Revision of the First National Communication

Argentine Republic

According to the United Nations Framework Convention on Climate Change

Secretariat for Natural Resources and Sustainable Development
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EXECUTIVE SUMMARY

In 1997, Argentina presented its First National Communication. Since then, there has been an important evolution in Argentina's climate-related policies. Consequently, and in accordance with Article 4 of the United Nations Framework Convention on Climate Change, the present Review of the above-mentioned document has been carried out to update the information supplied in the First Communication.

By way of this document, Argentina is now submitting its greenhouse gas emission target. Thus it complies with the announcement made by H.E. Dr. Carlos Saúl Menem, President of the Republic of Argentina, on the occasion of the Fourth Session of the Conference of the Parties, held in Buenos Aires. This target is aimed at achieving, within the framework of the country's developmental policies, a reduction in the rate of growth of GHG emissions, through the implementation of measures that may contribute to the process of sustainable development.

Another significant fact is that Argentina has signed the Kyoto Protocol, which is currently in the process of ratification in the National Congress, having already had the approval of the Senate.

In order to update the knowledge of the structure and evolution of GHG emissions, the 1997 Greenhouse Gas Inventory has been formulated, and the 1990 and 1994 inventories have been reviewed in accordance with the Revised 1996 IPCC Guidelines.

Greenhouse Gas Inventory and Emission Trends. 1990-1997

The Greenhouse Gases (GHGs) reported in this Inventory are the following: carbon dioxide, methane, nitrous oxide, hydrochlorofluorocarbons, perfluorocarbons and sulphur hexafluoride, on the one hand, and ozone precursors such as carbon monoxide, oxides of nitrogen other than N_2O, and Non-Methane Volatile Organic Compounds, on the other.

Overall emissions, excluding the Land-Use Change and Forestry Sector, increased by 13.7% between 1990 and 1994, and by 6.2% between 1994 and 1997. The detailed emission figures are shown in the table herein below.

Total emissions for each of the reported Inventories, in MMTCE

	1990	1994	1997
1. Energy	29.15	34.66	38.18
Burning of fossil fuels	25.22	29.90	33.11
Fugitive emissions	3.93	4.76	5.07
2. Industrial Processes	1.72	1.78	2.43
3. Solvent and Other Product Use	NE	NE	NE
4. Agriculture and Livestock Production	29.97	31.50	31.42
5. Land-Use Change and Forestry	(1) -9.37	(1)-9.37	-12.80
6. Waste management	2.48	4.04	4.44
7. HFC, PFC and SF6	NE	NE	0.31
Total	**53.97**	**62.61**	**63.96**
Total excluding Land-Use Change and Forestry	**63.32**	**71.98**	**76.77**

Note: totals may not sum due to independent rounding. NE = Not Estimated.
(1)Does not include the Land-Use Change and Forestry Subsector.

Energy

The Energy Sector has a growing participation in GHG emissions, accounting for 50% of total emissions for the year 1997. Most of these are carbon dioxide emissions, followed by a significant contribution from methane produced from fugitive emissions. Emissions originate largely in the burning of fossil fuels.

Burning of Fossil Fuels

Most of the emissions originate in the burning of oil products, and natural gas, roughly in the same amount, while the combustion of mineral coal only generates a small percentage of emissions. Energy industries utilize natural gas, and a smaller proportion of oil. The Industrial Processes sector also use mainly natural gas, and to a lesser extent, oil, and so do the Commercial, Institutional and Residential subsectors. The transport sector uses oil products, and a smaller yet growing proportion of natural gas, while gas is used mainly in the Residential and Industrial Processes sectors. The Agriculture and Forestry sectors utilize almost exclusively oil products.

Fugitive Emissions

Fugitive emissions from methane found in mineral coal are relatively small, given the existence of a single coal mine. On the other hand, the gas and oil systems produce a significant amount of emissions through venting and from the fugitive emissions resulting from the production, processing, transportation and distribution of natural gas.

Industrial Processes

The most significant sectors in terms of GHG emissions are those corresponding to Iron and Steel Production, and Cement Manufacture. However, their relative contribution to total emissions is small.

Agriculture and Livestock Production

Emissions from this sector are very significant in relation to total GHG emissions. In particular, the emissions from the Livestock Production sector amount to roughly 35% of the total. They are mainly methane emissions, but nitrous oxide emissions are also important. The Agriculture Sector produces nitrous oxide emissions from soil management, while methane emissions from rice cultivation are relatively small.

Land-Use Change and Forestry

Forestry

This sector contributes to the net sequestration of carbon. In managed forests, plantations contribute to the uptake of carbon, while native forests have an almost balanced net flux. The conversion of forests to agriculture produces emissions of the same order as those of managed forests, but in a smaller proportion. Finally, the natural regeneration of forests in abandoned lands produces a significant uptake of carbon. Except for plantations, there are considerable uncertainties associated with emissions and sequestration of carbon.

Land-Use Change

Due to the increasing utilization of low-till or no-till methods, land-use change has become an important sector in terms of carbon sequestration. Estimates for this sector were included only in the 1997 Inventory.

Waste Management

Methane emissions from waste are rapidly increasing as a result of greater consumption and of the larger proportion of solid waste deposited in landfills.

Projection of Emissions for the period 2008-2012

Prospective studies were carried out to establish GHG emission scenarios until the year 2012. The first step was the development of macro-economic scenarios, followed by the formulation of scenarios of the sectors contributing most actively to emissions.

The macro-economic scenarios estimate an expected growth of the economy, with an annual accumulative GDP growth rate of about 3.5. However, there are considerable uncertainties and extreme scenarios showing the aforementioned growth rate to be 2.2% and 5.2%. This uncertainty is conveyed, in turn, to the scenarios for several of the emitting sectors. Chapter 4 includes the projections of the emissions from these sectors corresponding to the mid-range emission scenario, and to the highest and lowest ones.

The Agriculture and Livestock production sector shows little flexibility with respect to the development of the domestic economy, depending fundamentally on international prices and conditions. Given the newly-acquired condition of the country free from foot–and–mouth disease, it is difficult to project the future evolution of the Livestock production sector that is responsible for a significant part of total GHG emissions. In order to assess the uncertainty inherent in future emission from the Agriculture and Livestock Production, three scenarios were developed: one, considered as the most likely, and the other two, representing the highest and the lowest possible emission scenarios, all of them based on extreme prices for livestock. The results are presented in Chapter 4.

The projection of total average emissions for the period 2008-2012 varies from 95 MMTCE to 122 MMTCE. Given the high degree of uncertainty that this represents, the option chosen has been an emission target that is a function of a variable representing an economic growth indicator. This aspect is discussed in Chapter 5, which also shows how the increment in both the emissions estimated in the inventories and those projected for the future is proportional to the square root of the GDP.

Argentina's commitment

In the last few decades, Argentina has considerably striven to achieve the goal of economic growth with less GHG emissions. With this aim, significant public and private investments have been made to enhance efficiency in the energy sector. Still, aware of the severe environmental, social and economic consequences arising from Climate Change, and without relinquishing the principle of common but differentiated responsibilities, Argentina considers it necessary to continue adopting new measures to reduce GHG emissions.

In view of the aforementioned, and considering the need to reduce the uncertainties associated with the actual emission reduction values Argentina would be committed to comply with in the case of adopting a fixed target, the decision has been made to establish a dynamic target based on the relation between emissions and GDP. The emission target will be expressed as $E = I * \sqrt{P}$. where emissions (E) are measured in tons of carbon equivalent and GDP (P) in 1993 Argentine pesos. The value chosen for the index I (151.5) tends to guarantee an effective GHG emission reduction for Argentina, for most of the likely scenarios.

1. INTRODUCTION

The purpose of this Review is to update the information reported in the First National Communication regarding some aspects that are of great importance for Argentina's climate-related policies.

These policies include a very significant decision: during the course of the Fifth Session of the Conference of the Parties, and by way of the present document, Argentina will submit its greenhouse gas emission target Thus it will comply with the announcement made by H.E. Dr. Carlos Saúl Menem, President of the Republic of Argentina, on the occasion of the Conference of the Parties at its Fourth Session, held in Buenos Aires in 1998. Dr. Menem then declared: "we shall define our targets for achieving growth and at the same time a reduction in carbon dioxide emissions", and he also pointed out that "…at the next session of the Conference of the Parties we shall announce our commitment for the period 2008 to 2012".

Argentina's proposal to establish its greenhouse gas emission targets is aimed at achieving, within the framework of the country's development policies, a reduction of the rate of growth of GHG emissions, through the implementation of mitigation measures and the adoption of measures that may contribute to the process of sustainable development. This implies fostering the creation of a new way under the Convention, which would allow countries wishing to assume this kind of commitment to have access to all the mechanisms of the Kyoto Protocol.

In order to determine this emission target, the President of Argentina created, through the presidential decree Nº 377/99, the National Commission for the Formulation and Proposal of the Greenhouse Gas Emission Target, designating the Secretary for Natural Resources and Sustainable Development as its president. The same decree empowers the Commission to appoint an Advisory Board composed of representatives from the private sector, scientific and academic sectors from both private and public universities, and Non-Governmental Organizations, specialized in issues associated with the objectives of the said decree.

Another significant fact is that Argentina has signed the Kyoto Protocol, which is currently in the process of ratification in the National Congress, having already had the approval of the Senate.

The prospective analysis of greenhouse gas (GHG) emissions, necessary to establish a rational voluntary commitment to reduce these emissions, requires a thorough knowledge of the most updated structure of these emissions, as well as of their recent evolution. This was the aim behind the estimation of the 1997 Greenhouse Gas Inventory, whose results are reported within the second chapter of the present Review.

The 1990 and 1994 greenhouse gas inventories included in the First National Communication and submitted to the Secretariat of the United Nations Framework Convention on Climate Change followed the methodology recommended in the 1995 IPCC Guidelines for National Greenhouse Gas Inventories. The abovementioned inventories did not report data on Land-Use Change and Forestry or on several sub-modules of the Agriculture Sector. These sectors, not previously reported, have been included in the 1997 Inventory presented in this Review, which have adjusted to the 1996 IPCC Guidelines, published in 1997. Consequently, and with the aim of clearly illustrating the trends in GHG emissions, the same methodology has been applied for the review of the 1990 and 1994 inventories, which includes all the sub-modules of the Agriculture Sector, and Forestry. These reviews are presented in Chapter 3.

2. 1997 INVENTORY

The aim of the present greenhouse gas inventory is to identify the sources of anthropogenic emissions. It complies with two premises:

1. A comprehensible and detailed methodology to determine greenhouse gas (GHG) sources and sinks.
2. A common and consistent mechanism that may ensure cross-country comparison with the countries that are signatories to the United Nations Framework Convention on Climate Change (UNFCCC).

This chapter provides a summary of the GHG emissions for Argentina, for the year 1997. To ensure that these emissions be comparable, the Revised 1996 IPCC Guidelines have been applied, adapting them whenever necessary to the conditions of the country.

The following greenhouse gases are considered in the present study: carbon dioxide, methane, nitrous oxide, hydrochlorofluorocarbons, perfluorocarbons and sulphur hexafluoride. Other gases, such as carbon monoxide, oxides of nitrogen other than N_2O, Non–Methane Volatile Organic Compounds, have no direct effect as greenhouse gases, yet they play a role as ozone precursors, for which reason they have been reported in this inventory.

Emission Trends

Excluding the Land-Use Change and Forestry sector, associated with considerable uncertainties, GHG emissions increased by 13.7 percent during the period 1990–1994, and by 6.2 percent during the period 1994-1997, which results in a total increase of 20% for the period 1990-1997. It is worth noticing that there was a strong recession during 1990, and that 1992 marked the beginning of a period of significant economic growth, which led to an increase in GHG emissions, although at a lower rate. The year 1997 marked a peak in economic growth, although a steep decline in the trend toward GHG emissions growth could also be observed. This was due to several factors, among which the most important were: a more–efficient generation of electricity derived from more environmentally sound technologies, such as the ones used in combined-cycle plants; the replacement of road vehicles with more efficient ones, and the reduction of the cattle population.

Table 2.1 shows emissions by gas and by source in millions of metric tons of carbon equivalent (MMTCE) for the three inventory years.

Table 2.1. *Total emissions by gas for the three reported Inventories, in MMTCE*

	1990	1994	1997
CO_2			
Burning of fossil fuels	24.78	29.34	32.42
Venting of natural gas	1.26	1.56	1.20
Limestone and dolomite use	0.49	0.81	1.14
Lime manufacture	0.02	0.04	0.02
Iron and steel production	1.15	0.87	1.20
Land–use change and forestry	* -9.52	* -9.52	-13.12
Total	18.19	23.10	22.86
Total excluding land-use change and forestry	27.71	32.62	35.98
CH_4			
Stationary sources	0.01	0.01	0.02
Mobile sources	0.05	0.19	0.20
Coal mining	0.05	0.03	0.05
Gas and oil systems	2.62	3.17	3.82
Petrochemical industry	0.01	0.01	0.02
Enteric fermentation	14.97	15.71	14.76
Manure management	0.59	0.68	0.57
Rice cultivation	0.11	0.22	0.26
Burning of agricultural residues	0.05	0.04	0.04
Land-use change and forestry	0.15	0.15	0.32
Sanitary landfills	1.81	3.29	3.53
Wastewater handling (inc. human sewage)	0.46	0.51	0.64
Total	20.89	23.96	24.21
Total excluding land-use change and forestry	20.74	23.83	23.90
N_2O			
Stationary sources	0.31	0.30	0.35
Mobile sources	0.07	0.09	0.12
Nitric Acid	0.05	0.05	0.05
Manure management	0.04	0.04	0.07
Management of agricultural soils	14.20	14.80	15.71
Burning of agricultural residues	0.01	0.01	0.01
Human Sewage	0.21	0.24	0.27
Total	14.89	15.53	16.58
HFC, PFC y SF6			
Substitution of ozone-depleting substances	NE	EN	0.17
Aluminum production	NE	EN	0.07
Consumption of halocarbons and SF6	NE	EN	0.07
	0	0	0.31
Total net emissions	**53.97**	**62.61**	**63.96**
Total emissions (excluding land-use change and forestry)	**63.62**	**71.98**	**76.77**

* GHG emissions from land-use change and forestry have not been reported in the 1990 and 1994 inventories. Uptake from this sector totalled 4.9 MMTCE in 1997.

Energy

Energy-producing activities are responsible for 50 percent of total greenhouse gas emissions. CO_2 is the principal source of emissions, followed by CH_4 and N_2O, responsible for smaller contributions. The bulk of emissions originates in the burning of fossil fuels, and another significant contribution originates in fugitive emissions.

Table 2.2. *Greenhouse Gas Emissions, (In Gg)*

	CO_2	CH_4	N_2O	NOx	CO	NMVOC	SO_2
Burning of fossil fuels	118854	36	5	694	736	367	
Fugitive Emissions	4390	678		4	540	39	44
Biomass burning	10884*	2	0	9	288	23	
Bunker Fuels *	2360			1	1	1	
Stored Carbon *	(3240)						
Total	**123244**	**718**	**6**	**707**	**1564**	**429**	

Note: Totals may not sum due to independent rounding
* These figures are included for informational purposes, since they do not contribute to total emissions.

Burning of fossil fuels

In the process of combustion of fossil fuels, most of the carbon stored in the fuel is released into the atmosphere as CO_2. The fuels involved are mainly oil and oil products, and natural gas, roughly in an equivalent proportion, with a negligible contribution from mineral coal. Most of the oil is used by the transport sector, while gas is used mainly in the Residential and Industrial Processes sectors.
Table 2.3 presents CO_2 emissions from the burning of fossil fuels, by fuel and by end-use sector.

Table 2.3. *CO_2 Emissions from the burning of fossil fuels, by fuel and by end-use sector.*

	Gg	MMTCE
Natural Gas	**58.238**	**16.2**
Energy Industries	27.654	7.6
Industrial Processes	13.535	3.7
Transport	2.459	0.8
Commercial and Institutional	3.212	0.9
Residential	11.378	3.1
Agriculture	+	+
Oil	**56.712**	**15.4**
Energy Industries	5.877	1.7
Industrial Processes	2.008	0.6
Transport	37.205	10.1
Commercial and Institutional	438	0.1
Residential	3.199	0.9
Agriculture	7.990	2.2
Coal	**3.904**	**1.1**
Energy Industries	2.444	0.7
Industrial Processes	1.460	0.4
Transport	+	+
Commercial and Institutional	+	+
Residential	+	+
Agriculture	+	+

Note: Totals may not sum due to independent rounding
+ Does not exceed 0.01 Gg

Table 2.4 Summarises emissions of GHGs other than CO_2 from the burning of fossil fuels.

Table 2.4. *Emissions of greenhouse gases other than CO_2, (Gg)*

	CH_4	N_2O	NOx	CO	NMVOC
Total	36	5	663	737	369
Oil and oil products	7	3	559	688	364
Natural gas	28	2	102	49	5
Coal	0	0	3	0	0

Note: Totals may not sum due to independent rounding.

The burning of biomass may produce GHGs different from CO_2, which should be included in the inventory, and are reported in Table 2.5.

Table 2.5. *Emissions of greenhouse gases other than CO_2, (Gg)*

	CH_4	N_2O	NOx	CO	NMVOC
Total	2	0	9	288	23
Firewood	1	0	2	99	21
Charcoal	0	0	0	47	1
Other biomass	1	0	7	142	1

Energy Industry Sector

This sector includes energy consumption and emissions from public electricity generation, autoproducers, and emissions arising from the rest of the energy-producing industries own energy use, especially in the case of petroleum refining and natural gas processing. Natural gas is responsible for most of the electricity generation in Argentina, the country having adopted combined-cycle technologies in recent years. Only one power plant utilizes coal, which must be partly imported, since there is only one coal mine in Argentina. Part of the non fossil fuels is used in the autoproducer sector.

Table 2.6

	Consumption (TJ)	Emissions (Gg) CO_2	CH_4	N_2O	NO_x	CO	COVDM
Oil and oil products	78739	5877	0.056	0.84	10.47	1.09	0.16
Natural gas	517850	27654	0.053	1.07	56.90	9.83	0.37
Coal mining	20344	2444	0.007	0.01	2.70	0.17	0.12
Firewood	1507		0.027	0.00	0.17	2.22	0.01
Charcoal	0		0.000	0.00	0.00	0.00	0.00
Other biomases	2679		0.048	0.01	0.24	4.57	0.002
Total	**621118.7**	**35974.81**	**0.192**	**1.93**	**70.47**	**17.88**	**0.69**

Industrial Processes Sector

Emissions arise mainly from the consumption of fossil fuels, as a result both of energy consumed at the different plants and the utilization of fuels in industrial processes. Consumption comprises mainly natural gas, with a smaller proportion of oil and its by-products, and some coal.

Table 2.7

	Consumption (TJ)	Emissions (Gg) CO_2	CH_4	N_2O	NO_x	CO	COVDM
Oil and oil products	26414	208	0.094	0.07	11.53	2.17	0.26
Natural gas	253462	13535	0.355	0.51	16.35	4.08	0.41
Coal mining	11595	1460	0.000	0.00	0.00	0.00	0.00
Firewood	1926		0.029	0.00	0.22	2.90	0.01
Charcoal	0		0.000	0.00	0.00	0.00	0.00
Other biomases	80413		1.206	0.17	7.08	137.18	0.51
Total	**373810**	**17003**	**1.684**	**0.76**	**35.18**	**146.33**	**1.19**

Commercial and Institutional Sector

It includes all activities associated with commerce and the use of energy in the institutional sector, eg., hospitals, schools, public buildings, among others. Most of the emissions arise from the burning of natural gas, and to a lesser extent, from oil and oil products.

Table 2.8

	Consumption	Emissions (Gg)					
	(TJ)	CO_2	CH_4	N_2O	NO_x	CO	COVDM
Oil and oil products	6028	438	0.010	0.09	0.39	0.10	0.02
Natural gas	60153	3212	0.072	0.12	2.77	0.55	0.14
Coal mining	0	0	0.000	0.00	0.00	0.00	0.00
Firewood	0		0.000	0.00	0.00	0.00	0.00
Charcoal	0		0.000	0.00	0.00	0.00	0.00
Other biomases	0		0.000	0.00	0.00	0.00	0.00
Total	**66181**	**3650**	**0.082**	**0.21**	**3.15**	**0.65**	**0.16**

Residential Sector

Most of the emissions in this sector originate in the combustion of natural gas; a smaller portion, in oil products, and an almost negligible one, in biomass consumption.

Table 2.9

	Consumption	Emissions (Gg)					
	(TJ)	CO_2	CH_4	N_2O	NO_x	CO	COVDM
Oil and oil products	51530	3199	0.124	0.62	2.63	0.67	0.15
Natural gas	213067	11378	0.192	0.43	9.06	2.00	0.51
Coal mining	0	0	0.000	0.00	0.00	0.00	0.00
Firewood	7660		0.567	0.12	1.21	93.97	21.38
Charcoal	6112		0.000	0.07	0.31	47.16	0.90
Other biomases	0		0.000	0.00	0.00	0.00	0.00
Total	**278369**	**14578**	**0.882**	**1.24**	**13.20**	**143.80**	**22.94**

Mobile Sources

Transport Sector

It comprises emissions from vehicles used in the transportation of goods and passengers, in all transport modes (road, railway, air, sea and river transportation). Most of these emissions arise from the combustion of oil products, with a smaller yet growing contribution from natural gas.

Agriculture and Forestry Sector

It includes emissions from agricultural vehicles in general (tractors, reaping and fumigating machines).

