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Enabling Activities for Preparation of Syria's Initial National Communication to UNFCCC

Green House Gases (GHG) Inventory for Industry Sector

July 2009

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Ministry of State for Environment Affairs (MSEA), in collaboration with United Nation Development Programm (UNDP) in Syria, and Global Environmental Facility (GEF).

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Inventory of Greenhouse Gas (GHG) Emissions from the Industrial Sector in Syria

(INC-SY_GHG_Industry Inventory-En)

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This report has been approved unanimously by the technical committee, during the Technical Workshop which took place on 23.7.2009, in the Resort of Mount Hermon, Qunitra.

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1. Introduction

Greenhouse phenomena are considered one of the most important environmental problem that threatened safe live on earth .The greenhouse gases are known also the activities that omitted them are classified un four sectors: energy sector, industry sector , and agriculture sector, waste sector. The contribution of each sector differs from nation to another according to the degree its development.

Industry sector is considered one of the important sectors that contribute in Greenhouse phenomena , the different kind of industrial activities that included chemical or physical transformation materials can released many different greenhouse gases during these processes, as CO2, CH4, N2O, and PFCs,.

2. Syrian Industry Sector Specifications

Industrial Section in Syrian Arab republic mainly is formed from general, privet and associated sectors, and it distribute between industrial ministry, petroleum and mineral treasure ministry and financial ministry .

Industry sector is divided to four ranges: mineral industry, chemical industry, mineral industry and other industry. In Syria these sectors are as follow:

- Mineral industry :cement industry is the first one since there are many factories ,also glass and asphalt, industries, in addition some mineral are used in many industries as soda ash and , lime.
- Chemical industry: fertilizer and petroleum refinery industries are the most important: the first produce ammonia ,nitric acid ,sulpher acid urea the other produce petroleum coke .
- Metal industry: there is one factory for melting and recycling iron produce steel and iron rods
- Other industry: there are many factories producing all kinds of dring and foods as biscuit, bread, fats, sugar.

The gases emitted from industry sector in Syria is estimated , they are CO2, CH_4 NMVOC , SO_2 CO, NO_X , N_2O , some of them are essential as CO2, CH_4 ,N_2O, the other are precursors as SO_2 CO, NMVOC , NO_X , .

Carbon dioxide emission:

In Syria CO2 emits from cement, ammonia ,iron and steel production in addition of soda ash usage. Figure(S1) clarifies emissions changes from industrial section between 1994-2005, where seems little since relate to production quantity

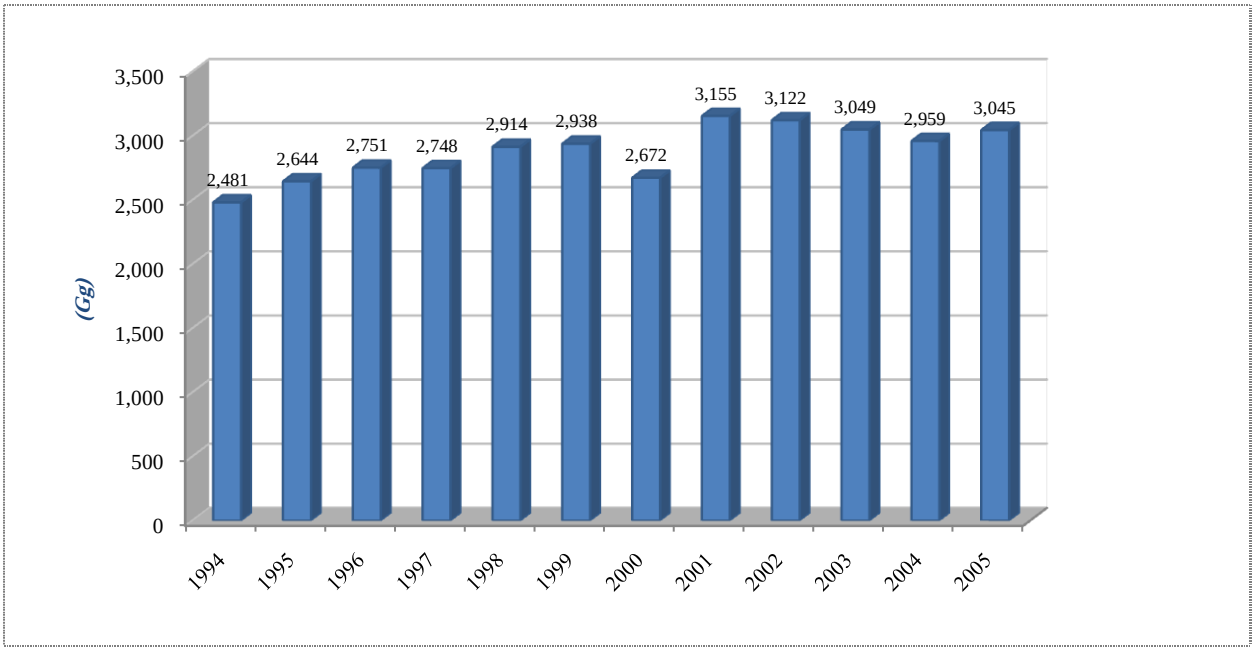

Figure S1. Changes of CO_2 from Industry Section 1994-2005

Figure (S2) clarifies the distribution of CO_2 emit from cement, ammonia, iron ans steel production and soda ash usage between 1994-2005 , it seems the big source of CO_2 in 1994 is cement 91% followed ammonia 7% and iron and steel 2% . The change distribution in 2005 is little limited between cement and steel production.

