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REPORT OF THE VIRTUAL WORKSHOP FOR TRAINING NATIONAL EXPERTS ON THE GREENHOUSE GAS (GHG) AND BLACK CARBON INVENTORY IN THE WASTE SECTOR IN CÔTE D'IVOIRE

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JACQUES BAMIKOLE KOUAZOUNDE

CONTENTS

ABBREVIATIONS AND ACRONYMS

BTR	: Biennial Transparency Report
BUR	: Biennial Update Report
CBIT	: Capacity-building Initiative for Transparency
COP	: Conference of the Parties
ECOWAS	: Economic Community of West African States
ETF	: Enhanced Transparency Framework
GHG	: Greenhouse Gas
IPCC	: Intergovernmental Panel on Climate Change
MRV	: Monitoring, Reporting and Verification
MULH	: Ministère de l'Urbanisme du Logement et de l'Hygiène
NDC	: Nationally Determined Contributions
PAM-CDN/ DS	: Projet d'Appui à la Mise en œuvre des Contributions Déterminées au Niveau National (CDN) dans le Secteur des Déchets Solides au Sénégal
QA/QC	: Quality assurance/Quality control
REDD-plus	: Reducing emissions from deforestation and forest degradation
SLCP	: Short-Lived Climate Pollutant
UCG	: Unité de Coordination de la Gestion des Déchets Solides
UNFCCC	: United Nations Framework Convention on Climate Change

INTRODUCTION

As part of the implementation of the "Support for the NDC implementation in the Waste Management sector in Senegal and Côte d'Ivoire" project (PAM-CDN / DS), a virtual training workshop on the Greenhouse Gas (GHG) and Black Carbon inventory in the waste sector was held on 1 and 2 October 2020 for Senegal national Experts.

Organised by the Ministry of Urban Planning, Housing and Public Hygiene of Senegal (Ministère de l'Urbanisme du Logement et de l'Hygiène (MULH), Sénégal), through its Solid Waste Management Unit (Unité de Coordination de la Gestion des Déchets Solides), with the support of the Environment and Climate Change Canada, UNEP and Stockholm Environment Institute (SEI), the global objective of the workshop was to train Senegal's national experts on the GHG and black carbon inventory in the waste sector on appropriate methodologies for emission calculation. Specifically, the workshop aimed to:

- Bring participants to have a better understanding of the Short-Lived Climate Pollutants (SLCP), their sources and links with the GHG emissions and Nationally Determined Contributions (NDC);
- Introduce participants to the use of GHG and SLCP inventory methodologies;
- Introduce participants to the use of GHG and SLCP inventory tools (IPCC software and excel worksheets).

The training was conducted by the consultant, Dr Jacques B. Kouazounde, an Expert in GHG and SLCP inventory. It was facilitated and moderated by Mr Idrissa Diatta, Coordinator of the PAM-CDN / DS in Senegal.

Participants at the meeting included the representatives from the: Directorate of Environment under the Ministry of Environment and Sustainable Development (Direction de l'Environnement et des Établissements Classés), National Sanitation Agency (Office National de l'Assainissement), Senegal Solid Waste Management Project (Projet pour la Promotion de la Gestion Intégrée et de l'Économie des Déchets Solides -PROMOGED-) and Solid Waste Management Coordination Unit.

The workshop agenda and participants list are presented in Annexes 1 and 2.

This report presents the proceedings of the training workshop.

1. OPENING OF THE WORKSHOP

The Coordinator of the UCG, Mr Mass Thiam, chaired the opening session of the workshop. There were four representatives' remarks from (i) Dr Phillip Osano, SEI Africa Centre Director, (ii) Dr Richard Munang, Regional Climate Change Coordinator at UNEP Africa Office, (iii) Excellency Sebastien Beaulieu, Ambassador of Canada to Senegal, Representative of the Canada Government, and (iv) Coordinator of the UGC.

1.1 SEI Keynote Address

Dr Phillip Osano on behalf of the SEI expressed his delight to witness the launch of the actual training workshop as part of the project SEI is implementing together with UNEP, Environment and Climate Change Canada and MULH for supporting the NDC implementation in the waste management sector in Senegal and Cote d'Ivoire. He acknowledged Senegal's Government, in particular, the PAM-CDN / DS Coordinator, Mr Idrissa Diatta, for the active engagement and the leadership provided so far. He also appreciated Dr Munang from UNEP for his support and leadership. Dr Osano acknowledged that the SEI's motivation followed the passion of UNEP for the PAM-CDN / DS.

