# - The LIFE Programme -
# Over 20 years improving waste-to-energy management in the EU

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LIFE Programme – Communications Team

**4th International Conference on Sustainable Solid Waste Management**
**23-25 June, Limassol**

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# What is LIFE?

## LIFE = L'Instrument Financier pour l'Environnement

**Fully dedicated**:

Pilot, innovative, demonstrative actions to contribute to implementing and developing EU environmental policy and legislation for the environment and climate action

**Since 1992**: 4306 projects

€ 3.46 billion for 2014-2020

Two sub-programmes:

- LIFE Environment
- LIFE Climate Action

# Structure: LIFE 2014-2020 (traditional projects)

Sub-Program. Environment
*2,6 billion € (75%)*

Environment & Resource efficiency

Water | Res. eff. | Waste | Health | Air

Nature & Biodiversity

Habitat & species | Biodiv.: strategy 2020

Governance & Information

Sub-Program. Climate Action
*864 mio € (25%)*

Climate change Mitigation

Climate change Adaptation

Governance & Information

**LIFE09 ENV/IT/000186** - Ennobling of sludge for energy use and industrial

# Sludge's Wealth

*Project beneficiary: COOMI SOC.COOP. (SME)*
*Contact person: Danilo MARANGONI / **d.marangoni@coomi.it***

## Main aim

To demonstrate an innovative & cost effective sludge waste treatment plant for offshore oil rigs & similar units that **converts biological sludge with 75% humidity into pellets**

## Methodology

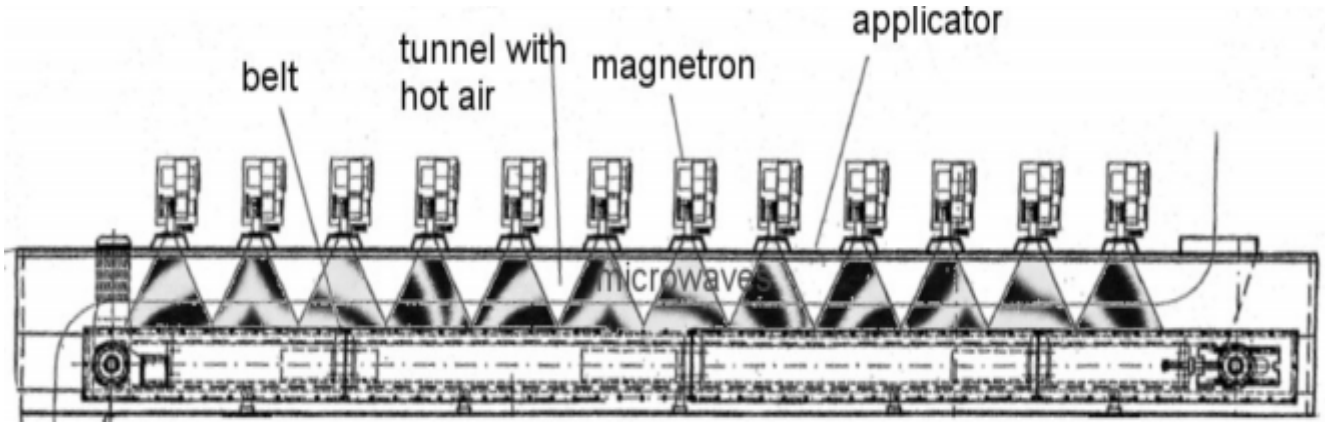
- To construct a mobile unit (portability and small size)
- To obtain agglomerates with high calorific value **(max water content of 18%)**, leading to an increased use of biological sludge in combustion plants

# Technology

## Design of the pilot plant

→ **Hybrid microwave hot air heating** technology with associated elements

- Loading station
- Drying tunnel
- The position & number of microwave generators
- The electromagnetic field distribution



## Results

- Highly **efficient drying** of the sludge **(14-18% humidity)**
- Annual **conversion of 650 tonnes of organic sludge** with 75% humidity
- Generation of **280 tonnes of pellets** with high heating power & easily transportable
- **Elimination of unpleasant odours** produced by the material
- Longer life of the unit's components due to the **lack of abrasion** in the process

**LIFE08 ENV/CY/000457** - Demonstration of an integrated waste-to-energy system for energy generation from biodegradable organic waste and wastewater

# INTER-WASTE

*Project beneficiary: Cyprus University of Technology*
*Contact person: Costas COSTA / **costas.costa@cut.ac.cy***

