National Greenhouse Gas Inventory Consultancy: Preparation of Methodologies for Industrial Processes and Product Use & Agriculture, Forestry and Other Land Use Sectors

Prepared by the National University of Samoa Consulting Ltd.
for the Ministry of Natural Resources, Environment and Meteorology

5 February 2007

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A. Introduction

As part of the Second National Communication Project, Samoa is currently preparing its second inventory of Greenhouse Gas (GHG) emissions. This inventory will be prepared in line with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, and will estimate emissions from the four sectors of: 1) Energy, 2) Industrial Processes and Product Use (IPPU), 3) Agriculture, Forestry and Other Land Use, and 4) Waste. It is anticipated that the inventory will cover annual GHG emissions for the years 2000 – 2005 inclusive, depending on the availability of data.

The Ministry of Natural Resources, Environment and Meteorology (MNREM) is responsible for preparing the inventory and has set up a GHG Inventory Working Group with representatives from the Ministry of Finance, Ministry of Works, Transport and Infrastructure, Ministry for Revenue (Customs Division), Ministry of Agriculture and Fisheries, Electric Power Corporation, the National University of Samoa, UNDP Samoa and various divisions of MNREM.

MNREM contracted the preparation of the methodologies for estimating GHG emissions from the IPPU and AFOLU sectors to NUS Consulting Ltd.

B. Objectives

The objectives of this consultancy were to formulate simple and straightforward methodologies for estimating GHG emissions from the IPPU and AFOLU sectors, and to build the capacity of key stakeholders so that they can participate in the preparation of Samoa's Second GHG Inventory for these two sectors.

C. Development of the Methodologies

The methodologies to estimate GHG emissions from the IPPU and AFOLU sectors in Samoa were developed through a 3-stage process.

1) The 2006 IPCC Guidelines were reviewed to determine which of the listed categories and subcategories of activities for each of the two sectors are relevant to Samoa, in consultation with selected stakeholders. A list of these stakeholders can be found in Table 1.

Table 1. List of Stakeholders Consulted for GHG Inventory Methodology Development for the IPPU and AFOLU Sectors in Samoa

Organisations	Stakeholders
MNREM – Climate Change Section	Anne Rasmussen; Will McGoldrick
MNREM – Ozone Section	Reima Leleimalefaga; Tumau Faasaoina
Ministry for Revenue	Silafau Paul Meredith; Richard Heather
Ministry of Commerce, Industry & Labour	Lemalu Samau Tate Simi
Samoa Association of Manufacturers & Exporters (SAME)	Papalii Grant Percival
Samoa Chamber of Commerce & Industry Inc.	Klaus J. Stunzner Jr.
Samoa Tourism Authority	Sealiimalietoa Melepone Isara
Ministry of Agriculture & Fisheries (MAF), Quarantine Division	Asuao Kirifi Pouono
National Health Services	Dr. Stanley Dean, Brent Rivers
Apia Concrete Products	Tupua Fred Wetzell
BOC Gases	Chris Fancourt
EPC	Muaausa Joseph Walter
Samoa Breweries Ltd. (SBL)	Cherith Lober; Faatutala Esera
MAF	Seumanutafa Malaki Iakopo; Peseta Frank Fong; Tiatia Faleupolu Tevita; Mulipola Taupau Atonio P. Mulipola; Laisene Samuelu
Ministry of Finance, Samoa Statistics	Sefuiva Reupena Muagututia
MNREM	Faumuina S.V. Pati Liu; Tagaloa Jude Kohlhase; Fetoloai Alama; Leoo Polutea; Faainoino Laulala; Malagamaalii Aokuso Leavasa; Muaausa Pau Ioane
Agriculture Store Corporation	Toomata A. Tuipea
Bluebird Lumber & Hardware	Andrew Ah Liki
Conservation International	Francois Martel; James Atherton
Farm Supplies Ltd.	Loise Moala
Food & Agriculture Organisation, SAPA	Paul Tomane; Dr. Mat Purea; Dr. Aru Mathias
Secretariat of the Pacific Regional Environment Programme (SPREP)	Taito Nagalevu
Strickland Brothers Ltd.	Stuart Tuifoi
University of the South Pacific (USP)	Dr. Sonny Lameta; David Hunter; Daya Perera
Institute for Research, Extension and Training in Agriculture (IRETA)	Dr. Faletoi T. Suavi
Ministry for Environment, New Zealand	Alastair Finlay*
Univ. of Wollongong, NSW, Australia	Dr. John Morrison Y

*provided a hard copy of *New Zealand's Greenhouse Gas Inventory 1990 – 2004*, including CD

The findings of the preliminary research were presented to a meeting of the GHG Inventory Working Group on 20 November 2006.

