Geophysical Research Abstracts
Vol. 16, EGU2014-10863, 2014
EGU General Assembly 2014

Climate mitigation scenarios of drained peat soils

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The national inventory reports (NIR) submitted to the UNFCCC show Sweden – which as many other countries has wetlands where parts have been drained for agriculture and forestry purposes, – to annually emit 12 million tonnes carbon dioxide equivalents, which is more GHG'es than industrial energy use release in Sweden. Similar conditions can be found in other northern countries, having cool and wet conditions, naturally promoting peat accumulation, and where land use management over the last centuries have promoted draining activities. These drained peatland, though covering only 2% of the land area, have emissions corresponding to 20% of the total reported NIR emissions. This substantial emission contribution, however, is hidden within the Land Use Land Use Change and Forestry sector (LULUCF) where the forest Carbon uptake is even larger, which causes the peat soil emissions become invisible. The only drained soil emission accounted in the Swedish Kyoto reporting is the N2O emission from agricultural drained organic soils of the size 0.5 million tonnes CO_2e yr-1. This lack of visibility has made incentives for land use change and management neither implemented nor suggested, however with large potential.

Rewetting has the potential to decrease soil mineralization, why CO_2 and N2O emissions are mitigated. However if the soil becomes very wet CH4 emission will increase together with hampered plant growth. By ecological modeling, using the CoupModel the climate change mitigation potential have been estimated for four different land use scenarios;
1, Drained peat soil with Spruce (business as usual scenario),
2, raised ground water level to 20 cm depth and Willow plantation,
3, raised ground water level to 10 cm depth and Reed Canary Grass, and
4, rewetting to an average water level in the soil surface with recolonizing wetland plants and mosses.
We calculate the volume of biomass production per year, peat decomposition, N2O emission together with nitrate and DOC/POC leakage. Based on the modelling results a cost benefit analysis is performed (economics), guiding to the design of environmental policies needed for land use change to come true.