d.

Charges/taxes

Waste management is paid for according to the size and quality of the residence.

Costs

Costs (all €/t) provided for different activities and different materials:

Material	Collection	Sorting	Treatment	Total costs
glass	52,00			
paper/card and packaging	154,00	126,00		280,00
residual waste*	74,00	103,00		177,00
civic amenity sites	38,00	62,00		100,00

** Represents direct and indirect costs, amortisation and investment.*

Other information

Authority	
Authority	Nordrhein Westfallen
Country	Germany
Population	18 000 000
Surface area (km²)	34084
Density	530
Reference year	2000

Waste production		
	Tonnes/year	Kg/person
Household		
Municipal	8 622 000	479

Residual quantity (per kg/hab/year)	262

Selective Collection

Material	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
organics	90,00			
paper/card	71,00			
glass	30,00			
light packaging	18,00			
TOTAL	**209,00**			

Other waste collected	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
other	8,00			
TOTAL	**8,00**			

Collection design

Material	**Kerbside frequency**	**Kerbside (%age population served by kerbside collection)**	**Neighbourhood banks (density - # residents per bank)**	**CA sites (density - # of residents per site)**
organics - garden	Garden: KC (6 months per year and max 2 times)			

INTRUMENTS

Prevention

n.d.

Legal

RRF: landfill ban + standards are drivers (p 52)

Economic

n.d.

Charges/taxes

n.d.

Costs

n.d.

Material	Collection	Sorting	Treatment	Total

Other information

Authority	
Authority	Priula
Country	Italy
Population	210 980
Surface area (km²)	583,76
Density	361
Reference year	2004

Waste production		
	Tonnes/year	**Kg/person**
Household	-	-
Municipal	80 200	388

Residual quantity (per kg/hab/year)	109

Selective Collection

Material	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
organics - kitchen	63,58	63,58	0,00	0,00
organics - garden	50,64	36,12	0,00	14,52
paper/card	54,39	44,76	0,00	9,63
beverage cartons/PMC - glass, plastic, composites	48,48	48,48	0,00	0,00
metal*	15,89	7,48	0,00	8,41
textiles	3,14	0,00	3,14	0,0000
WEEE	2,82	0,00	0,00	2,82
TOTAL**	**224,00**	**200,43**	**3,14**	**35,38**

** Metal includes non-packaging metal such as furniture (shelving units, tables, etc.) so figures appear higher for this material than usual.*
*** See 'Other information' for other materials collected*

Other waste collected	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
other	8,00			
TOTAL	**8,00**			

Collection design

Material	Kerbside frequency	Kerbside (%age population served by kerbside collection)	Neighbourhood banks (density - # residents per bank)	CA sites (density - # of residents per site)
garden organics	weekly (March - December)	65%		10 047
kitchen organics	2 times every week	70%		10 047
glass, paper/card, metal, plastic	every two weeks	100%		10 047
residual waste	weekly	100%		

INTRUMENTS

Prevention

According to the Consorzio, **30% of the population composts at home**, making up the remainder of the population that does not receive the door-to-door service.

Legal

n.d.

Economic

Charges/taxes

The Authority introduced a PAYT system starting in 2000, linked to the change from a roadside collection service to door-to-door.
The PAYT system is made up of a fixed rate and variable rate. The fixed rate is €76, and the variable rate is charged per collection.
The variable rate relates to whether the household performs home composting, as all households have a 120L bin. The charges per collection are:

No home composting	€ 8,36
With home composting	€ 5,85

Costs

The following costs were outlined by the Corsorzio. According to the Consorzio, total waste costs (including street cleansing, civic: amenity sites, etc. is €59/inhabitant.

Material	Collection	Sorting	Treatment	Total costs	Income
garden organics				26,00	
kitchen organics				52,00	
beverage containers - glass, plastic, composites		50,00		50,00	25,00
paper/card					40,00
metal					110,00
WEEE			350,00		
bulky wastes			137,00		
residual waste			156,00		

Other relevant information

The Authority also collects household batteries and expired medicines at various sites throughout the Authority area (near shops and pharmacies) and household hazardous waste and bulky wastes at civic amenity sites and at kerbside.

