



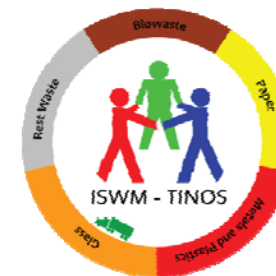
CYPRUS2016

4TH INTERNATIONAL CONFERENCE
on Sustainable Solid Waste Management



Municipal waste management Good practices in the field of solid waste management

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The 'ATHENS BIOWASTE' LIFE+ project

'ATHENS BIOWASTE' project aims to establish and promote biowaste separate collection systems and composting in Athens & Kifissia Municipalities. Appropriate tools for local authorities have also been developed aiming to enhance the replication of the biowaste management schemes.

- **Project Location:** Athens, Greece
- **Project Budget:** 1.339.930 € €, **EC Funding:** 638.715,00 €
- **Duration:** 36 months, **Start:** 01.09.2011 - **End:** 31.08.2014
- **Project partners:**
 - Coordinating Beneficiary: (1) National Technical University of Athens
 - Associated Beneficiaries: (2) EPTA S.A.
(3) Municipality of Athens
(4) Municipality of Kifissia
(5) Waste Management Authority of Attica Region (EDSNA)



<http://biowaste.gr>



Pilot areas in Kifissia Municipality

Total Households: 2651

NEA KIFISSIA

Population: 1189 inh
Density: 38 inh/ha

KATO KHFISSIA

Population: 875 inh
Density: 48 inh/ha

2nd expansion STROFILI

Population: 2180 inh
Density: 30 inh/ha

EKALI

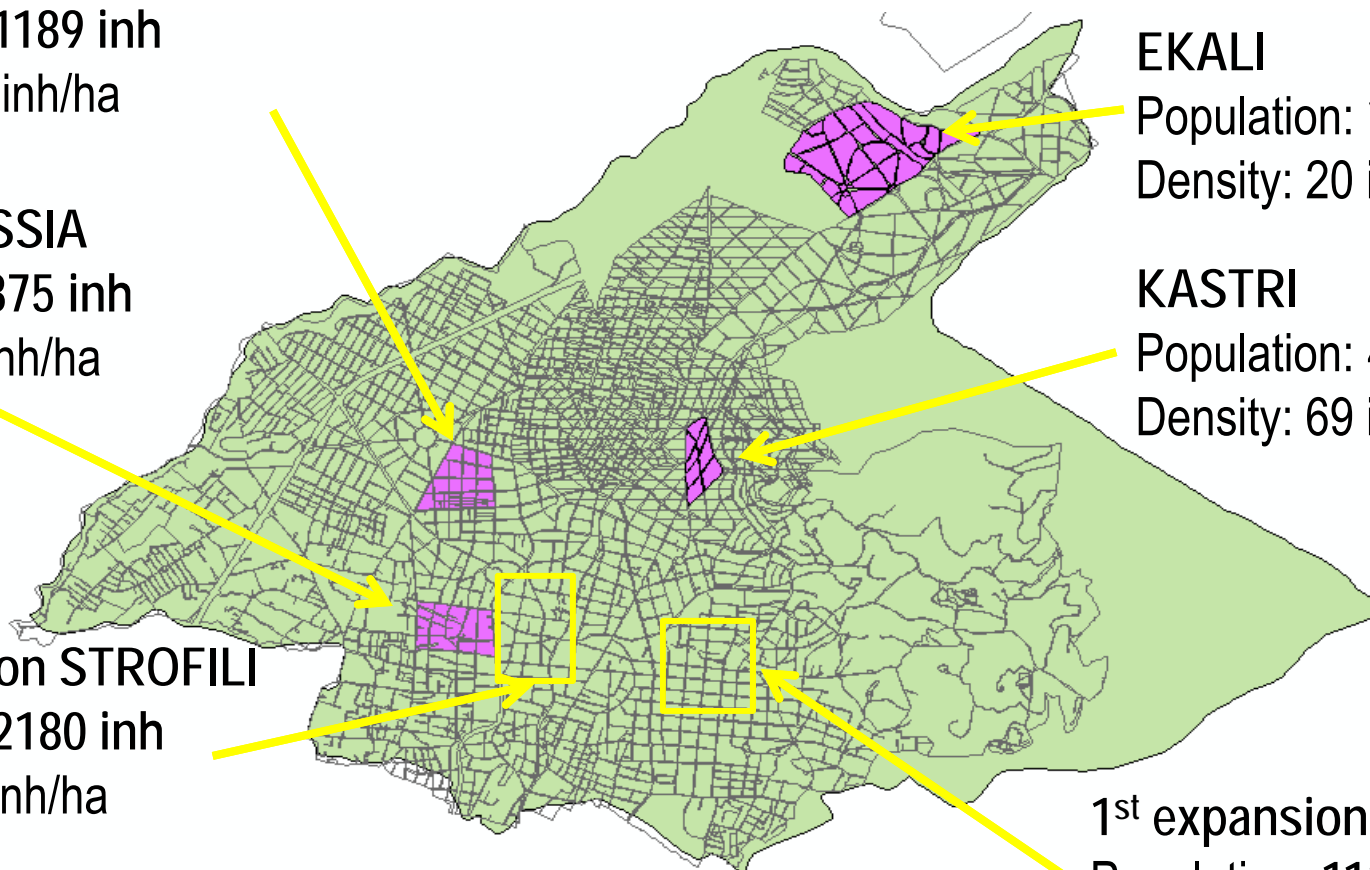
Population: 1108 inh
Density: 20 inh/ha

KASTRI

Population: 409 inh
Density: 69 inh/ha

1st expansion KEFALARI

Population: 1135 inh
Density: 41 inh/ha





Biowaste door to door collection system

Kifissia Municipality

120-360L bin for apartment blocks



35-50L for single-family detached residences



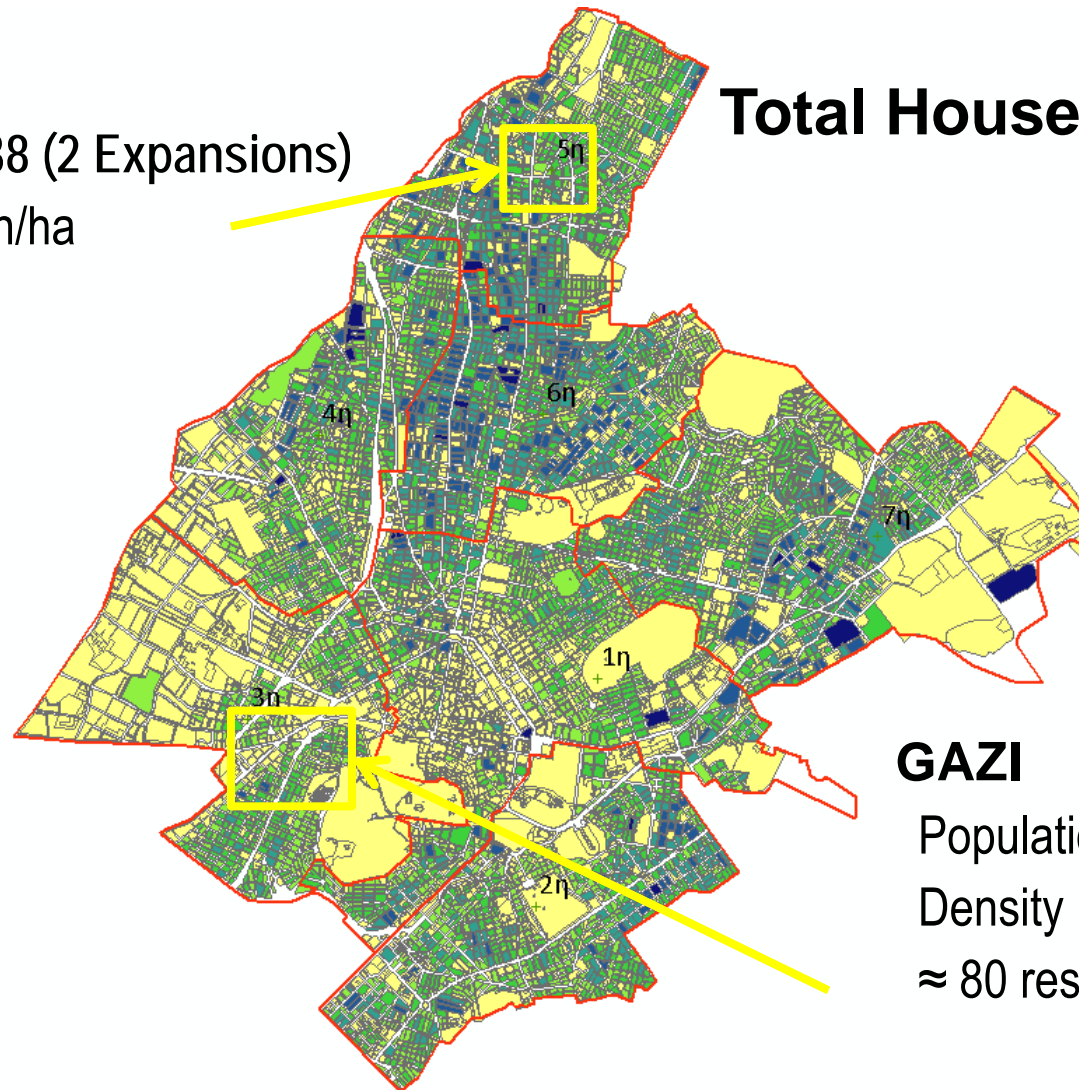
Pilot areas in Athens Municipality

KYPRIADOU

Population: 4638 (2 Expansions)

Density: 208 inh/ha

Total Households: 2341



GAZI

Population: 1.447

Density : 54 inh/ha

≈ 80 restaurant, bars etc



Biowaste kerbside collection system

Athens Municipality

10L bin per household
(including biobags)

