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ISOMON - Isotope application for remediation, aftercare and monitoring of contaminated sites

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The project ISOMON aims to develop and adapt stable isotope methods for their use in monitoring in-situ remediation of contaminated land. It brings together four Austrian research groups working in the field of site and soil remediation and SMEs offering services related to this area. The project is supported by the county of Lower Austria. Various aspects are elaborated in four work packages. Work package 1 aims to refine an elaborated stable isotope method for characterizing the biological stability of landfilled municipal waste in a landfill simulation reactor - which allows controlled and accelerated degradation – and validate its suitability under field conditions (closed landfill sites). Furthermore the stable isotope signatures are compared to FTIR (Fourier Transform Infrared) spectra and chemical parameters traditionally used to describe the stability of landfill sites. Work package 2 aims at improving the quantification of natural biodegradation of chlorinated hydrocarbons in the groundwater by looking at the spatial and time dependent changes in the carbon and hydrogen isotope fractionation factors in the field and in a simulated aquifer (Aqua-box). Results from the stable isotope methods will be compared to conventional investigations including groundwater modelling. Additionally, the application of electron donors i.e. enhanced natural attenuation and their effect on the carbon and hydrogen isotope fractionation factor will be explored. Work package 3 aims at ameliorating the effect of heavy metals on the biodegradation of organic contaminants by soil amendments, i.e. by immobilization of heavy metals. Biodegradation is quantified by monitoring the stable isotope fractionation of carbon in the soil-contaminant. To define degrading microorganisms ^{13}C labeled contaminants are used and the uptake in the microbial biomass is followed by ^{13}C phospholipid fatty acid analysis. Work package 4 aims to quantify degradation of petroleum hydrocarbons after in-situ biodegradation by monitoring the stable isotopic ratios of the electron acceptors used (nitrate and sulfate). The gained knowledge will be shared with SMEs offering services related to soil remediation and strengthen their market position and competitiveness.