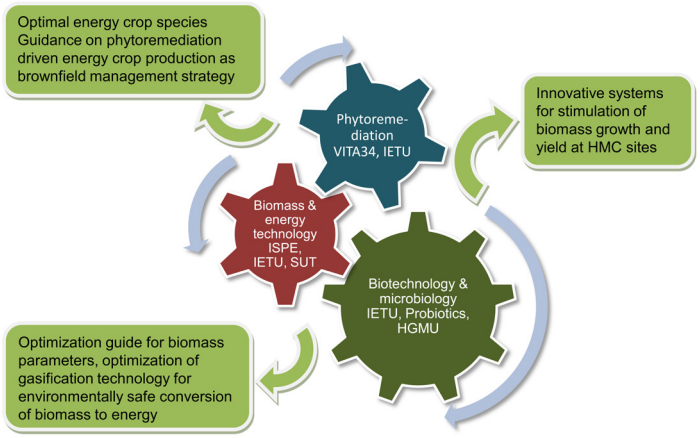
Innovations

Phytoremediation	• novel application of conventional energy plant species for remediation • novel site management approach
Microbiology	• identification of plant growth promoting rhizobacteria and their functional traits in the rhizosphere of bioenergy plant species used for bioremediation • definition of indicators for soil quality a t contaminated sites
Industrial Biotechnology	• production of improved microbial inocula for stimulating plant biomass at HMC sites combined with phytoextraction • development of sustainable inoculation strategies
Energy technology	• HMC biofuel stock optimised gasification technology • control parameters for valorizing HMC biomass as gasification fuel

Transfer of knowledge behind the S&T objectives

The project is implemented under the Maria Curie-Skłodowska Industry-Academia Partnership and Pathway scheme of the EU FP7 aims to strengthen the transfer of knowledge between the partners from commercial sector : VITA34 (DE), Probiotics (PL) and ISPE (RO) and research sector: IETU (PL), HMGU (DE) and SUT (PL) to make advancement in this field both from the scientific and business perspective. Technically, the transfer of knowledge will be ensured by a implemented as series of staff secondments between the commercial and scientific partners.



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Project details

Project scheme: **Industry-Academia Partnerships and Pathways**

Grant agreement no.: **610797**

Call identifier: **FP7-PEOPLE-2013-IAPP**

Project start date: **February 1st, 2014**

Duration of the project: **48 months**

Project consortium

Project co-ordinating unit:

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Project partners:

Helmholtz Zentrum München, German Research Center for Environmental Health GmbH (DE)

Institute for Studies and Power Engineering (RO)

ProBiotics (PL)

Silesian University of Technology, Institute of Thermal Technology (PL)

VITA 34, BioPlanta (DE)

Phyto2Energy

Phyto2Energy — Phytoremediation driven energy crops production on heavy metal degraded areas as local energy carrier

This project is funded from the European Union's Seventh Programme for Research, Technological Development and Demonstration under Grant Agreement No 610797

Why Phyto2Energy?

Current state of the art on the biomass for energy production on heavy metal degraded areas has not been fully explored leaving the potential of energy crops production with a simultaneous sites remediation highly underused. Renewability makes biomass an attractive source of energy which gains a constantly increasing interest. Simultaneously some energy crops demonstrate promising heavy metal absorption capacities.

The approach creates space for combining the knowledge on how to clenaup the soils, get a satisfactory biomass yield and produce energy out of it in an environmetally safe way provided by project partners into a novel, interdisciplinary approach with a business dimension.

Our S&T Goal and objectives

Our goal is to develop and validate in field conditions an innovative, complex approach combining phytoremediation of heavy metal contaminated (HMC) sites with energy crops production and their conversion to energy using gasification. This approach may become an alternative for managing agricultural areas and postindustrial sites contaminated with heavy metals while delivering an environmental and economic added value.

To achieve this goal the following scientific and technological objectives have been set up:

