

**Municipal Waste Minimisation and Recycling
in European Cities**

A report of the Association of Cities for Recycling

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FOREWORD

Things change in municipal waste management. The mobilisation of the populations and of the political authorities to protect their living environment has modified traditional waste management, based on landfilling and incineration, towards more environmentally friendly strategies. Among these strategies, there are prevention at source, re-use, recycling and recovery of waste. Even if there are still important progresses to make, these concepts have generally known a considerable development in recent years.

The 94/62/CE Directive on packaging and packaging waste has something to do with these good results. Notably by imposing recycling and recovery objectives of packaging waste, it has favoured systems which lean on the responsibilities of economic actors of the sectors which put the packaging on the market. The financial contribution to the recycling sector is important and enables the creation of numerous jobs. Moreover, selective collection generalisation is an essential awareness instrument for the populations as far as waste issues are concerned. As shown in various studies, the consumers-sorters are satisfied with selective collections and glad to participate in a citizen action useful for the community. The outstanding results of packaging waste recovery in some cities are encouraging and enable to open the way to the selective collections of other types of waste, and among others, organic waste.

The survey realised by ACR-AVR shows that, via many different approaches which take into account local socio-cultural realities, European cities manage, in the South as in the North, to obtain outstanding and convergent results as far as selective collections of dry and wet municipal waste are concerned. They are more and more numerous to develop initiatives to promote individual composting and to develop organic waste selective collection. The 99/31/CE directive regarding landfilling of waste will necessarily reinforce this tendency. It represents future prospects of substantial progresses because organic waste represent household waste most important and most homogeneous fraction.

The citizens' participation is one of the key factors of selective collection success and cities are developing numerous and varied strategies of communication to the population. At the same time, many cities take advantage of the reinforcement of the relationship with the citizens regarding waste collection, to develop awareness about prevention at source : other consuming, better buying, less throwing away...

Prevention, re-use, recycling,... the initiatives are numerous. One of the objectives of the Association of Cities for Recycling is to make them known to all the responsible parties who want to improve the performances of municipal waste management in their city or their region.

This report, written on the basis of the survey realised by ACR-AVR in 1998-1999, aims to give a global and synthetic vision of waste management in European cities.

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PART I : INTRODUCTION





I.1. INTRODUCTION

To make a synthetic table of municipal waste management in Europe is not easy. There are many scenarios which correspond to the geographical, economic, sociological and cultural differences of local contexts. The absence of harmonised system of reference in Europe for the assessment of household waste production and composition complicates the comparison of figures : cities use different methods of gathering and interpreting data and the employed terminology for the classification of the various waste categories is not uniform.

ACR-AVR has tried with its method of inquiry to maximise the level of preciseness of the data and to optimise their comparability in order to enable the reader to get an idea of the strategies developed throughout Europe and to learn from it about the ways to optimise at various levels the selective collections systems and waste management practices.

The present report is divided in two sections. In the first one, we have been trying to highlight the outstanding facts and the main themes of the strategies which are progressively developing as far as municipal waste management throughout Europe is concerned. We are trying as well to extract the balance of results, tendencies and prospects of this management. The second section presents, in descriptive forms and tables, figures and detailed actions implemented in the cities concerned by our survey.

Cities concerned by the survey :

Aalborg (DK), Almada (P), Aveiro (P), Basel (CH), Barcelona (E), Berne (CH), Bordeaux (F), Brussels (B), Cardiff (Irl), Carpi (I), Coimbra (P), Cordoba (E), Dublin (Irl), Dunkerque (F), Evora (P), The Hague (NL), Le Havre (F), Leiria (P), Liège (B), Lille (F), Lisbon (P), Lyon (F), Madrid (E), Milano (I), Milton-Keynes (UK), Munich (D), Namur (B), Nantes (F), Nicosia (CHY), Oslo (N), Palermo (I), Paris (F), Porto (P), Saarbrücken (D), Salzburg (A), San Sebastian (E), Setubal (P), Varsovia (PL), Vienna (A).

I.2. METHODOLOGY OF THE STUDY

The survey began in 1998 by sending a detailed questionnaire (see annex 1), divided in several parts to obtain information on :

- The city specific data as far as population and housing are concerned
- Waste production and the composition of the city standard waste bin
- The settled different collection flows and their destination
- Waste treatment centres
- The important achievements and projects in the city
- Specific initiatives in favour of prevention at source, re-use, composting or concrete developments as far as employment is concerned.

The survey has considered differently packaging waste and other waste. Its aim was also to highlight the interrelations between household waste and non household waste.

Answers to the questionnaire have most of the times been verified and completed via telephone.

We have very carefully compiled and retranscribed the presented information transmitted by the cities. Nevertheless, one has to keep in mind that the scenarios are constantly evolving and that it is difficult to illustrate in a synthetic document the multiplicity and the diversity of the scenarios of waste management settled by cities. Therefore, we invite you to contact directly the ACR-AVR secretariat if you have contradictory information.



I.3. PRELIMINARY REMARKS

Waste production:

The absence of normalisation and harmonisation of household waste typology is a well-known problem. The questionnaire has tried to limit, as much as possible, the importance of these inadequacies by referring to the notions used by the OCDE for municipal and household waste.

So, in this report, we must consider as :

Municipal waste : waste collected and treated by or for a municipality. It covers waste from households, including bulky waste, similar waste from commerce and trade, office buildings, institutions and small businesses, yard and garden waste, street sweepings, the contents of litter containers, and market cleansing waste. The definition excludes waste from municipal sewage networks and treatment, as well as municipal construction and demolition waste.»

Household waste: waste generated by the domestic activity of households. It includes : garbage, bulky waste and separately collected waste ».

However, some cities have not been able to respect the definition used here because they do not correspond to their measurement and waste classification systems. Therefore, we have made the results converge as much as possible, excluding systematically from household waste municipal waste which are clearly not household.

Waste composition

Household waste analysis methods are essentially aimed at determining the composition in recyclable materials which are divided in dry recyclable materials (paper cardboard, complex cardboard, textiles, plastics, glass, metals) and wet recyclable materials (food and garden waste). Other waste which cannot be included in these categories are included in another one called "other".

