

Saint Lucia National Greenhouse Gas Inventory Report 2010

**Prepared on behalf of the
Government of Saint Lucia
Ministry of Sustainable
Development, Energy, Science &
Technology
Sustainable Development &
Environment Division**

March, 2015

ACKNOWLEDGEMENT

Saint Lucia's **Greenhouse Gas Inventory Report** to the United Nations Framework Convention on Climate Change (UNFCCC), was made possible through the funding support of the Global Environment Facility (GEF). The United Nations Environment Programme (UN-Environment) office in Nairobi was the implementing entity. The Sustainable Development and Environment Division (SDED) of the Ministry of Sustainable Development, Energy, Science & Technology (MSDEST) of the Government of Saint Lucia served as the executing agency.

The TNC was prepared through the collaborative effort of local, regional and international resource persons. The MSDEST, wishes to extend its gratitude to the contributors of the various reports, workshop participants and other national stakeholders consulted across various sectors for their contribution to the final product and supporting efforts in undertaking a consultative process which fosters national ownership.

The invaluable support of the UN-Environment Office in Nairobi, through technical support and document reviews as well as that of other staff members within the MSDEST apart from the Project Team is also acknowledged with much gratitude.

MSDEST also wishes to express gratitude to Stiebert Consulting and Enviro Economics who compiled the report and provided training to local stakeholders in applying IPCC guidelines for Greenhouse gas inventories.

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1 INTRODUCTION

In accordance with Article 4.1(a) of the UNFCCC, all parties to the convention are required to update and report periodically on their inventory of anthropogenic emissions and removals of greenhouse gases (GHGs). In April 2012, Saint Lucia submitted their Second National Communication (SNC) which included a national inventory for the year 2000. The SNC inventory was prepared in compliance with Articles 4 and 12 of the UNFCCC and in accordance with the Intergovernmental Panel on Climate Change (IPCC) Guidelines of 1996. Saint Lucia's Initial National Communication (INC) reported emissions for the year 1994.

Following the recommendation of the Intergovernmental Panel on Climate Change (IPCC) this inventory reports greenhouse gas emissions and removals by sinks for years between and including 2000 and 2010. In addition, appropriate methodologies used and an analysis and interpretation of the data generated on anthropogenic greenhouse gas emissions and sinks, on a sector-by sector basis, are included in this report. The greenhouse gas Inventory was conducted on sector basis for the IPCC category sectors; Energy, Industrial Processes, Solvent and Product Use, Agriculture, Land Use, Land-Use Change and Forestry (LULUCF) and Waste. The greenhouse gases included are Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O) and partially fluorinated hydrocarbons (HFCs) not covered under the Montreal Protocol. Indirect greenhouse gases including Non-Methane Volatile Organic Compounds (NMVOC), Carbon Monoxide (CO) Nitrogen Oxides (NO_x) and Sulphur Dioxide (SO₂) are also reported as they have an important influence on chemical reactions in the atmosphere that can lead to the formation of greenhouse gases.

The IPCC *Revised 1996 Guidelines for National Greenhouse Gas Inventories* (Volumes 1, 2 and 3) and the *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* were used as the basis to undertake the necessary calculations on GHG Emissions and Removals. The use of these IPCC Guidelines for all years fulfills the objective of the Conference of the Parties for the use of comparable methodologies. In accordance with the Guidelines, CO₂ emissions from International Bunkers and burning of biomass are not included in the national totals, but are reported separately as Memo Items in the Inventory.

The calculation of emissions was assisted using UNFCCC's Non-Annex I National Greenhouse Gas Inventory Software (version 1.3.2). Updated results for the year 2000 and results for the year 2005 and 2010 have also been uploaded to the Non-Annex I inventory software (NAIIS) web-based application. For purposes of verification and transparency, the Inventory for Saint Lucia includes the completed relevant IPCC Worksheets for all Sectors, in addition to the Summary Report Sheets, used to prepare the Inventory Report (provided as Appendices to this report). Complete documentation of methods, activity data and emission factors along with references of all data sources are provided in individual sector reports. This level of documentation greatly assists in the transparency of the inventory and will aid in the preparation of future inventories.

2 ENERGY SECTOR

The Energy sector includes direct and indirect greenhouse gas emissions from the oxidation of carbon contained in fossil fuels during combustion, whether when generating other forms of energy, such as electricity, or in final consumption. In the case of biomass fuels (fuelwood and charcoal), CO₂ emissions are not accounted for in total energy sector emissions. Renewable fuels do not generate net emissions and emissions associated with the non-renewable part are included in the Land-Use Change and Forestry (LULUCF) Sector.

CO₂ emissions from combustion of fuels supplied for international water-borne navigation and international aviation (the so-called bunker fuels) are reported in accordance with Decision 17/CP.8, but not accounted for in total energy sector emissions.

The Energy sector also includes fugitive emissions from fossil fuel production, transportation and processing. In Saint Lucia's case this only includes emissions related to the storage and handling of crude oil at the Hess Oil Buckeye facility.

2.1 Methodology

Two approaches were used to calculate the GHG Inventory for the Energy Sector, an aggregate fuels supply-based top-down Reference Approach and a policy-oriented source categories bottom-up Sectoral Approach. Completion of both approaches is recommended by the IPCC as a comparison provides a cross-check and the Sectoral Approach responds to the need for emissions figures by sector for monitoring and abatement policy formulation.

In the Reference Approach the total amounts of fuels consumed nationally is estimated. This requires data on the production, imports, exports, transfers to international marine and aviation bunker and changes to stocks for all primary and secondary fuels including biomass fuels. From these amounts net annual consumption of fuels can be determined.

The sectoral approach is similar, except that it requires disaggregation of all fuels into specific sectors that include; energy industries, manufacturing and construction, transport, residential, commercial and institutional sectors, as well as into a broad sector that considers agriculture, fishing and forestry.

Emission factors and coefficients that were used to convert fuel consumption into emissions were primarily from the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Energy Reference Manual. Additional emission factors and coefficients for biomass fuels were from the IPCC (2000) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*.

2.2 Energy Activity Data

Saint Lucia does not have primary fossil fuel production. All fossil fuel products are imported from other countries and the Hess Oil Buckeye facility stores and transfers crude oil. Demand for petroleum fuels overall has increased since 2000 at an average annual rate of close to 2.8%. Demand for all petroleum fuel products with the exception of lubricants decreased. The electricity generation is the only sector where total fuel use has increased significantly since 2000 by approximately 3% per year. The overall use of biomass fuels was estimated to decrease 3.5% annually from 2000 to 2010.

The national consumption of fossil and biomass fuels is identified in Table 2.1. Data on fossil fuels was provided by the Ministry of Sustainable Development, Energy, Science and Technology (MSDEST). Estimates of biomass consumption were based on two separate studies including the Latin American Energy Organization *Energy Balances of Saint Lucia* and a study prepared by Donatien Gustave, *Development of a Sustainable Charcoal Industry in Saint Lucia*.

Table 2.1: Domestic Consumption of Fuels 1000's Barrel Oil Equivalent - BOE (2000-2010)

Type	Fuel	2000	2001	2002	2003	2004	2005 ¹
Secondary Fossil Fuels ²	LPG ^{5,3}	47.9	21.3	80.4	80.4	31.64	72.1
	Gasoline ³	287.3	303.4	318.7	313.5	378.1	312.1
	Kerosene	2.60	1.48	2.81	5.11	3.87	2.69
	Jet Kerosene	178.1	174.8	69.4	114.4	165.7	197.6
	Diesel ³	513.1	481.0	446.7	498.4	504.0	539.5
	Waste Oil ⁶	-	-	-	-	-	-
	Lubricants	6.7	6.46	6.61	8.10	7.45	7.54
Biomass Fuels ⁴	Fuelwood	47.8	46.4	44.8	43.2	41.7	40.2
	Charcoal	2.05	1.99	1.92	1.85	1.78	1.72
Type	Fuel	2006	2007	2008	2009	2010 ¹	
Secondary Fossil Fuels ²	LPG ^{5,3}	39.95	59.53	58.68	64.13	60.6	
	Gasoline ³	318.97	333.3	326.79	321.4	331.1	
	Kerosene	5.70	4.29	3.13	4.15	5.1	
	Jet Kerosene	159.7	208.0	224.3	223.3	225.1	
	Diesel ³	579.6	595.0	614.3	610.6	743.7	
	Waste Oil ⁶	-	0.71	2.5	3.0	2.2	
	Lubricants	10.34	6.48	6.34	6.84	4.11	
Biomass Fuels	Fuelwood	38.8	37.4	36.1	34.8	33.6	
	Charcoal	1.67	1.61	1.55	1.49	1.44	

Sources: ¹ Latin American Energy Organization (2014). *Energy Balances of Saint Lucia*. OLADE – CELAC. Paola Carrera. Castires, Saint Lucia. August 22, 2014.

² Petroleum import data from Central Statistics Office for 2001 to 2010. HS Code 2710. Provided in email communication.

³ Sales volumes of LPG, Diesel and gasoline from MSDEST for 2007-2010. Provided in email communication Dec 1, 2014.

⁴ Biomass fuels for 2010 based on two different studies, a consumer fuelwood survey value from Latin American Energy Organization (2014). *Energy Balances of Saint Lucia*. OLADE – CELAC. Paola Carrera. Castires, Saint Lucia. August 22, 2014, and a producer charcoal survey value from Gustave, D., (2009). *Development of a Sustainable Charcoal Industry in Saint Lucia*. An extrapolation of trends between 2010 to 2012 were used to estimate 2000 to 2009.

⁵ LPG data estimated from Saint Lucia Energy Balances 2000 to 2002 and extrapolated to 2006.

⁶ Waste oil is acquired from cruise ships and not accounted for in import data. Waste oil is used by Saint Lucia Linen and Saint Lucia Distillers that provided data in emails February 27, 2015 and March 6, 2015.

In order to estimate fuel consumption by different sectors, an analysis was conducted to determine how overall consumption could be disaggregated by IPCC source categories (energy industries, manufacturing industries and construction, transport, commercial / institutional, residential and agriculture, forestry and fishing). Activity data provided in the *Energy Balances of Saint Lucia* was the basis of the fuel allocation. Table 2.2 presents the sectoral allocation for 2010.

Table 2.2: Sectoral Energy Consumption (Barrel Oil Equivalent - BOE) in 2010

Activity / Sector	Firewood	LPG	Gasoline	Kerosene	Diesel	Charcoal	Lubricants	Jet Kerosene
Energy Industries	3,009	0	0	0	560,200	0	0	
Manufacturing Industries and Construction	0	0	800	1,450	11,100	6	0	
Transport	0	0	330,300	0	159,900	0	4,110	225,090
Domestic Aviation	0	0	0	0	0	0	141	0
Road	0	0	313,785	0	143,910	0	3,901	
National Navigation	0	0	0	0	7,995	0	68	
International Marine Bunkers	0	0	0	0	7,995	0	0	
International Aviation Bunkers	0	0	16,515	0	0	0	0	225,090
Commercial/Institutional	0	12,100	0	0	0	0	0	
Residential	30,594	48,500	0	3,650	0	1,435	0	
Agriculture / Forestry / Fishing	0	0	0	0	12,500	0	0	

Sources: ¹ Latin American Energy Organization (2014). *Energy Balances of Saint Lucia*. OLADE – CELAC. Paola Carrera. Castires, Saint Lucia. August 22, 2014.

² Split between domestic aviation and international aviation bunker fuel for jet kerosene is based on airport traffic statistics for 2010. In 2010 there were 23,192 take-offs and landings (TLO) from George F.L Charles Airport and 12,741 TLO from Hewanorra International Airport. All of these flights originate from or depart to international destinations and the traffic between the two domestic airports is negligible. It is assumed that 100% of jet kerosene and aviation gasoline is associated with international aviation bunker fuel.

Overall fuel consumption in Table 2.2 balances with the reference approach.

2.3 Greenhouse Gas Emissions

Emission estimates between reference and sectoral approaches agree to within less than 0.2%. This is not surprising given that both approaches use the same data sets.

Table 2.3, Table 2.4 and Table 2.5 present combustion and fugitive emissions for CO₂, CH₄ and N₂O based on the sectoral approach and for the years 2000, 2005 and 2010.

Table 2.3: Total Energy CO₂ Emissions (Gg) Sectoral Approach

Source	Energy Sub-Sector	CO ₂ Emissions (Gg)			Change 2000-2010
		2000	2005	2010	
Combustion Emissions	1 Energy Industries	176	202	251	+43%
	2 Manufacturing Industries & Construction	5.15	3.05	6.9	+34%
	3.a Civil Aviation	0	0	0	+0%
	3.b Road Transportation	131	157	197	+50%
	3.d Navigation	3.4	1.8	3.6	+6%
	4.a Commercial/Institutional	8.6	5.5	4.6	-46%
	4.b Residential	14.3	23.0	20.2	+41%
	4.c Agriculture/Forestry/Fishing	1.7	2.7	5.6	+222%
Fugitive Emissions	Storage	-	-	-	-
TOTAL ENERGY EMISSIONS		340	395	489	+44%

Table 2.4: Total Energy CH₄ Emissions (Gg) Sectoral Approach

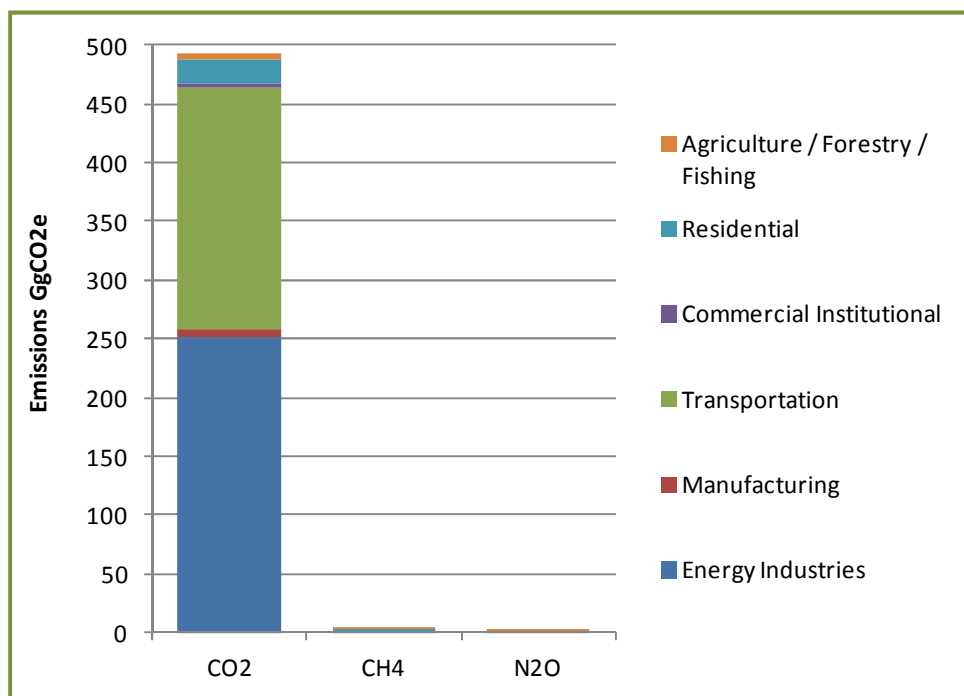
Source	Energy Sub-Sector	CH ₄ Emissions (Gg)			Change 2000-2010
		2000	2005	2010	
Combustion Emissions	1 Energy Industries	0.011	0.011	0.012	+15%
	2 Manufacturing Industries & Construction	0.000	0.000	0.000	+6%
	3.a Civil Aviation	0.000	0.000	0.000	0%
	3.b Road Transportation	0.034	0.038	0.043	+27%
	3.d Navigation	0.000	0.000	0.000	+9%
	4.a Commercial/Institutional	0.001	0.001	0.001	-38%
	4.b Residential	0.085	0.073	0.061	-28%
	4.c Agriculture/Forestry/Fishing	0.000	0.000	0.001	+485%
Fugitive Emissions	Storage	-	-	-	-
TOTAL ENERGY EMISSIONS		0.131	0.125	0.119	-10%

Table 2.5: Total Energy N₂O Emissions (Gg) Sectoral Approach

Source	Energy Sub-Sector	N ₂ O Emissions (Gg)			Change 2000-2010
		2000	2005	2010	
Combustion Emissions	1 Energy Industries	0.0015	0.0017	0.0021	+40%
	2 Manufacturing Industries & Construction	0.0000	0.0000	0.0000	+7%
	3.a Civil Aviation	0.0000	0.0000	0.0000	+0%
	3.b Road Transportation	0.0011	0.0013	0.0017	+49%
	3.d Navigation	0.0000	0.0000	0.0000	+7%
	4.a Commercial/Institutional	0.0001	0.0001	0.0000	-40%
	4.b Residential	0.0012	0.0011	0.0010	-22%
	4.c Agriculture/Forestry/Fishing	0.0000	0.0000	0.0000	+233%
Fugitive Emissions	Storage	-	-	-	-
TOTAL ENERGY EMISSIONS		0.0040	0.0042	0.0049	+22%

In 2010 the energy industries sub-sector generated the largest proportion of CO₂ emissions (51%). These are emissions from the generation of electricity. CH₄ emissions are largest for the residential sub-sector accounting for 52% of these emissions; however, overall in carbon dioxide equivalent (CO₂e), CH₄ and N₂O emissions represent only 1% of total energy sector emissions. Carbon dioxide equivalent expresses the overall radiative forcing of different greenhouse gas emissions by a common metric (i.e., the radiative forcing of carbon dioxide) so that the relative importance of emissions of greenhouse gases such as CO₂, CH₄ and N₂O can be easily compared. Figure 2.1 illustrates the contribution of emissions from different energy sub-sectors for each of the greenhouse gases.

Figure 2.1: Energy Sector Greenhouse Gas Emissions in 2010 expressed in CO₂e (Gg)



Emissions from international bunker fuels are summarized in Table 2.6.

Table 2.6: Total GHG Emissions from Bunker Fuels in (Gg)

Source	Greenhouse Gas	Emissions (Gg)			Change 2000-2010
		2000	2005	2010	
Aviation International Bunker	CO ₂	77.7	92.1	104.4	+34%
	CH ₄	0.0006	0.0007	0.0007	+35%
	N ₂ O	0.0007	0.0008	0.0009	+35%
Marine International Bunker	CO ₂	23.6	1.7	3.6	-85%
	CH ₄	0.0016	0.0001	0.0002	-85%
	N ₂ O	0.0002	0.0000	0.0000	-84%
TOTAL	CO₂	101.3	93.8	108.0	+7%
	CH₄	0.0022	0.0008	0.0009	-55%
	N₂O	0.0009	0.0008	0.0009	+8%

2.4 Indirect Greenhouse Gas Emissions

Indirect greenhouse gas emissions are presented in Table 2.7, Table 2.8, Table 2.9 and Table 2.10.