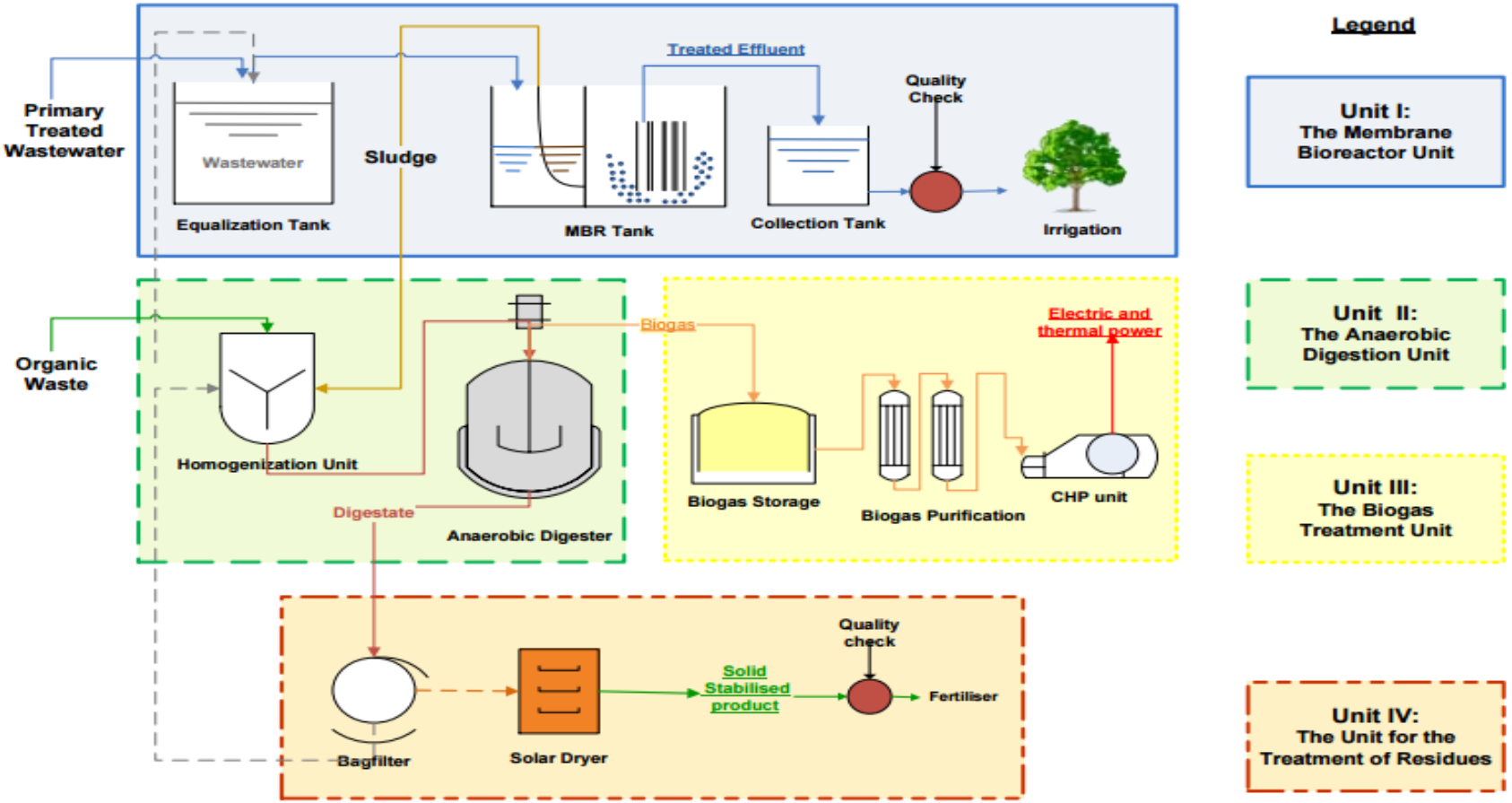
## Main aim

An integrated pilot system consisting of a Membrane Bioreactor (MBR) unit for wastewater treatment & an Anaerobic Digestion (AD) unit for Biodegradable Organic Waste (BOW) treatment

## Methodology

- To assess the **legislative framework** & the relevant AD&MBR systems at EU level
- To construct an integrated MBR-AD prototype unit based on a **"zero" waste symbiotic approach**

