GENERAL NOTICE

NOTICE 1104 OF 2009

DRAFT NATIONAL GREENHOUSE GAS INVENTORY FOR THE REPUBLIC OF SOUTH AFRICA

I, Buyelwa Patience Sonjica, the Minister of Water and Environmental Affairs, hereby publish the draft national greenhouse gas inventory for public comments. The draft national inventory can be also be downloaded by the members of the public at the following website **www.saaqis.org.za**.

Members of the public are invited to submit to the Minister, within 60 (sixty) days of publication of the notice in the *Gazette*, written representations on or objections to the draft national inventory to the following addresses:

By post to: The Director-General: Water and Environmental Affairs
Attention: Mr Jongikhaya Witi
Private Bag X447
Pretoria, 0001

By fax to: (012) 320 1167, and by e-mail to **jwiti@deat.gov.za**

Or hand delivered at corner Pretorius and Van Der Walt Streets, Fedsure Forum Building, 2nd Floor, North Tower.

Any inquiries in connection with the draft national inventory can be directed to Mr Tsietsi Mahema at (012) 310-3404 or Mr Jongikhaya Witi at (012) 310-3083.

Comments received after the closing date may not be considered.

BUYELWA SONJICA
MINISTER OF WATER AND ENVIRONMENTAL AFFAIRS

environment
& tourism
Department:
Environment Affairs and Tourism
REPUBLIC OF SOUTH AFRICA

GREENHOUSE GAS INVENTORY SOUTH AFRICA

1990 TO 2000

COMPILATION UNDER THE
UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE
(UNFCCC)

NATIONAL INVENTORY REPORT

MAY 2009

Preface

This report is the result of work commissioned by the Department of Environmental Affairs and Tourism (DEAT) to develop the 2000 national inventory of greenhouse gases (GHGs) for South Africa.

Information on energy and industrial processes was prepared by the Energy Research Centre (ERC) of the University of Cape Town, while information on agriculture, land use changes, forestry and waste was provided by the Centre for Scientific and Industrial Research (CSIR).

This report is published by the Department of Environmental Affairs and Tourism, South Africa. An electronic version of the report, along with the Common Reporting Format (CRF) tables, is available on the website of DEAT: http://www.saaqis.org.za/.

Authors and contributors

General responsibility: Stanford Mwakasonda (ERC), Rina Taviv (CSIR), Peter Lukey (DEAT) Jongikhaya Witi (DEAT), Margot Richardson (DEAT), Tsietsi Mahema (DEAT), Ajay Trikam (ERC).

Individual chapters:

Summary	Stanford Mwakasonda
Chapter 1	Stanford Mwakasonda, Stephen Davies (Section 1.5)
Chapter 2	Stanford Mwakasonda
Chapter 3.	Stanford Mwakasonda, Thapelo Letete, Philip Lloyd (section 3.2.1)
Chapter 4	Stanford Mwakasonda, Thapelo Letete, Mondli Guma
Chapter 5	Rina Taviv, Heidi van Deventer, Bongani Majeke, Sally Archibald
Chapter 6	Ndeke Musee

Report reviews: Harald Winkler, Marna van der Merwe, Bob Scholes
Report compilation: Stanford Mwakasonda, Ajay Trikam
Language editor: Robert Berold
Quality assurance: TBA

SUMMARY

SOUTH AFRICA'S GREENHOUSE GAS INVENTORIES

In August 1997 the Republic of South Africa joined the majority of countries in the international community in ratifying the United Nations Framework Convention on Climate Change (UNFCCC). To fulfil its obligation under the UNFCCC, a number of projects related to climate change have since been undertaken by South Africa. These include the preparation of greenhouse gas (GHG) inventories, which comprises one of the inputs to the agreed National Communications (NC) to UNFCCC.

The first national GHG inventory in South Africa was prepared in 1998, using 1990 data. It was updated to include 1994 data and published in 2004. It was developed using the 1996 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories. Its results are summarised in Tables 0-1 and 0-2.

