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The successful separate collection experiences in
Catalonia. The Door to Door collection.

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Resum

El municipi de Tiana (Barcelona, Espanya) va implantar l'any 2000, per primera vegada a Espanya i a partir de models italians, la recollida selectiva porta a porta de la fracció orgànica (FORM) i el rebuig dels residus municipals.

Posteriorment, els municipis de Tona (2000), Riudecanyes, Balenyà (2001), Calldetenes, Viladrau, Folgueroles, Taradell, Cervera, Sant Guim de Freixenet, Guissona, Torà, (2002), Arenys de Munt, Llavaneres, Vilobí d'Onyar, Vilassar de Mar i Torrelles de Llobregat (2003) han posat en funcionament sistemes de recollida porta a porta amb objectius similars.

La recollida porta a porta facilita al màxim la separació en origen i evita les actituds poc participatives, perquè s'exerceix un major control en la separació en origen. Això es deu a que els contenidors per al rebuig de la via pública es retiren completament, obtenint un benefici indirecte en espai públic i netedat.

Com a conseqüència, la recollida porta a porta obté nivells de participació molt elevats (80%) i uns resultats quantitius i qualitius molt importants en percentatges de recollida selectiva dels residus municipals d'entre un 65 al 80%; amb un índex d'entre 300 i 400 grams per habitant i dia de FORM recollida i amb nivells d'impropis inferiors al 5%.

Des d'un punt de vista econòmic, també es demostra que la recollida porta a porta no té perquè ser més cara que una recollida de les mateixes característiques, quan a separacions per fraccions, realitzada amb contenidors al carrer i pot arribar a ser més barata si es modifiquen cap amunt els preus dels tractaments finalistes del rebuig.

Les primeres experiències a Catalunya demostren que la recollida porta a porta és un model aplicable a municipis de dimensions petites o mitjanes, amb densitats de població entre mitges i baixes i també a nuclis històrics de ciutats compactes amb carrers estrets, però ja hi ha experiències de municipis més grans que demostren que hi ha molt camí per córrer.

Resumen

El municipio de Tiana (Barcelona, España) implantó en el año 2000, por primera vez en España y a partir de modelos italianos, la recogida selectiva puerta a puerta de la fracción orgánica (FORM) y el rechazo de los residuos sólidos municipales.

Posteriormente, los municipios de Tona (2000), Riudecanyes, Balenyà (2001), Calldetenes, Viladrau, Folgueroles, Taradell, Cervera, Sant Guim de Freixenet, Guissona, Torà, (2002),

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Arenys de Munt, Llaveneres, Vilobí d'Onyar, Vilassar de Mar y Torrelles de Llobregat (2003) han puesto en marcha sistema de recogida puerta a puerta con unos objetivos similares.

La recogida puerta a puerta facilita al máximo la separación en origen y evita las actitudes poco participativas, porque se ejerce un mayor control en la separación domiciliaria. Esto se debe a que los contenedores para el rechazo de la vía pública se retiran por completo, obteniéndose un beneficio indirecto en espacio público y limpieza.

Como consecuencia, la recogida puerta a puerta obtiene unos niveles de participación muy elevados (80%) y unos resultados cuantitativos y cualitativos muy importantes con porcentajes de recogida selectiva de los residuos sólidos municipales de entre un 65 y 80%. Con un índice de entre 300 a 400 gramos por habitante y día de FORSM recogida y con niveles de impropios inferiores al 5%.

Des de un punto económico, también se demuestra que la recogida puerta a puerta no tiene porque ser más cara que una recogida de las mismas características, en cuanto a separaciones, realizada con contenedores en la vía pública y puede llegar a ser más económica si se modifican al alza los precios de los tratamientos del rechazo.

Las primeras experiencias en Cataluña demuestran que la recogida puerta a puerta es un modelo aplicable a municipios de dimensiones pequeñas o medianas, con densidades de población medias o bajas y también en núcleos históricos de ciudades compactas con calles estrechas, pero ya existen experiencias de municipios mayores que demuestran que queda mucho camino por recorrer.