The objective for one city will be to establish a general balance of all its waste flows. Information related to these flows can easily be found for some, but much less for others. The « REMECOM Charter» which includes the recommendations of a network of partners for the Measurement and the Characterisation of Household Waste is a very useful tool for local authorities embarking on this type of exercise (See annex 2).

The categories of the questionnaire were the following ones :

Organic waste:

- Food waste
- Yard and Garden waste

Paper :

- Packaging
- Non packaging

Complex cardboards:

- Cardboard Composites packaging as tetrabricks
- Other composite packaging

Textiles

Health care Textiles

Plastics :

- Films
- Jars and bottles
- Others



- Glass :
 - Packaging
 - Non packaging
- Metals :
 - Packaging
 - Non packaging
- Special household waste
- Other waste :
 - Small elements
 - Others to be specified

Because of the lack of a precise typology, bins analysis realised in the different cities are not always referring to the same categories of waste. So, the category « other waste» is a general category which groups together all the waste which is not included by the city in one of the waste categories of the inventory. This category "other" can thus represent different fractions of waste according to the cities.

Results of recyclable household waste selective collection

The tables show the results of selective collections for recycling, either kerbside either by voluntary bringing to neighbourhood containers such as the igloos or via waste lots. They are expressed, in the description sheets, in kg/inhabitant/year (quantity of selectively collected household waste/city total population) and in percentages of weight related to the total amount of household waste (quantity of selectively collected household waste /total quantity of household waste). When these data exist, they are also expressed in relation to the served population (quantity of selectively collected household waste /population served by the collection).

Collection flows and waste treatment methods :

This information allows, when there are sufficient data, to create a complete and precise image of waste management global strategy. We can stress the fact that waste treatment most of the time applies to the first step of waste treatment after the collection. For dry recyclable waste, it generally concerns sorting or pre-treatment of waste with a view to the recycling. For organic waste, this first step concerns composting.





PART II : COMPARATIVE STUDY





II.1. WASTE PRODUCTION

The table 1 here below shows the total amount of household waste produced by inhabitant by year as well as the total amounts of waste in charge of the municipalities. The production of household waste varies between 281 and 631 kg with an average situated around 422 kg. Approximately, fifty per cent of the cities collect between 360 and 480 kg/inhab/year of household waste. Differences in ways of life and in the consumption customs may explain the variations. However, other factors, such as the method of calculation and of assessment of the bin or the differences existing between the definitions applied to household waste play also a certain part.

TABLE 1 : WASTE PRODUCTION AND MANAGEMENT

	City	Country	Inhabitants	Household Production (kg/inhab/year)	Municipal management (kg/inhab/year)
1.	Aalborg	DK	160.000	421	3.042 ¹
2.	Almada	P	152.477	532	612
3.	Aveiro	P	70.000	365	445
4.	Basel	CH	173.800	367	667
5.	Barcelona	E	1.550.000	356	456
6.	Bern	CH	127.000	417	447
7.	Bordeaux	F	658.200	631	/
8.	Brussels	B	950.597	353	618
9.	Cardiff	UK	316.800	383	453
10.	Carpi	I	60.200	554	848
11.	Coimbra	P	139.052	469	/
12.	Cordoba	E	311.729	438	545
13.	Dublin	IRL	481.854	358	841
14.	Dunkirk	F	208.548	539	933
15.	Evora	P	55.000	353	510
16.	The Hague	NL	442.183	407	461
17.	Le Havre	F	197.219	503	579
18.	Leiria	P	30.688	430	874
19.	Liège	B	188.390	465	510
20.	Lille	F	1.067.345	559	632
21.	Lisbon	P	663.394	543	560
22.	Lyon	F	1.158.820	324	433
23.	Madrid	E	3.044.980	405	457
24.	Milan	I	1.345.000	297	495
25.	Milton-Keynes	UK	200.700	426	473
26.	Munich	D	1.307.609	380	407
27.	Namur	B	104.988	406	477
28.	Nantes	F	546.000	442	/
29.	Nicosia	CHY	194.000	530	964
30.	Oslo	N	500.000	310	360
31.	Palermo	I	743.070	556	590
32.	Paris	F	2.152.329	382	524
33.	Porto	P	400.000	405	417
34.	Saarbrücken	D	185.891	560	/
35.	Salzburg	A	145.000	365	487
36.	San Sebastian	E			
37.	Setubal	P	110.000	469	/

¹ In Aalborg, commercial and demolition waste, as well as waste from energy sectors and water purification are considered as municipal waste