TABLE 0-1: GREENHOUSE GAS EMISSIONS BY GAS, 1994 (DEAT 2004)

GHG emissions	Gg CO_2 equivalent	% of total
CO_2 (with LULUCF)	297,341.25	
CO_2 (without LULUCF)	315,957.22	83.2 %
CH_4	43,206.03	11.4 %
N_2O	20,677.0	5.4 %
HFCs	NE	
PFCs	NE	
SF_6	NE	
Total (with LULUCF)	361,214.28	
Total (without LULUCF)	379,840.25	100%

LULUCF = Land Use, Land-use Change and Forestry; NE = Not estimated

TABLE 0-2: GREENHOUSE GAS EMISSIONS BY SECTOR, 1994 (DEAT 2004)

Sectors	Gg CO_2 equivalent	% of total
Energy	297,563.46	78.3 %
Industrial Processes	30,386.21	8.0 %
Solvent and Other Product Use	NE	
Agriculture	35,461.51	9.3 %
LULUCF	-18,615.97	
Waste	16,429.07	4.3 %
Other	NE	
Total (with LULUCF)	361,214.28	
Total (without LULUCF)	379,840.25	100 %

LULUCF = Land Use, Land-use Change and Forestry; NE = Not estimated

For the 2000 national inventory, a decision was made to use the recently published 2006 IPCC Guidelines to enhance accuracy and transparency, and also to familiarise researchers with the latest inventory

preparation guidelines. One of the most significant changes in the 2006 IPCC Guidelines was the restructuring of inventory sectors, in particular the combining of agriculture, forestry, and land use change into one sector and providing more comprehensive and holistic methodologies for emission calculation.

Institutional framework for inventory preparation in South Africa

South Africa is currently establishing a national system to manage its climate change obligations under the UNFCCC process. This implies institutionalizing how the country prepares its GHG inventories and how it manages data collection and all relevant climate change information for both internal and external reporting. The national system will be based on the "Single National Entity" (SNE) concept, and will be hosted at the Department of Environmental Affairs and Tourism (DEAT).

Key emission sources in South Africa

An analysis of key categories using previous inventories was made in order to determine the most significant emission sources in the country, contributing to about 95% of the total GHG emission estimate in the country. Using level and trend assessment on the basis of the 1990 and 1994 GHG inventories, the most significant emission sources contributing to more than 95% of total South Africa's emissions were identified. The full list of key emission sources is presented in Table 1-2. The first five emission sources in the list of key emission sources in South Africa , together accounting for 62.5% of emissions, were as follows:

1. Public electricity and heat production
2. Road transport
3. Iron and steel energy consumption
4. Iron and steel production (process emissions)
5. Enteric fermentation

Overview of the 2000 Inventory

The total emissions for the 2000 inventory was 436,257 Gg CO_2e (or 437.3 million tonnes CO_2e). Four fifths (78.9%) were were associated with energy supply and consumption, with smaller contributions from industrial processes (14.1%), agriculture (4.9%) and waste 2.1%) (see Table 0-4). These figures do not include emissions or sinks caused by agriculture, land use change and forestry activities. Activities in agriculture, land use and forestry contributed 40,772.94 Gg CO_2e as sources, but provided a sink of 20,279.43 Gg CO_2e, to provide a net source of emissions of 20,493.51 Gg CO_2e . If this is taken into account, the net emissions total from South Africa is reduced to 435 461.62 Gg CO_2e.

