

TINOS 2015

3RD INTERNATIONAL CONFERENCE
on Sustainable Solid Waste Management



LIFE 10 ENV/GR/000610

Waste Management in isolated areas: The case of the ISWM – TINOS project



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In Collaboration
with the:





MSW management in islands

- In EU there are hundreds of islands
- EU islands are inhabited by more than **3 %** of the total EU population

The difficulty of effective and sustainable solid waste management practices are related to

- The **fragility** of these areas,
- The **significant seasonal fluctuations** of waste resulting mainly from touristic activities and
- The **non favoured economies of scale**



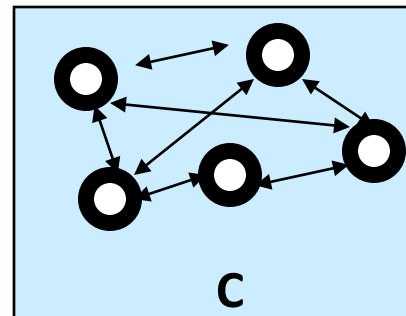
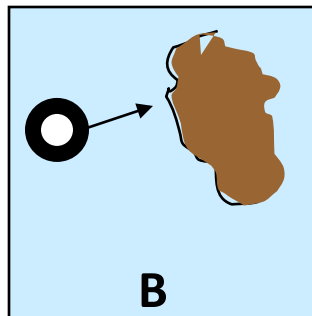
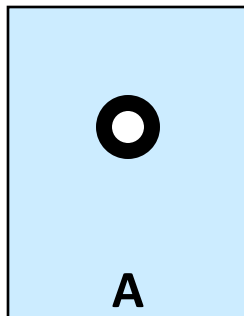
MSW management strategies in Islands

A. Single Strategy: All or major part of waste is managed on the island (typically possible for relative large islands and isolated islands with long distances from the mainland and from other islands)

B. Tandem Strategy: Waste transported to the mainland where it can be treated and disposed of in an environmentally sound way

C. Joint Strategy: Waste management cooperation between islands.

In practice a mix of strategies is applied for sound waste management

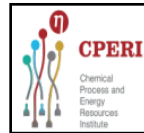




The 'ISWM TINOS' LIFE+ project

'ISWM-TINOS' project aims to promote and demonstrate an Integrated Solid Waste Management (ISWM) system to a selected area of the Municipality of Tinos for the sustainable management of MSW in line with the Waste Framework Directive 2008/98/EC

- **Project Location:** Tinos Island, Greece
- **Project Budget:** 1,437,368.00 €, **EC Funding:** 718,684.00 € (50%)
- **Duration:** 46 months, **Start:** 01.10.2011 - **End:** 31.07.2015
- **Project partners:**
 - Coordinating Beneficiary: (1) Municipality of Tinos
 - Associated Beneficiaries: (2) National Technical University of Athens
 - (3) Università degli studi di Verona
 - (4) Centre for Research and Technology Hellas/
Chemical Process and Energy Resources Institute