30-50L bin per bar
restaurant etc.
(including biobags)





Selected big biowaste producers



**Hellenic Armed Forces Officers' Club
(Ministry of Defense)**



Agricultural University of Athens



Attica Flower Producers Association



Collection & Transportation of SS biowaste

Bins outside residences



Collection & transportation by dedicated vehicles and trained personnel





MBT (composting) plan in Attica Region



Mechanical and Biological (Composting) Treatment plant in Attica Region –
Treating mixed MSW operated by ESDKNA



Biowaste reception area at the MBT

Biowaste weighting



Biowaste reception area



**Analysis of collected
biowaste**



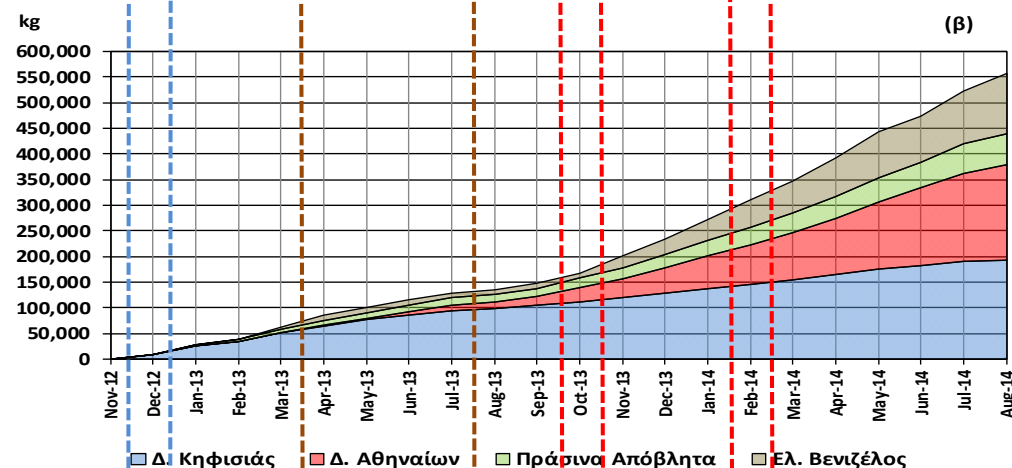
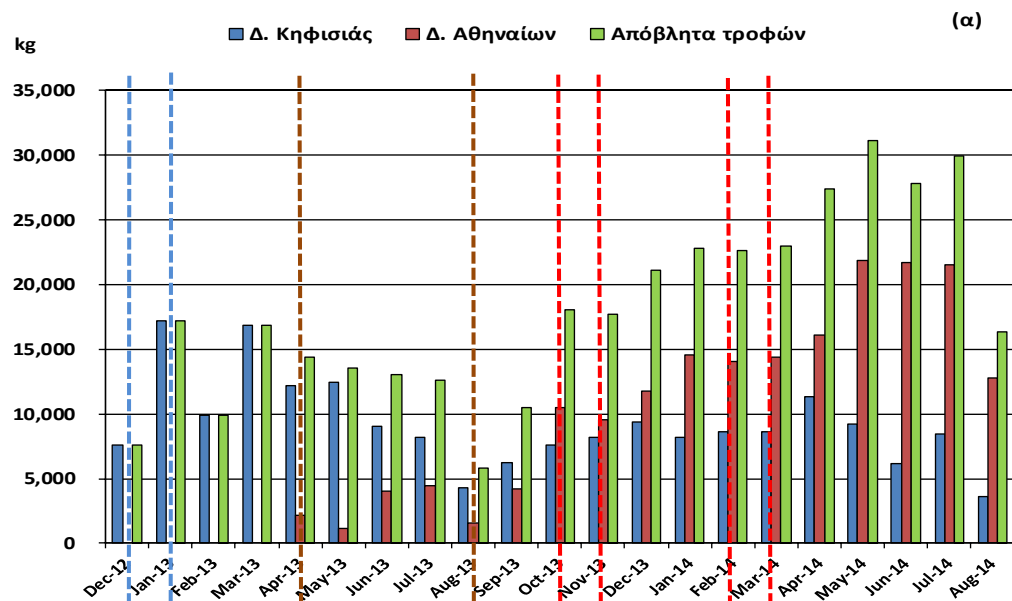


Biowaste collection quantity

Duration: 21 months
(11/2012-08/2014)

- Municipal Biowaste: 379tn
 - Athens M. – 186tn
 - Kifissia M. – 193tn
- El. Ven. Airport Biowaste: 118.5tn
- Green Waste: 59.7tn

Total Biowaste: 557 tn



Δ. Κηφισιάς
Εκάλη
Καστρί
Νέα Κηφισιά
Κάτω Κηφισιά

Δ. Κηφισιάς
Στροφύλι
Κεφαλάρι

Λοιπά Σημεία
Γεωπονικό Πανεπιστήμιο
Λέσχη Αξιωματικών
Ενόπλων Δυνάμεων

Δ. Αθηναίων
Γκάζι

Δ. Αθηναίων
Κυπριάδου +2 επεκτάσεις

Λοιπά Σημεία
Αγροτικός Ανθοπαραγωγικός
Συνεταιρισμός Αττικής ΣΠΕ
«Η Συνιδιοκτησία»