TABLE 0-3: NATIONAL GHG INVENTORY RESULTS, 2000

GHG source and sink category	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions)	**333,363.70**	**76,114.36**	**23,764.51**	**0.00**	**2,219.05**	**0.00**	**435,461.62**
1. Energy	**301,068.85**	**40,914.14**	**2,123.23**				**344,106.22**
A. Fuel Combustion (Sectoral Approach)	301,044.52	527.83	2,123.23				303,695.58
Energy Industries	212,226.48	78.23	1,070.09				213,374.81
Manufacturing Industries and Construction	38,879.34	65.61	145.87				39,090.83
Transport	38,623.88	258.19	629.23				39,511.31
Commercial/institutional	1,901.59	0.43	9.28				1,911.30
Residential	5,547.25	122.25	258.89				5,928.40
Agriculture/forestry/fishing	3,705.54	3.06	9.74				3,718.34
Other	160.42	0.06	0.11				160.60
B. Fugitive Emissions from Fuels	24.33	40,386.31	NA,NO				40,410.64
Solid Fuels	24.33	40,366.25	NA,NO				40,390.58
Oil and Natural Gas	0.00	20.07	NO				20.07
2. Industrial Processes and Product Use	**52,574.28**	**4287.377593**	**2,388.39**	**NA,NO**	**2,219.05**	**NA,NO**	**61,469.09**
A. Mineral Products	6,863.20	NA	NA				6,863.20
B. Chemical Industry	23,751.68	4,284.08	2,388.39	NO	NO	NO	30,424.14
C. Metal Production	21,959.40	3.30	0.00	NA	2,219.05	NA,NO	24,181.75
3. Agriculture, Forestry and Land Use	**-20,279.43**	**22,136.94**	**18,636.00**				**20,493.51**
A. Enteric fermentation		18,969.09					18,969.09
B. Manure management		1,904.70	415.40				2,320.10
C. Forest land	-13,020.52	NA,NO					-13,020.52
D. Cropland	-7,730.15						-7,730.15
F. Wetlands		190.89					190.89
I. GHG Emissions from biomass burning	471.24	1072.26	793.6				2,337.10
M. Indirect N2O emissions from managed soils			17427				17,427.00
4. Waste	**0.00**	**8,775.90**	**616.90**				**9,392.80**
A. Solid waste disposal on land		8,085.00					8,085.00
B. Waste-water handling		690.90	616.90				1,307.80
Memo Items:							
International bunkers	11,645.83	17.11	95.56				11,758.50
Aviation	2,906.25	0.43	25.20				2,931.87
Marine	8,739.59	16.68	70.36				8,826.62
CO_2 Emissions from biomass	**4,700.00**						**4,700.00**
Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry							**436,257.30**
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry							**435,461.62**

Overview of estimates and trends from 1990

The general trend in sector GHG emissions showed both increasing and decreasing trends between years 1990 and 2000. Agriculture and waste sectors showed significant decrease of emissions from 1990, whereas industrial processes and other product use emissions showed an increase of over 100% between 1990 to 2000. Energy sector emissions showed an increasing trend from 1990 to 2000. Some of these changes are attributable to changes in emission calculation methodologies and allocation of source categories , rather than significant change in activity data.

TABLE 0-4: SECTOR EMISSION TRENDS AND PERCENTAGE CHANGES FROM 1990

Sector	GHG emissions CO_2e Gg							
	1990 (CO_2e Gg)	% of total	1994 (CO_2e Gg)	% of total	2000 (CO_2e Gg)	% of total	2000 % change from 1994	2000 % change from 1990
Energy	260 886	75.1	297 564	78.3	344 106	78.9	15.6	31.9
Industrial Processes and Product Use	30 792	8.9	30 386	8.0	61 469	14.1	102.3	99.6
Agriculture	40 474	11.6	35 462	9.3	21 289	4.9	-40.0	-47.4
Waste	15 194	4.4	16 430	4.3	9 393	2.1	-42.8	-38.2
Total (without LULUCF)	347 346		379 842		436 257		14.8	25.6

The trends for individual gases gave a different picture. There was a uniform increase in emissions for all types of greenhouse gases, with no decreases. Methane showed the highest increase, recording an increase of more than 76% from 1990 to 2000. Nitrous oxide showed the lowest increase from 1990 to 2000, of 2.7%.

TABLE 0-5: GAS EMISSION TRENDS AND PERCENTAGE CHANGES FROM 1990

GHG emissions CO_2eGg	1990 Gg	% of total	1994 Gg	% of total	2000 Gg	% of total	1994 % change from 1990	2000 % change from 1994	2000 % change from 1990
CO_2	280 932	80.9	315 957	83.2	353 643	81.1	12.5	11.9	18.6
CH_4	2 053	12.4	2 057	11.4	3 624	17.2	0.2	76.2	76.5
N_2O	75	6.7	67	5.4	76.7	1.3	-10.7	14.5	2.7
CF_4	-		-	-	0.303	0.5		-	-
C_2F_6	-		-	-	0.027	0.06		-	-
Totals CO_2eqGg (without LULUCF)	347 346		379 842		436 257		9.4	14.8	25.6

Conclusions and recommendations

The 2000 GHG emission estimation continues to show a continued rise in GHG emissions in South Africa.

The GHG inventory process continues to face a number of challenges, the most significant of which is the availability of activity data for computation of the emissions.

