

GREEN CREW

ESTABLISHING A COMPOSTING PLANT

Μαρία Γιώρτσου

Δασολόγος MSc Διαχείριση Αποβλήτων

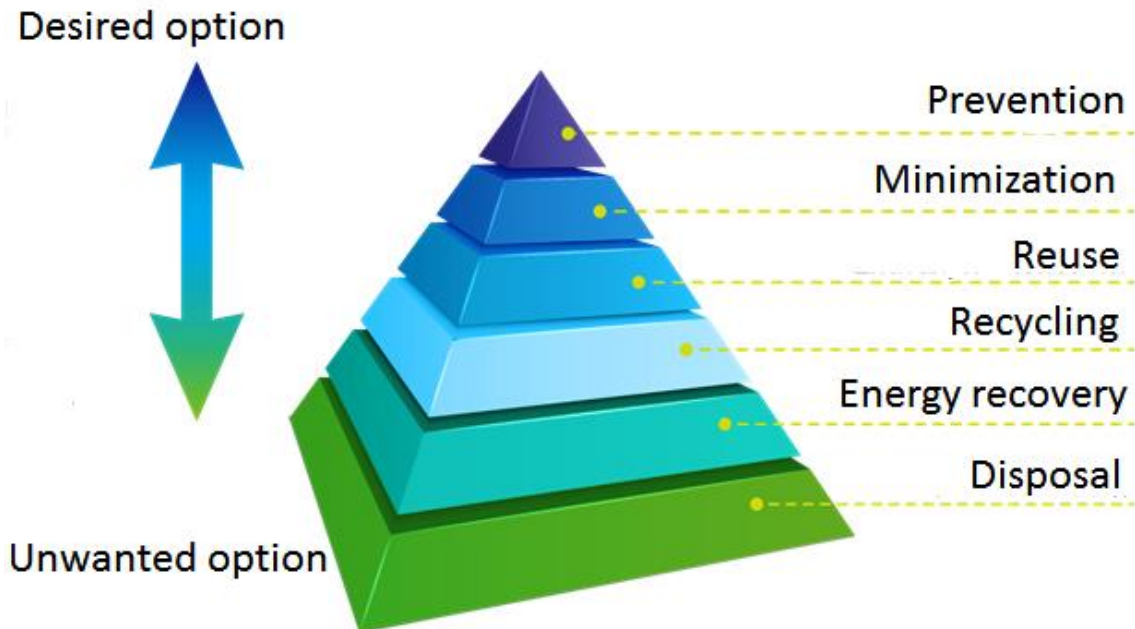


ESTABLISHING A COMPOSTING PLANT

Summary of European waste policy (Directive 2008/98)

Basic logic 1: Waste is a valuable resource that can deliver multiple benefits through rational management and exploitation.

IMPLEMENTATION OF THE WASTE MANAGEMENT OPTIONS



Basic logic 2: Promote the "cyclical economy with a view to sustainable economic growth and the creation of new jobs.

The role of Local Authorities in the context of the cyclical economy is particularly important: Municipalities have to integrate the directions of the cyclical economy through Local Decentralized Management Plans so that the cyclical economy does not remain merely a theoretical approach.

The cyclical economy will permanently preoccupy our country in the coming years as the largest European economic, political and social challenge that is directly related to the sustainability of our EU, our country and local communities.

The preparation of Local Solid Waste Management Plans where municipalities will develop new actions, based on a comprehensive plan and not fragmentary, in the direction of the three main priorities of the hierarchy (Prevention, Reuse, Recycling - **Composting**).

