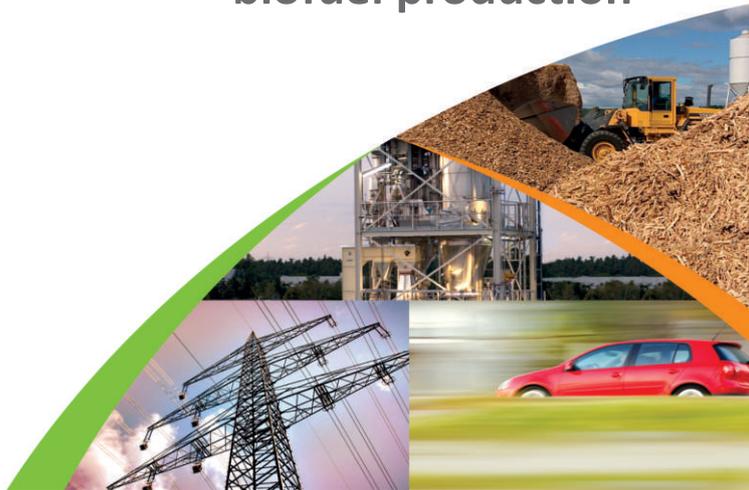


Biomass based energy intermediates boosting biofuel production



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Welcome to BioBoost

Converting residual biomass into a high energy density intermediate energy carrier for heat, power, fuels and chemical production is the aim of the collaborative project BioBoost. Transport and logistics of biomass over larger distances is generally costly. BioBoost investigates this challenge by optimizing three conversion pathways from several residual biomass feedstocks via fast pyrolysis, catalytic pyrolysis or hydrothermal carbonisation to fuels and chemicals. A heuristic transportation model is being developed and integrated into the environmental and economic

assessment. The applicability of the different energy carriers is investigated in existing and upcoming applications for heat and power production, synthetic fuels and chemical production as well as bio-crude for refineries.

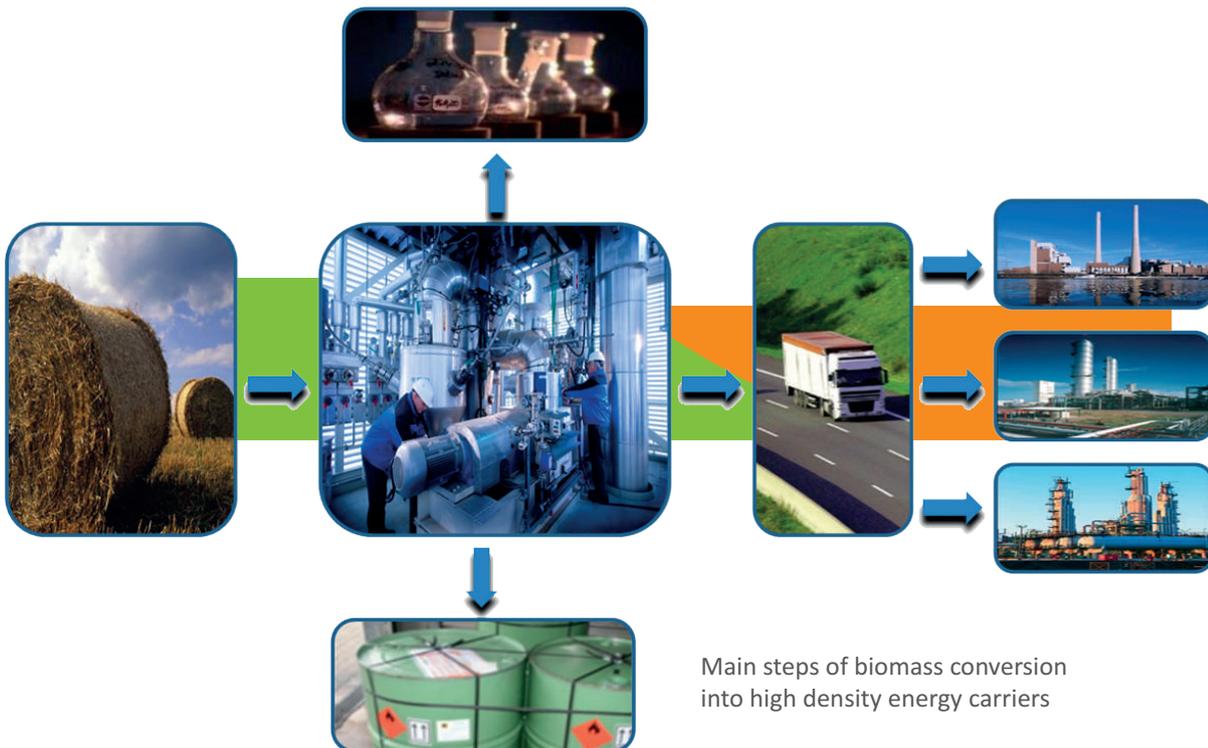
The project combines complementary expertise from 13 partners of six member countries representing research institutions, chemical industry, and energy suppliers. BioBoost is coordinated by the Karlsruhe Institute of Technology and funded by the 7th Framework programme of the European Union.