He thanked the Ambassador of Canada for the support of his government particularly in term of ensuring the implementation of the project and added this is well appreciated by the SEI.

According to Dr Osano, a lot of progress was made under the project despite COVID-19 Pandemic issues including the successful the training workshop on the Monitoring, Reporting and Verification (MRV) in the waste sector in the Economic Community of West African States (ECOWAS) region in February 2020 in Abidjan, and the development of the National Integrated and Sustainable Solid Waste Management Strategy and National Waste Management Law which has been approved by the national government.

About the actual training, the representative of SEI highlighted that the event is appreciated by the SEI since the capacity building is very critical. Taking advantage of this event, he appreciated Dr Jacques Kouazounde for being available to share his expertise with Senegal and also for having masterfully conducted the same training in Cote d'Ivoire. He wished to get very good feedback at the end of this training as for that of Cote d'Ivoire.

Finally, Dr Osano thanked Cassilde who has been really at the forefront of making sure that SEI's supports are available if needed before he wished on behalf of SEI a very fruitful training workshop to everyone.

1.2 UNEP Opening Remarks

On behalf of UNEP, Dr Munang expressed his pleasure to be part of this event and to appreciate the Environment and Climate Canada for the generous funding of the PAM-CDN / DS in Senegal and the great cooperation UN Environment and Canada have fostered over the years. He also appreciated the SEI for the great technical support for the project and Senegal for the collaboration as well as its cooperation around the project and the great work the UN Environment has done with this country. He highlighted and commended the numerous measures undertaken by Senegal in the past under the implementation of the United Nations Convention on the Climate Change including the ratification of the Paris Agreement in 2016, the determination to change its future by tapping opportunities inherent to the Paris Agreement. This was the fundamental reason that motivated the Environment and Climate Change Canada to support this project, according to him.

Some opportunities of the NDC implementation in the waste management sector

project were underlined by Dr Munang, such as building a very solid foundation to turn the challenge into an opportunity to ensure that waste can be turned to wealth, expanding macroeconomic growth while unlocking the realisation of multiple sustainable development goals (SDGs), contributing to the achievement of Senegal's National Development Strategy, creation of more jobs for the majority of the youth population. He encouraged Senegal to implement the PAM-CDN / DS in a manner that unlocks incomes opportunity for the country and to serve as a model for the ECOWAS region in Africa.

Dr Munang reminded the participants of the project's components, outcomes and opportunities for Senegal. He saluted the results already achieved, particularly the establishment of a unique legal/regulation framework for the waste management in the ECOWAS region. He indicated that the current training workshop was organised under the implementation of the second component of the project, "Enhance technical and operational capacity for data monitoring, reporting and verification in the waste sector". He wished that the training fostered the understanding of the appropriate methodology of emissions calculation, sourced the link between GHG and SLCP emissions and NDC and enabled Senegal to mitigate carbon emissions. Finally, he insisted on sharing of experiences gained by Senegal under the PAM-CDN / DS with other countries in Africa.

1.3 Ambassador of Canada to Senegal Opening Remarks

On behalf of the Government of Canada and Environment and Climate Change Canada, His Excellency Beaulieu, Ambassador of Canada to Senegal, welcomed participants and thanked them for their availability for the workshop. He was delighted with the good cooperation established between Senegal and Canada in the field of the Environment. This cooperation covers many elements of the climate change's components, including the financing of the PAM-CDN / DS. Finally, he wished for the participants a very successful workshop after he expressed his satisfaction that the workshop was held despite the prevailing COVID-19 Pandemic context.

1.4 Coordinator of the UCG Welcome Address

The Coordinator of the UCG, Mr Mass Thiam, cordially welcomed the participants to the training workshop on behalf of the MULH. He took the opportunity of this event to raise participants awareness of issues of emerging infectious diseases, including COVID 19 Pandemic. According to him, emerging infections include zoonosis and factors contributing to their emergence include biodiversity loss, increasing unpredictability of the global climate, etc. This international context is one of the reasons which led the Paris Agreement to recognize the need for a progressive and effective response to the threat of climate change through the sustainable development and fight against poverty, in particular by aiming the limitation of the increase in global average temperatures, the adaptation to the impacts of climate change. He stressed that the global response to the threat of climate change will require efforts by countries to reduce its national GHG emissions and the NDC is the reference document setting out these mitigation efforts.