Table 2.7: Total Energy NO_x Emissions in 2010 (Gg) Sectoral Approach

Source	Energy Sub-Sector	NO _x Emissions (Gg)			Change 2000-2010
		2000	2005	2010	
Combustion Emissions	1 Energy Industries	0.482	0.554	0.687	+43%
	2 Manufacturing Industries & Construction	0.015	0.008	0.016	+7%
	3.a Civil Aviation	0	0	0	+0%
	3.b Road Transportation	1.186	1.426	1.856	+56%
	3.d Navigation	0.069	0.037	0.074	+7%
	4.a Commercial/Institutional	0.122	0.009	0.007	-39%
	4.b Residential	0.051	0.060	0.052	2%
	4.c Agriculture/Forestry/Fishing	0.029	0.004	0.008	-74%
Fugitive Emissions	Storage	-	-	-	-
TOTAL ENERGY EMISSIONS		1.845	2.097	2.700	+46%

Table 2.8: Total Energy CO Emissions (Gg) Sectoral Approach

Source	Energy Sub-Sector	CO Emissions (Gg)			Change 2000-2010
		2000	2005	2010	
Combustion Emissions	1 Energy Industries	0.062	0.063	0.070	13%
	2 Manufacturing Industries & Construction	0.001	0.001	0.001	0%
	3.a Civil Aviation	0	0	0	0%
	3.b Road Transportation	13.145	14.902	16.238	+24%
	3.d Navigation	0.046	0.024	0.049	+7%
	4.a Commercial/Institutional	0.002	0.002	0.002	-38%
	4.b Residential	1.42	1.20	1.00	-30%
	4.c Agriculture/Forestry/Fishing	0.024	0.001	0.002	-94%
Fugitive Emissions	Crude Oil Storage	-	-	-	-
TOTAL ENERGY EMISSIONS		14.70	16.19	17.36	+18%

Table 2.9: Total Energy NMVOC Emissions (Gg) Sectoral Approach

Source	Energy Sub-Sector	NMVOC Emissions (Gg)			Change 2000-2010
		2000	2005	2010	
Combustion Emissions	1 Energy Industries	0.013	0.015	0.018	+38%
	2 Manufacturing Industries & Construction	0.000	0.000	0.000	+8%
	3.a Civil Aviation	0	0	0	0%
	3.b Road Transportation	2.468	2.799	3.056	+24%
	3.d Navigation	0.009	0.005	0.010	+8%
	4.a Commercial/Institutional	0.001	0.000	0.000	-34%
	4.b Residential	0.162	0.137	0.115	-29%
	4.c Agriculture/Forestry/Fishing	0.005	0.001	0.000	-92%
Fugitive Emissions	Crude Oil Storage	0.042	0.220	0.209	+403%
TOTAL ENERGY EMISSIONS		2.670	3.177	3.408	+26%

Table 2.10: Total Energy SO₂ Emissions (Gg) Sectoral Approach

Source	Energy Sub-Sector	SO ₂ Emissions (Gg)			Change 2000-2010
		2000	2005	2010	
Combustion Emissions	1 Energy Industries	0.056	0.065	0.080	+43%
	2 Manufacturing Industries & Construction	0.002	0.001	0.002	+27%
	3. Transportation	0.043	0.051	0.064	+48%
	4.a Commercial/Institutional	0.000	0.000	0.000	0%
	4.b Residential	0.058	0.049	0.041	-29%
	4.c Agriculture/Forestry/Fishing	0.000	0.001	0.002	+800%
Fugitive Emissions	Crude Oil Storage	-	-	-	-
TOTAL ENERGY EMISSIONS		0.159	0.166	0.189	+19%

3 INDUSTRIAL PROCESSES SECTOR

The Industrial Process Sector includes anthropogenic emissions from industry production processes that are not a result of fuel combustion, since the latter are reported in the Energy Sector.

The sub-sectors of importance in Saint Lucia include mineral products, food and beverage and the consumption of HFCs. Other potential industrial process sub-sectors such as the chemical industry and metal production were determined to have no significant production leading to greenhouse gas emissions.

There are no CO₂, CH₄ and N₂O greenhouse gas emissions from the Industrial Process Sector and the only direct greenhouse gas emissions are related to HFCs imported into Saint Lucia through products and bulk imports.

3.1 Methodology

Industrial activity in Saint Lucia was reviewed to identify processes that could lead to direct and indirect emissions of greenhouse gases. Country specific production statistics and import data were primarily obtained from the Saint Lucia Central Statistics Office. Emissions were based on default IPCC emissions factors that are related to these production levels following guidance from the *Revised 1996 IPCC Guidelines* and the *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*.

3.2 Industrial Process Activity Data

Mineral production data that were used to estimate emissions are presented in Table 3.1 and food and drink production data are presented in Table 3.2.

Table 3.1: Domestic Industrial Production for Select Minerals (tonnes of product) (2000-2010)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Bitumen Import ¹	453	681	256	329	3,620	31,747	5,554	1,784	385	162	1,424
Asphalt Production ²	4,529	6,812	2,564	3,289	36,200	317,470	55,540	17,843	3,854	1,622	14,237

Source: ¹ Central Statistics Office (2014). Flow Statistics by Commodity. HS Codes 27149010, 27149020 and 27150090. Provided in a spreadsheet in email communication from Central Statistics Office, November, 20 2014. An assumption is made that asphalt imports are actually bitumen used for asphalt production.

² Asphalt production is based on an assumption that there is 10% bitumen content in asphalt produced

Table 3.2: Food and Drink Production (2000 – 2010)

Food and Drink Production	2000	2001	2002	2003	2004	2005
Beer (hectoliters) ¹	98,934	NA	NA	NA	129,234	149,188
Rum (hectoliters) ^{2,3}	11,624	NA	11,233	11,061	10,792	7,042
Meat, Poultry (tonnes) ³	277	339	250	222	202	243
Fish (tonnes) ³	1,860	1,967	1,608	1,528	1,483	1,386
Bread (tonnes) ⁴	16,320	12,065	12,065	12,065	12,065	12,065
Cakes, Biscuits(tonnes) ⁴	951	703	703	703	703	703
Food and Drink Production	2006	2007	2008	2009	2010	2011
Beer (hectoliters) ¹	158,395	190,851	151,689	149,361	145,814	NA
Rum (hectoliters) ^{2,3}	8,724	5,233	5,342	8,042	7,942	9,574
Meat, Poultry (tonnes) ³	281	377	313	339	394	387
Fish (tonnes) ³	1,440	1,509	1,695	1,858	1,800	1,693
Bread (tonnes) ⁴	12,065	12,065	12,065	12,065	12,065	12,065
Cakes, Biscuits (tonnes) ⁴	703	703	703	703	703	703

Sources: ¹ Windward & Leeward Brewery Ltd. (2014). Received in an email from Windward & Leeward Brewery Ltd. 30 Oct 2014.

² Central Statistics Office (2013). *Economic and Social Review 2013*.

³ Central Statistics Office (2012). *Annual Statistics Digest 2012* and *Annual Statistics Digest 2006*. Table 5.2. Average retail weight per livestock slaughtered based on 300 kg for cattle, sheep and goat 22 kg, pigs 50 kg and chicken 1.3 kg.

⁴ Flour use data gathered by Ministry of Commerce. Email Communication, December 1st, 2014. Conversions of flour to bread and cakes based on information collected from Ideal Bakery, Mannees Bakery, Cadassse Bakery, Central Bakery for year 2000 inventory.

Saint Lucia does not manufacture HFCs; however, emissions of HFCs can still arise from the release of HFC gases imported in bulk that are used to recharge refrigeration and air conditioning products, as well as the stock of HFCs imported within refrigeration and air conditioning, aerosols and other products. Emissions are estimated assuming that they are equal to the amount of HFCs that are imported in the country. An assumption is made that there is no exportation or destruction of HFCs occurring in Saint Lucia. Total estimated HFC imports by type are reported in Table 3.3.

Table 3.3: HFC Imports in kg (2000 - 2010)

HFC Type	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
HFC 134A	20,173	11,191	22,006	38,356	9,299	17,357	15,507	17,509	11,589	11,292	16,391
HFC 404A	2,736	2,767	2,782	2,798	2,813	2,828	2,843	2,858	2,874	3,266	3,285
HFC 410a	2,310	2,337	2,350	2,362	2,375	2,388	2,401	2,414	2,427	2,835	2,835

Sources: MSDEST (2011). ODS Consumption 2010 Survey Report. National Ozone Unit.

Central Statistics Office (2014). *Flow Statistics by Commodity*. Import of air conditioners and refrigerators. HS Codes 841510000 to 84189900 and HS Codes 87031000 to 87039000, 84151000 and 84186900.

Provided in a spreadsheet 20-Nov-2014. Average vehicle charge based on IPCC/TEAP Special Report: *Safeguarding the Ozone Layer and the Global Climate System*. Refrigeration Chapter 4. Mobile Air

Conditioning Chapter 9 and Residential and Commercial Air Conditioning Chapter 5. Cambridge University Press.

Note: Per capita estimates for years between 2000 and 2009 are based on the average import per capita between 2009 and 2011.

3.3 Greenhouse Gas Emissions

Table 3.4 presents industrial process emissions for HFCs.

Table 3.4: Total Industrial Process HFCs Emissions (Gg)

Source	Energy Sub-Sector	HFC Emissions (Gg)			Change 2000-2010
		2000	2005	2010	
Consumption of HFCs	1 Bulk Import Emissions	0.007	0.007	0.009	+28%
	2 Product Emissions	0.018	0.015	0.013	-28%
TOTAL INDUSTRIAL PROCESS EMISSIONS		0.025	0.023	0.023	-9%

Note: The estimated average global warming potential of all HFC species for product emissions is 2,200. Product emissions are assumed to be all HFC134a which corresponds to a global warming potential of 1,300.

3.4 Indirect Greenhouse Gas Emissions

Indirect greenhouse gas emissions of NMVOC are the result of road paving with asphalt and food and beverage production. Table 3.5 identifies these emissions over time.

Table 3.5: Total Industrial Process NMVOC Emissions (Gg)

Source	Energy Sub-Sector	NMVOC Emissions (Gg)			Change 2000-2010
		2000	2005	2010	
Mineral Products	6 Road Paving with Asphalt	1.450	1,016	4.557	+214%
Other Production	2. Food and Drink	0.310	0.111	0.135	-56%
TOTAL INDUSTRIAL PROCESS EMISSIONS		1.760	1016.2	4.692	+167%

4 SOLVENT AND OTHER PRODUCT USE

Although specific guidance from the IPCC still has not been provided for this sector emission estimates from solvent and other product use are provided. The use of solvents and certain products can lead to significant sources of emissions of non-methane volatile organic compounds (NMVOCs). Nitrous oxide is released in certain medical applications (anaesthetics).

Estimations of NMVOC emissions were generated for products where import data was available for solvents related to paints. NMVOC emissions from household product use (e.g., personal care products, adhesives, automotive products) were also estimated based on typical use of these products estimated in other countries.

4.1 Methodology

A consumption based approach was used to estimate emissions from solvent and other product use. For paint applications import data was acquired from customs and excise data. The VOC content from different types of paints, varnishes and thinners were estimated based on typical solvent content limits.

Estimates of paint NMVOC emissions assume that 100% of the solvent content is released. NMVOC emissions from household product use were estimated based on average per capita emission factors published by the European Union. These emission factors estimate average emissions for the European Union and are adjusted by household expenditure to be representative for Saint Lucia as no other data was available to determine country-specific emission factors.

4.2 Solvent and Product Use Activity Data

Importation of paints and related solvents were reported by Customs and Excise. Total consumption of paints and related solvents are summarized in Table 4.1.

Table 4.1: Domestic Consumption of Paints (tonnes of product) (2001-2010)

Type of Paint	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Emulsion paint	445,918	407,661	402,961	346,620	473,792	505,766	422,264	403,713	373,035	369,705
Solvent based polyester paint	45,846	44,552	38,248	41,281	108,230	42,695	52,193	104,796	102,789	91,147
Enamels	140,297	157,776	150,637	138,518	204,333	167,727	197,114	127,756	162,062	128,256
Thinners (other solvents)	51,274	107,446	114,742	100,363	84,779	139,288	99,863	113,191	95,100	81,280
Solvent based varnish	89,578	141,415	97,871	92,431	158,010	146,216	137,122	144,892	84,740	105,670
Emulsion based varnish	12,304	3,210	7,493	17,116	12,337	21,075	17,420	17,519	14,468	13,093

Source: Customs and Excise Import data provided by Statistics Office. Email Communication Nov 20, 2014.
Spreadsheet - Selected commodities kg 2001-2010.

Average per capita estimates of NMVOC emissions for domestic solvent use are presented in Table 4.2. These emission factors are multiplied by the total population to estimate overall emissions.

Table 4.2: Per Capita NMVOC emissions for Domestic Solvent Use

Source	NMVOC Emission factor (g/person)	Adjusted for Saint Lucia NMVOC Emission Factor (g/person) ²
Household Cleaning Products	507	128
Car Care Products	464	117
Cosmetics and toiletries	1,088	274
Construction	522	131
Pharmaceutical Products	48	12
Pesticides	76	19
TOTAL	2,705	681

Source : ¹ European Environment Agency (2013). EMEP / EEA Emission Inventory Guidebook 2013. Domestic solvent use including fungicides. Retrieved from European Environment Agency website: <http://www.eea.europa.eu/publications/emep-eea-guidebook-2013>

² Adjusted by the ratio of household expenditures in the United States compared to Saint Lucia (25.3%). World Bank (2014). World Development Indicators. Retrieved from World Bank website: [http://data.worldbank.org/country/Saint Lucia](http://data.worldbank.org/country/Saint%20Lucia)

4.3 Direct Greenhouse Gas Emissions

Direct Greenhouse gas emissions arise only from the use of nitrous oxide gas for medical and other applications. Nitrous oxide emissions are summarized in Table 4.3.

Table 4.3: Total Solvent and Other Product Use N₂O Emissions (Gg)

Source	Energy Sub-Sector	N ₂ O Emissions (Gg)			Change 2000-2010
		2000	2005	2010	
Solvent and Other Product Use	Nitrous Oxide Product Use	0.0014	0.0020	0.0068	+386%

4.4 Indirect Greenhouse Gas Emissions

Indirect greenhouse gas emissions of NMVOC are estimated for the application of paints and for domestic household product use. Table 4.4 identifies these emissions over time. Emissions related to other solvent and product use categories such as degreasing and use of other chemical products and pesticide use were not estimated due to insufficient data availability.

Table 4.4: Total Solvent and Other Product Use NMVOC Emissions (Gg)

Source	Energy Sub-Sector	NMVOC Emissions (Gg)			Change 2000-2010
		2000	2005	2010	
Solvent and Other Product Use	A Paint Application	0.220	0.347	0.223	+1%
	D. Household Product Use	0.106	0.110	0.121	+14%
TOTAL SOLVENT AND OTHER PRODUCT USE EMISSIONS		0.326	0.457	0.344	+6%

5 AGRICULTURE

Economic activity in the agriculture sector has contracted between 2003 and 2010. Agriculture represented 4.8% of Gross Domestic Product (GDP) in 2003 and 3.4% in 2010. This decline coincides with a decline in overall livestock numbers and crop production. Cattle, sheep and goat populations have decreased, whereas swine has increased and poultry is approximately unchanged. Overall crop production over the same time period has fallen by more than one third. Banana exports make up a significant portion of crop production and between 2000 and 2010 have declined by 69%.

Agricultural activities contribute to greenhouse gas emissions through a variety of different processes. CH₄ and N₂O are the only significant greenhouse gases emitted by the Agriculture Sector. CH₄ emissions arise from enteric fermentation and manure management associated with livestock. N₂O Emissions arise primarily from synthetic and natural fertilizers (i.e., manure, crop residues) applied to cultivated soils and are based on IPCC assumptions regarding atmospheric deposition and leaching from soils.

5.1 Methodology

A Tier 1 approach was used to calculate enteric fermentation and manure management emissions based on regional default IPCC emission factors and the population of each category of livestock.

In order to calculate N₂O emissions from soils, animal production and from the application of fertilizers, the amount of nitrogen input from synthetic fertilizers, animal waste, nitrogen fixing crops and crop residues was estimated. Direct and indirect N₂O releases to the atmosphere were then estimated from these inputs using default IPCC emission factors.

5.2 Agriculture Activity Data

Populations of livestock were provided by the Ministry of Agriculture and are presented in Table 5.1.

Table 5.1: Historic livestock population (head of livestock) (2000-2010)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cattle	5,964	5,142	4,874	4,956	4,857	5,026	5,127	5,345	3,164	2,864	4,856
Swine	8,432	8,984	9,128	9,313	9,815	10,876	11,122	11,786	12,924	11,213	12,697
Sheep ²	10,074	9,740	9,406	9,072	8,738	8,404	8,070	7,736	6,753	5,771	4,788
Goats ²	9,212	9,155	9,099	9,042	8,986	8,929	8,873	8,816	8,063	7,311	6,558
Poultry	361,328	431,271	249,040	247,813	338,390	212,659	301,017	243,107	516,333	546,659	361,328

Source: ¹ Veterinary and Livestock Services Division Quarterly and Yearly Reports. Communication by email on 5-Dec-2014 and 14, Jan 2015 from MSDEST in excel spreadsheet.

² For the year 2000 the population of sheep and goats were based on year 2000 inventory and for the year 2000 on the 2007 Agriculture Census. Data was linearly interpolated between 2000 and 2007 and 2007 and 2010.

Crop production data is presented in Table 5.2.

Table 5.2: Production quantity of Crops (2000 – 2010 dry matter)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Pulses and Soybeans ¹	50.8	50.4	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8
Non-N Fixing Crops ²	20,421	17,055	19,522	17,041	15,833	12,285	14,685	14,214	16,667	14,624	12,930

Source: 1 Pulses and Soybean Data provided by Ministry of Agriculture in email communications from Cletus Alexander December 10, 2014. Converted to dry matter using 0.3 t dm / t conversion.

2 Non-N fixing crops include all crops other than pulses and soybeans. Data was collected from the FAOSTAT Database. Food and Agriculture Organization of the United Nations. Accessed 6-Jan-2015 for 2000 to 2010. However, this crop production data does not include food crops sold to local markets or for subsistence consumption that was not estimated.

The amount of synthetic fertilizers applied to agricultural soils is presented in Table 5.3.