Abstract

The municipality of Tiana (Barcelona, Spain) implemented in year 2000, for the first time in Catalonia and following Italian models, a door to door selective waste collection system for organic matter and refuse.

After that, other municipalities: Tona (2000), Riudecanyes, Balenyà (2001), Calldetenes, Viladrau, Folgueroles, Taradell, Cervera, Sant Guim de Freixenet, Guissona, Torà, (2002), Arenys de Munt, Llaveneres, Vilobí d'Onyar, Vilassar de Mar and Torrelles de Llobregat (2003) have implemented door to door selective waste collection systems with similar objectives.

The door to door collection facilitates at maximum household separation and avoids low participate behaviours, because greater control is exercised. This is due to the complete container removal from the street. Furthermore, more and cleaner public space achieved.

As a result, door to door collection obtains very high levels of participation (80%). Besides, very relevant qualitative and quantitative results are obtained: the levels achieved are between 65-80% of selective waste collection. Regarding organic matter the results achieved are: ratios between 300-400 grams by inhabitant per day and improper levels under 5%.

In economic terms, it is also clear that door to door collection has the same economic cost than container waste collection. And it may even become cheaper depending on refuse treatments fees.

The firsts experiences in Catalonia show that door to door collection is an applicable system to: small or medium municipalities, average or low population densities municipalities and narrow high densities city centres as well. The last experiences in medium and high density municipalities show us there is a long way to be walked.

1 Legal framework

Following the Council Directive 1999/31/EC on the landfill of waste, the measures taken to reduce the landfill of biodegradable waste should also aim at encouraging the separate collection of biodegradable waste, sorting in general, recovery and recycling and member States shall set up a national strategy for the implementation of the reduction of biodegradable waste going to landfills.

For Spain, this strategy shall ensure that:

- (a) not later than year 2006, biodegradable municipal waste going to landfills must be reduced to 75 % of the total amount (by weight) of biodegradable municipal waste produced in 1995.
- (b) not later than year 2009, biodegradable municipal waste going to landfills must be reduced to 50 % of the total amount;
- (c) and not later than year 2016, biodegradable municipal waste going to landfills must be reduced to 35 % of the total amount.

According to the Spanish law (10/98, regulating waste), municipalities of more than 5.000 inhabitants must implement separate collection of valuable waste before year 2001.

Following European legal framework, the Catalan waste policy is based on prevention principle, followed by re-use and recycling principles in order to minimise waste disposal. Waste that has to be disposed off should preferably be incinerated with energy-recovery and only if no other possibility remains, the waste has to be landfilled.

In Catalonia, the Law 6/93, 15 July, regulating waste, passed in 1993, establishes the basis for the separate collection of biowaste. According to this law, municipalities of more than 5.000 inhabitants must implement separate collection of biowaste before 1999. This imperative affects 178 municipalities, which is 19% of Catalan municipalities. They comprise a population of 5,7 million inhabitants, nearly 88% of Catalonia's population. The remaining municipalities, those with populations under 5.000 inhabitants, are not required to comply, although they may participate - and many are doing so - on a voluntary basis.

In addition to this, the last Municipal Waste Management Programme in Catalonia (2001-2006) sets objectives for separate collection for each of the fractions of municipal waste. Regarding biowaste, the objective for separate collection is 40% - of total biowaste produced - by the end of 2003, and 55% by the end of 2006.

The Municipal Waste Management Programme in Catalonia (2001-2006) also foresees to set a tax on landfilling in short term, we hope this will encourage the separate collection and recycling.

2 Focus on biowaste: selective collection systems.

In the early 90s, the Catalan Department for the Environment and its administrative organisation, Junta de Residus, implemented the selective collection (also for biowaste) as a mean of reducing the amount of waste to be landfilled or incinerated.

The biowaste collection in Catalonia is a separate collection system for all biodegradable matter in the municipal waste, including food, vegetables, plants...

At the end of 2003 almost 145 municipalities in Catalonia have already implemented, partially or totally, the separate collection for the food waste; the source separation of biowaste was

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involving, about 1.700.000 inhabitants. Since the implementation of biowaste separation collection, several schemes were used with irregular outcomes.

