



«Development and demonstration of an ecological, innovative system for in house waste recycling»

Success stories for recycling of MSW at municipal level: A review

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Presentation Outline

- ❖ Introduction
- ❖ Case studies in Europe
- ❖ Case studies at a global scale
- ❖ Conclusions



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Introduction

The following data were recorded for each case study:

- Description of the place
- Description of the system/technology
- Scope/objective
- Technical data
- Evaluation



Source separation systems

- Bring schemes:
 - Recycling centers
 - Rewarding recycling centers
- Collection schemes:
 - Door-to-door collection
 - Kerbside collection (not co-mingled collection)





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Case studies

At a European level, the following 17 municipalities are examined (from 8 countries):

- **Aarhus Municipality (Denmark)**
- Schweinfurt Municipality (Germany)
- Ludwigshafen Municipality (Germany)
- Wiesbaden Municipality (Germany)
- **Vienna (Austria)**
- Burgenland Municipality (Austria)
- Volarlberg Municipality (Austria)
- Borlange Municipality (Sweedden)
- Milton Keynes Municipality (UK)
- Dilbeek Municipality (Belgium)
- **Cappanori Municipality (Italy)**
- Navigli Municipality (Italy)
- Treviso Municipality (Italy)
- **Verdu Municipality (Spain)**
- Hernani Municipality (Spain)
- Rasquera Municipality (Spain)
- Miravet Municipality (Spain)

Recycling Rate in Europe

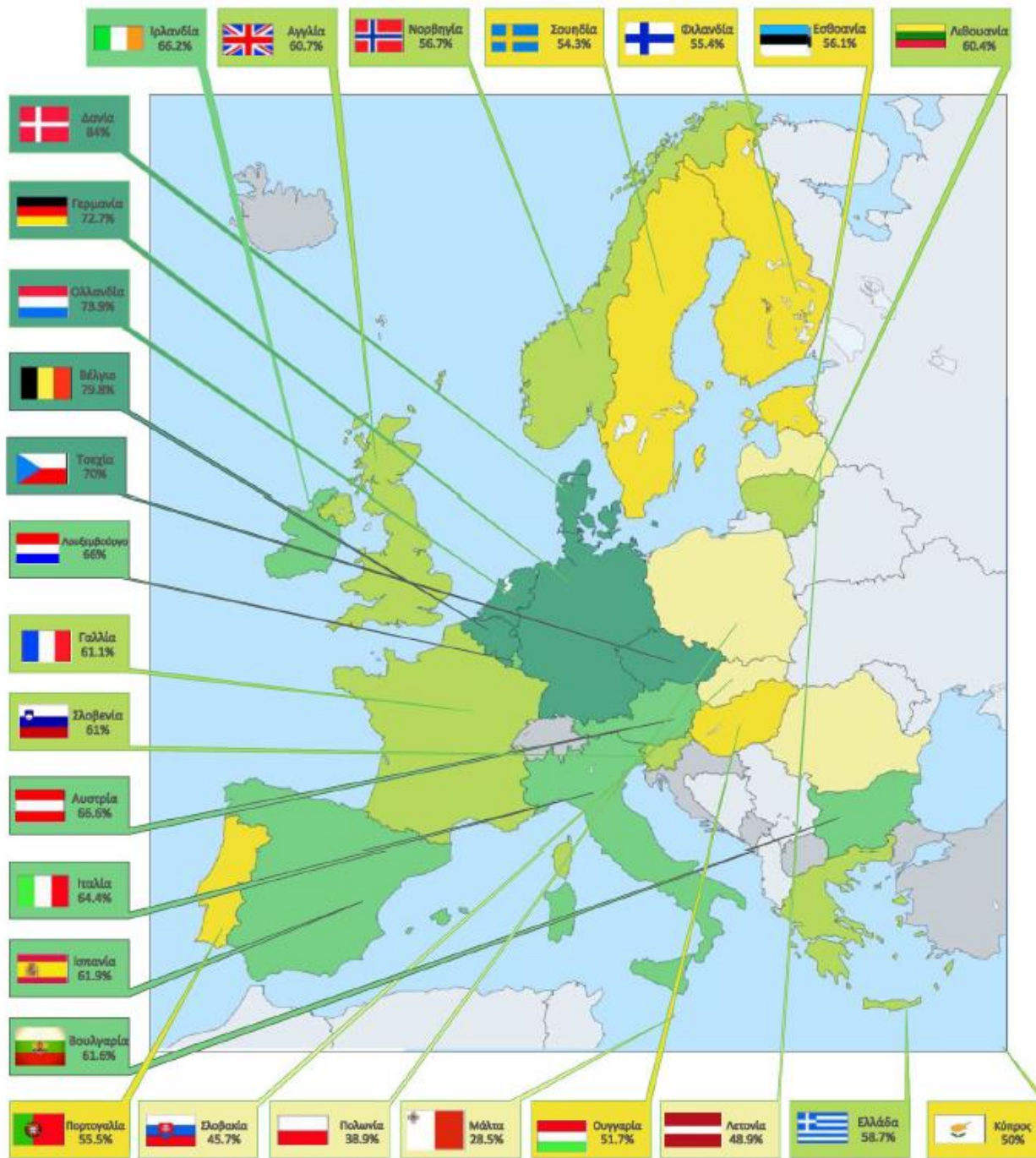


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Recycling rates for packaging waste - %
 (Eurostat: Online data code [\[ten00063\]](#))

Short Description: 'Recycling rate' for the purposes of Article 6(1) of Directive 94/62/EC means the total quantity of recycled packaging waste, divided by the total quantity of generated packaging waste.

