Abstract

The Integrated Greenhouse Gas Monitoring System (ITMS) project aims to enable Germany to operationally monitor the sources and sinks of the three most significant long-lived greenhouse gases CO_2, CH_4, and N_2O. This is accomplished by combining independent atmospheric concentration measurements with atmospheric transport models and bottom-up a priori emission information. With the Paris Agreement (2015), the monitoring of greenhouse gases for climate protection was put into force at the political level. The Intergovernmental Panel on Climate Change (IPCC) and the United Nations Framework Convention on Climate Change (UNFCCC) recommend supplementing the national inventory reports with an observation-based monitoring of greenhouse gas emissions. The WMO Framework Integrated Global Greenhouse Gas Information System (IG3IS) develops recommendations for national contributions. The ITMS implements the German contribution to the IG3IS.

The ITMS will establish on-line provision and visualisation of the natural and anthropogenic sources and sinks of Germany's most important greenhouse gases (CO_2, CH_4, N_2O). It will provide adequate spatially and temporally resolved, sector-specific information. This supports the national reporting of the Federal Environment Agency UBA, as well as the scientific basis of certificate trading. Overestimations and underestimations of sources and sinks as well as regional hotspots can be detected and thus uncertainties can be reduced. Differentiation of natural and anthropogenic contributions, quantification of diffuse sources, and reductions of greenhouse gases, as in agriculture, forestry, and other land uses (so-called AFOLU sector), but also in transport, will become possible. The ITMS also enables the evaluation and further development of observation strategies as well as support for other countries in this topic.

With the establishment of the operational ITMS service, the scientific measurement and modelling communities of Germany will be integrated, utilizing the Copernicus Services, the EU research projects, ICOS, IAGOS, as well as satellite data in a continuous manner. The long-term implementation of the ITMS research results at the operational authorities DWD, UBA, and Thünen-Institute make the project efficient and sustainable. Thus, the aims of ITMS are tightly related to enhancing transparency in GHG emissions reporting as done for Germany within the UBA, with input from the Thünen Institute regarding emissions from the LULUCF (Land Use, Land Use Change and Forestry) sector. These collaborations thus enable ITMS to provide in the long-term means for industry and policy consultation, tailored with regard to success in anthropogenic climate change mitigation.