Current revised EU policy proposal for wastes 1

- A target of 65% recycling of municipal waste by 2030
- A target for the recycling of 75% of packaging waste by 2030
- Binding target to reduce landfill to a maximum of 10% by 2030
- Prohibition of the landfill of separately collected waste
- Use financial means to discourage landfill

Current revised EU policy proposal for wastes 2

- Simplifying and improving definitions and harmonizing methods for calculating recycling rates throughout the E.U.
- Promoting re-use and enhancing industrial co-existence - turning a by-product of an industry into raw material from another industry
- Financial incentives for producers to have more green products on the market and support recovery and recycling programs

National legislation defining the establishment of a composting unit

- Low No
- Low No
- Low No

The National waste policy is geared to the following milestones for 2020:

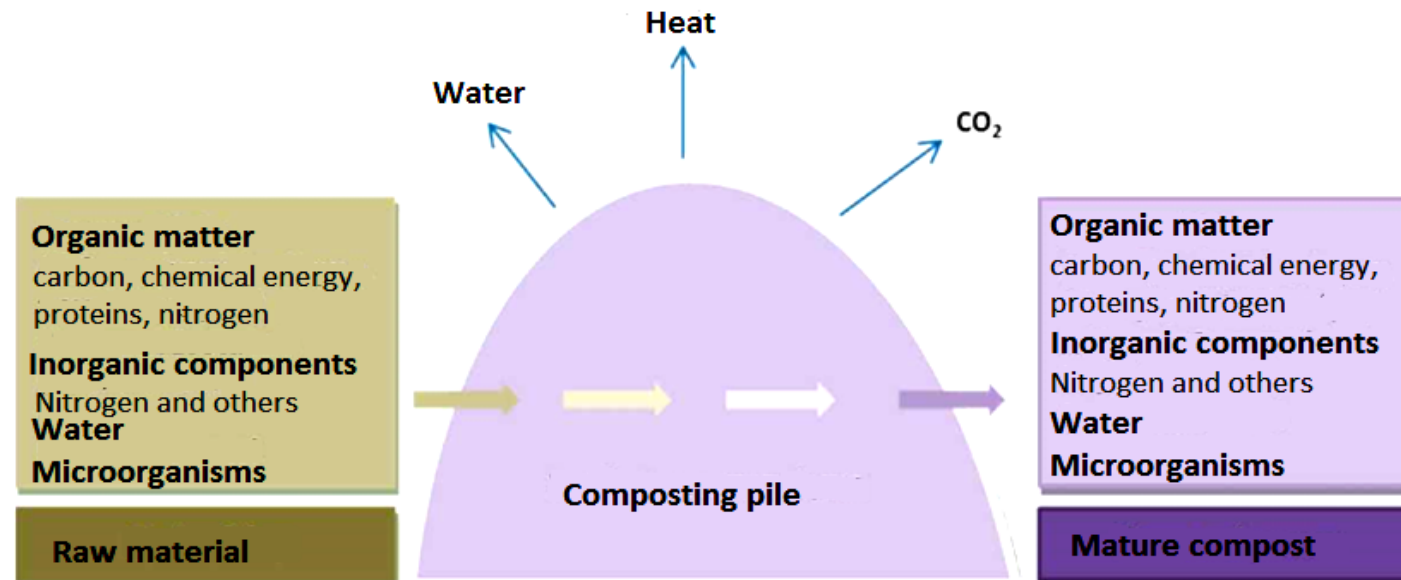
1. Ensuring the public nature of solid waste management
2. Integrated planning for all waste streams at national, regional and local level
3. Ensure high protection of the environment and human health
4. Promoting the efficient use of resources for the benefit of society and in a socially equitable manner
5. Upgrading public and municipal waste management services to citizens and waste producers
6. Rationalizing costs of waste management services and promoting economically viable and environmentally acceptable investments in the waste sector

National Strategy Specialization for the Biodegradable Urban Waste (BUW) - key directions

- Implementing combined actions to promote prevention on BUW production
- **Priority** is given to the creation of small-scale decentralized recovery units (composting, anaerobic digestion) of separately collected organic matter, and secondly to the processing of biomass processing units of residual aggregates on the basis of proximity and with the minimum operating and transport costs
- The **Development of synergies** with other productive sectors (agriculture, livestock farming, etc.) to co-manage organic waste and ensure the technical and economic viability of processing plants

Business Logic for the establishment of a small composting unit.
The "social" dimension of business operation:

- **Diversion of quantities** of organic waste from burial
- **Production of soil improvers** of good quality as input into local agriculture
- **Contribution to the development** of the local cyclical economy



The aim of the composting plant is to produce a product rich in humus that meets the market requirements for various uses

- as soil improvers
- as crop substrate
- for enriching problematic agricultural soils with organic matter
- for upgrading of leached - poor forest land for rehabilitation
- for green projects in urban regeneration
- for green projects in major public works e.g. road construction etc.