Mr Thiam reminded the participants of Senegal pledges under the Paris Agreement in the light of the above. The country committed itself to unconditionally reduce its GHG emissions by 5% and 11%, and conditionally by 25% and 61%, within the periods 2020-2024 and 2025-2030 respectively. The targeted sectors for this purpose include, inter alia, the waste sector.

Mr Thiam noted that the aforementioned commitment by Senegal is the reason why the capacity building of national experts in GHG and black carbon inventory in the waste sector is relevant under the project. He also noted the training workshop would not go unnoticed given the participants would be the first experts to benefit from a training dedicated exclusively to GHG and black carbon inventory in the

waste sector in Senegal. His expressed his expectations at the end of the training, including the development of the GHG and black carbon inventory of higher quality in the waste sector in Senegal for their uses of diverse purposes e.g. consolidate the emissions baseline in the CDN, contribute to the development of the First Biennial Update Report of Senegal, etc. Like the previous speakers, Mr Thiam shared with the participants the main achievements under the project which converge towards the strengthening of the strategic and legal framework of the waste management sector in Senegal.

On behalf of the MULH, he appreciated the Government of Canada through the Environment and Climate Change Canada for the support provided to Senegal under the PAM-CDN / DS. He also thanked the UNEP, the executing agency of the project, and SEI, project manager of this training, for the unfailing commitment they have shown. Finally, he declared the workshop open in his quality of the UCG national Coordinator.

2. GHG INVENTORIES: GENERAL AND CROSS-CUTTING CONCEPTS – THEORY

This presentation focused on the theoretical basis of the national GHG inventory. The main addressed points are as follows.

a) Climate change agreements related to national GHG inventories of countries not included in Annex I to the Convention

The Communication highlighted the relevant articles of the United Nations Framework Convention on Climate Change (UNFCCC) and major decisions of the Conference of the Parties (COP or CP) governing GHG inventories of non-Annex I countries. In particular, it focused on the articles 4.1 (a) and 12.1 (a) of the Convention, decision 17/CP.8 on guidelines for the preparation of non-Annex I national communications, decision 13/CP.9, decision 1/CP.16 from the Cancun Agreement, decision 2/CP.17 from the Durban Agreement, Paris Agreement and decision 8/CMA.1.

From this presentation, it appears that key elements of the existing Monitoring, Reporting and Verification (MRV) framework under the UNFCCC for non-Annex I Parties are structured around international MRV and domestic (national) MRV frameworks. The scope of the International MRV framework encompasses:

- Submitting national communications every four years;
- Submitting biennial update reports (BURs) every two years;
- Conducting international consultation and analysis (ICA) of BURs.

At the national level, MRV frameworks' key elements include domestic MRV of domestically supported Nationally Appropriate Mitigation Actions and MRV for reducing emissions from deforestation and forest degradation (REDD-plus) actions.

Under the Enhanced Transparency Framework (ETF) for action and support established under the Paris Agreement (Article 13), each party is required to submit through the Biennial Transparency Report (BTR) the following:

- A national inventory of anthropogenic emissions by sources and removals by sinks of GHGs;
- Information necessary to track progress made in implementing and achieving NDC;

- Information related to climate change impacts and adaptation;
- Information on financial, technology development and transfer and capacity-building support needed and received.