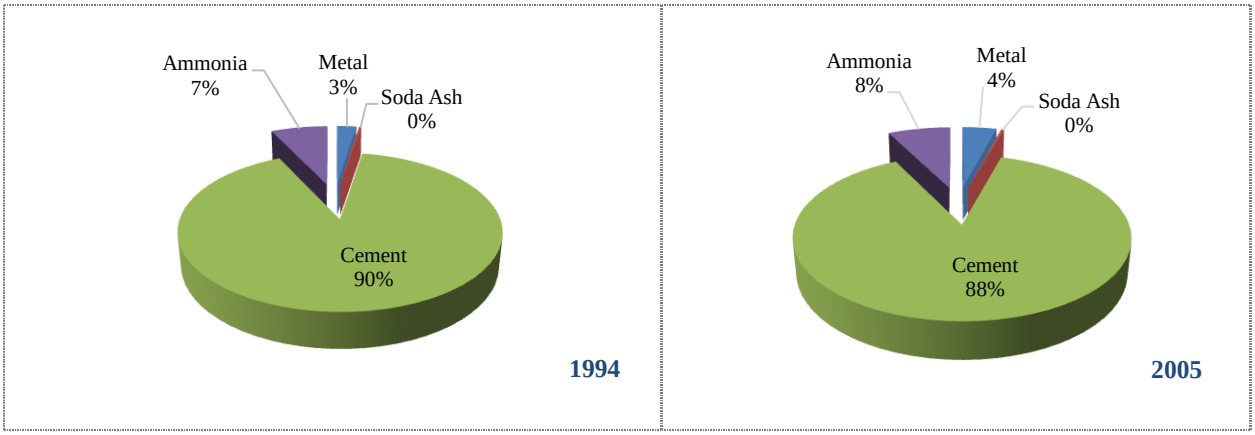

Figure S 2. CO_2 Distribution According Source Emissions

Methane Emission

Figure (S3) clarifies the CH_4 emission changes in industrial section between 1994-2005 , CH_4 emit only from petroleum coke production, the emission is lowered because coke production decreased as a consequent of crude oil kind change .

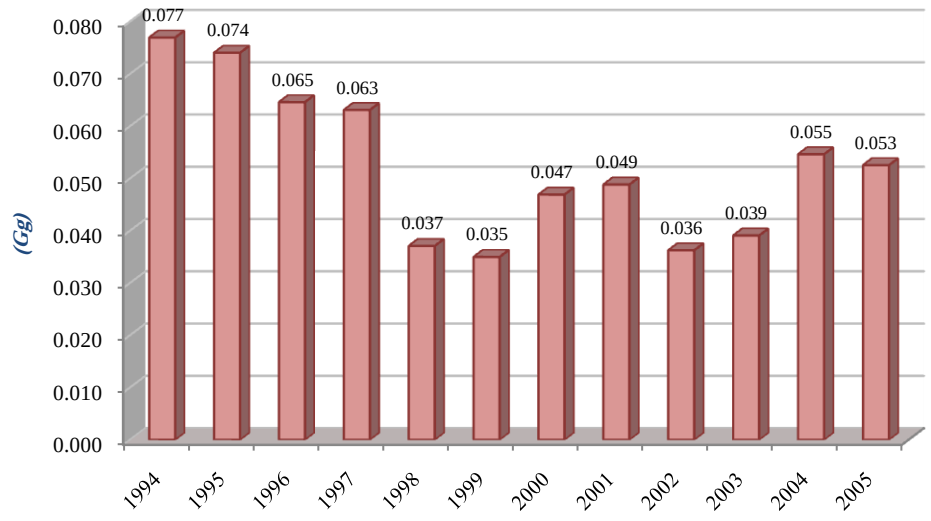

Figure S 3. Changes of CH_4 from Industry Section 1994-2005

Oxide Nitrous Emission

Figure (S4) clarifies the N_2O emission changes in industrial section between 1994-2005, N_2O emit only from nitric acid production, the emission change according production change.

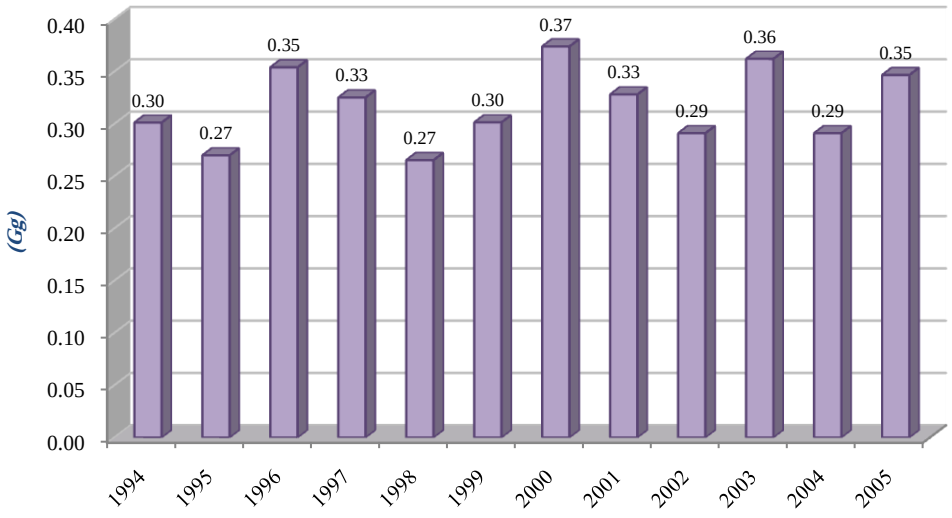

Figure S4. N_2O Emission Changes Between 1994-2005

Figure (S5) clarifies total greenhouse gases emissions of N_2O, CO_2, CH_4 which studied in this report after convert all gases as co_2 emission, one see the change emissions is very little but tends to increased, that can be returned to there are no new factories and most of them works on high capacities.