2) Further research was carried out, based mostly on the 2006 IPCC Guidelines, to determine the types of activity data that need to be collected for each of the relevant categories and subcategories identified in 1) above, to determine the appropriate emission factors and worksheets to be used to calculate the GHG emissions, and to identify the reporting tables that are required to be completed for Samoa's Second GHG Inventory.

3) The methodologies were finalised in consultation with the Climate Change Section of MNREM. These are attached in Annex 1 and Annex 2 for the IPPU and AFOLU sectors respectively.

D. GHG Inventory Training Workshop

A two-day training workshop was conducted at the National University of Samoa, on the 25th and 26th January 2007, for key MNREM staff and selected stakeholders, to introduce the methodologies for estimating GHG emissions from the IPPU and AFOLU sectors in Samoa.

The four main objectives for the training workshop were:

1) To raise awareness of the relationship between Industrial Processes and Product Use (IPPU) and Green House Gas Emissions
2) To raise awareness of the relationship between Agriculture, Forestry and Other Land Uses (AFOLU) and Green House Gas Emissions
3) To introduce the methodologies that have been developed to estimate GHG emissions from the IPPU and AFOLU sectors in Samoa
4) To become familiar with and practise the use of the methodologies

Both days of the training workshop featured PowerPoint presentations followed by discussion, and interactive group activities. A copy of the training workshop programme and materials are attached to this report in Annex 3. A list of the participants in the training workshop is also given in Annex 3. It was good to see a mix of participants from various companies, industry groups and government ministries.

An evaluation of the workshop showed that the participants generally rated the training as very good, in terms of delivery of information, improving their understanding of GHGs and Ozone Depleting Substances, and gaining an appreciation of the methodologies to estimate GHG emissions. They suggested that further training and practice is needed to become more confident in using the methodologies.

E. Supplementary Materials

In the course of the preliminary research, some stakeholders and overseas experts provided materials which can assist in the actual compilation of Samoa's Second GHG Inventory. These materials include sales data of bulk gases, import data of Ozone Depleting Substance substitutes and a copy of New Zealand's latest GHG inventory. A list of these supplementary materials is given in Annex 4 and electronic copies are provided with the electronic form of this report.

Annex 1: Methodologies for Estimating Greenhouse Gas Emissions in Samoa, Volume 2: Industrial Processes and Product Uses (IPPU)

Please see separately bound document

Annex 2: Methodologies for Estimating Greenhouse Gas Emissions in Samoa, Volume 3: Agriculture, Forestry and Other Land Use (AFOLU)

Please see separately bound document

Annex 3: Greenhouse Gas Inventory Training Materials: IPPU and AFOLU

1) Programme
2) Powerpoint presentation handouts (electronic copies in separate .ppt files on the CD)
    - Preparing Samoa's 2nd Inventory of Greenhouse Gas Emissions
    - Greenhouse Gas Inventory Training: Industrial Processes & Product Use Sector
    - Greenhouse Gas Inventory Training: Agriculture, Forestry and Other Land Use Sector
3) Group activity handouts
    - IPPU Group Activity Session, Group 1 and Group 2 handouts
    - AFOLU Group Activity Session, Group 1 and Group 2 handouts
4) Evaluation Form
5) Certificate of Participation
6) List of Participants

1) Programme

Greenhouse Gas Inventory Training:

Industrial Processes & Product Use and Agriculture, Forestry & Other Land Use

NUS Conference Room, Le Papaigalagala

Programme

Day 1, Thursday 25 January 2007

Industrial Processes and Product Use

9.00 a.m.	Welcoming Remarks Prof. Le'apai Lau Asofou So'o, Deputy Vice Chancellor, Institute of Higher Education, NUS
9.05 a.m.	Opening Prayer Rev. Vavatau Taufao, Lecturer in Mathematics and Statistics, NUS
9:10 a.m.	Opening Remarks Mulipola Ausetalia Titimaea, A-CEO Meteorology, MNREM
9:20 a.m.	Introduction of Workshop Participants and Workshop Objectives Patila Malua-Amosa, NUS Consulting Ltd.
9.30 a.m	Introduction to Climate Change and Greenhouse Gas Emissions Anne Rasmussen, Principal Climate Change Officer, MNREM
9.40 a.m.	Methodology for Estimating Greenhouse Gas emissions from Industrial Processes and Product Uses (IPPU) Dr. Jacinta Moreau, NUS Consulting Ltd.
10.40 a.m.	MORNING TEA *Stakeholder participants are free to leave after morning tea*
11.10 a.m.	Group Activity - Practising the Use of the Methodology *Greenhouse Gas Inventory Working Group and MNREM staff*
12.10 p.m.	Group Presentations
12.40 p.m.	Discussion and Summary
1.10 p.m.	Closing Remarks, Patila Malua Amosa, NUS Consulting Ltd.
1:15 p.m.	LUNCH

Greenhouse Gas Inventory Training:

Industrial Processes & Product Use and Agriculture, Forestry & Other Land Use

NUS Conference Room, Le Papaigalagala

Programme

Day 2 – Friday 26 January 2007

Agriculture, Forestry and Other Land Use

9.00 a.m.	Opening Remarks Patila Malua Amosa, NUS Consulting Ltd.
9.05 a.m.	Introduction of Programme & Participants Patila Malua Amosa, NUS Consulting Ltd.
9.10 a.m.	Introduction to Climate Change and Greenhouse Gas Emissions Will McGoldrick, Climate Change Section, MNREM
9:20 a.m.	Methodology for Estimating Greenhouse Gas emissions from Agriculture, Forestry and Other Land Use (AFOLU) Faainu Latu, NUS Consulting Ltd.
10.20 a.m.	MORNING TEA *Stakeholder participants are free to leave after morning tea*
10.50 a.m.	Group Activity - Practising the Use of the Methodology *Greenhouse Gas Inventory Working Group and MNREM staff*
12.00 a.m.	Group Presentations
12.30 p.m.	Summary and Discussion
12:50 p.m.	Workshop evaluation
1.00 p.m.	Closing Remarks Dr. Muagututia Ioana Chan Mow, Dean, Faculty of Science, NUS
1.10 p.m.	LUNCH

3) Group activity handouts

Greenhouse Gas Inventory Training: Industrial Processes & Product Use
Group Activity Session

Group 1:

Task A) Calculation of Emissions from Use of Carbon Dioxide, CO_2, for the year 2003

You are provided with a list of imports of CO_2 by BOC Samoa, both in numbers of 6.0 kg cylinders or in bulk (kg), from early 2003 up to the end of 2006.

1. Add up all the amounts of CO_2 sold during 2003, in kg units.
   - You will notice that after receiving each shipment, the stock on hand of **bulk** CO_2 is the same as the amount ordered. This means that the previous stock has all been sold locally. In this case, the amount of CO_2 sold between the two receipt dates is the same as the figure for the previous stock on hand.
   - For **cylinder** CO_2, the stock on hand after receiving the shipment is usually higher than the amount just received. This means that some of the previous shipment had not yet been sold. In order to calculate how much CO_2 was sold between the two receipt dates, add the previous stock on hand to the new stock on hand and then subtract the amount just received. The final figure should be in kg, not numbers of cylinders.

   Note that since this inventory is being done retrospectively, the data is not necessarily provided in the best user-friendly format, e.g. stock on hand at 31 December each year. You may need to use some judgment to arrive at sales figures from 1 January 2003 to 31 December 2003.

2. Convert the amount of CO_2 sales (bulk plus cylinder) in kg to tonnes by dividing by 1000 and then input this number into Worksheet 11 in Column A, row "Bulk". If any data is available on amounts of CO_2 from fermentation and combustion for use in soft drink manufacture (from Samoa Breweries Ltd representatives), input these figures, also in tonnes, in Column A.

3. The emission factor for Column B is 1.0. Follow the algorithms in Columns C and D to calculate the amount of CO_2 emissions in the units of Gg, and then add up all the rows in Column D to calculate the overall amount of CO_2 emitted from use in soft drink manufacture.