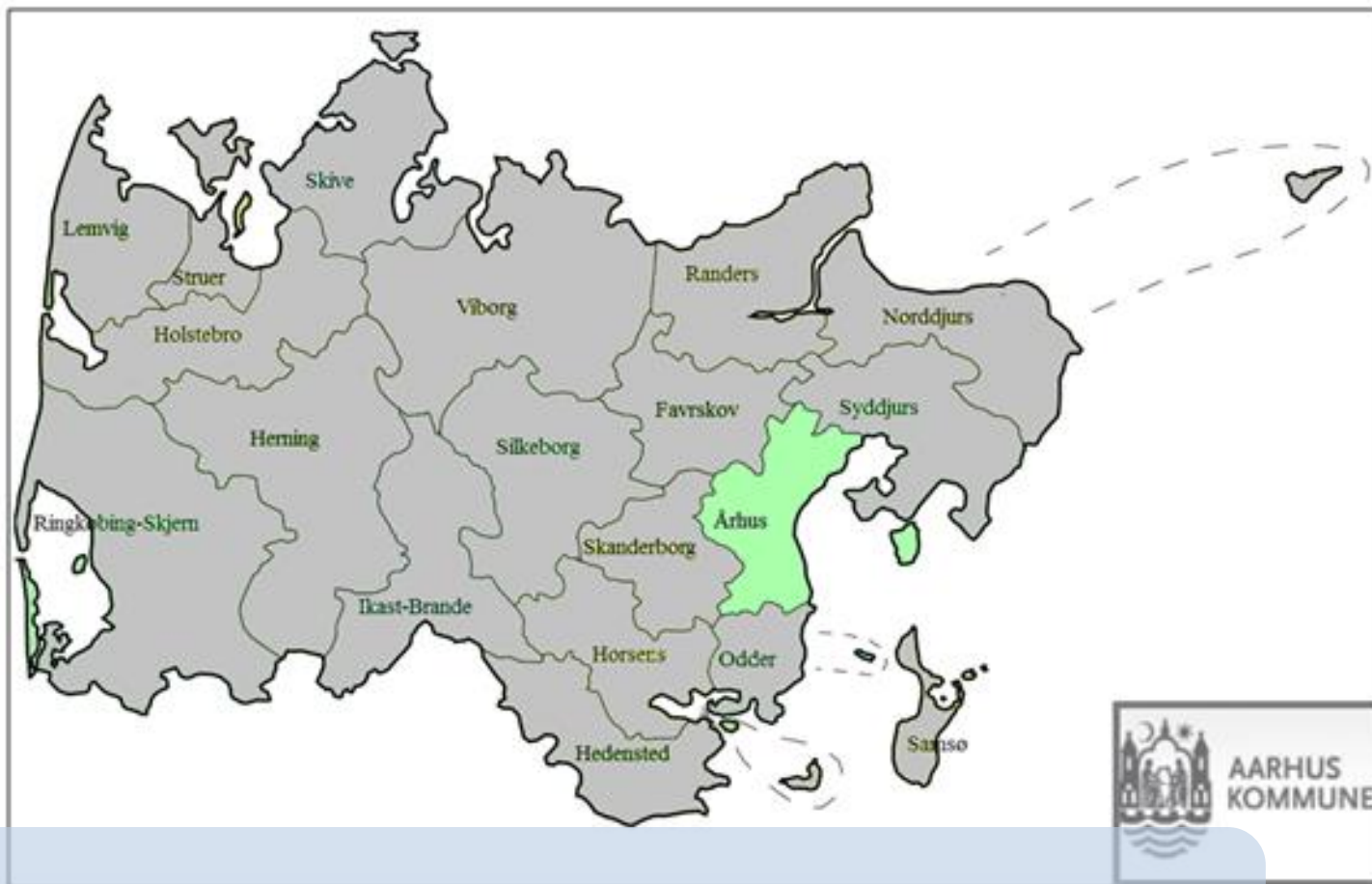
Data for 2010

Legend	Cases
28.5 - 48.9	6
48.9 - 56.1	6
56.1 - 61.1	6
61.1 - 66.6	6
66.6 - 84.0	5
Data not available	6

Minimum value:28.5
Maximum value:84.0



Denmark: Aarhus Municipality



- **Population:** 314,545 residents
- Population density:** 467.8 residents/km²



Denmark: Aarhus Municipality (2)

- **Implementation period:** 2008 - today
- **Collection scheme:** Kerbside system
- **Recycling rate:** 66% (2010 data)
- **Waste streams:** 3 (paper, glass, batteries, mixed MSW)
- **Selection criteria:** High satisfaction level of local citizens (~90%)



Denmark: Aarhus Municipality (3)



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Denmark: Aarhus Municipality (4)

