

GREEN CREW

Green - Employment in the Management of Biowastes WASTE MANAGEMENT IN GREECE

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ARISTOTLE
UNIVERSITY
OF THESSALONIKI



Municipality of Nastos





Aristotle University of Thessaloniki

- The Aristotle University of Thessaloniki is the largest University in Greece
- It consists of 7 Schools with more than 80.000 students and over 2.000 educational and research personnel
- The Department of Chemistry (P2) being part of the School of Natural Sciences, supports undergraduate, masters and PhD educational programs and conducts basic and applied research in all dominant fields of chemistry and chemical technology



Aristotle University of Thessaloniki

- The field of biomass valorization within the broader concept of Green Chemistry and Sustainability has been developed systematically over the last decade. The Department of Chemistry:
 - ▶ Possesses advanced infrastructure and scientific expertise enabling it to conduct high level basic and technological research as well as specialized measurements and industrial contracts on biomass and compost products.
 - ▶ Employs outstanding faculty members and new researchers, offering high quality teaching and training courses.
 - ▶ Carries out projects with the aim to raise environmental awareness, improve the quality of life and ensure the sustainability of resources in Greece



Role of AUTh in the project [1]

- Develop the social economy networking report and development of the social cooperation enterprise manual
- S.W.O.T analysis report stating the high level of situation awareness in all critical issues concerning the existing potential on bio-waste manipulation
- Education services, which include smart education methods, in composting methodologies and biomass management
- Support Municipalities of Serres and Nestos in optimization of compost systems
- Development of protocols for the production and application of compost



Role of AUTh in the project [2]

- Development analytical methodology for the determination of physicochemical characteristics of biomass raw material and the produced compost
- Evaluation of different compost products to improve soil properties and to contribute the sustainability of soil health
- Develop of a social impact evaluation study



WP3

Exploring the social contribution of bio-waste utilization

WP4

Recycling of organic waste

WP5

Evaluation & framework development

Waste Management in Greece

- ▶ During the last two decades the solid waste management in Greece has been upgraded.
- ▶ The legal framework that designates the direction of waste management in Greece follows closely the development of European waste management and the corresponding Directives.
- ▶ Over the last decade all relevant EU Directives have been transposed to Greek laws, with the most recent case being the transposition of the Waste Framework Directive (2008/98/EC) in the Law 4042/2012 of 2012
- ▶ National Waste Management Plan (NNAP) and the National Strategic Waste Prevention Plan were approved by Ministerial Act 49 of 15.12.2015 "Modifying and approving the National Waste Management Plan (NASDAW) and the National Strategic Plan Waste Prevention Plan, y, in accordance with article 31 of Law 4342/2015 "

Waste Management in Greece

- ▶ The major driver behind waste management in Greece is the Joint Ministerial Decision 50910/2727/2003 'on measures and terms for solid waste management - national and regional planning management' with the National Waste Management Plan annexed to it.
- ▶ Basic principles and targets for solid waste management together with the specifications for national and regional planning are set there. The plan will be revised every five years or earlier if necessary .
- ▶ The Ministry of Environment is responsible for policy making, national planning, technical matters, as well as licensing and regulating the financing of large waste treatment and disposal facilities

Waste Management in Greece

- ▶ According to the National Solid Waste Management Plan (NSWMP), the operation of transfer stations, the processing and disposal of waste lies within the jurisdiction of Waste Management Authorities (WMA),
- ▶ The Ministry of Interior is responsible for the establishment of the registry of WMA.
- ▶ For waste streams apart from MSW, the management responsibility lies with producers, according to the 'polluter pays principle' introduced in 2003 by the NSWMP.
- ▶ The inter-ministerial committee for integrated waste management was established in March 2008 according to the M.D. 325/14.03.08 on 'Establishment of a Waste Management Inter-ministerial Committee' and has been given strategic planning responsibilities.

Waste Management in Greece

- ▶ National waste policy is geared towards the following milestones for 2020:
 - per capita waste to be drastically reduced,
 - preparation for re-use and recycling with separate collection of recyclable bio-waste to be applied to 50% of all MSW,
 - energy recovery is a complementary form of management when the margins of any other recovery have been exhausted and landfill is the last option and has been reduced to less than 30% of all DMLs.