Task B) Calculation of Emissions from Use of Ammonia, NH_3, for the year 2004

You are provided with a list of imports of ammonia NH_3 by BOC Samoa, in terms of numbers of cylinders of 56 kg and of 230kg, over the last few years.

1. Add up all the amounts of Ammonia sold during 2004, in kg units, following the same procedure as detailed in Task A.

2. Convert the amount of Ammonia sales in kg to tonnes by dividing by 1000 and then input this number into Worksheet 15 in Column A, row "Coolant" (assuming that all Ammonia that is sold is used for cooling purposes).
3. Follow the algorithms in the remaining columns of Worksheet 15 to finally calculate the "Annual Indirect N_2O Emissions". The "Indirect N_2O Emission Factor" for Column D

has the value of 0.010. Note that Ammonia, NH_3, is a Precursor of the Greenhouse Gas N_2O.

Task A Worksheet: 2003 Sample GHG Emission Calculation Worksheet for Subcategory 2G4, Other Product Manufacture and Use – CO_2

Sector	**Industrial Processes and Product Use**			
Category	**Other Product Manufacture and Use – CO_2 for Soft Drink Manufacture**			
Category Code	**2G4**			
Sheet	**1 of 1**			
Source of CO_2	**A**	**B**	**C**	**D**
	Quantity of CO_2 Supplied	**Emission Factor**	**CO_2 Emissions**	**CO_2 Emissions**
	(tonnes)	**(fraction)**	**(tonne CO_2)**	**(Gg CO_2)**
			C = A*B	**D = C/10^3**
Fermentation				
Combustion of fossil fuel				
Bulk				
Other (please specify)				
Total				

Task B) Worksheet: Example GHG Precursor Emission Calculation Worksheet for Subcategory 2H3, Other – NH_3 Use

Type of Use	**A**	**B**	**C**	**D**	**E**
	Annual NH_3 Emissions	**Annual NH_3 Emissions**	**Annual NH_3 – N Emitted**	**Indirect N_2O Emission Factor**	**Annual Indirect N_2O Emissions**
	(tonnes)	**(Gg)**	**(Gg NH_3 - N)**	**(Gg N_2O-N per Gg NH_3-N emitted)**	**(Gg N_2O)**
		B = A/10^3	**C = B*14/17**		**E = C*D*44/28**
Coolant					
Other (please specify)					
Total					

Greenhouse Gas Inventory Training: Industrial Processes & Product Use
Group Activity Session

Group 2:

Task A) Calculation of Emissions from Use of Nitrous Oxide, N_2O, for the year 2002.

You are provided with a list of imports of N_2O by BOC Samoa, in kg amounts, since the year 2000.

1. Add up all the amounts of N_2O sold during 2002, in kg units.
    - You will notice that after receiving a shipment, the stock on hand of N_2O is sometimes greater than the amount that was just received. This means that there was some stock left over from the previous shipment. In order to calculate how much N_2O was sold between the two receipt dates, add the previous stock on hand to the new stock on hand and then subtract the amount just received.
    - In other cases, you will notice that after receiving a shipment, the stock on hand of N_2O is less than the amount just received. This means that there were some back orders that were filled as soon as the stock arrived. In order to calculate how much N_2O was sold between the two receipt dates, add the previous stock on hand to the amount just received, and then subtract the current stock on hand.

   Note that since this inventory is being done retrospectively, the data is not necessarily provided in the best user-friendly format, e.g. stock on hand at 31 December each year. You may need to use some judgment to arrive at sales figures from 1 January 2002 to 31 December 2002.

2. Convert the N_2O sales figure for 2002 from kg to tonnes by dividing by 1000 and then input this number into Worksheet 10 in Column A, row "Medical Applications". Repeat step 1 above for the year 2001, convert the N_2O sales figure for 2001 from kg to tonnes by dividing by 1000, and then input this number into Worksheet 10 in Column B, row "Medical Applications".

3. The emission factor for Column C is 1.0. Follow the algorithms in Columns D and E to calculate the amount of N_2O emissions in the units of Gg. Note that use of N_2O as a "Propellant in Aerosol Products" applies mostly to cans of whipped cream which is not relevant for Samoa, and there are no other uses of N_2O in Samoa. then add up all the rows in Column D to calculate the overall amount of CO_2 emitted from use in soft drink manufacture.