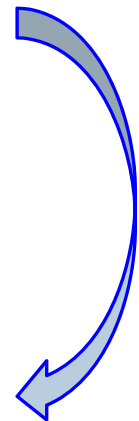
Evaluation of Biowaste SS scheme

Parameter	Unit	Athens M.	Kifissia M.
Duration	months	11	21
Quantity	tonnes	186.0	193.2
Households	Number of hh with bin	1653	1419
Participation	%	42.2	45.1
Collection rate	kg inh ⁻¹ yr ⁻¹	37.4	27.1
Recovery rate (purity)	%	91.5%	97%



Biowaste treatment process - composting

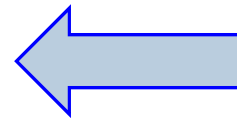
Conveyor system for biowaste



End product - compost



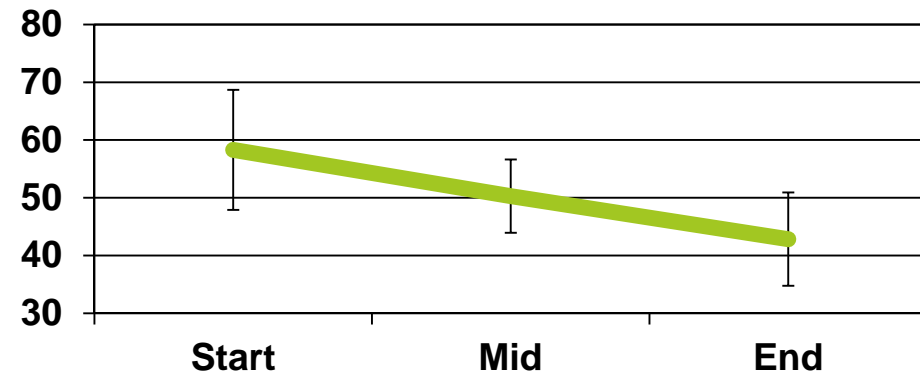
Refining



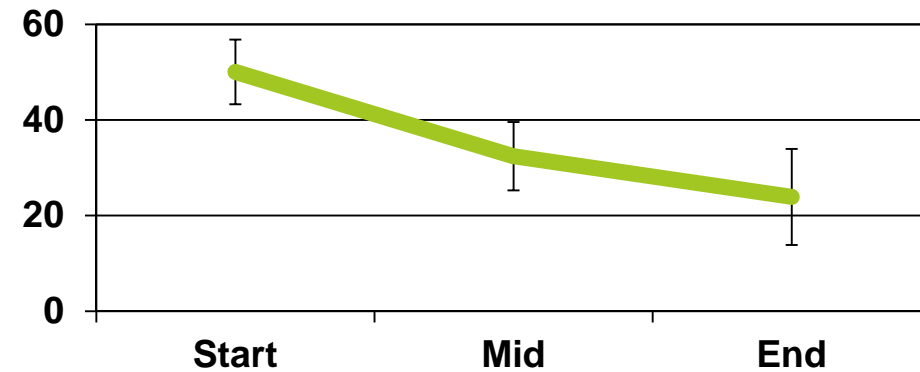


Composting process monitoring

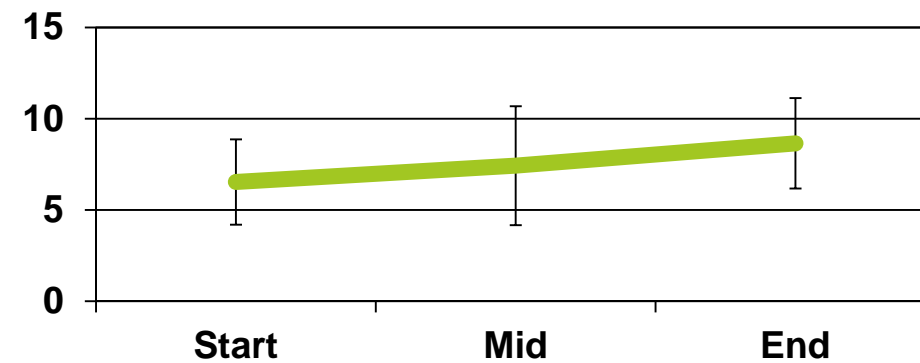
■ Temperature (°C)



■ Moisture (% w.w.)



■ Oxygen (%v.v.)