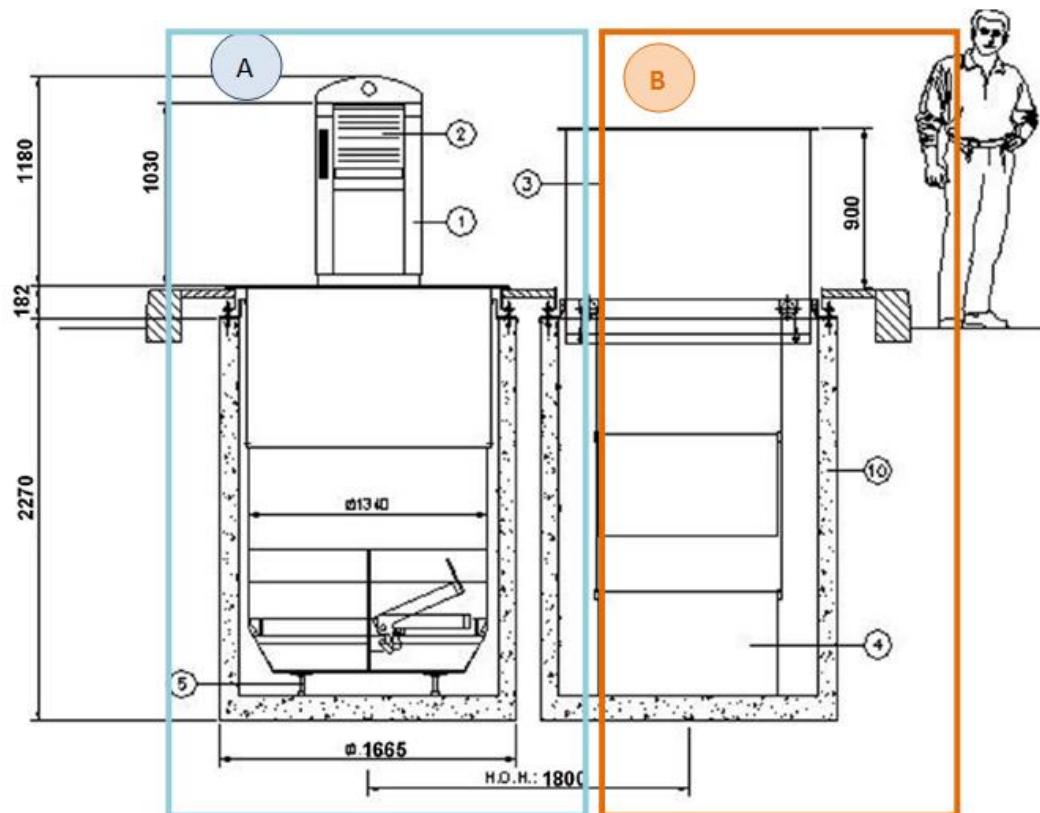




Denmark: Aarhus Municipality (5)

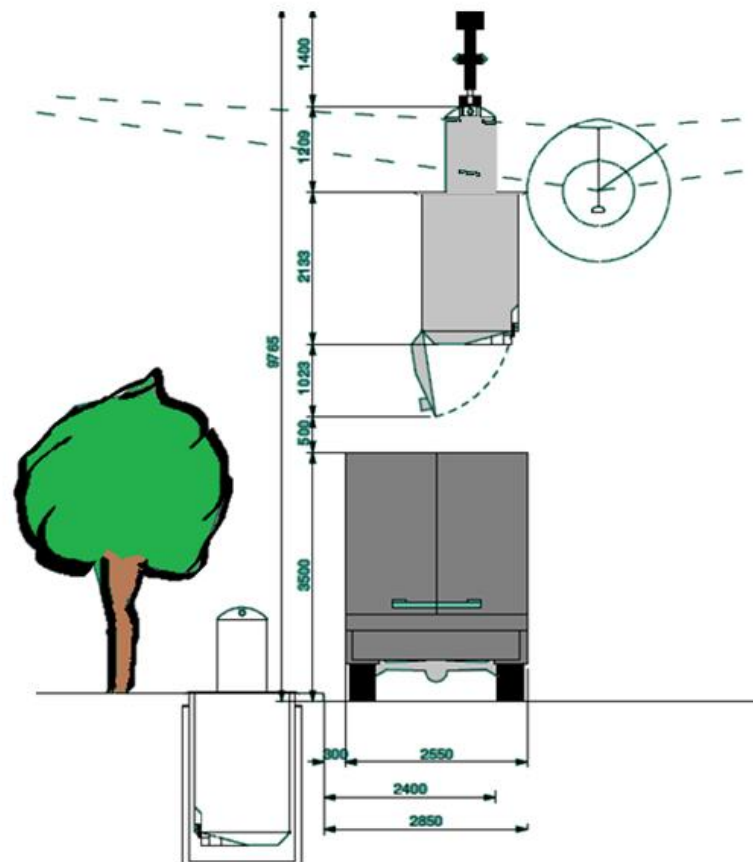


- 3 m³: 25 households
- 4 m³: 35 households
- 5 m³: 45 households





Denmark: Aarhus Municipality (6)





Denmark: Aarhus Municipality (7)

Assessment

Total waste production: 600,000t/y, out of which:

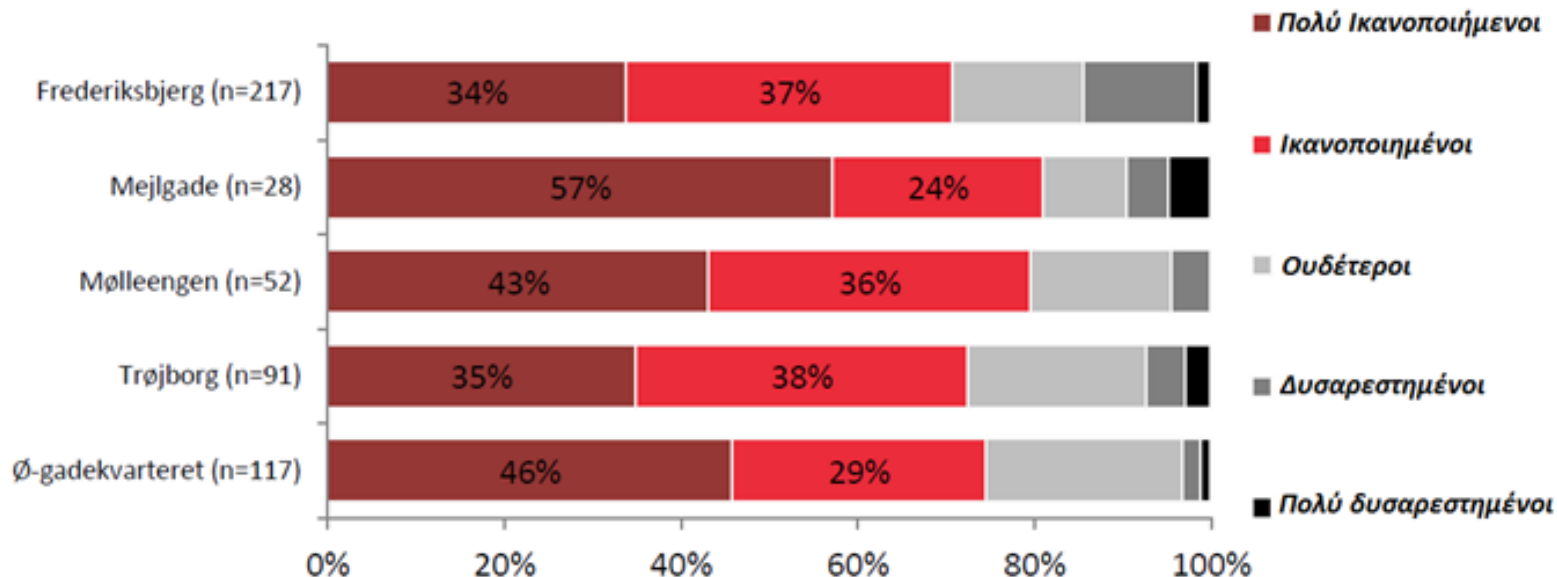
- 66% (~380,000t/y) is being recycled;
- 28% (~170,000t/y) is being incinerated; and
- Less than 3% (~17,000t/y) is being directed for landfilling.