Waste Management in Greece

- ▶ The strategies for implementing the new national waste management policy are as follows:
 1. Develop an integrated waste management plan
 2. Ensure high protection of the environment and human health
 3. Applying Sorting at Source as the most promising way of collecting to achieve high-quality recycling.
 4. Rationalization of waste management services costs and promotion of economically and environmentally sustainable investments in the waste sector, aiming to establish a rewarding benefit to the citizen from recycling
 5. Energy Recovery - Waste Energy Utilization

Waste Management in Greece

- ▶ In particular, per waste stream, the strategies adopted are:
 1. **Urban solid waste**
 - ❖ Establish separate collection and recovery of bio-waste.
 - ❖ Establish a separate collection of paper, glass, metals and plastics.
 - ❖ Organize separate collection and other MSW streams with targeted collection for further preparation for re-use and recycling.
 - ❖ Considering domestic composting as a recycling rather than as a prevention.
 - ❖ Establishment of measures to prevent waste generation, especially for food waste and packaging. Development of a Special Waste Management Zone (ZEDA) for island and tourist areas.
 - ❖ Upgrading the quality of city equipment (bins, vehicles, pavement abrasions, public cleaning labels, street sweepers, etc.).
 - ❖ Establishment of regulatory actions by local authorities to organize local communities and reward environmental management of MSWs.

Waste Management in Greece

2. Sludges urban type

- ❖ Tackling sludge as a resource - source of organic substance for use for the benefit of agriculture or for the recovery of energy.

3. Waste of utilities, public service, etc.

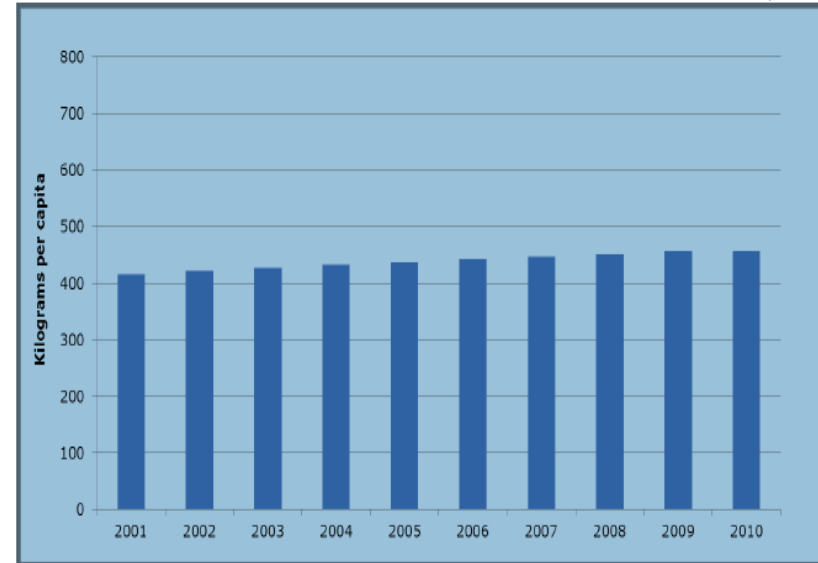
- ❖ Promoting the implementation of separate collection systems for at least paper, glass, metal and plastic using the best economic and environmental method and maximizing performance with the responsibility of facility operators

4. Agricultural and animal waste

- ❖ Seek full recovery of agricultural and livestock waste, with priority being given to their recovery in agriculture and establishing co-operation with the recycling industry for biodegradable waste.
- ❖ Optimal utilization of the energy content of agricultural and livestock waste.
- ❖ Promotion of organic methods in agricultural production, in order to increase the absorption of soil improvers produced by agro-livestock.
- ❖ Ensure the environmentally sound management of agricultural and livestock production waste (plastics greenhouses, pesticide packaging, etc.).
- ❖ Informing and raising awareness among producers of agricultural and livestock products about the benefits (economic and other) that can be caused by the legal management of such waste.

