

GREENHOUSE GAS INVENTORIES IN WEST AFRICA: RELEVANT ISSUES AND STRATEGY FOR IMPROVING THE QUALITY

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ABSTRACT

To meet the ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC) that is to stabilise the concentration of greenhouse gases in the atmosphere at a level that prevent all dangerous anthropogenic disturbance of the climate system, political commitment is absolutely essential. But there is also a need to have reliable data and results available from scientific and technological studies and researches related to climate change.

As far as the greenhouse gas inventories are concerned, the context that characterizes West African Region has been analysed. Firstly, on the basis of the greenhouse gas inventories review done for eleven countries, taking into account the Intergovernmental Panel on Climate Change (IPCC) Guidelines for national inventories and the IPCC Good Practice Guidance and Uncertainty Management (GPGUM), and secondly, considering the analysis of conclusions and synthesis reports of thematic workshops on inventories for the African Region. In this context, common and relevant issues, concerning inventories development in West Africa have been identified and classified. The main issues are related to methodologies, data, uncertainty assessment, quality control, institutional arrangements, technical capacity and greenhouse gas accounting and reporting principles. National priorities have been identified and a strategy formulated in order to contribute to the improvement of greenhouse gas inventories quality in West Africa and thus to reduce uncertainties introduced into global estimates, which will in turn enable to improve strategies for reducing greenhouse gas emissions.

1.0 INTRODUCTION

To face up to harmful effects of climate change that constitutes a threat for environment and sustainable development, International Community has reached agreements, in particular through the UNFCCC and the Kyoto Protocol. According to these legal tools, countries should provide information on their GHG emissions by sources and removals by sinks using comparable methods. The IPCC Guidelines for National GHG inventories and GPGUM facilitate this process.

However, a review of inventories developed in West African Countries and an analysis of reports and conclusions of thematic workshops on inventories in African countries, show that those inventories present some insufficiencies

related, among others, to activity data, emission factors and methodologies and that their development raises issues such as institutional arrangements, quality control.

With regard to these considerations, the current paper aims to contribute to the improvement of inventories quality in this region, which could be beneficial for the global estimates.

To address this subject, issues related to the establishment of inventories and approaches of solutions will be presented, as well as national priorities and formulated strategy.

2.0 MATERIALS AND METHODS

The situation in eleven countries including Benin, Burkina Faso, Côte d'Ivoire, The Gambia, Ghana, Guinea, Mali, Niger, Nigeria, Senegal and Togo is presented. These countries have already submitted their initial national communication on climate change to the Secretariat of the UNFCCC or provided to National Communication Support Programme (NCSP) the draft of their national inventory. The following table shows an overview of GHG emissions and removals for those countries.

Table 1: Overview of emissions and removals by country (Gg CO₂ equivalent)

Country	Base Year	Emissions				Total emissions	Removals
		Energy	Agriculture	LUCF	Other		
Benin	1995	997.86	38,180.15	14,584.76	395.34	54,156	62,108
C Ivoire	1994	12,438.07	3,448.85	75,731.29	9,839.64	101,458	95,579
Ghana	1994	6,567.80	5,255.70	6,143.33	753.65	18,720	25,616
Guinea	1994	11,181.15	2,523.83	83,638.50	479.33	97,823	101,529
Mali	1995	968.41	7,572.67	28,498.49	125.11	37,165	38,247
Niger	1990	928.47	1,839.55	6,106.26	37.78	8,912	368,013
Senegal	1994	3,788.60	2,957.60	19,823.04	2,571.70	29,141	25,820
Togo	1995	1,307.17	3,278.03	31,705.11	410.28	36,701	11,408

Sources: National communication or draft of GHG inventory of countries

The inventories have been reviewed as well as information provided to the NCSP by the countries within the framework of the development of Regional Project entitled "Capacity building for improving the quality of GHG inventory in West Africa". In addition to that, an analysis of synthesis reports of thematic workshops on inventories for the African Region has been carried out.

3.0 RESULTS AND DISCUSSION

The inventories review, taking into account the IPCC Guidelines for National GHG inventory (IPCC, 1997) and the IPCC GPGUM (IPCC, 2000), and the analysis of synthesis reports of thematic workshops on inventories for African Region, notably Nairobi, January 1999; Accra, August 1999; Cotonou, October 2001, have enabled to identify and classify issues that raises the establishment of GHG inventory in West Africa.

Common or relevant issues related to the quality of GHG inventories are outlined below:

Methodology: All countries in the region used the Revised 1996 IPCC Guidelines, but the latter as well as the software are not always been well used or mastered in the national circumstances.

Poor or inadequate scientific understanding of emission sources or processes has led some national inventory teams to badly calculate emissions. For example, in the regional context, with regard to methane emission from solid wastes management, the following method used by some inventory agencies to calculate methane emission from anaerobic decomposition of organic solid wastes is not suitable:

Emission (CH₄)= Quantity of solid wastes produced x EF_(IPCC), (where EF_(IPCC) is IPCC default emission factor).

Data: This is a critical issue for countries in the region. Data include mainly emission factors, activity data, conversion factors and assumptions used. The IPCC Guidelines recognise that a range of input data is fundamental for the inventory quality and recommend the use of national, not default, data where possible. The assessment shows that, there are large data gaps in all sectors, particularly in agriculture, land use change and forestry (LUCF), waste sectors. All countries have heavily relied on the IPCC default factors, which do not reflect their national circumstances or contexts.

Some countries have developed emission factors (G.H.S. Guendehou & E.D. Ahlonsou, 2002, in waste sector for Republic of Benin) but these are not sufficient with regard to the great number of emission factors to be developed.