Task B) Calculation of Emissions from Use of Ammonia, NH_3, for the year 2005

You are provided with a list of imports of ammonia NH_3 by BOC Samoa, in terms of numbers of cylinders of 56 kg and of 230kg, over the last few years.

1. Add up all the amounts of Ammonia sold during 2005, in kg units, following the same procedure as detailed in Task A.

2. Convert the amount of Ammonia sales in kg to tonnes by dividing by 1000 and then input this number into Worksheet 15 in Column A, row "Coolant" (assuming that all NH_3 that is sold is used for cooling purposes).

3. Follow the algorithms in the remaining columns of Worksheet 15 to finally calculate the "Annual Indirect N_2O Emissions". The "Indirect N_2O Emission Factor" for Column D has the value of 0.010. Note that Ammonia, NH_3, is a Precursor of the Greenhouse Gas N_2O.

Task A Worksheet: IPCC GHG Emission Calculation Worksheet for Subcategory 2G3, N_2O from Product Uses

Sector	**Industrial Processes and Product Use**		
Category	**Other Product Manufacture and Use – N_2O from Product Uses**		
Category Code	**2G3**		
Sheet	**1 of 2**		
Type of Applications	**A**	**B**	**C**
	Quantity of N_2O Supplied in this Application Type in Year t	**Quantity of N_2O Supplied in this Application Type in Year t - 1**	**Emission Factor**
	(tonne)	**(tonne)**	**(fraction)**
Medical Applications			
Propellant in Aerosol Products			
Other (please specify)			
Total			

Sector	**Industrial Processes and Product Use**	
Category	**Other Product Manufacture and Use – N_2O from Product Uses**	
Category Code	**2G3**	
Sheet	**2 of 2**	
Type of Applications	**D**	**E**
	N_2O Emission	**N_2O Emission**
	(tonne)	**(Gg)**
	D = (0.5 * A + 0.5 * B) * C	**$E = D/10^3$**
Medical Applications		
Propellant in Aerosol Products		
Other (please specify)		
Total		

Task B Worksheet: Example GHG Precursor Emission Calculation Worksheet for Subcategory 2H3, Other – NH_3 Use

Type of Use	**A**	**B**	**C**	**D**	**E**
	Annual NH_3 Emissions	**Annual NH_3 Emissions**	**Annual NH_3 – N Emitted**	**Indirect N_2O Emission Factor**	**Annual Indirect N_2O Emissions**
	(tonnes)	**(Gg)**	**(Gg NH_3 - N)**	**(Gg N_2O-N per Gg NH_3-N emitted)**	**(Gg N_2O)**
		$B = A/10^3$	**C = B*14/17**		**E = C*D*44/28**
Coolant					
Other (please specify)					
Total					

Greenhouse Gas Inventory Training: Agriculture, Forestry & Other Land Used

Group Activity – Practicing Use of Methodology

Group 1: Calculation of CH_4 Emissions from Enteric Fermentation and Manure Management

Worksheet

Sector	**Agriculture, Forestry and Other Land Use**				
Category	**Methane Emissions from Enteric Fermentation and Manure Management**				
Category code	**3A1 and 3A2**				
Sheet	**1 of 1**				
Species/ Livestock category	Number of animals	Emission factor for Enteric Fermentation	CH_4 emissions from Enteric Fermentation	Emission factor for Manure Management	CH_4 emissions from Manure Management
	Head	(kg head /yr)	Gg CH_4/yr)	(kg head /yr)	(Gg CH_4 /yr)
	N (A)	**EF (B)**	**A x B /10 ^{6}**	**EF (C)**	**A X EF(C) / 10 ^{6}**
Cattle					
Sheep					
Goats					
Horses					
Mules and Asses					
Swine					
Poultry					
Total					

Activity Data and Emission Factors for Worksheet Calculations of Methane from Enteric Fermentation and Manure Management for the year 1999

Source: Ministry of Agriculture and Fisheries, 1999 Agricultural Census

Livestock species	Number of Animals (Heads)	Emission Factor for Enteric Fermentation	Emission Factor for Manure Management
Cattle	28,000	60	2
Sheep	X	X	X
Goats	2,000	5	0.22
Horses	2,000	18	2.19
Other Livestock (Mules and Asses)	2,000	10	1.2
Swine	167,000	1	13
Poultry	431,000	Insufficient Data	0.02