<http://uest.ntua.gr/iswm-tinos>



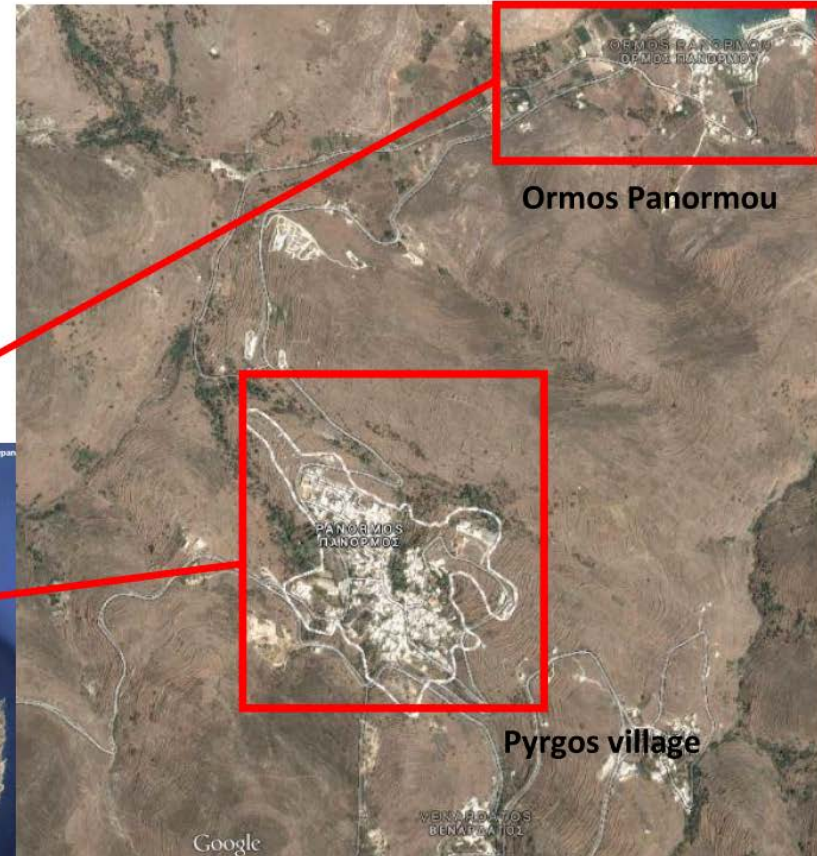
'ISWM TINOS' LIFE+ project - Objectives

- Separate collection scheme for dry recyclables (**paper/paperboard, glass, plastic & metal**) and **biowaste**
- Treatment of the separately collected biowaste in a **pilot prototype composting unit** in order to produce good quality compost
- Investigation of **Anaerobic Digestion** of source sorted biowaste
- **LCA analysis** of different MSW management scenarios for Tinos
- Evaluation of the ISWM system in Tinos and & suggestions for **full scale implementation**
- Raising public awareness and training on sustainable waste management



Project implementation area: Pyrgos & Panormos communities, Tinos Island

- Pyrgos & Panormos communities in Tinos Island
- Main MSW generators: households, institutional and commercial facilities





Tinos Island ISWM scheme process

1. Setup

- Selection of waste streams & Collection method
- Organization of collection, transportation & processing of waste
- Raise public awareness & training of operators
- Equipment distribution & ISWM scheme launching

2. Monitoring & Evaluation

- Collection of primary data on ISWM progress
- Evaluation of the performance of ISWM scheme



1. Set up: Target waste streams & Collection method

Estimated MSW generation and composition analysis

	Kg inh ⁻¹ yr ⁻¹	%
Paper/paperboard	70	16
Glass	15	3
Plastic & metal	60	14
Biowaste	223	52
Rest Waste	65	15
MSW	433	100

Recyclables & Biowaste constitute 85% of Total MSW

Grouping of MSW streams

- Separate collection of packaging **paper/paperboard**
- Separate collection of packaging **glass**
- Commingle collection of packaging **plastic & metal** (joint collection)
- Separate collection of **biowaste**

Colour

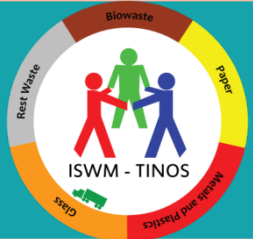
Yellow

Orange

Red

Brown

Source separation scheme applied: Kerbside collection system (decided considering the specific characteristics of the served area)



1. Setup: ISWM scheme for Packaging Waste

Packaging Waste
Paper/paperboard
Glass
Plastic & Metal

Indoor



Reusable bags

Outdoor



Wheelie bins 240L

χαρτί / χαρτόνι γυαλί μέταλλο & πλαστικό

MRF (mainland)



Shipment



**Temporary storage
(3 containers)**



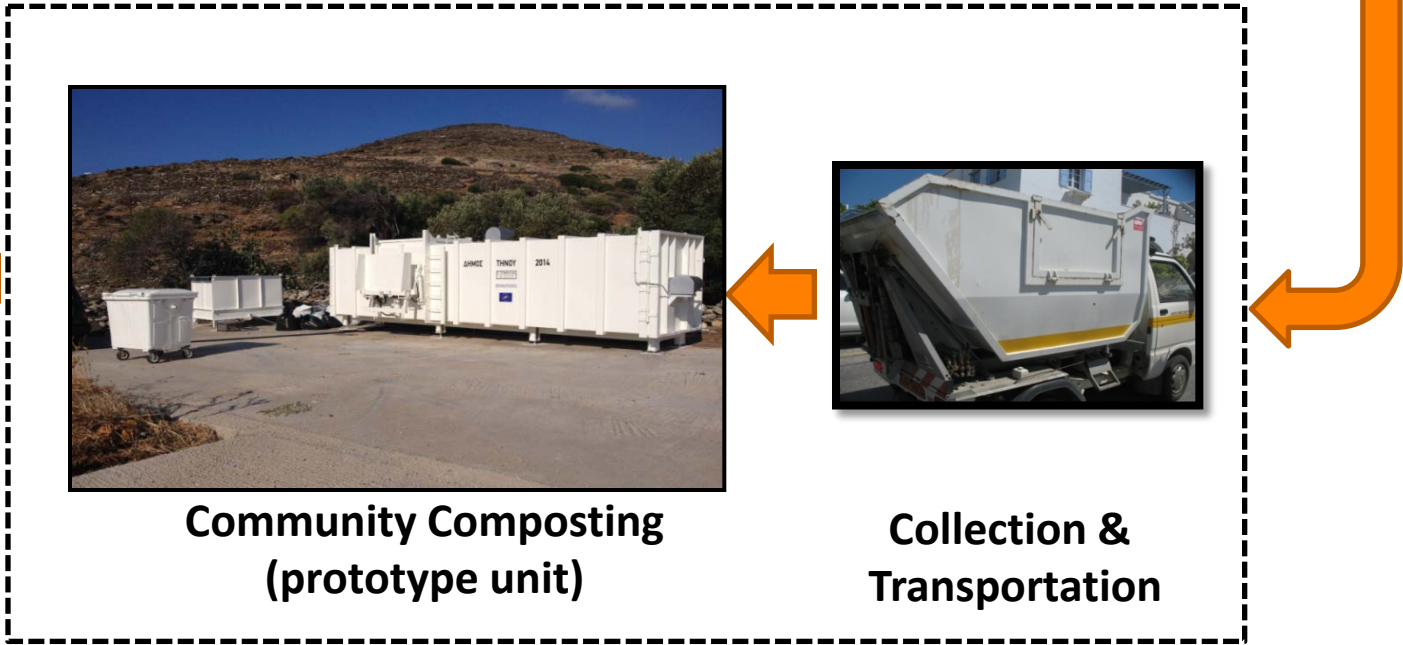
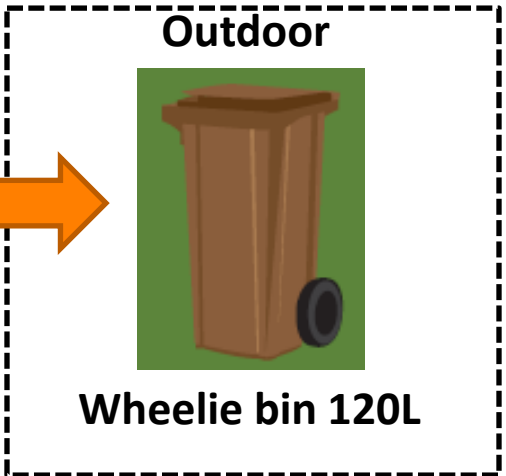
Collection & Transportation