# Technology

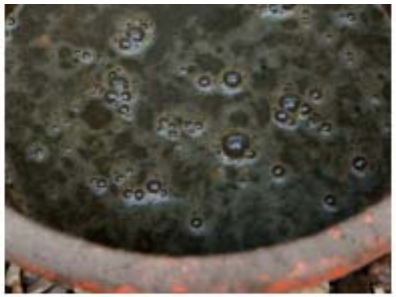

Primary Treated Wastewater
Wastewater
Equalization Tank
Sludge
Treated Effluent
MBR Tank
Collection Tank
Quality Check
Irrigation
Organic Waste
Homogenization Unit
Anaerobic Digester
Digestate
Biogas
Biogas Storage
Biogas Purification
CHP unit
Electric and thermal power
Bagfilter
Solar Dryer
Solid Stabilised product
Quality check
Fertiliser
Legend
Unit I: The Membrane Bioreactor Unit
Unit II: The Anaerobic Digestion Unit
Unit III: The Biogas Treatment Unit
Unit IV: The Unit for the Treatment of Residues

## Methodology

**Development, optimization & demonstration of the MBR-AD system**

→ Physicochemical analysis of the waste streams used (manure, organic MSW)
→ Start up and operation of the unit
→ Characterisation of sludge & treated wastewater (MBR)
→ Characterisation of biogas & stabilized solid residue (AD)
→ Optimisation of the unit (environmental impacts, viable & profitable level)
→ Examination of the capability of the unit to generate electricity

(a) Digestate



(b) Liquid Digestate

(c) Solid Digestate

# Technology

## Development of guidelines & specifications

→ **Optimum operation of the unit**
- built near the production of wastes
- adequate infra to receive municipal wastewater
- built near fields requiring irrigation

→ **Utilisation of the produced biogas, water & stabilised solid product**
- electricity generation
- watering cultivations / municipal parks
- soil improvement in agricultural applications / fuel material

## Results

• Integrated **stand alone & energy autonomous MBR-AD pilot system**

• The AD unit produces 12.1 m3/d of good quality biogas - contains 59% methane

• The dried solid digestate (AD unit), after bag filtering and drying, acquires good quality characteristics for **land application as organic fertilizer**

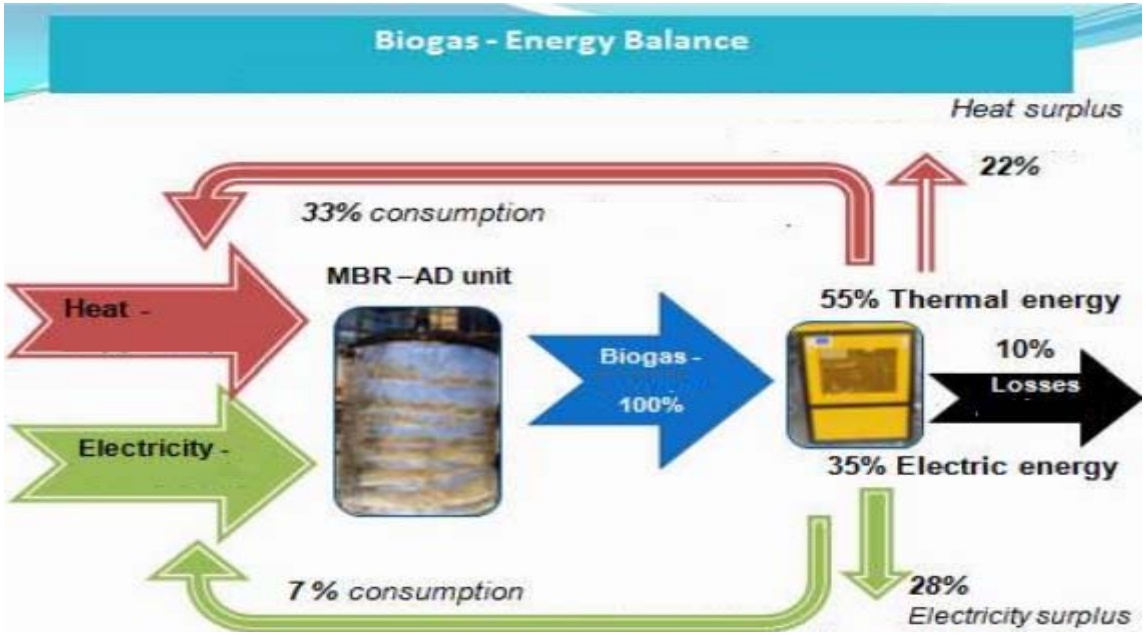
• The MBR unit treating wastewater and liquid digestate produces **high irrigation water** that conforms to the stringiest Cypriot water reuse limits