The following were collected:

Material	Tonnes	Kg/inh	Treatment
bulky wastes (at civic amenity sites and on demand)	1 866	8,84	recycled
other (batteries, oil, wood, medicines, etc.)	8 459	40,09	mechanical and chemical recycling, and incineration with energy recovery
glass (flat glass, etc.)	552	2,62	recycled

Authority

Authority	Salzburg (City)
Country	Austria
Population	147 000
Surface area (km²)	65,67
Density*	2238
Reference year	2003

Waste production

	Tonnes/year	Kg/person
Household	75 136	511
Municipal	76 082	518

Residual quantity (per kg/hab/year) 227

Selective Collection

Material	Kg/person	Kerbside	Neighbourhood banks	Civic amenity sites	On demand
organics - kitchen	75,22	75,22	0,00	0,00	0,00
organics - garden	27,97	0,00	0,00	0,00	27,97
paper/card	72,44	0,00	66,37	2,67	3,40
glass	23,80	0,00	23,80	0,00	0,00
plastic	7,75	0,00	0,00	7,75	0,00
beverage cartons/PMC	7,75	0,00	0,00	7,75	0,00
metal	6,88	1,87	0,00	5,01	0,00
textiles	2,20	0,90	1,29	0,00	0,00
WEEE	2,45	0,00	0,00	2,45	0,00
TOTAL	**226,45**	**77,99**	**91,46**	**25,63**	**31,37**

Other waste collected	Kg/person	Kerbside	Neighbourhood banks	Civic amenity sites	On demand
wood	10,00				
bulky	20,00				
tires	0,00				
hazardous	1,00				
TOTAL	**31,00**				

Collection design

Material	Kerbside frequency	Kerbside (%age population served by kerbside collection)	Neighbourhood banks (density - # residents per bank)	CA sites (density - # of residents per site)
garden organics*	up to 2 times per year	85%		147 000
kitchen organics**	weekly	85%		147 000
glass			200	147 000
paper/card, metal, plastic	weekly	100%		147 000
beverage cartons	every 3 weeks	20%		147 000
textiles			20	147 000
paper/card, metal	every 2 weeks	100%		147 000
bulky waste*		100%		147 000
residual waste	up to 3 times per week	100%		

** Also collected on request. Bulky waste is collected up to two times per year from households.*

*** According to the Authority, 15% of households do home composting.*

INTRUMENTS

Prevention

The Authority promotes the **leasing of products instead of purchase, home composting, repair and reuse**, and

environmentally-friendly purchasing behaviour.

Legal

n.d.

Economic

Charges/taxes

A yearly charge of €181.48 per household covers the weekly waste and biowaste-bin collections. Bulky and yard wastes are collected for free.

Costs

Costs (all €/t) provided for different activities and different materials:

Material	Collection	Sorting	Treatment	Total costs
garden organics	53,30		29,70	83,00

kitchen organics	69,30	98,70	168,00
paper/card			11,00
WEEE		1 000,00	1 000,00
Textiles			0,10
bulky waste	53,30	171,70	225,00
residual waste	75,50	137,50	213,00

Other information

In relation to the collection of WEEE products, the Authority believes:
'*The prime goal of the WEEE Directive is not only to recycle but to reuse and recover electrical and electronic equipment. This offers the opportunities that local authorities may act together with social enterprises working in this field. For this reason … Salzburg is in contact with socio-economic enterprises to establish a model where jobless people will be qualified and reintegrated into the labour market. It is not only to recover electrical equipment but also furniture and other parts of the bulky waste.*
These activities should also ensure that socially disadvantaged people get access to cheap, second-hand products.'

Future developments

The Authority provided details of two activities to be developed:

Recycling centre on tour: providing the pick-up service more frequently.
Internet waste exchange: possibly to be developed, an online exchange service for householders to 'swap' belongings.
Sustainable gardens: to reduce green and bulky, garden wastes, a campaign will be developed that explains how to manage
home gardens in a way that does not produce more waste, but instead produces vegetables, fruits and permaculture.
According to the Authority: *'Gardens should become more naturally structured to give homes to birds and other animals. It is intended to embed this campaign in several activities we will start in the next five years and which should lead towards a sustainable lifestyle.*

Authority	
Authority	Region of Styria
Country	Austria
Population	1 183 303
Surface area (km²)	16392
Density	72
Reference year	2003