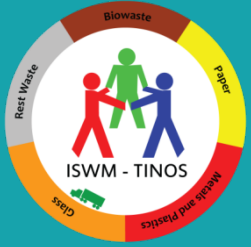


1. Setup: ISWM scheme for biowaste



BIOWASTE





1. Setup: ISWM scheme for biowaste

Compact prototype biowaste composting unit



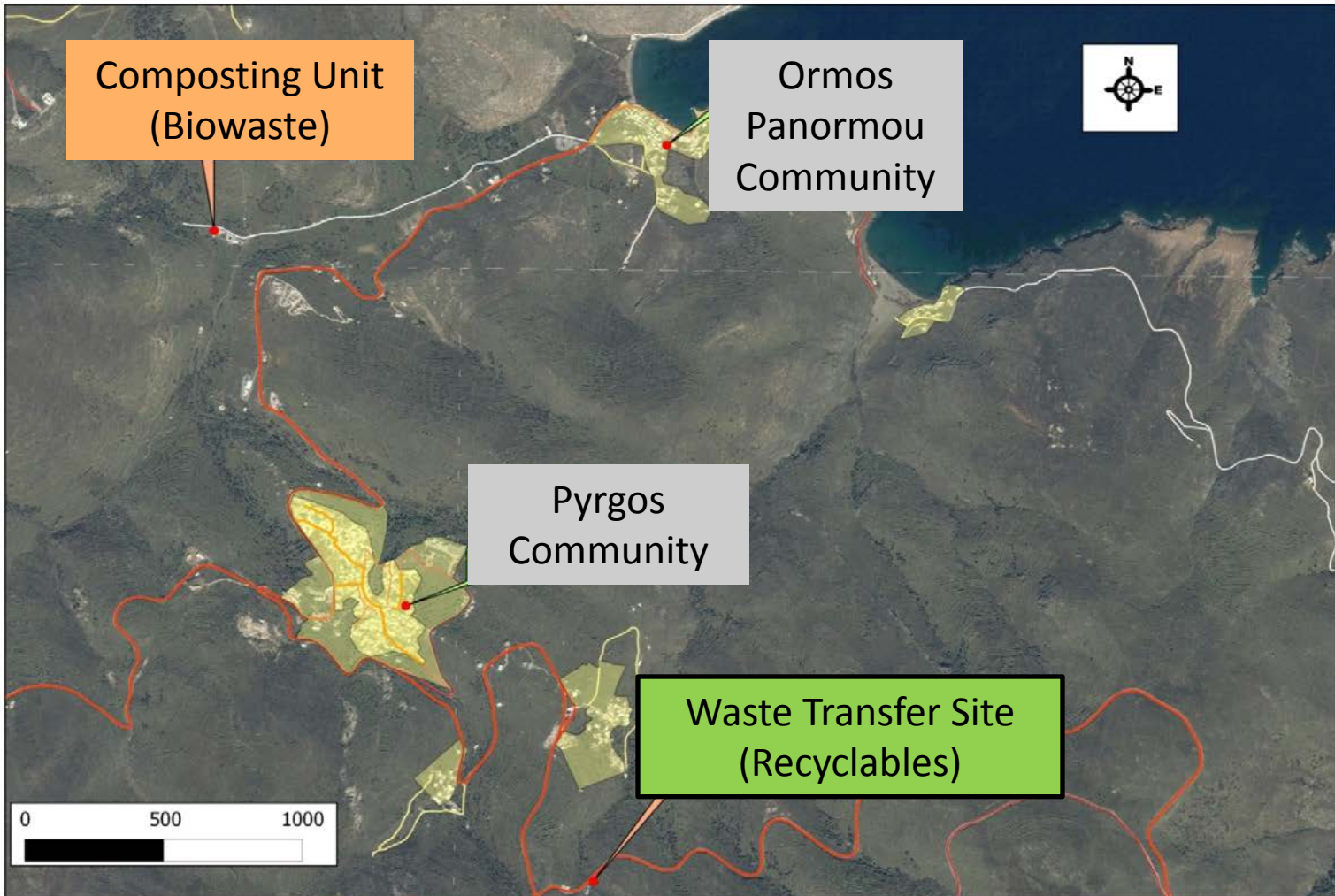
- ✓ The capacity ranges between 70 to 200 tn yr⁻¹ (residence time 15 to 60d)
- ✓ Automated hydration, aeration and deodorization systems
- ✓ Biofilter for the treatment of emitted gases
- ✓ Collection and recirculation of leachates
- ✓ No mechanical agitation is needed