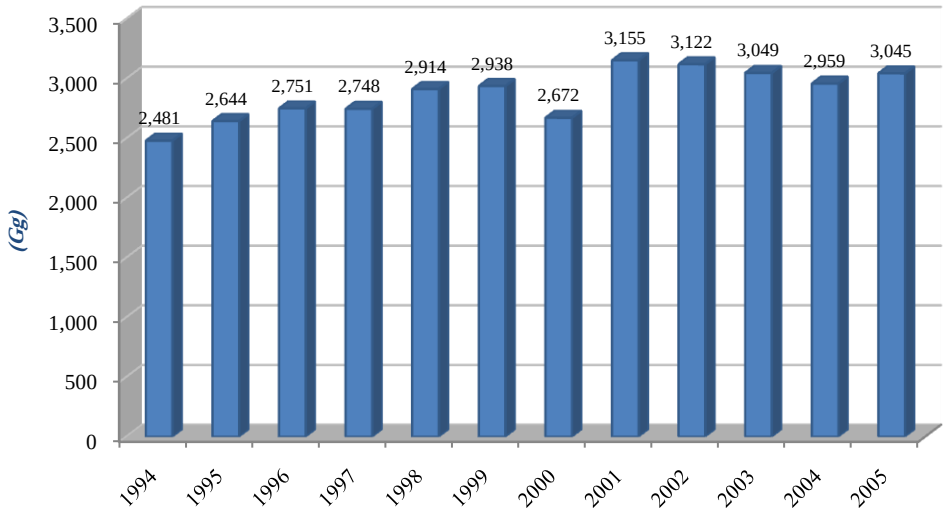

Figure S5 Clarifies Total Greenhouse Gases Emissions as CO_2

Figure (S6) clarifies CO_2distribution emission directly and equivalent from industrial section between 1994-2005 of cement , ammonia , steel and iron ,soda ash, petroleum coke , nitric acid . the most important emitter is cement 88% followed ammonia 7%, oxide nitrous 3% , iron and steel 2% , finely petroleum coke and soda ash usage . The changes between 1994 and 2005 is little and limited between cement and steel industries.

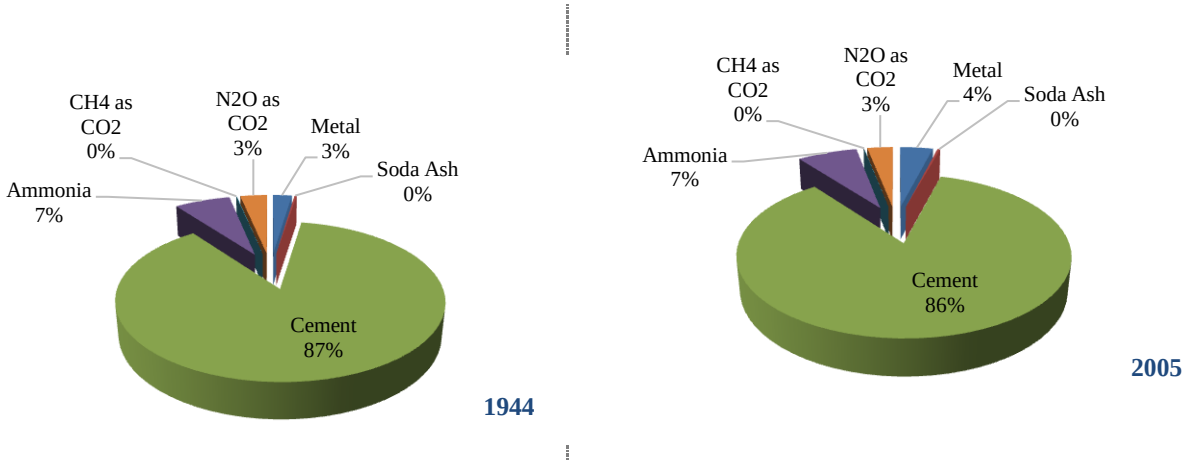

Figure S6. Clarifies CO_2 Distribution Emission Directly and Equivalent

Greenhouse gases Emissions for industry sector in Syria has been done for 18 industry products available with good certainty for product quantity emission factor ,so the precision and certainty for Syrian first national repot is realized in industrial sector

1. Introduction

Industrial sector is one of the important sectors that contributing clearly in greenhouse gas emissions in the world, as the quantity and the kind of gases emission from. Industrial sector contribution differs according to the degree of its development and presence of heavy industries.

Greenhouse gases CO_2 , N_2O, CH_4 HFC_s, PFC_s SF_6 are emitted from chemical or physical materials transformation of industrial activities which are not related of energy. In some instances, industrial process emissions are produced in combination with fuel combustion emissions and it may be difficult to decide whether a particular emission should be reported within the energy or industrial emission sector.

N2O emissions from industrial sector are recognized as an important anthropogenic contributors to global N2Oemissions. It is estimated that 3 to 20 per cent of all global emissions of N2O (IPCC, 1992). Also industrial processes emit HFCs, PFCs and SF6 which are an important contributor to national GHG emissions due to their high GWPs, and it is expected to grow substantially in the next decades due to their importance as substitutes for ozone-depleting substances.

Industrial section divided according to revised copy IPPU-1996 to four ranges:

- Mineral Products: include Cement production, Lime production, Limestone use, Soda Ash prod. And use ,Asphalt roofing ,Road paving ,Other.
- Chemical industry: include Ammonia .Nitric acid, Adipic acid, Urea, Carbides, Caprolactam, and Petrochemicals.
- Metal Production include Iron, steel and ferroalloys, Aluminium, Magnesium Other metals.
- Other industries include Pulp and paper, Food and drink production, Production of halocarbons ,Use of halocarbons and SF6 ,Other sources.