Composting tunnel length



Examination & assessment of the end product quality

EoWC aim to avoid confusion about the waste definition and to clarify when certain waste that has undergone recovery ceases to be waste

Quality Criteria for Compost	Parameter
Soil improvement	Organic Matter
Inorganic Pollutants (Heavy Metals)	Chromium (Cr)
	Copper (Cu)
	Nickel (Ni)
	Cadmium(Cd)
	Lead (Pb)
	Zinc (Zn)
	Mercury(Hg)
Hygiene (Pathogens)	Salmonella sp.
	E.Coli
Physical properties	Macroscopic Impurities (plastic, glass, metal)
Stability parameters (biological)	Viable weeds and plant propagules
	Respirometric index <u>or</u> Minimum Rottegrad III, IV, V



Heavy metals concentration (mg/kg d.m.) of mixed and ss compost

Organic Output	Cd	Cr _{tot}	Cu	Hg	Ni	Pb	Zn
Source Separated ATHENS BIOWASTE (n=17)	0.23 ±0.19	17.1 ±11.9	126.2 ±42.4	0.08 ±0.05	20.05 ±9.51	104.0 ±36.2	291.0 ±83.5
Mixed compost at the MTB	0.94	33.02	214.36	1.08	47.63	182.90	433.81
End of Waste Criteria for biowaste (EoWC)	1.5	100	200	1	50	120	600

Source separation of biowaste improves the end product quality in terms of H.M. concentration and thus can enhance the development of compost market



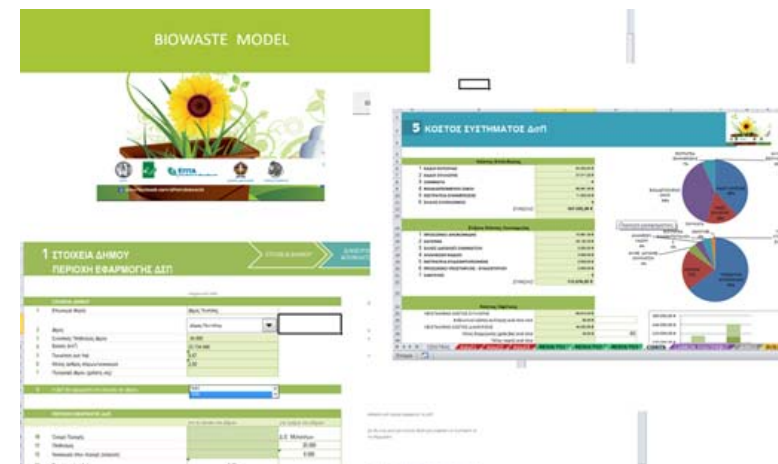
Decision support tool for biowaste management

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

Contents of the guide:

• Supplement existing biowaste management guidelines with the applied experience of Athens Biowaste LIFE + project

• 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





Public Information & Awareness Campaign

A' Phase

Introduction
Information

BEFORE SS scheme initiation

Informative Brochure, Poster

B' Phase

Engagement
Guidance

DURING SS scheme initiation

Letters to the public, Press releases, Inform the City Council and Municipal officials, Door to door Distribution of SS equipment and guidance manual, Informational Events

C' Phase

Reminding

AFTER SS scheme initiation

Letters to the public, School activities, Local events
Συλλογές Ασφαφειότητας, Τοπικές Εκδηλώσεις



The 'ISWM TINOS' LIFE+ project

'ISWM-TINOS' project aims to promote and demonstrate an **Integrated Solid Waste Management (ISWM)** system to selected areas 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%)

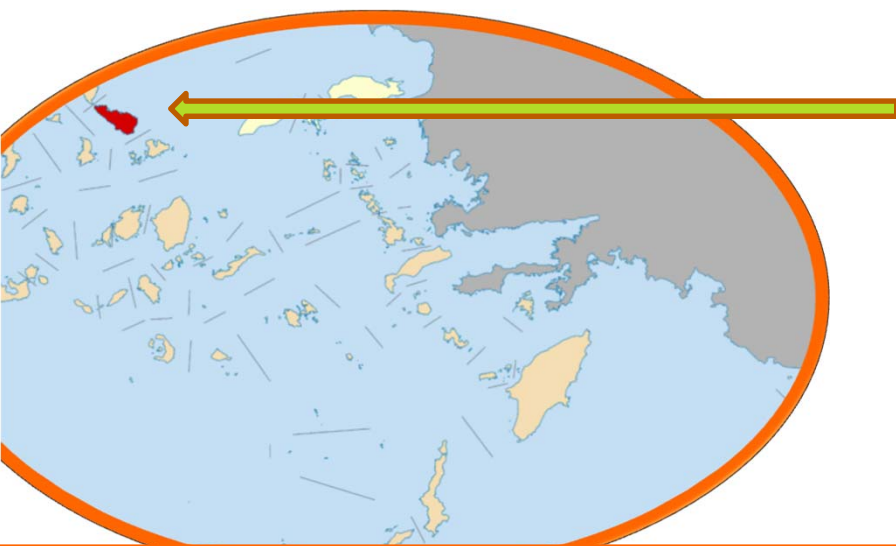
Duration: 46 months, **Start:** 01.10.2011 - **End:** 31.07.2015

Project partners:

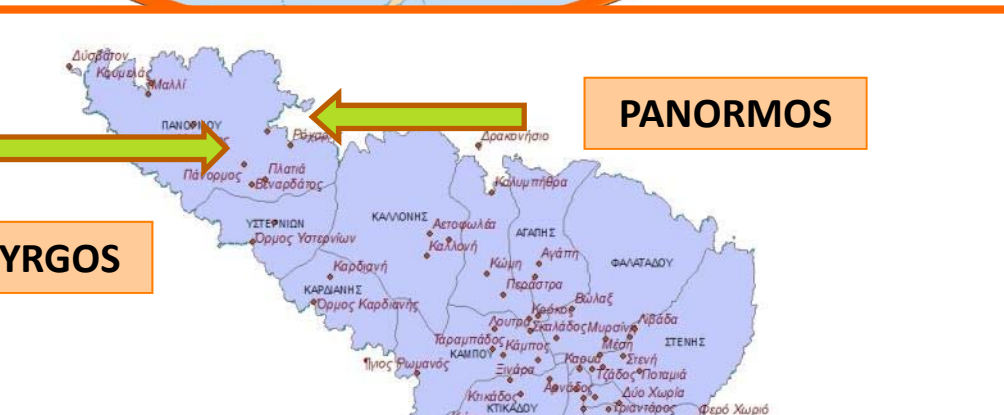
- Coordinating Beneficiary: (1) Municipality of Tinos
- Associated Beneficiaries: (2) National Technical University of Athens
- (3) Università degli studi di Verona
- (4) Centre for Research and Technology Hellas/



Pilot areas in Tinos municipality



Tinos Municipality
South Aegean Prefecture,
Greece



Population target
2 small isolated
communities
(100 households &
commercial activities)



1. Setup: ISWM scheme for Packaging Waste

Packaging Waste
Paperboard
Glass
Plastic & Metal



Indoor



Reusable bags



Outdoor



Wheelie bins 240L

(mainland)



Shipment



Collection





1. Setup: ISWM scheme for biowaste

WASTE



Indoor equipment



- Biodegradable bag
- Small bin (10 or 40 L)



Outdoor equipment



Wheelie bin 120L



mpost





1. Setup: ISWM scheme for biowaste

Compact prototype biowaste composting unit



The capacity ranges between 60 to 170 tn yr⁻¹ (residence time 15 to 60d)

Automated hydration, aeration and deodorization systems

Biofilter for the treatment of emitted gases

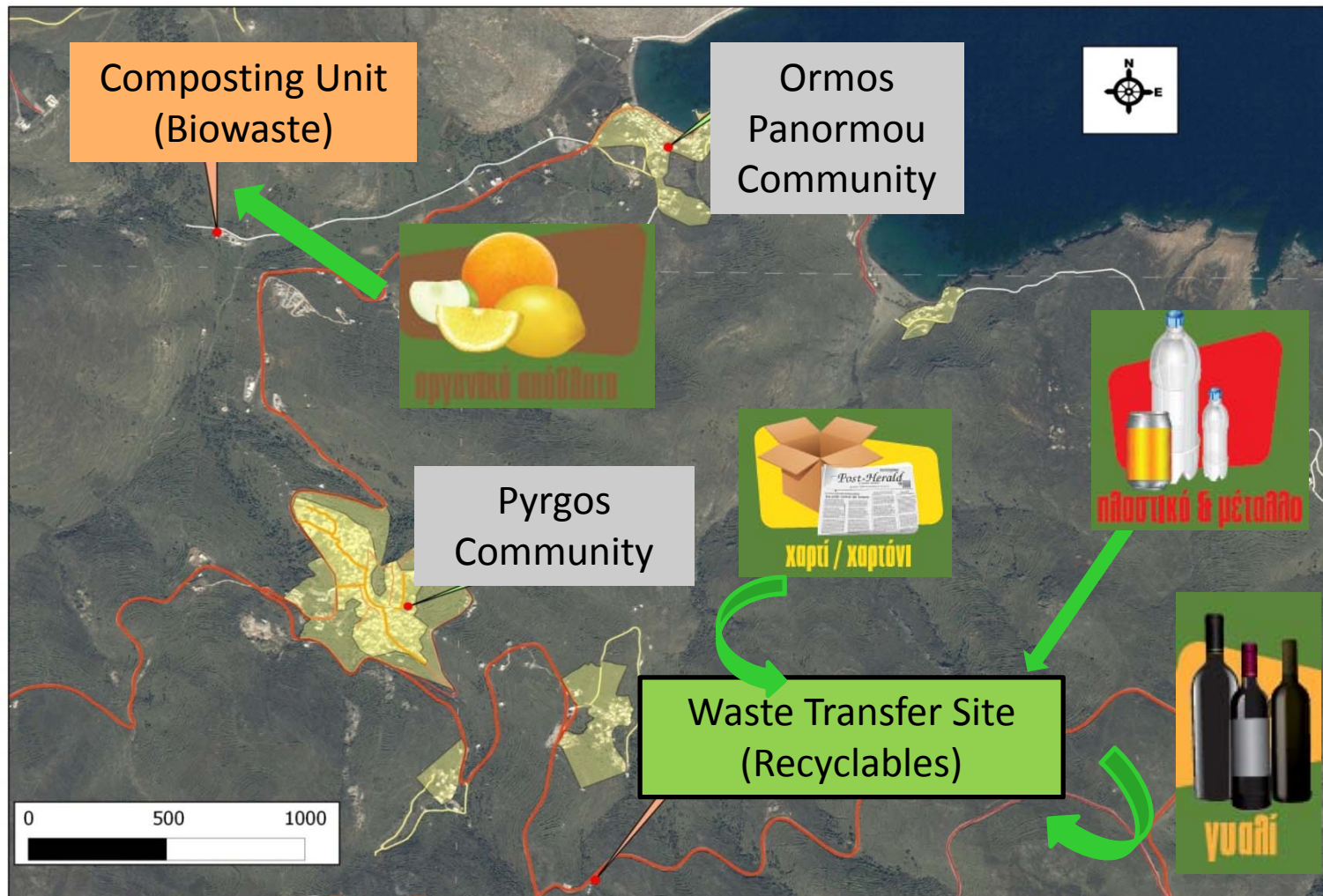
Collection and recirculation of leachates