Learn how the BioBoost approach works

BioBoost focuses on de-central conversion of biomass to optimised, high density energy carriers. The energy carriers can be utilised either directly in nearby small scale combined heat and power

(CHP) plants or via gasification to fuels and chemicals or can be transported over larger distances to be upgraded to transportation fuels and chemicals in existing refineries or chemical plants.



Main steps of biomass conversion into high density energy carriers

The 6 main research areas of BioBoost

1 Feedstock potential in EU-27+Switzerland and supply: Focus is on wood and forestry residues, agricultural residues, food and organic wastes, either dry or wet and all of them highly sustainable and not in direct competition to food production.

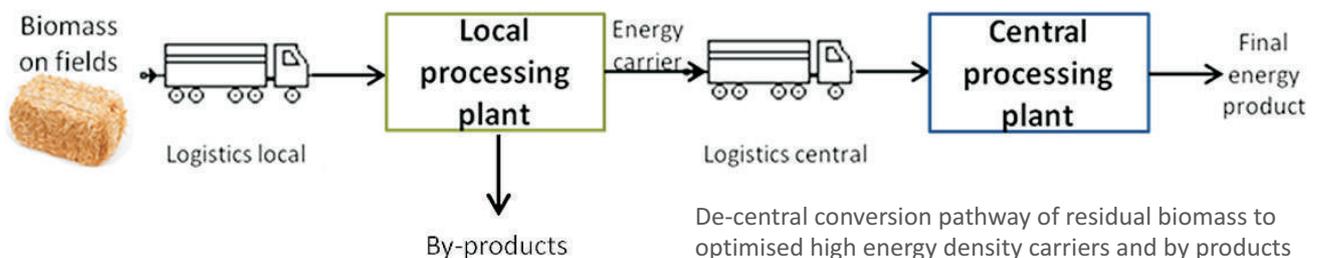
2 Conversion: The biomass is converted by fuel-flexible thermo-chemical processes such as fast pyrolysis (FP), catalytic pyrolysis (CP) and hydrothermal carbonization (HTC) to produce stable intermediate energy carriers in the form of bio-oil, -coal or -slurry. These can be utilized separately or in



different combinations. For straw, as an example, the energy density of the carrier can be increased by a factor of 10 to 15, enabling economic long range transportation from several regionally distributed conversion plants to few central large scale gasification plants for bio-fuel production.

- 3** **By-products:** Along the conversion routes several by products high value added chemicals from pyrolysis have been identified. The extraction and valorisation of these substances is investigated and business cases are setup.
- 4** **Logistics:** A logistic model of the supply chain taking into account de-central and central conversion scenarios with different types of energy carriers is set up and validated allowing the determination of distances, costs and the number and location of de-central and central sites.

- 5** **Assessment:** A techno-economic and environmental assessment of the value chains supports the optimisation of products and allows for comparison of the processes under consideration of the other conversion routes.
- 6** **Application:** The energy carriers are investigated in applications of heat and power production, synthetic fuels & chemicals and as bio-crude for refineries.