In some Catalan municipalities, the door to door separate collection (for at least biowaste and restwaste) represented both high capture and high quality of biowaste. In addition to this, it allowed to get the highest recycling rates, between 65 to 80 %.

Biowaste separate collection systems in Catalunya (2003):

1. Adding systems: (Containers System)

- Road container: 240, 360, 660 l.
- Road container, lateral charging: 800 – 1.100 l.
- Bipartition road container: 1.100 l.
- Subterranean road container
- Pneumatic road collection

2. Integrated systems:

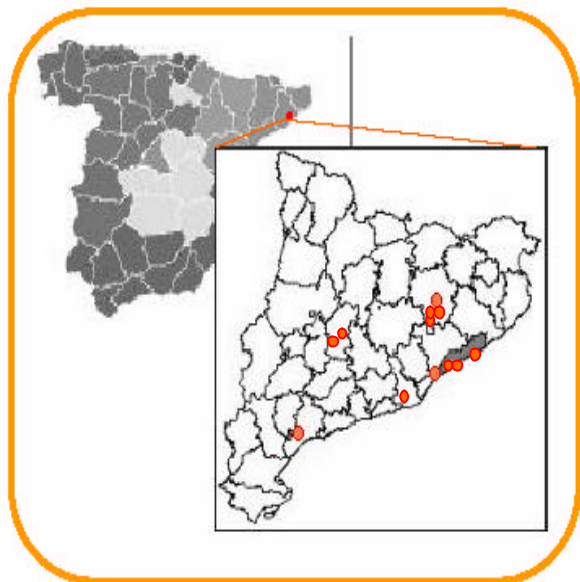
- Door to door: 10, 25 l. (houses), 90, 120, 240, 360 l. (commercial).

2.1. Comparative collection systems

Road Containers	Door to door
Containers in the street.	Containers removal from the street. Less urban furniture and cleaner streets.
Volunteer household biowaste (and others) separation → two collection systems, low participation.	Ensures high participation. Facilitates household biowaste (and others) separation → integrated collection.
24 hours, 7 days per week to throw away your own waste.	Door to door collection time is clearly scheduled.
145 case studies in Catalonia from 1996 (88% of total case studies)	17 case studies in Catalonia from 2000. (12% of total, and rising).
Low responsibility for the citizens and the local authority.	High corresponsibility, more control from local authority. Political consensus and impulse.
Low or medium selective waste rates.	High selective waste rates.
Low or medium biowaste collected per inhabitant rates.	High biowaste collected per inhabitant rates.
Variable biowaste improper levels (15% average +/- 10%).	Low biowaste improper levels (5% average +/- 3%).
Education and communication campaign required every year.	Strong education and communication campaign in the first year. Continuous technical and communication monitoring.
Cheaper biowaste collection cost per inhabitant, more expensive restwaste collection cost per inhabitant. Global collection cost is similar for both.	More expensive biowaste collection cost per inhabitant, cheaper restwaste collection cost per inhabitant.
Refuse treatment cost (fee + tax) is rising. For high improper level biowaste collected composting cost is higher.	Less treatment cost for landfilling and composting. Higher income for landfill tax.

3 Case studies

The municipality of Tiana (Barcelona, Spain) implemented, for the first time in Catalonia, in year 2000, and following Italian models, a door to door selective waste collection system for organic matter and refuse.



After that, other municipalities: Tona (2000), Riudecanyes, Balenyà (2001), Calldetenes, Viladrau, Folgueroles, Taradell, Cervera, Sant Guim de Freixenet, Guissona, Torà, (2002), Arenys de Munt, Lllavaneres, Vilobí d'Onyar, Vilassar de Mar and Torrelles de Llobregat (2003) have implemented door to door selective waste collection systems with similar objectives. This was done considering EU directives and Catalanian government objectives.

1. The door to door collection facilitates at maximum source separation and separate collection: local administration gives 10 l. and 25 l. biowaste bin to all houses. More information is given and response is monitored.
2. Low participation behaviours are avoided, because greater control is exercised. This is due to refuse container removal from the street.
3. Furthermore, more and cleaner public space is achieved.
4. More biowaste and valuable waste have to be collected, all of them with a lower improper level.

