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SOIL PROTECTION SPECIFIC REQUIREMENTS WITHIN THE FRAMEWORK OF CARBON DIOXIDE CAPTURE AND STORAGE (CCS) ACTIVITIES

Stange C. Florian^{*[1]}, Duijnsveld Wilhelmus H.m.^[1], Böttcher Jürgen^[2]

^[1] Federal Institute for Geosciences and Natural Resources ~ B 2.4 ~ Hannover ~ Germany ^[2] Leibniz University Hannover ~ Institute of Soil Science ~ Hannover ~ Germany

Mitigation of Climate Change is a challenge which requires efforts in different fields. Carbon capture and storage (CCS) in geological formations is discussed as a possible contribution to reduction of CO₂-emission. Risk analyses taking into account possible risks for the soil compartment are necessary for a well-founded decision. CO₂-leakage from the geological storage may be the main risk for soil. Currently there are no reliable assumptions about the possible amount of leakage, flux densities and the extent of the affected areas. Natural analogues show, that soil functions and soil ecology near to geological CO₂-sources are strongly influenced. Most studies compare areas with extremely CO₂-concentrations (>90%) with unaffected areas (control) and they show, that enhanced soil CO₂-concentrations are likely to change the chemistry of nutrients, lower the soil pH, mobilize heavy metals, and decrease plant growth. Systematic studies focussing on the influence of different CO₂-concentrations on soil functions are scarcely. Simulation studies with/without additional CO₂-sources can help to identify sites which are very susceptible to additional CO₂-input into the soil. Sensitivity analysis studies found in literature and modelling results from HYDRUS-1D in this project show the applicability of deterministic models to calculate concentration profiles in soils under the assumption of a small CCS-born CO₂-flux. Uncertainty analysis will be presented and discussed. Additionally a practical approach will be proposed to derive tolerable CO₂-fluxes (Critical Loads) into the soil ecosystem without causing damage to important soil functions.