

## **Biochar - from organic waste to resource for treatment of contaminated soil**

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Biochar-RE:Source is a 2-year research project aiming to develop a remediation technique with biochar to stabilize contaminated soil and increase soil quality to reduce waste and environmental risks. In Sweden, the most common remedial action is still “dig-and-dump”, leading to removal and landfilling of large volumes of soil. Biochar could here serve as an impressive alternative leading to more sustainable soil management, great socioeconomic savings and several other environmental benefits.

Biochar is the charred solid product resulting from the pyrolysis of biomass under low oxygen environment. It is used as a soil amendment in forestry and farming due to its capacity to increase the soil quality by its ability to conserve water, sequester carbon, prevent nutrient leaching and neutralize soil acidity. Due to its porous structure, large surface area, and many functional groups it can also sorb both inorganic and organic pollutants.

We aim to find biochars produced from local organic waste streams, suitable for remediation of historically contaminated soils. The project will also investigate the conditions for biochar production from organic waste, the ability to apply the biochar technique in urban environments and quantify the environmental impact of different system alternatives in a life-cycle perspective.

During 2018, a lab study was initiated to test four biochars of different origin (produced from urban garden waste and recycled wood, processed at 500-650°C) and two biochars modified by the addition of clay and miscanthus. Two historical contaminated soils (contaminated by metals and polycyclic aromatic hydrocarbons; PAH) were amended with 3% of each biochar. The bioavailability of PAH is being assessed using polyoxymethylene (POM) and the leachability of metals are studied at different pH using pH-static leaching tests. The soil quality of the biochar-amended soils and the untreated soils is evaluated by measuring CEC, organic carbon content, C/N-ratio, pH and available phosphate, while the characteristics of the different tested biochars are analysed by methods regulated by European Biochar Certificate (EBC).

The outcome of the lab-study will serve as the basis for choosing a suitable biochar to test in field experiment during 2019. The purpose of the field study is to determine environmental risks and biological effects under natural conditions (temperature, wind, moisture, rainfall, soil microbes, pH). We will study the impact of biochar addition to different amendment-percentage, and types of soils. The soils will be representative of masses that arise from excavation or demolition in urban environments and contain common pollutants such as PAH and metals, but differ in terms of organic content and permeability (clay content). The cultivation beds (approx. 3 × 3m) will be seeded with a

crop and analysed after a growing season (summer 2019) with respect to biomass production and contamination. The bioavailability of pollutants in amended areas and controls will be assessed using leaching and ecotoxicity tests. Impact on soil respiration and effects on soil microorganisms that control the nitrogen cycle will also be studied.