

Greenhouse gases from forest soils

April 12 2011

Reactive nitrogen compounds from agriculture, transport, and industry lead to increased emissions of the greenhouse gas nitrous oxide (N₂O) from forests in Europe. Nitrous oxide emission from forest soils is at least twice as high as estimated so far by the Intergovernmental Panel on Climate Change (IPCC). This is one of the key messages of the first study on nitrogen in Europe (European Nitrogen Assessment, ENA) that is presented this week at the International Conference "Nitrogen and Global Change 2011" in Edinburgh, Scotland.

Reactive nitrogen compounds (e.g. NH₃ and NO_x) are mainly of anthropogenic origin. After their deposition on forests via air, they are partly converted into nitrous oxide (N₂O). Following carbon dioxide and methane, nitrous oxide is the third biggest producer of the [greenhouse effect](#). One kilogramme of nitrous oxide is about 300 times as greenhouse-effective as the same amount of carbon dioxide.

The ENA study performed by more than 200 scientific and political experts from 21 countries and 89 organisations concludes that the input of reactive nitrogen from air in the European forests so far has been underestimated significantly. Based on the information now available, about 2 to 6% of the atmospheric reactive nitrogen is converted into nitrous oxide that is emitted from forest soil into the atmosphere again. The corresponding estimate of the IPCC so far was about 1% only.

Over a forest area of 188 million hectares, deposition of reactive nitrogen increased from 1860 to 2000 by 1.5 million tons per year. This corresponds to an annual increase in reactive nitrogen per hectare forest

by about 8 kilogrammes.

The increased atmospheric input of reactive nitrogen mainly comes from [fertilisation](#) in agriculture and the associated volatilisation of ammonia and from nitrogen oxide emissions due to the combustion of fossil fuels or biomass burning.

Increased deposition of reactive nitrogen on forests does not only cause climate-damaging [nitrous oxide emissions](#) from forest soils, but also a loss of diversity of plant and animal species and enhanced nitrate emissions into water.

When presenting the ENA study in Edinburgh, Professor Klaus Butterbach-Bahl emphasised: "The present atmospheric reactive nitrogen deposition is much too high. Our analysis shows that significant reductions in particular of ammonia emissions from agricultural activities are needed to reduce nitrous gas emissions from forest soils."

Klaus Butterbach-Bahl is professor at Karlsruhe Institute of Technology (KIT). He is heading the Atmospheric Environmental Research Division of the Institute of Meteorology and Climate Research (IMK-IFU) and lead author of the ENA chapter on reactive nitrogen as a threat to the European greenhouse balance.

The ENA study is the first study describing the multiple threats of nitrogen pollution, including its ecological and economic impacts, i.e. its contribution to climate change and biodiversity loss on the European scale. The ENA study also identifies the regions at greatest risk in Europe and outlines actions to be taken to reduce the risks to protect the environment and public health.

More information: Parallel to the ENA presentation, a commentary by the lead editor Dr Mark Sutton from the Centre for Ecology &

Hydrology, Great Britain, was published in Nature on 11 April. *Nature* 472, pages 159-161, April 14, 2011.

Provided by Helmholtz Association of German Research Centres

Citation: Greenhouse gases from forest soils (2011, April 12) retrieved 25 April 2024 from <https://phys.org/news/2011-04-greenhouse-gases-forest-soils.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.