


Liberia GHG Inventory and MRV Training Manual

Report to Environment Protection Agency
Liberia and Conservation International

Consultancy to Develop Liberia's National
GHGI and MRV System



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1 Introduction

This document has been prepared for individuals involved in Liberia's GHG inventory and climate action monitoring, reporting and verification (MRV) system. It was prepared during the 2020 'Consultancy to Develop Liberia's National GHGI and MRV System' project funded by Conservation International. The objective of this training manual is to document the training programme undertaken during this project and to detail the training resources that were produced. These resources can then be used for future training activities.

The focus of the training programme was to tutor national stakeholders so that they become familiar with greenhouse gas (GHG) inventory and MRV terminology and receive practical training on the methodologies used to calculate GHG emissions. The approach taken to deliver this training evolved over the course of the project to accommodate for and react to the needs of the participants.

This report provides updated information related to the training methods, approaches, delivery, and timescale that was provided in the Training Plan¹.

This report covers the following elements:

- Description of training methods and approach
- Summary of training delivery timetable
- Description and list of training topics.

2 Training methods and approach

The training was delivered by international MRV and GHG inventory experts with a wealth of knowledge from their experiences working with countries and organisations across the world. They were supported by the e-learning experts within the team to ensure that this knowledge was distilled and communicated to the stakeholders in an effective manner. The allocation of training responsibilities is given in the table below.

Table 1: Allocation of trainers

Training team	Name of trainer
Energy and Transport	Melanie Hobson
Industrial processes and product use (IPPU)	Emma Salisbury
Agriculture	Richard German
Forestry and other land use (FOLU)	Rosie Brook
Waste	Philip Acquah
Monitoring, reporting and verification (MRV)	Laurence Opie

¹ Liberia GHG and MRV Training Plan. Report to Environment Protection Agency, Liberia. July 2020

The training was conducted by the following means:

- Online stakeholder workshop introducing basic terminology (7th July 2020)
- Online cross-cutting training sessions
- Online sector specific mentoring throughout the project
- Sector specific training assignments completed using Nexus International University's (NIU) e-learning platform
- Stakeholder workshop on preliminary inventory findings (20th November 2020)
- Validation workshop on final inventory outputs (TBC, December 2020).

Due to the disruption caused by the global COVID-19 pandemic, all training sessions were conducted remotely. The project team used software solutions to conduct high quality training sessions. Zoom web conferencing platform and WhatsApp messaging platform were used throughout because they were deemed to be the most well-known and well understood platforms amongst participants. An e-learning platform was set-up by NIU to share all training material, assignments and resources. This platform provided a central point for participants and mentors to organise the training programmes and track the progress of participants. National participants were able to meet face-to-face for the November and December workshops, which supported the sharing of knowledge between the training courses.

2.1 Project workshops

The **Stakeholder workshop** took place on 7th July 2020 following the completion of the baseline study. Individuals engaging with the capacity building were invited to the workshop. They submitted an initial questionnaire to the project team prior to the event to explain their level of experience and knowledge, and their training group and role under the programme. The workshop was conducted online using Zoom hosted by NIU. It included some simple overview training for all stakeholders regarding GHG inventories, MRV and the online platforms that we will use during the project. It also included discussions regarding the findings under the baseline study.

The **Preliminary inventory workshop** took place on 20th November 2020 following the first phase of the training programme. Individuals engaging with the programme and individuals from the EPA were invited to the workshop. Each training team (see Table 1) presented a summary of the work that had been achieved during the training programme. They each ran a discussion group to obtain valuable information from stakeholders. The workshop took place at the Corina Hotel with the international experts joining via Zoom. It provided a valuable opportunity for participants to consolidate their learning and work up to this point, and ensure they had sufficient depth to their knowledge to present the findings and field questions from stakeholders.

The **Validation workshop** will take place in December 2020 following the finalisation of the training programme. Individuals engaged with the programme and individuals from the EPA will be invited to the workshop. Each training team (see Table 1) will present the GHG inventory outputs created during the training programme, and will take questions from stakeholders regarding their results. This workshop will also include a certification ceremony. The training team mentors will nominate participants for certification by NIU and these individuals will be acknowledged during the ceremony. The workshop will take place in-person with the international experts joining via Zoom.