Raw material of the composting plant 1

| Code according to European Waste Catalog | BASIC FEATURES |
|---|--|
| 02. WASTES FROM AGRICULTURE, GARDENING, AQUACULTURE, FORESTRY, HUNTING AND FISHING, PREPARATION AND FOOD PROCESSING | |
| 02 01 WASTES FROM AGRICULTURE, GARDENING, AQUACULTURE, FORESTRY, HUNTING AND FISHING | |
| 02 01 01 sludge from washing and cleaning | Sludge from cleaning and washing plant residues |
| 02 01 02 animal tissue waste <i>They fall under the Animal Production Residues Regulation</i> | Feathers, hair, horns, hooves, shells, raw milk, shellfish, eggs, hatchery by-products, etc. |
| 02 01 03 plant tissue waste | Crop residues (fruits, vegetables, cereals, dried herbs), seaweed |
| 02 01 06 feces, urine and animal feces (including spoiled fodder), effluent collected separately and processed outside the production site <i>They fall under the Animal Production Residues Regulation</i> | Mainly residues from livestock units |
| 02 01 07 wastes from forestry | Trees and logs of branches, branches, roots, leaves, shrubs, etc. |
| 02 02 WASTES FROM PREPARING AND PROCESSING MEAT, FAT AND OTHER FOODSTUFFS OF ANIMAL ORIGIN | |
| 02 02 02 animal tissue waste <i>They fall under the Animal Production Residues Regulation</i> | Feathers, hair, horns, hooves, shells, raw milk, shellfish, eggs, hatchery by-products, etc. |
| 02 02 03 materials unsuitable for consumption or processing <i>They fall under the Animal Production Residues Regulation</i> | |

Raw material of the composting plant 2

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| 02 03 WASTES FROM PREPARING AND MANUFACTURE OF FRUIT, VEGETABLES, CEREALS, SPIRIT OILS, COCOA, COFFEE, TEA AND TOBACCO MANUFACTURE OF CANNES PRODUCTION OF DESSERTS AND EXTRACTS OF DESSERT, PREPARATION AND MELASSON FERTILIZATION | |
| 02 03 01 sludge from washing, cleaning, peeling, centrifuging and separation | |
| 02 03 04 materials unsuitable for consumption or processing | Expired food from these production facilities |
| 02 05 WASTES FROM THE DAIRY PRODUCTS INDUSTRY | |
| 02 05 01 materials unsuitable for consumption or processing <i>They fall under the Animal Production Residues Regulation</i> | Expired dairy products |
| 02 06 WASTES FROM INDUSTRIAL BAKERY AND CONFECTIONERY | |
| 02 06 01 materials unsuitable for consumption or processing (sweets, etc.) | Expired pastry bakery products (bread, dough), |
| 02 07 WASTES FROM THE MANUFACTURE OF SPIRIT DRINKS AND NON-ALCOHOLIC BEVERAGES (EXCL. OF COFFEE, COCOA AND TEA) | |
| 02 07 01 wastes from washing, cleaning and mechanical reduction of raw materials | Provided that have not been added chemicals or other additives |
| 02 07 02 wastes from the distillation of alcohol | Fruit residues (e.g. grapes) |
| 02 07 04 materials unsuitable for consumption or processing | Vegetable Remnants |