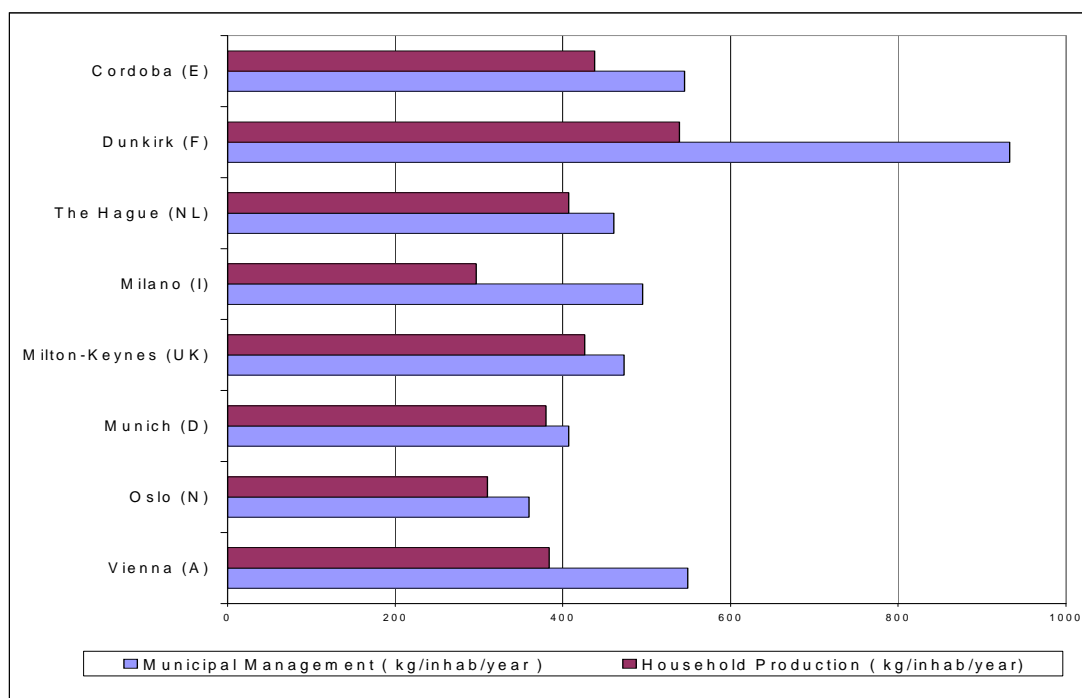


38.	Warsaw	PL	1.700.000	259	370
39.	Vienna	A	1.636.399	384	549
			Average	422	637
			Min	259	329
			Max	631	964 ²
			Standard deviation	90	469

Municipal waste are essentially reflecting the management techniques and other activities of local authorities and are quite different from one city to another. Usually, cities in Germany and The United Kingdom restrict closely their activities to the management of household waste. On the contrary, Aalborg in Denmark considers as municipal activity, the collection of a large range of waste non originating from households.

Household waste reflects actually more closely the households consumption and are a more propitious comparison basis. On average, household waste represent 2/3 of the waste managed by municipalities. Figure 1 shows, for some cities with more than 200.000 inhabitants, the portion represented by purely household waste in municipal management.

Figure 1 : Household production and municipal management of waste for some cities with 200.000 inhabitants and more.

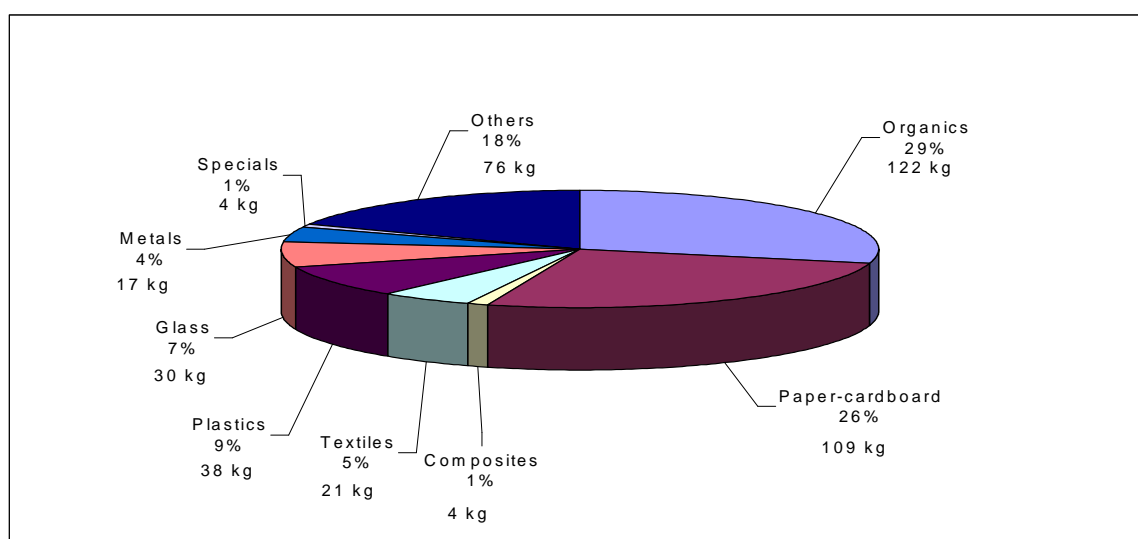


² With the exception of Aalborg

II.2. AVERAGE COMPOSITION OF HOUSEHOLD WASTE

Figure 2 shows the average composition of household waste calculated on all the results of the survey. On average, organic waste represent nearly 29% of all household waste which correspond to a theoretical average waste generation of 122 kg/inhab/year.³ Approximately 52% of waste are constituted by dry recyclables (paper/cardboard, multi-material packaging, textiles, plastics, glass and metals) i.e. 219 kg/inhab./year. Other categories (19% of household waste) ⁴ include bulky waste, inert, tires,... and special household waste (oils, batteries, medicines, paints,) which represent approximately 1% of the household waste.

Figure 2 : Average composition of household waste (in weight %)



II.3. RESULTS OF SELECTIVE COLLECTIONS

Table 2 shows the results of selective collections in several European cities for dry recyclable materials (paper, glass, plastics, metals) and wet recyclable materials (organic waste) of household waste. We have considered here fifteen cities from various countries whose collection scenarios seem to be the most mature. Collection results are given in kg/inhab/year (quantities of household waste selectively collected / total population of the city) and in percentage.

On average, 108 kg of organic waste and dry recyclable are selectively collected. This represents more than 27% of the amount of household waste. More than two third of recycled waste (81 kg) belong to dry fractions.

Several of the cities listed here (Basel, Bern, Munich, Oslo, Saarbrücken Salzburg, Warsaw or Vienna) have chosen variable fees according to the weight or the volume of the produced waste. On that

³ They represent with the 24% of paper cardboard, a potential of more than 50% of biodegradable waste which can be composted or biometanised.

⁴ N.B. : the category « other waste» represents a special category which groups together all the waste that the city does not include in the waste categories of the inventory and it represents in some cases different fractions of waste.



subject, the ACR-AVR has collected in a survey about tariff and tax systems regarding household waste collection⁵, information showing that variable fee systems allow not only to increase by 5 to 10% the output of selective collections by households but also to reduce the production of waste at source and to encourage home composting. However, appropriate accompanying methods must make sure to limit inadequate behaviours which lead to fly-tipping or illegal dumping of waste.