Table 5.3: Consumption of Synthetic Fertilizer (t N/yr) (2000 – 2010)

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
180.4	180.4	180.4	180.4	180.4	180.4	180.4	180.4	180.4	180.4	400.2

Source: Data provided by Ministry of Agriculture in emails January 5, 2015 and March 9, 2015 and is based on information provided by Renwick & Company Limited and National Fair Trade and Saint Lucia Golf and Country Club. Note average between 2000 and 2009 is used and that some synthetic fertilizer consumption may not be included due to complex number of productions containing nitrogen including bio stimulants, foliar fertilizer, fertilizer enhancements and some pesticides.

5.3 Greenhouse Gas Emissions

Table 5.4 and Table 5.5 present agricultural emissions for CH₄ and N₂O.

Table 5.4: Total Agriculture CH₄ Emissions (Gg)

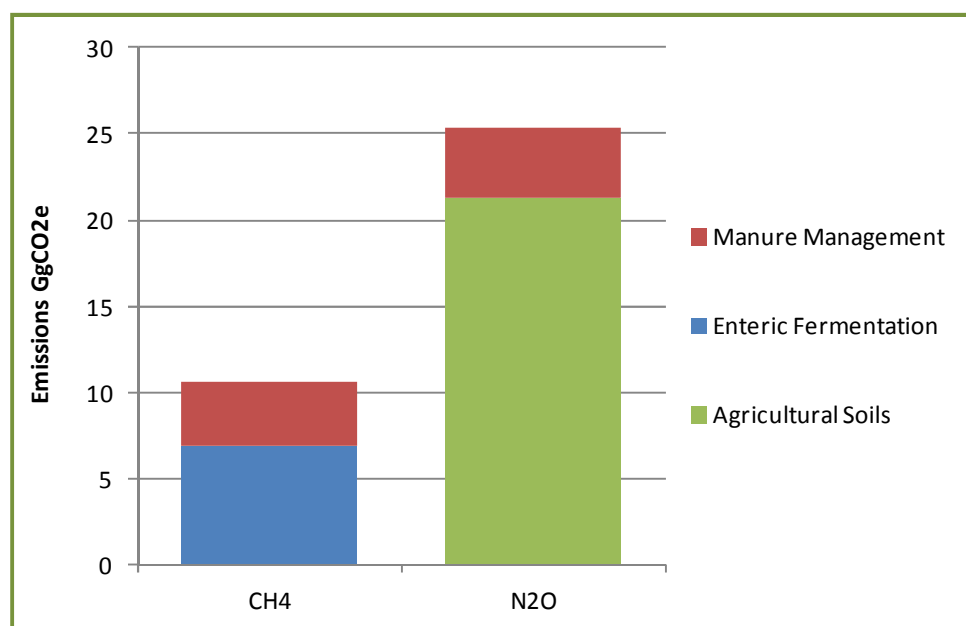
Source	CH ₄ Emissions (Gg)			Change 2000-2010
	2000	2005	2010	
A. Enteric Fermentation	0.421	0.364	0.327	-22%
B. Manure Management	0.128	0.155	0.181	+41%
D. Agricultural Soils	-	-	-	-
TOTAL AGRICULTURE EMISSIONS	0.549	0.519	0.508	-7%

Table 5.5: Total Agriculture N₂O Emissions (Gg)

Source	N ₂ O Emissions (Gg)			Change 2000-2010
	2000	2005	2010	
A. Enteric Fermentation	-	-	-	-
B. Manure Management	0.0129	0.0109	0.0130	+1%
D. Agricultural Soils	0.0762	0.0641	0.0686	-10%
TOTAL AGRICULTURE EMISSIONS	0.0891	0.0750	0.0816	-8%

Enteric fermentation generated the largest proportion of CH₄ emissions (64%) in 2010. Enteric fermentation is the production of methane by herbivores as part of the digestive process where carbohydrates are broken down by micro-organisms in simple molecules for absorption into the bloodstream.

The largest source of N₂O emissions was the Agricultural Soils sub-sector accounting for 84% of these emissions. Figure 5.1 illustrates the contribution of emissions from different agricultural sub-sectors for each of the greenhouse gases. Emissions are expressed in carbon dioxide equivalent (CO₂e) so that the relative importance of emissions of CH₄ and N₂O can be easily compared.

Figure 5.1: Agriculture Sector Greenhouse Gas Emissions in 2010 expressed in CO₂e (Gg)

5.4 Indirect Greenhouse Gas Emissions

Indirect greenhouse gas emissions were not estimated for the Agriculture Sector.

6 LAND-USE CHANGE AND FORESTRY

The LULUCF Sector includes estimates of emissions and removals of greenhouse gases associated with increases or decreases of carbon in living biomass as land-use changes occur over time, for example, in the conversion of a forest area to cropland, or when establishing new forest lands through reforestation or afforestation.

As recommended by the *2003 Good Practice Guidance for LULUCF*, estimations are provided for emissions and removals from land that did not undergo any land-use change, reflecting increase or loss of carbon under the same type of use (e.g. carbon increase in secondary vegetation or even in primary vegetation in managed areas), as well as, conversions of land between the six IPCC land-use categories (Forestland, Cropland, Grasslands, Wetlands, Settlements and Other Lands).

Saint Lucia's forest cover has increased since 2000 as the proportion of cropland under the classification of densely vegetated farming croplands has increased significantly over the years. In addition, the total area of forest reserve increased by 18% from the year 2000 to 9,415 ha in 2009.

Only CO₂ emissions and removals are projected from the year 2000 for the LULUCF Sector as there was no reported clearcut burning practices and wildfire that would lead to CH₄ and N₂O.

6.1 Methodology

A global land-use data approach is the basis for consistent representation of land areas. The dataset that is employed is from the study *National Forest Demarcation and Bio-Physical Resource Inventory Project for Saint Lucia*. This land-use representation method is described as Approach 1 in the *2003 IPCC Good Practice Guidance for LULUCF*.

The general method for calculating fluxes of CO₂ to or from the atmosphere and biomass carbon pools is the same as outlined in the *1996 Revised IPCC Guidelines*. The inventory considers all forests in Saint Lucia as managed forest where forest management is defined as the process of planning and implementing practices for stewardship and use of the forest aimed at fulfilling relevant ecological, economic and social functions of the forest.

The fundamental basis for the methodology rests upon two linked themes: i) the flux of CO₂ to or from the atmosphere is assumed to be equal to changes in carbon stocks in existing biomass and soils, and ii) changes in carbon stocks can be estimated by first establishing rates of change in land use and the practice used to bring about the change (e.g., burning, clear-cutting, selective cut, etc.). Simple assumptions or data are applied about their impact on carbon stocks and the biomass growth response to a given land use.

This inventory uses the approach of calculating carbon gains and losses that occur over the period of 2000 to 2009 that corresponds to the land-use representation data that is available for that time period. Longer time periods of more than twenty years are recommended but consistent and comparable LULUCF data was not available. Carbons stocks or gains and losses are calculated for above and below-ground biomass pools as well as soil organic carbon. Other pools such as dead organic matter (litter and dead wood pools) are not considered as little data is available to track the carbon flows of these pools and a simplifying Tier 1 assumption is made that the net flow of these carbon pools is zero.

6.2 Land Representation

For the purposes of this report, approach 2 (IPCC, 2003) for land representation, which requires a national assessment of losses or gains in the area of specific land categories was used. This requires not only data that identifies the total area converted to different land-uses overtime but also it must track the change from one land-use category to another.

The *National Forest Demarcation and Bio-Physical Resource Inventory Project for Saint Lucia* identified land-use classifications for the year 2000 and the year 2009 for all of Saint Lucia. These land-use classifications were mapped at a high level to the six IPCC land-use categories (Forest Land, Cropland, Grassland, Wetlands, Settlement and Other Land). Land-use types and historic areas are presented in Table 6.1.

Table 6.1: Land-Use Classification Areas (2000 and 2009)

IPCC Land-Use Categories	Land-Use Classifications	Area (hectares)		Change in Area (000 hectares) from 1990 to 2010
		2000	2009	
Forest Land	Forest Reserve	7,972	9,415	+1,444
	Natural Tropical Forest	6,159	4,786	-1,373
	Scrub Forest	6,756	6,303	-453
	Other Forest Vegetation	-	8,691	+8,691
	Mangrove	229	184	-45
Croplands	Densely Vegetated Farming	3,586	13,652	+10,066
	Intensive Farming	12,203	2,953	-9,250
	Mixed Farming	11,479	1,556	-9,923
Grasslands	Grasslands	2,694	188	-2,507
Wetlands	Ponds	43	43	0
Settlement	Built-up Areas	9,049	10,131	+1,082
Other Land	Bare Ground / Scrub	472	2,740	+2,268
Total Area for Country		60,641	60,641	

Source: Data provided by the Forestry Department in an email communication Nov 11, 2014 and Graveson, R. (2009) *The Classification of the Vegetation of Saint Lucia*. Technical Report No. 3 to the National Forest Demarcation and Bio-Physical Resource Inventory Project, FCG International Ltd, Helsinki, Finland.

6.3 Land Use Change and Forestry Activity Data

In order to estimate annual land-use changes between 2000 and 2009 initial areas in 2000 were compared to final areas in 2009. A non-spatially explicit land-use change matrix as described in the *2003 IPCC Good practice Guidance for LULUCF* was developed and is presented in Table 6.2.

Table 6.2: Areas Land-Use Changes between 2000 and 2009 (ha)

Final Initial	Forest Land					Cropland			Grasslands	Wetlands	Settlement	Other Land	FINAL TOTAL
	Forest Reserve	Natural Tropical Forest	Scrub Forest	Other Forest Vegetation	Mangrove	Densely Vegetated Farming	Intensive Farming	Mixed Farming	Grasslands	Ponds	Builtup Area	Bare Ground /Scrub	
Forest Reserve	7,972	1,373					71						9,415
Natural Tropical Forest		4,786											4,786
Scrub Forest			6,303										6,303
Other Forest Vegetation				0			2,302	4,531	1,858				8,691
Mangrove					184								184
Densely Vegetated Farming						3,586	6,063	4,003					13,652
Intensive Farming							2,953						2,953
Mixed Farming								1,556					1,556
Grasslands									188				188
Ponds										43			43
Builtup Area							212	870			9,049		10,131
Bare Ground/Scrub			453		45		602	519	649			472	2,740
INITIAL TOTAL	7,972	6,159	6,756		229	3,586	12,203	11,479	2,694	43	9,049	472	60,641

Note: Land-use changes over a ten year period are indicated in yellow cells. Green cells represent areas over the period that remains the same land-use.

Average annual wood removals between 2000 and 2009 for fuelwood, charcoal production and commercial roundwood were estimated based on a number of different sources identified in Table 6.3.

Table 6.3: Estimated Wood Removal (m³ /yr)

Year	Biomass Removal (m ³ / yr)		
	Fuelwood ¹	Charcoal Production ¹	Volume of Roundwood (m ³ /yr) ²
Average 2000 to 2009	27,302	2,681	1,544

Sources: ¹ Fuelwood and charcoal wood removal based on an average weighted value from two different studies, a consumer survey value from Latin American Energy Organization (2014). *Energy Balances of Saint Lucia*. OLADE – CELAC. Paola Carrera. Castires, Saint Lucia. August 22, 2014, and a producer survey value from Gustave, D., (2009). *Development of a Sustainable Charcoal Industry in Saint Lucia*.

² Volume of roundwood estimated from data provided by Forestry Department in email communication November 11, 2014 in spreadsheet format.

Note: Wood removal is based on conversion of 2.594 BOE/t dm and 0.52 t dm/m³.

6.4 Greenhouse Gas Emissions

Table 6.4 provides a summary of CO₂ emissions and removals that relate to different land-use categories, carbon pools and IPCC Guideline LULUCF categories. Removals are identified by a negative sign and emissions by a positive sign. The abbreviated IPCC land-use categories are as follows; FL- Forest Land, CL-Cropland, GL-Grassland, WL-Wetland, SL-Settlement Land, OL – Other Land.

Table 6.4: Total LULUCF CO₂ Emissions (Gg)

Land-Use Category ³		Carbon Pool	Sector in IPCC Guidelines ¹	Annual Change in Carbon Stocks CO ₂ (Gg)
Initial Land Use	Land Use during Reporting Year			2000 – 2009 ²
FL	FL	Living Biomass	5A	-54.39
		Soil	5D	0
CL	FL	Living Biomass	5A	-29.19
GL	FL	Living Biomass	5A	-14.41
Sub-Total For Forest Land				-98.00
CL	CL	Living Biomass	5A	-37.78
		Soil	5D	+0.005
Sub-Total For Cropland				-37.78
GL	GL	Living Biomass	5A	0
		Soil	5A	0
Sub-Total For Grassland				0
WL	WL	Living Biomass	5A	0
		Soil	5A	0
Sub-Total For Wetlands				0
SL	SL	Living Biomass	5A	-0.66
		Soil	5A	0
CL	SL	Living Biomass	5A	0
Sub-Total For Settlements				-0.66
OL	OL	Living Biomass	5A	0
		Soil	5A	0
FL	OL	Living Biomass	5B	7.91
CL	OL	Living Biomass	5E	5.67
GL	OL	Living Biomass	5B	0
Sub-Total For Other Land				13.58
TOTAL				-122.9

Notes: ¹ Headings from the IPCC Guidelines Reporting Instructions p.1.14-1.16: 5A - Changes in Forest and Other Woody Biomass Stocks; 5B - Forest and Grassland Conversion; 5C - Abandonment of Managed Lands; 5D - Emissions and Removals from Soils, and 5E - Other.

Table 6.4 identifies that Saint Lucia's LULUCF Sector was a net sink (net gain in carbon pools) between 2000 and 2009. The average annual CO₂ removal over this time period was 123 Gigagrams (Gg) per year. This finding is consistent with the observed increase in forest cover on Croplands over the time period. Soil carbon stocks were estimated to change only for croplands where there was a very small increase in carbon stocks between 2000 and 2009.

6.5 Indirect Greenhouse Gas Emissions

No indirect greenhouse gas emissions were estimated for the LULUCF Sector.

7 WASTE

Through the processes of disposal, treatment, recycling and incineration different types of waste can produce greenhouse gas emissions. The most important gas produced in this source category is methane (CH₄). Two major sources of this type of CH₄ production are solid waste disposal to land and wastewater treatment. In each case, methanogenic bacteria break down organic matter in the waste to produce CH₄. The emission potential increases where there are better disposal site control conditions and greater depths of solid waste. Wastewater emission potential increases for wastewater that has treatment that allows anaerobic conditions and has a high degree of organic content. Wastewater sources with high organic content include domestic wastewater from residential and commercial sectors, food and beverage industries and the pulp and paper industry.

Waste incineration, like other forms of combustion, generates CO₂ as well as smaller amounts of CH₄ and N₂O emissions. The amount of emissions largely depends on the composition of the waste and the type of incinerator used. The breakdown of human sewage can also lead to significant amounts of indirect N₂O emissions.

7.1 Methodology

The calculation of methane emissions from Solid Waste Disposal Sites (SWDS) was completed using the Tier 2 First Order Decay Model methodology from the *2006 IPCC Guidelines*. The FOD method produces a time-dependent emission profile that better reflects the true pattern of the degradation process over time, as opposed to the default method that assumes all potential CH₄ is released in the year the waste is disposed. The 2006 Waste Model spreadsheet developed by the IPCC was employed to estimate emissions between 2000 and 2010.

CH₄ emissions from domestic and industrial wastewater were estimated by determining the total amount of organic material (degradable organic component) in the wastewater for different types of wastewater handling systems and multiplying this by IPCC default emission factors that represent the amount of methane produced for each kg of degradable organic material.

Indirect N₂O emissions from human sludge were estimated from the N content of human sludge based on the per capita protein consumption of an average person in Saint Lucia and then by applying a default IPCC emission factor (kg N₂O / Kg human Sludge N).

7.2 Waste Activity Data

Solid domestic or municipal waste received at solid waste disposal sites in Saint Lucia is summarized in Table 7.1.

Table 7.1: Waste Disposal in Saint Lucia at Deglos and Vieux Fort Landfills (2004-2010) and Vieux Fort (2000-2003) (tonnes received)

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
83,177	73,664	67,085	71,501	73,012	81,617	78,097	84,526	84,230	82,054	82,332	78,021	74,819

Sources: ¹ Disposal between 2004 and 2012 provided by Saint Lucia Solid Waste Management Authority in an email communication November 3, 2014.

² Disposal between 2000 and 2003 from SLSWMA (2003) Annual report for the Period April 2002 to March 2003.

The solid wastes outlined in Table 7.2 were assumed to have the following composition based on waste characterization studies carried out in 2003 and 2008.

Table 7.2: Composition of wastes in Saint Lucia by IPCC Model Categories

IPCC Model Categories	2008 Municipal Waste Composition (%) ¹	2003 Municipal Waste Composition (%) ²	IPCC 2006 Guideline Caribbean Default Values (%) ³
Food	27.6%	40.5%	47%
Garden	11.5%	5.0%	0%
Paper	10.2%	12.1%	17%
Wood	3.2%	6.7%	2%
Textile	8.5%	3.6%	5%
Plastics, Other inert	39%	32.2%	29%
TOTAL	100%	100%	100%

Sources: ¹ SLWMA (2008). St. Lucia Solid Waste Management Authority (2008). *2008 Waste Characterisation Study*.

² SLSWMA (2003) *Annual report for the Period April 2002 to March 2003*.

³ IPCC (2006). *2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 5: Waste. Chapter 2: Waste Generation, composition and management data*. Table 2.3.

Notes: For 2008 data agriculture crop residues were mapped to wood as crop residues have a more similar DOC than yard waste. Construction and demolition, special care, other, glass, metal and plastic wastes were mapped to plastics and other inert.

For 2003 data residential and commercial waste was assumed to align with the Caribbean defaults in the last column. Green waste was considered to be equal parts wood and garden waste.

The fraction of domestic sewage treated by different wastewater treatment systems is shown in Table 7.3. The methane conversion factor represents the percentage of total potential methane emissions expected for each system and is based on IPCC defaults from the *2006 IPCC Guidelines*.

Table 7.3: Wastewater Treatment Systems for Domestic Wastewater in Saint Lucia

Wastewater Treatment Systems	Fraction of Total Sewage (%)		
	1991	2001	2010
Sea discharge	5.0%	3.5%	3.6%
Septic system	27.3%	41.4%	51.7%
Latrine	44.6%	31.7%	19.0%
Other	11.5%	8.9%	6.2%
Beausejour Stabilisation Pond	7.2%	9.5%	12.0%

Hotel Aerobic treatment plants	4.6%	6.3%	8.8%
	100%	100%	100%

Note: Fraction of wastewater produced by hotels and tourists based on average tourist population compared to total population (approximately 18% of total population in 2010). Fractions of household wastewater treatment systems indicated in Table 1.10 adjusted in Table 1.11 to represent both tourist and household population.