Raw material of the composting plant 3

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|---|---|
| 03. WASTES FROM WOOD PROCESSING AND MANUFACTURE OF TABLETS AND FURNITURE, AND PULP, PAPER AND PAPERBOARD | |
| 03 01 WASTES FROM WOOD PROCESSING AND MANUFACTURE OF TABLETS AND FURNITURE | |
| 03 01 01 waste bark and cork | Unprocessed natural wood |
| 03 01 05 ξshavings, sawdust, cuttings, wood waste, particle board and veneer other than those mentioned in 03 01 04 (i.e. not containing dangerous substances) | Unprocessed natural wood |
| 03 03 WASTES FROM THE MANUFACTURE AND MANUFACTURE OF PULP, PAPER AND PAPERBOARDS | |
| 03 03 01 bark and wood waste | Unprocessed natural wood |
| 04. WASTE FROM LEATHER, FURNITURE AND WEAVERS INDUSTRIES | |
| 04 02 WASTE FROM TEXTILE INDUSTRY | |
| 04 02 21 wastes from untreated textile fibers | Residues of cellulose fibers, vegetable fibers or wool fibers |
| 15. WASTES FROM PACKAGING, ABSORBENT MATERIALS, WIPER FABRICS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED OTHERWISE | |
| 15 01 PACKAGING (INCLUDING SPECIALLY COLLECTED MUNICIPAL PACKAGING WASTE) | |
| 15 01 02 plastic packaging | Biodegradable packaging certified according to EN 13432 |

Raw material of the composting plant 4

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| 19. WASTES FROM WASTE TREATMENT PLANTS, WASTE WATER TREATMENT PLANTS OUTSIDE PRODUCTION POINTS AND PREPARATION OF WATER INTENDED FOR HUMAN AND WATER CONSUMPTION FOR INDUSTRIAL USE | |
| 19 05 WASTES FROM AIRWORKS SOLID WASTE PROCESSING | |
| 19 05 03 compost products out of specification | The oversized fraction from the compost refining |
| 19 06 WASTES FROM WATER PROCESSING WASTE TREATMENT | |
| 19 06 06 fermentation products from the anaerobic treatment of animal and plant waste | The digestive from the anaerobic fermentation |
| 20 MUNICIPAL WASTES (HOUSEHOLD WASTE AND SIMILAR WASTES FROM COMMERCIAL ACTIVITIES, INDUSTRIES AND INSTITUTIONS) INCLUDING PARTIES OF SEPARATE COLLECTION | |
| 20 01 SEPARATE COLLECTED PARTS | |
| 20 01 08 Biodegradable kitchen waste and living quarters <i>They fall under the Animal Production Residues Regulation</i> | Residues of food from households, restaurants, bars, cafes, hospitals, |
| 20 01 38 Wood other than those mentioned in 20 01 37 | Residues of natural wood without treatment. Not furniture and bulky household waste. |

Raw material of the composting plant 5

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| 20 02 GARDEN AND PARK WASTES (INCLUDING GREEN WASTE FROM CEMETERIES) | |
| 20 02 01 Biodegradable waste | Grass, dry grass, leaves, flowers, tree bark, pruning from private gardens and public places (parks, squares, sports fields, etc.) |
| 20 03 OTHER MUNICIPAL WASTES | |
| 20 03 02 Waste from markets <i>They fall under the Animal Production Residues Regulation</i> | Only biodegradable materials similar to those that have code 20 01 08 and 20 02 01 |

Additive raw materials of the composting plant - 1

| DESCRIPTION | MATERIALS | USE |
|---|---|------------------------------------|
| ACTIVATORS | | |
| <p>They consist of microorganisms and enzymes added to the mixture for the rapid onset of biodegradation.</p> <p>An increase in the population of aerobic microorganisms is achieved resulting in an immediate start of the composting process and the avoidance of anaerobic conditions.</p> | <ul style="list-style-type: none">▪ mature compost that is always available in the plant▪ soil from fertile soil▪ other special actuators (should be tested by testing on compost stacks) | <p>Always in forming the pile.</p> |

Additive raw materials of the composting plant - 2

| DESCRIPTION | MATERIALS | USE |
|--|---|---|
| ACTIVATORS | | |
| Materials / substances added to regulate critical composting parameters (O / N, pH, porosity, moisture), avoiding anaerobic conditions and reducing odors during composting. | <p>Structural materials such as: cut branches, bark, straw, sawdust The addition of structural materials is necessary when the basic raw material is pre-biodegradable and should always be available in the plant.</p> <p>Other materials such as:</p> <ul style="list-style-type: none">▪ mineral powder (zeolite, basalt, pumice perlite)▪ bentonite clay▪ agricultural lime in powder or stone form▪ ash (up to 2% by weight) and non-hazardous by biomass burning▪ excavation soil | <p>Structure materials are required at 40-60% v / v. of the original compost mix.</p> <p>Other materials are added on a case-by-case basis and subject to availability in the area.</p> |