De-central conversion pathway of residual biomass to optimised high energy density carriers and by products

A more detailed look

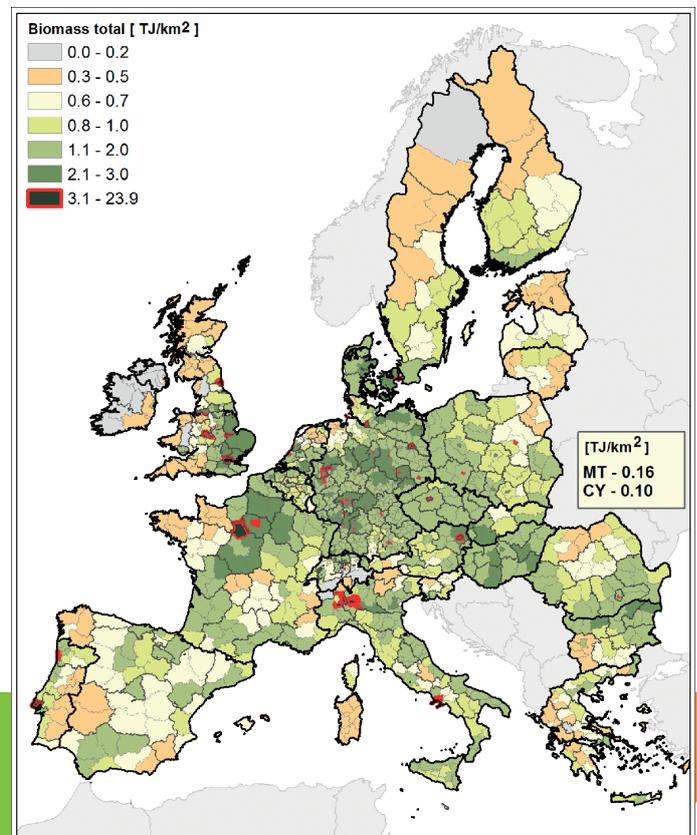
Feedstock resources in Europe

The feedstock potential of agricultural residues, organic wastes and forestry residues in EU-27 + Switzerland on the level of NUTS-3 regions (small regions with a geocode standard for referencing the subdivisions of countries for statistical purposes) is mapped in work package 1 by the Polish partner IUNG. In the first half of the project the biomass potential in the EU-27 and Switzerland along with their possible utilization in energy applications were analysed for: agricultural residues like straw orchard's pruning, and manure surplus, forestry residues, natural conservation matter, roadside vegetation, biodegradable municipal waste, selected waste from the food



and wood industry. The largest biomass potential based on residues and waste was found to be straw, second largest potential can be generated from residues from forestry and the third place is taken by biodegradable municipal waste. In certain areas, individual types of biomass may play a regional role.

The modelled results of the biomass potential, derived from waste and residues, are illustrated by maps of theoretical and technical potentials in NUTS-3. If you like to have a closer look, download the deliverable 1.2 on the feedstock potential assessment <http://bioboost.eu/results.php> on the BioBoost website.



Energy potentials (density) of biomass derived from waste and residues in NUTS-3 regions

Modelling the logistic chain to identify efficiency improvements

The work package 4 puts its focus on transport and logistics. By the Austrian partner FHOOE Forschungs & Entwicklungs GmbH a holistic logistics model encompassing operational, tactical as well as strategic decision variables is set up. More specifically, an optimized supply network that considers the availability and costs of biogenic residues, logistics process costs and conversion technology-based specifications is designed. A risk analysis pertaining to the underlying supply chain is complementing the system.