3.1. Tiana

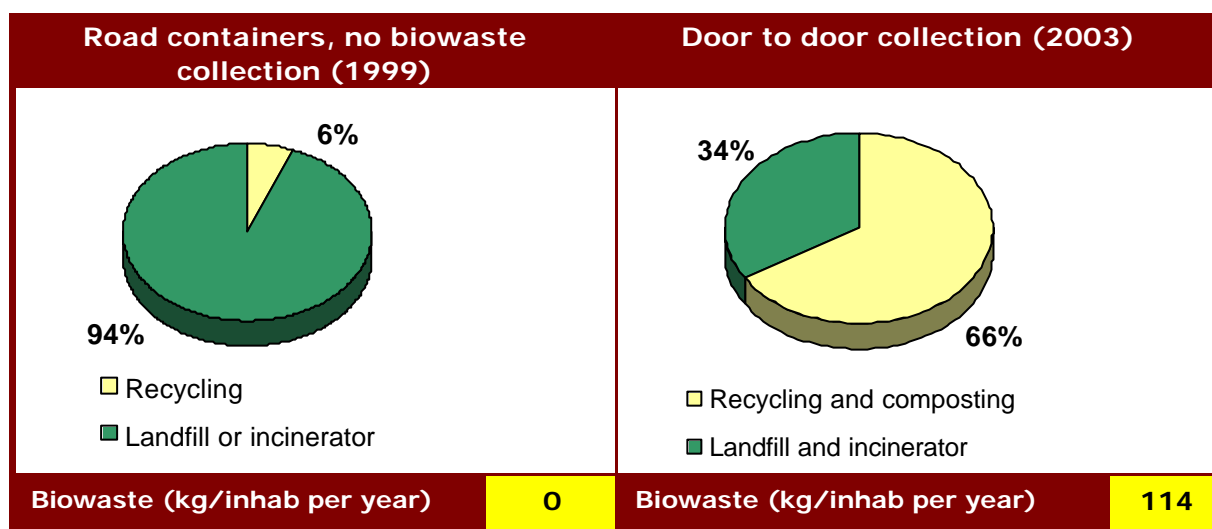
The municipality of Tiana (6.725 inhabitants, August 2003) is located near the coast, within Barcelona metropolitan area. It has a low population density and most of its urban space has residential use. It was the first municipality in Catalonia (5th June, 2000) to implement a door to door separate collection system.

Collection	Kind of waste	Collect times
Door to door	Biowaste	3 times per week
	Refuse	2 times per week
	Card (only commercial)	2 times per week
	Glass (only commercial)	1 time per week
Road containers (bells)	Glass (3 m ³)	2 times per month
	Card and paper (3 m ³)	2 times per week
	Packaging (3 m ³)	2 times per week
Emergency areas	Biowaste	3 times per week
	Refuse	6 times per week
Green point	Furniture, toxic waste...	
Others	Clothes, batteries, drugs...	

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The door to door collection includes **biowaste and refuse**, and card and glass only for commercials. The overall waste collection system costs **35 €/inhabitant per year**. Excluding treatment cost.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Biowaste	Refuse	Biowaste		Biowaste	Refuse	



3.2. Tona

The municipality of Tona (6.072 inhabitants, 2003) near Vic (Osona, a central Catalan shire) was the first municipality to implement a door to door separate collection system for biowaste, refuse and non-organic matter.

Tona, and eleven more municipalities, conform La Mancomunitat la Plana, a local administration for integral local services management (waste collection, separation plant, composting and other treatments, education campaigns, street cleaning, etc.).

After Tona experience, more neighbouring municipalities implemented a door to door separate collection: Balenyà, Calldetenes, Viladrau, Taradell and Folgueroles; a total of 14.000 inhabitants.