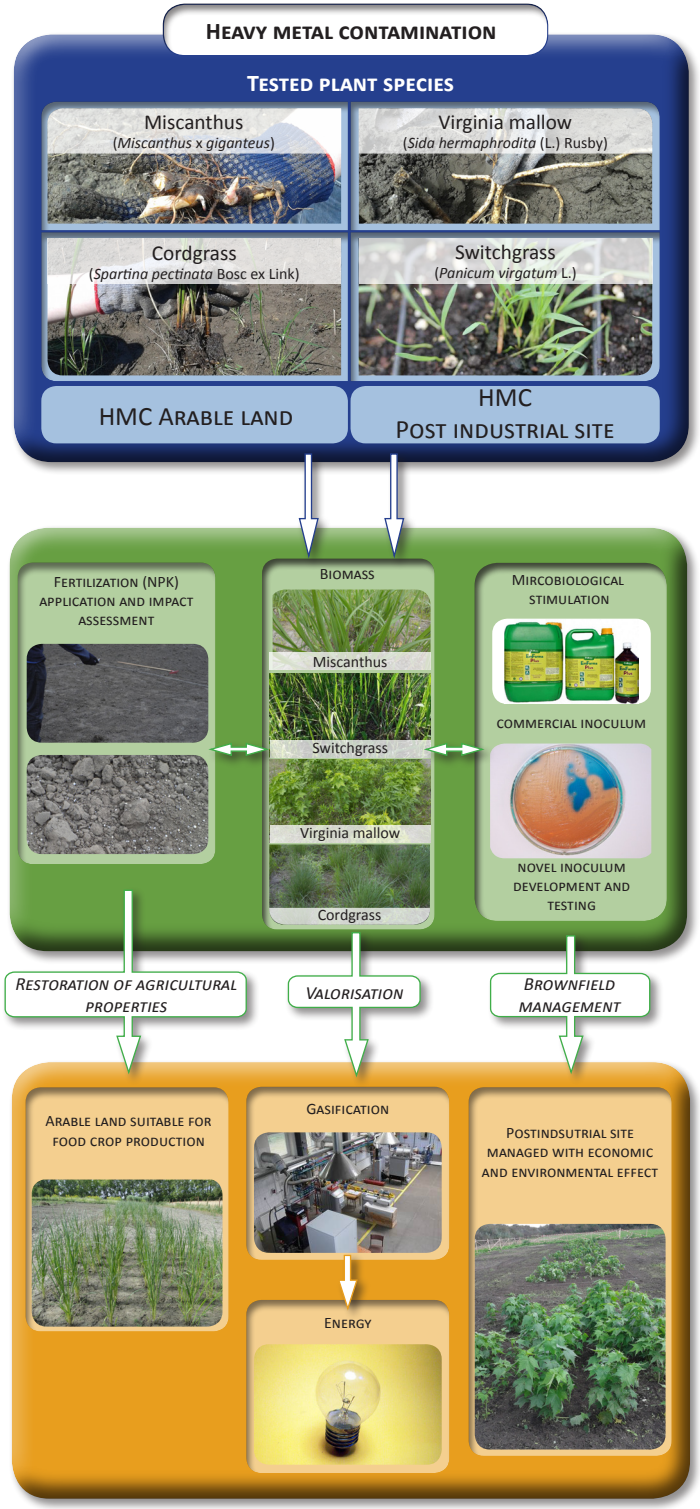
- Selection of optimal plant species suitable for phytoremediation driven energy crops production.
- Development of a microbiological method stimulating the biomass yield and phytoremediation effect at heavy metal contaminated sites
- Demonstration of an environmentally safe way of converting the heavy metal contaminated biomass into energy in a small scale gasification installation

Objective 1: Selection of optimal plant species

A four-year field experiment will be run jointly by IETU and VITA34 at two heavy metal contaminated sites: arable land (Poland) and a postindustrial site (Germany). It involves testing of 4 preselected plant species: *Miscanthus* x *giganteus*, *Sida hermaphrodita*, *Spartina pectinata*, *Panicum virgatum* to find which are the optimum ones with respect to both energy crop yield and phytoremediation capacity.

The study will deliver information which crop species are optimal in terms of phytoremediation effect, biomass yield, robustness and site management goals which are different for each site:

- upgrade the arable land function towards edible corps production (Polish site)
- eliminate the environmental risk while upgrading economically the use of the site (German site)



Expected results

A simple method for selection of optimal energy crop species to help transfer the Phyto2Energy concept to HMC sites management practice.

Objective 2: Use of the plant associated microbiome to stimulate plant biomass production at HMC sites

Mircobiological studies in Phyto2Energy project have a twofold role:

- to help determine the role of rhizobacteria, bacterial endophytes and mycorrhizal fungi in promoting biomass growth at contaminated sites
- to investigate the beneficial partnership between plants and their associated microbiomes as a strategy to accelerate plant biomass production and clean-up of the contaminated areas.

Expected results

Knowledge necessary to elaborate a formula of a new inoculum, based on a commercial product (EmFarma Plus™) provided by ProBiotics, that will enhance biomass growth and increase plants' resistance to diseases caused by pathogens occurring at HMC sites.

Objective 3: Valorization of the biomass from the HMC sites as a local energy carrier

Objective 3 aims to demonstrate how a HMC biomass can be converted to energy in an environmentally safe way by gasification as a promising technology which may become a competitive niche alternative for handling HMC biomass.

A set of parameters will be determined by SUT and ISPE to valorize HMC biomass from HMC sites as biofuel from the viewpoint of:

- characteristics and technical operation of gasification installations
- potential environmental concerns as well as benefits delivered by the treatment.

SUT will perform gasification tests of the obtained biomass in a small scale fixed bed downdraft gasifier installation with the purpose to:

- analyze andassess the impact of the feedstock parameters on the quality and composition of the end gas and other gasification products
- to understand which char/ash fractions are formed, how heavy metals behave during this process
- if and which mineral components contained in the biomass due to e.g. agritechnical measures facilitating the growth at HMC sites may affect the gasification process.

Expected results

Guidance on the improvement of the gasification process parameters worked out by SUT and ISPE that will help tyllor the process of HMC biofuel gasification taking into account the biomass production process and the environmental concerns. IETU and ISPE will also assess the applicability of the ash (and char) for land applications as mineral fertilizer in remediation process.