2. Syrian Industry Characterizations

Syrian is an undeveloped nation try to follow industrial nations through fabricate its minerals and agriculture products to provide its needs in addition to possess and nationalize modern techniques.

Industrial sector is distributed between three sectors : general, privet, share sectors. Industries that are included in Syrian inventory of Greenhouse gas according of IPPU-1996 are been founded in industry ministry, petroleum and mineral ministry and finance ministry and , general statistical office.

General sector

Industry Ministry: Industry Ministry is the side responsible of heavy and transformation industries that related of general sector of government, Industry ministry has eight establishments with 91 companies:

1) General Establishment of Cement and Construction Materials
2) General Establishment of Chemical Industries
3) General Establishment of Engineering Industries
4) General Establishment Sugar Industries
5) General Establishment Food Industries
6) General Establishment Textile Industries
7) General Establishment Cotton Industries
8) General Establishment of Fume Industries

Privet Sector

After of many series laws since 1991,2000 to 2007, the investment of Syrian privet sector contribution increases in the overall industrial sector, so many industrial constructions appear in many fields as foods chemical, engineering and textile industries .

Share Sector

In this sector, general and privet sectors cooperate together in many industrial projects as in taxi production , photoelectric cells.

Petroleum and Mineral ministry

Petroleum and mineral ministry interests of mineral treasure and petroleum industries and involved three establishments:

General refinery establishment, general petroleum establishment ,and general geology establishment.

Finance ministry

Financial ministry which interested of export and import raw and manufactured materials.

Syrian industry specification as mentioned in IPPU- 1996 is as follow :

2.1. Mineral Industry

In Syria There are many raw materials as limestone, silica, carbonate ,and petroleum crude oil, that aid to establish manufactories to produce cement ,glass, asphalts. Table (1) clarify all Syrian mineral industries and its production between 1994-2005

2.1.1. Cement Industry

Dioxide carbon produced from cement industry represent the most important source of co_2, it reach to 2.4% per cent of total global industrial and energy CO2 emissions[1]. In Syria , there is nine companies producing all kinds of cement, table (1) clarify all cement factories in Syria and its design capacities.

Table 1. All Cement Factories in Syria and its Design Capacities [2]

Factory	Design Capacities ton	Annual Production %
Adra Cement Factory, Damascus	845000	15
Al Rastan Factory, Homs	135052	3
Hama Cement Factory 1,2,3	1000000	18
Al Chahba Cement Factory 1,2,3	947000	17
Tartous Cement Factory	1450000	26
Militiry Housing Aleppo	300000	5
Arabian Cement, Aleppo	985000	17
Total	**5662052**	

2.1.2. Lime Production

Limestone and dolomite stone is used in many industries e.g., metallurgy, pulp and paper, construction materials, effluent treatment, water softening, pH control and soil stabilization.

In Syria this product is produced by privet sector, there are many calcimined plants provided Syria of its requirements of this material , particularly for water treatments stations(2). Since this material is produced by privet sector ,the data are distributed and there difficult to estimated the production quantity of this material.

2.1.3. Limestone and Dolomite Use

Limestone (CaCO3) and dolomite (CaCO3.MgCO3) are basic raw materials having commercial applications in a number of industries including metallurgy (e.g., iron and steel), glass manufacture, agriculture, construction and environmental pollution control. In industrial applications that involving the heating of limestone or dolomite at high temperatures, CO2 is generated.

[1] Revised 1996 IPPU Guidelines for National Greenhouse Gas Inventories ; Workbook
[2] Ministry of Industry

In Syria limestone is consumed in glass industry and others ,this material is produced by privet sector on available data.

2.1.4. Soda Ash Production and Use

Soda ash (sodium carbonate, Na2CO3) is a white crystalline solid that is used as a raw material in a large number of industries including glass manufacture, soap and detergents, pulp and paper production and water treatment. Carbon dioxide is emitted from the use of soda ash, and may be emitted during production, depending on the industrial process used to manufacture soda ash. During the production process, the principal ore is calcined in a rotary kiln and chemically transformed into a crude soda ash. Carbon dioxide and water are generated as by-products of this process.

In Syria this material is imported to cover the need of industries applications there is no production of this material, table (1).

2.1.5. Asphalt Roofing Production

Green house gases is emitted from producing different kinds of asphalts: roofing asphalt, blowing Asphalt that submitted to polymerization and stabilization process to modifying its proprieties toward climate, and paving asphalt are composed of compacted aggregate and asphalt binder . Also, gases are emitted from the asphalt uses: the road surfacing operations and the subsequent road surface.

In Syria asphalt paving is produced from natural asphalt stone and from asphalt produced from fuel oil in Homs and Banias refineries .Table (1) clarify the quantity of asphalt paving[(5)] and roofing asphalt.

2.1.6. Other Products

There may be several other mineral production processes emitting pollutants. These are probably not significant on a global scale, but may be significant on a national or local scale.

Glass industry

In Syria there is many glass factories distributed in general and privet sectors produced different kinds of glasses,table (2),clarify produced quantities.

Table 2. the Quantities Produced from Material Industry 1994-2005

Year	Cement t*1000/y	Soda ash t/y	paving Asphalt t/y	Roofing Asphalt t/y	Glass t/y
1994	4344	16063	273912	16575	53505
1995	4804	15792	316233	16316	70030
1996	4817	24274	417153	15000	58270
1997	4838	24801	441757	15017	69266
1998	5016	24007	496368	15291	57149
1999	5134	24700	521092	16306	69639
2000	4631	25141	458520	15307	69062
2001	5428	26275	496004	16899	72715
2002	5399	29259	554338	17276	78915
2003	5224	27220	554049	20572	78677
2004	5098	27879	604919	23263	83850
2005	5218	24606	607751	18553	84639

Source: Central Statistical Bureau 1994-2005

2.2. Chemical Industry

In Syria chemical industries concentrate in tow important industries : fertilizer industry and petroleum refinery in Homs and Banias refineries. Table (3) clarify the quantities produced from chemical industry 1994-2005[(4)].