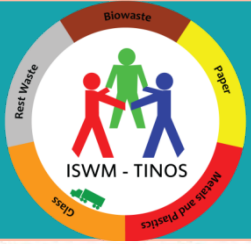
In operation since 29 July 2014



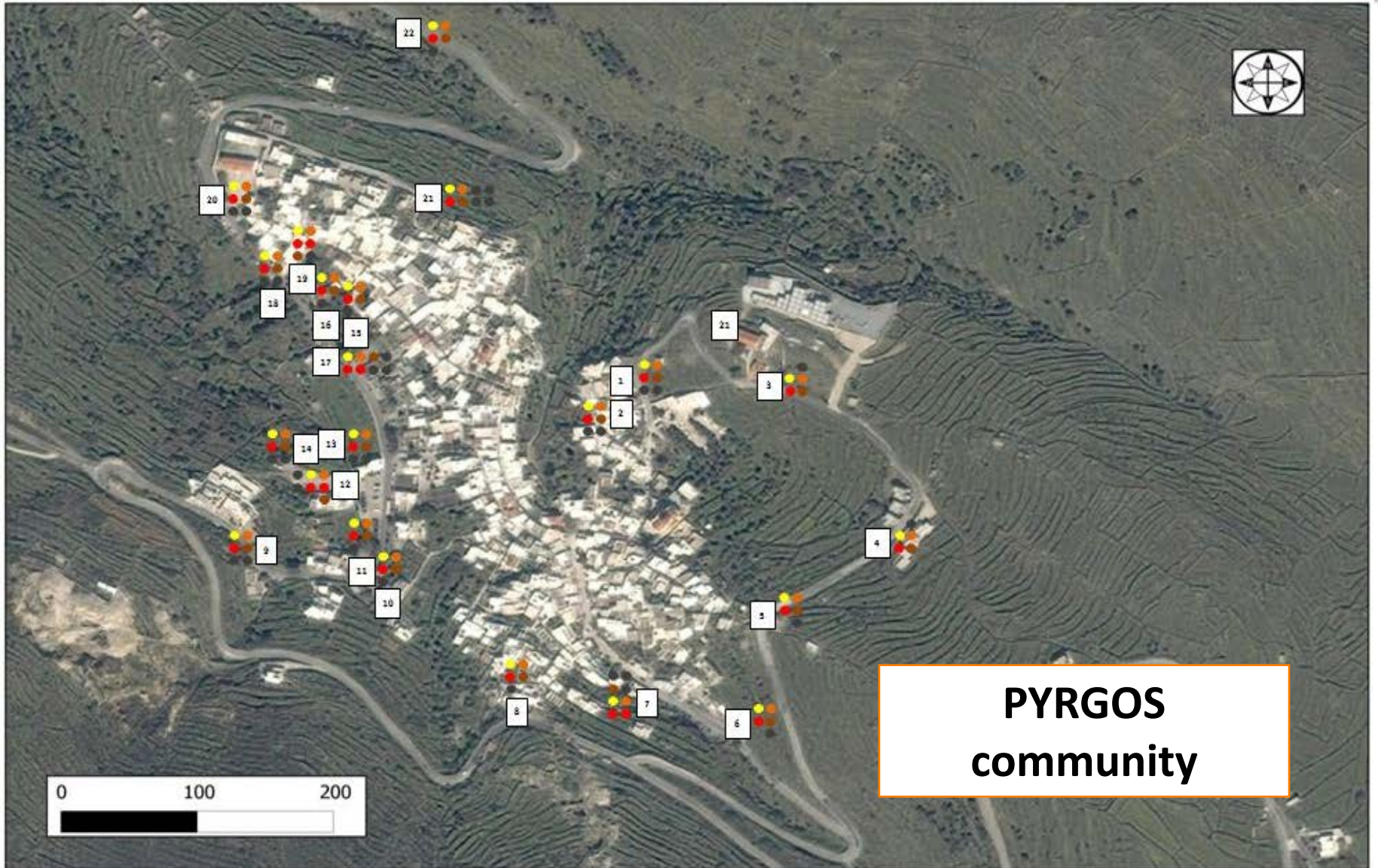


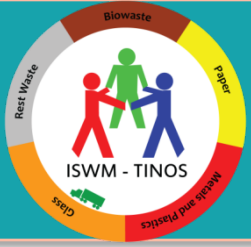
1. Setup: Overview of the ISWM



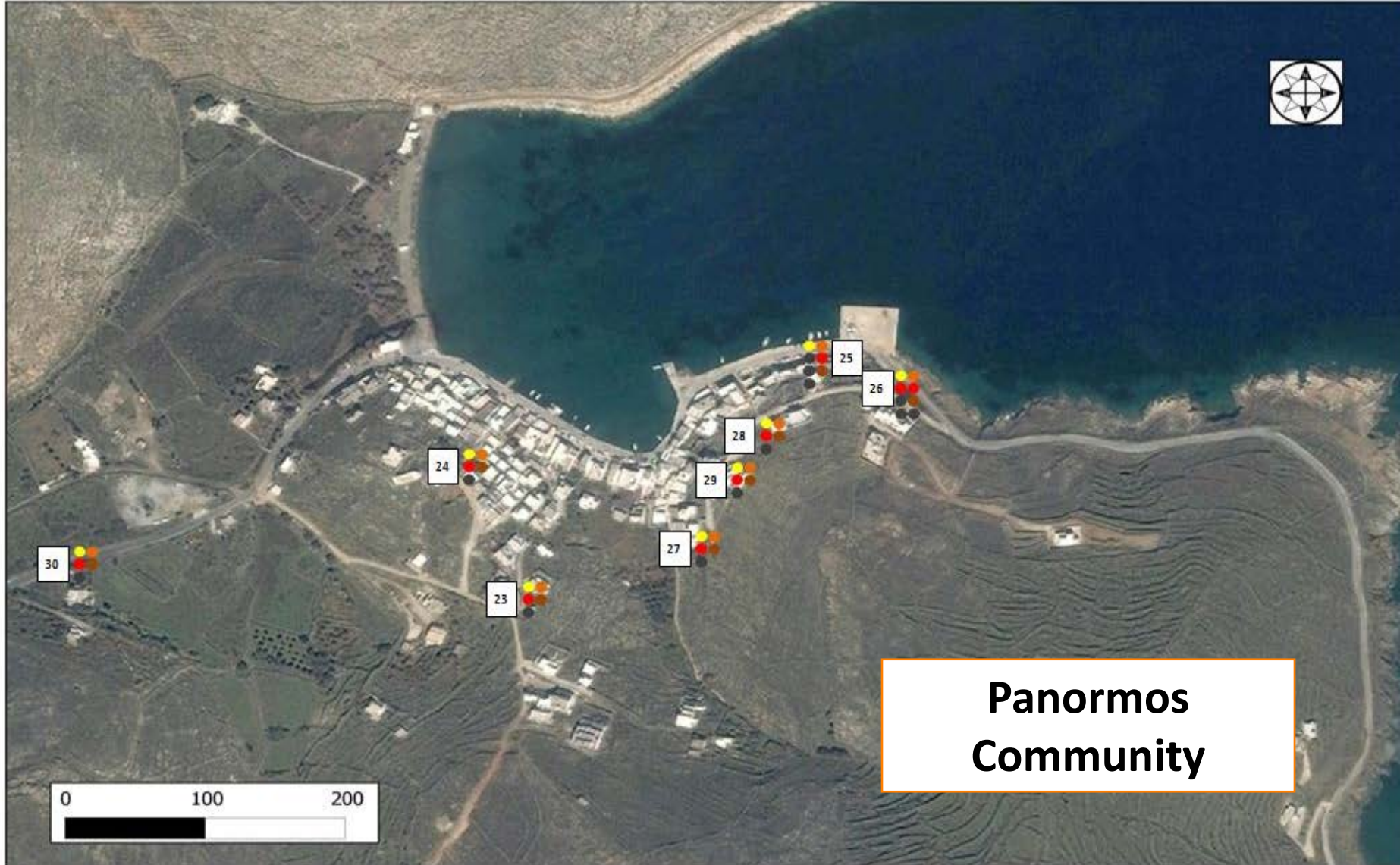


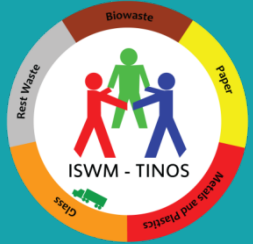
1. Setup - Kerbside collection network





1. Setup - Kerbside collection network





1. Set up: Raising awareness & Training



- ✓ Raising Awareness events & Training sessions
- ✓ Distribution of various informative material (posters, leaflets, cards, signboards etc)
- ✓ Dedicated website for the LIFE+ project: <http://iswm-tinos.uest.gr/>
- ✓ Activation of telephone helpline
- ✓ Distribution of questionnaires

INFORMATION and CONTINUOUS FEEDBACK is an integral element in order to implement successful recycling programs



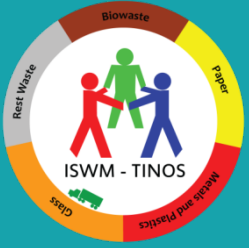
2. Evaluation: Packaging Waste Scheme (1/2)