Table 2.10. *Emissions from mobile sources (Gg)*

Type	Means		Fuel	CO_2	NO_x	CH_4	CO	COVDM	N_2O
Civil Aviation			Aviation gasoline/JP1	1.252	3,19	0,5	7,88	4,47	0,04
Road Transportation	Transport of Persons	Automobile	Motor gasoline	11.669	102,05	3,4	221,11	255,12	0,17
			Gas-Oil	1.264	5,17	0,0	5,17	1,21	0,07
			CNG	431	2,94	4,9	5,56	0,70	0,00
		Omnibus (urban)	Gas-Oil	1.829	24,94	0,2	22,45	4,99	0,07
		Omnibus (Interurban)	Gas-Oil	1.822	24,85	0,2	22,37	4,97	0,07
	Transport of freights	Does not exceed 4 t	Motor gasoline	1.381	14,09	0,4	167,09	28,18	0,02
			Gas-Oil	5.145	28,06	0,07	28,06	7,02	0,28
			CNG	2.027	13,80	22,9	26,15	3,27	0,00
		Exceeds 4 t	Gas-Oil	10.583	144,33	0,9	129,90	28,87	0,43
	Subtotal			36.151	360,24	32,8	627,86	334,32	1,12
Railway			G.Oil/D.Oil	361	8,86	0,03	3,00	0,64	0,01
Navigation			G.Oil/D.O/F.O.	1.899	45,01	0,2	5,00	1,30	0,05
Agriculture /and Forestry		Gas Oil		7.985	163,35	1,2	65,34	25,04	0,22
Total				47.649	580,65	34,7	709,85	365,75	1,44

Fugitive Emissions

Coal Mining

Methane emissions from coal mining originate in the release of the gas trapped in the coal. The release of methane continues during the post-mining process. In Argentina, there is only one underground mine, which produces sub-bituminous coal. Local demand is therefore completed with imported coal. These emissions are negligible.

Table 2.11. *Methane fugitive emissions from coal mining (Gg).*

Process	
Total	**8.71**
Mining	8.40
Post-mining	0.30

Fugitive emissions from the gas and oil systems

Natural gas venting

CO_2 emissions arise from flaring and from the combustion of CO_2 contained in natural gas, which either cannot be used productively or is flared at oil and gas production facilities. Methane is the main component of natural gas. Fugitive emissions occur during the production, processing, transport and distribution of natural gas. Given that natural gas is present in oil wells, the processes involving oil also produce emissions. The economic growth between 1990 and 1997 resulted in an expansion of oil and gas activities, which in turn produced an increase in fugitive emissions.

Table 2.12. *Fugitive emissions of methane from oil and gas activities (Gg).*

ACTIVITY	
TOTAL	**669.17**
Oil and gas	153.14
Gas	502.88
Production / processing	134.12
Transmission and distribution	231,39
Other non-residential leakage	111.46
Other residential leakage	25.91
Oil	10.82
Production	8.97
Refining	3.90
Storage	0.28

Table 2.13. *Total emissions from oil and gas activities (Gg).*

Year\gas	CO_2	CH_4	NOx	CO	NMVOC	SO_2
1990	4638	467.4	3.33	411.2	33.9	36.2
1994	5729	559.5	3.83	510.7	34.5	40.3
1997	4390	677.9	4.22	539.5	39.4	43.9

Industrial Processes

This chapter includes emissions from the processes related to the different non-energy activities. CO_2 emissions from such processes arise mainly from cement and lime manufacture, limestone and dolomite use, ammonia production, iron and steel production, ferroalloys production and aluminum production.

Cement Manufacture

Of the wide variety of hydraulic cements produced in Argentina, the type known as Portland cement is by far the most important, and the data in this inventory refer solely to this type. Limestone is the main element in its manufacture, this being the only source of CaO, which constitutes its principal component.

CO_2 emissions result from the production of clinker. Another gas arising from the manufacture of cement is SO_2.

Limestone and dolomite use

In the iron and steel industry, limestone is used as a flux and scorifier both in blast furnaces to produce pig iron, and in steel-production processes. It can be used directly or via sintering and pellets. Emissions from these processes are accounted for under “Iron and Steel Production”. Limestone with high contents of CaO –generally sea–shells–is used in the production of flat glass, packages, table ware, tubes, etc.

Ammonia Production

Natural gas is transformed into carbon monoxide and hydrogen gas in the presence of water vapor and an adequate catalyst; eventually, carbon monoxide is transformed into carbon dioxide in the presence of another catalyst. The hydrogen gas is combined with nitrogen gas present in the air to produce ammonia. These emissions are reported in the Energy Sector.

Petrochemical production

A little over 60 petrochemical products are manufactured in Argentina. This study includes emissions from only 22 of these products, which have been selected on the basis of their production levels, and of the data availability that would facilitate the estimation of emissions. A few processes produce small amounts of N_2O, CO and SO_2 emissions. Carbon dioxide emissions are significant due to the use of fuels in industrial processes. However, in the interest of accuracy, emissions from the use of fuels should be reported within the Energy Sector, as it has been done in the present inventory.

Metal Production

Iron and steel:

Four plants constitute the nucleus of the metallurgical industry in Argentina; they produce sheets, bars and tubing. Calculations of CO_2 emissions are based on the assumption that all carbon from the reducing agent is emitted to the atmosphere, which constitutes an overestimation in many cases. In Argentina, coal coke, firewood coke and natural gas are used as reducing agents in the different plants. The use of firewood is accounted for in the Agriculture sector, and that of natural gas in the Energy sector.

Ferroalloys:

CO_2 emissions from ferroalloy production were accounted for together with those of iron and steel, since information to distinguish the amount of reducing agent employed in this industry was not available.

Aluminum:

Argentina does not produce aluminum, since the mineral required for its production (bauxite) is not available in its territory. Therefore, the aluminum industry imports all the alumina it requires. The anodes that supply the carbon demanded by this process are produced from calcinated petroleum coke, in the same plant where electrolysis takes place.

In addition to CO_2 emissions, the aluminum production industry also emits perfluorocarbons (PFCs) such as carbon tetrafluoride (CF_4) and hexafluorethane (C_2F_6).

Nitric acid production

In Argentina, there is only one plant, which produces nitric acid (HNO_3) through the catalytic oxidation of ammonia. As a result of the high temperatures that occur during the chemical reaction, N_2O and NO_x are formed as by-products, and they are eliminated from the process gas via reactor vents into the atmosphere. Table 2.14 summarizes GHG emissions from industrial processes.

Table 2.14. *Emissions from industrial processes*

	CO_2	CH_4	N_2O	NO_x	CO	NMVOC	SO_2	CF_4	C_2F_6	SF6
A Production of non-metal mineral products	**4626.4**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2.03**	**0.00**	**0.00**	**0.00**
1 Cement Manufacture	3107.8						2.03			
2 Lime Manufacture	1068.1									
3 Use of limestone and dolomite in iron and steel production	437.1									
4 Soda Ash Production	N/P									
5 Asphalt roofing					N/E	N/E				
6 Road paving with asphalt						N/E				
7 Glass manufacture	13.3					N/E				
B1 Inorganic Chemical Industries	**87.60**	**0.00**	**0.62**	**0.66**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
1 Ammonia production	***				0.00	0.00	0.00			
2 Nitric acid production			0.62	0.66						
3 Adipic acid Production			N/P	N/P	N/P	N/P				
4 Carbide Production	87.60	N/E								
B2 Organic Chemical Industries	**0.00**	**2.81**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
1 Ethylene Dichloride		0.09								
2 Styrene		0.38								
3 Ethylene		0.60								
4 Formaldehyde		0.01								
5 Methanol		0.13								
6 Carbon black		1.60								
7 Polystyrene		0.00								
8 Propylene		0.01								
C Metal production	**3952.9**	**0.00**	**0.00**	**0.58**	**100.13**	**0.13**	**2.82**	**0.00**	**0.04**	**0.00**
1 Iron and steel production	3656.41			0.18	0.00	0.13	0.00			
2 Ferroalloys Production	0.001									
3 Aluminum Production	296.5			0.40	100.13		2.82	0..04	0.004	
4 SF6 in aluminum smelting										N/U
D Other products	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	29.46	0.00	0.00	0.00	0.00
1 Pulp and paper				N/D	N/D	N/D	N/D			
2 Food and drink						29.46				

*** reported within the energy sector
1 Emissions from iron, steel and ferroalloys are reported jointly
N/P: Not produced
N/E: Not evaluated
N/P: No data
N/U: SF6 is not used in aluminum production in Argentina

HFCs, PFCs and SF6

It is assumed that the utilization of HFCs and PFCs as substitutes for ozone–depleting substances has increased in recent years. This trend will show an upward curve in the next few years due to the entering into force of the Montreal Protocol.

Other sources include some industrial processes, such as aluminum smelting, which results in emissions of CF_4 and C_2F_6 (PFC). Emissions remain constant. The utilization of SF6 in the transmission of electricity produces fugitive emissions of this GHG, although they are minimal.

Table 2.15 summarizes emissions from these GHGs.

Table 2.15

PRODUCT	TON.	TCE
HFC – 23	0.40	1276
HFC – 125	1.63	1245
HFC – 134 A	430.38	152582
HFC – 143 A	0.43	445
HFC – 152 A	0.31	12
HFC – 227	29.37	23229
SF_6	1.50	9777

Agriculture and Livestock Production

The Agriculture and Livestock Production sector is responsible for 65% of total methane emissions, the principal source being enteric fermentation in domestic livestock, especially bovines. Other less significant sources are rice cultivation and the burning of agricultural residues.

Enteric fermentation in domestic livestock

The digestive process of animals releases methane produced by microbes present in the digestive system. Ruminants have a digestive system in which the rumen is an important source of methane emissions. Bovine cattle are responsible for 95% of these emissions.

Table 2.16. *Methane emissions from enteric fermentation in domestic livestock (Gg).*

ANIMAL TYPE	
Dairy Cattle	208
Non-dairy cattle	2237
Sheep	68
Goats	17
Swine	3
Horses	36
Camels	7
Asses and mules	2
Buffalos	0
Poultry	Not estimated
TOTAL	2577

Manure management

The management of livestock manure produces methane emissions due to anaerobic decomposition, especially in liquid-based manure systems. In Argentina, only swine manure is significant in terms of methane emissions.

Table 2.17. *Methane and nitrous oxide emissions from manure management (Gg).*

ANIMAL TYPE	
Methane	
Dairy cattle	2.4
Non-dairy cattle	40.2
Sheep	1.7
Goats	0.5
Swine	49.4
Horses	3.0
Camels	0.3
Asses and mules	0.2
Buffalos	0.0
Poultry	1.0
TOTAL	**98.7**
Nitrous Oxide	
Dairy cattle	0.1
Non-dairy cattle	0.0
Sheep	0.0
Swine	0.1
Poultry	0.7
Other	0.0
TOTAL	**0.8**

Rice cultivation

Rice cultivation in irrigated soils produces anaerobic conditions which result in the release of methane into the atmosphere. All of the rice in Argentina is cultivated under a layer of water (a flooding depth of about 20 cm). This layer is maintained at a constant level for periods of approximately 100 days. In Argentina, rice is cultivated in flatland areas with climates that range from temperate to moist subtropical. Methane emissions for the year 1997 were estimated in 44 Gg.

Agricultural soil management

Nitrous oxide is produced naturally in soils through the microbial processes of nitrification and denitrification. Agricultural activities may add nitrogen to soils, thus increasing the amount of nitrogen available for

nitrification and denitrification. Activities associated with agriculture and livestock production may add nitrogen to soils either directly or indirectly. Direct additions occur through a variety of cropping practices(application of synthetic and organic fertilizers, spread of animal wastes, production of nitrogen-fixing crops, incorporation of crop residues, and cultivation of high organic content soils, called histosols), and through animal grazing (direct deposition of animal wastes on range, pastures and paddocks by grazing animals). Indirect missions occur through two mechanisms: 1) volatilization of applied nitrogen (fertilizers and animal waste), and subsequent atmospheric deposition as oxides of nitrogen; 2) surface runoff and leaching of applied nitrogen.

Table 2.18. *N_2O emissions from agricultural activities (Gg).*

Grazing Animals	**116**
Direct	77
Indirect	39
Commercial Fertilizers	14
Direct	8
Indirect	6
Nitrogen fixation	33
Agricultural crops	24
Pastures	10
Consociated Pastures *	11
Incorporation of Residues	24
Agricultural	20
Pastures	4
TOTAL	**186**

* emissions from consociated pastures are reported for informational purposes, but they are not accounted for in the inventory.

Burning of agricultural residues

Some crop residues, especially those with a high C/N ratio (> 80), are difficult to decompose, which has made their burning a common practice. Other crops, such as sugar cane, are burned previous to their manual harvesting. These practices are currently declining, and they constitute minor sources of emissions.

Table 2.19. *Emissions from the burning of crop residues (Gg).*

CH_4	**6.7**
Cotton	0.4
Sugar cane	4.3
Linseed	0.2
Wheat	1.7
N_2O	**0.1**
Cotton	0.0
Sugar cane	0.1
Linseed	+
Wheat	0.0
NO_x	**4.2**
Cotton	0.3
Sugar cane	2.7
Linseed	0.1
Wheat	1.1
CO	**140.2**
Cotton	9.2
Sugar cane	91.0
Linseed	3.7
Wheat	36.3

+ does not exceed 0.01 Gg

Land-Use Change and Forestry

Forestry

Human activities may affect the net flux of carbon by altering the amount of carbon stored in forest floors and soils, and forest biomass. Such activities include: the conversion of forests to agricultural use (crop cultivation and pastures); timber harvesting for wood and wood products; forestation and reforestation; the abandonment of managed lands and their reconversion to forests, and agricultural practices affecting land use.

Native forests and forest plantations play an important role in the uptake of CO_2, although in some cases, they can also be a source of emissions. The conversion of forests to croplands and pasture lands is very significant in Northeastern Argentina, and it results in a net flux of CO_2 emissions. The Chaco Forest region (Bosque Chaqueño) has experienced a marked trend toward the natural regeneration of previously cleared forest areas, with the consequent carbon sequestration. In 1997, the net carbon flux for the Forestry sector resulted in an estimated carbon sequestration of 8.22 MTC.

Table 2.20. *Carbon budget for the "Managed Forests" module (Changes in forest and other woody biomass stocks).*

	Uptake	Emission	Budget
		Tg/year	
Subtropical Rain Forest			
Plantations	4.27	1.42	-2.86
Eastern Chaco	0.07	0.07	0.00
Misiones	0.13	0.19	0.06
'Yungas'	0.04	0.04	0.00
Subtotal	4.50	1.71	-2.79
Subtropical Dry			
Plantations	0.01	0.00	-0.01
Western Chaco	0.46	0.58	0.12
Subtotal	0.47	0.58	0.11
Moist Temperate			
Plantations	1.86	0.79	-1.07
Mixed *Nothofagus*	0.01	0.01	0.00
Lenga Forests	0.08	0.05	-0.03
Antarctic beech (Ñire) forests	0.02	0.01	-0.00
Cypress forests	0.01	0.01	0.00
Subtotal	1.97	0.87	-1.10
Dry Temperate			
Plantations	0.40	0.12	-0.28
Subtotal	0.40	0.11	-0.29
Subtotal native forests	**0.80**	**0.95**	**0.16**
Subtotal plantations	**6.54**	**2.32**	**-4.23**
TOTAL	**7.33**	**3.27**	**-4.06**

Table 2.21. *Carbon Budget corresponding to the sub-module on "Conversion of Forests to Croplands or Pastures".*

	Tg/year
Subtropical Rain Forest	
Eastern Chaco	0.19
Misiones	0.23
Yungas	2.51
Subtotal	**2.93**
Subtropical Dry	
Western Chaco	1.13
Espinal	0.08
Subtotal	1.21
TOTAL	**4.14**

Table 2.22. *Carbon Budget corresponding to the sub-module on "Abandonment of Croplands and Pastures".*

	Uptake Tg/year
Subtropical Rain Forest	
Eastern Chaco	2.48
Misiones	2.23
Subtotal	**4.71**
Subtropical Dry	
	3.59
Subtotal	**3.59**
TOTAL	**8.30**

Table 2.23 summarizes the contribution of *Human Activities in Forest Areas to the Atmospheric* CO_2 *Net Flux. The* table synthesizes the annual rates of carbon release to the atmosphere, and carbon uptake from the atmosphere as a result of the three processes considered previously: management of native forests and forest plantations, conversion of forest land to agricultural use or pastures, and abandonment of formerly managed lands. The signs indicate release of carbon to (positive sign), or the uptake of carbon (negative sign) from, the atmosphere.

Table 2.23. *Contribution of Human Activities in Forest Lands to the Atmospheric Carbon Dioxide Budget. (Tg/year).*

	Managed Forests	Conversion of Forests	Land Abandon-ment	Budget
Subtropical Rain Forest	-2.79	2.93	-4.71	-4.57
Subtropical Dry	0.11	1.21	-3.59	-2.27
Moist Temperate	-1.10	0	0	-1.10
Dry Temperate	-0.28	0	0	-0.28
TOTAL	**-4.06**	**4.14**	**-8.30**	**-8.22**

Activities implying the burning of crop residues, woody crop residues or forests on site, produce methane emissions due to incomplete combustion, but these are negligible.

Table 2.24. *Emissions from GHGs other than* CO_2 *(in Gg).*

CH_4	NO_x	CO
56	14	494

Land–Use Change

The utilization of environmentally sound tillage systems, especially the low-till system, may increase the organic content in soils and, in turn, reduce CO_2 emissions. It may also reduce land degradation and, most fundamentally, soil erosion.

The adoption of environmentally sound agricultural methods in the Pampean region has steadily increased in recent years. The rotation of agricultural crops, the prevention of soil erosion caused by water, the adoption of low-till methods and reduced vertical tilling maintaining certain levels of land cover, are practices that were increasingly used in the 1980s and continue to be used in the present decade. Of these, the no-till method is the practice that has been most widely adopted in the past few years (30% of the total agricultural area). The IPCC methodology was applied to only one part of the territory -the Pampean region, which includes the three provinces concentrating most of Argentina's agricultural activities. The report is based on the period 1977-1997. Table summarizes these results.

Table 2.25. *Land–use change. Carbon budget, 1977-1997 period.*

A Land management Systems		C Carbon in soil (t) (Mg C/ha)	D Area (t-20) (Mha)	E Area (t) (Mha)	F Carbon in soil (t-20) (Tg)	G Carbon in soil (t) (Tg)	H Net carbon flux in mineral soils (Tgd during 20 years)
Summer crop cultivation using low-till methods	Very active soils	80.85	1.825	5.009	147.55	404.98	257.43
	Not very actives soils	51.45	0.983	2.928	50.58	150.65	100.07
Summer crop cultivation using no-till methods	Very active soils	84.70	0	2.45	0.00	207.52	207.52
	Not very actives soils	53.90	0	0.95	0.00	51.21	51.21
Summer crop cultivation using intensive-till methods	Very active soils	69.30	7.303	1.669	506.10	115.66	-390.44
	Not very actives soils	44.10	3.932	1.037	173.40	45.73	-127.67
TOTAL			**14.043**	**14.043**			**98.11**

Land-use change has not been estimated outside the Pampean Region liming practices aimed at modifying soil acidity are considered negligible. It is assumed that there are no histosols in Argentina. Total carbon sequestration amounts to 4.9 MtCE.

Waste

Waste from most of the organic matter generated or utilized by man is deposited in large disposal sites, which can be of two types: open dumps or sanitary landfills (SL). Open dumps are large accumulations of

garbage that are generally deposited in the open, where the conditions for the formation of methane are more difficult. On the other hand, in sanitary landfills there is a systematic treatment of waste, which includes compaction for a better use of available space, thus fostering the necessary conditions for decomposition in the absence of oxygen, and the consequent generation of methane and its emission into the atmosphere.

Treatment systems of liquid waste (human sewage and industrial wastewater) are also significant sources of methane and nitrous oxide emissions. A summary of the emissions of greenhouse gases from the waste sector in Argentina is presented in Table 2.26.

Table 2.26. *Greenhouse Gas Emissions from the Waste Sector (Gg).*

Gas/Source	
CH_4	**728**
Solid Waste	617
Domestic Wastewater	36
Industrial Wastewater	75
N_2O	**3**
Human Sewage	3

REFERENCES

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3. REVIEW OF THE 1990 AND 1994 INVENTORIES

The 1990 and 1994 Greenhouse Gas Inventories included in the First National Communication submitted to the Secretariat of the United Nations Framework Convention on Climate Change in 1997 comply with the IPCC Guidelines for National Greenhouse Gas Inventories, published in 1995. These inventories did not include reports on Land-use Change and Forestry, and on several subsectors of the Agriculture Sector.

The above mentioned sectors, not previously reported, have now been included in the 1997 Inventory, which conforms to the methodology proposed in the 1996 IPCC Guidelines, published in 1997. Accordingly, and with the aim of clearly illustrating GHG emissions trends, a review of the 1990 and 1994 inventories has been carried out applying the Revised 1996 IPCC methodology, and including all the subsectors in the Agriculture Sector, and Forestry.

This review does not include emissions from HFCs, PFCs and SF6, which have a small relative magnitude in terms of units of carbon equivalent. The consumption of HFCs, which are imported in their totality to be used as substitutes for ozone-depleting substances controlled by the Montreal Protocol, began practically after the 1990 and 1994 formulation of the inventories.

Total Emissions from Gas

Table 3.1 summarizes total emissions by gas and by source, such as they were presented in the First National Communication, and also the new figures for 1990 obtained from recalculating these emissions in accordance with the methodology proposed in the 1996 IPCC Guidelines. The same procedure is followed in Table 3.2 with regard to data for the year 1994.