2.2.1. Fertilizers Industry

Ammonia

Fertilizers industry is considered main industry in syria, since the ore is abundant and the requirement of using is increased. Fertilizer company operate since 1972 year ago, it consists of nitrogen fertilizer factory, super phosphate and ammonia urea , production of these factories cover Syria need of fertilizer ,addition there are units for nitric acid , sulpher acid and phosphorous acid ,the production capacity of ammonia fertilizer is 11000 ton/ year , table (3)[(4)].

N*itric Acid*

Fertilizer factory produce nitric acid its concentration 47%, OF production capacity 280 ton / day, table (3)[(2)]

Urea

Fertilizer factory produces urea N 46% of production capacity 2400 ton/year ,table (3)[(4)]

Sulphric Acid

Fertilizer factory produces sulphric acid of production capacity 1300 ton/ day, table(3)[(2)] .

2.2.2. Petroleum Industry

In Syria there are two refineries with 12 million ton /year refine heavy and light Syrian crude oil, and produces petroleum derivatives for local market, petroleum derivatives submit to catalytic treatments to modifying its properties and lowering contaminations before using as a

final products. In Syria there are many factories to produce accompanied gas in Swedy, Gbesa, Ody, Omar, in addition to middle region gas factory, there is no petrochemical industry for producing chemical components, but since 1975 the thermal craking that fuel oil submitted produces petroleum coke as a byproduct, table(3).

Table 3. Chemical Industry Products 1994-2005

Year	Ammonia t/y	Nitric acid t/y	Urea t/y	Coke t/y	Sulphric Acid t/y
1994	112150	66952	118500	153939	81365
1995	77190	59985	62435	148118	217869
1996	97850	78705	100025	129228	213536
1997	101785	72283	118300	126232	200928
1998	157200	58977	173000	74189	192552
1999	136000	66991	159600	70000	317519
2000	110859	83138	123076	93850	239129
2001	168332	72943	21378	97698	343717
2002	173736	64702	192335	72539	249820
2003	161045	80503	197070	78200	249281
2004	140245	64702	166945	109288	330163
2005	145950	77061	158825	105115	307107

Source: Central Statistical Bureau 1994-2005

2.3. Metallurgy Industry

In Syria there is no metallurgy industry that producing different kinds of metals from its ores , but there is a factory for melting spent iron ,also there is many factories distributed between general and privet sectors for producing different figures of aluminum from imported ore, this operation don't emit greenhouse gases.

Melting Factory of Spent Metal

In Syria Hama town there is factory for melting spent emit greenhouse gases, this factory produce billet ,roll rods 8-18 mm for construction affairs and rods 3/8-3in ,table (4) clarify the quantity of billet 1994-2005

Table (4) clarify the quantity of billet 1994-2005

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Billet/ 1000 ton	35.9	33.1.	60.1	52.5	59.5	51.8	53.3	60.0	48.9	58.3	72.8	75.1

Source: Central Statistical Bureau 1994-2005

2.4. Others Industries

This category includes foods, drinks and solnents industries also producing and using halocarbons . In Syria many of food and drink products are fabricated in general and privet sectors ,table (5) clarify total productivity of these material from tow sectors 1994-2005.

2.4.1. Pulp and paper industry

In Syria have no Pulp and paper industry from raw materials ,there is only recycling of waste paper, this operation don't omit green house gases[9].

2.4.2. Spirit Drinks Industry

There are many mineral water industries and Spirit Drinks Industry distributed in Syria in many royals ,table (5).

2.4.3. Foods Industry

Margarine and solid cooking fats: there are many factories to fabricate these materials in general and privet sectors , table (5).

Biscuits:

There are many factories in general and privet sectors , table (5).

Bread:

There are many factories in general and privet sectors , table (5).

Sugar:

There are six factories for sugar some are patched about 100 days accordance of bill sugar time the other work all the years days refine imported red sugar, table (5) clarify sugar factories and its design capacity.

Table 5. Clarify Sugar Factories and its Design Capacity.

Factories	Production T/Day
Alepo sugar	3500
Homs sugar	290 red sugar 850 bill
Tal Salhab sugar	3500
Algab sugar	1000 bill 300 red sugar
Deir alzor sugar	4000 bill
Raqqa sugar	3200 bill

Source: Ministry of Industry

2.4.4. Using Halocarbons

Halocarbons components used in many fields as foam blowing, refrigeration and air conditioning, fire suppression and explosion protection ,solvent cleaning, aerosols ,other applications. In Syria these component are imported not fabricated ,no available data .

Table 6. Clarify Total Productivity of Foods and Drink Materials 1994-2005.

Year	WIN	RED WIN	BEAR	SPIRIT DRINK	BREAD	SUGAR	FAT	BISCUIT
	1000 L	1000 L	1000 L	1000 L	1000 T	1000 T	T	T
1994	2905	256	10243	1827	654	180	4806	13892
1995	3537	249	10243	1307	1531	158	5182	14041
1996	3752	276	10265	899	1568	181	2934	12625
1997	3137	265	9698	818	1671	176	1406	11648
1998	3400	218	9744	783	1753	89	946	11462
1999	3508	201	12062	635	1783	158	941	11517
2000	3823	326	9078	1187	1896	109	975	13079
2001	3762	303	9950	1248	2336	121	1169	13672
2002	3870	296	10370	1443	2457	214	1091	17361
2003	3341	315	10013	1535	2597	123	1054	17681
2004	4171	257	10855	2293	3232	231	926	19479
2005	4025	225	11073	3460	3373	148	774	19826

Source: Central Statistical Bureau 1994-2005

3. Methodologies of estimating Greenhouse Gases

To estimate the greenhouse gases from industrial section ,the methodology of IPCC-1996 (Revised 1996 IPPU Guidelines for National Greenhouse Gas Inventories; Workbook) will be used according to worksheet mentioned and the way of classification

3.1. Emissions from Mineral Industry

3.1.1. Cement Industry

3.1.1.1. Estimating CO_2 from Cement Production

To Estimate CO2 emitted from cement production between 1994-2005 the WORKSHEET 2-1 of (IPCC-1996) will be used also table (2) for quantity.

