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## Uncertainty analysis of greenhouse gases emission: application to the EDGAR inventory

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Emission inventories of greenhouse gases built up from international statistics of human-related activities and emission factors (often referred to as ‘bottom-up’ inventories) are at the core of emission trend analysis to inform policy actions and scientific applications, to support climate negotiation and pledges for mitigation options.

Increasingly gaining importance is the quantification of the inherent uncertainty of these inventories that could allow moving towards a verification system in support of the enhanced transparency framework of the Paris Agreement, in particular the global stocktakes. Recently, two H2020 projects – CHE (CO<sub>2</sub> Human Emissions) and VERIFY – are focusing on this sensible aspect. This paper produces an unprecedented propagation of uncertainty applied to emissions of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O, impinging in both projects. Starting from the human emission estimates of the Emission Database for Global Atmospheric Research (EDGAR), which encompasses historic and sectoral emissions from all world countries and using the error propagation method, uncertainties of the CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions were computed per sector and country.

The devised methodology applies uncertainty stemming from statistics of human activity and emission factors using the guidelines of Intergovernmental Panel on Climate Change (IPCC 2006). The analysis takes into consideration the accuracy of emission estimates for developed versus developing countries, correlation arising from sector aggregation, and includes an ad-hoc treatment for specific sources and country specific emission factors. The results of emissions and their uncertainties are available for all world countries and all IPCC/EDGAR sectors, and for each country, the share of the total uncertainty each sector is responsible for, is identified.

Our results show that world-wide CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions lies in a confidence range of 5%, 33% and in excess of 100%, respectively. The sectors most responsible for such uncertainty depend strongly on the statistical infrastructure of the country but we observe in general that few sectors with smaller emission total are contributing to a large proportion of the total uncertainty.

This global uncertainty assessment aims at contributing to the European initiative of the CO<sub>2</sub> Monitoring Task Force, building up an operational greenhouse gas monitoring and verification support capacity.