2.2 Cross cutting training sessions

The project team delivered a series of cross-cutting training sessions to provide all participants with training that is applicable to all sectors. These were conducted online by the training mentors. The schedule and detail of the training material can be found in the table below. The sessions were provided throughout the course of the training programme as short, online sessions so that they would easily fit into participants' schedules. Recordings and material from the sessions were uploaded to the e-learning platform so that participants who were unable to join could watch the session later. This flexible approach to learning supported increased engagement throughout the programme.

Table 2: Cross-cutting training plan

Training Session	Proposed date	Duration	Trainer
Introduction to GHG Inventories	7 th July 2020	1 hour	Emma Salisbury
Completeness assessments	7 th July 2020	30 minutes	Emma Salisbury
Introduction to MRV systems	7 th July 2020	1 hour	Laurence Opie
Excel training	19 th August 2020	1 hour	Rosie Brook
Data collection processes	21 st August 2020	1 hour	Richard German
Institutional arrangements	16 th September 2020	1 hour	Laurence Opie
Key category analysis	13 th October	1 hour	Melanie Hobson
Uncertainty analysis	13 th October 2020	30 minutes	Rosie Brook
QA/QC	27 th October	30 minutes	Richard German
Improvement Plan	30 th October	1 hour	Laurence Opie
UNFCCC reporting and review	3 rd December 2020	30 minutes	Emma Salisbury

2.3 Sector specific mentoring

The sector specific mentoring sessions were available for all participants and provided sector specific training sessions and hands-on practical sessions. The content of these sessions was tailored to the national circumstances in Liberia and the evolving level of knowledge of participants. The approaches for each sector are outlined in the sections below. The focus of this mentoring was the successful production of a GHG inventory and related statements summarising the method used to estimate emissions. The scope of the GHG inventory was as follows:

- National boundary of Liberia
- Annual totals for the years 2017, 2018 and 2019
- Six greenhouse gases: CO₂, CH₄, N₂O, HFCs, PFCs, SF₆
- Methods from the 2006 IPCC Guidelines² and 2019 Refinement³
- All anthropogenic activities covered by the IPCC codes.

² IPCC 2006, 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan (<https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>)

³ IPCC 2019, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Calvo Buendia, E., Tanabe, K., Kranjc, A., Baasansuren, J., Fukuda, M., Ngarize, S., Osako, A., Pyrozhenko, Y., Shermanau, P. and Federici, S. (eds). Published: IPCC, Switzerland. (<https://www.ipcc-nggip.iges.or.jp/public/2019rf/index.html>)

The GHG inventory estimates were calculated in Excel spreadsheets to ensure transparency of the calculations and help the participants understand every step of the calculations. These compilation spreadsheets are included in the training material. The method statements were compiled using a simple reporting template (see Method Statement template in archived training material) that is in line with the requirements for international reporting of GHG inventories. This ensured that the participants could easily work to international requirements without needing to write extensive reports. These approaches to the compilation and reporting process focussed efforts on building technical and practical capacity as efficiently as possible.

Sector teams worked to set deadlines to produce a preliminary inventory (November) and a final inventory (December). There was considerable difficulty collecting relevant national activity data for the inventory, so a significant proportion of the project was allocated to collecting activity data. Nonetheless, data gaps remained by the end of the training programme. These potential limitations to the national system are further discussed in the Institutional Arrangements Report delivered under this project⁴.

2.3.1 Energy

Many participants were new to compiling GHG inventories for the Energy sector. Therefore, the first session was an introduction to the Energy sector after which the training sessions moved on to more detailed aspects of the sector. The training was provided in short (1-2 hour) training sessions over the project. The sessions consisted of a mixture of presentations and hands-on training and additional tasks for completion between the sessions to reinforce learning. The following subjects were addressed alongside practical, hands-on training as the GHG inventory developed. Further details can be found in Table 4.

- Introduction to compiling greenhouse gas inventories for the Energy sector
- Data collection strategy for each sub-sector
- Compiling GHG estimates for fuel combusted in the electricity production sector
- Compiling GHG estimates for fuel combusted in the industrial sector
- Compiling GHG estimates for fuel combusted in the transport sector
- Compiling GHG estimates for fuel combusted in the residential, commercial / institutional, agriculture/forestry/fishing sector.