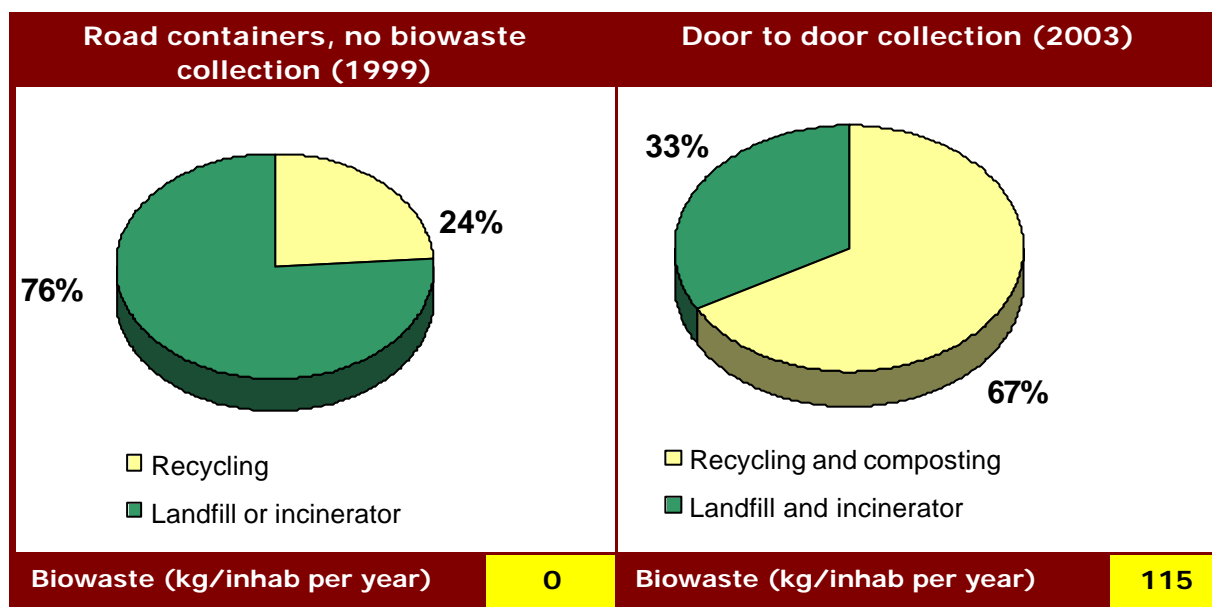
Collection	Kind of waste	Collect times
Door to door	Biowaste	3 times per week
	Refuse	1 time per week
	Non-organic	2 times per week
Road containers	Glass (3 m ³)	2 times per month
Emergency areas	Refuse, biowaste, non-organic	2 areas
Green point	Furniture, toxic waste...	

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The door to door collection includes **biowaste, refuse and valuable non-organic matter** (paper + packaging in the same bag).

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Non-organic	Biowaste	Refuse	Biowaste	Non-organic		Biowaste

The overall waste collection system costs **29 €/inhabitant per year**. Excluding treatment cost.



3.3. Riudecanyes

Riudecanyes is a little town (750 inhabitants all year and 1.500 in summer) near Tarragona in a south Catalan shire (El Baix Camp).