Fraction of sewage to Beausejour estimated based on assumption of reception of 50% of total sewer wastewater in Saint Lucia and 50% of hotel sewage wastewater.

7.3 Greenhouse Gas Emissions

Table 7.4 and Table 7.5 present emissions of CH₄ and N₂O for the waste sector.

Table 7.4: Total Waste CH₄ Emissions (Gg)

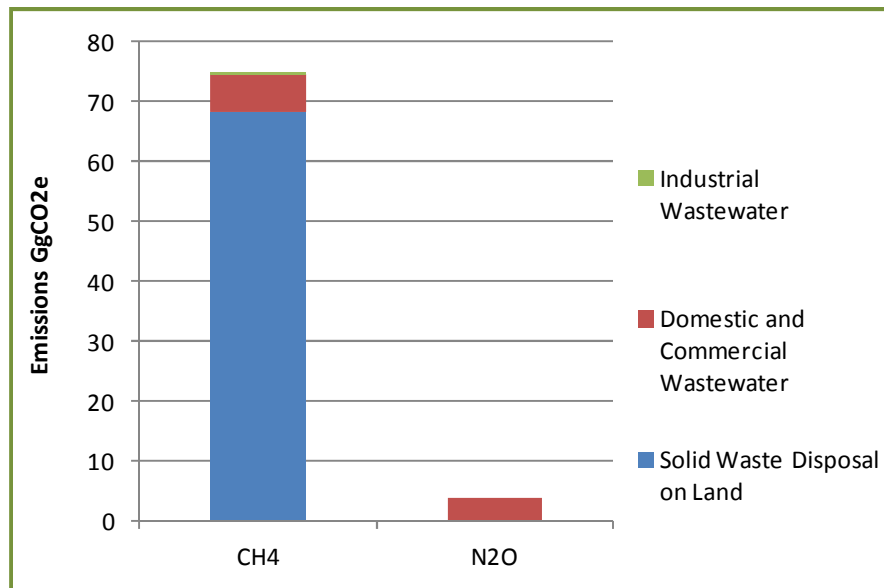
Source	CH ₄ Emissions (Gg)			Change 2000-2010
	2000	2005	2010	
A.2. Solid Waste Disposal on Land	2.909	3.130	3.258	+12%
B.1 Industrial Wastewater	0.007	0.004	0.005	-40%
B.2 Domestic and Commercial Wastewater	0.225	0.257	0.291	+29%
TOTAL WASTE EMISSIONS	3.141	3.391	3.554	+13%

Table 7.5: Total Waste N₂O Emissions (Gg)

Source	N ₂ O Emissions (Gg)			Change 2000-2010
	2000	2005	2010	
B.2 Domestic and Commercial Wastewater	0.0094	0.0104	0.0122	+30%

Methane from solid waste disposal accounts for more than 85% of overall CH₄ emissions. Figure 7.1 identifies the relative importance of CH₄ and N₂O emissions for the different waste sub-sectors in 2010.

Figure 7.1: Waste Sector Greenhouse Gas Emissions in 2010 expressed in CO₂e (Gg)



7.4 Indirect Greenhouse Gas Emissions

Indirect greenhouse gas emissions are not estimated for the waste sector.

8 INVENTORY GAPS, NEEDS AND RECOMMENDATIONS

A number of gaps, needs and constraints were identified during the preparation of the Third National Communication (TNC) inventory. Gaps include not only information on activity data, but also gaps in resources and capacity. There is a strong need for institutional capacity building and training of government staff to do the necessary data collection and analysis to reduce inventory uncertainties and improve the quality of activity data and emission factors used to generate the inventory.

The sub-sections below summarize specific gaps, needs and recommendations associated with activity data collection, capacity building and development of an integrated and sustainable greenhouse gas inventory system.

8.1 Activity Data Collection

Key data gaps that were identified in regards to activity data are outlined in Table 8.1 below and are organized by IPCC Sector. Specific recommendations are also provided that could be followed to address the data gaps. Additional recommendations related to the Key Category and Uncertainty Analysis are provided in Section 10.

Table 8.1: Key Inventory Activity Data Gaps and Recommendations

IPCC Sector	Key Activity Data Gap Identified	Recommendation for Addressing Data Gap
Energy	National energy balances, including imports, exports, consumption and international bunker data for major economic sectors (e.g., residential, commercial, transportation etc) are not consistently available.	While the Latin American Energy Organization (OLADE) recently compiled an energy balance for Saint Lucia for 2010, 2011 and 2012, the overall process would benefit if the MSDEST prepared energy balances annually using sales data from fuel distributors as well as import data. This would allow the ministry to prepare consistent and comparable energy balances annually that could also be used for planning and policy development.
	Estimates of woodfuel and charcoal consumption have very high uncertainty and recent consumer and producer surveys are different by several orders of magnitude.	A comprehensive nation-wide bottom-up survey of producers and a top-down survey of consumers should be conducted to reduce the level of uncertainty associated with the production and demand for woodfuel and charcoal.
Industrial Processes	Information on the HFCs imported annually in bulk and in products is not complete and has a high degree of uncertainty. Bulk imports of HFCs are tracked by MSDEST based on surveys of importers; however, the reliability of data on imports of products containing HFCs (e.g., refrigerators, air conditioners) is low as there is no information gathered that identifies whether a product contains HFC and the type and amount of HFC.	Additional training and support should be provided to customs agents so that there is a reliable tracking system for HFCs. The primary route of entry for HFCs is through products and surveys should be conducted to reliably estimate the number of HFC containing products imported and the charge and type of HFCs in associated air conditioning, refrigeration and aerosol products.

IPCC Sector	Key Activity Data Gap Identified	Recommendation for Addressing Data Gap
Solvent and Product Use	Information on solvents and paints imported was obtained from customs and excise; however, there is limited knowledge in regards to the solvent content of these products. In addition information on other products containing solvents including household products (not including paints) is limited.	A national survey to characterize solvent and product use in Saint Lucia would be very useful to improve the overall quality of the data. However, it is recognized that for the greenhouse gas inventory as a whole this is likely a low priority.
Agriculture	Data on the fraction of different livestock that are managed under different animal waste management systems is lacking and default data was used.	The Ministry of Agriculture should undertake an assessment to accurately determine the fraction of different livestock that are managed under different animal waste management systems.
	The amount of Nitrogen applied through fertilizers was estimated on available data from distributors. The data is of low quality and provides only an average estimate between 2000 and 2009. In addition, the estimated nitrogen does not include some products such as bio-stimulants, foliar fertilizers and some pesticides.	The Ministry of Agriculture should conduct a detailed survey to develop an inventory for the different fertilizers sold to farmers in Saint Lucia, and prepare estimates of the overall nitrogen content.
LULUCF	Changes in land-use were estimated using land-use classifications for the year 2000 and 2009. These classifications are not perfectly aligned as at least one category is not included for both years. Imperfect alignment of the land-use classifications results in greater uncertainty in emission estimates.	<p>The Forestry Department should develop a national land classification system aligned with IPCC Guidance that uses consistent and directly comparable classifications in the future.</p> <p>Continued research and effort is required to link the land-use changes indicated in this report to biomass stocks and changes in carbon pools.</p>
	Biomass stocks in forest reserves were estimated from a recent forest inventory. However, IPCC defaults are used for other land-use classifications.	The Forestry Department could work to improve estimates of the biomass stocks related to different land-use classifications to improve the quality of the LULUCF inventory.
	Estimates of wood removal from forests for woodfuel and charcoal have high uncertainty (see Energy Sector above).	Work on estimates of woodfuel removal and charcoal production identified for the energy sector would greatly enhance the robustness of the removal and emission estimates of the LULUCF sector.
Waste	The total degrade-able organic content of domestic wastewater is based on an IPCC default coefficient that has a high degree of uncertainty.	The Water Resources Management Authority could potentially conduct tests to determine the average degrade-able organic content of wastewater related to different wastewater treatment systems.

8.2 Capacity Building

Capacity building is required at both institutional and personnel levels. Multi-sectoral representation (i.e., Energy, Industrial Processes, Solvent and Product Use, Agriculture, LULUCF and Waste) is critical since expertise is typically embedded within institutions that follow similar sectoral divisions.

Different government departments and organizations integral to information gathering for the different sectors (e.g., MSDEST, Ministry of Agriculture, Department of Forestry) need increased capacity to continue supporting the future development of GHG inventories. One suggested approach is to provide training for stakeholders with specific expertise and mandate required to complete inventories. Sector leads from each of the six major sink/source categories could be identified for the training that would include familiarizing them with inventory methodologies and tools, engaging them in the data collection process and providing them with hands-on experience with inventory data, methods and tools. The ultimate objective of the training should be such that appointed government staff can complete all aspects of inventory work with limited outside consultancy.

It is recommended that at the beginning of the development of future inventories that responsibilities, roles, resources and training for sectoral teams be clearly identified. MSDEST staff, who are ultimately responsible for the preparation of the inventory, would benefit from being exposed to all sector training so as to serve as local assistance to national experts.

8.3 Sustainable Greenhouse Gas Inventory Systems

Developing a sustainable GHG Inventory system should be a key objective for Saint Lucia to address the challenge of more frequent and demanding reporting of inventories to the United Nations Framework Convention on Climate Change (UNFCCC). Frequent, accurate, consistent, complete and transparent reporting for Saint Lucia is crucial for not only meeting international obligations but for the assessment of Nationally Appropriate Mitigation Actions (NAMAs) and for projecting global progress towards targets to stop dangerous climate change warming.

In the context of more frequent reporting of national GHG inventories by non-Annex I Parties, it is imperative that the preparation process shift from a project-based approach to a more internalized and institutionalized approach (UNFCCC, 2012). This shift would support the timely delivery of the required information and more efficient use of available resources by Parties. Experience in Saint Lucia has demonstrated that because the development of greenhouse gas inventories has been conducted on an ad-hoc basis with the use of consultants there has been a “memory loss” between the preparation of the INC, SNC and TNC, and insufficient capacity developed within internal structures.

Key components of a sustainable GHG have been identified by IPCC and UNFCCC guidelines and are indicated below:

- Institutional Arrangements;
- Methods and Data Documentation;
- QA/QC Procedures;
- Archiving;
- Key Category Analysis; and,
- Inventory improvement planning.

A brief description of each of these components follows; however, any system must be tailored to account for national circumstances and constraints. Further details of these components are available from the United States Environmental Protection Agency's (US EPA's) approach to building sustainable national GHG inventory management systems using pre-defined [National System Templates](#).

8.3.1 Institutional Arrangements

Institutional Arrangements identify how different organizations can work together for collective action. These arrangements can either be formal or informal and include provisions that define roles and responsibilities of all the organizations that are involved in the inventory preparation process including key stakeholders.

Clearly defining institutional arrangements can help inventory teams assess and document the strengths and weaknesses of existing arrangements to ensure continuity and integrity of the inventory, promote institutionalization of the inventory process, and facilitate prioritization of future improvements. Memoranda of Understanding can be executed between the lead institution and lead sector institutions that clearly outlines expected deliverables and responsibilities and ensures that there is a mandate for ongoing contributions to the preparations of national inventories.

A sustainable GHG inventory system is best served by a strong lead institution that has a sound and capable expert team to develop inventories without extensive support from external consultants.

8.3.2 Methods and Data Documentation

Documenting the choice of methodologies and the activity data and emission factors used to prepare estimates of greenhouse gas emissions and removals is critical to the transparency of the inventory. Identifying documentation procedures can assist inventory teams in reporting the origin of methodologies, activity datasets, and emission factors used to estimate emissions or removals. Future inventory teams can then refer to the documentation to determine what information was collected, how the data were obtained, and what methods were used, as well as to reproduce estimates.

In addition to this inventory report, individual sector level inventory reports have been prepared to clearly document all methods and data for easy future reference.

8.3.3 QA/QC Procedures

Quality assurance (QA) is a planned system of review procedures. It is performed by personnel not directly involved in the inventory compilation and development process. Quality control (QC) is a system of routine technical activities to assess and maintain the quality of the inventory as it is being compiled. It is performed by the personnel compiling the inventory. Identifying QA/QC procedures can help to establish a cost-effective QA/QC program that improves transparency, consistency, comparability, completeness, and confidence in national GHG inventories.

8.3.4 Archiving

Archives refer to a collection of records in a given location that have been created during the development of the inventory (references, methodological choice, expert comments, revisions, etc.). An archive system

helps to make a national inventory transparent, allows estimates to be easily reproduced and facilitates development of subsequent inventories by future inventory team members.

A position of archiving officer within the lead institution should be considered to undertake this task.

8.3.5 Key Category Analysis

Key category analysis (KCA) has been conducted for this inventory and is presented in Section 9. The KCA identifies the sources and/or sinks that have the greatest contribution to national emissions, and thus should be the focus of improvement efforts. Resources should be allocated to prioritize the necessary data collection and development of country specific emission factors.

8.3.6 Inventory Improvement Plan

The concept of continual improvement is useful in developing inventories with the objective of increasing the transparency, consistency, comparability, completeness and accuracy of inventories over time. Inventory improvement planning is the process of developing priorities for future capacity-building projects based on the needs identified for each of the key components of sustainable GHG inventories (i.e., institutional arrangements, methods and data documentation, QA/QC procedures, archiving and Key Category Analysis).

9 KEY CATEGORY ANALYSIS

Key category analysis was performed for the 2010 inventory results. Two emission sources accounted for more than half of greenhouse gas emissions on a carbon dioxide equivalent (CO₂e) basis. The two most important emission sources were both related to the Energy Sector. CO₂ emissions related to electricity generation and road transportation accounted for 38.8% and 30.5% of overall emissions respectively (excluding LULUCF). The third largest emission source was related to methane emissions from solid waste disposal sites that contributed 10.6% of overall emissions. In total eight IPCC source categories listed in Table comprised 95% of greenhouse gas emissions when the LULUCF Sector was excluded. Table 9.1 lists these key IPCC source categories from highest to lowest in the level of emissions.

Table 9.1: Key Source Category Analysis (Excluding LULUCF)

IPCC Source Category	Sector	Source Categories to be Assessed in Key Source Category Analysis ¹	Applicable Greenhouse Gas	Emission Estimate (current year, non-LULUCF) (Gg CO ₂ eq)	Level Assessment excl. LULUCF (%)	Cumulative level excl. LULUCF (%)
Sum	Sum	Sum		646.9		
1.A.1	Energy	CO ₂ Emissions from Stationary Combustion (Liquid-A)	CO ₂	251.3	38.8%	38.8%
1.A.3	Energy	CO ₂ Mobile Combustion: Road Vehicles	CO ₂	197.1	30.5%	69.3%
6.A	Waste	CH ₄ Emissions from Solid Waste Disposal Sites	CH ₄	68.4	10.6%	79.9%
2.F	Industrial Processes	HFC Emissions from Substitutes for Ozone Depleting Substances (ODS Substitutes)	HFCs	37.0	5.7%	85.6%
4.D	Agriculture	N ₂ O (Direct and Indirect) Emissions from Agricultural Soils	N ₂ O	21.3	3.3%	88.9%
1.A.4	Energy	Other Sectors: Residential	CO ₂	20.2	3.1%	92.0%
1.A.2	Energy	CO ₂ Emissions from Manufacturing Industries and Construction	CO ₂	6.9	1.1%	94.2%
4.A	Agriculture	CH ₄ Emissions from Enteric Fermentation in Domestic Livestock	CH ₄	6.9	1.1%	95.1%

Including LULUCF emissions and removals, the fourth most important source category is, CO₂ emissions from land converted to Forest Land from the LULUCF Sector. This source contributed 7.0% overall to the level assessment that includes both emissions and removals, demonstrating that LULUCF is an important net sink in Saint Lucia. In total the LULUCF sector is estimated to contribute to a removal of 122 GgCO₂ reducing overall emissions from other IPCC sectors from 647 GgCO₂e to 524 GgCO₂e. Twelve IPCC source categories listed in Table 9.2 accounted for more than 95% of greenhouse gas emissions. Key IPCC source categories are listed highest to lowest in the level of emission or removals.

Table 9.2: Key Source Analysis (Including LULUCF)

IPCC Source Category	Sector	Source Categories to be Assessed in Key Source Category Analysis ¹	Applicable Greenhouse Gas	Total absolute estimate incl. LULUCF (current year) (Gg CO ₂ eq)	Level Assessment incl. LULUCF (%)	Cumulative level incl LULUCF (%)
Sum	Sum	Sum		524.0		
1.A.1	Energy	CO ₂ Emissions from Stationary Combustion (Liquid-A)	CO ₂	251.3	31.5%	31.5%
1.A.3	Energy	CO ₂ Mobile Combustion: Road Vehicles	CO ₂	197.1	24.7%	56.3%
6.A	Waste	CH ₄ Emissions from Solid Waste Disposal Sites	CH ₄	68.4	8.6%	64.9%
5.A	LULUCF	1. Forest Land Remaining Forest Land	CO ₂	-54.4	6.8%	71.7%
5.A	LULUCF	2. Land Converted to Forest Land	CO ₂	-43.6	5.5%	77.2%
5.A	LULUCF	1. Cropland Remaining Cropland	CO ₂	-37.8	4.7%	81.9%
2.F	Industrial Processes	HFC Emissions from Substitutes for Ozone Depleting Substances (ODS Substitutes)	HFCs	37.0	4.6%	86.5%
4.D	Agriculture	N ₂ O (Direct and Indirect) Emissions from Agricultural Soils	N ₂ O	21.3	2.7%	89.2%
1.A.4	Energy	Other Sectors: Residential CO ₂	CO ₂	20.2	2.5%	91.7%
5.E	LULUCF	2. Land Converted to Other Land	CO ₂	13.6	1.7%	93.4%
1.A.2	Energy	CO ₂ Emissions from Manufacturing Industries and Construction	CO ₂	6.9	0.9%	94.3%
4.A	Agriculture	CH ₄ Emissions from Enteric Fermentation in Domestic Livestock	CH ₄	6.9	0.9%	95.2%

Based on the key category analysis as well as the uncertainty analysis it is possible to prioritize efforts to improve the inventory and identify specific recommendations. These recommendations are provided in the following Uncertainty Analysis Chapter.

10 UNCERTAINTY ANALYSIS

Estimates of emissions and removals of greenhouse gases presented in this inventory have uncertainty due to several causes. These uncertainties include the lack of precision of activity data and incomplete knowledge of the processes that cause emissions or removals of greenhouse gases. The *2000 Good Practice Guidance* recognizes that the uncertainty of estimates cannot be completely eliminated and that the main objective should be to produce accurate estimates, i.e., estimates that are neither underestimated nor overestimated, while at the same time, whenever possible seeking to improve estimate precision.