2.3.2 Industrial processes and product use (IPPU)

The IPPU sector is a minor source of emissions within Liberia but is expected to increase in significance over the coming years as Liberia industrialises. Three national experts were assigned to the sector all of whom had very little knowledge of GHG inventories. The first session introduced the fundamentals: “Introduction to compiling GHG inventories for the IPPU sector with a focus on those categories applicable to Liberia and the data required for each one”.

Following this introduction, the sessions focussed on the completion of the inventory providing support through one-to-one mentoring sessions with each participant. The sub-sectors under IPPU were distributed between the three participants. They focussed on practical inventory compilation discussions regarding the data, methods and

⁴ Institutional Arrangements Report, Liberia’s National GHGI and MRV System. Report to Environment Protection Agency, Liberia. November 2020

assumptions needed to estimate a complete IPPU GHG sectoral inventory. The specific topics for each session was determined by the progress of the individual participant.

The training was highly practical, and the mentoring sessions included extensive use of screen-sharing and detailed discussions with (rather than presentations to) the participants. There was an open channel throughout the programme via WhatsApp and email through which the participants were able to ask any questions to the mentor.

2.3.3 Agriculture

The Agriculture participants included a mix of experience. As such, an introductory session to the agriculture sector was provided to discuss the sector-related activities occurring in Liberia and confirmation of the best data sources or expert judgement. This session introduced the participants to the specific methods, relevant sections of the 2006 IPCC Guidelines, and the format of the compilation spreadsheets. The overall flow of work was introduced, and compilation tasks set. Further details can be found in Table 4. Specific sub-sectors covered included:

- Livestock enteric fermentation and manure emissions
- Emissions from soils
- Emissions from crop residues, biomass burning and rice cultivation.

Throughout the programme, there was a series of 1-2-hour mentoring sessions for participants. These were practical sessions with screen-sharing to discuss progress and work through questions the trainees had.

Some support in developing Excel skills was provided, as this was a high priority for some participants, although skills-sharing in this regard amongst trainees was encouraged. Participants were able to send questions to the sector lead at any time via email or WhatsApp.

2.3.4 Forestry and other land use (FOLU)

The training was delivered in short (1-2 hour) practical training sessions held over a series of weeks. The participants were given tasks to complete in between the training sessions to progress the compilation of the FOLU inventory. Further details can be found in Table 4. The following training topics were covered:

- Introduction to the FOLU sector
- Translating land use area data into land use matrices
- Input data: country-specific parameters, disturbances and wood removals
- Calculating emissions and removals using the gain-loss method (living biomass)
- Calculating emissions and removals using the gain-loss method (DOM & SOC)
- The harvested wood products pool
- QA/QC of the FOLU sector
- Improvements.

2.3.5 Waste

The course for the waste sector training included the following content:

- National circumstances Waste “Resources” Sector

- 2006 IPCC Guidelines Sector Activities, Disaggregated Categories and Definitions
- Notation Keys and Identification of Emitting Sectoral disaggregated categories
- Decisions Trees
- Category-specific Activity Data Needs and Activity Data Collection
- Emission Factor (EF) Database and Selection of appropriate EFs
- Estimation of Emissions from all Categories Occurring
- Compilation of Sector Inventory: Input of Real time collected AD and Selected Default EFs into IPCC Inventory Database and the Solid Waste Model.
- Cross -cutting issues -Completeness, Uncertainty Assessment, QA/QC, Reporting and Documentation and Waste Sector Inventory Improvement Plan (NIIP).

2.4 Certification of training programme

The training programme was able to accommodate up to 95 trainees. Through discussions with the EPA, 60 individuals were identified and invited to attend the programme. The participation levels of the individuals were expected to vary depending on the capacity of and programme relevance to each person. There were approximately 20 individuals that fully participated throughout the programme, and these are distributed across the different sectors: Energy, IPPU, Agriculture, FOLU, Waste and MRV. This provided an excellent core base for capacity building across all sectors.

NIU, as a project partner, enabled the formal certification of individuals who had fully participated in the training programme. As such, approximately 20 individuals will be certificated by NIU at the close of the project to acknowledge their work and input. The certification will take place during the validation workshop.