Additive raw materials of the composting

| DESCRIPTION | MATERIALS | USE |
|--|--|--|
| ADDITIVES ON THE FINISHED PRODUCT | | |
| Materials added to mature compost in order to obtain commercial value or be suitable for specific agricultural uses. | <ul style="list-style-type: none">▪ zeolite, perlite, peat, sand, etc. | Depending on the final use of compost. |

Basic production units of the plant and work on them - 1

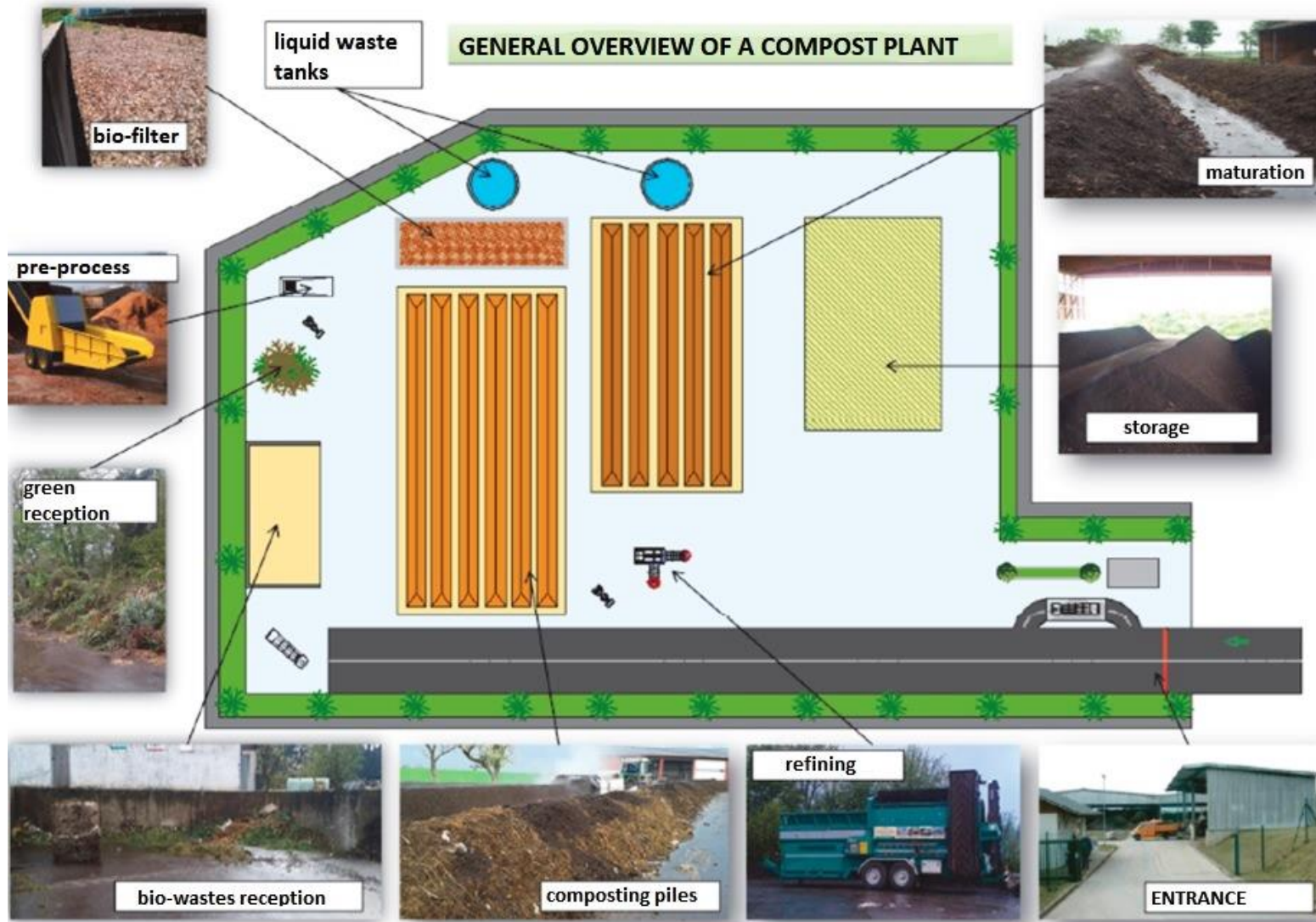
| PLANT STAGES | BASIC FUNCTIONS |
|--|---|
| 1. Reception - collection of waste It includes the unloading, control and final receipt of waste as well as its intermediate storage until the start of the pre-treatment. | <ul style="list-style-type: none">▪ Unloading incoming material from pick-up vehicles in a specially designed space depending on the type of material.▪ Visual inspection of incoming materials.▪ Final delivery of material or non-acceptance to the unit.▪ Temporary storage pending pre-processing. |
| 2. Pre-processing It mainly involves mechanical processes, which aim to optimize the characteristics of the incoming waste with a view to smooth composting. | <ul style="list-style-type: none">▪ Removing impurities.▪ The opening of sacks in case the Biological Waste Biomass is made in plastic bags.▪ Cutting woody materials (branches, trees, etc.) to create a structure material.▪ Mixing and homogenization of materials to adjust the parameters: C / N ratio, porosity, moisture. |