The most challenging sectors for data collection were AFOLU (Agriculture, Forestry and Other Land Use) and IPPU (Industrial Processes and other Product Use). For the AFOLU sector, spatial data, in-depth research and modelling studies are required in order to create a robust database for land use and land use changes. Data for the agriculture sector had to be obtained from international sources (FAO) for this 2000 inventory.

For the IPPU sector, one reason given for the difficulty in collecting data was lack of cooperation by some industrial companies connected to the protection of confidentiality. There is an urgent need for government assistance here. Government can consolidate the agreements it has entered into with industry so that industry provides the required data, and in a format that is commensurate with the data requirements for preparations of national GHG inventories.

Similarly, agreements are necessary with data custodians in other sectors (Forestry, Agriculture, etc.). A clear regulatory framework for the provision of data for GHG inventory purposes would be helpful in this regard.

Consistency of inventory preparation is another area that requires urgent attention. In a number of cases it was observed that emissions estimated were not consistent with reality on the ground. For example, there was apparently a decrease in transport sector emissions between 1994 and 2000, even though an increase in transport fuel consumption was observed in the same time period. This suggests that the decrease in transport sector emissions was related more to improper allocation of fuel consumption in this sector rather than to an actual decrease in transport emissions. To address the consistency problem, recalculation and reallocation need to be undertaken when preparing future GHG inventories.

South Africa's Greenhouse Gas Inventory 2000

Compiled by

Energy Research Centre & Council for Scientific & Industrial Research
University of Cape Town

For

environment & tourism

Department:
Environment Affairs and Tourism
REPUBLIC OF SOUTH AFRICA

Summary Report of CO_2 equivalent Emissions

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs [2]	PFCs [2]	SF_6 [2]	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) [1]	**333,395**	**76,072**	**23,554**	-	**2,219**	-	**435,240**
1. Energy	**301,100**	**40,871**	**1,913**				**343,884**
A. Fuel Combustion (Sectoral Approach)	301,076	485	1,913				303,473
1. Energy Industries	212,226	91	986				213,303
2. Manufacturing Industries and Construction	38,879	10	146				39,036
3. Transport	38,655	258	503				39,416
4. Commercial/institutional	1,902	0	9				1,911
5. Residential	5,547	122	259				5,928
6. Agriculture/forestry/fishing	3,706	3	10				3,718
5. Other	160	0	0				161
B. Fugitive Emissions from Fuels	24	40,386	NA,NO				40,411
1. Solid Fuels	24	40,366	NA,NO				40,391
2. Oil and Natural Gas	-	20	NO				20
2. Industrial Processes and Product Use	**52,574**	**4,287**	**2,388**	**NA,NO**	**2,219**	**NA,NO**	**61,469**
A. Mineral Products	6,863	NA	NA				6,863
B. Chemical Industry	23,752	4,284	2,388	NO	NO	NO	30,424
C. Metal Production	21,959	3	-	NA	2,219	NA,NO	24,182
D. Other Production	NO						NO
E. Production of Halocarbons and SF_6				NA,NO	NA,NO	NA,NO	NA,NO
F. Consumption of Halocarbons and SF_6 [2]				NE	NE	NE	NE
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Agriculture, Forestry and Land Use	**-20,279**	**22,137**	**18,636**				**20,494**
A. Enteric Fermentation		18,969					18,969
B. Manure Management		1,905	415				2,320
C. Forest Land	-13,021	NA,NO					-13,021
D. Cropland	-7,730						-7,730
E. Grassland							
F. Wetlands		191					191
G. Settlements							
H. Other Land							
I. GHG Emissions from Biomass burning	471	1,072	794				2,337
J. Liming							
K. Urea Application							
L. Direct N2O emissions from managed soils							
M. Indirect N2O emissions from managed soils			17,427				
N. Rice Cultivation		NA	NA				NA
O. Harvested wood products							
P. Other							-
4. Waste	-	**8,776**	**617**				**9,393**
A. Solid Waste Disposal on Land		8,085					8,085
B. Waste-water Handling		691	617				1,308
C. Waste Incineration							
D. Other							
5. Other *(as specified in Summary 1.A)*	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
Memo Items: [3]							
International Bunkers	11,646	17	96				11,758
Aviation	2,906	0	25				2,932
Marine	8,740	17	70				8,827
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**4,700**						**4,700**