## Novel approach for local communities

→ renewable energy production; hence reduction in fossil fuel dependency
→ reuse of treated water
→ soil fertility

## Results

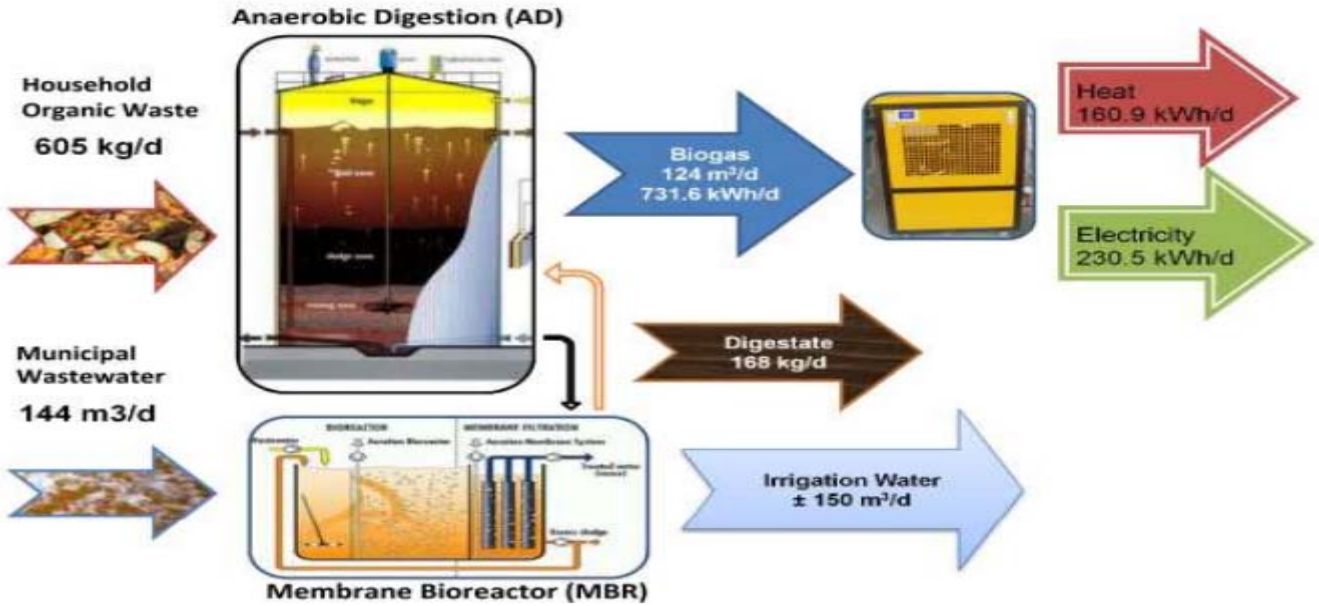
• The **MBR-AD system** is **energy autonomous** while the excess energy can be utilized for other purposes e.g. supply the electricity grid, provide heat to facilities or places at the vicinity of the unit



# Results

## Small community of 1000 people

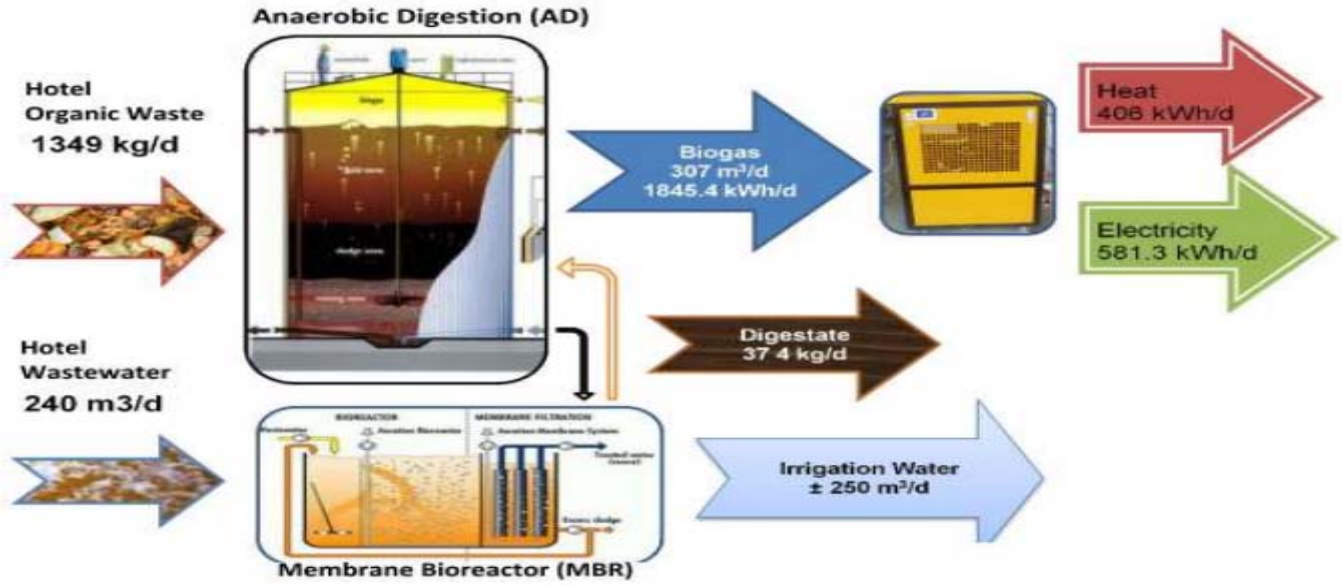
→ to treat the produced food waste & wastewater,
→ to cover the electricity needs of around 20 households,
→ to produce 150 m3/d of irrigation water & 12 kg/d of organic fertilizer