In accordance with the recommendations, an attempt was made in the inventory to ensure that estimates of greenhouse gas emissions and removals were not biased. Estimate precision varied depending on each sector's available data as well as resources that could be invested for determining emission factors that suited circumstances in Saint Lucia. Where emissions and removals were identified in the Key Category Analysis as the most important overall, emphasis was given where possible to ensuring that the best activity data and emission factors available were used.

The overall Inventory uncertainty is the result of the uncertainty associated with all activity and emission factor data and other parameters used in the estimates. For most sectors, it was not possible to conduct a detailed uncertainty analysis, since that would demand a considerable effort in analyzing the accuracy and precision of basic information used. Nevertheless, a general evaluation of Inventory precision was conducted based on the judgment and knowledge of inventory specialists. The objective was to identify sources of emissions and removals where additional resources could be used in the future to reduce the level of overall uncertainty. The precision associated with activity data and emission factors, as well as emission or removal estimates, is expressed as \pm a given percentage based on a 95% confidence interval limit.

Table 10.1 details the results of the analysis of uncertainty for emission and removal estimates. More detailed descriptions of uncertainties are provided in the *sectoral level inventory reports*.

The highest uncertainty of emission estimates when considering both uncertainty with activity data and emissions factors is related to the estimates of CO₂ from forest land remaining forest land in the LULUCF sector. The combined uncertainty as a percentage of total national emissions in 2010 is 7.4%. The next highest source is related to the estimates of CH₄ from solid waste disposal on land in the Waste Sector. The combined uncertainty as a percentage of total national emissions in 2010 for this source is 4.3%.

Table 10.1: Tier 1 Uncertainty Calculations and Reporting

IPCC Source Category	Gas	Year t emissions 2010 Gg CO ₂ equivalent	Activity data uncertainty %	Emission factor uncertainty %	Combined Uncertainty %	Combined uncertainty as % of total national emissions in year 2010 %
1.A.1 Energy Industries Fuel Combustion	CO ₂	251	5	5	7.1	2.23
	CH ₄	0.27	55	50	74.3	0.02
	N ₂ O	0.66	55	100	114.1	0.09
1.A. 2 Manufacturing Fuel Combustion	CO ₂	6.90	10	5	11.2	0.10
	CH ₄	0.00	10	50	51.0	0.00
	N ₂ O	0.02	10	100	100.5	0.00
1.A.3 Transport fuel combustion	CO ₂	200.76	10	5	11.2	2.82
	CH ₄	0.90	10	50	51.0	0.06
	N ₂ O	0.53	10	100	100.5	0.07
1.A.4 Other Sectors Fuel Combustion	CO ₂	30.46	10	5	11.2	0.43
	CH ₄	1.31	55	50	74.3	0.12
	N ₂ O	0.32	55	100	114.1	0.05
2.F Consumption of Halocarbons	HFC	37	50	0	50.0	2.32
3.C N ₂ O Emissions from Product Use	N ₂ O	2	20	0	20.0	0.05
4.A Enteric Fermentation	CH ₄	7	10	30	31.6	0.27
4.B Manure Management	CH ₄	4	10	20	22.4	0.11
	N ₂ O	4	10	50	51.0	0.26
4.D Agricultural Soils	N ₂ O	21	10	50	51.0	1.36
5.A.1 Forest Land Remaining Forest Land	CO ₂	54	104	30	108.4	7.40
5.A.2 Land Converted to Forest Land	CH ₄	44	67	30	73.1	4.00
5.A.1 Cropland Remaining Cropland	N ₂ O	38	67	30	73.1	3.47
5.D.1 Cropland Remaining Cropland	CO ₂	0	104	30	108.4	0.00
5.A.1 Settlements Remaining Settlements	CO ₂	1	67	30	73.1	0.06
5.E.2 Land Converted to Other Land	CO ₂	14	29	30	41.8	0.71
6.A Solid Waste Disposal on Land	CH ₄	68	5	50	50.2	4.31
6.B.2 Domestic and Commercial Wastewater	CH ₄	6	25	39	46.3	0.36
6.B.2 Domestic and Commercial Wastewater	N ₂ O	4	25	39	46.3	0.22
	TOTAL	796.9				

Note: Highlighted values indicate sources of emissions or removals that contribute more than 2% to the combined uncertainty of total national emissions.

The results in Table 10.1 suggest that efforts to reduce the overall uncertainty of Saint Lucia's greenhouse gas inventory could be focused on only a few emission sources. A total of seven source categories contributed to a combined uncertainty that is above 2% as a percentage of total national emissions in 2010. The following recommendations are made to reduce uncertainties associated with these six source categories which would greatly reduce the overall uncertainty of the inventory. The source categories appear in the list in the order of greatest contribution of uncertainty to the total national emissions which is provided in brackets.

1. **Forest Land Remaining Forest Land (7.4%).** The primary activity required is to improve the overall understanding of carbon stocks and land-use changes in forests. The representation of consistent forest lands in the inventory should be improved. In additions careful monitoring through the examination of regular and consistent geo-spatial data should be conducted to improve estimates of forest land-use changes. It is essential that data be collected to link land-use changes from the available GIS data to above ground biomass stocks, biomass growth and biomass removals. As part of this effort detailed surveys should be undertaken to ascertain the amount of biomass (fuelwood, wood for charcoal, commercial harvesting) that is removed from forests and their geographic distribution. This would also reduce the uncertainty of CH₄ and N₂O emissions (see fourth recommendation).
2. **Solid Waste Disposal on Land (4.3%).** Uncertainty in estimates of methane emissions from solid waste disposal at managed sites is driven almost entirely by uncertainty related to emission factors and not by activity data which is accurate and reliable. Estimates related to solid waste are already based on a Tier 2 method, a First Order Decay model that produces a time-dependent emission profile that better reflects the true pattern of degradation of organic material over time. However, this Tier 2 method relies almost entirely on regional IPCC default values for key parameters and country-specific conditions, with the exception of waste characterization, are not considered. Country specific values for the following parameters could be determined through measurement or other projection models that would greatly reduce the uncertainty of methane emission estimates:
 - a. **Fraction of DOC dissimilated,** fraction of carbon that is ultimately degraded and released from organic carbon.
 - b. **Degradable Organic Carbon.** Is the fraction of organic carbon that is degradable or accessible to biochemical decomposition. It can be obtained by performing waste generation studies and sampling of wastes.
 - c. **Fraction of Methane in landfill gas.** Assumed to be 0.5 but can vary between 0.4 and 0.6 depending on waste composition.
 - d. **Oxidation Factor.** The amount of methane that is oxidised in the soil or material covering of waste. Assumed to be zero but could be as high as 10%.
3. **Land Converted to Forest Land (4.0%).** The same recommendations identified above for Forest Land Remaining Forest Land apply.
4. **Carbon emissions from Cropland remaining as Cropland (3.5%).** The primary activity required is to improve the overall understanding of carbon stocks and land-use changes for Croplands. The representation of consistent croplands in the inventory should be improved. Current categories are Intensive Farming, Mixed Farming and Densely Vegetated Farming. It is essential that data be collected to link these land-uses to above ground biomass stocks, biomass growth and biomass removals.

5. ***Transport fuel combustion (2.8%).*** Roughly a quarter of total national emissions can be attributed to transport emissions. Although the uncertainty related to these emissions is low, estimated at approximately 11%, there overall combined contribution to uncertainty is still important. National energy balances should be developed annually that look at both import data and sales data from fuel suppliers to determine the point of sale of different transport fuels, so that consumption is accurately estimated. In addition work could be conducted to determine estimates of the jet kerosene and aviation gasoline consumption that is associated with domestic flights.
6. ***Consumption of Halocarbons (2.3%).*** Uncertainty in the amount of HFCs released annually in Saint Lucia is driven by uncertainty related to activity data. A Tier 1 method is used to estimate emissions assuming that imports are equal to releases in any given year. A Tier 2 method could be employed that considers leakage rates of HFCs from products; however, uncertainty could be reduced more cost effectively by improving estimates of how much HFC and what species of HFC are imported in bulk and through products. Additional training and support could be provided to customs agents so that there is a reliable tracking system for HFCs. It is important that on entry the species and quantity of HFC is properly identified. Surveys should also be conducted to reliably estimate the number of HFC containing products imported and the charge and type of HFCs in associated air conditioning, refrigeration and aerosol products.
7. ***Energy industries fuel combustion (2.2%).*** Roughly a third of total national emissions can be attributed to diesel requirements for electricity generation. Although the uncertainty related to these emissions is low, estimated at approximately 7%, there overall combined contribution to uncertainty is still important. It is recommended that LUCELEC be required to annually report the following parameters (if they are not already required to do so) that could help to reduce the level of uncertainty of estimates:
 - a. Amount of imported fuel annually;
 - b. Amount of fuel consumed annually;
 - c. Test results that determine the carbon content of the fuel (grams of carbon/KJ);
 - d. Test results that determine the sulfur content of the fuel.

11 IMPROVEMENTS BETWEEN SNC AND TNC

A number of improvements have been made to the inventory since the work on the Second National Communication. These improvements were made in an effort to reduce the overall uncertainty of emission estimates. New sources of emissions have been added, higher tier methodologies have been used and new activity data that improves emission estimates has been collected. The improvements impact all the six major IPCC categories (Energy, Industrial Processes, Solvent and Other Product Use, Agriculture, Land-Use Change & Forestry and Waste). Some of the changes resulted in substantial difference in overall emissions and removal estimates. Improvements are summarized in Table 11.1.

Table 11.1: Improvements between SNC and TNC

IPCC Sector	Improvements
Energy	<ul style="list-style-type: none"> Inclusion of emissions from crude oil storage
Industrial Processes	<ul style="list-style-type: none"> Improvement in estimate of HFC emissions based on survey data from importers and estimate of HCFs imported in products
Solvent and Product Use	<ul style="list-style-type: none"> Update and improved estimates of per capita NMVOC emissions for household product use
Agriculture	<ul style="list-style-type: none"> Improvements in estimates of livestock populations
LULUCF	<ul style="list-style-type: none"> Use of the 2003 GPG on LULUCF spreadsheets and guidance
Waste	<ul style="list-style-type: none"> Use of a Tier 2 method First Order Decay Model (2006 IPCC Guidelines) to estimate methane emissions from solid waste disposal sites Use of more detailed activity data on domestic wastewater treatment systems
General	<ul style="list-style-type: none"> Uncertainty Analysis Individual sector inventory reports that document all methods, activity data and emissions factors used in the generation of estimates of emissions and removals. Archive of all data, reports and software

Emission estimates in the SNC for the year 2000 were reported as 555 GgCO₂e/yr excluding the LULUCF sector. In the TNC year 2000 estimates excluding LULUCF are estimated at 494 GgCO₂e/yr, a decrease of 12% in overall emissions or 61 GgCO₂e. Almost all of the difference can be attributed to changes in the modeling of one source category - methane emissions from solid waste disposal sites. In the TNC a Tier 2 method First Order Decay Model is employed to estimate these emissions. This model estimates emissions overtime using a time-dependent emission profile that better reflects the true pattern of the degradation process, as opposed to the default method used in the SNC that assumes all potential CH₄ is released in the year the waste is disposed. In addition, improved regional emission factors and coefficients were employed that better reflected the de-gradeable organic content of the wastes. The revised estimates of emissions for methane emissions from solid waste in the year 2000 were nearly 60% lower than those reported in the TNC.

12 SUMMARY OF GREENHOUSE GAS EMISSIONS AND REMOVALS

An overall summary of greenhouse gas emissions for Saint Lucia between 2000 and 2010 is provided in this section. Greenhouse gas emissions are expressed as CO₂e (Carbon Dioxide Equivalent) by IPCC sectors. The carbon dioxide equivalent is calculated using the 100 year global warming potentials for specific gases that are identified for use with the *Revised 1996 IPCC Guidelines*. Table 12.1 summarizes the global warming potentials that were used.

Table 12.1: Global Warming Potentials of Greenhouse Gases identified in Saint Lucia

Gas	100 year GWP
Carbon Dioxide (CO ₂)	1
Methane (CH ₄)	21
Nitrous Oxide (N ₂ O)	310
HFC 134A	1,300
HFC 404A	3,260
HFC 410a	1,725

Note: Since the publication of the revised 1996 IPCC report, new global warming potentials have been estimated based on improved research; however, national inventories reported to the UNFCCC are currently still prepared using the GWP indicated above.

Overall greenhouse gas emissions in Saint Lucia have increased at a rate that is very similar to overall economic growth over the same time period. Average annual growth in emissions excluding LULUCF was 2.7% per year and including LULUCF it was 3.5% per year. Average economic growth for Saint Lucia over the same time period was estimated at 2.5% (WorldBank, 2014).

Total CO₂e emissions for the year 2010 are estimated to be 647 Gigagrams (Gg) without the contribution of the LULUCF Sector, an increase from the year 2000 of 152 Gg or 31%. Emission growth is primarily driven by the growth in energy emissions related to increased demand for fossil fuels. Emissions in the energy sector increased on average by 3.1% annually between 2000 and 2010. Emissions from the waste sector that are dominated by the solid waste disposal source category are also growing but at a slower rate of 1.1% annually. Industrial Processes and Agriculture emission remain virtually unchanged since the year 2000. The LULUCF sector acts as a large carbon sink leading to total CO₂e removals of 122 GgCO₂e annually over the time period. Accounting for this LULUCF sector decreases overall CO₂e emission to 524 Gg in 2010 and 371 Gg in 2000.

On a per capita basis greenhouse gas emissions in Saint Lucia including the LULUCF Sector have increased by 33% from 2.4 tCO₂e/capita in 2000 to 3.2 tCO₂e/capita in 2010.

The figures present the emissions of each IPCC Category as stacked wedges to show their relative and total contribution.

Figure 12.3 and Figure 12.4 indicates the relative contribution of the four main greenhouse gases (i.e., CO₂, CH₄, N₂O and HFCs) to total emissions for each of the inventory years 1995, 2000, 2005 and 2010.

Figure 12.1: Total Greenhouse Gas Emissions expressed in CO₂e Excluding LULUCF (Gg)

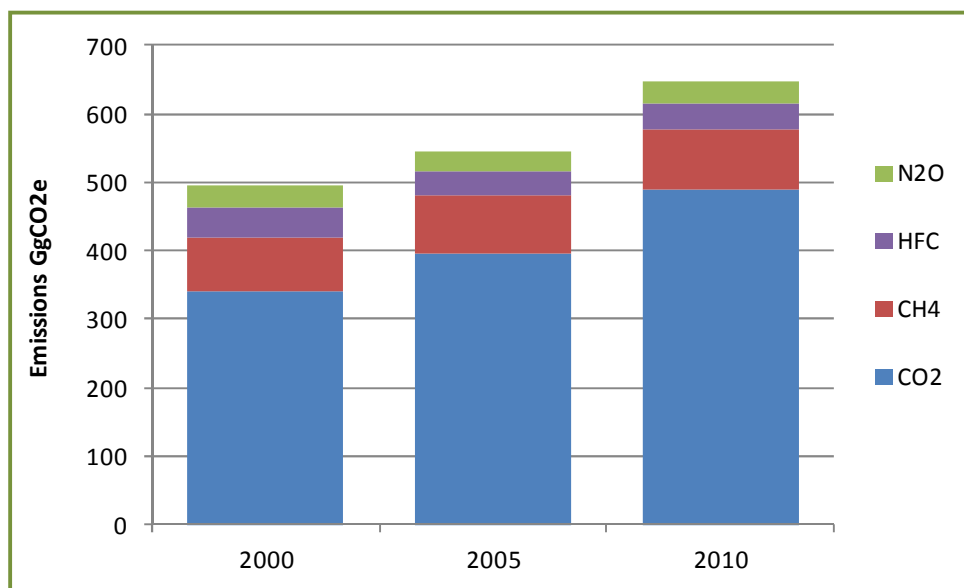
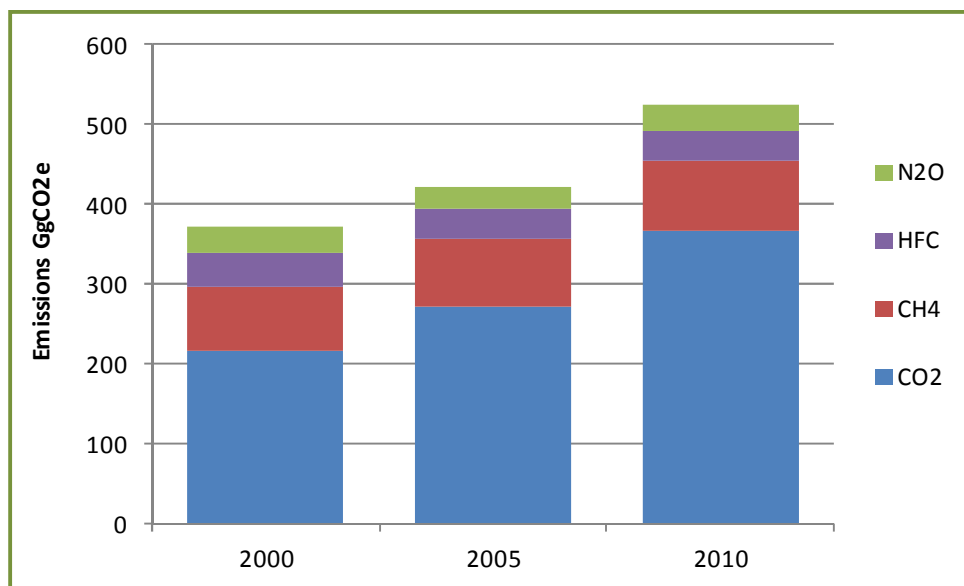


Figure 12.2: Total Greenhouse Gas Emissions expressed in CO₂e Including LULUCF (Gg)



Trends in total CO₂e emissions for each IPCC category for the complete time series 2000 to 2010 is shown in Figure 12.3 excluding the LULUCF sector. Figure 12.4 identifies the emissions profile with the LULUCF sector contributing as a net sink. The figures present the emissions of each IPCC Category as stacked wedges to show their relative and total contribution.