Table 3.1. *Greenhouse Gas Inventory for the year 1990, by gas and by sector*

	Reported		Revised	
CO_2	**Gg**	**MTCE**	**Gg**	**MTCE**
Burning of fossil fuels	97402	26.56	90805	24.77
Venting of natural gas	NE	NE	4638	1.26
Limestone and dolomite use	1848	0.50	1790	0.49
Ammonia production	61	0.02	0*	0*
Calcium carbide production	31	0.01	90	0.02
Iron and steel industries	300	0.08	4219	1.15
Land-use Change and Forestry	NE	NE	-34891	-9.52
Net Total			**68694**	**18.19**
Total excluding Land-Use Change and Forestry	**99642**	**27.17**	**101585**	**27.71**
CH_4				
Stationary sources	0.8	0.00	2	0.01
Mobile sources	13.17	0.07	8.5	0.05
Coal mining	6.2	0.04	9.4	0.05
Oil and gas systems	357.9	2.05	458	2.62
Petrochemical industry	0.4	0.00	2.1	0.01
Enteric fermentation	22 98.5	13.16	2613.3	14.97
Manure management	52.8	0.30	103.6	0.59
Rice cultivation	7.9	0.05	19.6	0.1
Burning of agricultural residues	NE	NE	8.4	0.05
Land-Use Change and Forestry	NE	NE	26.3	0.15
Sanitary landfills	348.0	1.99	315.3	1.81
Waste water handling	9.1	0.05	80.8	0.46
Net Total			**3647.3**	**20.89**
Total excluding Land-Use Change and Forestry	**3094.6**	**17.72**	**3621.8**	**20.74**
N_2O				
Stationary sources	0.01	0.00	3.62	0.31
Mobile sources	0.62	0.05	0.84	0.07
Nitric acid	NE	NE	0.54	0.05
Manure management	NE	NE	0.47	0.04
Management of agricultural soils	NE	NE	168	14.20
Burning of agricultural residues	NE	NE	0.14	0.01
Human sewage	NE	NE	2.47	0.21
Total	0.63	0.05	176.08	14.89
HFC. PFC y SF6	NE	NE	NE	NE
Substitution of ozone-depleting substances	NE	NE	NE	NE
Aluminum Production	NE	NE	NE	NE
Consumption of halocarbons and SF6	NE	NE	NE	NE
Net Total Emissions				**53.97**
Total Emissions (excluding Forestry)		**44.95**		**63.32**

NE: not estimated
* Reported under 'Fuel Combustion Activities.

Table 3.2. *Greenhouse Gas Inventory for 1994, by gas and by sector*

	Reported		Revised	
CO_2	**Gg**	**MTCE**	**Gg**	**MTCE**
Burning of fossil fuels	109000	29.73	107567	29.34
Venting of natural gas	NE	NE	5729	1.56
Limestone and dolomite use	3175	0.87	2982	0.81
Ammonia production	61	0.02	0*	0*
Calcium carbide production	45	0.01	130	0.04
Iron and steel industries	312	0.09	3193	0.87
Land-Use Change and Forestry	NE	NE	-34891	-9.52
Net Total			**84712**	**23.10**
Total excluding Land-Use Change and Forestry	**112593**	**30.72**	**119601**	**32.62**
CH_4				
Stationary sources	0.8	0.00	2.6	0.01
Mobile sources	32.5	0.19	27.2	0.16
Coal mining	7.3	0.04	5.9	0.03
Oil and gas systems	434.4	2.49	553.6	3.17
Petrochemical industry	0.5	0.00	2.2	0.01
Enteric fermentation	2398.9	13.74	2743	15.71
Manure management	55.4	0.32	119.3	0.68
Rice cultivation	15.3	0.09	37.7	0.22
Burning of agricultural residues	NE	NE	6.5	0.04
Land-Use Change and Forestry	NE	NE	26.3	0.15
Sanitary landfills	532.8	3.05	573.8	3.29
Waste water handling	9.7	0.06	88.4	0.51
Net Total			**4185.7**	**23.98**
Total excluding Land-Use Change and Forestry	**3487.6**	**19.97**	**4159.4**	**23.83**
N_2O				
Stationary sources	0	0.00	3.57	0.30
Mobile sources	0.82	0.07	1.12	0.09
Nitric acid	NE	NE	0.57	0.05
Manure management	NE	NE	0.49	0.04
Management of agricultural soils	NE	NE	175.00	14.80
Burning of agricultural residues	NE	NE	0.11	0.01
Human Sewage	NE	NE	2.8	0.24
Total	**0.82**	**0.07**	**183.66**	**15.53**
HFC. PFC y SF6	NE	NE	NE	NE
Substitution of ozone-depleting substances	NE	NE	NE	NE
Aluminum production	NE	NE	NE	NE
Consumption of halocarbons and SF6	NE	NE	NE	NE
Total Net Emissions				**62.61**
Total Emissions (excluding Forestry)		**50.76**		**71.98**

NE: not estimated
* Reported under 'Fuel Combustion Activities'.

The most significant difference for both years corresponds to nitrous oxide emissions from the "Management of Agricultural Soils" subsector, which had not been reported in the First National Communication. Due to the changes incorporated in the methodology of the Revised 1996 IPCC Guidelines, these emissions have proved to be very significant in the case of Argentina, which has a very important agriculture and livestock production sector. For both years, these emissions account for approximately 75% of the difference between the figures in the previous inventory and the ones in the Revised version, measured in carbon equivalent units.

Other important differences may be found in the estimates of fugitive emissions, reported in further detail in the Revised Inventory, and also in the enteric fermentation emissions. Differences in the latter case result from the lower digestibility factors employed.

The following report contains a detailed account of the differences in the diverse sectors of the Inventory.

Energy

CO_2 Emissions by Sector

Table 3.3. *CO_2 Emissions (Gg).*

	1990		1994	
	Reported	**Revised**	**Reported**	**Revised**
Energy Industries	29.494	29.562	32.186	31.858
Industrial Processes	18.906	12.705	17.000	14.907
Transport	27.516	27.338	34.878	34.716
Commercial and Institutional	3.344	4.628	3.110	3.379
Residential	13.606	12.033	14.592	13.989
Agriculture and Livestock production	4.535	4.539	7.235	7.237
Fugitive emissions	0	4.638	0	5.730
Total	**97.402**	**95.486**	**109.001**	**111.816**

The Review of the 1990 Inventory results in figures for total CO_2 emissions that are lower by 2.1% than the ones obtained previously. The difference is due to the fact that the present review has incorporated data with a greater degree of disaggregation for consumption sectors and, in addition, some sources which should not have been taken into account in the original estimates have now been excluded.

The majority of the modifications in the 1990 Inventory correspond to the Industrial Processes sector, whose emissions in the Revised Inventory are 32.80% lower than in the original one, and to fugitive emissions, which had not been calculated previously for this GHG. The principal differences in the figures for emissions from the Industrial Processes sector may be attributed to the exclusion of emissions from petroleum coke, sed as raw material in the manufacture of non-energy products, and now reported under Industrial Processes. In addition, the consumption of diesel-oil and fuel-oil is substantively smaller than had been estimated previously for the 1990 and 1994 inventories.

The same kind of differences between the earlier version and the Revised Inventory may be appreciated in the case of the 1994 Inventory. However, in the budget, the inclusion of fugitive emissions prevails over the lower figures for emissions from the industrial use of energy.

CH_4 Emissions by Sector

In the case of methane emissions, the comparison between the revised 1990 and 1994 versions and the original ones, shows greater differences than in the case of CO_2 emissions, in terms of percentages. These differences are due mainly to fugitive emissions, for which there has been more accurate information, since new data from the Secretariat for Energy and the private sector have become available.

Table 3.4. *CH_4 Emissions (Gg).*

	1990		1994	
	Reported	**Revised**	**Reported**	**Revised**
Energy industries	0.15	0.22	0.16	0.20
Industrial Processes	0.40	1.02	0.38	1.38
Transport	12.39	7.84	31.26	31.36
Commercial and Institutional	0,07	0.10	0.07	0.08
Residential	0.18	0.67	0.22	0.94
Agriculture and Livestock Production	0.88	0.68	1.09	1.09
Fugitive Emissions	357.92	458.05	441.74	553.63
Total	**371.78**	**468.59**	**474.91**	**588.67**

N_2O Emissions by Sector

As in the case of methane emissions, N_2O emissions in the Revised Inventory are significantly greater than those originally reported for the 1990 and 1994 inventories.

Table 3.5. *N_2O Emissions (Gg).*

	1990		1994	
	National C.	**Review**	**National C.**	**Review**
Energy Industries	0.00	2.26	0.00	2.08
Industrial Processes	0.01	0.52	0.00	0.65
Transport	0.50	0.72	0.62	0.92
Commercial and Institutional	0.00	0.41	0.00	0.22
Residential	0.00	0.43	0.00	0.62
Agriculture and Livestock production	0.12	0.12	0.20	0.20
Fugitive emissions	0.00	0.00	0.00	0.00
Total	**0.63**	**4.46**	**0.82**	**4.69**

The modifications in N_2O emissions are due mainly to the incorporation in the Revised 1996 IPCC Guidelines, which include emission factors that were not previously available, to be applied specifically in the case of this GHG.

NO_x Emissions by Sector

In the case of NO_x, the revised emissions show a decline by comparison with the ones previously calculated for the year 1990, while showing an increase in the year 1994 (2,5%.). The reason for such differences is that the emission factors used in the Revised Inventory were the specific factors supplied by the National Regulatory Energy Board, and obtained from actual measurements in the chimneys of thermal electricity generating plants.

Table 3.6. *NO_x Emissions (Gg).*

	1990		1994	
	National C.	Review	National C.	Review
Energy Industries	97.53	57.57	110.34	62.55
Industrial Processes	76.23	26.58	24.68	32.86
Transport	258.21	299.40	323.27	371.60
Commercial and Institutional	2.61	4.03	2.52	2.93
Residential	8.47	10.61	10.36	12.90
Agriculture and Livestock production	92.82	92.85	148.05	148.00
Fugitive Emissions	0.00	3.33	0.00	3.83
Total	**535.87**	**494.37**	**619.22**	**634.67**

In the case of the Industrial Processes sector, the differences between the current revised version and the 1990 National Communication is due to the fact that the previous version of the inventory included consumption now accounted for within the Industry sector.

CO Emissions by Sector

As with methane emissions, the availability of more accurate information for the calculation of fugitive emissions has been responsible for the higher level of emissions in the Revised version, as compared with the original inventories. Likewise, the inclusion of new, specific emission factors contained in the Revised IPCC Manual, has resulted in an increment in estimated emissions, except in those corresponding to the transport sector.

Table 3.7. *CO Emissions (Gg).*

	1990		1994	
	National C.	Review	National C.	Review
Energy Industries	8.36	15.83	9.07	14.24
Industrial Processes	15.84	82.39	5.48	117.15
Transport	1,447.01	962.10	1,659.18	1,089.30
Commercial and Institutional	0.52	0.86	0.50	0.61
Residential	1.82	94.01	2.24	162.61
Agriculture and livestock production	37,12	37.14	55.20	59.22
Fugitive emissions	0.00	411.15	0.00	510.71
Total	**1,510.67**	**1,603.48**	**1,731.67**	**1,953.84**

NMVOC Emissions by Sector

NMVOC emissions exceed those calculated in the previous inventories, mainly because fugitive emissions have now been included in the revised version, and also because specific emission factors have been used in the new calculations.

Table 3.8. *NMVOC Emissions (Gg).*

	1990		1994	
	National C.	Review	National C.	Review
Energy industries	0.41	0.63	0.56	0.78
Industrial Processes	1.50	0.82	0.47	1.04
Transport	258.11	307.01	305.13	354.32
Commercial and Institutional	0.13	0.20	0.13	0.15
Residential	0.00	15.57	0.00	25.74
Agriculture and livestock production	14.23	14.24	22.70	22.70
Fugitive emissions	0.00	33.91	0.00	39.50
Total	**274.38**	**372.38**	**328.99**	**443.23**

Mobile sources

The same emission factors as those used in 1997 were used for each subsector, varying in accordance with the type of fuel. Generally speaking, there are no significant differences in the total values. Only CO total emissions evidence important differences, which is explainable in terms of the different emission factors used in each case.

Table 3.9. *CO_2 Emissions (Gg.).*

Reported		
Subsector	**1990**	**1994**
Civil Aviation	1.365	1.463
Road Transportation	25.477	32.884
Railway	616	474
Navigation	58	61
Agriculture Forestry	4.535	7.235
Total	**32.051**	**42.113**

Revised		
Subsector	**1990**	**1994**
Civil Aviation	1.352	1.451
Road Transportation	25.352	32.716
Railway	626	477
Navigation	58	61
Agriculture Forestry	4.539	7.237
Total	**31.920**	**41.942**

Table 3.10. *CH_4 Emissions (Gg.).*

Reported		
Subsector	**1990**	**1994**
Civil Aviation	0.10	0.10
Road Transportation	12.25	31.13
Railway	0.04	0.03
Navigation	n/d	n/d
Agriculture-Forestry	0.68	1.09
Total	**13.07**	**32.34**

Revised		
Subsector	**1990**	**1994**
Civil Aviation	0.04	0.10
Road Transportation	7.75	25.96
Railway	0.05	0.04
Navigation	0,01	0.01
Agriculture-Forestry	0.68	1.09
Total	**8.52**	**27.14**

Table 3.11. *N_2O Emissions (Gg.).*

Reported		
Subsector	**1990**	**1994**
Civil Aviation	0.000	0.000
Road Transportation	0.480	0.610
Railway	0.020	0.010
Navigation	N/d	n/d
Agriculture-Forestry	0.110	0.190
Total	**0.620**	**0.820**

Revised		
Subsector	**1990**	**1994**
Civil Aviation	0.000	0.000
Road Transportation	0.702	0.908
Railway	0.017	0.010
Navigation	n/d	N/d
Agriculture-Forestry	0.124	0.197
Total	**0.842**	**1.115**

Table 3.12. *CO Emissions CO (Gg.).*

Reported		
Subsector	**1990**	**1994**
Civil Aviation	5.66	5.83
Road Transportation	1435.83	1649.02
Railway	5.12	3.94
Navigation	0.40	0.40
Agriculture-Forestry	37.13	59.22
Total	**1484.14**	**1718.41**

Revised		
Subsector	**1990**	**1994**
Civil Aviation	2.29	2.46
Road Transportation	954.54	1082.73
Railway	5.12	3.97
Navigation	0.14	0,14
Agriculture-Forestry	37.14	59.22
Total	**999.24**	**1148.52**

Table 3.13. *COVDM Emissions (Gg.).*

Reported		
Subsector	**1990**	**1994**
Civil Aviation	0.85	0.88
Road Transportation	256.08	295.76
Railway	1.09	8.40
Navigation	0.09	0.09
Agriculture-Forestry	14.23	22.70
Total	**272.34**	**327.83**

Revised		
Subsector	**1990**	**1994**
Civil Aviation	0.34	0.37
Road Transportation	305.54	352.07
Railway	1.09	0.85
Navigation	0.04	0.04
Agriculture-Forestry	14.24	22.70
Total	**321.25**	**377.02**

Table 3.14. *NO_x Emissions (Gg.).*

Reported		
Subsector	**1990**	**1994**
Civil Aviation	13.68	14.08
Road Transportation	228.15	296.3
Railway	15.12	11.63
Navigation	1.26	1.26
Agriculture-Forestry	92.82	148.05
Total	**351.03**	**471.32**

Revised		
Subsector	**1990**	**1994**
Civil Aviation	5.54	5.95
Road Transportation	277.30	352.48
Railway	15.12	11.70
Navigation	1.44	1.44
Agriculture-Forestry	92.85	148.05
Total	**392.25**	**519.61**

Industrial processes

Cement manufacture

CO_2 emissions data for the 1990 and 1994 inventories, reported in the National Communication, were obtained from activity data for cement production. The Argentine Chamber of Portland Cement Production supplied data on clinker production which contributed, together with the revised IPCC methodology (IPCC, 1996), to a more accurate calculation of CO_2 emissions. These data, as well as the corresponding emissions, are presented in Table 3.15.

Table 3.15.

YEAR	Clinker Production (t)	Revised CO_2 Emissions (Gg)	Reported CO_2 Emissions (Gg)
1990	3,528,948	1.790	1.800
1994	5,852,579	2.968	3.144

The difference is due to the utilization of clinker production instead of cement production.

Lime manufacture

The data used in the formulation of the 1997 inventory were taken from the database that the Secretariat for Mining started to compile that same year, contributing to the implementation of a disaggregate assessment of this activity. However, this type of information was not available for the years 1990 and 1994.

There are substantial differences between the activity data for this sector reported in the National Communication (61,330 and 40,000 ton) and the data reported for the year 1997 (1,360,742 ton). The production of limestone and dolomite increased by 60% and 200% respectively, between 1990 and 1997, which does not suffice to account for such a significant difference as the one shown in statistical records. This seems to point to an underestimation in the activity data for the sector reported in the 1990 and 1994 inventories. Consequently, due to the lack of availability of adequate data for the revised version, emissions from this sector have not been included in the present inventory.

Limestone and dolomite use in glass manufacturing

Table 3.16 presents emissions corresponding to the year 1994 (there is no available information for the year 1990).

Table 3.16. *CO_2 emissions from the use of lime in glass manufacturing.*

YEAR	Amount of glass produced (t)	Revised CO_2 (Gg)	Reported CO_2 (Gg)
1990	N/D	N/D	N/D
1994	137.843	14	N/D

Ammonia production

The same ammonia production statistics were used. Emissions of CO_2, on the other hand, proved to be more significant, due to the fact that calculations were based on the methodology recommended in the Revised IPCC Guidelines, which suggest that all the carbon absorbed as methane is released as CO_2. This implied the utilization of an emission factor of 1.2 kg/t,, higher than the one used in 1990 and 1994, which resulted in higher emissions. Anyway, in this review, emissions from fuels are accounted for within the Energy sector. With regard to methane, the emissions reported by local plants for the year 1994 have been included.

Table 3.17. *CO_2 and methane emissions from ammonia production.*

YEAR	Ammonia Production (Ton/year)	CO_2 Emissions (Gg)	Methane Emissions (Gg)
1990 Review	88002	(106) 0	N/D
1990 Reported	88022	60.7	N/D
1994 Review	89256	(107) 0	0.24
1994 Reported	89256	61.3	N/D

Nitric acid production

The Petrochemical Institute (API, 1998) has kept a record of the local nitric acid production at least since 1988. The review of the nitric acid production module shows that no production of this compound was reported in the 1990 and 1994 inventories, and consequently, N_2O and NO_x emissions were nil. Table 3.18 shows the emissions corresponding to the review.

Table 3.18

YEAR	Nitric acid production (Ton/year)	N_2O Emissions (Gg)	NO_x Emissions (Gg)
1990 review	28200	536	564
1990 Reported	0	0	0
1994 review	30051	571	601
1994 Reported	0	0	0

Petrochemical industry

In the 1997 inventory, the following products, which had not been accounted for in previous inventories, were incorporated: maleic anhydride, aromatics, nylon 6 and 66 fiber and yarn, polyester fiber, and methanol. Butadiene was not included, since its production was discontinued as from 1994. The production data for the other substances reported in the three inventories coincide, and they were taken from the 18th edition of the "Información Estadística de la Industria Petroquímica y Química de la Argentina (IPA, 1998)"/Statistical Information for the Petrochemical and Chemical Industry in Argentina (IPA, 1998) (Table 3.19).

Table 3.19. *Production data for petrochemical products.*

Product	Production (ton)			
	1990 review	1990 Reported	1994 review	1994 Reported
Phtalic Anhydride	18068	18068	25290	25290
Maleic Anhydride	5658	N/D	14500	N/D
Aromatics	384419	N/D	368739	N/D
Styrene-butadiene Rubber-SBR	56700	56700	46449	46449
Vynil Chloride – VCM	160546	160546	109489	109489
Ethylene Dichloride	236000	236000	169000	169000
Styrene	71300	71300	84920	84920
Ethtylbenzene	93000	93000	96200	96200
Ethylene	286444	286444	268686	268686
Nylon 6 and 66 fiber and yarn	21270	N/D	25390	N/D
Polyester fibers	N/D	N/D	16900	N/D
Formaldehyde	31613	31613	44448	44448
Styrene-Butadiene Latices	10000	10000	7700	7700
Methanol	45781	N/D	69773	N/D
Carbon black	39943	36683	42465	42465
Polyvinylchloride - PVC	104543	104543	90962	90962
Polystyrene	34298	34298	62900	62900
High-density Polyethylene- HDPE	52805	52805	80921	80921
Low-density Polyethylene – LDPE	174607	174607	165674	165674
Polypropylene	55700	55700	144323	144323
Propylene	96996	96996	194000	194000
ABS Resins	8350	8350	6800	6800
Urea	110000	110000	97824	97824

Methane Emissions

The differences that may be observed in Table 3.20 are due to the following: a) the IPCC has recently published emission factors for ethylene dichloride, styrene and methanol, which were not available at the time when the 1990 and 1994 inventories were developed; b) the emission factor for carbon black was taken from EPA; c) the difference in the data for formaldehyde in the 1990 inventory is due to a typing mistake and d) in the case of ethylene, the emission factor was taken from IPA.

Table 3.20. *CH_4 Emissions from the petrochemical industry.*

Product	FECH$_4$ (kg/ton)	CH$_4$ Emissions (Gg)			
		1990 review	1990 Reported	1994 review	1994 Reported
Ethylene dichloride	0.4[3]	94.4		67.6	
Styrene	4[3]	285.2		339.7	
Ethylene	2.2[4]	630.2	0.6	591.1	0.6
Formaldehyde	0.31[1]	9.8	4.1	13. 8	13.8
Methanol	2[3]	91.6		139.6	
Carbon Black	25[2]	998.6	376.4	1061.6	435.7
Polysterene	0.01[1]	0.3	0.3	0.6	0.6
Propylene	0.023[1]	2.2	2.2	4.5	4.5
TOTAL		**2112.3**	**383.1**	**2218.4**	**455.1**

Sources: [1] UNEP-SECYT, 1997; [2] EPA, 1995; [3] IPCC, 1996b; Instituto Petroquímico Argentino (1999).

NMVOC Emissions

The differences shown in Table 3.21 are due to the utilization of emission factors recently published by EPA and the IPCC, which were not available when the 1990 and 1994 inventories were developed. Such is the case of the emission factors for phtalic anhydride, maleic anhydride, styrene, ethylbenzene, ethylene, nylon fibers, polyester fibers, styrene-butadiene rubber, carbon black, polysterene, polyvinylchloride, polypropylene and propylene. The production of butadiene was discontinued in 1994.