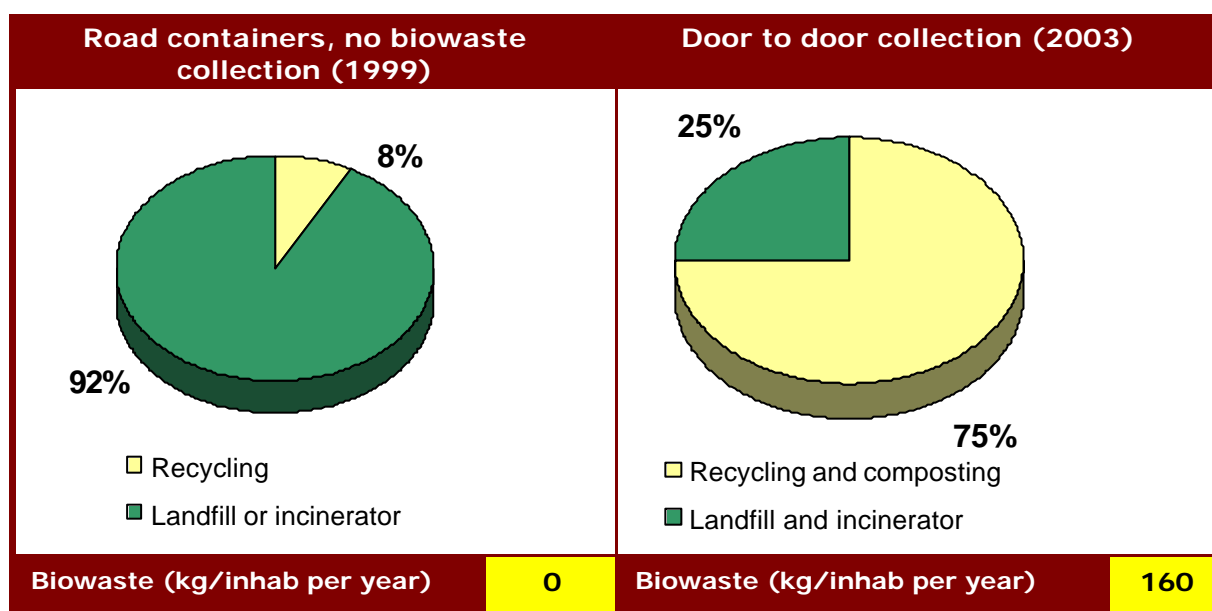
In this case, the door to door collection systems started with an intense citizens participation process.

Collection	Kind of waste	Collect times
Door to door	Biowaste Refuse Paper and card Packaging	3 times per week 1 time per week 1 time per week 1 time per week
Road containers	Glass (3 m ³)	2 times per month
Emergency areas	Refuse, biowaste, non-organic	2 areas

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The door to door collection includes **biowaste, refuse, paper and packaging**.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Biowaste	Paper	Biowaste	Packaging	Biowaste	Refuse	



3.4. Torrelles de Llobregat

The municipality of Torrelles de Llobregat (4.300 inhabitants, 2003), is also in Barcelona Metropolitan Area.

Torrelles de Llobregat was the first town in Catalonia to implement a biowaste separate collection system in 1996, through Residu Mínim model (Wet and dry model). This model creates four waste matters: biowaste, paper, glass and non-organic matter (refuse and packaging in the same bag).

Collection	Kind of waste	Collect times
Door to door	Biowaste	3 times per week
	Paper and card	1 time per week
	Non - organic	2 times per week
Road containers	Glass (3 m ³)	2 times per month
Green point	Furniture, toxic waste, emergencies...	

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The door to door collection includes **biowaste, paper and non – organic (or dry) matter.**

In 14th January, 2003, implemented a door to door collection system and it was the first municipality in Spain to create a “pay-as-you-throw” tax for the municipal solid waste. Nowadays, under the new local government (March 2003), this tax has been abolished, even though door to door collection continues.

For the moment, we don't have a whole year data, but the first results show us a separate collection rate near 80%, a biowaste rate near 95 kg/inhab per year and a biowaste improper level near 1,4%.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
	Biowaste	Non-organic	Biowaste	Paper	Non-organic	Biowaste

3.5. Vilassar de Mar

Vilassar de Mar is a coastal municipality (18.000 inhabitants all year, but more than 25.000 in summer and weekends) near Mataró (El Maresme).

Collection	Kind of waste	Collect times
Door to door	Biowaste	3 times per week
	Paper and card	1 time per week
	Refuse	1 time per week
	Packaging	2 times per week
	Glass	1 time per week
Road containers	NONE	
Emergency areas	Refuse, biowaste...	Some areas
Green point	Furniture, toxic waste, emergencies...	

It was the first city in Catalonia over 15.000 inhabitants, with high density buildings to implement door to door collection system (Novembre, 2003). For the moment, we don't have a whole year data, but the first results show us a separate collection rate near 70%.

The door to door collection includes **biowaste, paper and non – organic (or dry) matter.**

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Packaging	Paper	Biowaste	Packaging	Biowaste	Refuse	Biowaste
					Glass	

4 Common results

These graphs show separate collection, biowaste and refuse rates based on population and separate collection system (all municipalities have biowaste collection system).