Figure 12.3: Greenhouse Gas Emissions in GgCO₂e excluding LULUCF (2000-2010)

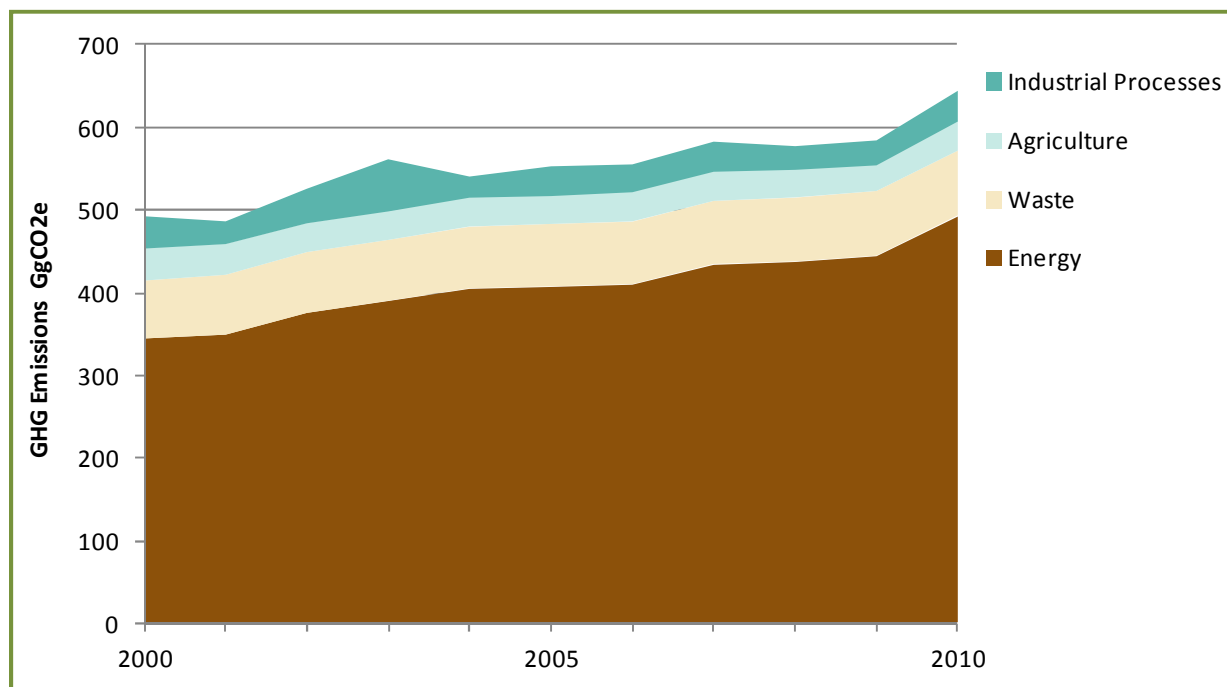
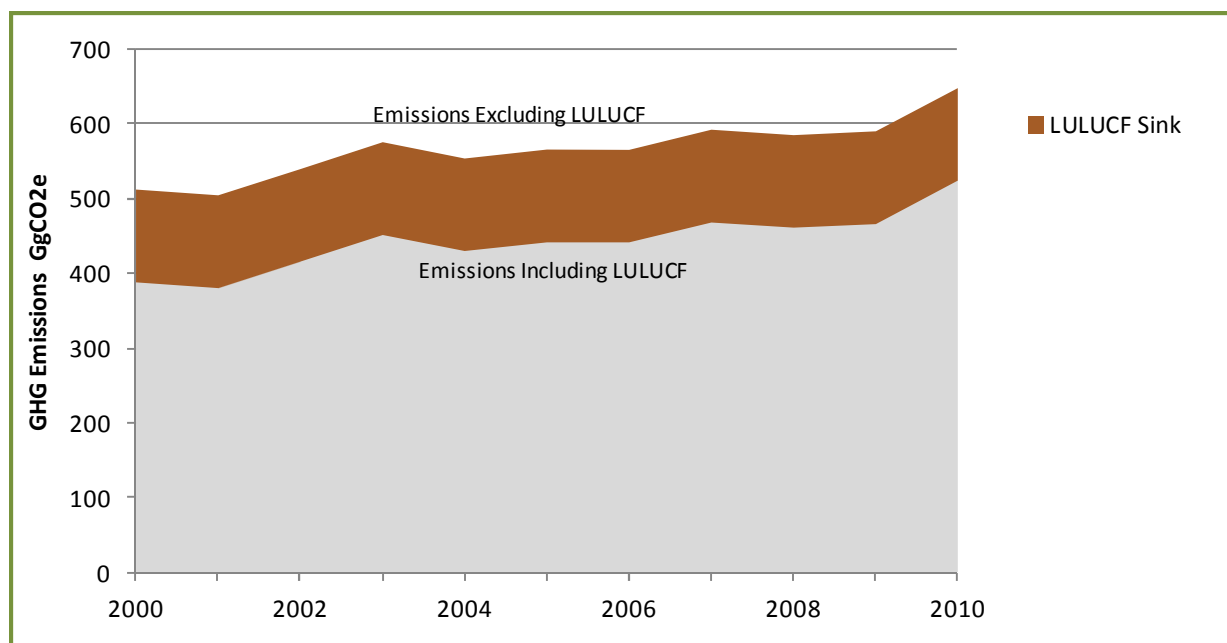


Figure 12.4: Greenhouse Gas Emissions in MtCO₂e including LULUCF (2000-2010)



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Country	Saint Lucia
Inventory Year	2010
Title of Inventory	Third National Communication Greenhouse Gas Inventory for Saint Lucia
Contact Name	Seton Stiebert
Title	Principal
Organisation	Stiebert Consulting
Address	Ministry of Sustainable Development, Energy, Science and Technology (MSDEST)
	Norman Francis Building, Balata, Castries
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Fax	
E-Mail	seton@stiebertconsulting.com
Is uncertainty addressed?	yes
Related documents filed with UNFCCC	

Country	Saint Lucia
Inventory Year	2010

TABLE 1 SECTORAL REPORT FOR ENERGY
(Sheet 1 of 3)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES							
(Gg)							
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂	CH ₄	N ₂ O	NO _x	CO	NMVOC	SO ₂
Total Energy	489.430	0.118	0.0049	2.700	17.365	3.408	0.189
A Fuel Combustion Activities (Sectoral Approach)	489.430	0.118	0.0049	2.700	17.365	3.199	0.189
1 Energy Industries	251.305	0.0127	0.0021	0.687	0.070	0.018	0.080
a Public Electricity and Heat Production							
b Petroleum Refining							
c Manufacture of Solid Fuels and Other Energy Industries							
2 Manufacturing Industries and Construction	6.903	0.00017	0.000049	0.0163	0.0010	0.00041	0.0019
a Iron and Steel							
b Non-Ferrous Metals							
c Chemicals							
d Pulp, Paper and Print							
e Food Processing, Beverages and Tobacco							
f Other (please specify)							

Country	Saint Lucia
Inventory Year	2010

TABLE 1 SECTORAL REPORT FOR ENERGY
(Sheet 2 of 3)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES							
(Gg)							
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂	CH ₄	N ₂ O	NO _x	CO	NM VOC	SO ₂
3 Transport	200.7614	0.0430	0.0017	1.9301	16.2873	3.0655	0.0643
a Civil Aviation	0.0313	0.000000	0.000000	0.0000	0.0000	0.0000	
b Road Transportation	197.1285	0.0428	0.00168	1.8562	16.2380	3.0556	
c Railways	0.0000	0.0000	0.00000	0.0000	0.0000	0.0000	
d Navigation	3.6016	0.00025	0.000030	0.0740	0.0493	0.0099	
e Other (please specify)	0.0000						
Pipeline Transport	0.0000						
4 Other Sectors	30.4608	0.0626	0.00104	0.0665	1.0067	0.1155	0.0429
a Commercial/Institutional	4.6452	0.00074	0.000044	0.0074	0.0015	0.0004	
b Residential	20.2081	0.0611	0.00095	0.0515	1.0037	0.1148	0.0412
c Agriculture/Forestry/Fishing	5.6075	0.00076	0.00005	0.0076	0.0015	0.0004	0.0018
5 Other (please specify)	0.0000	0.0000	0.00000	0.0000	0.0000	0.0000	0.0000
B Fugitive Emissions from Fuels	0.0000	0.0000	0.00000	0.0000	0.0000	0.2088	0.0000
1 Solid Fuels	0.0000	0.0000	0.00000	0.0000	0.0000	0.0000	0.0000
a Coal Mining		0.0000					
b Solid Fuel Transformation							
c Other (please specify)							
2 Oil and Natural Gas	0.0000	0.0000	0.0000	0.0000	0.0000	0.2088	0.0000
a Oil		0.0000		0.0000	0.0000	0.2088	0.0000
b Natural Gas		0.0000					
c Venting and Flaring		0.0000					

Country	Saint Lucia
Inventory Year	2010

TABLE 1 SECTORAL REPORT FOR ENERGY
(Sheet 3 of 3)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES							
(Gg)							
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂	CH ₄	N ₂ O	NO _x	CO	NMVOC	SO ₂
Memo Items (1)							
International Bunkers	107.9985	0.00098	0.00092	0.5168	0.1967	0.0837	0.0000
Aviation	104.4120	0.00074	0.00089	0.4435	0.1478	0.0739	0.0000
Marine	3.5865	0.00024	0.00003	0.0734	0.0489	0.0098	0.0000
CO₂ Emissions from Biomass	23.0348						

(1) Please do not include in energy totals.

Country	Saint Lucia
Inventory Year	2010

TABLE 2 SECTORAL REPORT FOR INDUSTRIAL PROCESSES
(Sheet 1 of 2)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES													
(Gg)													
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂	CH ₄	N ₂ O	NO _x	CO	NMVOC	SO ₂	HFCs		PFCs		SF ₆	
								P	A	P	A	P	A
Total Industrial Processes	0.0000	0.0000	0.0000	0.0000	0.0000	1,016.1984	0.0000	0.0226	0.0000	0.0000	0.0000	0.0000	0.0000
A Mineral Products	0.0000	0.0000	0.0000	0.0000	0.0000	1,015.9898	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1 Cement Production	0.0000						0.0000						
2 Lime Production	0.0000												
3 Limestone and Dolomite Use	0.0000												
4 Soda Ash Production and Use	0.0000												
5 Asphalt Roofing					0.0000	0.0000							
6 Road Paving with Asphalt						1,015.9898							
7 Other (please specify)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Glass Production						0.0000							
Concrete Pumice Stone							0.0000						
B Chemical Industry	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1 Ammonia Production	0.0000				0.0000	0.0000	0.0000						
2 Nitric Acid Production			0.0000	0.0000									
3 Adipic Acid Production			0.0000	0.0000	0.0000	0.0000							
4 Carbide Production	0.0000	0.0000											
5 Other (please specify)		0.0000		0.0000	0.0000	0.0000	0.0000						
C Metal Production	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1 Iron and Steel Production	0.0000			0.0000	0.0000	0.0000	0.0000						
2 Ferroalloys Production	0.0000												
3 Aluminium Production	0.0000			0.0000	0.0000		0.0000				0.0000		
4 SF ₆ Used in Aluminium and Magnesium Foundries													0.0000
5 Other (please specify)	0												

P = Potential emissions based on Tier 1 Approach. A = Actual emissions based on Tier 2 Approach. This only applies in sectors where methods exist for both tiers.

Country	Saint Lucia
Inventory Year	2010

TABLE 2 SECTORAL REPORT FOR INDUSTRIAL PROCESSES
(Sheet 2 of 2)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES													
(Gg)													
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂	CH ₄	N ₂ O	NO _x	CO	NMVOC	SO ₂	HFCs		PFCs		SF ₆	
								P	A	P	A	P	A
D Other Production	0.0000	0.0000	0.0000	0.0000	0.0000	0.2086	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1 Pulp and Paper				0.0000	0.0000	0.0000	0.0000						
2 Food and Drink						0.2086							
E Production of Halocarbons and Sulphur Hexafluoride	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1 By-product Emissions									0.0000		0.0000		
2 Fugitive Emissions									0.0000		0.0000		
3 Other (please specify)													
F Consumption of Halocarbons and Sulphur Hexafluoride	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0226	0.0000	0.0000	0.0000	0.0000	0.0000
1 Refrigeration and Air Conditioning Equipment									0.0000		0.0000		
2 Foam Blowing									0.0000		0.0000		
3 Fire Extinguishers									0.0000		0.0000		0.0000
4 Aerosols									0.0000		0.0000		
5 Solvents									0.0000		0.0000		
6 Other (please specify)									0.0000		0.0000		0.0000
G Other (please specify)													

P = Potential emissions based on Tier 1 Approach. A= Actual emissions based on Tier 2 Approach. This only applies in sectors where methods exist for both tiers.

Country	Saint Lucia
Inventory Year	2010

TABLE 3 SECTORAL REPORT FOR SOLVENT AND OTHER PRODUCT USE
(Sheet 1 of 1)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)			
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂	N ₂ O	NM VOC
Total Solvent and Other Product Use	0.0000	0.0068	0.3440
A Paint Application			0.223
B Degreasing and Dry Cleaning			
C Chemical Products, Manufacture and Processing		0.0068	
D Other (household use)			0.121

Please account for the quantity of carbon released in the form of NMVOC in both the NMVOC and the CO₂ columns.

Note: The Revised 1996 IPCC Guidelines do not provide methodologies for the calculation of emissions of N₂O from solvent and other product use. If you have reported such data, you should provide additional information (activity data and emission factors) used to make these estimates.

Country	Saint Lucia
Inventory Year	2010

TABLE 4 SECTORAL REPORT FOR AGRICULTURE
(Sheet 1 of 2)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)					
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH ₄	N ₂ O	NO _x	CO	NMVOC
Total Agriculture	0.5075	0.0815	0.0000	0.0000	0.0000
A Enteric Fermentation	0.3268				
1 Cattle	0.2574				
2 Buffalo	0.0000				
3 Sheep	0.0239				
4 Goats	0.0328				
5 Camels and Llamas	0.0000				
6 Horses	0.0000				
7 Mules and Asses	0.0000				
8 Swine	0.0127				
9 Poultry	0.0000				
10 Other (please specify)					
B Manure Management	0.1807	0.0130			
1 Cattle	0.0049				
2 Buffalo	0.0000				
3 Sheep	0.0010				
4 Goats	0.0014				
5 Camels and Llamas	0.0000				
6 Horses	0.0000				
7 Mules and Asses	0.0000				
8 Swine	0.1651				
9 Poultry	0.0083				

Country	Saint Lucia
Inventory Year	2010

TABLE 4 SECTORAL REPORT FOR AGRICULTURE
(Sheet 2 of 2)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)					
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CH ₄	N ₂ O	NO _x	CO	NMVOC
B Manure Management (cont...)					
10 Anaerobic		0.0000			
11 Liquid Systems		0.0002			
12 Solid Storage and Dry Lot		0.0128			
13 Other (please specify)		0.0000			
C Rice Cultivation	0.0000				
1 Irrigated	0.0000				
2 Rainfed	0.0000				
3 Deep Water	0.0000				
4 Other (please specify)					
D Agricultural Soils		0.0686			
E Prescribed Burning of Savannas	0.0000	0.0000	0.0000	0.0000	
F Field Burning of Agricultural Residues ⁽¹⁾	0.0000	0.0000	0.0000	0.0000	
1 Cereals					
2 Pulse					
3 Tuber and Root					
4 Sugar Cane					
5 Other (please specify)					
G Other (please specify)					

Note: The Revised IPCC 1996 Guidelines do not provide methodologies for the calculation of CH₄ emissions, and CH₄ and N₂O removals from agricultural soils, or CO₂ emissions from savanna burning or agricultural residues burning. If you have reported such data, you should provide additional information (activity data and emissions factors) used to make these estimates

(1) Sub-items of F should be linked to Worksheet 4-4 sheets 1 and 2.

Country	Saint Lucia
Inventory Year	2010

TABLE 5 SECTORAL REPORT FOR LAND-USE CHANGE AND FORESTRY
(Sheet 1 of 1)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES						
(Gg)						
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ Emissions	CO ₂ Removals	CH ₄	N ₂ O	NO _x	CO
Total Land-Use Change and Forestry	(1) 0.0000	(1) -122.8683	0.0000	0.0000	0.0000	0.0000
A Changes in Forest and Other Woody Biomass Stocks	(1) 0.0000	(1) -136.4525				
1 Tropical Forests						
2 Temperate Forests						
3 Boreal Forests						
4 Grasslands/Tundra						
5 Other (please specify)						
B Forest and Grassland Conversion	7.9127					
1 Tropical Forests	7.9127					
2 Temperate Forests	0.0000					
3 Boreal Forests	0.0000					
4 Grasslands/Tundra	0.0000					
5 Other (please specify)	0.0000					
C Abandonment of Managed Lands		0.0000				
1 Tropical Forests		0.0000				
2 Temperate Forests		0.0000				
3 Boreal Forests		0.0000				
4 Grasslands/Tundra		0.0000				
5 Other (please specify)		0.0000				
D CO₂ Emissions and Removals from Soil	(1) 0.0049	(1) 0.0000				
E Other (Conversion of cropland to other land)	5.67					

(1) The formula does not provide a total estimate of both CO₂ emissions and CO₂ removals. It estimates “net” emissions of CO₂ and places a single number in either the CO₂ emissions or CO₂ removals column, as appropriate. Please note that for the purposes of reporting, the signs for removals are always (-) and for emissions (+).

Country	Saint Lucia
Inventory Year	2010

TABLE 5B (OPTIONAL) SECTORAL REPORT FOR LAND USE, LAND-USE CHANGE AND FORESTRY
(Using the categories of the IPCC Good Practice Guidance on Land Use, Land-Use Change and Forestry)
(Sheet 1 of 1)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES						
(Gg)						
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ Emissions	CO ₂ Removals	CH ₄	N ₂ O	NO _x	CO
Total Land Use, Land-Use Change and Forestry	-13.5842	136.4525	0.0000	0.0000	0.0000	0.0000
A. Forest Land	0.0000	98.0018	0.0000	0.0000	0.0000	0.0000
1. Forest Land Remaining Forest Land		54.3946	0.0000	0.0000	0.0000	0.0000
2. Land Converted to Forest Land		43.6072	0.0000	0.0000	0.0000	0.0000
B. Cropland	-0.0049	37.7870	0.0000	0.0000	0.0000	0.0000
1. Cropland Remaining Cropland	-0.0049	37.7870	0.0000	0.0000	0.0000	0.0000
2. Land Converted to Cropland			0.0000	0.0000	0.0000	0.0000
C. Grassland	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1. Grassland Remaining Grassland			0.0000	0.0000	0.0000	0.0000
2. Land Converted to Grassland			0.0000	0.0000	0.0000	0.0000
D. Wetlands	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1. Wetlands Remaining Wetlands			0.0000	0.0000	0.0000	0.0000
2. Land Converted to Wetlands			0.0000	0.0000	0.0000	0.0000
E. Settlements	0.0000	0.6636	0.0000	0.0000	0.0000	0.0000
1. Settlements Remaining Settlements		0.6636	0.0000	0.0000	0.0000	0.0000
2. Land Converted to Settlements			0.0000	0.0000	0.0000	0.0000
F. Other Land	-13.5793	0.0000	0.0000	0.0000	0.0000	0.0000
1. Other Land Remaining Other Land			0.0000	0.0000	0.0000	0.0000
2. Land Converted to Other Land	-13.5793		0.0000	0.0000	0.0000	0.0000
G. Other (Please specify)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Harvested Wood Products						
Information items						
Forest Land converted to Other Land-Use Categories						
Grassland converted to Other Land-Use Categories						

Non-CO₂ Emissions in this Summary Table are directly linked to the Summary Table in Module5B (LULUCF). CO₂ emissions and CO₂ removals, however, need to be entered manually here.