TABLE 2 : SELECTIVE COLLECTIONS OF HOUSEHOLD RECYCLABLE WASTE

City	Country	Household Production (kg/inhab/year)	Selectively collected quantities (kg/inhab/year)			Recycling percentage for household waste		
			Dry	Wet	Total	Dry in %	Wet in %	Total in %
Aalborg	DK	421	61	55	116	14,5	13,1	27,6
Basel	CH	367	117	/	117	31,9		31,9
Bern	CH	417	117	19	135	28,1	4,6	32,4
Bordeaux	F	631	48	22	70	7,6	3,5	11,1
Carpi	I	554	51	30	81	9,2	5,4	14,6
Cordoba	E	438	33	33	66	7,5	7,5	15,1
Dunkirk	F	539	103	14	117	19,1	2,6	21,7
The Hague	NL	407	46	33	79	11,3	8,1	19,4
Milton-Keynes	UK	426	66	/	66	15,5		15,5
Munich	D	380	101	23	124	26,6	6,1	32,6
Namur	B	406	85	27	112	20,9	6,7	27,6
Oslo	N	310	76	/	76	24,5		24,5
Saarbrücken	D	560	120	20	140	42,7	7,1	49,8
Salzburg	A	365	94	72	166	25,8	19,7	45,5
Vienna	A	384	101	58	159	26,3	15,1	41,4
Average		422	81	34	108	20,8	8,3	27,4
Maximum		631	120	72	166	42,7	19,7	49,8

The maximums give an idea of the potentialities of selective collections. Selective collections in Saarbrücken allow to recover more than 120 kg of dry recyclable materials whereas in Salzburg 70 kg of organic waste are selectively collected before composting. In total, this shows that it is possible to foresee the recycling of 50% of household waste.

It must be underlined that our survey only concerns the most common dry recyclable materials (paper-cardboard, glass, plastic, metals and textiles) whereas numerous cities have already taken initiatives for the collection and the recycling of household electrical appliances notably in Vienna, Munich or Salzburg ; old furniture, toys, shoes notably in Salzburg; « neon tubes » or other special household waste as in Almada, Basel, Warsaw, Brussels, The Hague, Liège, Oslo and many other cities.

⁵ The Application of local Taxes and Fees for the Collection of household Waste : local Authority jurisdiction and practice in Europe. ACR-AVR Technical Report 2000.



II.4. RESULTS OF SELECTIVE COLLECTIONS BY MATERIAL⁶

Table 3 shows that organic materials represent an average of 25% of selectively collected materials. Among dry recyclable waste, paper represents by far, with an average of 35 %, the most important fraction of collected household waste. After comes the glass (with 11%), then metals (2,5%), far before plastics and textiles which represent each less than 1% of separately collected quantities. These figures must be analysed while taking into account the fractions of dry recyclable waste collected in mixed fractions⁷, before being brought to sorting plants. They represent an average of 25% of selective collections total result.

**TABLE 3 : SELECTIVE COLLECTIONS OF HOUSEHOLD RECYCLABLE WASTE
RESULTS BY MATERIALS (in kg/inhab/year)**

	PC	Glass	Plastic	Metals	Textiles	Mixed dry recyclable	Organic	Total
Aalborg (DK)	30	18	/	13	/	/	55	116
Basel (CH)	81		/	4,3	/	31	/	117
Bern (CH)	84	31	/	2,0	/	/	19	135
Bordeaux (F)	6,0	14	0,6	/	/	28	22	70
Carpi (I)	25	17	3,2	3,5	/	/	30	81
Cordoba (E)	12	8,4	/	/	/	13	33	66
Dunkirk (F)	/	/	/	/	/	101	14	115
The Hague (NL)	28	16	/	/	2	/	33	79
Milton-Keynes (UK)	/	/	/	/	/	66	/	66
Munich (D)	62	/	/	/	/	39	23	124
Namur (B)	41	25	/	5,0	4	10	27	112
Oslo (N)	67	6,6	/	/	2,6	/	/	76
Saarbrücken (D)	/	/	/	/	/	120	20	145
Salzburg (A)	65	21	6,0	2,0	/	/	72	166
Vienna (A)	70	16	4,0	11	0,2	/	58	159
Average (in kg/inhab/year)	36	11	0,9	2,5	0,6	26	25	101
Average (in %)	35	11	0,9	2,5	0,5	25	25	100,0
Maximums (in kg/inhab/year)	84	31	6,0	13	4,0	120	72	166
Average theoretical Waste Generation ⁸ (in kg/inhab/year)	109	30	38	17	21	/	122	422

⁶ Tables show the results of selective collection for recycling : either kerbside collection, either voluntary bringing via neighbourhood containers such as igloos, or via waste lots.

⁷ See also tables 5 and 6.

⁸ See figure 2



II.5. MODALITIES OF WASTE COLLECTION

Table 4 presents the methods of collection for paper-cardboard, glass, plastic, metals (ferrous and non ferrous) and organic waste used in the cities of this survey. The "multimaterial" column concerns the collections of dry recyclable material collected together before going to sorting plants. (see also tables 5 and 6). For each of these materials, the columns represent, from left to right, regular kerbside or voluntary collections ⁹. For organic waste, collection via waste lots is also mentioned. The last column shows the cities with waste lots.

Without going into details, it appears from these figures that out of the 39 studied cities, approximately half of them (20) combine the three methods of take-back, kerbside, via neighbourhood containers or via waste lots. Seven cities combine two methods of collection. The ten cities which only use one collection method use neighbourhood containers.

Neighbourhood containers are the most widely used, since, apart from one exception all the cities use this system for some materials. They are principally used to collect glass (29 cities) but many cities also use them to collect paper-cardboard (24), plastics and metals (6 and 5). Nineteen cities have neighbourhood containers (or eco-points) to collect several materials. In some cases, sorting is realised by the people who deposit their waste. In other cases, fractions are collected together before being sent to the sorting plant.

It is interesting to mention the original experience of Carpi, where the inhabitants are invited to empty their bags of organic waste in specific containers distributed over the city. The quality of the material is guaranteed by the fact that containers are locked up and are only accessible to the neighbourhood inhabitants who have the adequate key.

Barcelona is currently testing an original method of collection which enables notably to reduce the visual and sonorous impact of containers. The inhabitants of the two concerned streets can deposit their waste separated into organic waste, paper-cardboard, light recyclable (plastic, metals, multimaterial) and other non recyclable waste in some "boxes" with circular openings situated along the streets and which open into containers situated underground. A lorry collect them by aspiration. This system is completely automated and can be controlled from a computer situated in the collection vehicle.