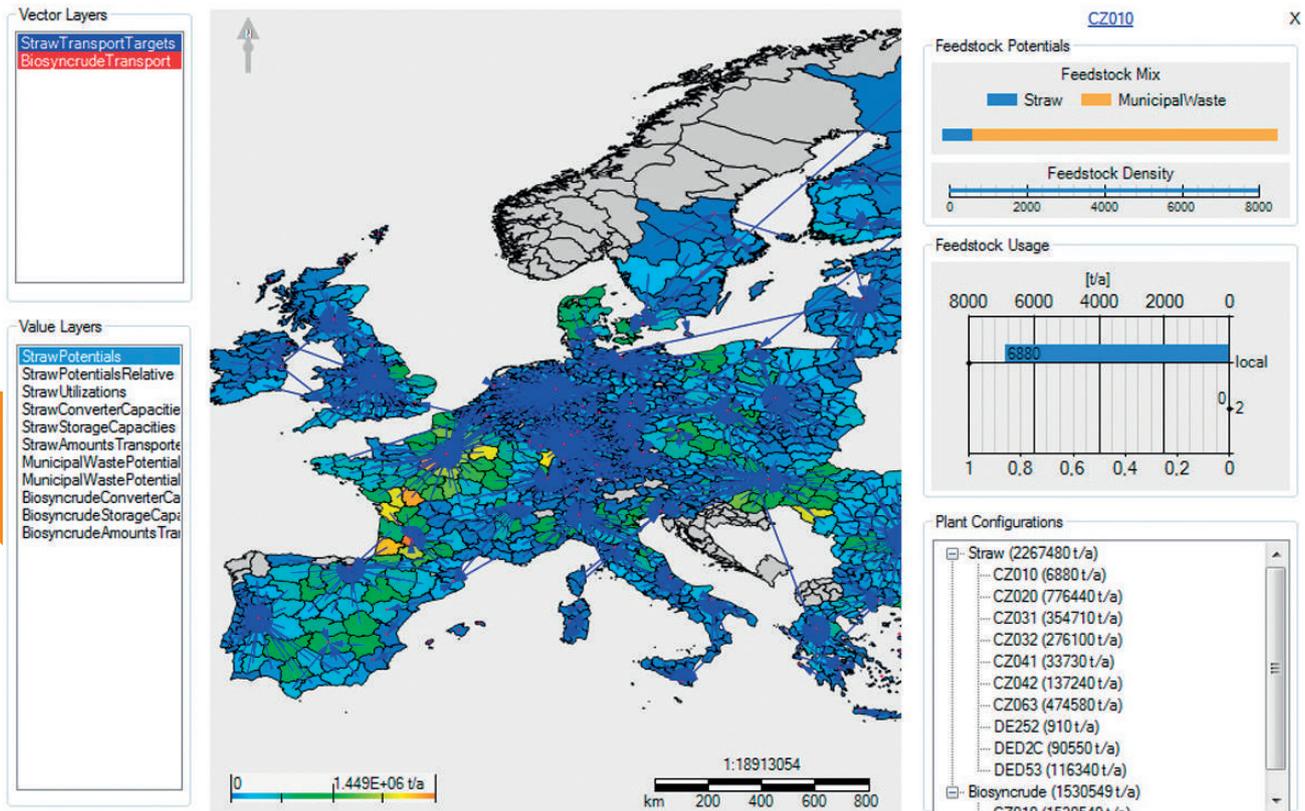
During the first half of the project, fundamental data on biomass as well as energy carrier logistics had been gathered. Transport, handling and storage processes were analyzed on a cost basis.

Different transport vehicle and trailer types (e.g. farm tractors with platform trailers) that are applied in practice were analyzed on the basis of distance fixed costs and distance variable costs. Furthermore, different handling equipment and storage infrastructure required were investigated according to its applicability for individual product properties and serve as input data for the holistic logistics model.

A prototype of the simulation environment has been developed based on the open-source software HeuristicLab. Evolutionary algorithms are applied to find ideal biomass networks with respect to both economic as well as ecologic objectives. Scenarios that are generated during

the optimization are evaluated using the holistic simulation model which considers a multi-stage supply network. As a result, favorable plant locations for de-central conversion and central processing are identified and visualized on a map along with the most economic feedstock usage

and supply network. The simulator yields a single quality value that describes the overall desirability of a specific scenario. The program includes a graphical user-interface that enables the interactive analysis of the proposed scenarios.



The holistic simulation model generates optimized scenarios for favourable locations of plants for de-central conversion and central processing along with the most economic feedstock usage and supply network.

All the results will be integrated into the BioBoost navigator. The simulation model together with the feedstock potential data on a high geographical resolution will finally allow investors to identify locations suitable for the erection of biomass conversion plants of a certain type and capacity. The data will allow to make predictions on transport and logistics properties of the supply chain, on costs and environmental impacts.