Activity Data and Emission Factors for Worksheet Calculations of Methane from Enteric Fermentation and Manure Management for the year 2005

Source : Ministry of Agriculture and Fisheries, Ministry of Finance, Statistics Division

Note: These figures are from the Draft 2005 survey (10% Sample size)

Livestock species	Number of Animals (Heads)	Emission Factor for Enteric Fermentation	Emission Factor for Manure Management
Cattle	49,000	60	2
Sheep	>24	5	0.2
Goats	>2,300	5	0.22
Horses	2500	18	2.19
Mules and Asses	15	10	1.2
Swine	258,000	1	13
Poultry	470,00	Insufficient Data	0.02

Note for sheep: 24 animals were introduced on 5th August 2004

Greenhouse Gas Inventory Training: Agriculture, Forestry & Other Land Used

Group Activity – Practicing Use of Methodology

Group 2: Calculation of CO_2 Emissions from Land Converted to Cropland

GOS (2001) BD SAP gives deforestation at that time of 1,500 ha/ year. Assuming that most of the forest land was converted to Cropland test the following for clarity for 2006 IPCC Guidelines Worksheets A1.24-.26, i.e.:

Using the activity data and emission factors provided, complete the worksheets for each of the years [2005-2000].

1. For example, for worksheet A1.24 Land Converted to Cropland: Annual change in carbon stocks in biomass (third column from the left) requires entry of subcategories of land
2. In the fourth column, enter the land area converted to cropland
3. The fifth column requires EF from the previous step (C2 Table 5.8) which refers to Tables 4.7-4.12 in the Methodology for which the latter may be the most relevant
4. The sixth column uses the carbon fraction default of 0.5 tonne C per tonne of dry matter. Note that the fourth through sixth columns refer to equation 2.16 which is also referred to in the following, together with equation 2.15 as described in Volume 4 *2006 IPCC Guidelines*
5. The seventh column refers to Table 5.9 of the Methodology for which the default biomass stock removed due to land conversion to crops in the year following conversion to annual crops (such as taro) is 5.0 tonnes C per hectare per year
6. The eighth column refers to Table 5.1 for which aboveground biomass of 50 tonnes C per hectare in a 5 year cycle removes 10 tonnes C per hectare per year.
7. The nineth and final column column of Worksheet A1.24 integrates columns 4-6 and 7-8 to obtain annual change in C stock in biomass as tonne C per year.

- Total the last column to obtain the total emission from Worksheet A1.24

i. Multiplication of the previous column by 44/12 converts C to CO_2, and moving the decimal to the left three (3) places converts tonne to Gg CO_2 per year for the final Step 4.

For the example of Land Converted to Cropland, Annual changes are also required for Worksheets A.25 dead organic matter due to land conversion, and A1.26 C stocks in mineral soils (if not also A1.27 in organic soils if relevant) to be calculated and added per the above. Note well the reference to Equation 2.25, formulation B in Box 2.1 (page 34) which indicates that it is not the tonne C per hectare for the relevant soils chosen but rather the reduction from that. Although referred to as a Tier 1 default method, in practice it can not be calculated without further information on the change in soil C stock. For the latter, Stewart (1994) reported organic C % in five Samoa soils (series) and bulk densities (g/ cm3) under bush fallow, first and second crop taro.[1]

[1] Four of the five soils (A'ana, Avele, Etimuli, Falealili & Tiavi series) increased in organic C from 2 to 52 per cent in the first crop with two of those having further increase in the second crop with the other two decreasing by 8-11 per cent. Tiavi soil with very low bulk density is possibly an Andisol from volcanic ash.

Table C3.3: *2006 IPPC Guidelines* Worksheet A1.25 calculations							
Sector		**Agriculture, Forestry and Other Land Use**					
Category		**Land Converted to Cropland: Annual change in dead organic matter due to land conversion1**					
Category code		**3B2b**					
Sheet		**1 of 1**					
Equation		**Equation 2.2**	**Equation 2.23**				
Land-use category		Subcategories for reporting year	Area undergoing conversion from old to new land-use category	Dead wood/litter stock under the old land-use category	Dead wood/ litter stock under the new land-use category	Time period of the transition from old to new land-use category	Annual change in carbon stocks in dead wood/ litter
Initial land use 2	Land use during reporting year						
			(ha)	(tonnes C ha-1)	(tonnes C	(yr)	(tonnes C
			National statistics or international data	Table 2.2 for litter, or national	default value is zero	default value is 1	ΔCDOM = Aon * (Cn – Co)/ Ton
			Aon	**Co**	**Cn**	**Ton**	**ΔCDOM**
FL	**CL**	**Foothill forest2**	**1200**	**2.1**	**0**	**1**	**-2520**
		(b)			**0**	**1**	
Sub-total …..							
Total							

1 Use separate worksheets to separately estimate carbon stock changes in dead wood and in litter. [Note dead wood NA and default is 0 so no separate worksheet needed.]