Waste production		
	Tonnes/year	Kg/person
Household		
Municipal	425 989	360

Residual quantity (per kg/hab/year)	113,8

Selective Collection

Material	**Kg/person**	**Kerbside collection**	**Neighbourhood banks**	**Civic amenity sites**
organics	61,10			
paper/card	69,50			
glass	24,90			
light fraction	18,00			
metal/packaging	12,10			
metal	4,90			
textiles	2,50			
TOTAL	**193,00**			

Other waste collected	**Kg/person**	**Kerbside collection**	**Neighbourhood banks**	**Civic amenity sites**
wood	9,60			
bulky	39,40			
hazardous	4,20			
TOTAL	**53,20**			

INTRUMENTS

Prevention

60kg/person/year for homecomposting (RRF, p48)

Legal

n.d.

Economic

Landfill tax €140/t (RRF p48)

Charges/taxes

n.d.

Costs

n.d.

Material	Collection	Sorting	Treatment	Total

Other information

Authority	
Authority	Canton of Vaud
Country	Switzerland
Population	650 791
Surface area (km²)	3212
Density	198
Reference year	2004

Waste production		
	Tonnes/year	Kg/person
Household		
Municipal	321 705	494

Residual quantity (per kg/hab/year)	265

Selective Collection

Material	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
organic waste	77,00	x		
paper/card	71,00	x		
glass	44,00	x		
metal	15,00			
TOTAL	**207,00**			

Other waste collected	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
bulky	33,00			
TOTAL	**33,00**			

Collection design

Material	**Kerbside frequency**	**Kerbside (%age population served by kerbside collection)**	**Neighbourhood banks (density - # residents per bank)**	**CA sites (density - # of residents per site)**
n.d.	n.d.	n.d.	n.d.	n.d.

INTRUMENTS

Prevention

Scholar network and specialised courses - sensibilisation of citizens and professionals

Legal

n.d.

Economic

n.d.

Charges/taxes

n.d.

Costs

n.d.

Material	Collection	Sorting	Treatment	Total

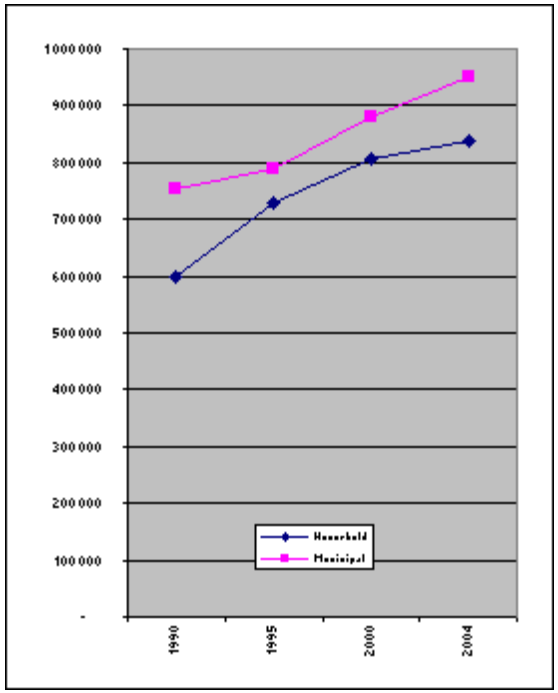
Other information

Authority	
Authority	Vienna
Country	Austria
Population	1 644 816
Surface area (km²)	414,95
Density*	3964
Reference year	2003

Waste production		
	Tonnes/year	Kg/person
Household	814 238	495
Municipal	935 819	569

Waste production trends				
	1990	1995	2000	2004
Household	599 027	728750	806010	838257
Municipal	752 178	788632	879105	951330

Residual quantity (per kg/inhhab/year)	301



Selective Collection

Material	Kg/person	Kerbside	Neighbourhood banks	Civic amenity sites	On demand
organics - kitchen	4,26	0,00	4,26	0,00	0,00
organics - garden	45,69	37,96	1,22	5,69	0,83
paper/card	72,22	64,03	7,11	1,07	0,00
glass	14,71	0,61	14,10	0,00	0,00
plastic	5,41	0,00	5,41	0,00	0,00
metal	11,11	0,00	2,77	7,91	0,43
textiles	0,15	0,00	0,15	0,00	0,00
WEEE	1,79	0,00	0,00	1,64	0,16
TOTAL	**155,34**	**102,60**	**35,02**	**16,32**	**1,41**