The first BTR / National Inventory Reports shall be delivered at the latest 31st December 2024 (UNFCCC, 2018).

b) IPCC methodological guides and technical tools for national GHG inventories

The relevant provisions of the Convention recommending Parties to the Convention to use comparable methods approved by the COP to develop GHG inventories, appropriateness of using comparable methods, major decisions of the COP on approved methods and tools for GHG inventory were outlined. The communication also emphasized the methodological guides approved by the COP including 2006 IPCC Guidelines for National GHG Inventories.

c) Elements of a National GHG Inventory

Then communication focused on the definition of the GHG inventory, benefits/ challenges of a GHG inventory, methodological basis and methods for estimating GHG emissions/removals, main sectors suggested by the IPCC, GHGs considered by the IPCC and the scope of a GHG inventory report.

d) Good practices, inventory quality and Cross-cutting issues

It has been shared with participants the key concepts of good practice and quality of an inventory. The indicators of the inventory's quality (transparency, completeness, consistency, comparability, accuracy) and the concept of quality assurance/quality control (QA/QC) were explained and clarified.

e) Compilation of GHG inventory

The various stages of compiling a GHG inventory were briefly presented and the content of each step was clarified. In particular, data collection and reporting steps were highlighted.

f) IPCC Guidelines for National Greenhouse Gas Inventories

The structure of the IPCC 2006 guidelines was presented by the Consultant, with emphasis on volume 5 related to the waste sector.

On the course of this presentation, the points of discussion/exchange were around the clarification of the concept of the sink of carbon, good practices to avoid the underestimate/overestimate emissions when using the Tier 1 method, carbon trading, etc.

3. PRESENTATION OF THE GUIDELINES AND METHODOLOGY OF THE GHG INVENTORY IN THE WASTE SECTOR

In the first part of his communication, the Consultant shared some general aspects on the waste with participants, including the classification, composition and management of waste. He also explained how carbon and nitrogen streams during waste management affect the natural cycles of these chemical elements.

The second part of this communication focused on the 2006 IPCC guidelines for GHG inventory in the waste sector. The Consultant focused on the following: scope of the waste sector, waste sector categories and sub-categories, GHG emissions processes, methodological issues and data requirements.

The discussion which followed the Consultant intervention focused on the allocation of emissions from the treatment of sludge, sources of emission factors, choice of emission factors, allocation of emissions from waste's transport, sequestration of carbon in the waste sector.

5. PRESENTATION OF THE GUIDELINES AND METHODOLOGY OF THE EMISSION INVENTORY OF BLACK CARBON IN THE WASTE SECTOR

The Consultant shared with participants the theoretical basis of the SLCP inventory. The main addressed points are as follows: main SLCP and their sources, existing international agreements regarding SLCP, existing technical resources for SLCP inventory and guidelines and methodology of the SLCP inventory. It should be noted that there are no methodologies and emission factors internationally agreed for SLCP inventory. However, the IPCC and the Climate and Clean Air Coalition (CCAC) suggested using existing methodologies for air pollutants inventory, including the IPCC guidelines and EMEP/EEA air pollutant emission inventory guidebook. According to the CCAC, the published emission factors in the peer-reviewed journals may be used.

The EMEP/EEA air pollutant emission inventory guidebook 19 was presented to the participants by the Consultant with regard to the waste sector. The methodological approach recommended by the EMEP/EEA is based on the equation: Emissions = Activity Data X Emission Factors

The Consultant shared with participants the waste volume of the EMEP/EEA air pollutant emission inventory guidebook 2019 and the list of emission factors of SLCP and co-generated pollutants compiled by the CCAC from the literature search for technical support to countries.

6. PRACTICAL EXERCISE: ESTIMATION OF GHG AND SLCP EMISSIONS IN THE WASTE SECTOR

Under the supervision of the Consultant, the participants estimated GHG from the open burning of the municipal solid waste, wastewater management and elimination of solid waste following the IPCC default method (Annex 3). For this, Benin activity data, IPCC default emission factors and the IPCC software version 2.691 were used. Emissions from the open burning of the municipal solid waste were also estimated manually with IPCC excel worksheets. They also estimated emissions of SLCP from the open burning of municipal solid waste using the tier 1 method and Excel sheets.

7. CLOSING CEREMONY

The Coordinator of the PAM-CDN / DS in Senegal, Mr Idrissa Diatta, gave the closing remarks of the workshop. On behalf of the MULH, he thanked the project partners including SEI, UNEP and Environment and Climate Change Canada. He noted that the training met the participants' expectations and he thanked and congratulated Dr Kouazounde for that. The closing ceremony ended with a vote of thanks of Mr Diatta towards the participants and the evaluation of the workshop by them.