# Results

## 5 star hotel of 1200 beds

→ to treat the produced food waste and wastewater,
→ to cover 3.5% of its energy requirements (electric and thermal energy)
→ to produce 250 m3/d of irrigation water and 26 kg/d of organic fertilizer



**LIFE07 ENV/E/000847** - Energy self-sustaining and environmental footprint reduction on wastewater treatment plants via fuel cells

# BIOCELL

*Project beneficiary: Centro Tecnológico del Agua (Research Institution)*
*Contact person: Rosa Maria PIERAS / **rmpieras@cetaqua.com***

## Main aim

The project aimed to demonstrate the viability of two methodologies **– energy efficient fuel cells –** for generating electricity from the biogas produced at waste water treatment plants (WWTPs)

## Methodology

- To construct two prototype plants & test the **Solid Oxide Fuel Cell** & the **Proton Exchange Membrane Fuel Cell**
- To **publish a guide** which includes an economic & environmental assessment for WWTP managers

## Technology

### Prototype plant in the WWTP of Murcia

→ **Proton Exchange Membrane Fuel Cells (PEMFC)**

- Low temperature (60 ºC)
- Biogas cleaning **- caustic scrubber -** and drying process
- **Biogas reforming process**: conversion of methane into hydrogen
- Designed to produce 3 kW of electric power

CLOSE VIEW OF PEMFC PILOT PLANT

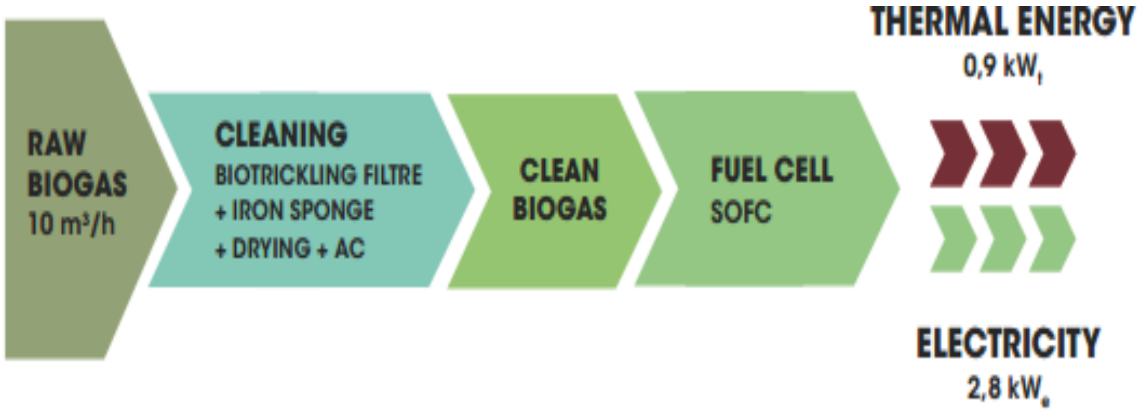
## Technology

**Prototype plant in the WWTP of Mataró, Catalonia**

### → Solid Oxide Fuel Cell (SOFC)

- High temperature (800 ºC)
- Biogas H2S cleaning process **- biotrickling filter -**
- Biogas purification process **- iron oxides, activated carbon -**
- Designed to produce 2,8 kW of electric power & 1kW of heat