Total CO2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	414,746
Total CO2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	435,240

[1] For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

[2] Actual emissions should be included in the national totals (2006 IPCC Guidelines)

[3] Countries are asked to report emissions from international aviation and marine bunkers and multilateral operations, as well as CO_2 emissions from biomass, under Memo Items. These emissions should not be included in the national total emissions from the energy sector. Amounts of biomass used as fuel are included in the national energy consumption but the corresponding CO_2 emissions are not included in the national total as it is assumed that the biomass is produced in a sustainable manner. If the biomass is harvested at an unsustainable rate, net CO_2 emissions are accounted for as a loss of biomass stocks in the Land Use, Land-use Change and Forestry sector.

Document Status: Please note that, although this is the final draft of the document compiled as an output of the Department of Environmental Affairs and Tourism's Greenhouse Gas Information Management Project, it has not been subjected to an independent audit, peer review or public comment process. The Project Steering Committee will still engage with the documents before they are reviewed by an external reviewer. Thus, although this document has been circulated at the Climate Change Summit 2009 in order to initiate a process of public engagement around its content and findings, the broad circulation and/or citation of this document is discouraged until such time as the independently audited and peer reviewed draft is formally published for public comment in the Gazette.

South Africa's Greenhouse Gas Inventory 2000

Compiled by

Energy Research Centre & Council for Scientific & CSIR

For

environment & tourism

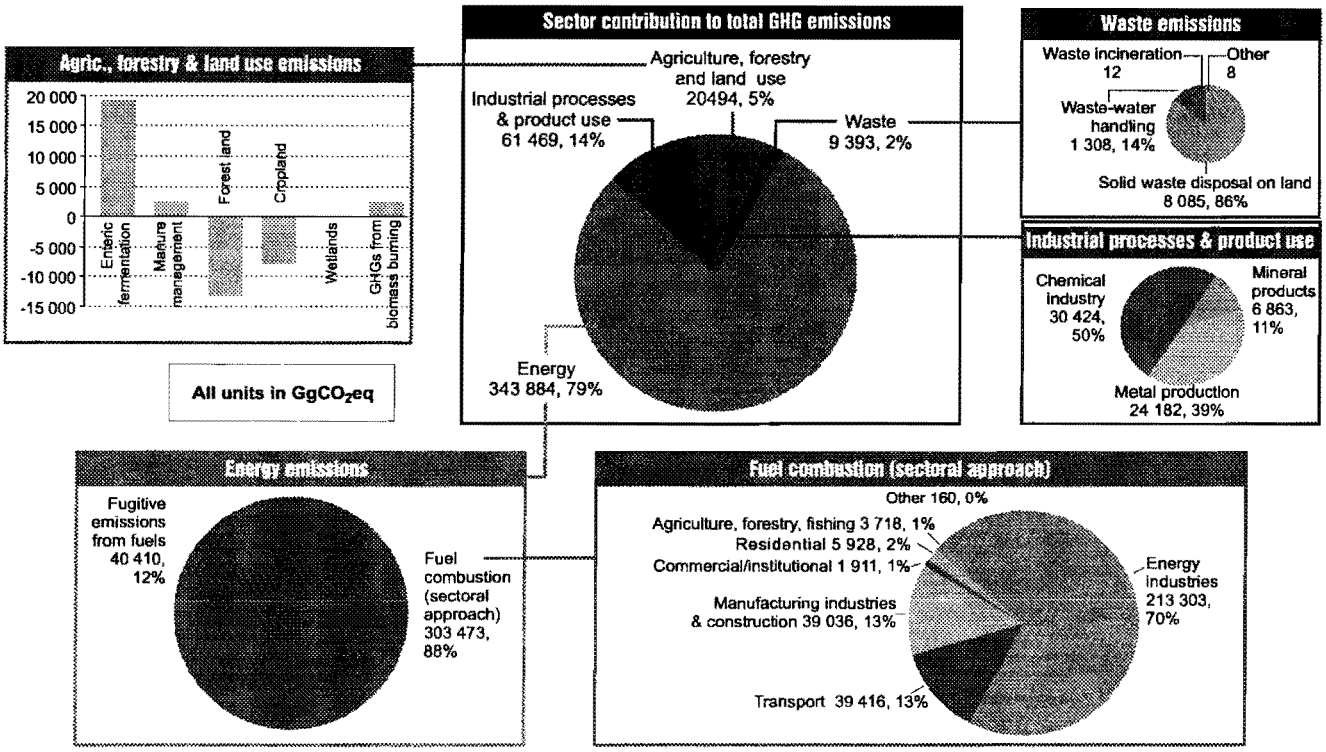
Department: Environment Affairs and Tourism
REPUBLIC OF SOUTH AFRICA