ANNEXE 1: AGENDA

TIME	ACTIVITIES Day 1 : Thursday, 1st October 2020	RESPONSIBLE
8:30– 09:00	Registration of Workshop Participants	Organizers
9:00–10:00	Opening Ceremony of the workshop • Keynote Address from Stockholm Environment Institute • Opening remarks from UN Environment • Opening remarks from ECC Canada • Welcome from the UCG Coordinator	
	Objectives and agenda of the workshop	Consultant
	Self-introduction by participants	Participants
	Group Photo	UCG
10:00 – 10:15	Coffee Break	UCG
10:15 – 11:00	GHG Inventories: General and Cross-cutting Concepts – Theory • Climate change agreements related to national GHG inventories of countries not included in Annex I to the Convention; • IPCC Guidelines for National Greenhouse Gas Inventories and technical tools for national GHG inventories; • Elements of a National GHG Inventory; • Good practices and inventory quality; • Cross-cutting issues; • Compilation of GHG inventory	Consultant
11:00 – 11:30	Exchange and discussion	Facilitator

11:30–12:30	Presentation of the guidelines and methodology of the GHG Inventory in the waste sector • Overview of the sector, • Methods for Estimation of Greenhouse Gas Emissions from Waste Sector: i. Solid waste disposal (4A); ii. Biological treatment of solid waste (4B); iii. Incineration and open burning of waste (4C); iv. Wastewater treatment and discharge (4D) • Waste Data	Consultant
12 :30-13 :00	Exchange and discussion	Facilitator
13 :00 – 14: 30	Lunch Break	UCG
14: 30 – 16: 00	Practical exercise: Introduction to the use of the IPCC software and Excel worksheet for GHG inventory • Presentation of IPCC software and emissions estimation Excel worksheet; • First set up of the IPCC software with the participants • Familiarisation of the participants with the IPCC software and Excel worksheet.	Consultant / Participants
16:00 – 16h15	Coffee Break	UCG
16 :15 – 17 :30	Practical Exercise: Estimation of GHG emissions in the waste sector • Use of the emissions estimation Excel worksheet • Use of the IPCC software	Consultant / Participants
17 :30	End of first day	
	Day 2: Friday, 2th October 2020	Facilitator
9:00– 9:30	Synthesis in plenary of the first day of the workshop	
9:30 – 10:30	Practical Exercise: Estimation of GHG emissions in the waste sector • Use of the IPCC software	Consultant / Participants
10 :30 – 10 :45	Coffee Break	UCG

10:45– 11 :15	Presentation of the guidelines and methodology of the emission inventory of black carbon in the waste sector: • Sources of the black carbon • Back carbon inventory methodology • Link with the GHG emissions inventory • Important agreements in relation to SLCPs at the international	Consultant
11:15-11:30	Exchange and discussion	Facilitator
11 :30 – 12 :30	Practical Exercise: Estimation of GHG/Black carbon emissions in the waste sector • Use of IPCC software and emissions estimation excel sheet	Consultant and Participants
12 :30 – 14:00	Lunch Break	UCG
14 :00 – 16 :00	Practical Exercise: Estimation of GHG/ Black carbon emissions in the waste sector (continued) • Use of IPCC software and emissions estimation excel sheet.	Participants
16 :00 – 16 :15	Coffee Break	UCG
16 :15 – 17:00	Practical Exercise: Estimation of GHG/ Black carbon emissions in the waste sector (continued) • Use of IPCC software and emissions estimation excel sheet	Consultant and Participants
17 :00 – 17 :30	Exchange and discussion/ Workshop Evaluation	Facilitator
17: 30	End of the second day	

ANNEX 2: PARTICIPANTS LIST

Direction de l'Environnement et de Établissements Classés (2 participants)

1. Mr Papa Lamine DIOUF
2. Mme Fatma NIANG

PROMOGED (2 participants)

1. Mme Mbicine Khady Sarr BONI
2. Mme Khoudia Sarr GUEYE

UCG (8 participants)

1. Mme Pod Estelle NDOUR
2. Mme Coumba Diarra SALL
3. Mr Assane GUEYE
4. Mr Cheikh Bamba FALL
5. Mr Mamadou Moutapha DIENG
6. Mme Awa Betty DIOUF
7. Mr Papa Madiaw DIEYE
8. Mr Idrissa DIATTA

ANNEX 3: EXERCISES

Exercice d'application 1 : Calcul des émissions de GES issues des mises à feu à l'air libre des déchets solides.