BIOGAS CLEANING SYSTEM
OF SOFC PILOT PLANT



## Economic benefits

- Both plants are technically & financially viable

- The **cost for sludge** treatment **is reduced** by the use of biogas energy

**The WWTP is self-sufficient from an energetic point of view**

→ The produced energy can be used to heat the digesters, dramatically **lowering the natural gas consumption**

→ The produced electricity can be used to **cover up to 60-70%** of the electrical needs of the installation

**The size of the prototype units is not sufficiently large to confirm whether up-scaling is feasible or economically viable**

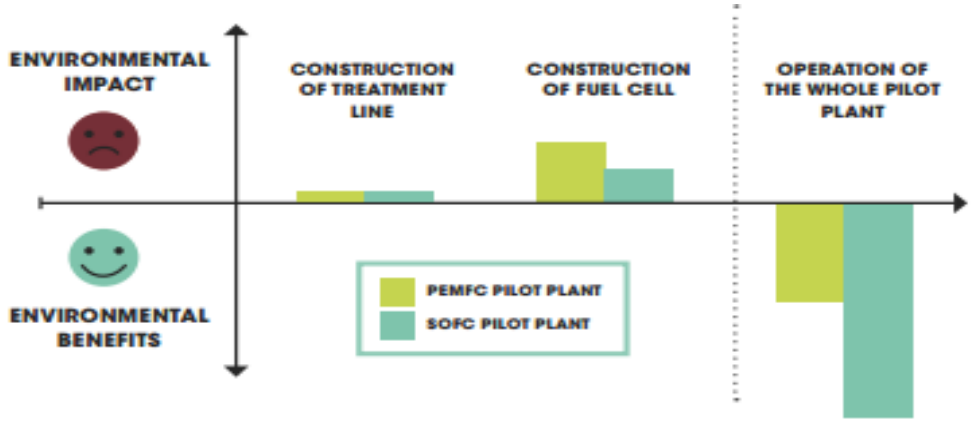
# Environmental benefits

## Construction phase

→ Energy conversion systems (the fuel cells) are the main contributors to the environmental impact, both in PEMFC and SOFC pilot plants

## Operation phase

→ Compared to deployed technologies such as Internal Combustion Engines (ICE), fuel cells have a positive environmental impact because of electricity production & thermal energy generation

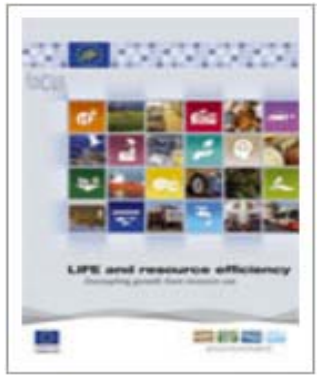


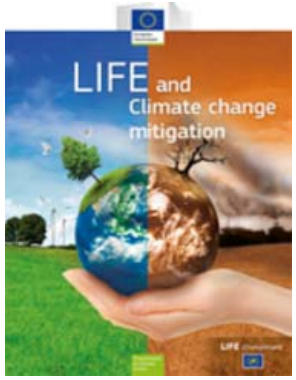
# LIFE Communication tools & services

- LIFE website
- Project database
- Thematic publications


- LIFE thematic brochure

on **LIFE & resource efficiency**
on **LIFE & Climate change mitigation**




*Photos: LIFE Programme*

# More information

**New Regulation 2014-2020:**

Regulation (EC) No 1293/2013

**National Contact Points:**

Information on eligibility and project preparation
http://ec.europa.eu/life/contact/nationalcontact


*Photos: LIFE Programme*

# More information

## Funding:

General information
http://ec.europa.eu/environment/life/funding/life.htm

2016 call for proposals for LIFE Grants
http://ec.europa.eu/environment/life/funding/life2016/index.htm

| Calendar 2016: Traditional projects Summary Table | | |
|---|---|---|
| **Grant Type** | **Opening Date** | **Closing Date** |
| Climate Change Action (Mitigation, Adaptation and Climate Governance & Information) | 19 May 2016 | 07 September 2016 at 16:00 Brussels time |
| Environment & Resource Efficiency | 19 May 2016 | 12 September 2016 at 16:00 Brussels time |
| Nature & Biodiversity | 19 May 2016 | 15 September 2016 at 16:00 Brussels time |
| Environmental Governance & Information | 19 May 2016 | 15 September 2016 at 16:00 Brussels time |

# Thank you for your attention!

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