BOTTOM-UP AND TOP-DOWN METHODS IN NATIONAL GHG EMISSION REPORTING

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Emissions of anthropogenic greenhouse gases are assessed on the basis of national greenhouse inventories. These have to be of high quality and comply with the criteria of transparency, completeness, consistency, comparability, and accuracy. Emission inventories comprise anthropogenic emissions of biogenic and non-biogenic gases which are emitted from five main sectors (energy, industrial processes and product use, agriculture, LULUCF and waste) from a large number of source categories. They are usually calculated by multiplication of 'activity data' with representative 'emission factors'. The more important emissions from a certain source category are, the higher is the demand on data collection and the development of national emission factors and methodologies. Detailed guidance how this has to be done is given by a series of guidelines issued by the IPCC (such as the IPCC, 2006 Guidelines). National emission inventories are annually checked through a review process by the UNFCCC. To ensure GHG inventories of high quality, countries should carry out quality check and quality control procedures and verification. One possible method for verification is the comparison with atmospheric concentrations combined with tools (inverse models) that are able to estimate total GHG emissions from the earth's surface. Those methods have gone through a rapid development during the last decade(s) and emission fields of CH4 and N2O at national resolution are now available for some countries or regions that have a sufficient density of atmospheric observations. In order to make this approach generally 'fit' for providing national GHG emission estimates, further investment in model improvement and atmospheric concentration measurements is required. However, only few countries currently have the resources and capacity to build system to provide independent national GHG emission estimates based on inverse modelling techniques for into their GHG inventory.

We argue that on the long run atmospheric concentration measurement combined with inverse models have a high potential of providing national GHG emission estimates with uncertainties that for some gases are smaller than those that could be attained with bottom-up methods, as biogenic source categories often are characterized by inherently high variability which makes improvement of its accuracy very expensive. We will develop ideas of a future system of national GHG emission reporting that makes best use of resources and information in order to serve the goals of the Paris agreement.