In Greece they are produced every year:

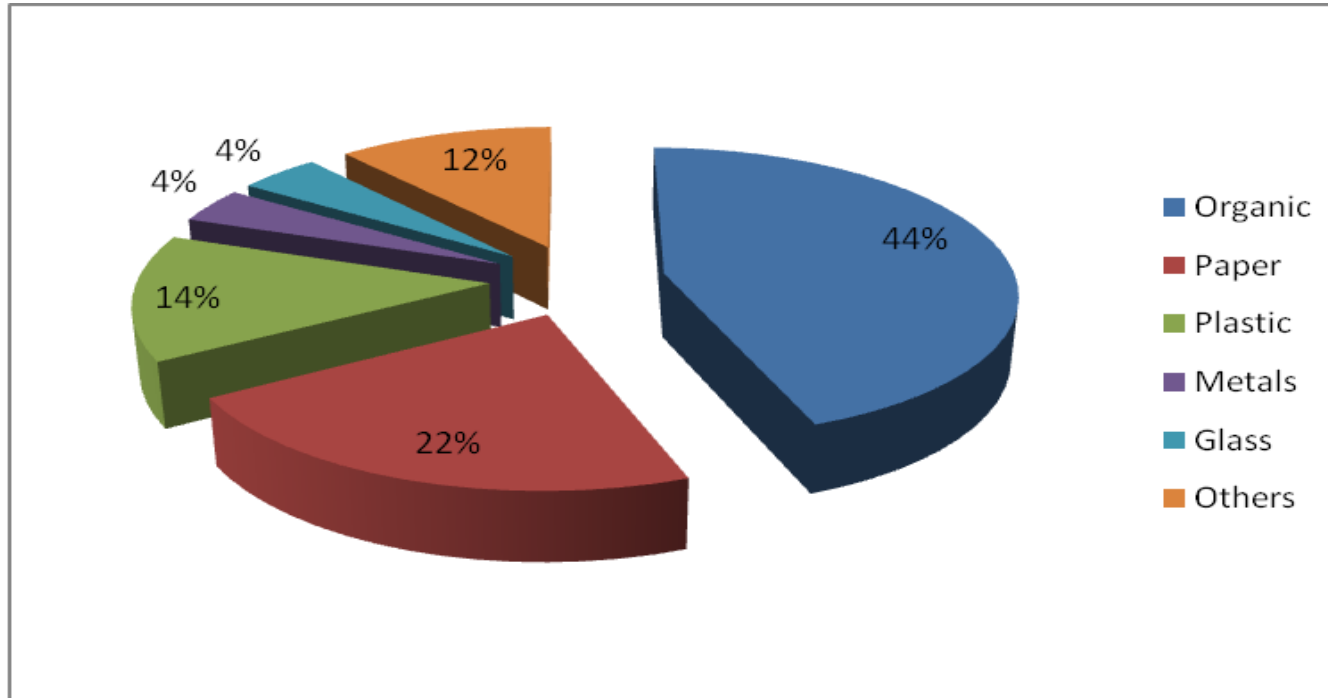
- ▶ 5 million tonnes of household waste
- ▶ 450,000 tonnes of hazardous industrial waste
- ▶ 15,000 tons of infectious hospital waste



Source: Eurostat, 2012

MSW generation per capita in Greece

Average qualitative composition



Average qualitative composition (%) of MSW in Greece (from Department of Solid Waste Management MEECC)

Composting in Greece

- ▶ Composting in Greece is still a concept unknown in general public, while at the same time in most developed countries of Europe America and Asia is an important way to dispose of solid waste
- ▶ For Greece, composting becomes even more important, as it belongs to the Mediterranean where climatic conditions, terrain and farming practices result in a high degradation rate of soil organic

Composting of Organic Wastes



The degradation of the organic substance as a biological process, and as it occurs in nature, it has two main drawbacks:

- ▶ It is a slow process
- ▶ Human intervention in order to influence the process is very difficult

Compost Definition

The process of biological degradation of organics residues and wastes, by human intervention; under controlled conditions, is attributed to the international term composting.

The material in which organic residues are converted into by the particular process is called internationally compost (compost) and is one organic (organo-chemical) soil conditioner.

Composting is the natural biological process of degradation of organic matter, in which human intervention has led to intensification & maximization of its performance. The process is microbial, aerobic, thermophilic and yields a stabilized combo product.