Methodology

- Enter the Quantity of Cement Produced in column A in tones.
- Enter the Emission Factor of (0.4985 tones of CO_2 per ton of cement produced) in column B,(because the lime fraction of cement is 0.635)[3]
- Multiply column A by column B to obtain CO_2 Emitted in tones of CO_2, and enter this value in column C.
- Divide column C by 10^3 to convert to units of Giga grams CO_2, and enter this value in column D.

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	CEMENT PRODUCTION			
WORKSHEET	2-1A			
SHEET	1 OF 2 CO_2 EMISSIONS			
COUNTRY				
YEAR				
STEP 1				
Year	A	B	C	D
	Quantity of Cement Produced	Emission Factor	CO_2 Emitted	CO_2 Emitted
	(t)	(t CO_2/t cement produced)	(t)	(Gg)
			C = (A x B)	D = C/1000
1994	4344000	0.4985	2165484	2165.48
1995	4804000	0.4985	2394794	2394.79
1996	4817000	0.4985	2401275	2401.27
1997	4838000	0.4985	2411743	2411.74
1998	5016000	0.4985	2500476	2500.48
1999	5134000	0.4985	2559299	2559.30
2000	4631000	0.4985	2308554	2308.55
2001	5428000	0.4985	2705858	2705.86
2002	5399000	0.4985	2691402	2691.40
2003	5224000	0.4985	2604164	2604.16
2004	5098000	0.4985	2541353	2541.35
2005	5218000	0.4985	2601173	2601.17

[3] Rastan cement factory – Hama

3.1.1.2. Estimating SO_2 from Cement Production

To estimating SO_2 emitted from cement production between 1994-2005 the WORKSHEET 2-1 of (IPCC1996)[1] will be used, also table - 2 for quantity

Methodology

- Estimate the Quantity of Cement Produced and enter this value in column A in tonnes.
- Enter the Emission Factor (0.3 kg SO2/tonne cement)(1) in column B (because no information on sulphur content and degree of absorption)(1).
- Multiply column A by column B to obtain SO_2 Emitted in kg of SO_2,and enter this value in column C.
- Divide column C by 10^6 to convert to units of Giga grams SO_2, andenter this value in column D.

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	CEMENT PRODUCTION			
WORKSHEET	2-1			
SHEET	2 OF 2 SO_2 EMISSIONS			
COUNTRY				
YEAR				
STEP 2				
Year	A	B	C	D
	Quantity of Cement Produced	Emission Factor	SO_2 Emitted	SO_2 Emitted
	(t)	(kg SO_2 /t cement produced)	(kg)	(Gg)
			C = (A x B)	D = C/1 000 000
1994	4344000	0.3	1303200	1.30
1995	4804000	0.3	1441200	1.44
1996	4817000	0.3	1445100	1.45
1997	4838000	0.3	1451400	1.45
1998	5016000	0.3	1504800	1.50
1999	5134000	0.3	1540200	1.54
2000	4631000	0.3	1389300	1.39
2001	5428000	0.3	1628400	1.63
2002	5399000	0.3	1619700	1.62
2003	5224000	0.3	1567200	1.57
2004	5098000	0.3	1529400	1.53
2005	5218000	0.3	1565400	1.57

3.1.2. Estimating CO_2 Emitted from Soda Ash Use

To Estimating CO_2 emitted from soda ash between 1994-2005 WORKSHEET 2-1 page 2-8 of (IPCC1996)[1] will be used to enter data and also table - 2 for quantity

Methodology

- Estimate Quantity of Soda Ash Used and enter this value in column A in tones.
- Enter the Emission Factor of (415 kilograms of CO2 per ton of soda ash)(1) used in column B.
- Multiply column A by column B to obtain CO2 Emitted in kilograms
- of CO2, and enter this value in column C.
- Divide column C by 10^6 to convert to units of Giga grams CO2, and
- Enter this value in column D.

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	SODA ASH PRODUCTION AND USE			
WORKSHEET	2-4			
SHEET	2 OF 2 SODA ASH USE - CO_2 EMISSIONS			
COUNTRY				
YEAR				
STEP 2				
Year	A	B	C	D
	Quantity of Soda Ash Used	Emission Factor	CO_2 Emitted	CO_2 Emitted
	(t)	(kg CO_2/t soda ash used)	(kg)	(Gg)
			C = (A x B)	D = C/1 000 000
1994	16063	415	6,666,145.00	6.67
1995	15792	415	6,553,680.00	6.55
1996	24274	415	10,073,710.00	10.07
1997	24801	415	10,292,415.00	10.29
1998	24007	415	9,962,905.00	9.96
1999	24700	415	10,250,500.00	10.25
2000	25141	415	10,433,515.00	10.43
2001	26275	415	10,904,125.00	10.90
2002	29259	415	12,142,485.00	12.14
2003	27220	415	11,296,300.00	11.30
2004	27879	415	11,569,785.00	11.57
2005	24606	415	10,211,490.00	10.21

3.1.3. Asphalt

3.1.3.1. Estimating NMVOC Emitted from Road Paving with Asphalt

To estimate NMVOC emitted from Road Paving with Asphalt between 1994-2005 WORKSHEET 2-5 page 2.11 of (IPCC1996)[1] will be used to enter data also table - 2 for quantity.

