The WaysTUP! project
Transforming urban waste into valuable products

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etam s.a.
consulting services
ETAM SA – Consulting Services

- **Type:** SME
- **YEAR OF ESTABLISHMENT:** 1993
- **LOCATION:** Greece, Heraklion Crete
- **MAIN AREAS OF EXPERTISE:** Developmental Planning, Communication & Marketing Strategies, Business & Marketing Plans, Environmental Studies
- **EXPERIENCE:** Partnerships and consultation in numerous EU projects
- **Role in the project:** WP8 Communication and Dissemination

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Project’s INFO

• **Title**: Value chains for disruptive transformation of urban biowaste into biobased products in the city context

• **Funded under**: Horizon 2020

• **Budget**: €11,664,322.50

• **Implementation period**: 01.09.2019 - 31.08.2023

• **Partners**: 26

• **Participating countries**: Spain, Greece, Belgium, United Kingdom, Czech Republic, Italy, Turkey, Serbia, Austria (9)

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The overall objective of WaysTUP! is to demonstrate the establishment of new value chains for urban biowaste utilisation for the production of higher value purpose products (i.e. biobased products, including food and feed ingredients), through a multi-stakeholder approach in line with circular economy.
The Workplan

W1: Identification of opportunities and barriers to utilisation of urban biowaste sources

W2: Preparation of pilots

W3: Demonstration of urban biowaste utilisation through PILOTS operation

W4: A behavioural change approach for the collection of urban bio-waste and usage of bio-waste derived products with citizens & communities

W5: Evaluation of PILOTS, end-products and new value chains from urban biowaste

W6: New business concepts along the entire value chain from urban biowaste

W7: Policy Implications and Recommendations

W8: Communication and Dissemination

W9: Management

W10: Ethics Requirements
Pilots’ overview

**FOOD & FEED**
- **VALENCIA**
  - MEAT WASTE
  - FISH WASTE
  - MEAT & FISH

**COFFEE OIL**
- **LONDON**
  - COFFEE
  - COFFEE BY-PRODUCTS
  - COFFEE OIL

**INSECT PROTEIN**
- **ALICANTE**
  - SOURCE SEPARATED BIOWASTE
  - INSECT PROTEIN (PROTEIN RICH INSECT FLOUR)

**BIOPLASTICS**
- **PRAGUE**
  - USED COOKING OILS
  - PHAS
  - BIOPLASTICS FOR PACKAGING

**BIOSOLVENTS**
- **ATHENS**
  - USED COOKING OILS
  - LONG CHAIN DICARBOXYLIC ACID
  - BIOPLASTICS FOR PACKAGING

**PERSEO**
- **L’ALCUDIA**
  - SOURCE SEPARATED BIOWASTE
  - BIOSOLVENTS
  - ETOL

**SLUDGE BIOCHAR**
- **CRETE**
  - CELLULOSIC REJECTIONS
  - SEWAGE SLUDGE
  - BIOCHAR
  - TERRA I XUFA

**Value Chains for Disruptive Transformation of Urban Biowaste into Biobased Products in the City Context**

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement no. 818308.
Pilot 1: FOOD & FEED

Bio-processing of meat by-products
- Meat by-products are costly to be treated and disposed of ecologically.
- They contain good amounts of nutrients (i.e. essential amino acids, minerals, and vitamins).

The objective
- To demonstrate the production of functional ingredients from animal by-products (active peptides, enzymes for tendering) in a city context.
- To emphasize in the sociological aspect of the recycling process, fighting to destigmatize the concept of waste not being valuable.
# Pilot 1: FOOD & FEED