What is stabilized compost?

- ▶ The main characteristic of the dead organic matter is its instability, as it is constantly in the process of decomposing under certain favorable conditions.
- ▶ By the Composting process we can achieve a more rapid decomposition and its passage to relative stabilization, in which its degradation continues but at a slow pace.
- ▶ In this situation, no environmental problems are caused at the same time as it can be exploited in agriculture, but also in other uses.

Desirable materials for composting

- ▶ Plant and ornamental plant residues (branches, shoots)
- ▶ Various weeds (do not have mature seeds)
- ▶ Leaves
- ▶ Ground from pots (when their soil is renewed)
- ▶ Branches of trees and shrubs
- ▶ Grass from lawns
- ▶ Superior or damaged fruit
- ▶ Eggs
- ▶ Coffee residue (with filters) and tea residue
- ▶ Vegetable residues from cleaning them in the kitchen (potato stalks, beans, peas, beans, etc.)
- ▶ Remnants of cooked foods that have not been added to oil
- ▶ Flowers from the cupboards
- ▶ Wood shavings & sawdust

Unwanted materials to be composting

- ▶ stones
- ▶ metal objects
- ▶ plastic
- ▶ glass
- ▶ printed paper
- ▶ food residues containing fats, meat, bones
- ▶ cleaning equipment
- ▶ remnants of affected crops or excessively sprinkled
- ▶ manure from animals treated with antibiotics
- ▶ large amounts of citrus peel
- ▶ pine needles

The technique & the factors that affect composting

1. The particle size of the organic matter

- ▶ It greatly affects microbial activity - increased surface effect
- ▶ It reduces air gaps thus allowing the prevalence of anaerobic conditions
- ▶ Ideal particle size: 1.5 - 7.5 cm

The technique & the factors that affect composting

2. Microflora

- ▶ The most important sums of microorganisms in composting are bacteria, fungi and actinomycetes
- ▶ This microflora is normally present in the waste, it is pre-existing in the soil, air and water, and it is usually not necessary to add a microflora contaminant to the line stacks of the organic wastes

The technique & the factors that affect composting

3. The humidity of composting rows

- ▶ The ideal moisture level varies according to the origin of the material to be decomposed.

Desired humidity = 45% for fine materials

Desired humidity = 60% for coarse materials

The technique & the factors that affect composting

4. C / N ratio (carbon / nitrogen)

- ▶ The various organic residues usually have a high C / N ratio
- ▶ The ideal value of the C / N ratio in the material to be digested is that of 30 / 1, since from 30 parts the microorganisms hold 1 / 3 to build their own cells and exhale 2 / 3 as CO₂.

The technique & the factors that affect composting

5. The pH of the composting windrows

- ▶ Ideal pH for composting is considered to be the one that is slightly alkaline since it favors the activity of bacteria without significantly limiting the activity of fungi
- ▶ However, it is not always necessary to correct the pH of the material as with the onset of digestion the pH rises to the slightly alkaline region mainly due to the release of ammonia and consequently this need is covered by the process itself

The technique & the factors that affect composting

6. Composting temperature

The ideal temperature for microbial activity in compost heaps is considered to be between 50 and 65 °C

Quality - Applications of compost 1

- ▶ The quality of the compost depends mainly on the raw material and the correct process of composting.
- ▶ Compost is used in two ways in agricultural practice.
- ▶ One is for the improvement of cultivated lands and the other for the preparation of substrates for the development of horticultural and floricultural plants.
- ▶ The addition of mature compost to the soil has positive effects due to the increase in organic soil, which means improving some of its physical and chemical characteristics such as:
 - the porosity
 - water capacity
 - the water / air relationship,
 - the pH value
 - the available amount of nutrients, etc.

Quality - Applications of compost 2

Compost is used in the following situations:

1. As a soil enrichment material for the production of outdoor ornamental plants instead of peat
2. In the plots of new gardens, when mixed with the new fertile soil in a ratio of 1 : 3 (compost : soil)
3. In the new lawn installations, instead of using peat, which must be free from weed seeds, otherwise we may encounter infestation problems
4. On old degraded lawns, due to intensive use by customers

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