Since May 2008, the company Epinion performs statistical surveys on a regular basis for recording the level of satisfaction of local residents, regarding the installation of the new underground system.



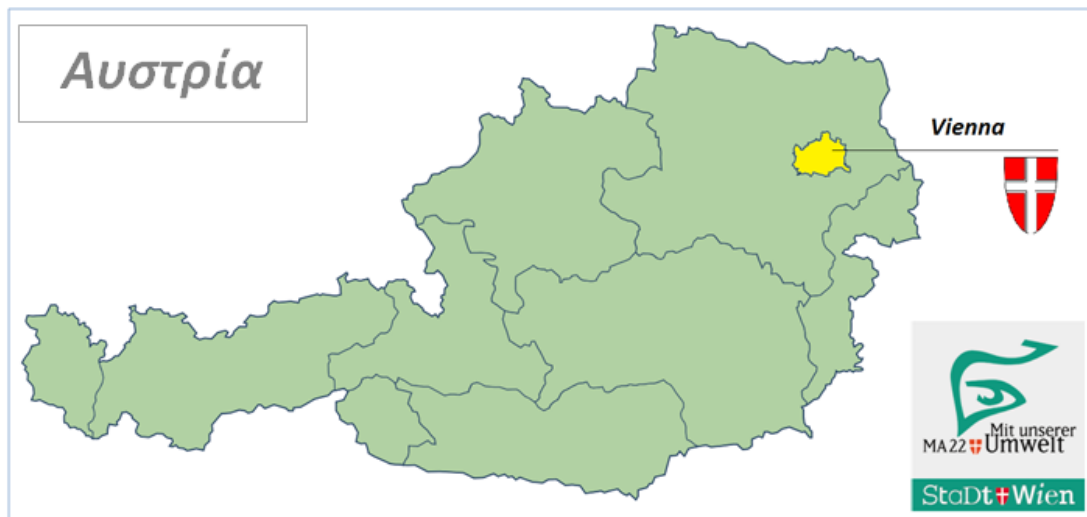
Denmark: Aarhus Municipality (8)

The survey was realized in a representative sample of the municipality via phone meetings (500 interviewers). According to the latest available results (April 2011), more than 90% are satisfied with the installation of the new underground system.



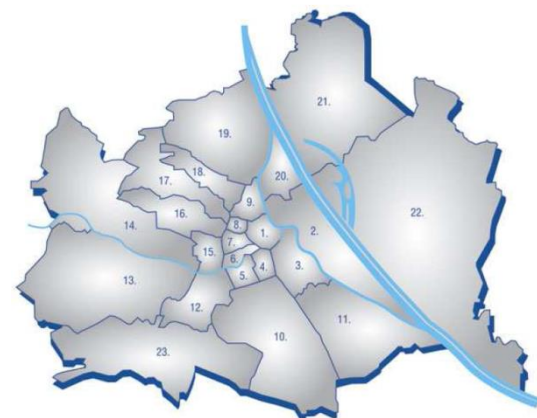


Austria: Vienna



The Republic of Austria is a mountainous country in Central Europe, comprising nine (9) provinces

- **Population:** 1,714,000 residents
- Pop. density:** 4,010 residents /km²









Austria: Vienna (2)

- **Program title:** *ARA System*
- **Implementation period:** 2008 until today
- **Collection scheme:** Bring scheme and kerbside collection scheme
- **Recycling rate:** 81%
- **Waste streams:** 5 (paper, metal, glass, plastic, organics)
- **Selection criteria:** High recycling rate (respecting waste hierarchy)
Good monitoring of waste streams' results



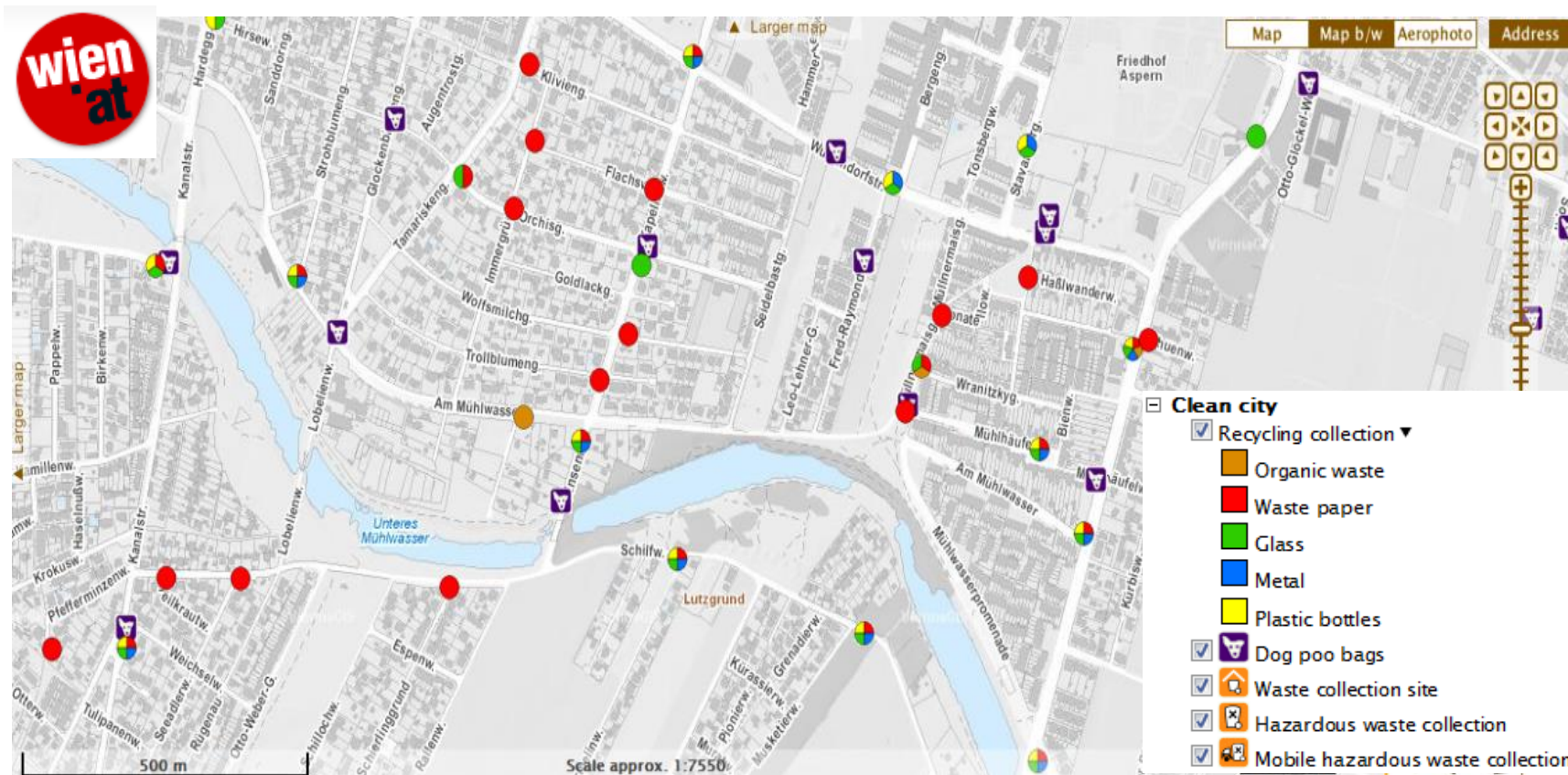
Austria: Vienna (3)