- Door to door collection system 1st generation (started in 2000-2001: Tiana, Tona, Riudecanyes, etc.)
- ◆ Street containers (5 matters: biowaste, paper, glass, envelopes, refuse = Valor separation model).
- Street containers (4 matters: biowaste, non-organic, paper and glass = Residu Mínim model (or Wet & Dry model)).

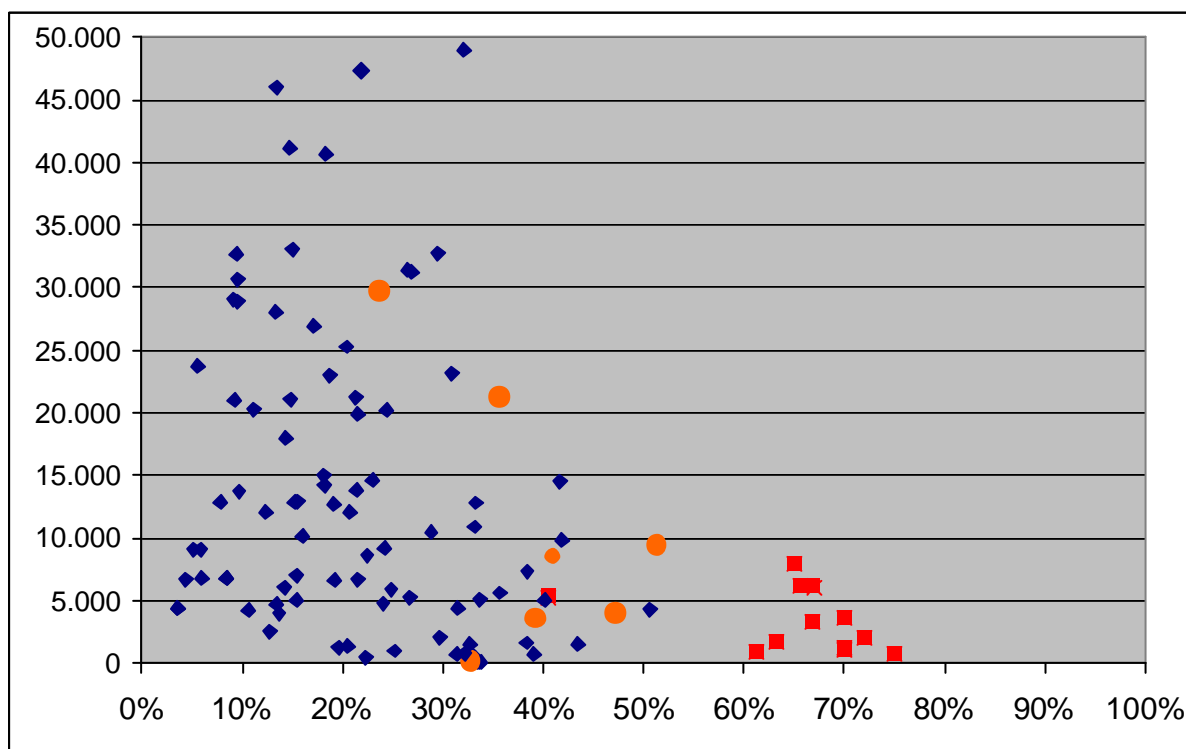


Figure 1. Separate collection rates (%)

