No good decisions without good data: Climate, policymaking, the critical role of science

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"If you can't measure it, you can't improve it." This concept is also true within the context of climate policy, where the achievement of the

objectives of the United Nations Framework Convention on Climate Change (UNFCCC) is dependent on the ability of the international community to accurately measure greenhouse gas (GHG) emission trends, and consequently, to alter these trends.

Greenhouse gas (GHG) emission inventories represent the link between national and international political actions on climate change, and climate and environmental sciences. Research communities and inventory agencies have approached the problem of climate change from different angles and by using terminologies, metrics, rules and approaches that do not always match. This is particularly true in dealing with "Land Use, Land-Use Change and Forestry" (LULUCF), representing about 25% of the emissions reductions pledged by countries in their National Determined Contributions (NDCs) to the Paris Agreement. This sector is one of the most challenging among the inventory sectors to deal with, mainly because of high level of complexity of its carbon dynamics and the difficulties in disaggregating the fluxes between those caused by natural and anthropogenic processes.

The study led by the CMCC Foundation Euro-Mediterranean Center on Climate Change (CMCC) and recently published in *Environmental Science and Policy* facilitates the understanding by research communities of the current (UNFCCC) and future (under the Paris Agreement) reporting requirements, while identifying the main issues and topics that should be considered when targeting improvement of the GHG inventory.

"Our research," explains Lucia Perugini, CMCC scientist and first author of the study, "aims to build bridges between research community and inventory agencies. Specifically, it provides an overview of the current and future GHG reporting and verification requirements under the Paris Agreement, identifying how and where the research community can provide an effective contribution (providing inputs, data,

solutions, methodologies) to support GHG inventory agencies and, therefore, towards the implementation of the Paris Agreement."

At present, a discrepancy of about of 5 gigatons of CO_2 per year ($GtNO_2/y$) in global anthropogenic net land-use emissions between global models (assessed in the last IPCC assessment report AR5) and national GHG inventories (reported to UNFCCC), largely attributable to differences in defining what is the anthropogenic land flux, has been estimated. The global modeling community and national governments currently apply different methods to estimate and report land-based greenhouse gas (GHG) emissions. How to reconcile conceptual differences in anthropogenic forest sink estimation between models and GHG inventories?

Each approach has its own advantages and limitations—the real problem is that they are not fully comparable. Reconciling these differences does not require that the research community abandon its own approach, but rather that solutions are found to ensure comparability.

The results of this study highlight that the research community needs to better understand terms, rules, procedures and guidelines that countries follow to estimate and report their GHG emissions under the Paris Agreement. Too often, scientific papers speak a language which is different from that used by the GHG inventory community. Moreover, to be relevant for the improvement of countries' GHG inventories, research should provide methodological guidance and research results (e.g. more innovative methodologies and tools, databases, research infrastructures and shared protocols for data gathering).

The policy process would greatly benefit from science that considers specific inventory needs; conversely, GHG inventories can represent a valid source of data that is constantly reviewed and updated and that can be particularly useful for research studies.

Promotion of national and regional networking initiatives on specific topics can help both communities in exchanging of data and methods, solving interpretative problems, and understanding each other's data and needs.

More information: Lucia Perugini et al, Emerging reporting and verification needs under the Paris Agreement: How can the research community effectively contribute?, *Environmental Science & Policy* (2021). DOI: 10.1016/j.envsci.2021.04.012

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