Country	Saint Lucia
Inventory Year	2010

TABLE 6 SECTORAL REPORT FOR WASTE
(Sheet 1 of 1)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES						
(Gg)						
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ ⁽¹⁾	CH ₄	N ₂ O	NO _x	CO	NMVOC
Total Waste	0.0000	3.5539	0.0122			
A Solid Waste Disposal on Land	0.0000	3.2579	0.0000			
1 Managed Waste Disposal on Land						
2 Unmanaged Waste Disposal Sites						
3 Other (please specify)						
B Wastewater Handling	0.0000	0.2960	0.0122			
1 Industrial Wastewater		0.0050				
2 Domestic and Commercial Wastewater		0.2910	0.0122			
3 Other (please specify)						
C Waste Incineration						
D Other (please specify)						

(1) Note that CO₂ from waste disposal and incineration should only be included if it stems from non-biological or inorganic waste sources.

Country	Saint Lucia
Inventory Year	2010

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 1 of 3)

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES														
(Gg)														
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ Emissions	CO ₂ Removals	CH ₄	N ₂ O	NO _x	CO	NM VOC	SO ₂	HFCs		PFCs		SF ₆	
									P	A	P	A	P	A
Total National Emissions and Removals	489.4300	-122.8683	4.1799	0.1054	2.7003	17.3648	1,019.9506	0.1893	0.02257	0.0000	0.0000	0.0000	0.0000	0.0000
1 Energy	489.4300	0.0000	0.1185	0.0049	2.7003	17.3648	3.4083	0.1893						
A Fuel Combustion (Sectoral Approach)	489.4300		0.1185	0.0049	2.7003	17.3648	3.1995	0.1893						
1 Energy Industries	251.3047		0.0127	0.0021	0.6873	0.0698	0.0181	0.0802						
2 Manufacturing Industries and Construction	6.9031		0.0002	0.0000	0.0163	0.0010	0.0004	0.0019						
3 Transport	200.7614		0.0430	0.0017	1.9301	16.2873	3.0655	0.0643						
4 Other Sectors	30.4608		0.0626	0.0010	0.0665	1.0067	0.1155	0.0429						
5 Other (please specify)	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
B Fugitive Emissions from Fuels	0.0000		0.0000		0.0000	0.0000	0.2088	0.0000						
1 Solid Fuels			0.0000		0.0000	0.0000	0.0000	0.0000						
2 Oil and Natural Gas			0.0000		0.0000	0.0000	0.2088	0.0000						
2 Industrial Processes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1,016.1984	0.0000	0.0226	0.0000	0.0000	0.0000	0.0000	0.0000
A Mineral Products	0.0000					0.0000	1,015.9898	0.0000						
B Chemical Industry	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000						
C Metal Production	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
D Other Production	0.0000				0.0000	0.0000	0.2086	0.0000						
E Production of Halocarbons and Sulphur Hexafluoride									0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
F Consumption of Halocarbons and Sulphur Hexafluoride									0.0226	0.0226	0.0226	0.0226	0.0226	0.0226
G Other (please specify)	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000				0.0000		0.0000

P = Potential emissions based on Tier 1 Approach. A = Actual emissions based on Tier 2 Approach.

Country	Saint Lucia
Inventory Year	2010

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 2 of 3)

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES														
(Gg)														
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ Emissions	CO ₂ Removals	CH ₄	N ₂ O	NO _x	CO	NM VOC	SO ₂	HFCs		PFCs		SF ₆	
									P	A	P	A	P	A
3 Solvent and Other Product Use	0.0000			0.0068			0.3440							
4 Agriculture			0.5075	0.0815	0.0000	0.0000								
A Enteric Fermentation			0.3268											
B Manure Management			0.1807	0.0130										
C Rice Cultivation			0.0000											
D Agricultural Soils				0.0686										
E Prescribed Burning of Savannas			0.0000	0.0000	0.0000	0.0000								
F Field Burning of Agricultural Residues			0.0000	0.0000	0.0000	0.0000								
G Other (please specify)			0.0000	0.0000										
5 Land-Use Change & Forestry ⁽¹⁾	(1) 0.0000	(1) -122.8683	0.0000	0.0000	0.0000	0.0000								
A Changes in Forest and Other Woody Biomass Stocks	(1) 0.0000	(1) -136.4525												
B Forest and Grassland Conversion	7.9127		0.0000	0.0000	0.0000	0.0000								
C Abandonment of Managed Lands		0.0000												
D CO ₂ Emissions and Removals from Soil	(1) 0.0049	(1) 0.0000												
E Other (please specify)	5.6666	0.0000	0.0000	0.0000	0.0000	0.0000								
6 Waste			3.5539	0.0122	0.0000	0.0000	0.0000	0.0000						
A Solid Waste Disposal on Land			3.2579											
B Wastewater Handling			0.2960	0.0122										
C Waste Incineration														
D Other (please specify)			0.0000	0.0000										
7 Other (please specify)														

(1) The formula does not provide a total estimate of both CO₂ emissions and CO₂ removals. It estimates "net" emissions of CO₂ and places a single number in either the CO₂ emissions or CO₂ removals column, as appropriate. Please note that for the purposes of reporting, the signs for uptake are always (-) and for emissions (+).
(2) Note that if you have used the IPCC Good Practice Guidance on Land Use, Land-Use Change and Forestry, you will have to use a mapping back procedure before entering emission/removals here

Country	Saint Lucia
Inventory Year	2010

TABLE 7A S
(Sheet 3 of 3)[illegible]

Country	Saint Lucia
Inventory Year	2010

TABLE 7B SHORT SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 1 of 1)

SHORT SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES													
(Gg)													
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ Emissions	CO ₂ Removals	CH ₄	N ₂ O	NO _x	CO	NM VOC	SO ₂	HFCs		PFCs		SF ₆
									P	A	P	A	
Total National Emissions and Removals	489.4300	-122.8683	4.1799	0.1054	2.7003	17.3648	1,019.9506	0.1893	0.0226	0	0	0	0
1 Energy	Reference Approach ⁽¹⁾	490.3427											
	Sectoral Approach ⁽¹⁾	489.4300	0.1185	0.0049	2.7003	17.3648	3.4083	0.1893					
	A Fuel Combustion	489.4300	0.1185	0.0049	2.7003	17.3648	3.1995	0.0000					
B Fugitive Emissions from Fuels	0.0000		0.0000		0.0000	0.0000	0.2088	0.0000					
2 Industrial Processes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1,016.1984	0.0000	0.0226	0	0	0	0
3 Solvent and Other Product Use	0.0000			0.0068			0.3440						
4 Agriculture			0.5075	0.0815	0.0000	0.0000							
5 Land-Use Change & Forestry	(2) 0.0000	(2) -122.8683	0.0000	0.0000	0.0000	0.0000							
6 Waste			3.5539	0.0122									
7 Other (please specify)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000					
Memo Items:													
International Bunkers	107.9985		0.0010	0.0009	0.5168	0.1967	0.0837	0.0000					
Aviation	104.4120		0.0007	0.0009	0.4435	0.1478	0.0739	0.0000					
Marine	3.5865		0.0002	0.0000	0.0734	0.0489	0.0098	0.0000					
CO ₂ Emissions from Biomass	23.0348												

P = Potential emissions based on Tier 1 Approach. A = Actual emissions based on Tier 2 Approach.

(1) For verification purposes, countries are asked to report the results of their calculations using the Reference Approach and explain any differences with the Sectoral Approach. Do not include the res of both the Reference Approach and the Sectoral Approach in national total

(2) The formula does not provide a total estimate of both CO₂ emissions and CO₂ removals. It estimates “net” emissions of CO₂ and places a single number in either the CO₂ emissions or CO₂ removals column, as appropriate. Please note that for the purposes of reporting, the signs for uptake are always (-) and for emissions (+).

Country	Saint Lucia
Inventory Year	2010

TABLE 8A OVERVIEW TABLE FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 1 of 3)

OVERVIEW TABLE																							
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂		CH ₄		N ₂ O		NO _x		CO		NMVOC		SO ₂		HFCs		PFCs		SF ₆		Documen- tation	Disaggre- gation	Footnotes
	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality			
Total National Emissions and Removals																							
1 Energy																							
A Fuel Combustion Activities																							
Reference Approach	ALL	H																					
Sectoral Approach	ALL	H	ALL	M	ALL	M	ALL	M	ALL	M	ALL	M	ALL	M	NO	-	NO	-	NO	-	M	2	1
1 Energy Industries	ALL	H	ALL	M	ALL	M	ALL	M	ALL	M	ALL	M	ALL	M	NO	-	NO	-	NO	-	M	2	1
2 Manufacturing Industries and Construction	ALL	H	ALL	M	ALL	M	ALL	M	ALL	M	ALL	M	ALL	M	NO	-	NO	-	NO	-	M	2	1
3 Transport	ALL	H	ALL	M	ALL	M	ALL	M	ALL	M	ALL	M	ALL	M	NO	-	NO	-	NO	-	M	3	1
4 Other Sectors	ALL	H	ALL	M	ALL	M	ALL	M	ALL	M	ALL	M	ALL	M	NO	-	NO	-	NO	-	M	3	1
5 Other (please specify)	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-	NA	-	NO	-	NO	-	NO	-	M	-	-
B Fugitive Emissions from Fuels	NA	-	NA	-	NA	-	NA	-	NA	-	PART	M	NA	-	NO	-	NO	-	NO	-	M	2	1
1 Solid Fuels	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	-	-	-
2 Oil and Natural Gas	NA	-	NA	-	NA	-	NA	-	NA	-	PART	M	NA	-	NO	-	NO	-	NO	-	M	2	1
2 Industrial Processes																							
A Mineral Products	NO	-	NO	-	NO	-	NO	-	NO	-	ALL	M	NO	-	NO	-	NO	-	NO	-	M	2	1
B Chemical Industry	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	-	-	NA
C Metal Production	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	-	-	NA
D Other Production	NO	-	NO	-	NO	-	NO	-	NO	-	ALL	M	NA	-	NO	-	NO	-	NO	-	M	2	1
E Production of Halocarbons and Sulphur Hexafluoride	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NA	-	NO	-	NO	-	NO	-	-	-	NA

Notation Key for Overview Table							
Estimates		Quality		Documentation		Diaggregation	
code	Meaning	code	Meaning	code	Meaning	code	Meaning
PART	Partly Estimated	H	High Confidence in Estimation	H	High (all background information included)	1	Total emissions estimated
ALL	Full estimate of all possible source	M	Medium Confidence in Estimation	M	Medium (some background information included)	2	Sectoral split
NE	Not estimated	L	Low Confidence in Estimation	L	Low (only emission estimates included)	3	Subsectoral split
IE	Estimated but included elsewhere						
NO	Not occurring						
NA	Not applicable						

Country	Saint Lucia
Inventory Year	2010

TABLE 8A OVERVIEW TABLE FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 2 of 3)

OVERVIEW TABLE																							
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂		CH ₄		N ₂ O		NO _x		CO		NMVOC		SO ₂		HFCs		PFCs		SF ₆		Documen- tation	Disaggre- gation	Footnotes
	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality			
Industrial Processes (cont...)																							
F Consumption of Halocarbons and Sulphur Hexafluoride																							
(1) Potential	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	PART	L	NO	-	NO	-	M	3	1
(2) Actual	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NE	-	NO	-	NO	-	-	-	-
G Other (please specify)	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	-	-	-
3 Solvent and Other Product Use	NO	-	NO	-	PART	M	NO	-	NO	-	PART	L	NO	-	NO	-	NO	-	NO	-	M	2	1
4 Agriculture																							
A Enteric Fermentation	NO	-	ALL	M	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	M	3	1
B Manure Management	NO	-	ALL	M	ALL	M	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	M	3	1
C Rice Cultivation	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	-	-	-
D Agricultural Soils	NO	-	NO	-	ALL	M	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	M	1	1
E Prescribed Burning of Savanna	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	-	-	-
F Field Burning of Agricultural Residues	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	-	-	-
G Other (please specify)	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	-	-	-
5 Land-Use Change & Forestry																							
A Changes in Forest and Other Woody Biomass Stocks	ALL	L	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	L	2	1
B Forest and Grassland Conversion	ALL	L	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	L	2	1

(1) Potential emissions based on Tier 1 Approach.

(2) Actual emissions based on Tier 2 Approach.

Saint Lucia
2010

(Sheet 3 of 3)

[illegible]

Country	Saint Lucia
Inventory Year	2010

National greenhouse gas inventory of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol and greenhouse gas precursors								
Greenhouse gas source and sink categories	CO ₂ emissions (Gg)	CO ₂ removals (Gg)	CH ₄ (Gg)	N ₂ O (Gg)	NO _x (Gg)	CO (Gg)	NMVOCs (Gg)	SO _x (Gg)
Total national emissions and removals	489.430	-122.868	4.180	0.105	2.700	17.365	1,019.951	0.189
1. Energy	489.430	0.000	0.118	0.005	2.700	17.365	3.408	0.189
A. Fuel combustion (sectoral approach)	489.430		0.118	0.005	2.700	17.365	3.199	0.189
1. Energy Industries	251.305		0.013	0.002	0.687	0.070	0.018	0.080
2. Manufacturing industries and construction	6.903		0.000	0.000	0.016	0.001	0.000	0.002
3. Transport	200.761		0.043	0.002	1.930	16.287	3.065	0.064
4. Other sectors	30.461		0.063	0.001	0.067	1.007	0.116	0.043
5. Other (please specify)	0.000		0.000	0.000	0.000	0.000	0.000	0.000
B. Fugitive emissions from fuels	0.000		0.000		0.000	0.000	0.209	0.000
1. Solid fuels			0.000		0.000	0.000	0.000	0.000
2. Oil and natural gas			0.000		0.000	0.000	0.209	0.000
2. Industrial processes	0.000	0.000	0.000	0.000	0.000	0.000	1,016.198	0.000
A. Mineral products	0.000				0.000	0.000	1,015.990	0.000
B. Chemical industry	0.000		0.000	0.000	0.000	0.000	0.000	0.000
C. Metal production	0.000		0.000	0.000	0.000	0.000	0.000	0.000
D. Other production	0.000		0.000	0.000	0.000	0.000	0.209	0.000
E. Production of halocarbons and sulphur hexafluoride								
F. Consumption of halocarbons and sulphur hexafluoride								
G. Other (please specify)	0.000		0.000	0.000	0.000	0.000	0.000	0.000
3. Solvent and other product use	0.000			0.007			0.344	
4. Agriculture			0.507	0.082	0.000	0.000	0.000	0.000
A. Enteric fermentation			0.327					
B. Manure management			0.181	0.013			0.000	
C. Rice cultivation			0.000				0.000	
D. Agricultural soils				0.069			0.000	
E. Prescribed burning of savannahs			0.000	0.000	0.000	0.000	0.000	
F. Field burning of agricultural residues			0.000	0.000	0.000	0.000	0.000	
G. Other (please specify)			0.000	0.000	0.000	0.000	0.000	
5. Land-use change and forestry ¹	0.000	-122.868	0.000	0.000	0.000	0.000	0.000	0.000
A. Changes in forest and other woody biomass stocks	0.000	-136.452						
B. Forest and grassland conversion	7.913	0.000	0.000	0.000	0.000	0.000		
C. Abandonment of managed lands		0.000						
D. CO ₂ emissions and removals from	0.005	0.000						
E. Other (please specify)	5.667	0.000	0.000	0.000	0.000	0.000		
6. Waste			3.554	0.012	0.000	0.000	0.000	0.000
A. Solid waste disposal on land			3.258		0.000		0.000	
B. Waste-water handling			0.296	0.012	0.000	0.000	0.000	
C. Waste incineration					0.000	0.000	0.000	0.000
D. Other (please specify)			0.000	0.000	0.000	0.000	0.000	0.000
7. Other (please specify)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Memo items								
International bunkers	107.999		0.001	0.001	0.517	0.197	0.084	0.000
Aviation	104.412		0.001	0.001	0.443	0.148	0.074	0.000
Marine	3.587		0.000	0.000	0.073	0.049	0.010	0.000
CO₂ emissions from biomass	23.035							

¹ If you have completed the LUCF section of Table 7As, these data will appear here automatically. If, however, you have used the IPCC Good Practice Guidance and Categories therein, apply the mapping back procedure for this sector and insert the corresponding numbers here manually.

		Country		Saint Lucia						
		Inventory Year		2010						
National greenhouse gas inventory of anthropogenic emissions of HFCs, PFCs and SF ₆										
Greenhouse gas source and sink categories			HFCs ^{a,b} (Gg)					PFCs ^{a,b} (Gg)		SF ₆ ^a (Gg)
			HFC-23	HFC-134	HFC410 a	HFC- 404a	Insert HFC	CF ₄	C ₂ F ₆	Insert PFC
Total national emissions and removals			0	0.01639	0.002835	0.003285		0	0	0
1. Energy										
	A. Fuel combustion (sectoral)									
		1. Energy Industries								
		2. Manufacturing industries and construction								
		3. Transport								
		4. Other sectors								
		5. Other (please specify)								
	B. Fugitive emissions from fuels									
		1. Solid fuels								
		2. Oil and natural gas								
2. Industrial processes			0	0.01639	0.002835	0.003285		0	0	0
	A. Mineral products									
	B. Chemical industry									
	C. Metal production									
	D. Other production									
	E. Production of halocarbons and sulphur hexafluoride									
	F. Consumption of halocarbons and sulphur hexafluoride			0.01639	0.002835	0.003285				
	G. Other (please specify)									
3. Solvent and other product use										
4. Agriculture										
	A. Enteric fermentation									
	B. Manure management									
	C. Rice cultivation									
	D. Agricultural soils									
	E. Prescribed burning of savannahs									
	F. Field burning of agricultural									
	G. Other (please specify)									
5. Land-use change and forestry										
	A. Changes in forest and other woody									
	B. Forest and grassland conversion									
	C. Abandonment of managed lands									
	D. CO ₂ emissions and removals from									
	E. Other (please specify)									
6. Waste										
	A. Solid waste disposal on land									
	B. Waste-water handling									
	C. Waste incineration									
	D. Other (please specify)									
7. Other (please specify)										
Memo items										
	International bunkers									
		Aviation								
		Marine								
	CO ₂ emissions from biomass									

^a Parties may wish to express HFC, PFC and SF₆ emissions as either potential or actual. Potential emissions should be estimated using the tier 1 approach of the IPCC Guidelines. Actual emissions should be estimated using the tier 2 approach of the IPCC Guidelines.

