



## Independent data for transparent monitoring of greenhouse gas emissions from the land use sector – What do stakeholders think and need?



Erika Romijn<sup>a,\*</sup>, Veronique De Sy<sup>a</sup>, Martin Herold<sup>a</sup>, Hannes Böttcher<sup>b</sup>, Rosa Maria Roman-Cuesta<sup>a,c</sup>, Steffen Fritz<sup>d</sup>, Dmitry Schepaschenko<sup>d</sup>, Valerio Avitabile<sup>a</sup>, David Gaveau<sup>c</sup>, Louis Verchot<sup>e</sup>, Christopher Martius<sup>c</sup>

<sup>a</sup> Laboratory of Geo-Information Science and Remote Sensing, Wageningen University & Research, Droevendaalsesteeg 3, 6708 PB Wageningen, The Netherlands

<sup>b</sup> Oeko-Institut e.V., Schicklerstr. 5-7, D-10179 Berlin, Germany

<sup>c</sup> Center for International Forestry Research, P.O. Box 0113 BOCBD, Bogor, 16000, Indonesia

<sup>d</sup> International Institute for Applied Systems Analysis, Schlossplatz 1 - A-2361 Laxenburg, Austria

<sup>e</sup> International Center for Tropical Agriculture, Km 17 Recta Cali-Palmira CP 763537, Apartado Aéreo 6713, Cali, Colombia

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### ABSTRACT

The agriculture, forestry and other land use (AFOLU) sectors contribute substantially to the net global anthropogenic greenhouse gas (GHG) emissions. To reduce these emissions under the Paris Agreement, effective mitigation actions are needed that require engagement of multiple stakeholders. Emission reduction also requires that accurate, consistent and comparable datasets are available for transparent reference and progress monitoring. Availability of free and open datasets and portals (referred to as independent data) increases, offering opportunities for improving and reconciling estimates of GHG emissions and mitigation options. Through an online survey, we investigated stakeholders' data needs for estimating forest area and change, forest biomass and emission factors, and AFOLU GHG emissions. The survey was completed by 359 respondents from governmental, intergovernmental and non-governmental organizations, research institutes and universities, and public and private companies. These can be grouped into data users and data providers. Our results show that current open and freely available datasets and portals are only able to fulfil stakeholder needs to a certain degree. Users require a) detailed documentation regarding the scope and usability of the data, b) comparability between alternative data sources, c) uncertainty estimates for evaluating mitigation options, d) more region-specific and detailed data with higher accuracy for sub-national application, e) regular updates and continuity for establishing consistent time series. These requirements are found to be key elements for increasing overall transparency of data sources, definitions, methodologies and assumptions, which is required under the Paris Agreement. Raising awareness and improving data availability through centralized platforms are important for increasing engagement of data users. In countries with low capacities, independent data can support countries' mitigation planning and implementation, and related GHG reporting. However, there is a strong need for further guidance and capacity development (i.e. 'readiness support') on how to make proper use of independent datasets. Continued investments will be needed to sustain programmes and keep improving datasets to serve the objectives of the many stakeholders involved in climate change mitigation and should focus on increased accessibility and transparency of data to encourage stakeholder involvement.

### 1. Introduction

The agriculture, forestry and other land use (AFOLU) sectors play important roles in climate change and contribute with nearly 25% to the net total global anthropogenic greenhouse gas (GHG) emissions (estimated in 2010; IPCC, 2014a). AFOLU sectors emissions include those from deforestation, fire, wood harvesting, and agricultural

emissions including croplands, paddy rice, and livestock (Roman-Cuesta et al., 2016a). Effective mitigation actions in these domains are needed in order to reduce the emissions from these sectors (UNEP, 2015; Grassi et al., 2017). A global agreement to combat climate change and to adapt to its effects was reached in Paris at the 21<sup>st</sup> Conference of Parties (COP21) of the United Nations Framework Convention on Climate Change (UNFCCC). The Paris Agreement creates a binding and

\* Corresponding author.

E-mail address: [erika.romijn@wur.nl](mailto:erika.romijn@wur.nl) (E. Romijn).

progressive framework that obliges all countries to formulate climate mitigation strategies and goals to limit global warming to well below 2.0 degrees C (UNFCCC, 2016; Turnhout et al., 2017). Countries' strategies and actions are formulated in the nationally determined contributions (NDCs) and anthropogenic emissions and removals from the AFOLU sector should be communicated with the national GHG inventory reports. The accounting mechanism for NDCs includes all categories of anthropogenic emissions and removals and should comply with the requirement of the Intergovernmental Panel on Climate Change (IPCC) that estimates should be complete, consistent, comparable, transparent and accurate (IPCC, 2003, 2006, 2014b). The purpose of the "enhanced transparency framework" of the Paris Agreement (UNFCCC, 2016: Article 13) is to provide 'clear understanding of climate change action' including 'clarity and tracking of progress towards achieving Parties' individual nationally determined contributions' and 'Parties' adaptation actions' including 'good practices, priorities, needs and gaps'. With high levels of donor support and engagement of stakeholders, the Global Environment Facility established the Capacity-building Initiative for Transparency (CBIT) which will assist developing countries, pre- and post-2020 to strengthen their institutional and technical capacities to meet this essential element of the agreement. To understand what is being done and achieved in climate mitigation action, transparency of biophysical land and emission data and information in the submitted national communications and NDCs is key. Art. 13 also asks for "a full overview of aggregate financial support provided", but in the present paper we focus on data related to climate change action and do not address the question of finance data.