3 Training delivery timetable

The table below outlines the timeline for the training programme. All sectors experienced significant difficulties in obtaining national activity data for the GHG inventory. This meant that much of the GHG inventory compilation work was completed towards the end of the project.

Table 3: Training schedule

	Week	July	August	September	October	November	December
Workshops	Stakeholder workshop						
	Preliminary inventory workshop						
	Validation workshop						
Cross cutting training	Introduction to GHG Inventories						
	Completeness assessments						
	Introduction to MRV systems						
	Excel training						
	Data collection processes						
	Sustainable institutional arrangements						
	Improvement Plan						
	Key category analysis						
	Uncertainty analysis						
	QA/QC Training						
	UNFCCC reporting and reviews						
Sector mentoring	Energy						
	IPPU						
	Agriculture						
	LULUCF						
	Waste						
	MRV						

4 Training material

Training material specific to Liberia was produced, delivered and used by the sector mentors and participants. During the programme, this extensive collection of training material was uploaded and shared via the NIU e-learning platform. After the completion of the programme, this platform will be terminated, and all material will be archived by the project team and shared with the EPA through a platform deemed appropriate by the EPA. This is an important process to support the sustainable development of national capacity of GHG inventory compilation.

Throughout the programme, the key reference documents were the IPCC Guidelines, and these should be used as the basis for all future training related to national GHG inventories:

- 2006 IPCC Guidelines – <https://www.ipcc-nggip.iges.or.jp/public/2006gl/>
- 2019 Refinement to the 2006 IPCC Guidelines – <https://www.ipcc-nggip.iges.or.jp/public/2019rf/index.html>

The key outputs from the programme were the GHG inventory compilation spreadsheets and the GHG inventory method statements. These contain the data, calculations and documentation required to calculate GHG emissions and removals for Liberia. They will be a key resource for future GHG inventory compilation activities. They will be included in the archived training material that will be provided to the EPA.

The table below provides a summary of the training sessions and material that will be made available to the EPA before the completion of the project. This table should be used as a reference for prioritising training and developing training plans for new members of the GHG inventory team.

Table 4: Summary of training sessions and activities

#	Training	Objective	Session Date and mentor	Available training material
Workshops				
1	Stakeholder workshop	Introduction to GHG inventories and MRV.	7 th July 2020	Presentations from the workshops
2	Preliminary inventory workshop	National experts present their work to solidify their understanding.	20 th November 2020	
3	Validation workshop	National experts present their work to solidify their understanding, gain validation from stakeholders, receive certification from NIU.	TBC	
Cross cutting training				
3	Introduction to GHG Inventories	To have a good understanding of the fundamentals of GHG inventories: collect, calculate, review, report.	7 th July 2020 Emma Salisbury	Slide deck
4	Completeness assessments	To understand the requirements for a complete inventory and investigate/discuss those activities relevant for Liberia.	7 th July 2020 Emma Salisbury	Slide deck
5	Introduction to MRV systems	To have a good understanding of the fundamentals of an MRV system: Organisation mandates, data flows, expertise, systems and tools, stakeholder engagement.	7 th July 2020 Laurence Opie	Slide deck
6	Excel training	To be familiar with main functions and features of excel. To develop excel skills to improve the compilation of the GHG inventory.	19 th August 2020 Rosie Brook	Slide deck and Excel spreadsheet with tasks
7	Data collection processes	To outline different potential sources of data and expert judgement, the quality criteria to assess suitability, and the processing and documentation required for use in an inventory.	21 st August 2020 Richard German	Slide deck
9	Improvement Plan	To introduce the concept of tracking step by step improvements to the GHG inventory and MRV system.	30 th October 2020 Laurence Opie	Slide deck

