Project description

Background

Municipal Solid Waste (MSW) management in Greece remains a challenge. Most MSW still goes to landfills. In Attica, with more than four million inhabitants, MSW disposal poses a serious environmental challenge. In the region of Athens, around 2.7 million tonnes of mixed household waste was generated annually in the period prior to the project starting. Some 94% of which was transferred to the central sanitary landfill in Athens. The remainder went to smaller landfills, including semi-controlled landfill sites. Biodegradable organics, mainly kitchen waste, was the major waste fraction generated by households worldwide and in Greece (47% of MSW in 2000). In order to ensure proper management of this waste stream, efficient practices and schemes promoting sustainability are necessary. These practices should be based on the provisions and the principles of EU environmental policy and legislation. Under the Landfill Directive (1999/31/EC) Greece was tasked to, compared with 2000 levels, reduce the quantity of biodegradable waste going to final disposal by 20% by 2010 and by 50% by 2050. It was far from these targets prior to the project. One promising option for the management of domestic organic household waste is to encourage householders to separate and dry the organic waste at home in order to significantly reduce its volume.

Objectives
The DRYWASTE project aimed to design, develop, and demonstrate an innovative, flexible, compact and convenient home drying system for the drying out of organics, in order to reduce their volume at source, without an increase of emissions to air, water and soil. This would lead to the generation of a 'final dry organic waste product', the alternative uses of which was to be investigated. In general however, dried biowaste is a constant carbon source which can be used for green energy production. The dried biowaste material is very light since most of the water has been removed and at the same time its volume has been reduced by 90% compared with the initial waste volume, this means that the transportation costs of the dried end products are very low. In addition, as this material is odourless it can be stored in households for long periods, thus reducing the collection rate of waste, and consequently reducing the truck emissions and the collection cost. The project also planned to generate information on how the prototype household dryer can be implemented across a wider area, and what the environmental, social and economic benefits of the prototype are. Project findings were to be disseminated to local authorities and other target groups via a website, meetings, conferences, organised demonstration activities and other channels. Other project deliverables included maintenance manuals and engineering designs. The project would thus produce tangible results, including data and guidelines, which could help contribute to the implementation of EU environmental policy on waste management.

Results

The DRYWASTE project achieved its objectives and delivered the intended results. The successes of the project include the design and implementation of a relatively simple home drying device which was used to reduce household biodegradable food waste by 67% w/w (percent by weight of solute in the total weight of solution), chiefly through heating in a closed ceramic chamber. The final dry residue was of high quality (over 99% pure) indicating that the households were well-informed and responsibly involved in separating and preparing their food waste for drying. Participation was expanded from the foreseen 20 households to 30, and interest was generated in the wider community as well as in other municipalities. The LCA proved that positive environmental, social and economic benefits could be achieved from the pilot application.

DRYWASTE’s innovative technology is flexible and able to dry small quantities of organic waste in a relatively short time period by households themselves. The methodology introduces a stage that could be applied prior to the existing technologies for organic waste treatment in order to facilitate the implementation of existing waste treatment technologies and to produce a waste product of high added value.

The system that was designed, optimised, and demonstrated through the project consists of a ceramic vessel with a capacity of about 4 kg of bio-waste. The thermal plate inside the device raises the temperature to 70°C while the contents are aerated with a centrifugal fan. A water vapour and leachate collector is positioned below the basket containing the biowaste. The device is optimised to minimise noise and odours.
The dryers were distributed and operated in households of the Cholargos-Papagou municipality. The resulting dry residues were collected on a weekly basis by the project team and then analysed for a variety of parameters. The pilot demonstration in households lasted for 8.5 months. Each household was supplied with a dryer, an electricity meter to measure the electricity that was consumed, a weighing scale for weighing the biowaste before being placed in the dryer, and bags to store the dried organic product. Training on the use of the device was conducted at each household and continuous support was provided by the project team.