Table 3.21. *NMVOC Emissions.*

Product	FECOVDM (kg/ton)	NMVOC emissions (ton)			
		1990 review	1990 Reported	1994 review	1994 Reported
Phtalic Anhydride	7.5[2]	135.5	82	189.7	114.8
Maleic Anhydride	87[2]	492.3	N/D	1261.5	N/D
Butadiene	23.26[1]	888.5	888.5	0	0
Styrene-Butadiene Rubber -SBR	2.89[1]	163.9	163.86	134.2	134.2
Vinyl Chloride – VCM	2.95[1]	473.6	473.61	323	323
Ethylene Dichloride	3.95[1]	932.2	932.2	667.6	667.6
Styrene	18[3]	1283.4	1.43	1528.56	1.7
Ethylbenzene	2[3]	186	94.9	192.40	98.1
Ethylene	1.4[3]	401.0	300.8	376.16	282.1
Nylon 6 and 66 fibers	2.44[2]	51.9	N/D	61.95	N/D
Polyester fibers	0.05[2]	N/D	N/D	0.85	N/D
Formaldehide	6.95[1]	219.7	219.7	308.9	308.9
Styrene-butadiene Latices	14.34[2]	143.4	76.6	110.4	59
Carbon black	47.2[2]	1885.3	1294	2004.4	1498
Polyvinylchloride- PVC	8.5[3]	888.6	805.3	773.2	701.3
Polystyrene	3.34[2]	114.6	54.2	210.1	99.4
High-density Polyethylene- HDPE	30.14[1]	1591.5	1591.5	2438.9	2438.9
Low-density Polyethylene – LDPE	29.93[1]	5226	5226	4958.6	4958.6
Polypropylene	12[3]	668.40	17.8	1731.9	46.2
Propylene	1.4[3]	135.79	41.7	271.6	83.4
ABS Resins	40.82[1]	340.8	340.8	277.6	277.6
Total		**15333.9**	**12645.9**	**17821.5**	**12092.8**

Sources: [1] UNDP-SECYT, 1997; [2] EPA, 1995; [3] IPCC, 1996b.

CO and SO_2 Emissions

Neither CO nor SO_2 emissions were reported in the 1990 and 1994 inventories. The emission figures for these gases included in the present review correspond to the production of phtalic anhydride (Table 3.22).

Table 3.22. *CO and SO_2 emissions.*

	FE (Kg/Ton) review	1990 Reported	1990 review	1994 Reported	1994
CO (Ton)	283[3]	5113.24	N/D	7157.1	N/D
SO_2 (Ton)	18.8[3]	339.67	N/D	475.45	N/D

Sources: [3] IPCC, 1996b

Metal production

Iron, Steel and Ferroalloy Production

This is the subsector that marks the most significant difference between the 1990 and 1994 inventories reported in the National Communication, and the review carried out for the Industrial Processes Sector, since in the former case, emissions from coke used as a reducing agent were accounted for in the energy sector, whereas in the latest inventory, and based on the new methodology developed by the IPCC (1996), they were included within the Industrial Processes sector.

The consumption data for coke used as a reducing agent were taken from the Argentine Institute of Metallurgy (IAS, 1999). The values included in this review, like those included in the 1997 inventory, are those reported by local plants. These figures, together with those corresponding to CO_2 emissions, are shown in Table 3.23.

Table 3.23. *Consumption of petroleum coke and coal coke used as reducing agents in blast furnaces. CO_2 emissions from utilization of reducing agents. Comparison with the figures presented in the 90/94 inventories.*

	Annual Consumption of reducing agent (ton)		Emission Factor ton CO_2/ton reducing agent	CO^2 Emissions (Gg)	
	1990	1994		1990	1994
Coal Residue	191.000	274.800	3.6	688	986
Coal Coke	1.042.100	611.000	3.1	3.231	1.894
			Revised Total	**3.918**	**2.881**
			Reported Total	**0.065**	**0.059**

CO_2 emissions from ferroalloy production were accounted for together with those of iron and steel, since information to distinguish the amount of reducing agent employed in this industry was not available.

This analysis does not account for carbon derived from scrap iron and coal feedstocks for electric furnaces, from the carbon electrodes consumed in the said furnaces, and from ferroalloys, which in any case, would represent only a slight amendment to the reported values.

Data for NO_x, NMVOCs, CO and SO_2 emissions derived from the lamination process were calculated on the basis of steel production and using the 1996 IPCC emission factors. The activity data (steel production) included in the earlier 1990 and 1994 inventories were not modified, so that the difference in emission figures results from the different emission factors employed.

Table 3.24. *NO_x, NMVOCs and CO emissions from iron and steel production.*

Amount of steel produced (t)		Emission Factor (g of gas/t of steel produced)	Emission (Gg)	Emission reported inventory 90/94 (Gg)[1]	
1990	3.636.000	NOx	40	0.15	N/D
		NMVOC	30	0.11	1.17
		CO	1	0.01	0.83
1994	3.289.200	NOx	40	0.13	N/D
		NMVOC	30	0.09	0.70
		CO	1	0.01	0.53

[1] corresponds to the sum of items "steel production" and "metallurgic coke ".

Aluminum production

For the 1990 and 1994 inventories included in the National Communication, the calculations for the emissions from this industry were based on plant-specific emission factors taken from the only aluminum-producing plant in Argentina. The calculation of CO_2 emissions was based on the 1996 IPCC Guidelines and, consequently, no corrections were made to the values for these emissions, which amounted to 300 Gg in 1990, and 312 Gg in 1994. Emissions of CF_4 and C_2F2_6 for 1990 and 1994 were not reported.

As for CO and NO_x emissions, the emission factors supplied by domestic producers differ from those recommended by the IPCC, i.e., 135 and 2.15 kg of gas per ton of aluminum produced, respectively. Table 3.25 presents the emissions corresponding to these gases as they were previously reported, and the revised figures based on the IPCC emission factors.

Table 3.25. *CO and NO_x emissions from aluminum production*

		NOx		CO	
	Amount of aluminum produced (t)	Review (Gg)	Reported (Gg)	Review (Gg)	Reported (Gg)
1990	166.000	0.36	0.12	22.41	4.65
1994	708.820	1.52	0.12	95.69	4.25

Food production

The inventory reported in the National Communication for the years 1990 and 1994 includes values for beer, wine, whisky and bread production. The activity data for the first two items were verified, while no data were obtained on this occasion for whisky and bread. On the other hand, the review includes data on sugar production. The emission factors used in the review are those contained in the 1996 IPCC, although they do not always coincide with the ones used in the first report. Activity and emission data are reported in Table 3.26.

Table 3.26. *NMVOC emissions from food production.*

Year 1990	Production	Revised NMVOC emissions (Gg)	Reported NMVOC emissions (Gg)
Sugar	1,069,591 t	10.70	Not reported
Wine	1,713,100 hl(1)	0.14	0.98
Beer	6,170,000 hl(1)	0.22	0.15
Bread	N/D	N/D	2.09
Whisky	N/D	N/D	1.37
	TOTAL	**11.06**	**4.59**

Year 1994	Production	Revised NMVOC emissions (Gg)	Reported NMVOC emissions (Gg)
Sugar	1,110,344 t	11.10	Not reported
Wine	1,417,900 hl(1)	0.11	0.81
Beer	11,272,000 hl(1)	0.39	0.27
Bread	N/D	N/D	2.25
Whisky	N/D	N/D	1.86
	TOTAL	**11.6**	**5.19**

(1) This information corresponds to sales.

Calcium carbide

The activity data for calcium carbide manufacture for the year 1990 coincides with the data reported in the National Communication. No production data were available for the year 1994. In the absence of such data, emissions corresponding to the year 1993, which had been verified, were used in the former case, and have been used again in the present review, applying the emission factors supplied in the 1996 IPCC Guidelines, Table 3.27.

Table 3.27. *CaC_2 production values and CO_2 emissions.*

	CaC_2 Production	Revised CO_2 emissions (Gg)	Reported CO_2 emissions (Gg)
1990	41,321 t	90	31
1993(1)	59,550	130	45

(1) This information is used in the absence of data for the year 1994.

Agriculture and Livestock Production

The 1990 and 1994 inventories for the Livestock Production Sector were recalculated, applying the IPCC Guidelines (Revised 1996 IPCC Guidelines - IPCC/UNEP/OECD/IEA 1997), which include the methodology to estimate nitrous oxide emissions.

Livestock production

The revision of methane emissions was based on the digestibility of bovine cattle diets. Having found that the digestibility of the diets had been overestimated in the initial inventories, methane emissions from enteric fermentation for those years were re–calculated using the same digestibility values as those used for 1997.

ANIMAL TYPE	Digestibility of the diet	
	First Nat. Com.	Review
Dairy cattle	70%	65%
Non-dairy cattle		
– Breeding	65%	60%
– Fattening	65%	55%

In the First National Communication, methane emissions from manure management of swine kept in confined conditions were estimated on the basis of systems promoting aerobic conditions, while anaerobic conditions should have been considered (according to the treatment in anaerobic lagoons).

Table 3.28 shows the estimates for methane and nitrous oxide emissions for the years 1990 and 1994, as reported in the First National Communication and in the current one.

Table 3.28. *Methane and nitrous oxide emission estimates (Gg).*

EMISSIONS	1990		1994	
	Reported	Revised	Reported	Revised
Methane				
– Enteric Fermentation	2298.5	2613.3	2398.9	2743
– Manure management	52.8	103.6	55.4	119.3
Nitrous Oxide				
– Manure management	NE	1	NE	1

NE : Not estimated

Rice cultivation

Table 3.29 presents the compared methane emissions from rice cultivation.

Table 3. 29. *Methane emissions from rice cultivation (Gg).*

Reported		Revised	
1990	1994	1990	1994
7.90	19.6	15.3	37.7

The new inventory shows higher methane emissions from rice cultivation for the 1990/91 campaign than the previous ones. These differences are due to the utilization of different calculation methods. In the first inventory, the methodology used was the one recommended in the 1995 IPCC Reference Manual, which consists in applying an emission coefficient range to the area cultivated daily (for instance, multiplying the annual cultivated area by the number of days of flooding), to obtain an annual emission factor for CH_4.

In the new inventory, on the other hand, the methodology recommended in the Revised 1996 IPCC Reference Manual was applied. This methodology simply applies a global emission factor to the whole growing season.

Agricultural soil management

This subsector was not reported in the National Communication. The values included in the review are reported in tables 3.30, 3.31 and 3.32

Table 3.30. *Nitrous oxide emissions from agricultural soils due to animal grazing (Gg/year).*

FIND OF EMISSION	1990	1994
Direct	83	86
Indirect	41	42
TOTAL	**124**	**128**

The estimation of the nitrous oxide emissions from livestock production within the Agricultural Soil Management subsector constitutes the greatest difference in the whole inventory, in terms of carbon equivalent, between the values reported in the First National Communication and those reported in the revised version.

Table 3.31. *Direct N_2O emissions from agricultural practices (Gg).*

	N_2O Gg/year	
	90	94
Commercial Fertilizers	2	5
Nitrogen fixation	24	20
Agricultural crops	17	16
Pastures	7	4
Consociated Pastures *	12	15
Incorporation of crop residues	17	18
Agricultural	13	15
Pastures	3	3
TOTAL	**42**	**43**

* The emissions from consociated pastures were reported for informational purposes only, but they are not included in the inventory totals.

Table 3.32. *Indirect N_2O Emissions (Gg).*

	1990	1994
Volatilization and Atmospheric deposition		
Commercial Fertilizers	0,1	0,5
Surface runoff and leaching		
Commercial Fertilizers	1,0	3,4
TOTAL	**1,1**	**3,9**

Burning of agricultural residues

Data for this subsector were not reported in the National Communication. The values included in the review are reported in Table 3.33.

Table 3.33. *Emissions from the burning of agricultural residues (Gg).*

	1990	1994
CH_4	**8.4**	**6.5**
Cotton	0.4	0.3
Sugar cane	5.7	4.7
Linseed	1.2	0.3
Wheat	1.1	1.1
N_2O	**0.1**	**0.1**
Cotton	0.0	0.0
Sugar cane	0,1	0,1
Linseed	0.0	+
Wheat	0.0	0.0
NO_X	**5.1**	**4.2**
Cotton	0.2	0.2
Sugar cane	3.4	3.0
Linseed	0.7	0.2
Wheat	0.7	0.7
CO	**176.0**	**137.1**
Cotton	8.2	6.3
Sugar cane	119.3	98.6
Linseed	25.4	5.9
Wheat	22.9	22.2

+ does not exceed 0,01 Gg

LAND-USE CHANGE AND FORESTRY

No data for this sector were reported in the National Communication. The values included in the review are reported in tables 3.34, 3.35, 3.36 and 3.36 and 3.37.

Table 3.34. *Carbon budget corresponding to the sub-module Managed Forests (Changes in forest and other woody biomass) 1989-1994.*

	Uptake	Emission Tg/year	Net Flux
Subtropical Rain Forests			
Plantations	3.58	0.62	-2.96
Eastern Chaco Forests	0.07	0.24	0.18
Misiones Rain Forest	0.12	0.18	0.06
'Yungas'	0.07	0.03	-0.04
Subtotal	3.84	1.07	-2.76
Subtropical Dry Forests			
Plantations	0.01	0.00	0.00
Western Chaco Forests	0.44	0.83	0.39
Subtotal	0.44	0.83	0.39
Moist Temperate Forests			
Plantations	1.88	0.56	-1.32
Mixed *Nothofagus*	0.00	0.01	0.00
Lenga forests	0.07	0.03	-0.04
Antarctic beech (Ñire) forests	0.02	0.02	-0.00
Cypress forests	0.01	0.01	0.00
Subtotal	1.98	0.63	-1.35
Dry Temperate			
Plantations	0.54	0.05	-0.49
Subtotal	0.54	0.05	-0.49
Subtotal native forests	**0.79**	**1.36**	**0.57**
Subtotal plantations	**6.00**	**1.22**	**-4.77**
Total	**6.79**	**2.59**	**-4.21**

Table 3.35. *Carbon Budget corresponding to the sub-module Conversion of forests to agricultural use or pastures 1989-1994 Inventory.*

	Tg/year
Subtropical Rain Forestz	
Eastern Chaco Forests	0.48
Misiones Rain Forest	0.30
'Yungas'	0.94
Subtotal	1.72
Subtropical Dry	
Western Chaco Forests	0.91
Total	2.68

Table 3.36. *Carbon Budget corresponding to the sub-module Abandonment of croplands and pastures. 1989-1994 Inventory.*

	Uptake Tg/ year
Subtropical Rain Forest	
Eastern Chaco forests	2.48
Misiones Rain Forest	2.39
Subtotal	4.87
Subtropical Dry	
Western Chaco Forests	3.07
Subtotal	3.07
Total	**7.93**

Table 3.37. *Contribution of Human Activities in Forest Lands in Argentina to the Atmospheric Carbon Dioxide Budget. 1989-1994. Tg/Year.*

	Managed Forests	Conversion of Forests	Land Abandonment	Budget
Subtropical Rain Forest	-2.76	1.72	-4.87	-5.91
Subtropical Dry	0.39	0.91	-3.06	-1.72
Moist Temperate	-1.35	0	0	-1.35
Dry Temperate	-0.49	0	0	-0.49
Total	-4.22	2.63	-7.93	-9.52

Other gases

Emissions from other greenhouse gases other than CO_2 originate in the conversion of forests to agriculture.

Table 3.38. *Emissions of GHGs other than CO_2 (in Gg).*

	CH_4	NO_x	CO
1989–94	26	7	231

Waste

The estimated results for total CH_4 emissions for the years 1990 and 1994 included in the National Communication proved to be smaller than those included in the present report (Table 3.39). The most significant difference appears in the emissions originating in municipal wastewater, as a consequence of the inclusion of industrial wastewater. In the case of domestic wastewater, the values climbed from 9 Gg to 32.5 Gg for the year 1990, and from 9.7 Gg to 34.7 Gg for the year 1994. This difference was due to the fact that, in the calculations presented in the First National Communication, the fraction of waste treated anaerobically was estimated using the IPCC default value (10%). The value used in the review was 39.8%, which represents the percentage of the country's population with sewage. (1991 National Population and Housing Census; INDEC 1998).

Table 3.39. *Total methane and nitrous oxide Emissions Gg).*

Methane	Reported		Review	
Source	**1990**	**1994**	**1990**	**1994**
Solid Waste	348	533	396	574
Wastewater	9	10	81	89
Nitrous Oxide				
Human wastes	NE	NE	3	3

In the case of emissions from industrial wastewater, for the present report information was available on the industrial production for the years 1990 and 1994 which had not been published at the moment of developing the initial inventories.

In the review, the estimated emissions from solid waste were higher than those in the previous inventory, but the differences were comparatively smaller than those found in wastewater, especially for 1990. This was due to the fact that waste values for the provinces proved to be actually higher that the ones that had been considered for the First National Communication. The information utilized in that Communication was derived from data reported by the agencies in charge of waste management in some cities in the provinces where data could be obtained. The calculations for the present review, on the other hand, were based on the totality of the urban population of the country. In both cases, calculations were based on the 1996 IPCC default values.

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4. PROJECTION OF EMISSIONS UP TO THE PERIOD 2008–2012

Argentina's proposal to define its greenhouse gas emission targets is aimed at achieving, within a framework of sustainable development, the reduction of the growth rates of GHG emissions below the one that would have resulted in the absence of mitigation measures. The commitment period for the target is the one comprised between the years 2008 and 2012 —the same that applies to Annex B parties under the Kyoto Protocol— as was announced in President Menem's address to COP 4 participants.

The GHG emissions baseline is closely related to the baseline for activities responsible for these emissions. In the case of Argentina, these activity levels—excluding the Agriculture and Livestock Production Sector, as is explained hereinafter— are, in turn, strongly influenced by the macro–economic scenario. Consequently, the analysis of the emission target has included the following steps:

1) Development of macro–economic scenarios up to the year 2012,
2) Development of baseline scenarios for activities responsible for GHG emissions and
3) Projection of the corresponding emissions and analysis of the possible mitigation options for such emissions.

The prospective calculation of emissions requires not only the projection of the activity level of emitting sectors but also a thorough and as–updated–as–possible knowledge of the structure of emissions by source, by gas and by sector, as well as of its evolution in the recent past. This was the purpose of the 1997 Greenhouse Gas Inventory, and of the updating and reviewing of the 1990 and 1994 inventories, whose results are reported in the second and third chapters of this Communication.

Macro-economic projections

Three of the most prestigious scientific centers, conspicuous for their projections related to Argentina's economy, and each of them associated with different ideologies, were commissioned to carry out studies to define the above-mentioned target. Both characteristics were considered a *sine qua non* condition for the target to be regarded seriously, both at a domestic and an international level. This work constituted a true landmark, since it was the first time that such long-term projections were formulated in Argentina, and more importantly, that they were done to contribute to the implementation of environmental policies.

The selected centers were the CEMA University, the Foundation for Economic Latin American Research (FIEL), and the Latin American Faculty of Social Science (FLACSO). Due to the great uncertainty implied in the projections of economic growth for a developing country such as Argentina, each of the studies develop three different scenarios: a medium scenario and two alternative –high and low*– scenarios The macro-economic projections included economic evolution parameters of the international economy, basically: Gross Domestic Product (GDP) growth rates for countries with which Argentina is commercially related, prices, exchange rates and international rates of interest. As regards Argentina's economy, the following five types of indicators were considered: 1) Total and per capita GDP at market price; 2) Macro-economic aggregates: Consumption, Investment, Exports and Imports; 3) Sectoral GDP (one or more digits with the Uniform International Industrial Classification, UIUC); 4) Prices, Exchange Rate, Rates of Interest and 5) Evolution of the labor market.

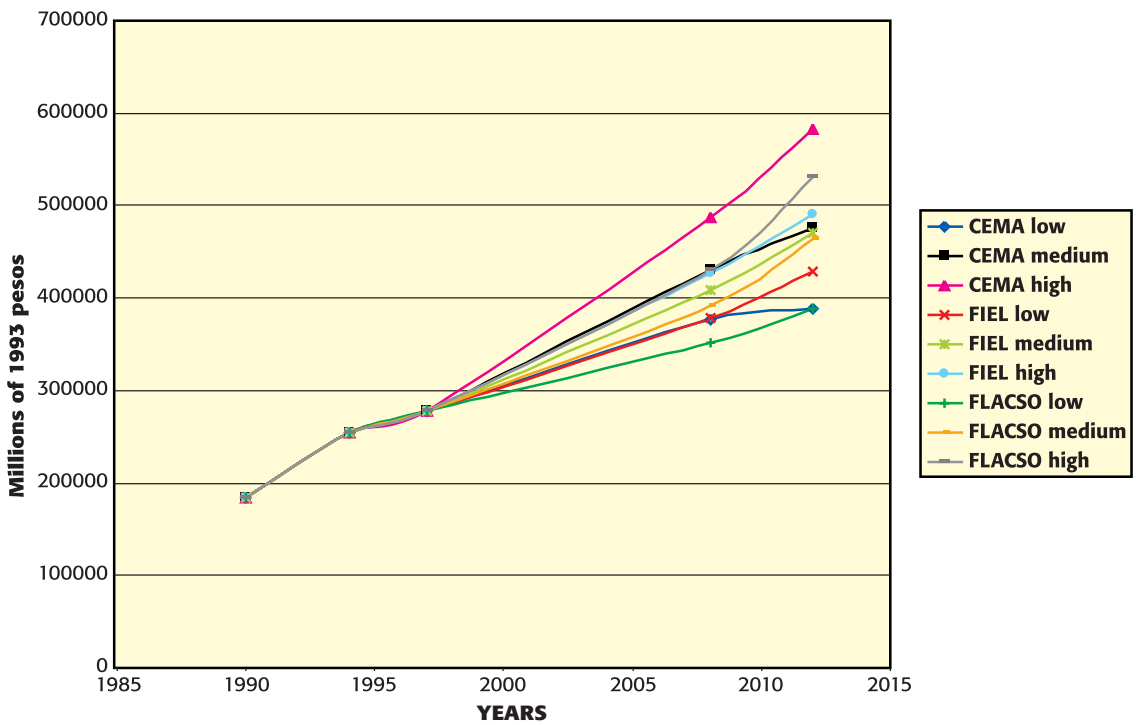
* The Fundación Mediterránea was also commissioned to perform an analysis. The projection of the medium-growth scenario coincided with the one of the other three foundations. But, given that this study was submitted after the established deadline, the scenarios were not included in the final calculations.