10	Key category analysis	To gain an understanding of the methods for conducting a KCA and the reasons for completing one.	13 th October Melanie Hobson	Slide deck
11	Uncertainty analysis	To be familiar with the purpose of uncertainty analysis within a GHG inventory and to be aware of the required elements for completing an uncertainty analysis in line with the 2006 IPCC Guidelines.	13 th October Rosie Brook	Menti slide outputs
12	QA/QC training	To understand the purpose and importance of QA/QC, the meaning of the TACCC quality objectives, and to introduce the concepts of QA/QC plans, roles and QA/QC activities	27 th October Richard German	Slide deck
13	Sustainable institutional arrangements	To develop understanding of how to build long term, sustainable institutional arrangements	16 th September 2020 Laurence Opie	Slide deck
14	UNFCCC reporting and review	To have a good understanding of the international reporting requirements, review process and available funding for national experts.	25 th November 2020 Emma Salisbury	Slide deck
Sector mentoring				
15	Energy	<p>Six core training sessions were held together with a few small group mentoring sessions. The six sessions were:</p> <ol style="list-style-type: none"> 1.Introduction to compiling GHG inventories for the energy sector and familiarisation with the 2006 IPCC Guidelines. Allocation of sub-sectors to individuals. Quiz 2.Discussion on data availability and introduction to the GHG compilation spreadsheet. Quiz. 3.Discussion on progress with data collection (no presentation slides available) 4.Unit conversion and discussion on progress with data collection. Quiz 5.Introduction to the method statement and time series consistency. Quiz 6.Introduction to notation keys and the Reference v Sectoral method. Quiz 	Melanie Hobson 18 th August to 6 th October 2020	Slide decks and quizzes
16	IPPU	<ol style="list-style-type: none"> 1. Introduction to IPPU including IPCC Guidelines, IPCC codes and scope of IPPU sector, completeness assessment, 2. Introduction to IPPU data collection and compilation including explanation of template. 3. Introduction to IPPU sectoral reporting of methodologies, assumptions and data. 4. Introduction to fluorinated gases including their makeup, uses and emission estimates methodologies. <p>Multiple: one-to-one mentoring sessions with each of the IPPU sector participants to teach basic inventory skills including specific Excel skills, Tiers, notation keys, use of IPCC Guidelines, extrapolation and interpolation techniques, sector-specific data collection requirements,</p>	Emma Salisbury August to December 2020	Slide decks, quizzes, videos, resource material

		stakeholder engagement and data collection methods. These one-to-one sessions were set at the pace and technical level of each participant.		
17	Agriculture	<p>Three core training sessions were delivered, followed by more flexible mentoring sessions.</p> <ol style="list-style-type: none"> 1. Introduction to the agriculture training, including an overview of the scope of the sector, indicative timeline and roles expected of trainees and mentor, session format and communication arrangements and key resources (including IPCC Guidelines) 2. Introduction to livestock emissions calculations, data requirements, and comparison of IPCC 2006 versus 2019 methods and EFs. 3. Introduction to emission calculation methods for non-CO2 and aggregate sources of emissions from land. <p>Early mentoring sessions covered prioritisation of data collection activities and presentation of compilation spreadsheets. Later mentoring sessions covered updates on data collection and review of data collected, documentation and method statements, and providing help on using compilation templates.</p>	Richard German August to December 2020	Slide decks
18	FOLU	<ul style="list-style-type: none"> • Introduction to inventories and the FOLU sector, including an overview of the scope of the sector, indicative timeline and roles expected of trainees and mentor, session format and communication arrangements and key resources (including IPCC Guidelines) • Inventory compilation using FAO data for living biomass, biomass burning and HWP (using the IPCC HWP model) • Finalising the FOLU inventory using FAO data and writing up method statements • Discussing the available national land use data • How land use matrix data can be processed and applied to a FOLU inventory 	Rosie Brook August to December 2020	Slide decks
19	Waste	<ul style="list-style-type: none"> • Introduction to GHG emissions from the Waste Sector • The landfill model and IPCC software • Emissions from wastewater and QAQC 	Philip Acquah August to December 2020	Slide decks
22	MRV	<ul style="list-style-type: none"> • Introduction to MRV roles, responsibilities and supporting legal framework. Stakeholder engagement and consultation on current arrangements and legislation. • Introduction to MRV data flows, inputs, the evidence base, outputs and outcomes. Stakeholder engagement and consultation on identifying Liberia's outputs and outcomes e.g. the revised NDC. • Introduction to improvement plans and their importance in an ever-improving national system • Introduction to steering committees and validation processes including the NCCSC 	Laurence Opie September to December 2020	Slide decks, Excel templates, NCCSC concept note



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