Uncertainty assessment: Uncertainty analysis needs to be accomplished as an essential element of the complete inventory. Some countries have carried out quality control procedures at a low to medium level. For the most part, uncertainty assessments have been based on expert judgment and are generally estimated as high (see table below). This is largely caused by the use of the IPCC default emission and conversion factors (mainly for the LUCF and Agriculture sectors) and the gaps in activity data.

Table 2: Level of uncertainty in GHG inventory using expert judgement

Country	Sector				
	Energy	Ind. Proc.	Agriculture	LUCF	Waste
Benin	H	M	H	M	M
Burkina Faso	L	--	H	H	H
Côte d'Ivoire	--	--	--	--	--
Gambia	L	H	L	M	M
Ghana	--	--	H	H	--
Guinea	M	H	M	M	H
Mali	L	L	M	H	L
Niger	L	M	M	H	H
Nigeria	--	--	--	--	--
Senegal	L	M	H	H	M
Togo	M	M	M	M	M

Notes: H= high; M= medium; L= low uncertainty; --= no information provided

Source: Country responses to NCSP questionnaire. (2001)

Quality control: The inventory development process should include numerous quality checks on a regular basis to spot any of the technical errors such as incomplete identification of emission sources, use of incorrect methods or assumptions, errors in converting measurement units, use of incorrect data, mistakes in data entry, incorrect use of calculation tools.

In the region, no countries have formal quality assurance/quality control procedures in place, as prescribed in GPG. The reason is that the GPG was not available when the majority of inventories for Initial National Communications were being prepared. Measures used for data verification and quality control to ensure the accuracy of GHG inventories are not institutionalised and inventories are mostly peer-reviewed at the national level or by international expert.

Institutional arrangements – National inventory systems: All countries have a lead agency such as climate change enabling activity team, National Climate Committee, established either under the national communication development process or as part of the implementation strategy of the UNFCCC. However, in most countries, national systems do not exist to enable the improvement of inventories quality or to allow for periodic updating. Lack of funding is identified as a limiting factor. Each country uses different mechanisms for collecting, managing, updating and archiving data. Many countries used individual experts from universities, research institutes, NGOs and government, etc, to prepare inventories.

Technical capacity: All countries in West Africa lack human resources to conduct studies or researches related to inventory. There are only a few people dedicated to GHG inventory issues and the scientific contribution of the region to studies and researches on climate change issues is very low. In addition to that, we don't participate fully in scientific and policy communities. There is then a need for inventory teams to follow regular training programmes to enable their involvement and participation in IPCC works and UNFCCC processes by working in areas like emission inventories and mechanisms.

GHG accounting and reporting principles: To develop a high quality inventory, it is essential to adopt and apply GHG accounting and reporting principles in all phases of the inventory development process. GHG accounting and reporting principles include the following: relevance, completeness, consistency, transparency, accuracy and comparability.

In the region, many countries lack GHG accounting and reporting principles. Information related to sectors, gases, tables and sources of data are often missing without any justification provided.

For example, Ghana does not provide all the methodological tables. No country reports GHG emissions from biomass burning in case of conversion of lands separately from energy emissions. Aquatic emissions of nitrous oxide from rivers and coastal waters, due to agricultural N (indirect N₂O emissions from agriculture sector) or non-agricultural N have not been included in the national inventory of Benin although such a source exists.

Now that these issues have been identified, what should be national priorities?

National priorities

To ensure a high quality inventory, it is essential to find solutions for the major problems raised by the issues.

The first priority is related to the human resources who will be responsible for conducting studies and researches on inventory as well as development tools. In this connection, there is a need to establish a national GHG inventory team composed of qualified experts from public sector, universities, research centres, NGOs, etc. Funding for the functioning of such a team may be a limiting factor.

The second priority related to the development of a consistent national system is the most neglected aspect in previous inventories.

Others priorities concern 1) capacity building for gathering, updating, archiving of relevant and reliable data, 2) development of national emission factors and 3) use of the IPCC GPGUM.

Strategy for improving GHG inventories quality

While much of the previous discussion has concentrated on activity data and emission factors, there is a gradual realisation that the quality of inventories is the net result of a more complex process. A simplified process to ensure inventories quality is described through the ten main following points.

- 1- Adopt and apply GHG accounting and reporting principles: relevance, completeness, consistency, comparability, transparency, and accuracy, in all phases;
- 2- Identify all probable sources and sinks of GHG. Comprehensive knowledge of emission by sources and removal by sinks is required.
- 3- Select an appropriate emissions calculation and reporting methodology: choose emission factors and parameters. Development and use of country- and source-specific emission factors are always preferred as it leads to higher certainty in emissions data (IPCC recommendations);
- 4- Set up a robust country-specific data collection system;
- 5- Apply calculation tools to estimate GHG emissions: software or protocol (e.g. IPCC GHG inventory software);
- 6- Undertake an uncertainty analysis: identify sources of uncertainty and use approaches for characterizing and quantifying uncertainty;
- 7- Undertake accuracy checks for technical errors;
- 8- Conduct technical reviews;
- 9- Obtain independent external verification;
- 10- Organize regular training seminars for inventory development team members.

4.0 CONCLUSION AND RECOMMENDATIONS

The magnitude of uncertainties associated with GHG emissions inventories from West African Region are due to issues related, among others, to data, methodologies, and human resources.

It is important to note that, some countries are coming to an increase in their socio-economic activities such as transportation, agriculture, land use identified as sources of GHG emissions. Therefore, there is a need to improve the inventory system, in order to get rid of uncertainties introduced into the regional and global estimates or minimize them.

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