Ρεύμα ΑΣΑ	Σχήματα Συλλογής			
	Συλλογή από τα νοικοκυριά	Συλλογή από γειτονιές	Κέντρα Ανακύκλωσης	Συλλογή επικίνδυνων αποβλήτων
	(σχήμα αποκομιδής)	(σχήμα προσκομιδής)	(σχήμα προσκομιδής)	(σχήμα προσκομιδής)
Χαρτί	✓	✓	✓	
Γυαλί		✓	✓	
Μέταλλο		✓	✓	
Πλαστικό		✓	✓	
Άλλα			✓	
Οργανικά	✓	✓	✓	
Υπολείμματα	✓			
WEEE			✓	✓
Επικίνδυνα			✓	✓
				

Πηγή: (Rolland, 2011)



Austria: Vienna (4)



Vienna GIS: <http://www.wien.gv.at/stadtplan/en/>



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Austria: Vienna (5)

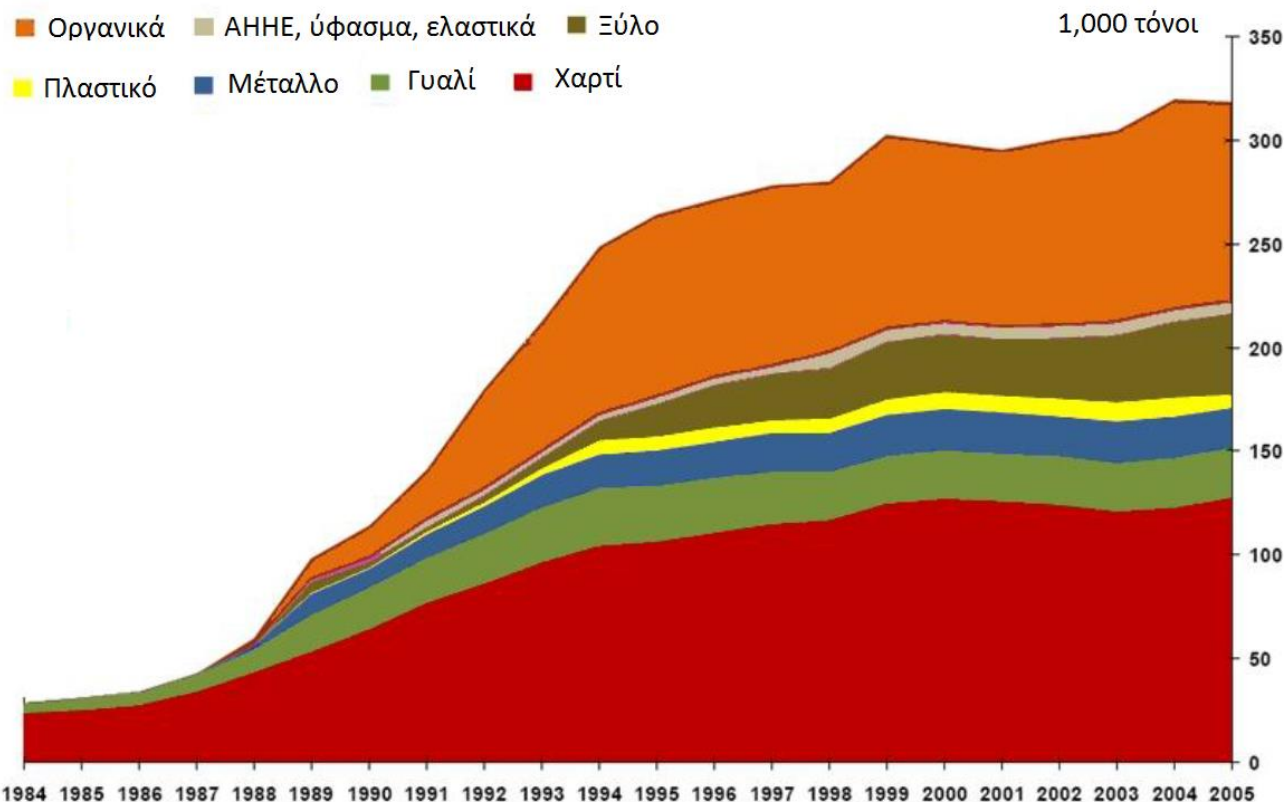


- Glass: since 1977
- Paper: since 1982
- Metal: since 1985
- Organics: since 1988
- Plastics: since 1989





Austria: Vienna (6)