Duration of Packaging Waste scheme: **24 months**

Waste Stream	Production (kg inh ⁻¹ yr ⁻¹)	Recycling (average)				
		Capture rate (kg inh ⁻¹ yr ⁻¹)			Source Separation Ratio (%)	
Packaging Waste	Tinos	Tinos	GR	EU-27	EU Targets	Tinos
Paper/paperboard	24,8	22,5	31	52	60	90,5
Glass	14,5	11,4	10	22	60	78,4
Plastic & metal	36,8	21,1	10,5	16,6	22,5 & 50	57,4
Total Packaging	76,1	54,9	62,4	63,6	Min 55	72,2
Total Recyclables	144,7	65,8			50 (by 2020)	45,5

including **mixed paper**
10,9 kg inh⁻¹ yr⁻¹

New National Target: 65%
Supplementary
methods required (green point)



2. Evaluation: Packaging Waste Scheme (2/2)

- Quantity received at the MRF: **33 tn/yr**
- Recovery rate at the MRF: **≈90% (10% impurities)**
 - **94 % Paper/Paperboard**
 - **79 % Plastic & Metals**
 - **98 % Glass**

Packaging waste recovery rates in Greece range between **50-60%**

The efficiency difference is mainly related to the separation of packaging waste in different streams compared to the mixed packaging waste scheme which commonly applied in Greece (blue bin scheme)



2. Evaluation - Biowaste

Duration of Biowaste scheme: **12 months**

Total biowaste production **223 kg inh⁻¹ yr⁻¹**

1. Capture rate for composting: **15,5 kg inh⁻¹ yr⁻¹ (7% of biowaste produced)**

Examples in Greece (ATHENS BIOWASTE LIFE+ project):

- 37.4 kg inh⁻¹ yr⁻¹ Athens Municipality
- 27.1 kg inh⁻¹ yr⁻¹ Kifissia Municipality

Examples of other EU countries:

- Spain (Catalonia) > 50 kg inh⁻¹ yr⁻¹ (2010)
- Italy > 60 kg inh⁻¹ yr⁻¹ (2009)

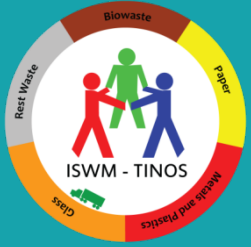
Low capture rate is attributed to:

- Low participation of large producers i.e. restaurants
- Alternative diversion methods i.e. animal feed

2. Estimated Total Capture rate: **82 kg inh⁻¹ yr⁻¹ (37% of biowaste produced)**

Composting 7% & **Animal Feed 30%**

3. Impurities rate of source separated material: **<1,5%**



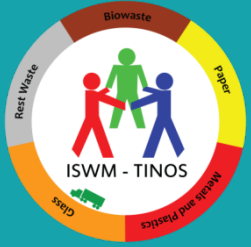
2. Evaluation – Overall ISWM Scheme

Recycling Scheme	MSW Recycling	
	kg inh ⁻¹ yr ⁻¹	% of MSW
Packaging Waste	65,8	15,2
Biowaste	15,5	3,6
Packaging Waste & Biowaste (<u>without</u> biowaste animal feed)	81,3	18,8
Packaging Waste & Biowaste (<u>including</u> biowaste animal feed)	133	30,8



Need for Biodegradable MSW management

- Separate collection targets (GR 40% by 2020)
- WFD sets 50% recovery of materials by 2020 (“preparation for reuse or recycling”)
- Target for diversion of Biodegradable MSW from landfills (Directive 1999/31 on Landfills)
 - By **2006 (2010)** reduction of disposal of biodegradable MSW to **75%** (1995)
 - By **2009 (2013)** reduction of disposal of biodegradable MSW to **50%** (1995)
 - By **2016 (2020)** reduction of disposal of biodegradable MSW to **35%** (1995)
- Decrease MSW management costs, while gate fees for disposal are growing



MSW & Biowaste production in Greece

MSW: 5,831,855 tn/yr

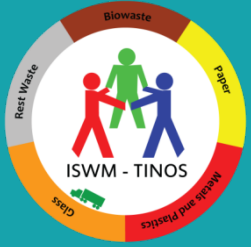
**B - MSW: 3,923,126 tn/yr
(67% of MSW)**