To achieve the same objective, each of the institutions utilized the methodology they considered the most adequate. This led to the desired results in terms of diversity. For instance, CEMA made a "bottom-up" analysis and, based on the sectoral evolution of GDP, it arrived at the aggregate GDP, whereas FLACSO chose the opposite procedure and projected the aggregate GDP based on the basic macro-economic equality under which PBI = Consumption + Investment + Exports + Imports, and having calculated this, it made projections for each sector. Although a general balance computable model is not available for Argentine economy, each of the studies was based, in one way or another, on a consistent system of equations that is a very simple approximation to this type of scheme. In all cases, the key coefficients were econometrically estimated. In each of this type the three models, the different scenarios were projected on the basis of different hypotheses regarding the evolution of the exogenous variables.

The results thus obtained supplied a range of possible evolutions (projected on an annual basis, in every case) of the Argentine economy from 1997 until 2012 (Figure 4.1). However, due notice should be paid to the similitude among the medium scenarios, whose average GDP growth rate (1999-2012) shows a close likeness reflected in the 3.7 percent obtained by CEMA, 3.6 percent obtained by FIEL, and 3.7 percent by FLACSO. For the purpose of defining the target, the medium scenario considered was that of FIEL (3.6% of average GDP growth); CEMA's was taken as the lowest scenario, with 2.2% of average GDP growth (practically the same as FLACSO's low scenario), and the highest scenario was that projected by CEMA, reflecting 5.2% average GDP growth. Together with the sectoral studies mentioned these three scenarios (low, medium and high) constituted the basis for the projection of the "Business-as-usual" (BAU) scenario to determine the target.

The selected scenarios of maximum and minimum growth imply accumulative rates which, although unlikely, are not altogether impossible, bearing in mind that in the past two decades, Argentina's economy has gone through a long period of stagnation, followed by another of sustained growth that now seems to have become exhausted as a result of the exogenous recessive effects contributing to the weakening of its economy's growth factors. These negative-positive variations have been the consequence of domestic policies, of profound structural reforms which contributed to the reversion of the previous recession cycle, and of the transmission of external factors that the opening up of the country's economy helps to potentiate.

Figure 4.1. *GFP Evolution.*



Sectoral Analyses

As has been evidenced in the 1990 and 1994 inventories, and verified in the 1997 Inventory, that GHG emissions originate mainly in the energy sector (including transport) and the Agriculture and Livestock Production. Consequently, the most detailed sectoral analyses have been done for the energy, transport, and agriculture and livestock sectors. The Waste Management sector was considered in less detail, partly on account of its lower degree of complexity. A projection of future HFC emissions was also developed based on surveys conducted in the private sector. Emission projections for the other sectors were formulated on the basis of sectoral projections included in the macro-economic studies.

The LEAP simulation model was used in the energy and transport sectors, and both macro-economic projections, and projections of stocks and exports supplied by the Secretariat for Energy were taken into account. In all cases, the base scenarios contemplate an enhanced efficiency derived from the incorporation of the most adequate technologies as a result of the market forces. Thus, for electricity generation, it is assumed that the new generating equipment or the replacements due to obsolescence will utilize mainly natural gas with a combined cycle. Furthermore, in some cases such as transport, the emission scenarios have been calculated taking into account some technological improvements expected to be incorporated before or during the projection period.

The Argentine Agriculture and Livestock sector shows little flexibility with respect to macro-economic development. Its evolution is mainly linked to international prices and conditions. Bovine cattle are responsible for the bulk of emissions from this sector. There are diverging opinions regarding the future of Argentine livestock production, given the new status of the country free from foot-and-mouth disease, which makes future projections more uncertain. For this reason, and to be able to count upon results that allow the assessment of uncertainty associated with future emissions from the sector, three scenarios of livestock production development have been designed, one of them considered as the most likely, and another two (maximum and minimum), determined by the most extreme possible prices for livestock. In addition, the highest included a favorable scenario for the Agriculture sector, which mitigated, to some extent, the advance of livestock production.

The OECD model, adapted to Argentina, was used in the simulation of the Agriculture and Livestock sector as a whole. This model uses agriculture and livestock-related prices and the levels of efficiency of the production systems. A distinctive characteristic of the Argentine Agriculture and Livestock sector is its rapid response to prices, fundamentally to international ones. This leads to a significant portion of the lands with an agricultural potential to be used alternately in agricultural or livestock-producing activities. The model that has been used makes it possible to simulate this competition between agriculture and livestock production, for which reason, although emissions are higher in scenarios with high prices for cattle, there is a certain compensation due to more reduced emissions from agriculture. In any case, given the importance of the livestock production sector as a GHG emission source in Argentina, the different possible livestock production scenarios contribute an additional quota of uncertainty regarding future GHG emissions.

In the Solid Waste Management Sector, a linear regression model based on per capita GDP was used. Data was supplied by The Great Buenos Aires Agency for Garbage collection and Disposal and other agencies in charge of the disposal of solid waste. The historical adjustment of the regression is very good, for which reason its utilization in future projections was considered adequate.

Macro-economic projections present a high degree of dispersion among their extreme scenarios. Consequently, sectoral scenarios (except the one corresponding to Agriculture and Livestock) reflect this dispersion, giving rise to different sectoral emission scenarios of GHGs. To this is added the already-mentioned case of the livestock production sector, which places Argentina in an unprecedented situation with regard to foot-and-mouth disease, generating uncertainty as to the future scenario for the sector. This, in turn, is reflected in the emissions projected by the sectoral model. This situation is very important for the definition of the future scenario for total GHG emissions, since livestock production is responsible for 35% of Argentina's emissions, and even if they decreased in all the possible scenarios toward the period 2008-2012, they would still be close to 30%.

Since emissions from the livestock production sector are relatively non-elastic with regard to GDP variations, and strongly depend on the external sector, each of the three emission scenarios for this sector (high, medium and low growth of the livestock production sector) have been combined with each of the three scenarios resulting from the rest of the economic sectors sensitive to GDP, i.e.: energy, industrial processes, and waste management. In this way, the 9 GHG emission scenarios include, to a great extent, a wide range of the probable scenarios.

Figure 4.2 shows the emissions for 1990, 1994 and 1997 and the emission projections for these scenarios until the year 2012. Carbon equivalent GHG emissions, broken down by sector, are presented in tables 4.1 and 4.2. The former includes emissions from the sectors with a high correlation with GDP, and the latter shows emissions from the livestock production sector.

Figure 4.2. *GHG Emissions.*

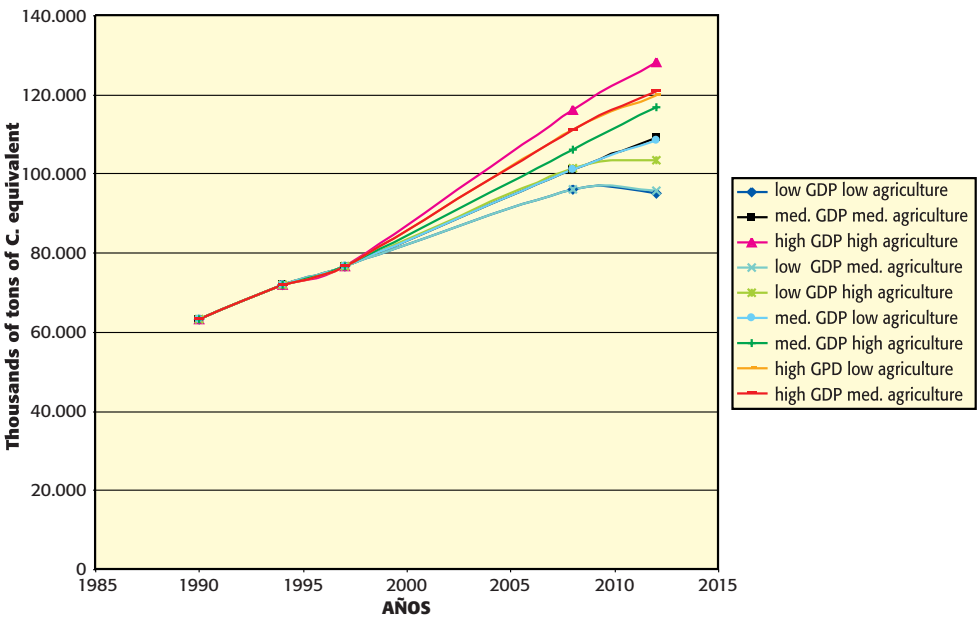


Table 4.1. *GHG Emissions in MTTCE*
Energy, Industrial Processes and Waste Management sectors.

	1990	1994	1997	Average for 2008-2012 Low–growth	Average for 2008-2012 Medium–growth	Average for 2008-2012 High–growth
ENERGY	30.1	34.9	38.2	52.3	59.2	69.1
Combustion	26.2	30.1	33.1	46.2	52.3	61.2
Fugitive E.	3.9	4.8	5.1	6.1	6.9	7.9
INDUSTRIAL PROCESS	1.6	1.7	2.5	2.8	4.0	4.0
WASTE MANAGEMENT	2.5	4.1	4.4	5.9	6.6	7.5
TOTAL	**34.2**	**40.7**	**45.1**	**61.0**	**69.8**	**80.6**

Table 4.2. *GHG Emissions in MTTCE*
Agriculture and Livestock Production Sector

	1990	1994	1997	Average for 2008-2012 Low emission scenario for Livestock prod.	Average for 2008-2012 Medium emis. scenario for Livestock prod.	Average for 2008-2012 High emis. scenario for Livestock prod.
AGRICULTURE	3.6	3.7	6.2	9.1	7.2	8.2
LIVESTOCK PRODUCTION	26.2	27.4	25.1	25.4	28.2	33.4
TOTAL	**29.8**	**31.1**	**31.3**	**34.5**	**35.4**	**41.6**

As may be appreciated, both the relative increments resulting from the inventories and the projected increments are substantially smaller in the Agriculture and Livestock sector than in the others.

Mitigation Options and Policies

This section summarizes the principal mitigation options examined as part of the work carried out to determine the GHG emission target. They include those corresponding to the forestry sector, management of solid waste, livestock production, no-till methods, the control of fugitive emissions, hydro and wind energy-generating technologies, energy co-generation, and the growing penetration of compressed natural gas for use in the transport sector. There are also other mitigation options which were not analysed due to a number of circumstances, fundamentally, the a priori assumption of the existence of economic or social barriers that would hinder their implementation in the next decade.

Argentina is already implementing sectoral sustainable development policies that are fostering the abatement of GHG emissions, in certain sectors by facilitating the incorporation of efficient technologies, and in others, through regulations or subsidies with fiscal or private costs. It is worth reiterating that the baseline scenarios already incorporate better performing technologies, assuming that the best available technology should be used every time that new equipments or processes must be incorporated

In the case of the Forestry Sector, Argentina follows active policies with explicit fiscal costs that are contributing to increase the carbon stocks stored in plantations, and since there is a legislation in force that will continue to sustain such policies in the long term, the increment in the carbon stocks of forest plantations during the commitment period should be considered a mitigation option. The Plantations subsector was analyzed applying a statistical regression model with balanced supply and demand at the regional level since, given the transportation costs, the industrial demand must be concentrated close to the areas of forestry activity. Future demand was estimated on the basis of surveys in the private sector regarding current and future investments and supply, following the sector's response to fiscal incentives and future demand. The uncertainty concerning future evolution is high, since the fiscal deficit may jeopardize the level of subsidies, thus affecting future plantations. Emissions from the deforestation of native forests for their conversion to croplands and pastures was smaller than carbon sequestration by plantations, as shown in the 1990, 1994 and 1997 inventories. According to estimates, these emissions will remain stable toward the end of the commitment period or eventually they will decline gradually.

Another sector for which there exists national and provincial legislation that includes fiscal incentives to promote its utilization is that of wind-energy. Argentina's potential capacity to produce wind-energy is equal to several times the total installed capacity for the generation of electric power in the country. However, for several reasons -among them its cost- the utilization of this resource is currently very limited.

As regards regulations favoring the mitigation process, mention should be made of the fact that the Secretariat for Energy has issued a resolution determining the progressive reduction of natural gas emissions from oil wells.

In the case of solid waste management, methane emissions from sanitary landfills may be flared, thus avoiding the greenhouse gas effect of this gas, which is much greater than that of the carbon dioxide produced from its combustion. Until 1997, only the waste from the Greater Buenos Aires was disposed of in sanitary landfills, yet toward the commitment period, this practice is expected to be extended to at least another six major cities.

The mitigation measures for the livestock production sector contemplate, in the first place, an improved efficiency in the sector through the enhancement of its production systems, with better diets and an increased percentage of animals managed in confined conditions. These measures are not neutral, and they would favor a greater efficiency in the livestock production sector, which would lead to a greater degree of competition with the Agriculture sector for the use of the land.

The promotion of the “low-till” and “no-till” (commonly known as 'direct sowing') land-use practices will lead to less fuel being consumed for agricultural purposes. In addition, the 'no-till' method has a highly positive impact on soil conservation.

Every one of the hydroelectric power plants for which there were available studies facilitating the estimation of their mitigation costs, have been examined. The majority of them have burdensome incremental costs for the avoided carbon emission in comparison with the baseline scenario in which energy is generated from natural gas in combined-cycle plants. Besides, in many cases these power plants generate doubts as to their adequacy from an environmental viewpoint.

Co-generation plants constitute an important mitigation option in the case of industrial activities, with additional benefits derived from the saving of fuel and the decrease in local pollution.

In the case of the greater penetration of natural gas in the transport sector, it is assumed that with adequate regulations or taxes, this penetration will increase in automobiles and extend to public urban buses, and light duty trucks.

5. DYNAMIC GHG EMISSION INDICATORS

Among the extreme emission scenarios shown in Figure 4.2, there is a difference of 30 million tons of carbon equivalent for the period 2008-2012, that is to say, a little over 25% of the total emissions of the medium emission scenarios for that same period. Given this high level of uncertainty, it would not be convenient for Argentina to assume a fixed GHG emission target, independent of the evolution of the economic conditions. Although a relatively indulgent target might reduce the risk of non-compliance, it would imply, at the same time, a risk derived from requiring little or no mitigation at all of GHG emissions. Moreover, from the point of view of the international community, a target that were not stringent would not constitute a solid argument in favor of access to emissions trading and to the joint implementation mechanisms. Too stringent a target, on the other hand, would bind Argentina beyond its capacity to achieve the mitigation that the assumed commitment would require. The alternative is to take a dynamic target, that is to say, associate this target to an economic activity index, in order to substantially reduce uncertainty.

GDP-related emissions intensity indicator

Due to the reasons already mentioned, there is an alternative that could be preferable to a fixed target, namely, a dynamic target based on some relationship between emissions and GDP. The simplest of these targets associates emission rates (E) and GDP (P) in a formula, E = KP, in which the value of K would be a fixed value, and the target would depend on the average GDP level for the commitment period 2008-2012.

Figure 5.1 shows the projection of the K index for the commitment period, for all 9 scenarios assessed. Through this process, the corresponding range of variation for emissions between extreme scenarios is close to about 30 million tons of carbon equivalent in the case of the medium-growth scenario. The decrease in the uncertainty resulting from this dynamic-target scheme is therefore very modest.

Figure 5.2 presents the emission reduction that should be implemented in the "business-as-usual" scenarios considered, if a target corresponding to a 10% reduction in emissions were to be adopted for one of the most likely scenarios, namely, the one corresponding to a medium GDP growth and a high growth of the Agriculture and Livestock sector. Under these conditions, the increase in emission reductions would be directly proportional to the increase in emissions from the Agriculture and Livestock sector, which constitutes a satisfactory result. However, in low economic-growth scenarios, emission reductions should be greater, and they would completely disappear in the scenarios reflecting a high economic growth. Consequently, besides its proving not to be very efficient to reduce uncertainty, this type of target would result in the creation of "hot air" under high economic growth conditions.

The inadequacy of this simple target in reducing uncertainty is due to the fact that a significant part of GHG emissions in Argentina, amounting to about 40% of the total, is generated by the Agriculture and Livestock sector, and although this percentage is expected to decline during the period 2008-2012, it will still remain stable at about 30% in the different scenarios assessed. On the other hand, this sector contributes under 7% of the GDP, and the historical series show that changes in agricultural and livestock production are not correlated to variations in GDP or to total emissions; neither are they expected to be so in the future. On the contrary, emissions from this sector are expected to have a maximum increase of 29%, considerably more modest than the increase in the other sectors, and well under the GDP growth.

Figure 5.1. *Emission Intensity*

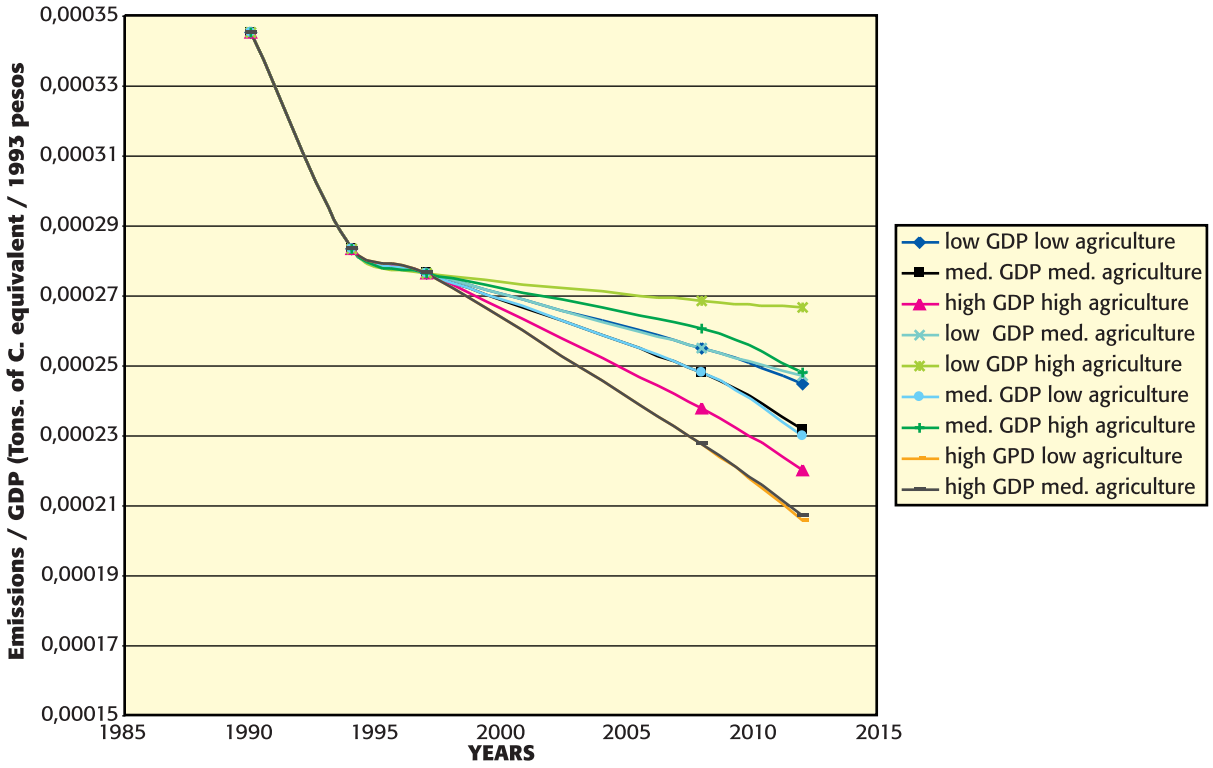
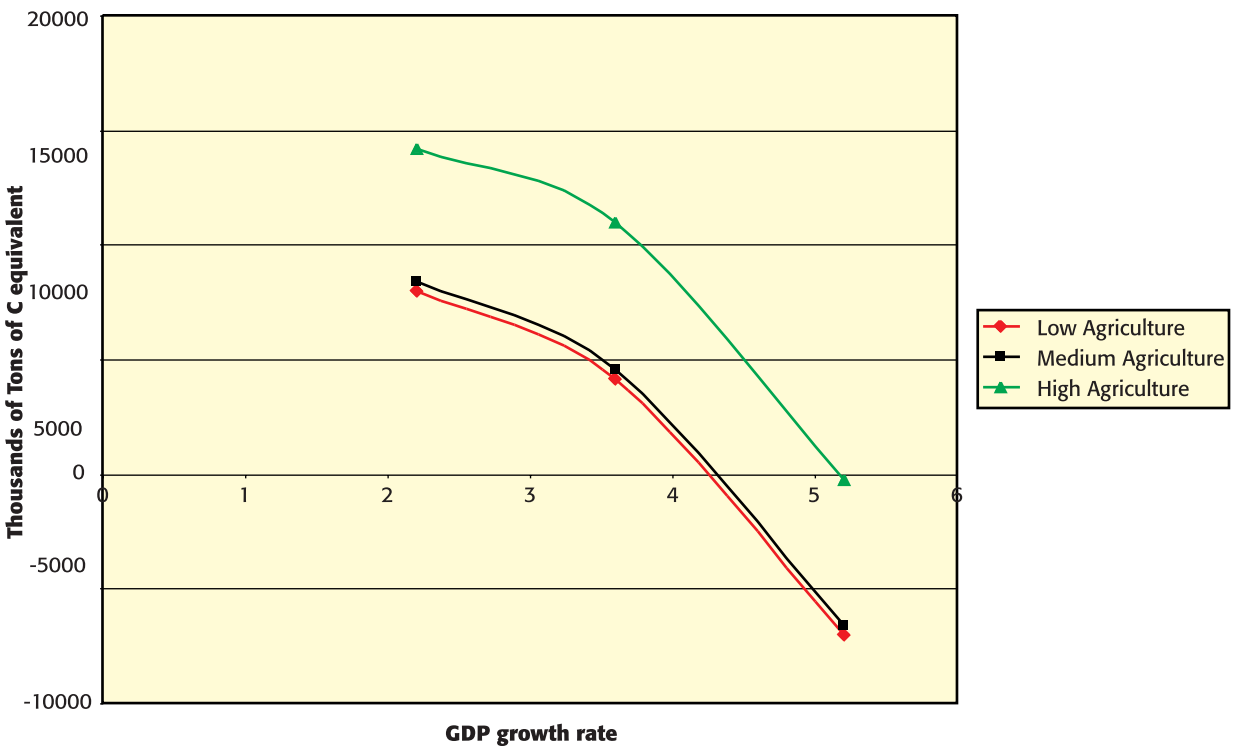


Figure 5.2. *Emission reductions. Intensity emission index.*



Definition of the target as the ratio between emission intensity and the square root of GDP

Clearly, another index related to GDP that may better explain the dynamics of Argentina's emissions must be explored. Figure 5.3 shows the variation relative to 1990 of GDP, the square root of GDP and GHG emissions, both for the estimated values of all three years 1990, 1994 and 1997, and for those projected for the period 2008-2012. As can be observed, emissions show a relative growth which is very similar to the square root of the GDP. Thus, an index has been created, which is constituted by the ratio between emissions (E) and the square root of the GDP (P). Then, once a value for the index I has been adopted, the target can be expressed as $E = I * \sqrt{P}$.