26 cities organise regular selective kerbside collections¹⁰ for one or various material flows. Paper and cardboard are most of the time collected this way (17 cities). The other dry recyclable materials, when they are kerbside collected, are subject, in half of the cases (13 cities), to a combined collection of several materials but kerbside selective collections also exist for organic waste (8 cities), glass, metals and plastics. It must further be pointed out that, in neighbourhoods with a high concentration of multi-storey buildings, kerbside collection is regularly substituted by neighbourhood containers.

In many Spanish and Portuguese cities, mixed waste are most of the time collected via neighbourhood containers situated in the streets. The Hague is contemplating adopting this system for non-recyclable waste, which could allow to reduce collection global costs and to increase selective collection efficiency.

Waste lots exist in 21 of the studied cities. In our survey, we have only taken into account waste lots intended for the recycling of some collected fractions. In some cases, indeed, waste lots are deposit places where the population can get rid of mixed, special and bulky waste which are then taken to an incinerator or to landfills.

⁹ Only collection organised on a regular basis at least once a month.

¹⁰ Only the kerbside collections with a frequency of 1 per month or more have been considered in these statistics. The city of Basel for instance organises three kerbside collections per year for metals and glass. These are not listed in this table.



Selectively collected materials in some waste lots

Paper-cardboard, glass, metals, plastics, composite materials, textiles, bulky waste (household electrical appliances, furniture, ...), organic waste, wood, rubber (e.g. used tyres), inert waste (clay, rubble, bricks, ...), household special waste (mineral and vegetable oils, paints, solvents, medicines, batteries, neon tubes, ...)



**TABLE 4 : HOUSEHOLD RECYCLABLE WASTE SELECTIVE COLLECTIONS -
COLLECTION METHODS AND MATERIALS**

		PAP & CARD		GLASS		PLAST.		METALS		Mult.MAT		ORG.			Waste lots
A = Kerbside B = Neighbourhood Containers C = Waste lots		A	B	A	B	A	B	A	B	A	B	A	B	C	
Aalborg	DK														
Almada	P														
Aveiro	P														
Basel	CH														
Barcelona	E														
Bern	CH														
Bordeaux	F														
Brussels	B														
Cardiff	UK														
Carpi	I														
Coimbra	P														
Cordoba	E														
Dublin	IRL														
Dunkirk	F														
Evora	P														
The Hague	NL														
Le Havre	F														
Leiria	P														
Liège	B														
Lille	F														
Lisbon	P														
Lyon	F														
Madrid	E														
Milan	I														
Milton-Keynes	UK														
Munich	D														
Namur	B														
Nantes	F														
Nicosia	CHY														
Oslo	N														
Palermo	I														
Paris	F														
Oporto	P														
Salzburg	A														
San Sebastian	E														
Setubal	P														
Warsaw	PL														
Vienna	A														
Occurrences		17	24	3	29	1	6	2	5	13	19	8	4	15	21



Multimaterial kerbside collections

Table 5 shows materials collected by cities which organise multi-material kerbside collections.

TABLE 5 : MATERIALS COLLECTED BY MULTIMATERIAL KERBSIDE COLLECTIONS

City	Country	Paper-cardboard	Glass	Plastics	Metals	Composites
Bordeaux	F					
Brussels	B					
Cardiff	UK					
Dublin	IRL					
Dunkirk	F					
Liège	B					
Lille	F					
Lyon	F					
Milan	I					
Milton-Keynes	UK					
Namur	B					
Nantes	F					
Oslo	N					
Warsaw	PL					
Occurrences		10	7	12	11	8

Table 6 shows materials collected by the cities which organise multimaterial collection in neighbourhood containers.

TABLE 6 : MATERIALS COLLECTED BY MULTIMATERIAL COLLECTION IN NEIGHBOURHOOD CONTAINERS

City	Country	Paper-cardboard	Glass	Plastics	Metals	Composites
Basel	CH					
Barcelona	E					
Bordeaux	F					
Cardiff	UK					
Cordoba	E					
Dublin	Irl					
Dunkirk	F					
Lille	F					
Lisbon	P					
Lyon	F					
Milan	I					
Milton Keynes	UK					
Munich	D					
Nantes	F					
Oslo	N					
Salzburg	A					
San Sebastian	E					
Warsaw	PL					
Vienna	A					
Occurrences		8	9	14	16	12



Figures 3 and 4 present, in weight percentages, the collected quantities according to the different methods of collection for dry and wet recyclable waste.