^b Parties reporting HFCs and PFCs should provide emission estimates on a gas-by-gas basis, that is, disaggregated estimates by chemical expressed in units of mass (Gg), as indicated in the table (e.g. HFC-23), where information is available. This should be done by inserting a column for each HFC and PFC gas for which emissions do occur in the country; the gases in the column headings are given as examples only. Other gases to be reported in this table include HFC-32, HFC-41, HFC-43-10, HFC-125, HFC-134a, HFC-152a, HFC-43-10mee, HFC-143a, HFC-227ea, HFC-236fa, HFC-245ca, C₃F₈, C₄F₁₀, c-C₄F₈, C₅F₁₂, C₆F₁₄, and any other GHG with high global warming potential not covered in this list.

Country	Saint Lucia														
Inventory Year	2010														
IPCC Source Category	Sector	Source Categories to be Assessed in Key Source Category Analysis ¹	Applicable Greenhouse Gas	Estimate (current year, non-LULUCF) (Gg CO2eq)	Estimate (current year, LULUCF) ² (Gg CO2eq)	Removals (current year, all sectors) (GgCO2eq)	Emissions estimate (non-LULUCF) base year (Gg CO2eq)	Emissions/ Removals LULUCF base year (Gg CO2eq)	Emissions/ Removals all sectors base year (Gg CO2eq)	Total absolute estimate incl. LULUCF (current year) (Gg CO2eq)	Level Assessment excl. LULUCF (%)	Cumulative level excl. LULUCF (%)	Level Assessment incl. LULUCF (%)	Cumulative level incl LULUCF (%)	Perform Level Assessment
Sum	Sum	Sum		646.9	-122.9	524.0	0.0	0.0	0.0	796.9					Perform Trend Assessment
1.A.1	Energy	CO2 Emissions from Stationary Combustion (Liquid-A)	CO2	251.3		251.3			0.0	251.3	38.8%	38.8%	31.5%	31.5%	Specify Base Year
1.A.3	Energy	CO2 Mobile Combustion: Road Vehicles	CO2	197.1		197.1			0.0	197.1	30.5%	69.3%	24.7%	56.3%	
6.A	Waste	CH4 Emissions from Solid Waste Disposal Sites	CH4	68.4		68.4			0.0	68.4	10.6%	79.9%	8.6%	64.9%	
5.A	LULUCF	1. Forest Land Remaining Forest Land	CO2		-54.4				0.0	54.4	n/a	79.9%	6.8%	71.7%	
5.A	LULUCF	2. Land Converted to Forest Land	CO2		-43.6				0.0	43.6	n/a	79.9%	5.5%	77.2%	
5.A	LULUCF	1. Cropland Remaining Cropland	CO2		-37.8				0.0	37.8	n/a	79.9%	4.7%	81.9%	
2.F	Industrial	HFC Emissions from Substitutes for Ozone Depleting Substances (ODS Substitutes)	HFCs	37.0		37.0			0.0	37.0	5.7%	85.6%	4.6%	86.5%	
4.D	Agriculture	N2O (Direct and Indirect) Emissions from Agricultural Soils	N2O	21.3		21.3			0.0	21.3	3.3%	88.9%	2.7%	89.2%	
1.A.4	Energy	Other Sectors: Residential CO2	CO2	20.2		20.2			0.0	20.2	3.1%	92.0%	2.5%	91.7%	
5.E	LULUCF	2. Land Converted to Other Land	CO2		13.6				0.0	13.6	n/a	92.0%	1.7%	93.4%	
1.A.2	Energy	CO2 Emissions from Manufacturing Industries and Construction	CO2	6.9		6.9			0.0	6.9	1.1%	93.1%	0.9%	94.3%	
4.A	Agriculture	CH4 Emissions from Enteric Fermentation in Domestic Livestock	CH4	6.9		6.9			0.0	6.9	1.1%	94.2%	0.9%	95.2%	
6.B	Waste	CH4 Emissions from Wastewater Handling	CH4	6.2		6.2			0.0	6.2	1.0%	95.1%	0.8%	96.0%	
1.A.4	Energy	Other Sectors: Agriculture/Forestry/Fishing CO2	CO2	5.6		5.6			0.0	5.6	0.9%	96.0%	0.7%	96.7%	
1.A.4	Energy	Other Sectors: Commercial CO2	CO2	4.6		4.6			0.0	4.6	0.7%	96.7%	0.6%	97.2%	
4.B	Agriculture	N2O Emissions from Manure Management	N2O	4.0		4.0			0.0	4.0	0.6%	97.3%	0.5%	97.7%	
4.B	Agriculture	CH4 Emissions from Manure Management	CH4	3.8		3.8			0.0	3.8	0.6%	97.9%	0.5%	98.2%	
6.B	Waste	N2O Emissions from Wastewater Handling	N2O	3.8		3.8			0.0	3.8	0.6%	98.3%	0.5%	98.7%	
1.A.3	Energy	CO2 Mobile Combustion Water Borne Navigation	CO2	3.6		3.6			0.0	3.6	0.6%	99.1%	0.5%	99.1%	
3	Solvent and	N2O Emissions	N2O	2.09		2.1			0.0	2.1	0.3%	99.4%	0.3%	99.4%	
1.A.4	Energy	Other Sectors: Residential CH4	CH4	1.3		1.3			0.0	1.3	0.2%	99.6%	0.2%	99.6%	
1.A.3	Energy	CH4 Mobile Combustion: Road Vehicles	CH4	0.9		0.9			0.0	0.9	0.1%	99.7%	0.1%	99.7%	
5.A	LULUCF	1. Settlements Remaining Settlements	CO2		-0.7				0.0	0.7	n/a	99.7%	0.1%	99.8%	
1.A.1	Energy	N2O (Non-CO2) Emissions from Stationary Combustion	N2O	0.7		0.7			0.0	0.7	0.1%	99.8%	0.1%	99.8%	
1.A.3	Energy	N2O Mobile Combustion: Road Vehicles	N2O	0.5		0.5			0.0	0.5	0.1%	99.9%	0.1%	99.9%	
1.A.4	Energy	Other Sectors: Residential N2O	N2O	0.3		0.3			0.0	0.3	0.0%	99.9%	0.0%	100.0%	
1.A.1	Energy	CH4 (Non-CO2) Emissions from Stationary Combustion	CH4	0.3		0.3			0.0	0.3	0.0%	100.0%	0.0%	100.0%	
1.A.3	Energy	CO2 Mobile Combustion: Aircraft	CO2	0.0		0.0			0.0	0.0	0.0%	100.0%	0.0%	100.0%	
1.A.4	Energy	Other Sectors: Agriculture/Forestry/Fishing CH4	CH4	0.0		0.0			0.0	0.0	0.0%	100.0%	0.0%	100.0%	
1.A.4	Energy	Other Sectors: Commercial CH4	CH4	0.0		0.0			0.0	0.0	0.0%	100.0%	0.0%	100.0%	
1.A.2	Energy	N2O Emissions from Manufacturing Industries and Construction	N2O	0.0		0.0			0.0	0.0	0.0%	100.0%	0.0%	100.0%	
1.A.4	Energy	Other Sectors: Agriculture/Forestry/Fishing N2O	N2O	0.0		0.0			0.0	0.0	0.0%	100.0%	0.0%	100.0%	
1.A.4	Energy	Other Sectors: Commercial N2O	N2O	0.0		0.0			0.0	0.0	0.0%	100.0%	0.0%	100.0%	
1.A.3	Energy	N2O Mobile Combustion Water Borne Navigation	N2O	0.0		0.0			0.0	0.0	0.0%	100.0%	0.0%	100.0%	
1.A.3	Energy	CH4 Mobile Combustion Water Borne Navigation	CH4	0.0		0.0			0.0	0.0	0.0%	100.0%	0.0%	100.0%	
5.D	LULUCF	1. Cropland Remaining Cropland	CO2		0.0				0.0	0.0	n/a	100.0%	0.0%	100.0%	
1.A.2	Energy	CH4 Emissions from Manufacturing Industries and Construction	CH4	0.0		0.0			0.0	0.0	0.0%	100.0%	0.0%	100.0%	

¹ A Key Category Analysis including the Land Use, Land-Use Change and Forestry is only performed if the Categories of the IPCC (2003) are being used. If the 1996 IPCC Land-Use categories are being used, they first need to be mapped onto the more recent categories before they can be entered here.

² Follow the Guidance in Section 5.4.2 of IPCC (2003) on the aggregation level at which the analysis should be performed. Take into account Tables 3.1.1 and 3.1.3 in Chapter 3 of IPCC (2003).

³ In this column net emissions/removal estimates from the LULUCF sector should be entered

Country	Saint Lucia
Inventory Year	2005
Title of Inventory	Third National Communication Greenhouse Gas Inventory for Saint Lucia
Contact Name	Seton Stiebert
Title	Principal
Organisation	Stiebert Consulting
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	Price Waterhouse Coopers Building
	St. Lucia
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Is uncertainty addressed?	yes
Related documents filed with UNFCCC	

Country	Saint Lucia
Inventory Year	2005

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 1 of 3)

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES															
(Gg)															
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ Emissions	CO ₂ Removals	CH ₄	N ₂ O	NO _x	CO	NM VOC	SO ₂	HFCs		PFCs		SF ₆		
									P	A	P	A	P	A	
Total National Emissions and Removals	395.2796	-86.7919	4.0340	0.0918	2.0973	16.1936	8.3257	0.1661	0.0225	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1 Energy	395.2796	0.0000	0.1239	0.0043	2.0973	16.1936	3.1768	0.1661							
A Fuel Combustion (Sectoral Approach)	395.2796		0.1239	0.0043	2.0973	16.1936	2.9573	0.1661							
1 Energy Industries	202.2563		0.0111	0.0017	0.5539	0.0634	0.0149	0.0646							
2 Manufacturing Industries and Construction	3.0544		0.0001	0.0000	0.0084	0.0006	0.0002	0.0010							
3 Transport	158.7325		0.0384	0.0014	1.4625	14.9262	2.8043	0.0508							
4 Other Sectors	31.2364		0.0742	0.0012	0.0724	1.2034	0.1379	0.0498							
5 Other (please specify)	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000							
B Fugitive Emissions from Fuels	0.0000		0.0000		0.0000	0.0000	0.2195	0.0000							
1 Solid Fuels			0.0000		0.0000	0.0000	0.0000	0.0000							
2 Oil and Natural Gas			0.0000		0.0000	0.0000	0.2195	0.0000							
2 Industrial Processes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	4.6924	0.0000	0.0225	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
A Mineral Products	0.0000					0.0000	4.5571	0.0000							
B Chemical Industry	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000							
C Metal Production	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
D Other Production	0.0000				0.0000	0.0000	0.1352	0.0000							
E Production of Halocarbons and Sulphur Hexafluoride									0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
F Consumption of Halocarbons and Sulphur Hexafluoride									0.0225	0.0225	0.0225	0.0225	0.0225	0.0225	0.0225
G Other (please specify)	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000					0.0000		0.0000

P = Potential emissions based on Tier 1 Approach. A = Actual emissions based on Tier 2 Approach.

Country	Saint Lucia
Inventory Year	2005

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 2 of 3)

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES														
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	(Gg)													
	CO ₂ Emissions	CO ₂ Removals	CH ₄	N ₂ O	NO _x	CO	NM VOC	SO ₂	HFCs		PFCs		SF ₆	
									P	A	P	A	P	A
3 Solvent and Other Product Use	0.0000			0.0020			0.4565							
4 Agriculture			0.5190	0.0750	0.0000	0.0000								
A Enteric Fermentation			0.3639											
B Manure Management			0.1550	0.0109										
C Rice Cultivation			0.0000											
D Agricultural Soils				0.0641										
E Prescribed Burning of Savannas			0.0000	0.0000	0.0000	0.0000								
F Field Burning of Agricultural Residues			0.0000	0.0000	0.0000	0.0000								
G Other (please specify)			0.0000	0.0000										
5 Land-Use Change & Forestry ⁽¹⁾	(1) 0.0000	(1) -86.7919	0.0000	0.0000	0.0000	0.0000								
A Changes in Forest and Other Woody Biomass Stocks	(1) 0.0000	(1) -100.3761												
B Forest and Grassland Conversion	7.9127		0.0000	0.0000	0.0000	0.0000								
C Abandonment of Managed Lands		0.0000												
D CO ₂ Emissions and Removals from Soil	(1) 0.0049	(1) 0.0000												
E Other (please specify)	5.6666	0.0000	0.0000	0.0000	0.0000	0.0000								
6 Waste			3.3912	0.0104	0.0000	0.0000	0.0000	0.0000						
A Solid Waste Disposal on Land			3.1300											
B Wastewater Handling			0.2612	0.0104										
C Waste Incineration														
D Other (please specify)			0.0000	0.0000										
7 Other (please specify)														

(1) The formula does not provide a total estimate of both CO₂ emissions and CO₂ removals. It estimates “net” emissions of CO₂ and places a single number in either the CO₂ emissions or CO₂ removals column, as appropriate. Please note that for the purposes of reporting, the signs for uptake are always (-) and for emissions (+).
(2) Note that if you have used the IPCC Good Practice Guidance on Land Use, Land-Use Change and Forestry, you will have to use a mapping back procedure before entering emission/removals here

Country	Saint Lucia
Inventory Year	2005

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 3 of 3)

[illegible]

Country	Saint Lucia
Inventory Year	2000
Title of Inventory	Third National Communication Greenhouse Gas Inventory for Saint Lucia
Contact Name	Seton Stiebert
Title	Principal
Organisation	Stiebert Consulting
Address	Ministry of Economic Affairs, Economic Planning, National Development and the Public Service
	Price Waterhouse Coopers Building
	St. Lucia
Phone	(613) 294-5955
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E-Mail	seton@stiebertconsulting.com
Is uncertainty addressed?	yes
Related documents filed with UNFCCC	

Country	Saint Lucia
Inventory Year	2000

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 1 of 3)

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES															
(Gg)															
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ Emissions	CO ₂ Removals	CH ₄	N ₂ O	NO _x	CO	NM VOC	SO ₂	HFCs		PFCs		SF ₆		
									P	A	P	A	P	A	
Total National Emissions and Removals	340.1902	-86.7919	3.8207	0.1039	1.8448	14.7042	4.7862	0.1590	0.02522	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1 Energy	340.1902	0.0000	0.1305	0.0040	1.8448	14.7042	2.7001	0.1590							
A Fuel Combustion (Sectoral Approach)	340.1902		0.1305	0.0040	1.8448	14.7042	2.6586	0.1590							
1 Energy Industries	175.7222		0.0106	0.0015	0.4819	0.0621	0.0133	0.0561							
2 Manufacturing Industries and Construction	5.1522		0.0002	0.0000	0.0152	0.0010	0.0004	0.0015							
3 Transport	134.6191		0.0338	0.0012	1.2557	13.1907	2.4773	0.0434							
4 Other Sectors	24.6966		0.0860	0.0013	0.0919	1.4505	0.1677	0.0581							
5 Other (please specify)	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000							
B Fugitive Emissions from Fuels	0.0000		0.0000		0.0000	0.0000	0.0415	0.0000							
1 Solid Fuels			0.0000		0.0000	0.0000	0.0000	0.0000							
2 Oil and Natural Gas			0.0000		0.0000	0.0000	0.0415	0.0000							
2 Industrial Processes	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.7597	0.0000	0.0252	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
A Mineral Products	0.0000					0.0000	1.4497	0.0000							
B Chemical Industry	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000							
C Metal Production	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
D Other Production	0.0000				0.0000	0.0000	0.3100	0.0000							
E Production of Halocarbons and Sulphur Hexafluoride									0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
F Consumption of Halocarbons and Sulphur Hexafluoride									0.0252	0.0252	0.0252	0.0252	0.0252	0.0252	0.0252
G Other (please specify)	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000				0.0000			0.0000

P = Potential emissions based on Tier 1 Approach. A = Actual emissions based on Tier 2 Approach.

Country	Saint Lucia
Inventory Year	2000

TABLE 7A SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES
(Sheet 2 of 3)

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES														
(Gg)														
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO ₂ Emissions	CO ₂ Removals	CH ₄	N ₂ O	NO _x	CO	NM VOC	SO ₂	HFCs		PFCs		SF ₆	
									P	A	P	A	P	A
3 Solvent and Other Product Use	0.0000			0.0014			0.3264							
4 Agriculture			0.5490	0.0891	0.0000	0.0000								
A Enteric Fermentation			0.4210											
B Manure Management			0.1280	0.0129										
C Rice Cultivation			0.0000											
D Agricultural Soils				0.0762										
E Prescribed Burning of Savannas			0.0000	0.0000	0.0000	0.0000								
F Field Burning of Agricultural Residues			0.0000	0.0000	0.0000	0.0000								
G Other (please specify)			0.0000	0.0000										
5 Land-Use Change & Forestry ⁽²⁾	(1) 0.0000	(1) -86.7919	0.0000	0.0000	0.0000	0.0000								
A Changes in Forest and Other Woody Biomass Stocks	(1) 0.0000	(1) -100.3761												
B Forest and Grassland Conversion	7.9127		0.0000	0.0000	0.0000	0.0000								
C Abandonment of Managed Lands		0.0000												
D CO ₂ Emissions and Removals from Soil	(1) 0.0049	(1) 0.0000												
E Other (please specify)	5.6666	0.0000	0.0000	0.0000	0.0000	0.0000								
6 Waste			3.1411	0.0094	0.0000	0.0000	0.0000	0.0000						
A Solid Waste Disposal on Land			2.9093											
B Wastewater Handling			0.2318	0.0094										
C Waste Incineration														
D Other (please specify)			0.0000	0.0000										
7 Other (please specify)														

(1) The formula does not provide a total estimate of both CO₂ emissions and CO₂ removals. It estimates “net” emissions of CO₂ and places a single number in either the CO₂ emissions or CO₂ removals column, as appropriate. Please note that for the purposes of reporting, the signs for uptake are always (-) and for emissions (+).

(2) Note that if you have used the IPCC Good Practice Guidance on Land Use, Land-Use Change and Forestry, you will have to use a mapping back procedure before entering emission/removals here

Country	Saint Lucia
Inventory Year	2000

TABLE 7A S
(Sheet 3 of 3)

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