**Bio-waste: 2,567,867 tn/yr
(44% of MSW)**

**Household Bio-waste:
2,196,682 tn/yr (38% of MSW)**

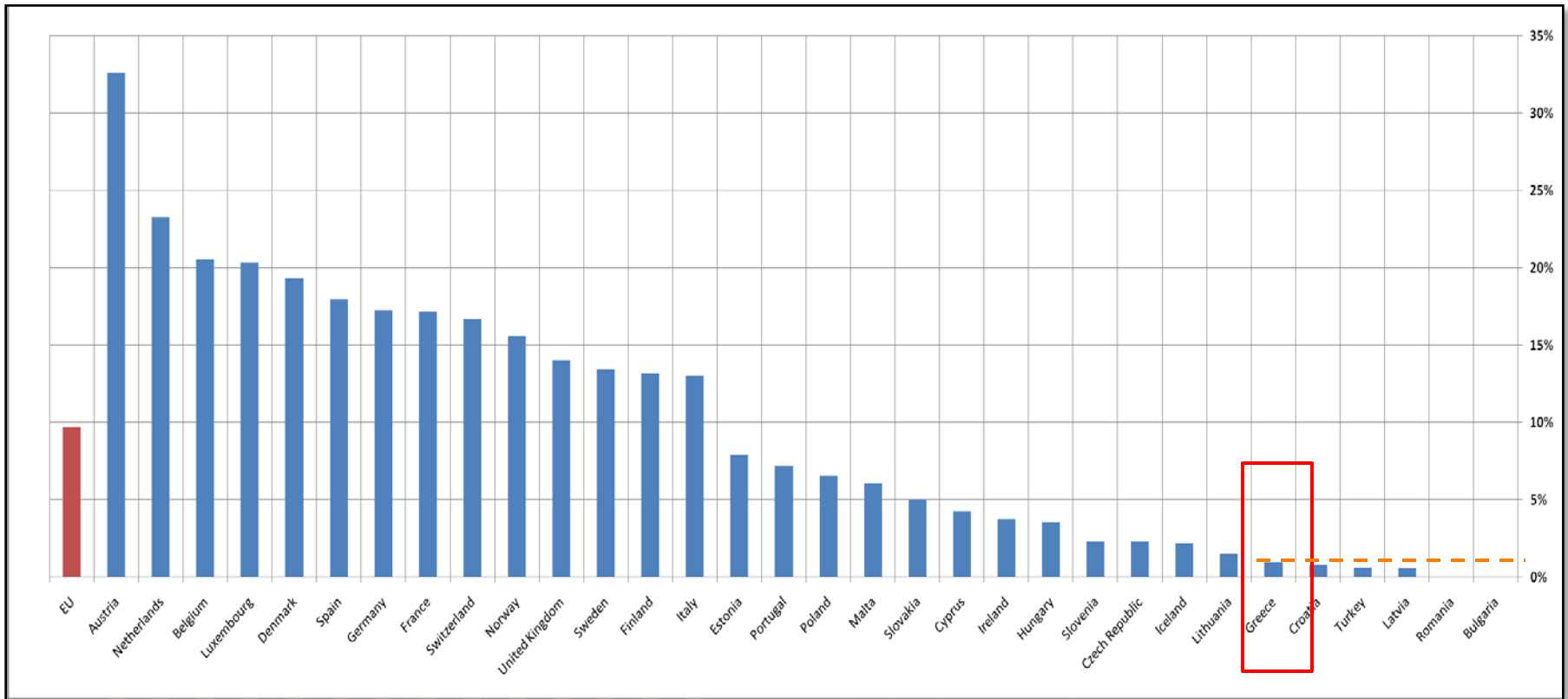
**76.5 % food waste
23.5 % green waste**

(ΕΠΠΕΡΡΑ, 2012)

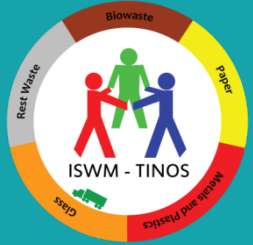


Biowaste Recycling in EU

Biowaste recycling % of total MSW (2010)



GREECE = 0.96% of MSW
While Biowaste constitute 44 of MSW



Biowaste source separation & composting

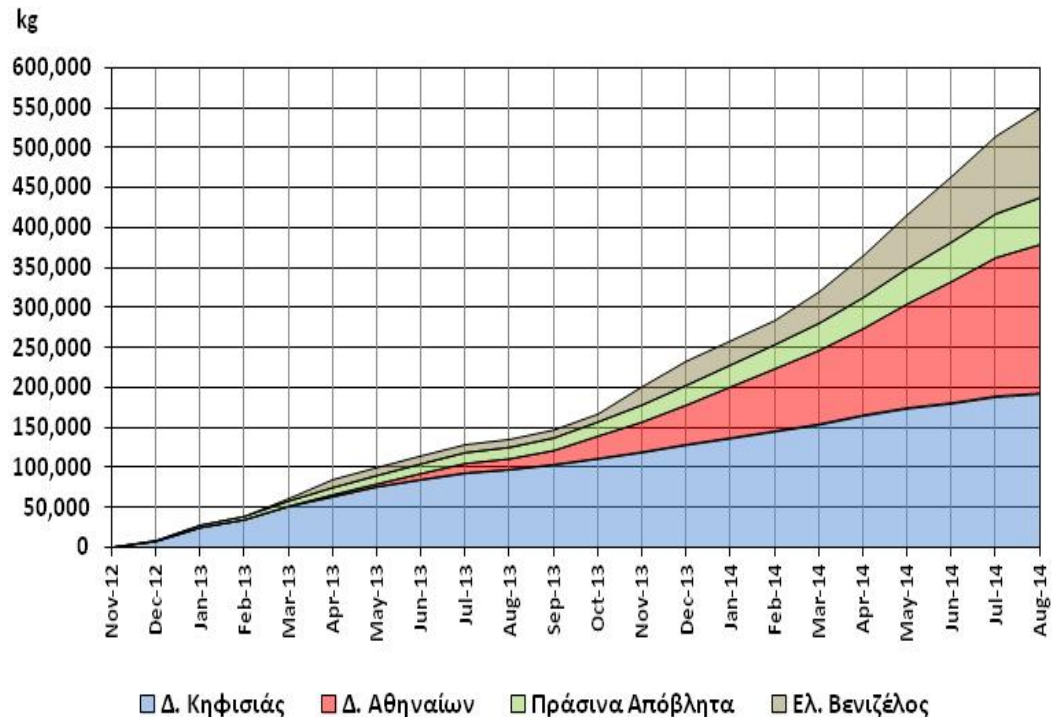
Athens Biowaste LIFE+ project:

Aimed at establishing and promoting sustainable bio-waste management in Greece by establishing biowaste separate collection systems in Athens and Kifissia Municipalities (5000 households) which is then composted at the MBT facility in Attica Region,

Collection & Composting 551 tn biowaste



<http://www.biowaste.gr>





Decision support tool for biowaste management

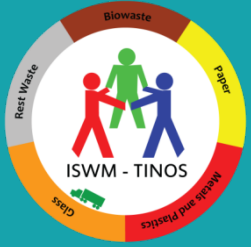
Aims to assist local authorities in the following:

- Customize source separation programs according to the specific characteristics and needs of the municipalities
- Evaluation of the investment & operational cost of a source separation program at the examined municipalities
- Assessment of CO₂ emissions in respect to the biowaste management (comparison of present situation & suggested source separation program)
- Support decision making for the initiation of biowaste source separation programs

Available online

<http://model.biowaste.gr/>





Biowaste management guide for Local Authorities

Scope of the guide:

- To supplement existing biowaste management guidelines with the applied experience of Athens Biowaste LIFE + project
 - To provide competent authorities and waste management operators primary data and information on biowaste management from Greek case studies
- Organizing biowaste source separation schemes
 - Initiating biowaste source separation schemes
 - Operating, Monitoring & Evaluating biowaste source separation system
 - List of minimum requirements for installing, applying and monitoring biowaste source separation schemes
 - Planning of awareness campaign

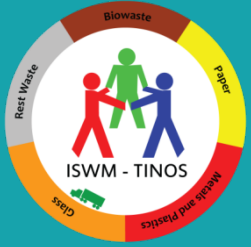




Household Composting of Biowaste



<http://www.uest.gr/comwaste>



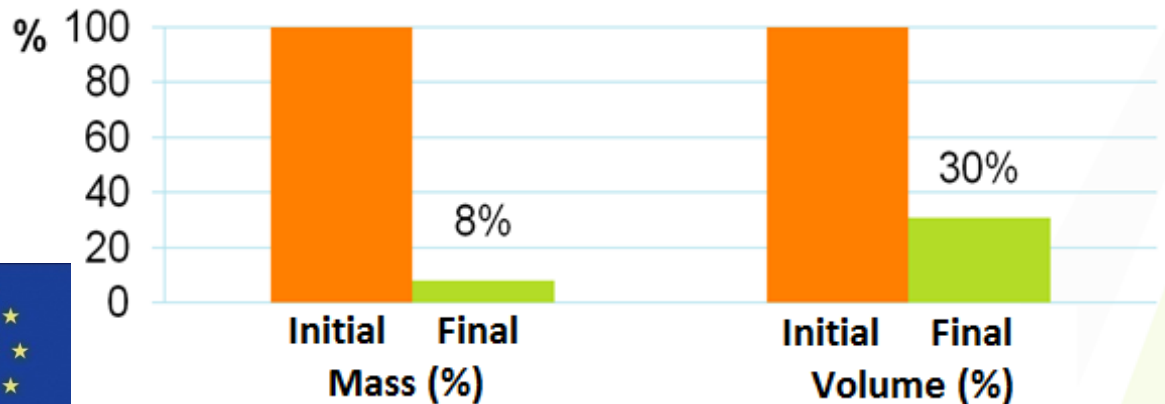
Biowaste source separation & drying

Advantages of household biowaste drying (DRYWASTE Project);

- Significant reduction of biowaste mass & volume at source (70 to 90% reduction)
- Absence of nuisance
- Production of high added value biomass
- Significant reduction of waste collection & transportation cost (collection once every one or two months)
- Pilot scale application in Papagos- Cholargos Municipality, Greece



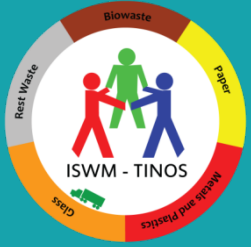
Household dryer



DRYWASTE



www.uest.gr/drywaste



Biofuel production from biowaste



Waste2Bio LIFE+ project:

- Production of biofuel (bioethanol) from biowaste
- Reinforcing the Greek and European effort in the sector of sustainable biowaste management
- The project is implemented at Papagos-Cholargos and Aspropyrgos municipalities, Greece



<http://www.waste2bio.eu>

Thank you

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