Figure 3 : Modalities of dry recyclable waste collections

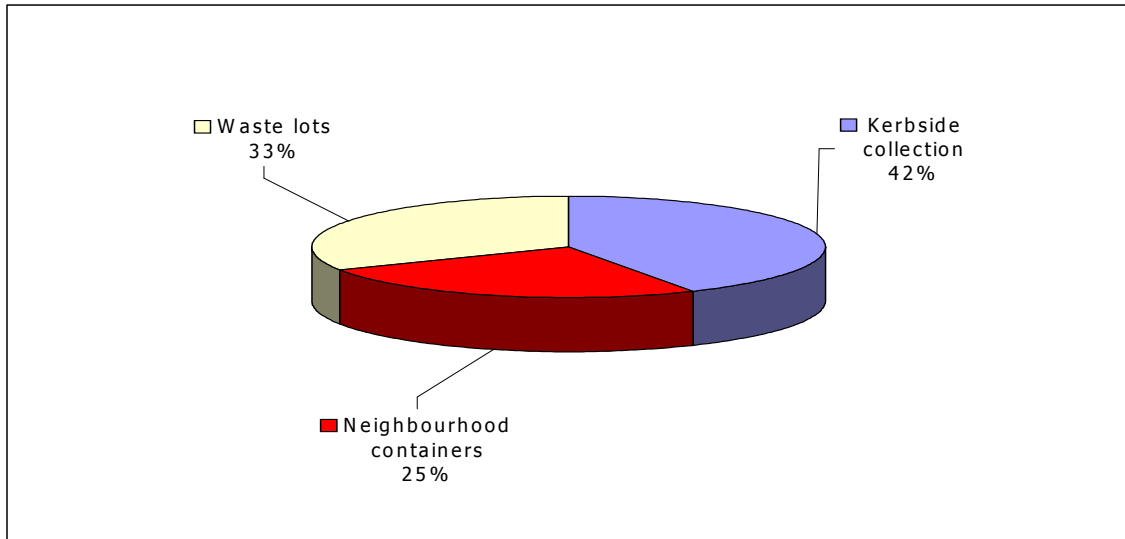
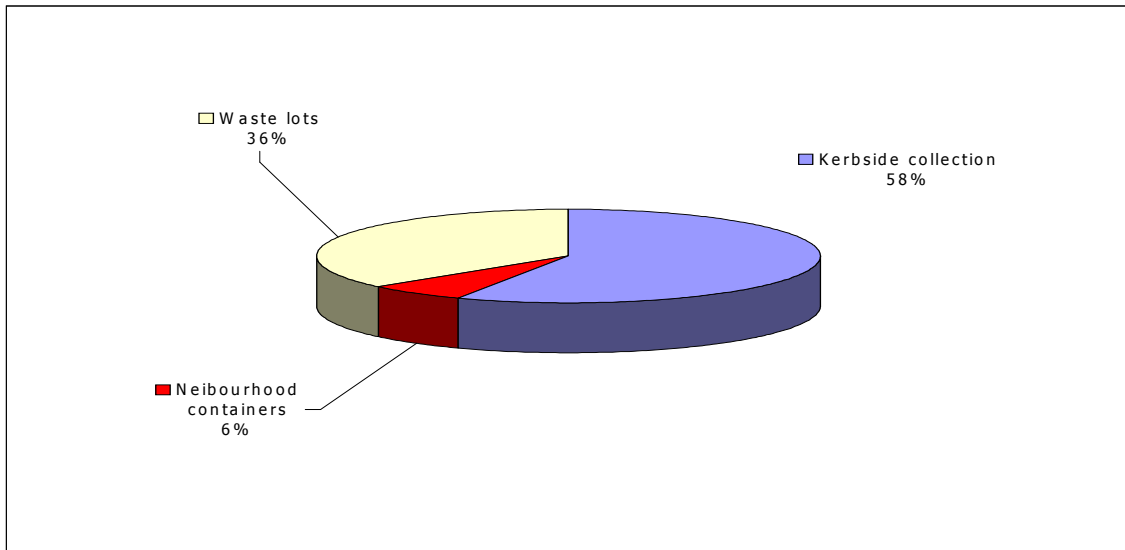


Figure 4 : Modalities of organic waste collection



All the cities which collect organic waste do not make the distinction between garden and food waste. However, it appears that waste lots are principally used for garden waste collection whereas kerbside collection are principally aimed at food waste.

II.6. TREATMENT METHODS

Table 6 presents for the studied cities the destinations of the collected municipal waste. These data's concern all the collected waste and are not related only to the recyclable fractions.

Table 6 : Distribution in % of municipal waste treatment methods

City	Country	Landfill	Incineration	Composting	Recycling
Aalborg	DK	20	18	2	59
Almada	P	98	0	0	2
Aveiro	P	97	0	0	3
Basel	CH	0	82	0,3	18
Barcelona	E	74	21	0,2	5
Bern	CH	0	70	4	26
Bordeaux	F	38	42	3	17
Brussels	B	1	89	0	10
Cardiff	UK	93	0	0	7
Carpí	I	87	0	7	7
Coimbra	P	98	0	0	2
Cordoba	E	88	6	0	6
Dublin	IRL	98	1	0	1
Dunkirk	F	46	41	0	13
Evora	P	98	0	0	2
The Hague	NL	0	78	7	15
Le Havre	F	32	64	1	3
Leiria	P	99	0	0	2
Liège	B				
Lille	F	27	63	3	6
Lisbon	P	96	0	0	4
Lyon	F	16	74	3	8
Milan ¹¹	I	0	26	12	21
Milton-Keynes	UK	86	0	0	14
Munich	D	2	67	6	25
Namur	B	75	0	7	18
Nantes	F	12	71	4	13
Nicosia	CHY	100	0	0	0
Oslo	N	2	76	0	23
Palermo	I	98	0	0	2
Paris	F	14	80	0	7
Oporto	P	70	0	28	2
Saarbrücken	D	0	57	6	37
San Sebastian	E				
Salzburg	A	56	3	20	21
Setubal	P	98 ¹²	0	0	0
Warsaw ¹³	PL	75	0	3	3
Vienna	A	16	50	11	23
Average		53	30	4	12
Max		100	89	28	59

¹¹ + 41% of mixed waste sorting-composting

¹² + 2% of mixed waste sorting-composting

¹³ + 19% of mixed waste sorting-composting



On average, landfilling and incineration remain the two most important methods of municipal waste management. Recycling operations concern approximately 20 % of waste. These figures globally confirm the estimations of the « European Environment Agency » which assessed in 1995, recycling and composting rates at respectively 10 and 5 %.

These data indicate a situation which is evolving and will still notably evolve since numerous cities are implementing strategies whose objective is a noticeable increase of recycling. So, Dublin is aiming to reach 60% of recycling in 2004, Oporto is envisaging to multiply its recycling rates by twenty for the next few years. As far as Liège is concerned, the intensification of its collection scenario has enabled it to make evolve its selective collection rate from 43kg/inhab/year in 1998 to nearly 110 kg in 1999. The case of Milan must also be emphasised. This city is sorting, recycling and composting nearly 74% of collected municipal waste. As far as Aalborg is concerned, it has chosen biomethanisation with the construction of a biogas production centre where organic waste collected in the most populated areas of the city should go in the near future.

II.7. BESIDES RECYCLING : THE MINIMISATION OF WASTE

If there is a move of local waste management strategies towards more recycling, there is also a strong move towards prevention (or so called *source reduction*) and minimisation of urban waste. Public participation is key to success of recycling policies and this is even more true when we talk about home composting or waste prevention through individual actions such as green purchasing. Our study shows that some Local Authorities have launched initiatives to increase public awareness about the waste management problems and to try to make them adapt their consumption pattern.