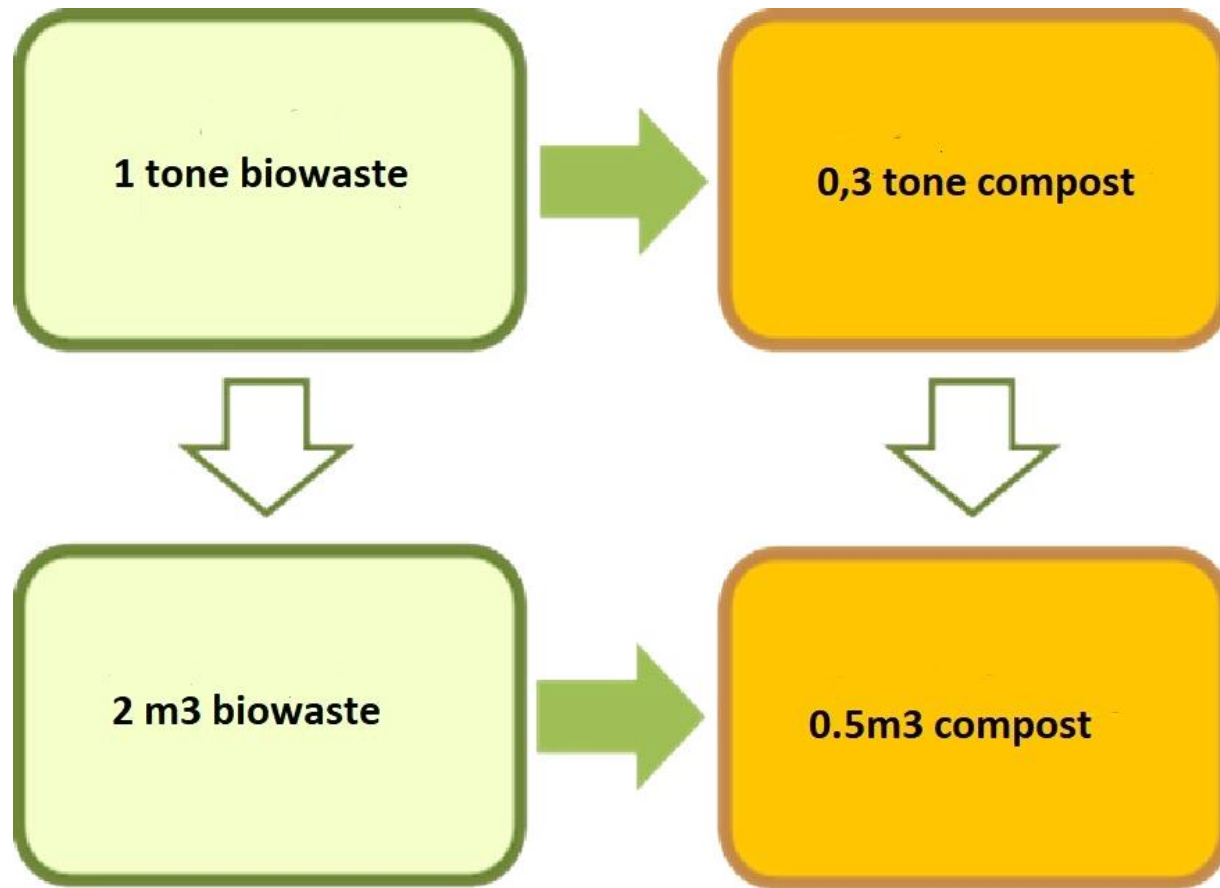
Basic production units of the plant and work on them