With the values projected on the basis of this index for the nine analyzed scenarios, the variation in the range of emission levels is now only 10 million tons of carbon equivalent, the majority of them resulting from the uncertainty associated with the Agriculture and Livestock Production sector. This would indicate that the uncertainty has been significantly reduced.

As in the previous case, the target assumed is based on a 10% reduction using the same scenario (high agriculture and livestock production level, medium GDP growth). The resulting emission reductions are shown in Figure 5.4. Emission reduction commitments increase with increasing emissions from the Agriculture and Livestock Production emissions, which is appropriate. In addition, the utilization of this index results in an effective emission reduction commitment, both in high and low-economic-growth scenarios, with an enhanced degree of effective commitment in the scenarios with the greatest growth.

Figure 5.3. *Reactive evolution to 1990*

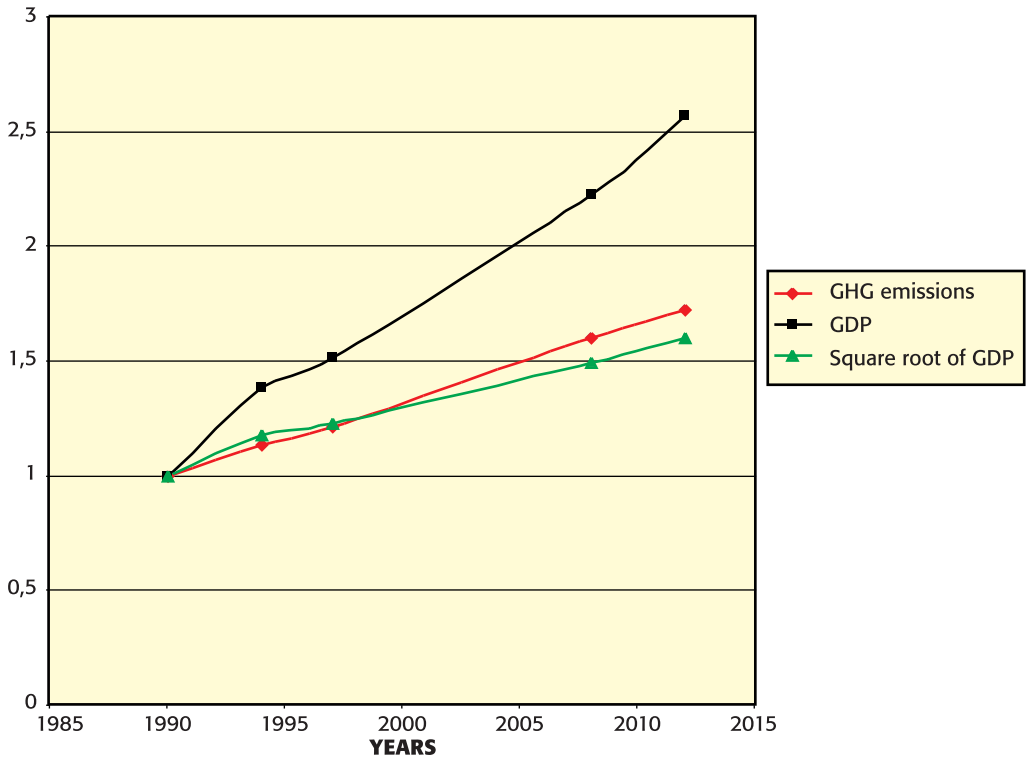
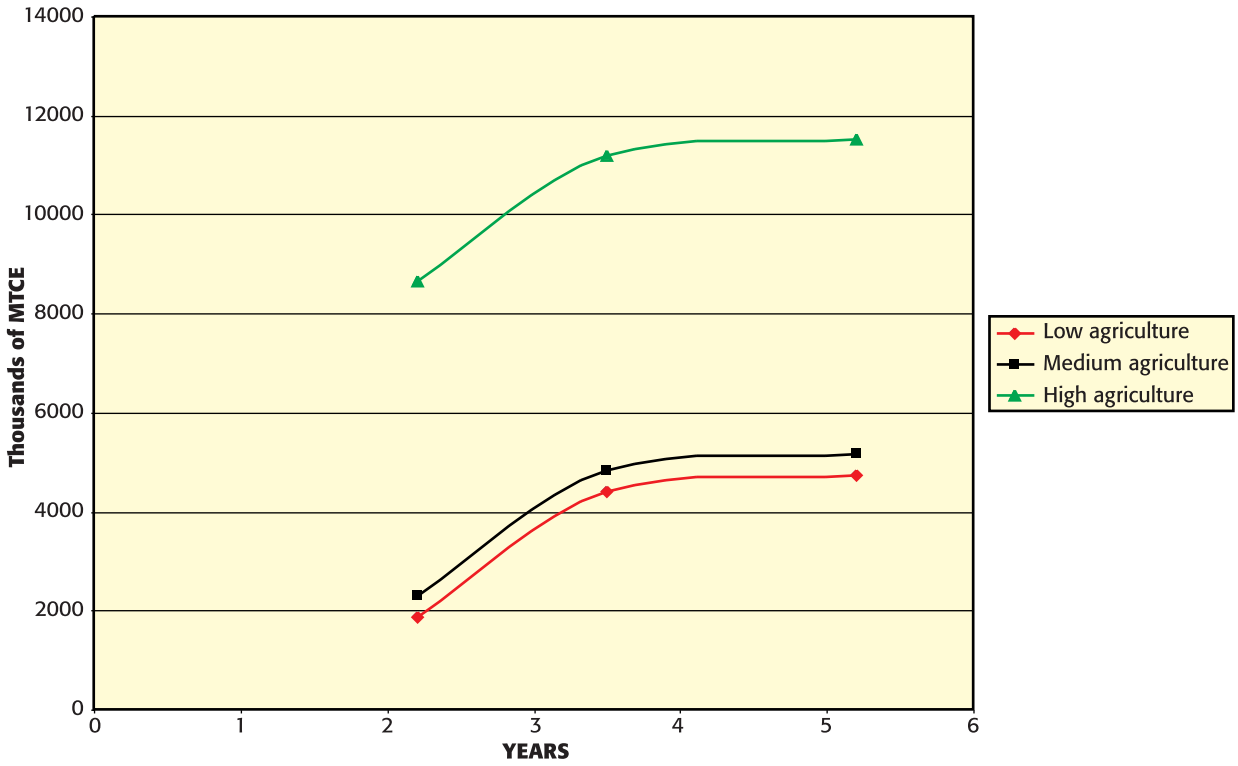


Figure 5.4. *Emission reductions (Target scenarios).*



Conclusion

A dynamic target with an index $I = E\sqrt{P}$ seems to be appropriate to be adopted as Argentina's GHG emission target for the period 2008-2012.

6. ARGENTINA'S COMMITMENT

Comments on the greenhouse gas emission target

Like any developing country, Argentina requires a socio-economic progress which, due to its characteristics, implies a greater rate of growth of greenhouse gas (GHG) emissions than the one required by developed countries. In spite of this fact, in the past few decades Argentina has engaged in a considerable effort towards achieving a clean economic growth. With this aim, significant public and private investments have been made to enhance efficiency in the energy sector, substituting energy-producing sources with a high polluting potential with non-emitting ones, or with sources generating lower relative emissions (eg., natural gas and hydroelectric power from oil and coal). In particular, in the present decade, profound structural transformations have been carried out which, besides enabling the country to achieve high rates of growth, have also resulted in a significant reduction in GHG emission intensity in relation to the Gross Domestic Product (GDP). Thus, emission intensity, measured as a ratio between emissions (in thousands of tons of carbon equivalent) and GDP (in millions of 1993 pesos), has decreased from 0.34 in 1990 to 0.28 in 1997. The energy sector has already attained high levels of efficiency, for which reason any additional reductions of GHG emissions will demand the contribution of other sectors.

Still, sharing the global concern regarding the severe environmental, social and economic consequences arising from Climate Change, and without relinquishing the principle of common but differentiated responsibilities, Argentina considers it necessary to continue adopting new measures which, adapted to its particular and specific conditions, may contribute to the abatement of GHG emissions.

One of the major challenges for the formulation of developing countries' targets for GHG emission reductions lies in overcoming the associated elements of risk and uncertainty, by devising a target that may contribute to the abatement of emissions without relinquishing the objective of a sustainable socio-economic growth.

In view of the aforementioned, what constitutes an alternative to a fixed target is a dynamic target based on some kind of relation between emissions and GDP. Given the significant relative contribution of the Agriculture and Livestock Production sector to total GHG emissions and its expected small growth, Argentina's GHG emissions will be approximately proportional to the square root of the GDP. Consequently, a dynamic target, based on an intensity indicator associating emissions with gross domestic product—although not in a direct way, but through its square root—appears to be the optimum way to reduce uncertainty and, at the same time, guarantee an effective emission reduction.

Consequently, the emission target shall be expressed as $E = I * \sqrt{P}$., where emissions (E) are measured in tons of carbon equivalent and GDP (P) in 1993 Argentine pesos at market prices. The value chosen for the index I (151.5) is aimed at ensuring an effective GHG emission reduction for Argentina, in a wide range of scenarios, which includes the most likely macro-economic and Agriculture and Livestock Production baseline scenarios. Table 6.1 shows GHG emission reductions expected in different scenarios as a result of the adoption of the index target I =151.5.

Table 6.1. ***GHG Emission reduction relative to baseline scenarios.***
Annual mean values for the period 2008-2012 (In thousands of tons of carbon equivalent, and in percentage of the emissions of the respective baseline scenario).

	Economic growth rate annual accumulative rate (1997/2012)		
SCENARIOS	**2,3%**	**3,6%**	**5,1%**
Low agriculture and livestock production growth	1888 (2.0%)	4413 (4.2%)	4759 (4.1%)
Medium agriculture and livestoc production growth	2304 (2.4%)	4829 (4.6%)	5175 (4.5%)
High agriculture and livestock production growth	8671 (8.5%)	11196 (10.0%)	11542 (9.4%)

The selection of the value for the target's index was made in such a way that it imply an effective reduction in the assessed scenarios, while at the same time reductions might not exceed 10% in any of them.

This emission target implies a substantial reduction in emission intensity—the ratio between emission (in thousands of tons of carbon equivalent) and GDP (in millions of 1993 pesos) in the scenarios considered in Table 6.1. Indeed, this intensity decreases from 0.34 in 1990 and 0.28 in 1997, to 0.24 in the period 2008-2012 in the case of the scenario reflecting GDP medium growth, and medium development of the Agriculture and Livestock sector.

As has already been explained, the baseline GHG emission scenarios originate in different growth hypotheses associated to both GDP and the Agriculture and Livestock Production sector. In all cases, the baseline scenarios contemplate energy-efficiency improvements derived from the incorporation of the most adequate technologies as a result of the assignment derived from the market itself. This implies that the emission reduction estimated to occur as a result of the target will be actually effective, and that it should be the product of policies and measures aimed at the abatement of GHG emissions.

The adoption of a GHG emission target implies Argentina's ratification of a State Policy. This policy is oriented toward the achievement of two objectives: to consolidate a strategy for a sustainable socio-economic development based on a clean economic growth, and to contribute to the abatement of global GHG emissions by way of measures implemented at the national level, and also of an active participation in the search for consensus that may contribute to the achievement of the objectives of the United Nations Framework Convention on Climate Change. This latter aspect encourages the creation of a new way under the Convention, which would allow countries wishing to assume this kind of commitment to have access to all the mechanisms of the Kyoto Protocol.

Early Credits

In order to comply with the commitments assumed through the target that has been described, Argentina will have to implement the corresponding domestic policies. In this context, and with the aim of encouraging the private sector to implement measures tending to the abatement of GHG emissions before the commitment period, the granting of emission reduction credits for early action will be considered.

Greenhouse Gas Emission Target

The Republic of Argentina, in accordance with the objectives of the United Nations Framework Convention on Climate Change, bearing in mind its differentiated responsibilities, its right to a sustainable socio-economic development and the characteristics proper to its particular production system and emission-generating structure, and in its condition as Non-Annex I country under the Convention, and Non-Annex B country under the Kyoto Protocol, voluntarily commits itself to ensure that its net anthropogenic greenhouse gas emissions shall not exceed an amount that is termed 'emission target'.

The compliance period for the said target shall be the period 2008-2012, and it shall be applicable to the annual emission average for that period.

The target shall be equal to the product of an index multiplied by the square root of the five-year average Gross Domestic Product corresponding to the commitment period. The index is established at 151.5. This value implies an effective reduction in Argentina's greenhouse gas emissions relative to the emissions estimated for the most likely scenarios, resulting from projections that do not contemplate intervention measures, and that are estimated at between 2% and 10%.

The calculation of the Gross Domestic Product shall be based on market prices and expressed in 1993 pesos, according to the Republic of Argentina's statistical records of national accounts.

Greenhouse gas emissions shall be considered as aggregate emissions and expressed in metric tons of carbon equivalent, in accordance with the provisions of Article 5 of the Kyoto Protocol. In the context of this commitment, greenhouse gases means those included in Annex A of the said Protocol.

Emissions shall be those originating in the sectors and source categories described in Annex A of the above-mentioned Protocol, plus the net changes in greenhouse gas emissions from sources and removals by sinks resulting from direct human-induced land use change and forestry activities. In this context forestry means afforestation, reforestation and deforestation.

The emission and sequestration of greenhouse gases shall be calculated in accordance with the methodology adopted by the United Nations Framework Convention on Climate Change.

The present commitment shall constitute a binding international commitment once the Conference of the Parties to the United Nations Framework Convention on Climate Change implements a new option that may enable Non-Annex I countries which, like the Republic of Argentina, wish to assume an emission target, to participate in the mechanisms established in Articles 4, 6 and 17 of the Kyoto Protocol and after this Protocol became in force.

Anex A
1990

Points and comas are used as in the spanish notation

Table 1. *Sectoral Report for Energy*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)							
Greenhouse Gas Source and Sink Categories	**CO_2**	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOC**	**SO_2**
Total Energy	95.486	478,0	4,46	493	1.601	357	14
A Fuel Combustion Activities (Sectoral Approach)	**90.848**	**10,5**	**4,46**	**491**	**1.192**	**338**	**0**
1 Energy Industries	**29.562**	**0,2**	**2,26**	**58**	**16**	**1**	**0**
a Petroleum	10.558						
b Coal	1.573						
c Natural Gas	17.432						
2 Manufacturing Industries and Construction	**12.705**	**0,1**	**0,52**	**27**	**82**	**1**	**0**
a Petroleum	1.551						
b Coal	1.864						
c Natural Gas	9.290						
3 Transport	**27.382**	**7,8**	**0,72**	**299**	**962**	**307**	**0**
a Civil Aviation	1.352	0,0	0,0	6	2	0	
b Road Transportation	25.352	7,7	0,71	277	954	305	
c Railways	616	0,1	0,02	15	5	1	
d Navigation	61	0,0	0,00	1	0	0	
e Other (please specify)	NO						
Pipeline Transport	NO						
4 Other Sectors	**21.199**	**1,5**	**0,97**	**107**	**132**	**30**	**0**
a Commercial/Institutional	4.628	0,1	0	4	1	0	
b Residential	12.033	0,7	0	11	94	16	
c Agriculture/Forestry/Fishing	4.539	0,7	0,12	93	37	14	
5 Other (please specify)	**0**	**0,0**	**0**	**0**	**0**	**0**	
B Fugitive Emissions from Fuels	**4.638**	**467,4**	**0**	**2**	**409**	**1914**	
1 Solid Fuels	**0**	**9,4**	**0**	**0**	**0**	**0**	**0**
a Coal Mining		9,4					
b Solid Fuel Transformation							
c Other (please specify)							
2 Oil and Natural Gas	**4.638**	**458,0**	**0**	**2**	**409**	**19**	**14**
a Oil		6,8		2	409	19	14
b Natural Gas		380,5					
c Venting and Flaring	4.638	70,7					
Memo Items (1)							
International Bunkers	**3.280**	**0,0**	**0**	**0**	**0**	**0**	**0**
Aviation	996	0,0	0	0	0	0	0
Marine	2.284	0,0	0	0	0	0	0
CO_2 Emissions from Biomass	**5.713**						

(1) Not included in energy totals.

Table 2. *Sectoral Report for Industrial Processes*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)													
Greenhouse Gas Source and Sink Categories	**CO_2**	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOC**	**SO_2**	**HFCs**		**PFCs**		**SF_6**	
					P	**A**	**P**	**A**	**P**	**A**			
Total Industrial Processes	**6.099**	**2,1**	**0,54**	**23**	**6**	**268**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
A Mineral Products	**1.790**	**NE**	**NE**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
1 Cement Production	1.790						1						
2 Lime Production	NE												
3 Limestone and Dolomite Use	NE												
4 Soda Ash Production and Use	NO												
5 Asphalt Roofing	NE				0	0							
6 Road Paving with Asphalt	NE					0							
7 Other (please specify)	NE	0,0	0,00	0	0	0	0	0	0	0	0	0	0
Glass Production					0								
Concrete Pumice Stone						0							
B Chemical Industry [1]	**90**	**2,1**	**0,54**	**1**	**6**	**268**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1 Ammonia Production [1]	106				1	0	0						
2 Nitric Acid Production	NA		0,54	1									
3 Adipic Acid Production	NO		0,00	0	0	0							
4 Carbide Production	90	0,0											
5 Other: Petrochemical	NA	2,1		0	5	268	0						
C Metal Production	**4.219**	**NE**	**NE**	**23**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1 Iron and Steel Production	3.918			0	0	0	0						
2 Ferroalloys Production	IE												
3 Aluminium Production	301			22	0		0				0		
4 SF_6 Used in Aluminium and Magnesium Foundries	NO												0
5 Other (please specify)	NO												

Table 2. *Sectoral Report for Industrial Processes (cont.)*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)													
Greenhouse Gas Source and Sink Categories	**CO_2**	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOC**	**SO_2**	**HFCs**		**PFCs**		**SF_6**	
					P	**A**	**P**	**A**	**P**	**A**			
D Other Production	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**
1 Pulp and Paper			0	0	0	0							
2 Food and Drink					0								
E Production of Halocarbons and Sulphur Hexafluoride	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
1 By-product Emissions								0		0			
2 Fugitive Emissions								0		0			
3 Other (please specify)													
F Consumption of Halocarbons and Sulphur Hexafluoride	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**
1 Refrigeration and Air Conditioning Equipment									0		0		
2 Foam Blowing								0		0			
3 Fire Extinguishers								0		0		0	
4 Aerosols								0		0			
5 Solvents								0		0			
6 Other (please specify)								0		0		0	
G Other (please specify)													

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

NE: Not estimated
IE: Estimated but included elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 3. *Sectoral Report for Solvent and Other Product use*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)			
Greenhouse Gas Source and Sink Categories	**CO_2**	**N_2O**	**NMVOC**
Total Solvent and Other Product Use	NE	NE	NE
A Paint Application			
B Degreasing and Dry Cleaning			
C Chemical Products, Manufacture and Processing			
D Other (please specify)			

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 4. *Sectoral Report for Agriculture*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES					
	(Gg)				
Greenhouse Gas Source and Sink Categories	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOC**
Total Agriculture	**2725,3**	**169,13**	**5**	**176**	**0**
A Enteric Fermentation	**2613,3**	**NE**	**NE**	**NE**	**NE**
1 Cattle	2437,9				
2 Buffalo	0,1				
3 Sheep	110,0				
4 Goats	18,5				
5 Camels and Llamas	6,9				
6 Horses	36,0				
7 Mules and Asses	1,3				
8 Swine	2,7				
9 Poultry	NE				
10 Other (please specify)					
B Manure Management	**103,6**	**0,47**	**NE**	**NE**	**NE**
1 Cattle	43,0				
2 Buffalo	0,0				
3 Sheep	2,7				
4 Goats	0,5				
5 Camels and Llamas	0,3				
6 Horses	3,0				
7 Mules and Asses	0,1				
8 Swine	53,4				
9 Poultry	0,5				
10 Anaerobic	NA	0,12			
11 Liquid Systems	NA	0,00			
12 Solid Storage and Dry Lot	NA	0,28			
13 Other (please specify)		0,07			
C Rice Cultivation	**19,6**	**NE**	**NE**	**NE**	**NE**
1 Irrigated	19,6				
2 Rainfed	NO				
3 Deep Water	NO				
4 Other (please specify)					