Basel (CH), Munchen (D),...: information and audit centre

A new information centre for the protection of the environment and prevention of waste, and awareness days ("Clean Town") are organised for the inhabitants. In Basel, a two agents team visits households who ask for, to help them consider and evaluate their production of waste and energy consumption. Other target of waste prevention are industries and trade (responsible with the administrations for 60% of the produced waste). Since 1997, a lot of companies are participating in Basel in a program of waste minimisation in three steps: audits, co-operation agreements and controls. In Munich, the city employs 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.

Brussels (B): Observatory of sustainable consumption

A partnership between the Brussels authorities (IBGE) and consumers associations (CRIOC), inaugurated in March 1999, comes within the framework of the waste prevention plan of the Brussels Capital Region. The observatory spreads reliable information about labelling and products so that consumers can "buy smart and throw less away". Besides an information centre about labels, Brussels has from now on a research and information centre for sustainable consumption. It notably carries out surveys among consumers, analyses of stand trolleys... First realisation in May 1999: about 50.000 copies of a general explanation folder for the general public have been distributed, explaining the most frequent logos and label or those to promote.

Dublin (Ir): quantified minimisation targets

The new plan for waste management in Dublin includes an ambitious program of waste minimisation with quantified targets. The growth of waste which amounts today to 2% for domestic waste, 1% for trade waste and 1,5% for industrial waste, should be halted within 2007-2011 period. An information folder about prevention is being distributed to households. It includes tips and alternative solutions that guide the consumer in his purchasing practices and choices.



Munich (D): suppression of disposable cutlery

In 1991, the city created a municipal waste advisory service. Encouraged by the success of this first initiative, the City set up a five-person «waste avoidance» team in 1993. This group is responsible for taking initiatives to prevent waste generation at the source and giving impetus to waste reduction efforts. The team developed a service for the hire of reusable dishes and cutlery as well as dishwashers for parties and small public events. A ban on disposable cutlery, dishes and glasses at large events was introduced. After some hesitation on the part of organisers, attitudes began to change and most now support this initiative. School food services have replaced single-use cans and bottles with reusable containers.

In 1997-98, Munich launched a campaign to change purchasing and consumption habits and holds information sessions on the repair and restoration of used goods. Offices and shops are also targeted. The goal is to create a genuine dialogue on the topic of prevention, between urban authorities and all the actors concerned producers, consumers, manufacturers' associations and other groupings.

A call centre for household waste producers and commercial waste producers helps the inhabitants of Munich to solve their waste problems. This centre received in 1998, 24.120 calls from households and 6.000 calls from shops and small businesses.

Brussels (B), Milan (I), Milton-Keynes (U-K), Munchen (D): education, information, awareness campaigns...

A folder published by the Multi-community grouping and given at request to the inhabitants, contains detailed information about a series of possible initiatives in the field of domestic waste prevention. A preventive message is also included in the quarterly and half-yearly publications (collection schedule) distributed to each household.

In Brussels, Munchen, Milton-keynes,... special interest is given to educational programs to "educate" school children who then take the messages home. Full time education officers, work not only with school children but also with community groups and the business sector.

Milton-Keynes (U-K), Munchen (D), ... : promotion of re-usable nappies

Various communes promote the purchase of reusable cotton nappies. The City of Milton-Keynes for example has calculated that disposable nappies represent about 6% of the volume of households waste. It has launched in 1999, a promotion campaign of a private service of laundry of nappies.

Basel, Oslo, Salzburg : The support of producers

Oslo, Salzburg, rely or intend to rely on producer responsibility for electric and electronic appliances wastes or end of live vehicles and force on the producer to take in charge the collection and recycling of the waste of their products.

Oeiras (P), Aalborg (DK), Dunkirk (F), Munchen (D), ...: promotion of individual composting

In Oeiras, home composting has been encouraged since 1992 by the free distribution of composting boxes and the information and technical support by composting ambassadors: 150 families voluntarily participated from the early stage. In 1994, this practice progressively extended and schools were also involved. In 1997, the project was extended again, houses with a garden having priority and direct contacts being privileged. At present, although the campaign still has a relatively small scale (250 accommodations and schools participate), it is observed that in Oeiras, the growth of 2% of waste production observed in other cities, has been stopped.

Many other communities also develop actions in favour of individual composting.



In Aalborg (DK), 3000 households have been reached by an action for the promotion of individual composting, inhabitants being offered free composting boxes. In Dunkirk (F), households who buy a composting box receive a subvention. And 100 households in Lille (F) are experimenting home composting since May 1998. Some cities as Bern, Brussels,..... organise special « one evening course » in borough associations about composting or rely on « Composting Ambassadors » who are in charge of answering questions and helping people of the borough to solve problems they may encounter with their compost. Other similar experiences are reported from Basle, The Hague, Milton Keynes, Munich, Oslo, Palerme, Oporto, Salzburg, Saarbrücken, Vienna...

II.8. PERSPECTIVES

II.8.1. ORGANIC WASTE

The organic fraction, notably because it represents an important and homogeneous fraction of household waste, is an important potential of recycling development. Compost produced from these waste can benefit from an extensive market as far as its quality is good. Theoretically, for whole Europe, 3 to 4 % of agricultural lands are enough to absorb the produced compost. It is clear that the percentage will locally vary according to the population density and to the size of the agricultural sector.

A recent contribution of the Institute of Waste Management and Environmental Monitoring (IfAU, Germany), about the different biological treatment methods of municipal waste shows that different European countries have obtained, in some places, quite interesting results as far as organic waste recycling is concerned.

So, the Netherlands have managed to increase their selective collection rates by 95 % in 3 years. More than 50% of the households are served by selective collection and organic waste treatment in Austria, Luxembourg, Flanders and Germany and our study shows that many cities are taking initiatives in this field.

II.8.2. DRY RECYCLABLE WASTE

Through the impetus given by the Packaging Directive, selective collections of dry recyclable waste are progressively extending in Europe. The achieved results in pioneer countries of the system (notably Germany) give an idea of the results which can be reached in Europe in the medium-term.