Une pratique courante utilisée par les populations dans nos régions pour se débarrasser des déchets solides est la mise à feu où la combustion de la partie combustible des déchets se fait à l'air libre.

Cet exercice porte sur l'estimation des émissions de GES (CO2, CH4, N2O) dues à la combustion a l'air libre des DSM au Benin sur la période de 2010 à 2015.

Les Lignes Directrices 2006 du GIEC, les feuilles de calcul Excel et le logiciel du GIEC seront utilisés à cet effet. Les estimations des émissions seront faites sur la base de la méthode par défaut du GIEC.

Les données sur le brulage a l'air libre au Benin sont présentes en annexe 1.

1. Quels sont les besoins en données nécessaires à l'estimation des émissions envisagées dans le présent contexte.
2. Quels sont les données manquantes ? Combler les lacunes éventuelles de données en utilisant les Lignes Directrices du GIEC.
3. En utilisant les feuilles de calcul Excel du GIEC, estimer les émissions de CO2, CH4 et du N2O pour l'année 2015. Exprimer les résultats en Gg Equivalent CO2.
4. En utilisant le logiciel du GIEC, estimer les émissions de ces GES au Benin de 2010 à 2015.
5. Générer la base de données contenant les données d'inventaire et extraire du logiciel le Tableau sectoriel contenant les résultats de l'estimation de ces émissions. Exprimer les résultats en GG Equivalent CO2, puis les analyser.

Exercice d'application 2 : Exemple d'estimation des émissions de CH4 et du N2O dues à la gestion des eaux usées domestiques

Cet exercice porte sur l'estimation des émissions de GES dues à la gestion des eaux usées domestiques au Benin sur la période de 2010 à 2015.

Les Lignes Directrices 2006 du GIEC, les feuilles de calcul Excel et le logiciel du GIEC seront utilisés à cet effet. Les estimations des émissions seront faites sur la base de la méthode par défaut du GIEC.

Les données sur la gestion des eaux usées domestique au Benin sont présentées en annexe 2.

1. Quels sont les besoins en données nécessaires à l'estimation des émissions envisagées dans le présent contexte.
2. Quels sont les données manquantes ? Combler les lacunes éventuelles de donner en utilisant les Lignes Directrices du GIEC
3. En utilisant les feuilles de calcul Excel du GIEC, estimer les émissions de CH4 et du N2O pour l'année 2015. Exprimer les résultats en Gg Equivalent CO2.
4. En utilisant le logiciel du GIEC, estimer les émissions de ces GES au Benin de 2010 à 2015.
5. Générer la base de données contenant les données d'inventaire et extraire du logiciel le Tableau sectoriel contenant les résultats de l'estimation de ces émissions. Exprimer les résultats en Equivalent Gg CO2, puis les analyser.

Exercice d'application 3 : Calcul des émissions de PCDV et polluants associes issues des mises à feu à l'air libre des déchets solides.

Une pratique courante utilisée par les populations dans nos régions pour se débarrasser des déchets solides est la mise à feu où la combustion de la partie combustible des déchets se fait à l'air libre.

Cet exercice porte sur l'estimation des émissions de PCDV et polluants associes (PM2,5; Carbone organique, NH3, SO2, CO, CVONM, Nox, CO2, N2O, CH4) dues à la combustion a l'air libre des DSM au Benin sur la période de 2010 à 2015.

Les Lignes Directrices 2006 du GIEC, le Guide EMEP/EEA des inventaires des émissions de polluants atmosphériques (EEA, 2019) et les facteurs d'émission des PCDV et polluants associés compiles par la CCAC peuvent être utilisés à cet effet.

Les données sur le brulage a l'air libre au Benin sont présente en annexe 1.

1. Quels sont les besoins en données d'activité nécessaires à l'estimation des émissions envisagées dans le présent contexte.
2. Rechercher et présenter dans un tableau, les valeurs des facteurs d'émission dont vous avez besoin.
3. En utilisant des feuilles de calcul Excel, estimer les émissions des PCDV et polluants associes concernes ici pour les années 2010-2015 au Benin, et présenter les résultats dans un tableau.

Exercice d'application 3 : Calcul des émissions du CH4 provenant d'une décharge.