No mechanical agitation is needed



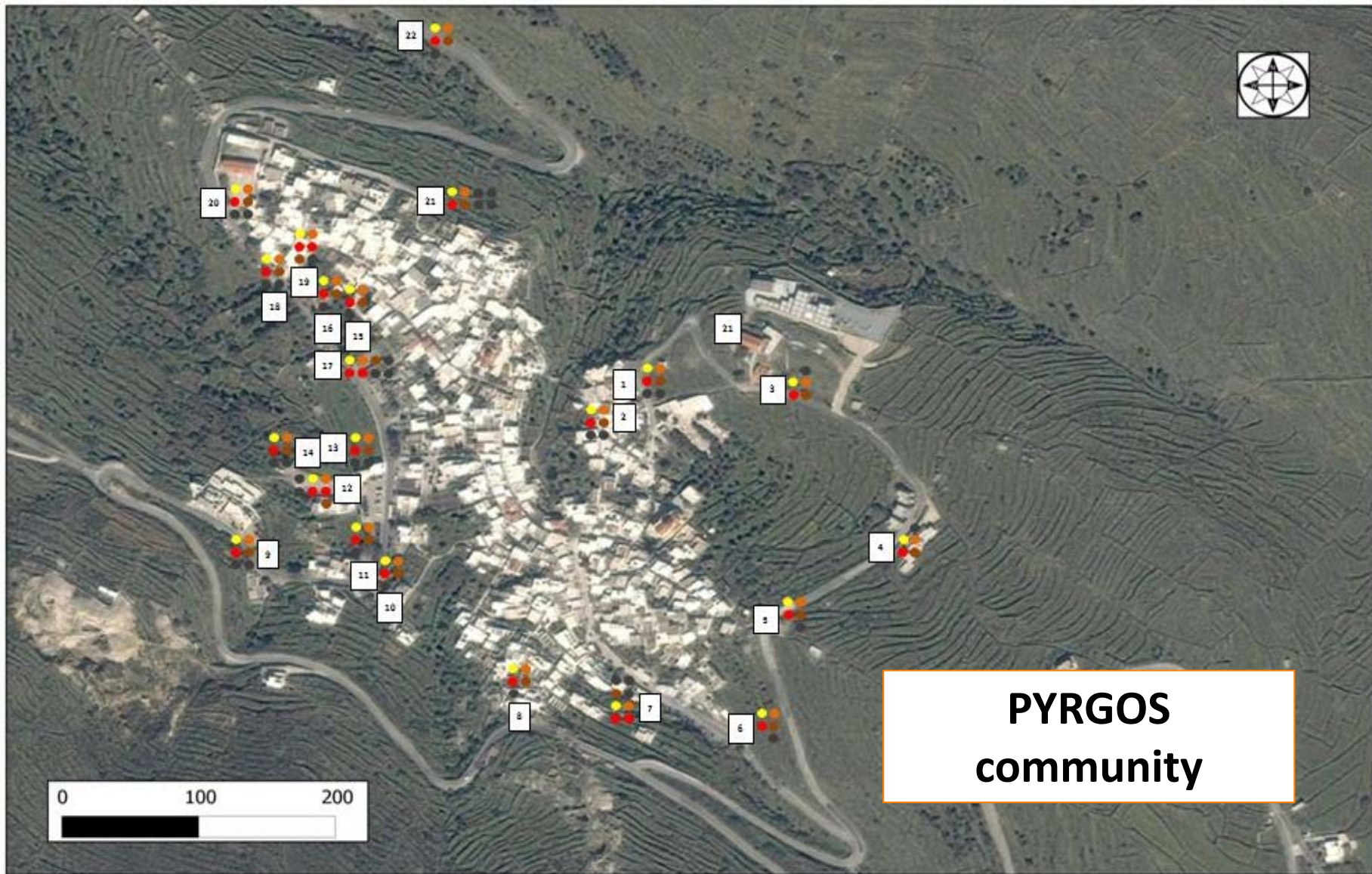


1. Setup: Overview of the ISWM



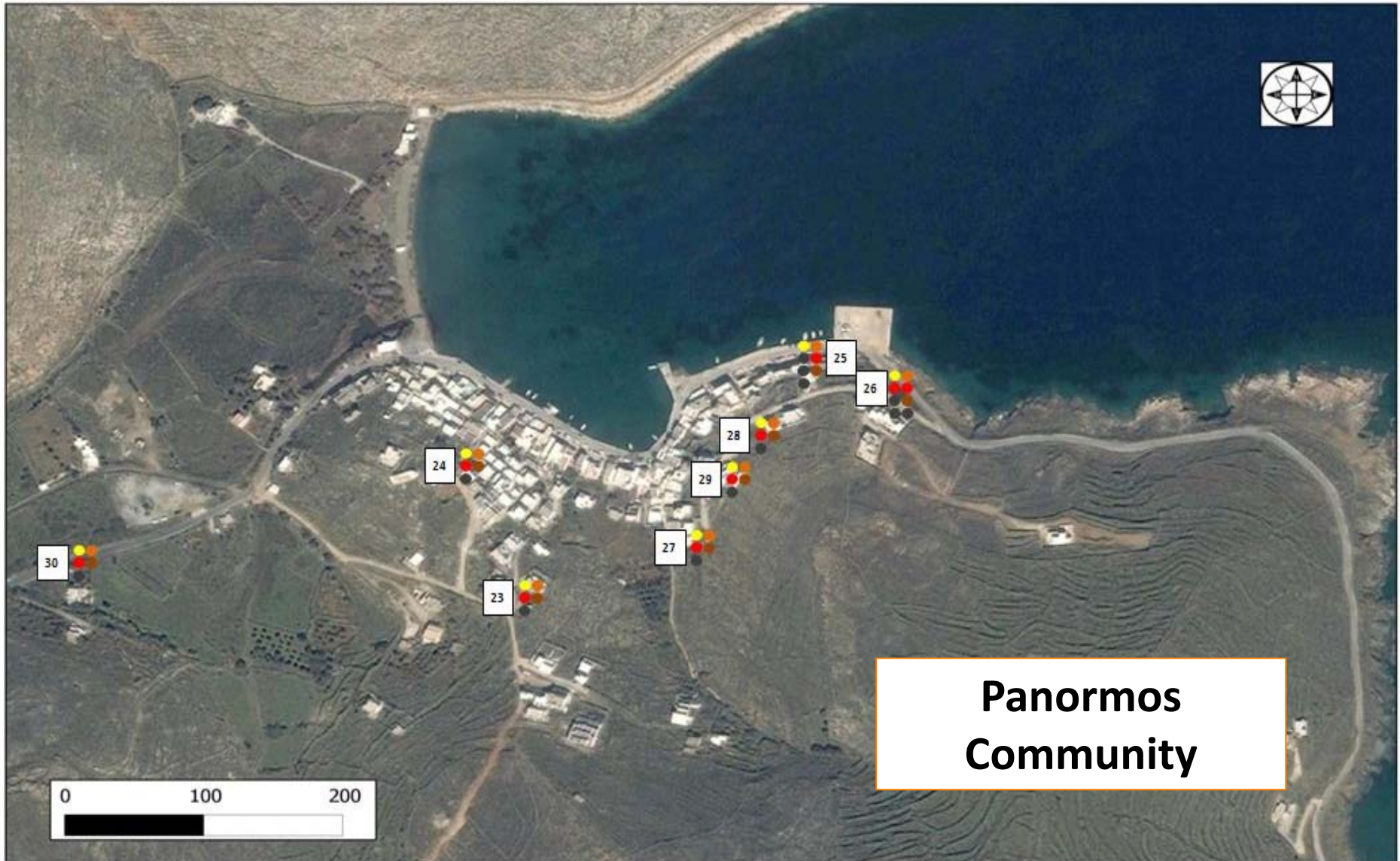


1. Setup - Kerbside collection network





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 – Overall ISWM Scheme

Waste Stream	Units	Recycling
		kg inh ⁻¹ yr ⁻¹
Paper/Paperboard	kg inh ⁻¹ yr ⁻¹	33.3
Glass	kg inh ⁻¹ yr ⁻¹	11.4
Plastic & metal	kg inh ⁻¹ yr ⁻¹	21.1
Biowaste	kg inh ⁻¹ yr ⁻¹	82.4
Total MSW	kg inh⁻¹ yr⁻¹	148.2
	% of MSW	34.2

MSW landfill diversion and recycling 28.9 tonnes per year (≈90% Recovery rate)

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)



Thank you

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