The high purity results from the demonstration were significant as a source for further exploitation as biomass for energy production, compost, and other potential uses. This is also an important contribution to the reduction of costs for collection, transportation, reuse and disposal of such a waste fraction. In addition it contributes to the reduction of methane and toxic leachates in landfills, and extends the lifetime of landfills by reducing the mass of municipal solid waste.

Another feature of the dried residue (which ended up with an average moisture content of 25.86%) was that further biological decomposition is inhibited at this level. This, in turn, prevents odour and allows for longer storage capability. It also enhances its ease of handling. Electricity use was monitored and was reported to be 1.87 kwh/kg biowaste, at a cost of about 1.17 euro/household/month.

A survey questionnaire filled in by the residents participating in the demonstration resulted in positive evaluations on the performance of the drying system and gave support to the potential to integrate the dryer in the existing waste management system. Positive aspects noted by the households included ease of handling, reduction of biowaste mass and volume, reduction of odors, and ability for temporary storage. A willingness to buy and use such a system was clearly expressed.

Higher environmental awareness was noted amongst the residents, resulting from their participation in separating their waste at the sources and increasing their responsibility for their own production and disposal of waste.

Other key outcomes include the benefits to local authorities. These were provided with a useful tool for improving their solid waste management, thereby offering cost savings, reduced burden for collection and transportation, improved ease of handling, and enhanced potential for using the end product for energy or compost.

A study on potential added-value products that can be developed from the dry residue showed many possibilities that can be exploited by private companies and research groups involved with biomass conversion. Multiple options exist for use of the dry residue, including bioethanol, biogas through anaerobic digestion, and composts. Other uses include pellets.

Policy benefits are available for public authorities and policy makers since application of this technology will assist the Greek government to meet its quantitative targets for the fraction of biodegradable waste that must be diverted from landfills. Increases in recycling rates and reduction in GHG production from landfills are further positive outcomes. What’s more the use of this waste-derived recyclable material can replace the use of land for biofuel
production - which may displace food crops.

Further information on the project can be found in the project's layman report and After-LIFE Communication Plan (see "Read more" section).

Environmental issues addressed:

Themes

Waste - Municipal waste (including household and commercial)

Keywords

waste treatment, municipal waste, organic waste, compost

Target EU Legislation

- Waste

Natura 2000 sites

Not applicable

Beneficiaries:

<table>
<thead>
<tr>
<th>Coordinator</th>
<th>National Technical University of Athens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of organisation</td>
<td>University</td>
</tr>
<tr>
<td>Description</td>
<td>The project team belongs to the School of Chemical Engineering at the National Technical University of Athens (NTUA), one of Greece's premier universities.</td>
</tr>
<tr>
<td>Partners</td>
<td>Papagos - Cholargos Municipality, Greece</td>
</tr>
</tbody>
</table>

Top
Administrative data:

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project reference</td>
<td>LIFE08 ENV/GR/000566</td>
</tr>
<tr>
<td>Duration</td>
<td>01-JAN-2010 to 30-JUN-2012</td>
</tr>
<tr>
<td>Total budget</td>
<td>923,142.00 €</td>
</tr>
<tr>
<td>EU contribution</td>
<td>453,262.00 €</td>
</tr>
<tr>
<td>Project location</td>
<td>Attiki(Ellas)</td>
</tr>
</tbody>
</table>

Read more:

Project website: Project's website

Publication: After-LIFE
- Title: After-LIFE Communication Plan
- Year: 2014
- Editor: NTUA
- No of pages: 9

Publication: Layman report
- Title: Layman report (Greek version)
- Year: 2014
- Editor: NTUA
- No of pages: 9

Publication: Layman report
- Title: Layman report
- Year: 2014
- Editor: NTUA
- No of pages: 9

Video link: Innovative Household Waste Drying System

Video link: "Καινοτόμο Σύστημα Οικιακής Ξήρανσης"
(项目视频 on Youtube)

Video link: "Innovative Household Waste Drying System"
(项目视频 on Youtube)

Video link: "Econews (Σύστημα Οικιακής Ξήρανσης)" TV broadcast 20/02/12

Project description
Read more