- Glass: since 1977
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- Organics: since 1988
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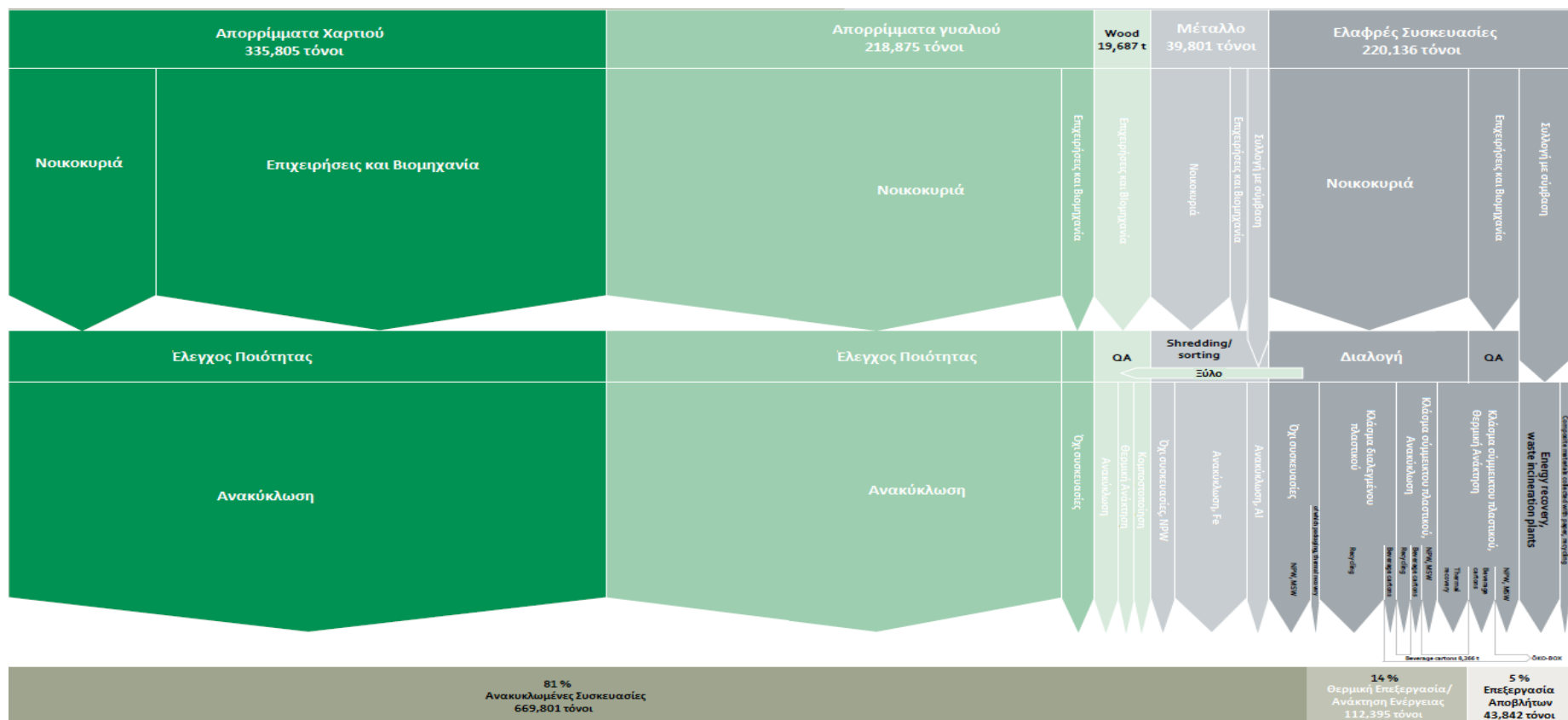
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Austria: Vienna (7)



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Austria: Vienna (8)

Information campaigng “*Oida Trenn!*”

- **Key message:** *Sort your waste, dude!*
- **Target group:** young people
- **Description:** The famous singer Trackshittaz, remade his song “*Oida Taunz!*” (“Dance, dude!”) changing the title to “*Oida Trenn!*” (“Sort your waste, dude!”) for the purposes of the environmental campaign



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Austria: Vienna (9)





Austria: Vienna (9)

Awareness event (Vienna, 2011)

- Key message: *Everyone sort your waste*
- Target group: Adults
- The famous dance teacher Thomas Schäfer-Elmayer, participated in the event organized by the Municipality of Vienna, giving the signal “Alles trennt” instead of “Alles Walzer” meaning “*Everyone sort your waste*” instead of “*Everyone waltz*”



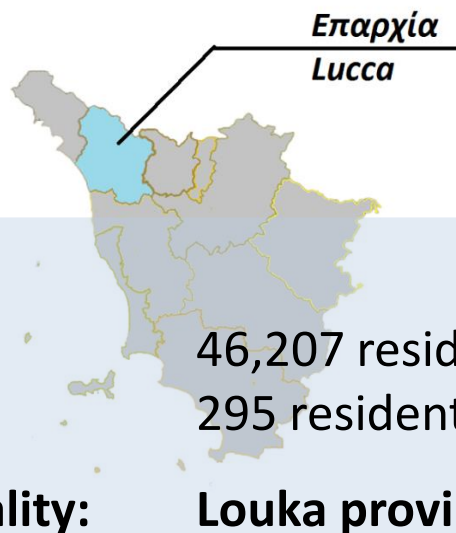
Italy: Cappanori Municipality



- **Population:**
Population density:

- **Cappanori Municipality:** **Louka province**

Cappanori Municipality comprises one of the 35 municipalities in total which belong to Louka province, Tuscany region, Italy.