<table>
<thead>
<tr>
<th>VALUE CHAIN 1.</th>
<th>Feedstock type</th>
<th>Technology solution/PILOT</th>
<th>End-products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat waste</td>
<td>Fermentation/ PILOT 1</td>
<td>Functional ingredients i.e. active peptides &amp; enzymes for tendering</td>
<td></td>
</tr>
<tr>
<td>Feedstock providers</td>
<td>Technology solution providers</td>
<td>End-user/Industry</td>
<td></td>
</tr>
<tr>
<td>SAV</td>
<td>BIOPOLIS</td>
<td>Consumers, NS, ADMW</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VALUE CHAIN 2.</th>
<th>Feedstock type</th>
<th>Technology solution/PILOT</th>
<th>End-products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish waste</td>
<td>Fermentation/ PILOT 1</td>
<td>Gelatine and active peptides production</td>
<td></td>
</tr>
<tr>
<td>Feedstock providers</td>
<td>Technology solution providers</td>
<td>End-user/Industry</td>
<td></td>
</tr>
<tr>
<td>SAV</td>
<td>BIOPOLIS</td>
<td>Consumers, NS, ADMW</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VALUE CHAIN 3.</th>
<th>Feedstock type</th>
<th>Technology solution/PILOT</th>
<th>End-products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spent coffee grounds</td>
<td>Fermentation/ PILOT 1</td>
<td>Flavours, polyphenols, oils, carotenoids</td>
<td></td>
</tr>
<tr>
<td>Feedstock providers</td>
<td>Technology solution providers</td>
<td>End-user/Industry</td>
<td></td>
</tr>
<tr>
<td>SAV</td>
<td>BIOPOLIS</td>
<td>Consumers, NS, ADMW</td>
<td></td>
</tr>
</tbody>
</table>
Pilot 2: COFFEE OIL

- **Coffee-oils from Spent coffee grounds**
  Spent coffee grounds (SCG) are currently quite unexplored.
- **SCG into liquid bio-chemicals**.

**The objective**
- Sustainable production of coffee oil from spent coffee grounds.
- Revalorization of coffee oil for the production of PHAs.
**Pilot 2: COFFEE OIL**

<table>
<thead>
<tr>
<th>VALUE CHAIN 4.</th>
<th>Feedstock type</th>
<th>Technology solution/PILOT</th>
<th>End-products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coffee waste</td>
<td>Extraction/PILOT 2</td>
<td>Coffee oil</td>
<td></td>
</tr>
<tr>
<td>Feedstock providers</td>
<td>Technology solution providers</td>
<td>End-user/Industry</td>
<td></td>
</tr>
<tr>
<td>BIOBEAN</td>
<td>BIOBEAN</td>
<td>Chemical industry, plastic industry</td>
<td></td>
</tr>
</tbody>
</table>
Pilot 3: INSECT PROTEIN

Insect protein from biowaste
• Insects are efficient converters of organic waste.
• Insect meals are a high-quality protein source in animal feeds.

The objective
• Achieve a reduction of waste as well as retaining and upgrading valuable nutrients.
• Create protein-rich insect flour from source-separated bio-waste and meat and fish by-products.
# Pilot 3: INSECT PROTEIN

<table>
<thead>
<tr>
<th>VALUE CHAIN 5.</th>
<th>Feedstock type</th>
<th>Technology solution/PILOT</th>
<th>End-products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source separated biowaste</td>
<td>Insect breeding/PILOT 3</td>
<td>Protein-rich flour for feed</td>
<td></td>
</tr>
<tr>
<td>Feedstock providers</td>
<td>Technology solution providers</td>
<td>End-user/Industry</td>
<td></td>
</tr>
<tr>
<td>SAV</td>
<td>UA</td>
<td>Feed industry</td>
<td></td>
</tr>
</tbody>
</table>
**Bioplastics from used oils**
- Long-chain dicarboxylic acids (IcDCA), have a wide range of applications as raw materials for the synthesis of polymers (polyesters).
- Optimize the process of IcDCA production through fermentation.

