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Greenhouse gases from drained peatland

Source: TorvForsk report no 15, Olsson, professor em, SLU

Peat amount

The area of peat covered land in Sweden amounts to about 10 million ha. Of this area, ca. 6 million ha ha, has a peat layer thicker than 30 cm and is classified as peatland. About 2.6 million ha of the peatland, i.e, almost half the area, is affected by drainage carried out for enabling agriculture and forestry.
Most of what is drained, 2.1 million ha, is productive forest land (according to international definition of forest land), whereas 0,3 million ha ha is agricultural land and 0,2 million ha ha is land where drainage has failed and is classified as mire without any forest production.

Carbondioxide equivalents

The drained peatlands emit large amounts of greenhouse gases, carbon dioxide as well as methane and dinitrous oxide, and are for this reason a significant source for greenhouse gases. The cumulative effect of these gases can be determined by assessing the amount of carbon dioxide, CO_2, that corresponds to the climate effect of methane and nitrous oxide. The sum is expressed as carbon dioxide equivalents (CO_2eqv).

One turn around the Earth

For peatlands with a groundwater table at 30 cm or deeper the emissions of the three greenhouse gases from peat vary between 5.2 and 9.1 ton CO_2ekv per ha and year, depending on differences in hydrology and peat properties. To visualize the size of this emission one might compare it with the emitted amount of carbon dioxide when driving a medium-sized car 28000 - 46000 km, i.e. one turn around the Earth.

Amount of greenhouse gases

The total emission of the greenhouse gases carbon dioxide, methane and dinitrous oxide from drained peatland in Sweden amounts to 15 – 24 million ton CO_2eqv per year. This is at the same level as the emissions from all domestic traffic in Sweden (1.5 million ton CO_2eqv) and one third of Sweden's reported total emissions of greenhouse gases 2013 (in total 55.8 million ton CO_2eqv). Of the drained peatlands in Sweden, the part with productive forestry is the one with the biggest emissions. This is due to the large area. The emissions amount to 11-19 million ton CO_2eqv per year.

The size depends on drainage
The biggest proportion of the emitted greenhouse gases from drained peatlands is made up of carbon dioxide, 68-100 %. This is due to the increased oxygen availability, following drainage, enabling oxidation of the peat.

At undrained peatlands the emissions of greenhouse gases might be even bigger, but, due to lack of oxygen, the emissions occur not as carbon dioxide but as methane. On the contrary, at wet undrained peatlands, a carbon dioxide sink might occur due to peat growth. Consequently, drainage can result in peatlands changing from being net sinks to being net sources of carbon dioxide.

Disappear to no use
The amount of lost through oxidation following drainage (2,6 miljoner ha) is 8-14 million ton or 81-148 million m^3. The amount of energy that in this way annually is lost is equal to the energy content in 2,7 – 4,9 million m3 fuel oil.

The role of forestry
There is significant uptake of carbon dioxide at 2.1 million ha drained peatland due to the growth of forest biomass. The trees fix through photosynthesis carbon dioxide, but all the uptake do not be considered as a long-term sink because a big part of the uptake is recycled to the atmosphere due to decomposition of dead plant residues (litter) and the fact that wood is used in the processing industries like pulp industry.

Could be a sink
However, there is a long-term increase of the standing forest biomass. Furthermore, wood can substitute fossil fuels and e.g. concrete for construction. This results in a sink and avoided emissions which together correspond to about 50 % of the emissions from peatland with productive forestry.

Management
Peat cutting in combination with an effective use of the peat and regenerated forest might turn the drained peatland system into a substantial sink for carbon dioxide. In addition, creation of new wetlands and lakes after finished peat cutting might be suitable measures.

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