Δήμος
Cappanori

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Italy: Cappanori Municipality (2)

- **Program title:** *Zero Waste*

First of the 33 communities in total (latest data available: 11/02/2013) in Italy, which applies a Zero Waste Plan

- **Implementation period:** 2004 until today

- **Collection scheme:** Door-to-door collection

- **Recycling rate:** >80% (2010 data)

- **Waste streams:** 4 (organics, glass, plastic/metalls, paper)

- **Success:** High recycling rate
Information campaigns applied for waste prevention





Italy: Carranori Municipality (3)

CALENDARIO RACCOLTA

(Ημερολόγιο Συλλογής)



	Υπολειμτικά Οργανικά	Χαρτί & Χαρτόνι	Συσκευασίες	Γυαλί
Δευτέρα				●
Τρίτη	●			
Τετάρτη	●			
Πέμπτη		●		
Παρασκευή			●	●
Σάββατο	●			

Συλλογή γυαλιού
Μηνιαίο πρόγραμμα 2013
Κάθε δεύτερη Παρασκευή ως ακολούθως:

Ιανουάριος	4 - 18
Φεβρουάριος	1 - 15
Μάρτιος	1 - 15 - 29
Απρίλιος	12 - 26
Μάιος	10 - 24
Ιούνιος	7 - 21
Ιούλιος	5 - 19
Αύγουστος	2 - 16 - 30
Σεπτέμβριος	13 - 27
Οκτώβριος	11 - 25
Νοέμβριος	8 - 22
Δεκέμβριος	6 - 20



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Italy: Cappanori Municipality (4)

Implementation steps of Zero Waste strategy :

- **Pilot application :** 2005

The implementation of zero waste strategy initiated in 2005 (door-to-door collection) in Guamo, a village of 600 residents.

- **Expansion step:** 2007

The zero waste plan was expanded in areas Marlia and Lamari
23% of total municipal area (10,000 residents)

- **Full-scale implementation:** 2010

In June 2010, the Zero Waste Plan was expanded at the whole municipality.





Italy: Cappanori Municipality (5)

Assessment

- **Recycling Rate (2010):** >80%
- **Recycling Rate (2006):** ~40%
- **Waste reduction:** ~64% (2005-2009)
(not sorted)
- **Total reduction (MSW):** 21% (2005-2009)

Per capita MSW production was reduced from 672 kg in 2006 to 532 Kg in 2009, while the per capita (not sorted) waste was reduced from 340kg in 2006 to 152kg in 2009.



Spain: Verdú Municipality



Επαρχία Urgell
Καταλονία



Δήμος
Verdú

- **Population:** 1,029 residents
- **Population density:** 28.8 residents/km²
- **Verdú Municipality:** Urgell province
Verdú Municipality comprises one of the 20 Municipalities in total of Urgell province, in Catalonia, Spain

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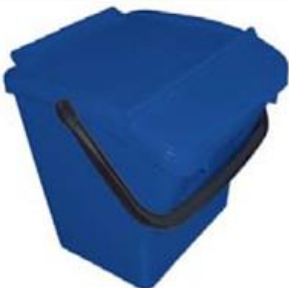


Spain: Verdú Municipality (2)

- **Project title:** *Porta-Porta*
- **Implementation period:** 2008 until today
- **Collection scheme:** Door-to-door collection
- **Recycling Rate:** 70%
- **Waste streams:** 4 (organics, glass, plastic/metal, paper)
- **Success:** High recycling rate achieved





Spain: Verdú Municipality (3)

Οργανικά		Υπολειμματικά
		
Κάδος κουζίνας 7 λίτρα	Εξωτερικός κάδος 20 λίτρα	Εξωτερικός κάδος 20 λίτρα
Χαρτί/Χαρτόνι	Μέταλλο/Πλαστικό	Γυαλί
		
Εξωτερικός κάδος 40 λίτρα	Εξωτερικός κάδος 40 λίτρα	Εξωτερικός κάδος 40 λίτρα

Project's targets:

- **Organics:** 85%
- **Glass:** 90%
- **Paper:** 60%
- **Packages:** 60%



Spain: Verdú Municipality (4)

Porta Porta
VERDÚ RECICLA

Ημερολόγιο Συλλογής



Ajuntament
de Verdú



Agència de
Residus de
Catalunya
Departament de Medi Ambient
i Habitatge

	Δευτέρα	Τρίτη	Τετάρτη	Πέμπτη	Παρασκευή	Σάββατο	Κυριακή	
Χαρτί/ Χαρτόνι								
Γυαλί								
Πλαστικό/ Μέταλλο								
Οργανικό								
Άλλα								
Πάνες								

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Spain: Verdú Municipality (5)

Information campaigns *Porta-Porta*:

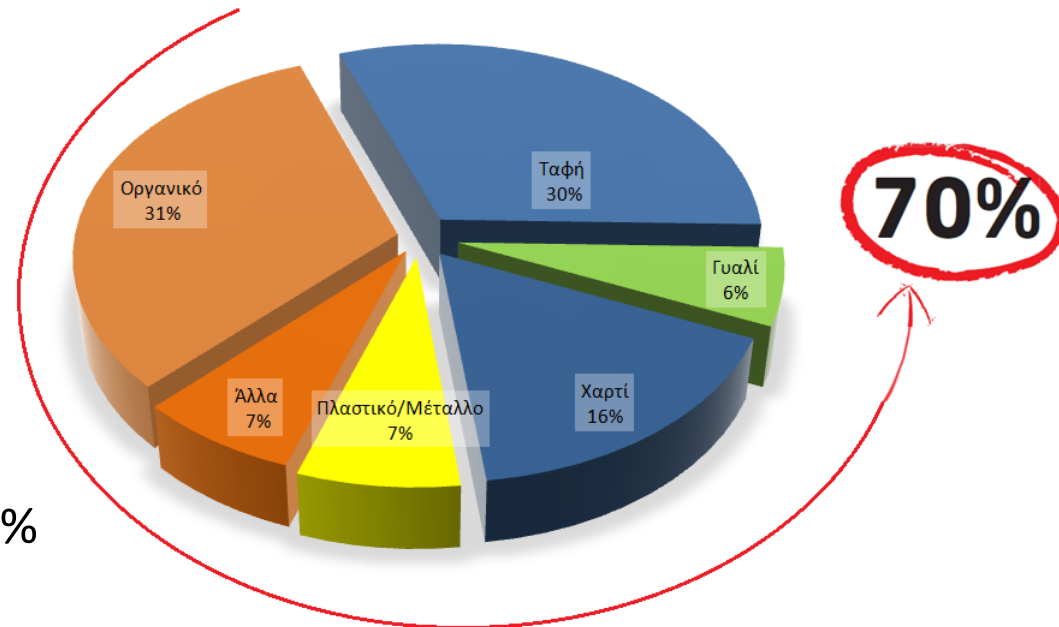
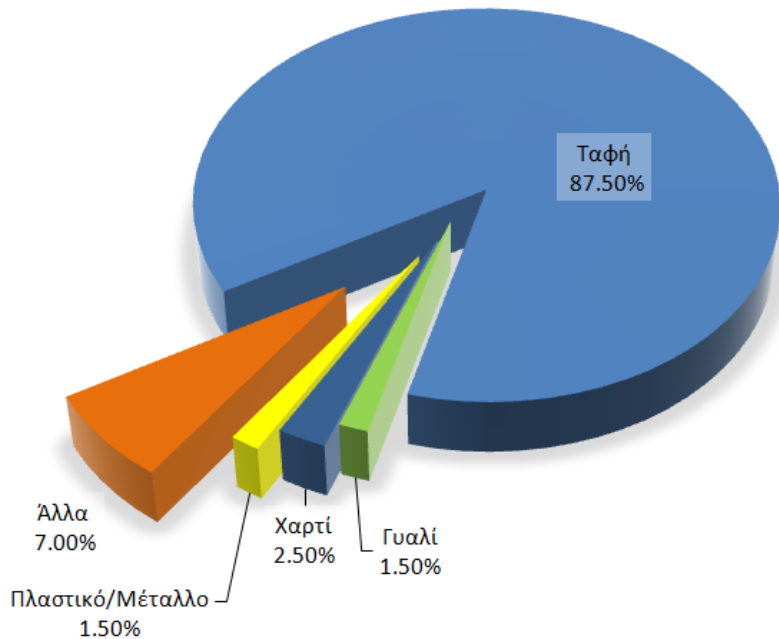
- **Campaign «Expectation»:** **07 - 09/2009**
Campanya “expectació (Dissemination activities at Schools and publications in print and electronically)
- **Campaign «Countdown» :** **09 – 10/2009**
Campanya “compte enrere”: Two informative letters are sent to the households of the Municipality.
- **Campaign «Launching event»:** **31/10/2009**
Campanya d’inici: Press conference/
Movie presentation / Organization of two local events
For the residents of the Municipality. During the events
The following were distributed: informative material,
Bags and waste bins for the implementation of the porta-Porta system,
- **Monitoring campaign :** **11/2009-today**
Campanya de seguiment (Monitoring and dissemination actions)





Spain: Verdú Municipality (6)

Assessment



- Recycling rate (before): 12.5%
- Recycling rate (after): 70%

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Παραδοτέο Α.3.1: Κεφάλαιο 3

At a global level the following six municipalities were examined (4 countries):

- Hamilton Municipality (Canada)
- Antigonish Municipality (Canada)
- San Fransisco (USA)
- Palo Alto Municipality (USA)
- Oakland Municipality (USA)
- **Kamikatsu Municipality (Japan)**



Japan: Kamikatsu Municipality



Επαρχία Katsuura
Περιφέρεια Tokushima



Περιφέρεια
Kagawa

Δήμος
Kamikatsu

Περιφέρεια
Ehime

Περιφέρεια
Kochi

- **Population :** 2,042 residents
- **Population density:** 18.62 residents/km²
- **Kamikatsu municipality:** Katsuura province, Tokushima region

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Japan: Kamikatsu Municipality (2)

- **Project title:** *Zero Waste*
- **Implementation period:** 2001 until today
- **Collection scheme:** Bring Scheme
- **Recycling rate:** 90%
- **Waste streams:** 34 (see below)
- **Success:** High separation level at source,
High recycling rate achieved,
Excellent awareness level of local residents
(based on the residents will, no PAYT scheme)





Japan: Kamikatsu Municipality (3)

“It is a shame for something to go to waste without having made use of its full potential”

‘Mottanai’ Principle



The height of the municipality ranges between 100 and 800 meters above sea level requiring large financial resources for the Municipality compared to its size and number of residents.



Japan: Kamikatsu Municipality (5)



Photos from the recycling centers in Kamikatsu Municipality.

Source: <http://www.guardian.co.uk/world/gallery/2008/aug/05/japan.recycling#/?picture=336197909&index=2>



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Japan: Kamikatsu Municipality (6)



Figure (left): Recycling center, Kamikatsu Municipality, Japan

Figure (right): Employee of the Zero Waste Academy in the Hibigaya recycling center





Japan: Kamikatsu Municipality (7)

Assessment

- **Recycling rate (2005) :** 90%

This recycling rate involves also estimations for composting of organics. Nearly half of the households of the municipality uses home composting units and use the produced compost for their gardens. The vast majority of composting (98%) is performed with home composting units.

- **Recycling rate (2005) :** 75-80% (no composting considered)

The awareness of local residents regarding waste separation and recycling is significant. In Kamikatsu municipality there is no landfilling ban or other form of fees. However, the recycling rate is at very high levels due to increased awareness of the local community.



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Conclusions

- ❖ It is not likely to expect that inhabitants will significantly improve their behaviour to increase the recycling rate of municipal solid waste from about 18% to 75% (rational assessment of behavioural changes of people)

This was proven wrong with the case of Verdu Municipality in Spain. An increase from 12.5% to 75% in the recycling rate was observed within the first two years of implementation.

- ❖ High separation of waste streams is too ambitious and will fail,

This was proven wrong with the case of Kamikatsu Municipality in China, where 34 waste streams were separated. Additionally, no economic incentives were provided. This stresses that people tend to do what they are being told in case they believe in what you suggest (credibility) and you give them to understand their contribution to changing the problem (awareness).



Conclusions

❖ There is no one-size-fits-all solution

For this reason local authorities have to make decisions that are right for their local circumstances (housing density, geographical characteristics etc.) For instance, due to the mountainous characteristics of Kamikatsu Municipality, it was necessary that a bring scheme was followed and thus the focus for the success of the source separation system was raising awareness of local community (public acceptability).



Thank you for
your attention!