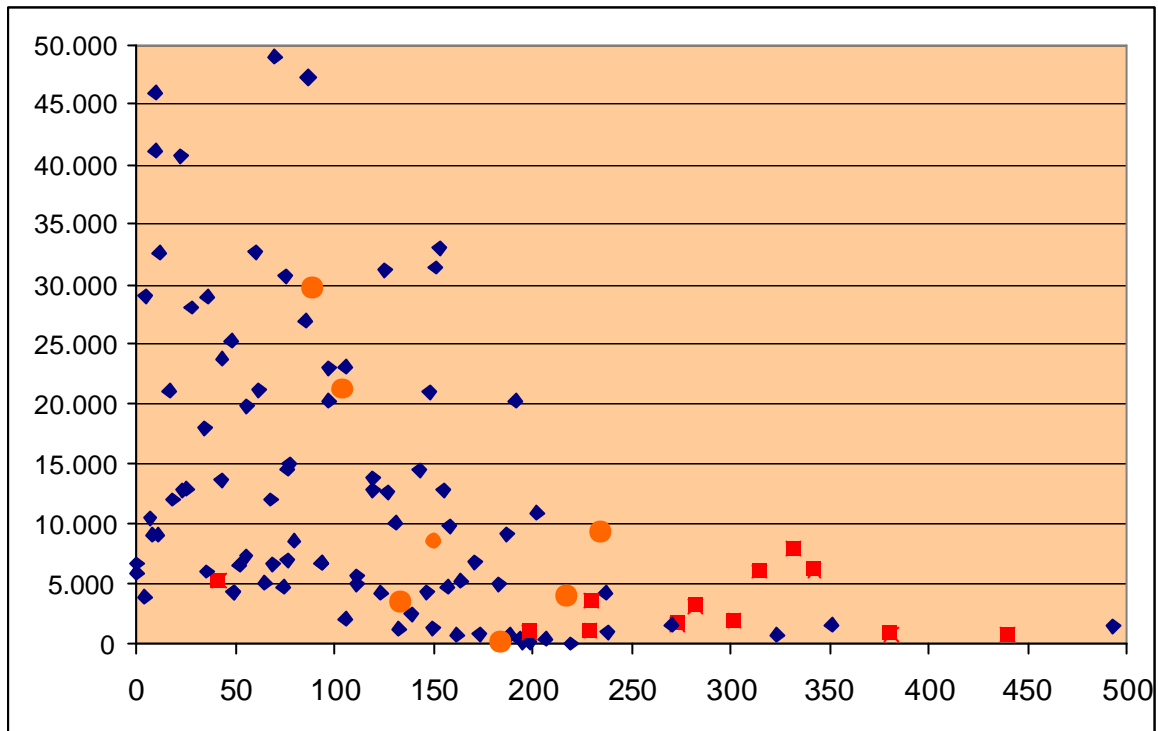


Figure 2. Biowaste collection rates (Grams/ inhabitants per day)

5 Door to door separate collection conclusions

- UE landfill directive objective for 2016 has been achieved in 2003.
- The highest separate waste collection rates in all Catalonia (65 to 80%) have been achieved.
- Ratios between 300-400 grams by inhabitant per day of Biowaste collected and improper levels below 5% (simpler composting installations)
- Highly relevant qualitative and quantitative results are obtained: 10% reduction MW.
- Door to door separate waste collection is a highly adaptable collection system: every municipality has a different collection calendar based on its own characters (urban density, second residence, etc.). It can be implemented in a short period of time.
- Container removal is a positive action: more cleaning and public space is achieved. Avoids low participate behaviours and promote very high levels of participation (more than 80%).
- Environmental communication and education campaign are key elements for success.
- Focus on biowaste door to door collection.
- Door to door separate collection has similar economic costs to container waste separate collection. It is based on a cost redistribution from refuse collection to biowaste collection. Furthermore, it may become cheaper according to the refuse treatments fees.

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- Necessary conditions to guarantee success:
 - Strong political commitment and consensus.
 - High corresponsability between citizens and local administration.
 - Local regulations (for example in Tiana or Torrelles de Llobregat.
 - Technical and communication monitoring. Information and response.
- In the first moment, it has been applied in small or medium municipalities, average or low population densities municipalities and narrow city centers as well.
- But today, we have studied the last experiencies in medium and high densities municipalities.
- Nowadays, in Catalonia there are 906 municipalities below 25.000 inhabitants (96 % of total number of municipalities in Catalonia). They comprise a population of 2,24 millions inhabitants (34% of total inhabitants in Catalonia).
- For the moment, 17 municipalities have implemented door to door separate collection systems, but there are more than 20 municipalities interested on it.
- It is possible to apply the door to door separate collection system in a lot of municipalities with diferent urban densities and population size. But it 's not necessary to copy one model to all the municipalities: we must adapt the door to door objectives to every municipality.

We have to do a lot of work in the next years.

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