Data and methods should be able to support implementation of mitigation activities and encourage stakeholder engagement at different scales. Stakeholders can be divided into data users and data producers. Stakeholders have different roles and responsibilities and need different types of data related to climate change mitigation efforts and GHG emissions reporting (Böttcher et al., 2017). At national level, policy makers and mitigation planners frequently need national datasets for assessment of mitigation and adaptation options. This can, for example, include land use and land use change monitoring or improved accuracies for more effective mitigation strategies. Governmental stakeholders (e.g. national GHG experts) are seeking data at national level on forest area changes, forest carbon stock changes and GHG emissions, including uncertainty estimates, to compile national GHG inventories and to track progress on the commitments made under their NDCs. UNFCCC roster of experts need to perform technical assessment and independent reviews of national GHG inventories. These experts would benefit from independent datasets against which to compare national GHG trends and their uncertainties. NGOs and Civil Society commonly operate at local level. Especially those groups in charge of implementing the mitigation activities on the ground (i.e. farmers, forest owners, etc.) need reliable data on land use changes, associated emissions and information about uncertainties at a local level. Local communities (including indigenous groups) can be involved in monitoring implementation, to assess performance. They would require accurate local data and uncertainties, and could also benefit from independent data creation through community monitoring (i.e. forest plot monitoring of carbon stock changes) (Pratihast et al., 2013). However, often these groups are underrepresented and require improved capacities and training on data collection, monitoring and reporting. Other key stakeholders may include the private sector aiming for deforestation-free commodity supply chains (e.g. oil palm, cocoa, beef, coffee). These companies that have committed to zero-deforestation would benefit from accurate data on deforestation at local and regional scales. They may need to develop specific MRV systems, targeting different commodities and their supply chains. Academia (i.e. the global modelling and carbon science community) have a role in building confidence in land use and emission estimates by providing independent references for GHG emissions. This is important to improve scientific understanding. The data they provide help increase transparency, accuracy,

consistency, completeness and comparability.

To monitor progress in achieving emissions reductions, accurate spatially explicit GHG emissions estimates and their associated uncertainties need to be produced at the scale at which appropriate mitigation actions are implemented (Roman-Cuesta et al., 2016a). A considerable amount of independent, publicly available, comprehensive spatial (regional to global scale) data on land cover, land emissions, land use, their dynamics and the associated carbon stocks and flows has become available (e.g., Global Forest Watch: <http://www.globalforestwatch.org>; Avitabile et al. 2016; Federici et al. 2015; Hansen et al. 2013; Roman-Cuesta et al., 2016b). Apart from national and local datasets, global datasets are of great importance for a wide variety of stakeholders involved in GHG emissions monitoring and reporting (e.g., Hansen et al., 2013; Baccini et al., 2012). However, these datasets also contain errors or misclassification problems (e.g. not being able to distinguish between forest re-growth and plantation) and therefore they need to be adapted for use at national scale and may need to be corrected for misclassifications or other data problems (GFOI, 2016). Policy makers and people involved in preparing the GHG inventories need to be aware of data quality as an issue. First, estimates of emissions and removals from AFOLU can have considerable uncertainties of up to 50% from the mean (Houghton et al., 2012; Smith et al., 2014; Tubiello et al., 2015), to which various sources of errors contribute. Second, different estimations diverge as they are based on different conceptual frameworks, forest and biomass definitions, methods, assumptions, sources of activity data (AD) and emission factors (EF) (Abad-Viñas et al., 2014; Federici et al., 2017; Grassi and Dentener, 2015; Roman-Cuesta et al., 2016b; Romijn et al., 2013). Furthermore, inappropriate scale, lack of data on uncertainties and limited guidance on how to and how not to use such information, limits their usefulness (e.g. Grassi et al. 2017). Also, differences in the countries' technical capacities in monitoring and reporting of GHG emissions lead to divergence and uncertainty in the reported data (Romijn et al., 2012).

Large uncertainties hinder progress in implementing, monitoring and verifying effective mitigation strategies. Our assumption is that data quality and data availability can be improved by making use of independent AFOLU datasets: datasets, tools, and portals that support countries' needs by providing complementary data to what is mandated by their own monitoring systems. In the context of the Paris Agreement, and given the bottom-up nature of the NDCs, we believe that independent data has many functions. They can be used for independent assessment of national estimates; i.e. as a reference dataset to improve national estimates. Moreover, by comparing national and independent datasets and harmonizing definitions, more insight can be derived on the sources of errors, and differences in estimating, allocating, and reporting GHG emissions (Federici et al., 2017; Harris et al., 2012; Roman-Cuesta et al., 2016b). Independent data can also be used as a data source for the various stakeholder groups with their varying needs involved in climate change mitigation efforts. Their use would promote better stakeholder engagement and participation, particularly from currently underrepresented groups such as indigenous peoples and forest-dependent communities, and promote greater transparency in GHG reporting. Independent data could make an important contribution to the implementation of the Paris Agreement and can support countries' mitigation planning and implementation, and related GHG reporting, in particular in cases where in-country capacities are lacking.

The purpose of this research is to analyse different stakeholder data requirements, needs and preferences regarding the use, accessibility and usefulness of different existing open data sources associated with *forest area and area change data, forest biomass and emission factors, and AFOLU GHG emissions*, through an online survey. Furthermore, based on evaluation of existing datasets from a stakeholder perspective, we aim to identify challenges and gaps currently limiting data availability and lastly, we evaluate readiness of approaches, including existing and future monitoring programs and datasets, for an independent use for

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