Table 4. *Sectoral Report for Agriculture (cont.)*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES					
	(Gg)				
Greenhouse Gas Source and Sink Categories	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOC**
D Agricultural Soils	**NA**	**168,52**	**NE**	**NE**	**NE**
E Prescribed Burning of Savannas	**0,0**	**0**	**0**	**0**	
F Field Burning of Agricultural Residues	**8,4**	**0,14**	**5**	**176**	
1 Cereals	1,1	0,02			
2 Pulse	NE	NE			
3 Tuber and Root	NE	NE			
4 Sugar Cane	5,7	0,09			
5 Other (please specify)	1,6	0,02			
G Other (please specify)					

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 5. *Sectoral Report for Land-Use Change and Forestry*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)						
Greenhouse Gas Source and Sink Categories	**CO_2 Emissions**	**CO_2 Removals**	**CH_4**	**N_2O**	**NOx**	**CO**
Total Land-Use Change and Forestry	**0**	**-34891**	**26,3**	**0**	**7**	**231**
A Changes in Forest and Other Woody Biomass Stocks	**0**		**-15458**			
1 Subtropical Moist Forests	725					
2 Subtropical Dryt Forests	1.448					
3 Temperate Moist Forests			-117			
4 Temperate Dry Forests						
5 Other: Plantations			-17514			
B Forest and Grassland Conversion	**9.645,7**		**26,3**	**0**	**7**	**231**
1 Subtropical Moist Forests		6.295,3				
2 Subtropical Dryt Forests		3.350,3				
3 Boreal Forests		NA				
4 Grasslands/Tundra		NA				
5 Other (please specify)		NE				
C Abandonment of Managed Lands				**-29079**		
1 Subtropical Forests				-29079		
2 Temperate Forests		NO		0		
3 Boreal Forests		NA		0		
4 Grasslands/Tundra		NA		0		
5 Other (please specify)		NE				
D CO_2 Emissions and Removals from Soil		**NE**		**0**		
E Other (please specify)						

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 6. *Sectoral Report for Waste*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)						
Greenhouse Gas Source and Sink Categories	**CO_2**	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOC**
Total Waste	**NE**	**396,1**	**2,47**	**NE**	**NE**	**NE**
A Solid Waste Disposal on Land	**NE**	**315,3**	**0,00**			
1 Managed Waste Disposal on Land						
2 Unmanaged Waste Disposal Sites						
3 Other (please specify)						
B Wastewater Handling	**NE**	**80,8**	**2,47**			
1 Industrial Wastewater		48,3				
2 Domestic and Commercial Wastewater		32,5	2,47			
3 Other (please specify)						
C Waste Incineration	**NE**	**NE**	**NE**			
D Other (please specify)	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 7a. *Summary Report for National Greenhouse Gas Inventories*

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)														
Greenhouse Gas Source and Sink Categories	CO_2 Emissions	CO_2 Removals	CH_4	N_2O	NOx	CO	NMVOC	SO_2	HFCs		PFCs		SF_6	
									P	A	P	A	P	A
Total National Emissions and Removals	**101.585**	**-34.891**	**3647,5**	**176,78**	**528**	**2.014**	**626**	**16**	**0**	**0**	**0**	**0**	**0**	**0**
1 Energy	**95.486**	**0**	**478,0**	**4,46**	**493**	**1.601**	**357**	**14**						
A Fuel Combustion (Sectoral Approach)	90.848		10,5	4,46	491	1.192	338							
1 Energy Industries	29.562		0,2	2,26	58	16	1							
2 Manufacturing Industries and Construction	12.705		1,0	0,52	27	82	1							
3 Transport	27.382		7,8	0,72	299	962	307							
4 Other Sectors	21.199		1,5	0,97	107	132	30							
5 Other (please specify)	0		0,0	0,00	0	0	0							
B Fugitive Emissions from Fuels	4.638		467,4		2	409	19	14						
1 Solid Fuels			9,4											
2 Oil and Natural Gas	4.638		458,0		2	409	19	14						
2 Industrial Processes	**6.099**	**0**	**2,1**	**0,54**	**23**	**6**	**268**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
A Mineral Products	1.790					0	0	1						
B Chemical Industry	90		2,1	0,54	1	6	268	0						
C Metal Production	4.219		NE	NE	23	0	0	0	0	0	0	0	0	0
D Other Production	NE				NE	NE	NE	NE						
E Production of Halocarbons and Sulphur Hexafluoride									NO	NO	NO	NO	NO	NO
F Consumption of Halocarbons and Sulphur Hexafluoride									NE	NE	NE	NE	NE	NE
G Other (please specify)	0		0,0	0,00	0	0	0	0				0		0
3 Solvent and Other Product Use		**NE**				**NE**			**NE**					
4 Agriculture					**2744,9**	**169,13**	**5**	**176**						
A Enteric Fermentation					2613,3									
B Manure Management					103,6	0,47								
C Rice Cultivation					19,6									
D Agricultural Soils						168,52								
E Prescribed Burning of Savannas					0,0	0,00	0	0						

Table 7a. *Summary Report for National Greenhouse Gas Inventories (cont.)*

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)													
Greenhouse Gas Source and Sink Categories	CO_2 Emissions	CO_2 Removals	CH_4	N_2O	NOx	CO	NMVOC	SO_2	HFCs		PFCs		SF_6	
									P	A	P	A	P	A
F Field Burning of Agricultural Residues					8,4	0,14	5	176						
G Other (please specify)					0,0	0,00								
5 Land-Use Change & Forestry		**0**		**-34.891**	**26,3**	**0,18**	**7**	**231**						
A Changes in Forest and Other Woody Biomass Stocks		0		-15.458										
B Forest and Grassland Conversion		9.646			26,3	0,18	7	231						
C Abandonment of Managed Lands				-29.079										
D CO_2 Emissions and Removals from Soil		NE	(1)	0										
E Other (please specify)		0		0	0,0	0,00	0	0						
6 Waste					**396,1**	**2,47**	**0**	**0**	**0**	**0**				
A Solid Waste Disposal on Land					315,3									
B Wastewater Handling					80,8	2,47								
C Waste Incineration														
D Other (please specify)					NE	NE								
7 Other (please specify)														
Memo Items														
International Bunkers	3.280		0	0	0	0	0	0						
Aviation	996		0	0	0	0	0	0						
Marine	2.284		0	0	0	0	0	0						
CO_2 Emissions from Biomass	**5.713**													

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

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 7b. *Short Summary Report for National Greenhouse Gas Inventories*

SHORT SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)															
Greenhouse Gas Source and Sink Categories	CO_2 Emissions	CO_2 Removals	CH_4	N_2O	NOx	CO	NMVOC	SO_2	HFCs		PFCs		SF_6	
									P	A	P	A	P	A
Total National Emissions and Removals	**101.585**	**-34.891**	**3647,5**	**176,78**	**528**	**2.014**	**626**	**16**	**0**	**0**	**0**	**0**	**0**	**0**
1 Energy **Reference Approach**	**100.844**													
Sectoral Approach	**95.486**		**478,0**	**4,46**	**493**	**1.601**	**357**	**14**						
A Fuel Combustion	90.848	10,5	4,46	491	1.192	338								
B Fugitive Emissions from Fuels	4.638	467,4		2	409	19	14							
2 Industrial Processes	**6.099**	**2,1**	**0,54**	**23**	**6**	**268**	**1**	**0**	**0**	**0**	**0**	0	0	
3 Solvent and Other Product Use	**NE**			**NE**			**NE**							
4 Agriculture			**2744,9**	**169,13**	**5**	**176**								
5 Land-Use Change & Forestry	**0**		**-34.891**	**26,3**	**0,18**	**7**	**231**							
6 Waste			**396,1**	**2,47**										
7 Other (please specify)	**0**		**0**	**0,0**	**0,00**	**0**	**0**	**0**	**0**					
Memo Items:														
International Bunkers	**3.280**			**0,0**	**0,00**	**0**	**0**	**0**	**0**					
Aviation	996			0,0	0,00	0	0	0	0					
Marine	2.284			0,0	0,00	0	0	0	0					
CO_2 Emissions from Biomass	**5.713**													

P = Potential emissions based on Tier 1 Approach. A = Actual emissions based on Tier 2 Approach.
NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Anex A
1994

Points and comas are used as in the spanish notation

Table 1. *Sectoral Report for Energy*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)							
Greenhouse Gas Source and Sink Categories	**CO_2**	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOC**	**SO_2**
Total Energy	113.296	589,3	4,69	633	1.952	424	18
A Fuel Combustion Activities (Sectoral Approach)	107.567	29,8	4,69	630	1.443	404	0
1 Energy Industries	**31.858**	**0,2**	**2,08**	**63**	**14**	**1**	**0**
a Petroleum	9.131						
b Coal	3.352						
c Natural Gas	19.374						
2 Manufacturing Industries and Construction	**14.907**	**1,4**	**0,65**	**32**	**117**	**1**	**0**
a Petroleum	2.324						
b Coal	1.064						
c Natural Gas	11.519						
3 Transport	**34.716**	**26,1**	**0,92**	**372**	**1.089**	**354**	**0**
a Civil Aviation	1.451	0,0	0	6	2	0	
b Road Transportation	32.727	26,0	0,91	352	1.083	353	
c Railways	477	0,0	0	12	4	1	
d Navigation	61	0,0	NE	1	0	0	
e Other (please specify)	NE						
Pipeline Transport	NE						
4 Other Sectors	**24.605**	**2,1**	**1,04**	**164**	**222**	**49**	**0**
a Commercial/Institutional	3.379	0,1	0,22	3	1	0	
b Residential	13.989	0,9	0,62	13	163	26	
c Agriculture/Forestry/Fishing	7.237	1,1	0,20	148	59	23	
5 Other (not specified)	**1.481**	**0,0**	**0**	**0**	**0**	**0**	
B Fugitive Emissions from Fuels	**5.729**	**559,5**	**0**	**2**	**509**	**20**	**18**
1 Solid Fuels	**NE**	**5,9**	**0**	**0**	**0**	**0**	**0**
a Coal Mining		5,9					
b Solid Fuel Transformation							
c Other (please specify)							
2 Oil and Natural Gas	**5.729**	**553,6**	**0**	**2**	**509**	**20**	**18**
a Oil		8,8		2	509	20	18
b Natural Gas		456,7					
c Venting and Flaring	5.729	88,1					
Memo Items (1)							
International Bunkers	**2.744**	**0,0**	**0**	**0**	**0**	**0**	**0**
Aviation	1.384	NE	NE	NE	NE	NE	NE
Marine	1.360	NE	NE	NE	NE	NE	NE
CO_2 Emissions from Biomass	**8.986**						

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

[2] Not included in energy totals.

Table 2. *Sectoral Report for Industrial Processes*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)													
Greenhouse Gas Source and Sink Categories	**CO_2**	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOC**	**SO_2**	**HFCs**		**PFCs**		**SF_6**	
					P	**A**	**P**	**A**	**P**	**A**			
Total Industrial Processes	**6.307**	**2**	**1**	**96**	**9**	**18**	**2**	**0**	**0**	**0**	**0**	**0**	**0**
A Mineral Products	**2.982**	**NE**	**NE**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**
1 Cement Production	2.968						2						
2 Lime Production	NE												
3 Limestone and Dolomite Use	14												
4 Soda Ash Production and Use	NO												
5 Asphalt Roofing	NE				0	0							
6 Road Paving with Asphalt	NE					0							
7 Other (please specify)	NE	0,0	0,00	0	0	0	0	0	0	0	0	0	0
Glass Production					0								
Concrete Pumice Stone						0							
B Chemical Industry	**130**	**2,2**	**0,57**	**1**	**8**	**18**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1 Ammonia Production (1)	107				1	0	0						
2 Nitric Acid Production	NA		0,57	1									
3 Adipic Acid Production	NO		0,00	0	0	0							
4 Carbide Production	130	0,0											
5 Other (please specify)	NA	2,2		0	7	18	0						
C Metal Production	**3.195**	**NE**	**NE**	**96**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1 Iron and Steel Production	2.883			0	0	0	0						
2 Ferroalloys Production	IE												
3 Aluminium Production	312			96	2		0				0		
4 SF_6 Used in Aluminium and Magnesium Foundries	NO												0
5 Other (please specify)	NO												

Table 2. *Sectoral Report for Industrial Processes (cont.)*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)													
Greenhouse Gas Source and Sink Categories	**CO_2**	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOC**	**SO_2**	**HFCs**		**PFCs**		**SF_6**	
					P	**A**	**P**	**A**	**P**	**A**			
D Other Production	**NO**	**NO**	**NO**	**0**	**0**	**11**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1 Pulp and Paper			0	0	0	0							
2 Food and Drink					11								
E Production of Halocarbons and Sulphur Hexafluoride	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
1 By-product Emissions								0		0			
2 Fugitive Emissions								0		0			
3 Other (please specify)													
F Consumption of Halocarbons and Sulphur Hexafluoride	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**
1 Refrigeration and Air Conditioning Equipment									0		0		
2 Foam Blowing								0		0			
3 Fire Extinguishers								0		0		0	
4 Aerosols								0		0			
5 Solvents								0		0			
6 Other (please specify)								0		0		0	
G Other (please specify)													

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

NE: Not estimated
IE: Estimated but included elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 3. *Sectoral Report for Solvent and Other Product use*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)			
Greenhouse Gas Source and Sink Categories	**CO_2**	**N_2O**	**NMVOC**
Total Solvent and Other Product Use	NE	NE	NE
A Paint Application			
B Degreasing and Dry Cleaning			
C Chemical Products, Manufacture and Processing			
D Other (please specify)			

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 4. *Sectoral Report for Agriculture*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)					
Greenhouse Gas Source and Sink Categories	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOC**
Total Agriculture	**2906,6**	**175,50**	**4**	**137**	**0**
A Enteric Fermentation	**2743,0**	**NE**	**NE**	**NE**	**NE**
1 Cattle	2590,4				
2 Buffalo	0,1				
3 Sheep	85,0				
4 Goats	20,0				
5 Camels and Llamas	6,9				
6 Horses	36,0				
7 Mules and Asses	1,3				
8 Swine	3,4				
9 Poultry	0,0				
10 Other (please specify)					
B Manure Management	**119,3**	**0,49**	**NE**	**NE**	**NE**
1 Cattle	45,5				
2 Buffalo	0,0				
3 Sheep	2,1				
4 Goats	0,6				
5 Camels and Llamas	0,3				
6 Horses	3,0				
7 Mules and Asses	0,1				
8 Swine	67,2				
9 Poultry	0,5				
10 Anaerobic	NA	0,13			
11 Liquid Systems	NA	0,00			
12 Solid Storage and Dry Lot	NA	0,28			
13 Other (please specify)		0,07			
C Rice Cultivation	**37,7**	**NE**	**NE**	**NE**	**NE**
1 Irrigated	37,7				
2 Rainfed	NO				
3 Deep Water	NO				
4 Other (please specify)					

Table 4. *Sectoral Report for Agriculture (cont.)*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)					
Greenhouse Gas Source and Sink Categories	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOCD**
D Agricultural Soils	**NA**	**174,91**			
E Prescribed Burning of Savannas	**NE**	**NE**	**NE**	**NE**	**NE**
F Field Burning of Agricultural Residues (1)	**6,5**	**0,11**	**4**	**137**	
1 Cereals	1,0	0,02			
2 Pulse	NE	NE			
3 Tuber and Root	NE	NE			
4 Sugar Cane	4,9	0,08			
5 Other (please specify)	0,6	0,01			
G Other (please specify)					

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 5. *Sectoral Report for Land-Use Change and Forestry*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)						
Greenhouse Gas Source and Sink Categories	**CO_2 Emissions**	**CO_2 Removals**	**CH_4**	**N_2O**	**NOx**	**CO**
Total Land-Use Change and Forestry	**0**	**-34.731**	**26,3**	**0**	**7**	**231**
A Changes in Forest and Other Woody Biomass Stocks	**0**	**-15.458**				
1 Subtropical Moist Forests		725				
2 Subtropical Dry Forests		1.448				
3 Temperate Moist Forests				-117		
4 Plantations				-17.514		
5 Other (please specify)						
B Forest and Grassland Conversion	**9.805**		**26,3**	**0**	**7**	**231**
1 Subtropical Moist Forests		6.295				
2 Subtropical Dry Forests		3.510				
3 Boreal Forests		NA				
4 Grasslands/Tundra		NA				
5 Other (please specify)		NE				
C Abandonment of Managed Lands				**-29.079**		
1 Subtropical Forests				-29.079		
2 Temperate Forests		NO		0		
3 Boreal Forests		NA		0		
4 Grasslands/Tundra		NA		0		
5 Other (please specify)		NE				
D CO_2 Emissions and Removals from Soil		**NE**		**0**		
E Other (please specify)						

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 6. *Sectoral Report for Waste*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)						
Greenhouse Gas Source and Sink Categories	**CO_2**	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOC**
Total Waste	**NE**	**662,2**	**2,80**			
A Solid Waste Disposal on Land	**NE**	**573,8**	**0,00**			
1 Managed Waste Disposal on Land						
2 Unmanaged Waste Disposal Sites						
3 Other (please specify)						
B Wastewater Handling	**NE**	**88,4**	**2,80**			
1 Industrial Wastewater		53,7				
2 Domestic and Commercial Wastewater		34,6	2,80			
3 Other (please specify)						
C Waste Incineration	**NE**	**NE**	**NE**			
D Other (please specify)	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 7a. *Summary Report for National Greenhouse Gas Inventories*

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)														
Greenhouse Gas Source and Sink Categories	CO_2 Emissions	CO_2 Removals	CH_4	N_2O	NOx	CO	NMVOC	SO_2	HFCs		PFCs		SF_6	
									P	A	P	A	P	A
Total National Emissions and Removals	**119.603**	**-34.731**	**4186,6**	**183,74**	**740**	**2.329**	**442**	**20**	**0**	**0**	**0**	**0**	**0**	**0**
1 Energy	**113.296**	**0**	**589,3**	**4,69**	**633**	**1.952**	**424**	**18**						
A Fuel Combustion (Sectoral Approach)	107.567		29,8	4,69	630	1.443	404							
1 Energy Industries	31.858		0,2	2,08	63	14	1							
2 Manufacturing Industries and Construction	14.907		1,4	0,65	32	117	1							
3 Transport	34.716		26,1	0,92	372	1.089	354							
4 Other Sectors	24.605		2,1	1,04	164	222	49							
5 Other (please specify)	1.481		0,0	0,00	0	0	0							
B Fugitive Emissions from Fuels	5.729		559,5		2	509	20	18						
1 Solid Fuels			5,9											
2 Oil and Natural Gas	5.729		553,6		2	509	20	18						
2 Industrial Processes	**6.307**	**0**	**2,2**	**0,57**	**96**	**9**	**18**	**2**	**0**	**0**	**0**	**0**	**0**	**0**
A Mineral Products	2.982					0	0	2						
B Chemical Industry	130		2,2	0,57	1	8	18	0						
C Metal Production	3.195		NE	NE	96	2	0	0	0	0	0	0	0	0
D Other Production	NO				0	0	11	0						
E Production of Halocarbons and Sulphur Hexafluoride									NO	NO	NO	NO	NO	NO
F Consumption of Halocarbons and Sulphur Hexafluoride									NE	NE	NE	NE	NE	NE
G Other (please specify)	0		0	0	0	0	0	0				0		0
3 Solvent and Other Product Use		**NE**				**NE**			**NE**					
4 Agriculture					**2906,6**	**175,50**	**4**	**137**						
A Enteric Fermentation					2743,0									
B Manure Management					119,3	0,49								
C Rice Cultivation					37,7									
D Agricultural Soils						174,91								
E Prescribed Burning of Savannas					NE	NE	NE	NE						

Table 7a. *Summary Report for National Greenhouse Gas Inventories (cont.)*

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)												
Greenhouse Gas Source and Sink Categories	CO_2 Emissions	CO_2 Removals	CH_4	N_2O	NOx	CO	NMVOC	SO_2	HFCs		PFCs		SF_6	
									P	A	P	A	P	A
F Field Burning of Agricultural Residues					6,5	0,11	4	137						
G Other (please specify)					0,0	0,00								
5 Land-Use Change & Forestry		**0**	**-34.731**		**26,3**	**0,18**	**7**	**231**						
A Changes in Forest and Other Woody Biomass Stocks		0	-15.458											
B Forest and Grassland Conversion		9.805			26,3	0,18	7	231						
C Abandonment of Managed Lands			-29.079											
D CO_2 Emissions and Removals from Soil		NE	0											
E Other (please specify)		0		0	0,0	0,00	0	0						
6 Waste					**662,2**	**2,80**	**0**	**0**	**0**	**0**				
A Solid Waste Disposal on Land					573,8									
B Wastewater Handling					88,4	2,80								
C Waste Incineration														
D Other (please specify)					NE	NE								
7 Other (please specify)														
Memo Items														
International Bunkers	**2.744**		**0**	**0**	**0**	**0**	**0**	**0**						
Aviation	1.384		NE	NE	NE	NE	NE	NE						
Marine	1.360		NE	NE	NE	NE	NE	NE						
CO_2 Emissions from Biomass	**8.986**													

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

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 7b. *Short Summary Report for National Greenhouse Gas Inventories*