Other waste collected	Kg/person	Kerbside	Neighbourhood banks	Civic amenity sites	On demand
wood	17,00				
bulky	20,00				
inert	45,00				
tires	1,00				
hazardous	1,00				
TOTAL	**84,00**				

Collection design

Material	Kerbside frequency	Kerbside (%age population served by kerbside collection)	Neighbourhood banks (density - # residents per bank)	CA sites (density - # of residents per site)
garden organics	weekly	20%	687	86 569
glass	every two weeks or monthly	2%	586	86 569
paper/card	weekly or twice weekly	80%	612	86 569
metal	monthly or every two weeks	1%	1 052	86 569
plastic	monthly or every two weeks	1%	1 058	86 569
residual waste	weekly and up to daily	100%		

INTRUMENTS

Prevention

Promotion of home composting (RRF p62)

The Authority has:

* calculated the **population's ecological footprint**
* involved its citizens in **participative democracy**, involving them in political choices and implementation
* delivered **high-visibility activities on waste prevention and sustainable consumption**
* communicated messages to **change citizens' thoughts on 'needs'**
* promoted **leasing instead of purchasing of products**
* promoted **home composting**
* promoted **environmentally-friendly purchasing behaviour**
* **rewarded sustainable consumption choices**
* **monitored progress towards sustainable consumption choices**
* promoted **reuse and repair**
* lead by example through **green public procurement**

The Authority has established a group of representatives from the different departments in the municipality to focus on waste prevention activities: awareness-raising, fundamental studies, campaigns and implementation projects. The budget is approximately €5m per year. Activities in 2005 have included a focus on **food waste, food packaging, and waste prevention at events.**

In 2006, focus will be on **demolition waste.**
The Authority's audience for activities is **the public, students, producers and retailers.**

Legal
RRF: Landfill bans + producer responsibility 'covenants' with key industry sector p63 + duty of acceptance (take back obligation for producers *) p64 + reduction of 6% in total household waste relative to 1995 levels, and by 10% by 2006

Economic
RRF: Landfill and incineration taxes + subsidies and finanicial incentives + direct charging of householders (PAYT) p61,63
Net costs of MWM in FL in 2000=€386 million (p69-70)

Charges/taxes
Residual waste collection is charged according to bin size. The owner of the house is required to pay, rather than the inhabitant of the apartment, but charges are incorporated into rent costs.
Apartments are charged according to the size of the dwelling.

Size (Litre)	Charge
120	3.16
240	6.32
770	22.12
1 100	31.60
2 200	63.20
4 400	126.40

The Green Dot System also partially covers costs, and this is charged to the authority according to the percentage of packaging.

Costs
n.d.

Other information

Future developments
In 2008, a new **incineration plant** with a 250,000 t per year capacity will be built, and an **anaerobic digestion plant** (fermentation plant???) will be built in 2007, with an initial capacity of 17,000t per year and increasing eventually to 34,000 t per year.

Authority	
Authority	Zurich
Country	Switzerland
Population	343 000
Surface area (km²)	92
Density	3992
Reference year	2002

Waste production		
	Tonnes/year	Kg/person
Household		
Municipal	152 000	443

Residual quantity (per kg/hab/year)	147

Selective Collection

Material	**Kg/person**	**Kerbside**	**Neighbourhood banks**	**Civic amenity sites**
organics	21,00	x		
paper/card	90,00	x	x	
glass	30,00			
metal	6,00			
TOTAL	**147,00**			

Collection design

Material	**Kerbside frequency**	**Kerbside (%age population served by kerbside collection)**	**Neighbourhood banks (density - # residents per bank)**	**CA sites (density - # of residents per site)**
paper/card	newspaper & magazines: 2 times per week & cardboard: every 2 months			
garden waste	weekly during summer months (March to December)			

INTRUMENTS

Prevention

Homecomposting + network of community composting centres (p99)

Legal

n.d.

Economic

Volume-based charging system (with Züri-Sacks of 35 litres)

Charges/taxes

n.d.

Costs

n.d.

Material	Collection	Sorting	Treatment	Total

Other information