| PLANT STAGES | BASIC FUNCTIONS |
|--|---|
| 3. Composting (active biodegradation) It includes the first stages of composting: <ul style="list-style-type: none">the psychrophilic phase where the material is colonized by microorganismsthe mesophilic phase (22 °C - 40 °C) where the readily degradable substances decomposethe thermophilic phase (40 °C - 60 °C) where the material is sanitized. | <ul style="list-style-type: none">Continuous degradation of organic substances.The health of the material.Creating a relatively odorless product, which can be further processed (ripening, refining) to create the final product.Composting takes place in triangular or trapezoidal form |
| 4. Maturation It involves the last phase of composting: <ul style="list-style-type: none">The second mesophilic phase (40 °C ambient temperature). It is completed when the temperature of the material equals the ambient temperature | <ul style="list-style-type: none">The breakdown of difficult-to-decompose organic substances (cellulose, lignin) contained e.g. in wood waste.Creating a relatively odorless product, which can be further processed (refining) to create the final product.The curing takes place in piles of triangular or trapezoidal shape. |

Basic production units of the plant and work on them - 3

| PLANT STAGES | BASIC FUNCTIONS |
|---|--|
| 5. Refining Τελική μηχανική επεξεργασία του κόμποστ. | <ul style="list-style-type: none">▪ The separation of residual impurities, such as plastics, metals, glass▪ The production of compost with stable quality characteristics |
| 6. Storage Storage of ready-made compost under suitable conditions and for a reasonable period of time to avoid deterioration in the quality. | <ul style="list-style-type: none">▪ Ensuring appropriate storage conditions so that the end product can be used for the purpose it has produced▪ Protect the finished compost from severe weather (rain, drought, wind) |





Simplified method of calculating weight / volume ratios
in composting of organic - biodegradable materials

We must thoroughly search, gather and extensively study all relative legislation that is in force.

- **Legislation for:** Specifications concerning the establishment of mechanical sorting and composting facilities
- **Legislation for:** Where composting units manage animal by-products, such as food waste
- **Legislation for:** Standard Environmental Commitments for composting plants
- **Legislation for:** Quality standards and allowed uses for the types of compost to be produced
- Take all necessary permits from the relevant authorities

Coarse estimate the investment cost:

- **100,000 to 150,000 €** construction costs (fences, composting surfaces, reception and processing of raw materials, warehouses, staff accommodation building)
- **300.000 to 450.000 €** equipment procurement cost

| ITEM | INDICATIVE COST / PIECE |
|--|----------------------------|
| Plastic buckets | 250 – 400 € |
| Metal bins | 300 – 450 € |
| Green shredder | 20.000 – 50.000€ |
| windrow inverter | 30.000 – 50.000€ |
| Tractor - Loader, Multipurpose vehicle | 60.000 – 90.000 € |
| Sifter | 15.000 – 25.000 € |
| Weighbridge | 10.000 – 20.000 € |
| Fire safety system | 3.000 – 8.000 € |
| Instruments for monitoring and control of composting | 3.000 – 6.000 € |