**The Objectives**
- Test and evaluate possibilities of feedstock from used cooking oils as well as coffee oil.
- Formulate bio-based and biodegradable polyesters based on long-chain dicarboxylic acids with enhanced properties.
## Pilot 4: BIOPLASTICS

<table>
<thead>
<tr>
<th>VALUE CHAIN 6.</th>
<th>Feedstock type</th>
<th>Technology solution/PILOT</th>
<th>End-products</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Used cooking oils</td>
<td>Fermentation/ PILOT 4</td>
<td>PHAs, long chain dicarboxylic acid, bioplastics</td>
</tr>
<tr>
<td>Feedstock providers</td>
<td>Technology solution providers</td>
<td></td>
<td>End-user/Industry</td>
</tr>
<tr>
<td>AMB</td>
<td>AIMPLAS, NFG, NVMT</td>
<td></td>
<td>Consumers, plastic industry</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VALUE CHAIN 7.</th>
<th>Feedstock type</th>
<th>Technology solution/PILOT</th>
<th>End-products</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>From waste coffee grounds</td>
<td>Fermentation/ PILOT 4</td>
<td>PHAs, long chain dicarboxylic acid, bioplastics</td>
</tr>
<tr>
<td>Feedstock providers</td>
<td>Technology solution providers</td>
<td></td>
<td>End-user/Industry</td>
</tr>
<tr>
<td>BIOBEAN</td>
<td>AIMPLAS, NFG, NVMT</td>
<td></td>
<td>Consumers, plastic industry</td>
</tr>
</tbody>
</table>
Pilot 5: BIOSOLVENTS

<table>
<thead>
<tr>
<th>VALUE CHAIN 8.</th>
<th>Feedstock type</th>
<th>Technology solution/PILOT</th>
<th>End-products</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Source separated biowaste</td>
<td>Fermentation/PILOT 5</td>
<td>Biosolvents</td>
</tr>
<tr>
<td>Feedstock providers</td>
<td>Technology solution providers</td>
<td>End-user/Industry</td>
<td>Chemical industry</td>
</tr>
<tr>
<td>SUST</td>
<td>NTUA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Pilot 6: PERSEEO BIOETHANOL®

The idea!

Ethanol from cellulosic rejections streams of MWTP and WWTP

- PERSEO & CIEMAT, have developed a bio-technological patented technology to produce second-generation bioethanol from the organic fraction of MSW (PERSEO Bioethanol®).

Objectives

- Succeed in circular bioethanol production.
- Ethanol will be further processed to produce ethyl lactate via a reactive distillation.
### Pilot 6: PERSEO BIOETHANOL®

<table>
<thead>
<tr>
<th>VALUE CHAIN 9.</th>
<th>Feedstock type</th>
<th>Technology solution/PILOT</th>
<th>End-products</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cellulosic rejections</td>
<td>Fermentation/PILOT 6</td>
<td>Bioethanol, Biosolvents</td>
</tr>
<tr>
<td>Feedstock providers</td>
<td>Technology solution providers</td>
<td></td>
<td>End-user/Industry</td>
</tr>
<tr>
<td>AMB</td>
<td>IMECAL, CIEMAT, TBWR</td>
<td></td>
<td>Chemical industry</td>
</tr>
</tbody>
</table>
Pilot 7: BIOCHAR

Biochar from Sewage Sludge
- Biochar is a carbon-rich, fine-grained, porous material, which can be applied to soil to offer both agricultural and environmental benefits.
- Treat gas emissions of the biochar production process to produce an off-gas concentrate (Pirolenheso) rich in nutrients and micro-nutrients.
- Both used in agriculture (fertiliser and plant nutrient).

Objectives
- Transform sewage sludge into biochar.
- Generate Pirolenheso to increase the value of the procedure and its circularity.
## Pilot 7: BIOCHAR

![Technical University of Crete](image)

<table>
<thead>
<tr>
<th>VALUE CHAIN 10.</th>
<th>Feedstock type</th>
<th>Technology solution/PILOT</th>
<th>End-products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sewage sludge</td>
<td>Slow pyrolysis/PILOT 7</td>
<td>Biochar</td>
<td></td>
</tr>
<tr>
<td>Feedstock providers</td>
<td>Technology solution providers</td>
<td>End-user/Industry</td>
<td></td>
</tr>
<tr>
<td>TUC</td>
<td>TUC</td>
<td>TiX, farmers</td>
<td></td>
</tr>
</tbody>
</table>
VALUE CHAINS FOR DISRUPTIVE TRANSFORMATION OF URBAN BIOWASTE INTO BIOBASED PRODUCTS IN THE CITY CONTEXT