Methodology

- Estimate Quantity of Road Paving Material Used and enter this value in column A in tones.
- Enter the Emission Factor of (320 kg NMVOC per ton of asphalt paved)(1) in column B.
- Multiply column A by column B to obtain NMVOC Emitted in kilograms of NMVOC, and enter this value in column C.
- Divide column C by 106 to convert to units of Giga grams of NMVOC Emitted, and enter this value in column D.
- Sum the values in column D and enter the result in the bottom of that column to obtain the total NMVOC

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	PRODUCTION AND USE OF MISCELLANEOUS MINERAL PRODUCTS			
WORKSHEET	2-5			
SHEET	3 OF 5 ROAD PAVING WITH ASPHALT- NMVOC EMISSIONS			
COUNTRY				
YEAR				
STEP 3				
	A	B	C	D
Emission Source	Quantity of Road Paving Material Used	Emission Factor	NMVOC Emitted	NMVOC Emitted
	(t)	(kg NMVOC/t road paving material used)	(kg)	(Gg)
Road Surface			C = (A x B)	D=C/1,000,000
Year			0.00	
1994	273912	320	87651840	87.65
1995	316233	320	101194560	101.19
1996	417153	320	133488960	133.49
1997	441757	320	141362240	141.36
1998	496368	320	158837760	158.84
1999	521092	320	166749440	166.75
2000	458520	320	146726400	146.73
2001	496004	320	158721280	158.72
2002	554338	320	177388160	177.39
2003	554049	320	177295680	177.30
2004	604919	320	193574080	193.57
2005	607751	320	194480320	194.48
Asphalt Plant				

3.1.3.2. Estimating NMVOC Emitted from Asphalt Roofing production

To Estimating NMVOC emitted from Asphalt Roofing production between 1994-2005 WORKSHEET 2-5 page 2.11 of (IPCC1996)[1] will be used to enter data and also table - 2 for quantity.

Methodology

- Estimate the Quantity of Asphalt Roofing Produced and enter this
- value in column A in tones.
- enter the corresponding Emission Factor (0.047Kg NMVOC/tone asphalt as an average value from table 2-2)(1) in column B.
- Multiply column A by column B to obtain NMVOC Emitted in kilograms of NMVOC, and enter this value in column C.
- 4 -Divide column C by 10^6 to convert to units of Giga grams NMVOC, and enter this value in column D.
- Sum the values in column D and enter the result in the bottom of that column to obtain the total NMVOC Emitted.

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	PRODUCTION AND USE OF MISCELLANEOUS MINERAL PRODUCTS			
WORKSHEET	2-5			
SHEET	3 OF 5 Roofing Aspphalt WITH ASPHALT- NMVOC EMISSIONS			
COUNTRY				
YEAR				
STEP 3				
	A	B	C	D
Emission Source	Quantity of Road Roofing Aspphalt	Emission Factor	NMVOC Emitted	NMVOC Emitted
	(t)	(kg NMVOC/t Roofing Aspphalt'	(kg)	(Gg)
			C = (A x B)	D=C/1,000,000
1994	16575	0.047	779.03	0.00078
1995	16316	0.047	766.85	0.00077
1996	15000	0.047	705.00	0.00071
1997	15017	0.047	705.80	0.00071
1998	15291	0.047	718.68	0.00072
1999	16306	0.047	766.38	0.00077
2000	15307	0.047	719.43	0.00072
2001	16899	0.047	794.25	0.00079
2002	17276	0.047	811.97	0.00081
2003	20572	0.047	966.88	0.00097
2004	23263	0.047	1093.36	0.00109
2005	18553	0.047	871.99	0.00087

3.1.3.3. Estimating CO Emitted from Road Paving with Asphalt

To estimating NMVOC emitted from Road Paving with Asphalt between 1994-2005 WORKSHEET 2-5 of (IPCC1996) will be used to enter data and also table - 2 for quantity.

Methodology

- Estimate the Quantity of Asphalt Roofing Produced and enter this value in column A in tones.
- 2 -Enter the corresponding Emission Factor (0.0095Kg CO/tone asphalt as an average value from table 2-2) in column B.
- Multiply column A by column B to obtain CO Emitted in kilograms of CO, and enter this value in column C.
- Divide column C by 10^6 to convert to units of Giga grams CO, and enter this value in column D.

MODULE	INDUSTRIAL PROCESSES				
SUBMODULE	PRODUCTION AND USE OF MISCELLANEOUS MINERAL PRODUCTS				
WORKSHEET	2-5				
SHEET	3 OF 5 Roofing Aspphalt WITH ASPHALT- NMVOC EMISSIONS				
COUNTRY					
YEAR					
STEP 3					
		A	B	C	D
	Emission Source	Quantity of Road Paving Material Used	Emission Factor	CO Emitted	CO Emitted
Year		(t)	(kgCO/t ASPHALT ROOFING PRODUCTION paving material used)	(kg)	(Gg)
				C = (A x B)	D=C/1,000,000
	Roofing Aspphalt			0.00	0.00
1994		16575	0.0095	157.46	0.00016
1995		16316	0.0095	155.00	0.00016
1996		15000	0.0095	142.50	0.00014
1997		15017	0.0095	142.66	0.00014
1998		15291	0.0095	145.26	0.00015
1999		16306	0.0095	154.91	0.00015
2000		15307	0.0095	145.42	0.00015
2001		16899	0.0095	160.54	0.00016
2002		17276	0.0095	164.12	0.00016
2003		20572	0.0095	195.43	0.00020
2004		23263	0.0095	221.00	0.00022
2005		18553	0.0095	176.25	0.00018

3.1.4. Estimating NMVOC Emitted from Glass Production

To estimating NMVOC emitted from glass production between 1994-2005 WORKSHEET 2-5 page 2-12 of (IPCC1996)[1] will be used to enter data, and also table - 2 for quantity.