Events

Successful Midterm Assessment and Consortium Meeting in Brussels in September 2013

At half time the BioBoost consortium held the 4th Plenary Meeting in September 2013 in Brussels, Belgium in conjunction to the BioBoost Mid Term Review. It became clear that BioBoost activities are fully in line with the EU strategies and policies towards a safe, renewable and decentral energy supply. Emphasis needs to be taken to strengthen

scenario analysis of the BioBoost pathways. Data collection for CAPEX and OPEX, important figures when it comes to the business cases still need refinement. Open discussions and small group meetings helped to point out where further interaction, data exchange and strategic decisions are needed.

SECTOR Workshop

The SECTOR project „Production of Solid Sustainable Energy Carriers from Biomass by Means



BioBoost consortium during 4th Plenary Meeting in September 2013

strategic planning and to the documentation of exploitation activities. The exploitation potential of some chemical by-products in pyrolysis oil and the HTC process need to be focussed.

BioBoost Consortium Meeting at Neste Oil Corporation in Porvoo, Finland

The 5th BioBoost Meeting was hosted by Neste Oil Corporation in Porvoo, Finland from 5th to 6th March 2014. Neste Oil Corporation is the world's leading supplier of renewable diesel transportation fuels. Significant results could be presented in all work packages. Important milestones – MS 3 pyrolysis oil spray tests for utilisation in flox burners and MS 4 the setup of the heuristic logistic simulation model have been achieved. The logistic optimization tool is ready to be used as a powerful simulator in the heuristic optimization environment developed by FHOOE with the HeuristicLab software. Further work will be directed towards a

of Torrefaction“ held its midterm meeting on 16.-18.10.2013 in Pamplona, Spain. In order to enhance interaction with related projects and thus create synergies, representatives of 3 projects (IEA Task 40, INFRES, BioBoost) participated in a workshop moderated by the SECTOR Coordinator Daniela Thrän (DBFZ).

There is a potential in cooperation in many fields; e.g. technological questions could be discussed between engineers and scientists. Special interest was attracted by BioBoost's feedstock potential determination, logistics/supply chain modelling and the techno-economic and LCA assessment. Both projects aim to intensify their cooperation which led to a meeting of the BioBoost Coordinator, project office with the SECTOR Coordination in January 2014 at the DBFZ in Leipzig, Germany. Fields for cooperation like dissemination activities and comparison of results have been identified and will be implemented in the future.

International Conference „Protection of soil functions – challenges for the future” in Pulawy, Poland, 16-18 October 2013

The conference was hosted by the Department of Soil Science, Erosion and Land Conservation of IUNG within Proficiency project co-funded by EU FP 7.

The conference was dedicated to the protection of main soils functions with particular emphasis on topics such as: measures for soil protection against threats, erosion, compaction, loss of soil carbon, pollution, acidification and loss of the biodiversity, management and protection of soils of different use (agriculture, urban), methodologies for risk assessment at local, regional and European level. IUNG Scientists involved in BioBoost presented their results from BioBoost work package 1 with a poster titled „The feedstock potential assessment for EU-27 + CH in NUTS-3”, which you can download for a closer look on the BioBoost website.

http://bioboost.eu/uploads/files/16-10-2013-bioboost_poster_iung.pdf

Contact & Partners

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Ecochem conference in Basel, Switzerland, 19 - 21 November 2013

The sustainability assessment methodology developed by TNO was presented, describing the importance of the economic, social, and environmental impacts across the biofuels value chain. The reference value chains of BioBoost project and their benchmarks were explained. Intermediate economic and environmental impacts were presented to illustrate the importance of an adequate value chain integration and to foresee the effect of the feedstock, logistics and process efficiency.

What's happening next...

22nd European Biomass Conference and Exhibition in Hamburg, Germany, 23-26 June 2014

<http://www.conference-biomass.com/>

6th BioBoost Meeting in Thessaloniki, Greece on 13-14 October 2014. Meet us during the workshop on de-centralized conversion technologies of biomass in Greece hosted by CERTH in Agios Athanasios, Greece on 15 October 2014.

Web links

www.bioboost.eu

www.sector-project.eu