2 If data by initial land use are not available, use only "non-CL" in this column.

4) Evaluation Form

EVALUATION FORM – WORKSHOP ON THE METHODOLOGY FOR ESTIMATING GHG EMISSIONS IN SAMOA

(Coordinated by NUS Consulting Ltd., NUS: 25th – 26th January, 2007)

To help us to evaluate this workshop and to provide even better quality workshops in the future, please take the time to fill in this form.

What day(s) did you attend? Thursday 25/01/07 ☐
Friday 26/01/07 ☐

1=Very Good 2 = Good 3 = Fair **Circle your choice**

1. What level of preparedness did you feel the presenters had overall? 1 2 3
Comments:_____
_____

2. To what degree do you think your understanding of the information was due mainly to the way the presenters delivered the information? 1 2 3
Comments:_____
_____

3. To what degree do you think your understanding of GHG emissions was enhanced by the materials presented? 1 2 3
Comments:_____
_____

4. To what degree do you think your understanding of the Methodology for estimating GHG emissions was improved by this workshop? 1 2 3
Comments:_____
_____

5. To what degree were your expectations met, about what you would learn from the workshop? 1 2 3
Comments:_____
_____

6. As a result of attending this workshop, what level of confidence do you now have about understanding and using the Methodology to estimate GHG emissions? 1 2 3
Comments:_____
_____

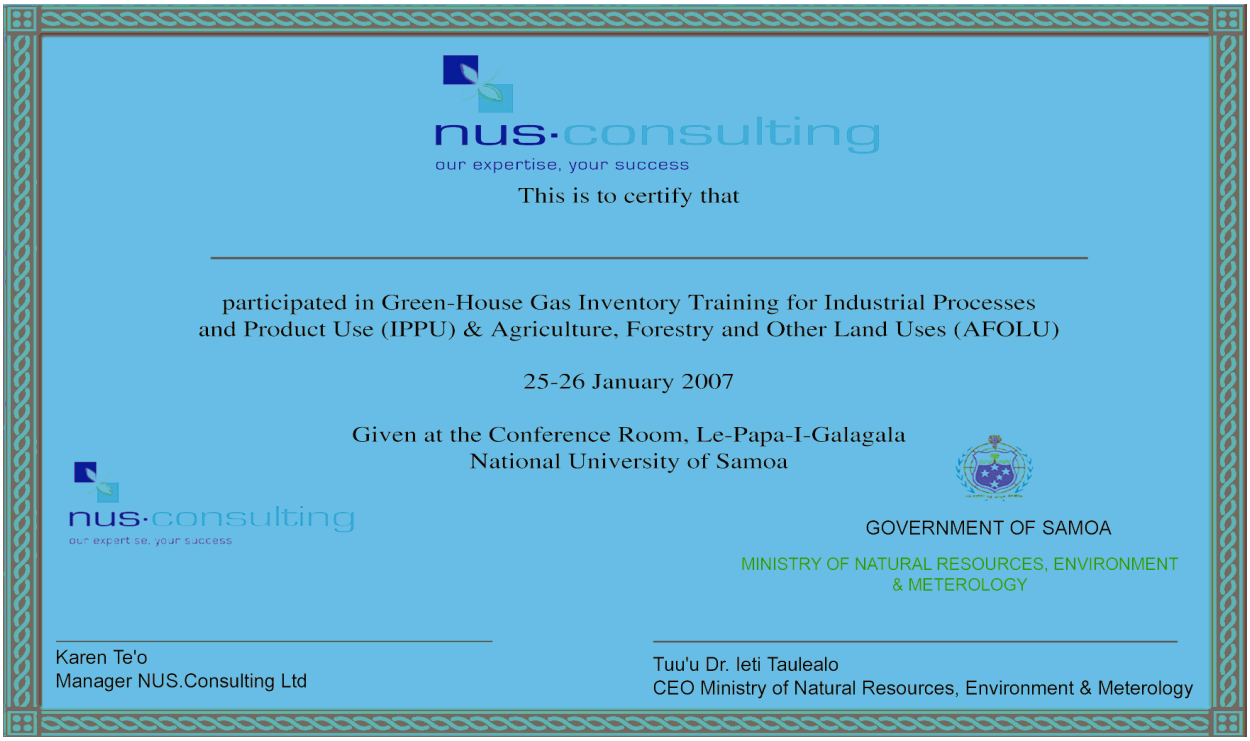
7. How do you rate the success with which the presenters responded to questions asked and/or comments made by the participants? 1 2 3
Comments:_____
_____