SHORT SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)														
Greenhouse Gas Source and Sink Categories	CO_2 Emissions	CO_2 Removals	CH_4	N_2O	NOx	CO	NMVOC	SO_2	HFCs		PFCs		SF_6	
									P	A	P	A	P	A
Total National Emissions and Removals	**119.603**	**-34.731**	**4186,6**	**183,74**	**740**	**2.329**	**442**	**20**	**0**	**0**	**0**	**0**	**0**	**0**
1 Energy — **Reference Approach**	**118.678**													
1 Energy — **Sectoral Approach**	**113.296**			**589,3**	**4,69**	**633**	**1.952**	**424**	**18**					
A Fuel Combustion		107.567			29,8	4,69	630	1.443	404					
B Fugitive Emissions from Fuels		5.729			559,5		2	509	20	18				
2 Industrial Processes	**6.307**		**2,2**	**0,57**	**96**	**9**	**18**	**2**	**0**	**0**	**0**	**0**	**0**	**0**
3 Solvent and Other Product Use			**NE**				**NE**			**NE**				
4 Agriculture			**2906,6**	**175,50**	**4**	**137**								
5 Land-Use Change & Forestry	**0**	**-34.731**	**26,3**	**0,18**	**7**	**231**								
6 Waste			**662,2**	**2,80**										
7 Other (please specify)	**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**					
Memo Items:														
International Bunkers	**2.744**			**0**	**0**	**0**	**0**	**0**	**0**					
Aviation	1.384			NE	NE	NE	NE	NE	NE					
Marine	1.360			NE	NE	NE	NE	NE	NE					
CO_2 Emissions from Biomass	**8.986**													

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

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Anex A
1997

Points and comas are used as in the spanish notation

Country	Argentina
Inventory Year	1997
Title of Inventory	Inventario de Gases de Efecto Invernadero de la República Argentina
Contact Name	Vicente Barros
Organization	Secretaría de Recursos Naturales y Desarrollo Sustentable
Address	San Martín 459 (1417) Buenos Aires Argentina
Phone	+5411 4348-8685 +5411 4348-8678
E-Mail	ccli@sernah.gov.ar
Is uncertainty addressed?	Yes
Related documents filed with IPCC	Yes

Table 1. *Sectoral Report for Energy*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)							
Greenhouse Gas Source and Sink Categories	**CO_2**	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOC**	**SO_2**
Total Energy	123.245	715,4	5,40	706	1.553	413	23.311
A Fuel Combustion Activities (Sectoral Approach)	118.855	37,5	5,40	703	1.016	391	23.292
1 Energy Industries	**35.975**	**0,2**	**1,93**	**70**	**18**	**1**	**0**
a Petroleum	5.877						
b Coal	2.444						
c Natural Gas	27.654						
2 Manufacturing Industries and Construction	**17.003**	**1,7**	**0,76**	**35**	**146**	**1**	**0**
a Petroleum	2.008						
b Coal	1.460						
c Natural Gas	13.535						
3 Transport	**39.664**	**33,5**	**1,05**	**418**	**642**	**341**	**0**
a Civil Aviation	1.252	0	0	3	8	4	
b Road Transportation	36.152	32,8	0,94	361	627	334	
c Railways	361	0	0	9	3	1	
d Navigation	1.899	0	0	45	5	1	
e Other (please specify)	NO						
Pipeline Transport	NO						
4 Other Sectors	**26.213**	**2,2**	**1,67**	**180**	**210**	**48**	**0**
a Commercial/Institutional	3.650	0,1	0,21	3	1	0	
b Residential	14.578	0,9	1,24	13	144	23	
c Agriculture/Forestry/Fishing	7.985	1,2	0	163	65	25	
5 Other (not specified)	**0**	**0,0**	**0**	**0**	**0**	**0**	
B Fugitive Emissions from Fuels	**4.390**	**677,9**	**NO**	**3**	**537**	**23**	**19**
1 Solid Fuels	**NE**	**8,7**	**NE**	**0**	**0**	**0**	**0**
a Coal Mining		8,7					
b Solid Fuel Transformation							
c Other (please specify)							
2 Oil and Natural Gas	**4.390**	**669,2**	**NO**	**3**	**537**	**23**	**19**
a Oil		13,1		3	537	23	19
b Natural Gas		502,9					
c Venting and Flaring	4.390	153,1					
Memo Items[2]							
International Bunkers	**2.360**	**0,1**	**0,04**	**1**	**1**	**4**	**0**
Aviation	162	0,1	0,04	1	1	4	0
Marine	2.198	0,0	0,00	0	0	0	0
CO_2 Emissions from Biomass	**10.884**						

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

[2] Not included in energy totals.

Table 2. *Sectoral Report for Industrial Processes*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)													
Greenhouse Gas Source and Sink Categories	**CO_2**	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOC**	**SO_2**	**HFCs**		**PFCs**		**SF_6**	
					P	**A**	**P**	**A**	**P**	**A**			
Total Industrial Processes	**8.124**	**0**	**1**	**1**	**35**	**1**	**5**	**8,38**	**1,02**	**0**	**0**	**0**	**0**
A Mineral Products	**4.189**	**NE**	**NE**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**
1 Cement Production	3.108						2						
2 Lime Production	1.068												
3 Limestone and Dolomite Use	13												
4 Soda Ash Production and Use	NO												
5 Asphalt Roofing	NE				0	0							
6 Road Paving with Asphalt	NE					0							
7 Other (please specify)	NE	0,0	0,00	0	0	0	0	0	0	0	0	0	0
Glass Production					0								
Concrete Pumice Stone						0							
B Chemical Industry	**88**	**0,0**	**0,62**	**1**	**9**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**
1 Ammonia Production (1)	150				1	1	0						
2 Nitric Acid Production	NA		0,62	1									
3 Adipic Acid Production	NO		0,00	0	0	0							
4 Carbide Production	88	0,0											
5 Other (please specify)	NA	0,0		0	8	0	1						
C Metal Production	**3.847**	**NE**	**NE**	**1**	**25**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**0**
1 Iron and Steel Production	3.551			0	0	0	0						
2 Ferroalloys Production	IE												
3 Aluminium Production	296			0	25		3				0		
4 SF_6 Used in Aluminium and Magnesium Foundries	NO												0
5 Other (please specify)	NO												

Table 2. *Sectoral Report for Industrial Processes (cont.)*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)													
Greenhouse Gas Source and Sink Categories	**CO_2**	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOC**	**SO_2**	**HFCs**		**PFCs**		**SF_6**	
					P	**A**	**P**	**A**	**P**	**A**			
D Other Production	**NO**	**NO**	**NO**	**0**	**0**	**29**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1 Pulp and Paper			0	0	0	0							
2 Food and Drink					29								
E Production of Halocarbons and Sulphur Hexafluoride	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
1 By-product Emissions								0		0			
2 Fugitive Emissions								0		0			
3 Other (please specify)													
F Consumption of Halocarbons and Sulphur Hexafluoride	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**	**8,38**	**1,02**	**0**	**0**	**0**	**0**
1 Refrigeration and Air Conditioning Equipment									0		0		
2 Foam Blowing								0		0			
3 Fire Extinguishers								1		0		0	
4 Aerosols								0		0			
5 Solvents								0		0			
6 Other (please specify)								0		0		0	
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.

NE: Not estimated
IE: Estimated but included elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 3. *Sectoral Report for Solvent and Other Product use*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)			
Greenhouse Gas Source and Sink Categories	**CO_2**	**N_2O**	**NMVOC**
Total Solvent and Other Product Use	NE	NE	NE
A Paint Application			
B Degreasing and Dry Cleaning			
C Chemical Products, Manufacture and Processing			
D Other (please specify)			

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 4. *Sectoral Report for Agriculture*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)					
Greenhouse Gas Source and Sink Categories	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOC**
Total Agriculture	**2727,4**	**186,72**	**4**	**140**	**0**
A Enteric Fermentation	**2577,3**	**NE**	**NE**	**NE**	**NE**
1 Cattle	2445,2				
2 Buffalo	0,1				
3 Sheep	67,5				
4 Goats	17,0				
5 Camels and Llamas	7,1				
6 Horses	36,0				
7 Mules and Asses	2,0				
8 Swine	2,5				
9 Poultry	0,0				
10 Other (please specify)					
B Manure Management	**98,9**	**0,83**	**NE**	**NE**	**NE**
1 Cattle	42,6				
2 Buffalo	0,0				
3 Sheep	1,7				
4 Goats	0,5				
5 Camels and Llamas	0,3				
6 Horses	3,0				
7 Mules and Asses	0,4				
8 Swine	49,4				
9 Poultry	1,0				
10 Anaerobic	NA	0,13			
11 Liquid Systems	NA	0,00			
12 Solid Storage and Dry Lot	NA	0,57			
13 Other (please specify)		0,14			
C Rice Cultivation	**44,5**	**NE**	**NE**	**NE**	**NE**
1 Irrigated	44,5				
2 Rainfed	NO				
3 Deep Water	NO				
4 Other (please specify)					

Table 4. *Sectoral Report for Agriculture (cont.)*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)					
Greenhouse Gas Source and Sink Categories	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOCD**
Agricultural Soils	**NA**	**185,77**			
E Prescribed Burning of Savannas	**NE**	**NE**	**NE**	**NE**	**NE**
F Field Burning of Agricultural Residues	**6,7**	**0,12**	**4**	**140**	
1 Cereals	1,7	0,03			
2 Pulse	NE	NE			
3 Tuber and Root	NE	NE			
4 Sugar Cane	0,2	0,00			
5 Other: cotton and lineseed	4,8	0,08			
G Other (please specify)					

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 5. *Sectoral Report for Land-Use Change and Forestry*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)						
Greenhouse Gas Source and Sink Categories	**CO_2 Emissions**	**CO_2 Removals**	**CH_4**	**N_2O**	**NOx**	**CO**
Total Land-Use Change and Forestry	**0**	**-48.617**	**56,4**	**0**	**14**	**494**
A Changes in Forest and Other Woody Biomass Stocks	**0**	**-14.890**				
1 Subtropical Moist Forests		233				
2 Subtropical Dry Forests		441				
3 Temperate Moist Forests				-101		
4 Plantations				-15.462		
5 Other (please specify)						
B Forest and Grassland Conversion	**14.673**		**56,4**	**0**	**14**	**494**
1 Subtropical Moist Forests		10.748				
2 Subtropical Dry Forests		3.926				
3 Boreal Forests		NA				
4 Grasslands/Tundra		NA				
5 Other (please specify)		NE				
C Abandonment of Managed Lands				**-30.414**		
1 Subtropical Forests				-30.414		
2 Temperate Forests		NO		0		
3 Boreal Forests		NA		0		
4 Grasslands/Tundra		NA		0		
5 Other (please specify)		NE				
D CO_2 Emissions and Removals from Soil	**0**	**-17.987**				
E Other (please specify)						

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 6. *Sectoral Report for Waste*

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)						
Greenhouse Gas Source and Sink Categories	**CO_2**	**CH_4**	**N_2O**	**NOx**	**CO**	**NMVOC**
Total Waste	**NE**	**727,7**	**3,16**			
A Solid Waste Disposal on Land	**NE**	**616,5**	**0,00**			
1 Managed Waste Disposal on Land						
2 Unmanaged Waste Disposal Sites						
3 Other (please specify)						
B Wastewater Handling	**NE**	**111,2**	**3,16**			
1 Industrial Wastewater		75,2				
2 Domestic and Commercial Wastewater		36,0	3,16			
3 Other (please specify)						
C Waste Incineration	**NE**	**NE**	**NE**			
D Other (please specify)	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 7a. *Summary Report for National Greenhouse Gas Inventories*

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)														
Greenhouse Gas Source and Sink Categories	CO_2 Emissions	CO_2 Removals	CH_4	N_2O	NOx	CO	NMVOC	SO_2	HFCs		PFCs		SF_6	
									P	A	P	A	P	A
Total National Emissions and Removals	**131.369**	**-48.617**	**4227,0**	**196,29**	**725**	**2.222**	**414**	**24**	**8**	**1**	**0**	**0**	**0**	**0**
1 Energy	**123.245**	**0**	**715,4**	**5,40**	**706**	**1.553**	**413**	**19**						
A Fuel Combustion (Sectoral Approach)	118.855		37,5	5,40	703	1.016	391							
1 Energy Industries	35.975		0,2	1,93	70	18	1							
2 Manufacturing Industries and Construction	17.003		1,7	0,76	35	146	1							
3 Transport	39.664		33,5	1,05	418	642	341							
4 Other Sectors	26.213		2,2	1,67	180	210	48							
5 Other (please specify)	0		0,0	0,00	0	0	0							
B Fugitive Emissions from Fuels	4.390		677,9		3	537	23	19						
1 Solid Fuels			8,7											
2 Oil and Natural Gas	4.390		669,2		3	537	23	19						
2 Industrial Processes	**8.124**	**0**	**0,0**	**0,62**	**1**	**35**	**1**	**5**	**8**	**1**	**0**	**0**	**0**	**0**
A Mineral Products	4.189					0	0	2						
B Chemical Industry	88		0,0	0,62	1	9	1	1						
C Metal Production	3.847		NE	NE	1	25	0	3	0	0	0	0	0	0
D Other Production	NO				0	0	29	0						
E Production of Halocarbons and Sulphur Hexafluoride									NO	NO	NO	NO	NO	NO
F Consumption of Halocarbons and Sulphur Hexafluoride									8	8	8	8	8	8
G Other (please specify)	0		0	0	0	0	0	0				0		0
3 Solvent and Other Product Use		**NE**				**NE**			**NE**					
4 Agriculture					**2727,4**	**186,72**	**4**	**140**						
A Enteric Fermentation					2577,3									
B Manure Management					98,9	0,83								
C Rice Cultivation					44,5									
D Agricultural Soils						185,77								
E Prescribed Burning of Savannas					NE	NE	NE	NE						

Table 7a. *Summary Report for National Greenhouse Gas Inventories (cont.)*

SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)													
Greenhouse Gas Source and Sink Categories	CO_2 Emissions	CO_2 Removals	CH_4	N_2O	NOx	CO	NMVOC	SO_2	HFCs		PFCs		SF_6	
									P	A	P	A	P	A
F Field Burning of Agricultural Residues					6,7	0,12	4	140						
G Other (please specify)					0,0	0,00								
5 Land-Use Change & Forestry	**0**	**-48.617**	**56,4**	**0,39**	**14**	**494**								
A Changes in Forest and Other Woody Biomass Stocks	0	-14.890												
B Forest and Grassland Conversion		14.673			56,4	0,39	14	494						
C Abandonment of Managed Lands				-30.414										
D CO_2 Emissions and Removals from Soil	0	-17.987												
E Other (please specify)		0		0	0,0	0,00	0	0						
6 Waste					**727,7**	**3,16**	**0**	**0**	**0**	**0**				
A Solid Waste Disposal on Land					616,5									
B Wastewater Handling					111,2	3,16								
C Waste Incineration														
D Other (please specify)					NE	NE								
7 Other (please specify)														
Memo Items														
International Bunkers	**2.360**		**0**	**0**	**1**	**1**	**4**	**0**						
Aviation	162		0	0	1	1	4	0						
Marine	2.198		0	0	0	0	0	0						
CO_2 Emissions from Biomass	**10.884**													

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

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 7b. *Short Summary Report for National Greenhouse Gas Inventories*

SHORT SUMMARY REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)														
Greenhouse Gas Source and Sink Categories	CO_2 Emissions	CO_2 Removals	CH_4	N_2O	NOx	CO	NMVOC	SO_2	HFCs		PFCs		SF_6	
									P	A	P	A	P	A
Total National Emissions and Removals	**131.369**	**-48.617**	**4227,0**	**196,29**	**725**	**2.222**	**414**	**24**	**8**	**1**	**0**	**0**	**0**	**0**
1 Energy — **Reference Approach**	**130.851**													
1 Energy — **Sectoral Approach**	**123.245**		**715,4**	**5,40**	**706**	**1.553**	**413**	**19**						
A Fuel Combustion	118.855		37,5	5,40	703	1.016	391							
B Fugitive Emissions from Fuels	4.390		677,9		3	537	23	19						
2 Industrial Processes	**8.124**		**0,0**	**0,62**	**1**	**35**	**1**	**5**	**8**	**1**	**0**	**0**	**0**	**0**
3 Solvent and Other Product Use	**NE**			**NE**			**NE**							
4 Agriculture			**2727,4**	**186,72**	**4**	**140**								
5 Land-Use Change & Forestry	**0**	**-48.617**	**56,4**	**0,39**	**14**	**494**								
6 Waste			**727,7**	**3,16**										
7 Other (please specify)	**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**					
Memo Items:														
International Bunkers	**2.360**			**0**	**0**	**1**	**1**	**4**	**0**					
Aviation	162			0	0	1	1	4	0					
Marine	2.198			0	0	0	0	0	0					
CO_2 Emissions from Biomas	**10.884**													

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

NE: Not estimated
IE: Estimated but icluded elsewhere
NO: Not known to be occurring
NA: Not applicable

Table 8a. *Overview Table for National Greenhouse Gas Inventories*

Overview Table																								
Greenhouse Gas Source and Sink Categories	CO_2		CH_4		N_2O		NOx		CO		NMVOC		SO_2		HFCs		PFCs		SF_6		Documentation	Disaggregation	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	M																				
Sectoral Approach																							
1 Energy Industries																							
2 Manufacturing Industries and Construction	ALL	M	ALL	M	ALL	M	ALL	M	ALL	M	ALL	M	NE		NO		NO		NO		M	3	
3 Transport	ALL	M	ALL	M	ALL	M	ALL	M	ALL	M	ALL	M	NE		NO		NO		NO		M	3	
4 Other Sectors	ALL	M	ALL	M	ALL	M	ALL	M	ALL	M	ALL	M	NE		NO		NO		NO		M	3	
5 Other (please specify)	NE																						
B Fugitive Emissions from Fuels																							
1 Solid Fuels	NA		ALL	M	NE		NE		NE		NE		NE		NO		NO		NO		M	3	
2 Oil and Natural Gas	ALL	L																					
2 INDUSTRIAL PROCESSES																							
A Mineral Products	ALL	M	NE		NE		ALL	M	ALL	M	ALL	M	ALL	M	NO		NO		NO		M	3	
B Chemical Industry	PART	M	PART	M	PART	M	PART	M	PART	M	PART	M	PART	M	NO		NO		NO		M	3	
C Metal Production	PART	M	NE		NE		PART	M	PART	M	PART	M	PART	M	NO		NO		NO		M	3	
D Other Production	NA		NA		NA																		
E Production of Halocarbons and Sulphur Hexafluoride	NO		NO		NO		NO		NO		NO		NO		NO		NO		NO		M	1	
F Consumption of Halocarbons and Sulphur Hexafluoride																							
Potential[1]	NO		NO		NO		NO		NO		NO		NO		PART	M	PART	M	PART	M	M	2	
Actual[2]	NO		NO		NO		NO		NO		NO		NO		ALL	M	ALL	M	ALL	M	M	2	
G Other (please specify)	NA																						
3 SOLVENT AND OTHER PRODUCT USE	NO		NO		NO		NE		NE		NE		NO		NO		NO		NO				
4 Agriculture																							
A Enteric Fermentation	NE		PART	M	NE		NE		NE		NE		NE		NO		NO		NO		M	2	
B Manure Management	NA		PART	M	PART	M	NE		NE		NE		NE		NO		NO		NO		M	2	

Greenhouse Gas Source and Sink Categories	CO_2		CH_4		N_2O		NOx		CO		NMVOC		SO_2		HFCs		PFCs		SF_6		Documentation	Disaggregation	Footnotes
	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality	Estimate	Quality			
C Rice Cultivation	NA		ALL	M	NE			NE		NE		NE		NE		NO		NO		NO		M	2
D Agricultural Soils	NA		ALL	M	ALL		M	NE		NE		NE		NE		NO		NO		NO		M	2
E Prescribed Burning of Savannas	NE		NE		NE			NE		NE		NE		NE		NO		NO		NO		M	2
F Field Burning of Agricultural Residues	NE		PART	M	PART		M	PART	M	PART	M	NE		NE		NO		NO		NO		M	2
G Other (please specify)																							
5 LAND-USE CHANGE & FORESTRY																							
A Changes in Forest and Other Woody Biomass Stocks	ALL	M	NE		NE			NE		NE		NE		NE		NO		NO		NO		M	3
B Forest and Grassland Conversion	ALL	M	ALL	M	ALL		M	ALL	M	ALL	M	NE		NE		NO		NO		NO		M	3
C Abandonment of Managed Lands	PART	L	NE				NE		NE		NE		NE		NE		NO		NO		NO	M	3
D CO_2 Emissions and Removals from Soil	PART	L	NE				NE		NE		NE		NE		NE		NO		NO		NO	M	2
Other (please specify)																							
6 WASTE																							
A Solid Waste Disposal on Land	NE		ALL	M			ALL	M	NE		NE		NE		NE		NO		NO		NO	M	2
B Wastewater Handling	NE		ALL	M			ALL	M	NE		NE		NE		NE		NO		NO		NO	M	2
C Waste Incineration	NE		NE				NE		NE		NE		NE		NE		NO		NO		NO		
D Other (please specify)	NE		NE				NE		NE		NE		NE		NE		NO		NO		NO		
Memo Items: International Bunkers																							
Aviation	ALL	M	IE				M	IE	M	IE	M	IE	M	IE	M	NO		NO		NO	NO	M	1
Marine	ALL	M	IE				M	IE	M	IE	M	IE	M	IE	M	NO		NO		NO	NO	M	1
CO_2 Emissions from Biomass	ALL	M	IE				M	IE	M	IE	M	IE	M	IE	M	NO		NO		NO	NO	M	2

(1) Potential emissions based on Tier 1 Approach.
(2) Actual emissions based on Tier 2 Approach.

NE: Not estimated
Quality:
Documentation:
Disaggregation:

IE: Estimated but icluded elsewhere
H: High confidence of estimation
H: High (all background information included)
1: Total emissions estimated
NO: Not known to be occurring
M: Medium confidence of estimation
M: Medium (some background information included)

2: Sectoral split
NA: Not applicable
L: Low confidence of estimation
L: Low (only emission estimates included)
3: Subsectoral split
PART: Partly estimated
ALL: Full estimate of all possible sources

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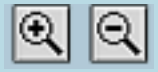 Zoom-in and zoom-out tool magnifies or reduces pages.

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