The Packaging Directive is still recent and the objectives of packaging waste recycling have come into force in 1997 or 1998 in many European countries. Partnership between local authorities and "Green dot" organisms, which manage financial participation of packaging producers in these waste collection and recycling, is developing. Selective collections in all the territory is rapidly progressing. In Portugal, « Ponto Verde » was already covering nearly 50% of the population in 1999. In Belgium, Fost Plus covering rate will go from 50 % in 98 to 100% in 2002.

At the same time, set up systems extend to other waste than packaging, in particular in the case of paper, to the newspapers, magazines and other graphic papers.



II.8.3. WASTE FROM THE "OTHER" CATEGORY

Many cities start recycling waste from the "other" category and have taken initiatives for selective collection of electric and electronic waste, inert, bulky waste, and may be even special waste.

So, there are schemes of collection, sorting and even of repair of electric household appliances notably in Vienna, Munich, Salzburg or Carpi. Salzburg also promotes the initiatives of repair and resale of old furniture, toys, shoes, electric household appliances, computers by the diffusion of booklets on craftsmen and second hand stores... Cities like Basle, Oslo or Salzburg have taken or plan to take measures to encourage the restitution to the producers of PET, " neon tubes " or electrical and electronic appliances. In Milan, collected old clothes are, once sorted, distributed to the neediest persons.

Many cities are also organising the collection of special household waste either kerbside like in Almada, either via neighbourhood containers near chemists' shops notably in Basel and Warsaw or via waste lots. In Brussels, The Hague or Liège notably, hazardous waste are also collected via vehicles which do predefined rounds of the different neighbourhoods of the city.

II.8.4. GLOBAL OBJECTIVES

The cities which have developed active policies for packaging (paper-cardboard, glass, plastics, metals) and organic waste reach 50% of household waste selective collection and recycling. Of course, the key is here the participation of the population.

The initiatives developed and the results obtained in some cities for the other waste, notably electrical and electronical equipments, bulky or inert waste, require to be further studied.

Without a doubt, the implementation of the initiatives of the European Commission in the field of electric and electronic waste would enable to reproduce in this field a dynamic comparable to the one impuled for packaging by directive 94/62 . Global recycling of 50% of municipal waste in each European country could therefore be easily reached.

II.8.5. COMPLEMENTARY SORTING AND TREATMENT TOOLS

Bio-mechanical treatment (BMT), especially applied in Germany and in Austria, for instance in Salzburg, enables to treat the remaining fraction as well as residues from processes such as sorting and composting plants. This treatment is in fact the application to this fraction of municipal solid waste of the techniques which have been applied in the past, many times unsuccessfully, to the total amount of municipal waste. The BMT enables to reduce the water content of residual waste, reduces waste volume and facilitates a better separation of recyclable products, highly energetic materials and toxic substances, while achieving an additional degradation of organic waste. Water reduction enables as well to increase the calorific value of the waste which can be incinerated. The separation of hazardous substances enables to reduce polluting emissions during incineration and in landfills. These techniques, which can be used with other technologies, enable to increase the rates of waste recycling and recuperation and to ensure their pre-treatment before landfilling and even before energetic valorisation of a fraction of waste. BMT techniques are currently being experimented and are in full expansion, especially in Germany.

II.8.6. RECYCLING AS AN OPPORTUNITY FOR JOBS CREATION AND SOCIAL IMPROVEMENT

Besides its environmental benefits, Recycling can also have positive socio-economic impacts. Various studies conducted in France and Austria, and also in the USA show that recycling creates 5 to 7 times the



number of jobs in incineration, and ten times more than landfilling, and the number of jobs per value added in recycling is generally more than for producing virgin materials.

Social enterprises have been active for many years in Europe in waste sorting, repair/reselling and material recovery. They are often present in the form of scattered associations and are badly structured and poorly recognised. However, their importance in terms of jobs and sorted tonnage should not be underestimated. According to a study realised by the CWESAR (Coördination des entreprises d'Économie sociale actives dans le Recyclage et le Réemploi), the number of jobs in waste management in these social enterprises would exceed 35.000 in Europe.

Countries	Social jobs (Minimal assessment)
Germany	8.130
Austria	80
Belgium	2.100
Spain	1.500
France	4.000
Greece	50
Ireland	500
Italy	2.500
Luxembourg	100
Netherlands	4.000
Scandinavia	8.500
Portugal	400
United Kingdom	3.000-5.000
Total	34.860-36.860

In his book, "Creating Wealth from Waste", Robin Murray¹⁴ estimates that an intensive programme of recycling in the UK could create between 10.000 and 55.000 new jobs, taking into account those who would be lost in the process.

Operations of collection and processing of waste materials are the privileged place for the development of integration initiatives accompanied, if necessary, by professional requalification and redynamisation. These jobs may serve as a trampoline and permit the reintegration of workers into professional circuits. The cities of Bordeaux, Den Haag, Dunkirk, Lille, Palermo, and Dublin, in particular, have developed this approach.

Thanks to the sorting office TRISELEC, the social economy is a key element of the management of waste in Lille (F). A programme of reintegration via contracts "Emploi-solidarité", along with requalification and redynamisation programs, makes it possible for unemployed people to reintegrate a professional course. Indeed, except for a fixed core of workers which ensures the operation of the centre, the workmen are held to present themselves in the professional world besides their work at TRISELEC. Employment is varied and ranges from the sorting operator to the quality assistant who evaluates the composition of samples taken on the sorting line or the coordinator of workshop. Since 1993, approximately 270 people were engaged on the basis of contract half-time at given duration (6 months renewable). The experiment is a success since the rate of professional reclassification exceeds 60%.

¹⁴ Creating Wealth from Waste, Robin Murray, 1999, p.48



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PART III : SURVEY REPORT





PART IV : APPENDICES





IV.1. : ACR-AVR QUESTIONNAIRE : CITIES AND RECYCLING

**IV.2. : REMECOM - INTERNATIONAL NETWORK DEFINING AN ANALYSING
AND QUANTIFYING METHOD FOR HOUSEHOLD WASTE AT LOCAL LEVEL**

**IV.3. SUMMARY TABLE - RESULTS OF SELECTIVE COLLECTIONS BY
MATERIAL, BY CITY AND BY COLLECTION METHOD**