8. Do you think a follow-up workshop is necessary/desirable? Yes ☐ No ☐
If yes, what particular areas would you like to see covered in a subsequent workshop?
_____

9. Please make any further comments, requests or indicate concerns you still have:

Thank you for taking the time to complete this Evaluation Form

5) Certificate of Participation



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our expertise, your success

This is to certify that

participated in Green-House Gas Inventory Training for Industrial Processes and Product Use (IPPU) & Agriculture, Forestry and Other Land Uses (AFOLU)

25-26 January 2007

Given at the Conference Room, Le-Papa-I-Galagala
National University of Samoa

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GOVERNMENT OF SAMOA

MINISTRY OF NATURAL RESOURCES, ENVIRONMENT & METEROLOGY

Karen Te'o
Manager NUS.Consulting Ltd

Tuu'u Dr. Ieti Taulealo
CEO Ministry of Natural Resources, Environment & Meterology

6) List of Training Workshop Participants

Name	Organisation
Tipaula Laupue	Fire Services
Will McGoldrick	Climate Change Section, MNREM
Anne Rasmussen	Climate Change Section, MNREM
Iosefa Iosefa	Yazaki EDS Samoa Ltd.
Tumau Faasaoina	MNREM
Reima Leleimalefaga	MNREM
Ken Kingelin	Asco Motors
Papalii Grant Percival	SAME
Aiono Sam Aiono	SAMATIC Company
Mulipola Ausetalia Titimaea	ACEO Meteorology Division, MNREM
Cherith Lober	Samoa Breweries Ltd
Genevieve Chan Mow	Samoa Breweries Ltd
Aukusitino Lei Sam	Samoa Breweries Ltd
Silia Kilepoa Ualesi	Ministry of Finance
Heremoni Suapaia	Ministry of Finance
Aukuso Leavasa	Forestry Division, MNREM
Segi Usufono	Customs Division, Ministry for Revenue
Mataia Uaine Silailai	MNREM
Patrick Rasmussen	Samoa Paints
Faainoino Laulala	MNREM
Sharon Teuialiloautagi Lauina	Ministry of Commerce, Industry & Labour
Le'apai Lau Dr. Asofou So'o	Deputy Vice Chancellor, IHE, NUS
Rev. Vavatau Taufao	NUS
Peseta Frank Fong	Forestry Division, MNREM
Siatua Lautua	IRETA

Annex 4: Supplementary Materials Provided by Stakeholders and Overseas Experts (only electronic copies provided except where noted)

1) IPPU Stakeholder inputs
   - BOC Samoa Ltd, some sales data for CO_2, N_2O, NH_3, refrigerant blends
   - Samoa Breweries Ltd., some details of CO_2 production and use
   - Ozone Section, Climate Services, MNREM, import and local sales data for Ozone Depleting Substances substitutes for 1999 – 2004
2) AFOLU Stakeholder inputs
   - MAF and MoF, Agricultural Survey, 2005
   - MoF and MAFFM, Agricultural Census, 1999
   - MoF and MAFFM, Agricultural Survey, 2002
   - Samoa Forest Resources Information System (SAMFRIS), 2005
   - FAO, Forest Resource Assessment, 2005
   - Sediment analysis (organic carbon and total nitrogen) results from Vaisigano River mouth and Fuluasou Stream, USP Soil Science Laboratory
3) Overseas Expert input
   - Ministry for Environment, New Zealand's Greenhouse Gas Inventory 1990 – 2004 (hard copy and CD provided)