Selected Greenhouse Gas Emissions above 1% of Total Emissions

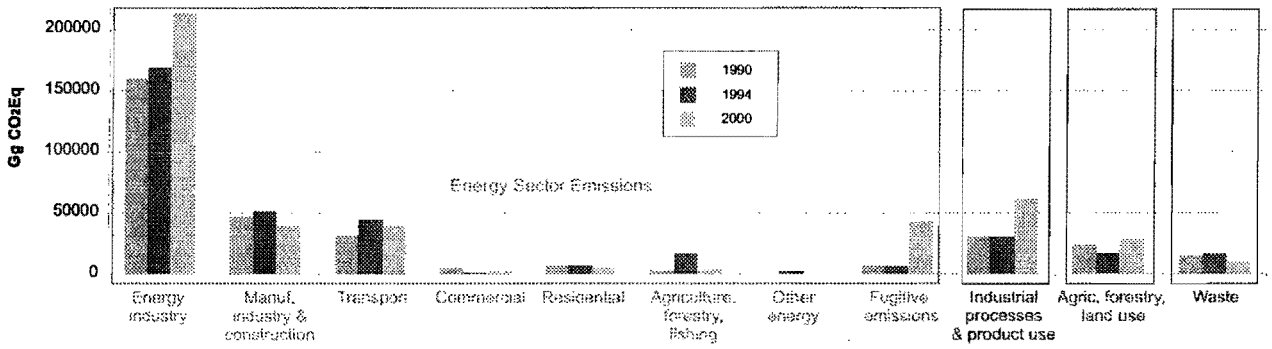
	CO2 eq Gas Emissions (kt)			Total
	CO_2	CH_4	N_2O	CO_2e Gg (Kt)
ENERGY				
ENERGY INDUSTRY				
Sub Bituminous coal for public electricity	170,716	37	825	171,578
Autoproducers	7,819	2	38	7,858
Refinery coal	28,562	19	56	28,638
MANUFACTURING AND CONSTRUCTION				
Other bituminous coal	24,378	5	120	24,503
Blast furnace gas	4,822	0	1	4,823
TRANSPORT				
Road Gasoline	24,412	244	349	25,005
Road Gas/Diesel	11,521	13	62	11,596
INTERNATIONAL BUNKERS				
Marine RFO	7,759	15	62	7,836
FUGITIVE EMISSIONS				
Underground mining	20	35,444	-	35,463
INDUSTRIAL PROCESSES				
MINERALS INDUSTRY				
cement production	4,443			4,443
CHEMICAL INDUSTRY				
Gas production processes	23,531			23,531
METAL INDUSTRY				
Iron production - Blast furnaces (t)	6,825	-	-	6,825
Steel production oxygen furnace (t)	298	-	-	298
AFOLU				
LIVESTOCK				
Enteric Fermentation		18,969		18,969
LANDS				
Indirect N2O emissions from managed soils			17,427	17,427
WASTE				
Solid waste disposal on land		8,085		8,085

Document Status: Please note that, although this is the final draft of the document compiled as an output of the Department of Environmental Affairs and Tourism's Greenhouse Gas Information Management Project, it has not been subjected to an independent audit, peer review or public comment process. The Project Steering Committee will still engage with the documents before they are reviewed by an external reviewer. Thus, although this document has been circulated at the Climate Change Summit 2009 in order to initiate a process of public engagement around its content and findings, the broad circulation and/or citation of this document is discouraged until such time as the independently audited and peer reviewed draft is formally published for public comment in the Gazette.

South Africa's greenhouse gas emission profile – 2000



1990, 1994 & 2000 emissions profile



GHG inventories and LTMS