Methodology

- Estimate the Quantity of Glass Produced by Glass Type and enter this value in tones in column A.
- 2-Enter the corresponding Emission Factor for glass production (default 4.5 kg NMVOC per ton of product)(1) in column B in kilograms of NMVOC per ton of product produced.
- 3 -Multiply column A by column B to obtain NMVOC Emitted in kilograms of NMVOC and enter this value in column C.
- 4-Divide column C by 10^6 to convert to units of giga grams of NMVOC, and enter this value in column D.
- 5- Sum the values in column D and enter the result in the bottom of that column to obtain the total NMVOC Emitted.

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	PRODUCTION AND USE OF MISCELLANEOUS MINERAL PRODUCTS			
WORKSHEET	2-5			
SHEET	4 OF 5 PRODUCTION OF OTHER MINERAL PRODUCTS – GLASS PRODUCTION - NMVOC EMISSIONS			
COUNTRY				
YEAR				
STEP 4				
	A	B	C	D
Glass	Quantity of Glass Produced	Emission Factor (kg NMVOC/t glass produced)	NMVOC Emitted	NMVOC Emitted
	(t)		(kg)	(Gg)
			C = (A x B)	D=C/1,000,000
Year			0.00	0.00
1994	53505	4.5	240772.50	0.24
1995	70030	4.5	315135.00	0.32
1996	58270	4.5	262215.00	0.26
1997	69266	4.5	311697.00	0.31
1998	57149	4.5	257170.50	0.26
1999	69639	4.5	313375.50	0.31
2000	69062	4.5	310779.00	0.31
2001	72715	4.5	327217.50	0.33
2002	78915	4.5	355117.50	0.36
2003	78677	4.5	354046.50	0.35
2004	83850	4.5	377325.00	0.38
2005	84639	4.5	380875.50	

3.2. Emissions from Chemical Industry

3.2.1. Ammonia Industry

3.2.1.1. Estimation CO_2 Emission from Ammonia Production

Tier 1b - Based on Ammonia Production

To estimating CO_2emitted from ammonia production *Tier 1b* between 1994-2005 WORKSHEET 2-6 page 2-14 of (IPCC1996)[1] will be used to enter data, and also table (3) for quantity.

Methodology

- Obtain an estimate of the Amount of Ammonia Produced in tones
- and enter this value in column A.
- Enter the corresponding Emission Factor (The default emission factor
- is 1.5 t CO2/t NH3 produced)(1) in column B in tonnes
- Multiply column A by column B to obtain CO2 Emitted in tonnes of
- CO2, and enter this value in column C.
- Divide column C by 10^3 to convert to units of gigagrams CO2, and enter this value in column D.

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	AMMONIA PRODUCTION			
WORKSHEET	2-6			
SHEET	2 OF 3 TIER 1b - CO_2 EMISSIONS			
COUNTRY				
YEAR				
STEP 2				
	A	B	C	D
	Amount of Ammonia Produced	Emission Factor	CO_2 Emitted	CO_2 Emitted
	(t)	(t CO_2/t ammonia produced)	(t)	(Gg)
			C = (A x B)	D = C/1000
1994	112150	1.5	168225	168.23
1995	77190	1.5	115785	115.79
1996	97850	1.5	146775	146.78
1997	101785	1.5	152678	152.68
1998	157200	1.5	235800	235.80
1999	136000	1.5	204000	204.00
2000	110859	1.5	166289	166.29
2001	168332	1.5	252498	252.50
2002	173736	1.5	260604	260.60
2003	161045	1.5	241568	241.57
2004	140245	1.5	210368	210.37
2005	145950	1.5	218925	218.93

3.2.1.2. Estimating NMVOC, CO and SO2 Emitted

To estimating NMVOC, CO and SO2 emitted from ammonia production between 1994-2005 WORKSHEET 2-6 page 2-15 of (IPCC1996) will be used to enter data, and also table (3) for quantity

Methodology

- Obtain an estimate of the Amount of Ammonia Produced in tones, and enter this value in column A for each pollutant, NMVOC, CO and SO2.
- Enter the corresponding Emission Factor for each pollutant NMVOC, CO and SO2 as given in Table 2-4,(4.7 for TOCa.7.9 for CO,0.03 for SO2)[(1)] in column B in kg per ton of ammonia produced.
- Multiply column A by column B to obtain Pollutant Emitted in kg, and enter the corresponding value for each pollutant NMVOC, CO and SO2 in column C.
- Divide column C by 10^6 to convert to units of Giga grams for each pollutant NMVOC, CO and SO2, and enter this value in column D.

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	AMMONIA PRODUCTION			
WORKSHEET	2-6			
SHEET	3 OF 3 NMVOC, CO AND SO_2 EMISSIONS			
COUNTRY				
YEAR				
STEP 3				
	A	B	C	D
	Amount of Ammonia Produced	Emission Factor	Pollutant Emitted	Pollutant Emitted
	(t)	(kg pollutant/ t ammonia produced)	(kg)	(Gg)
		NMVOC	C = (A x B)	D = C/1 000 000
1994	112150	4.7	527105.00	0.53
1995	77190	4.7	362793.00	0.36
1996	97850	4.7	459895.00	0.46
1997	101785	4.7	478389.50	0.48
1998	157200	4.7	738840.00	0.74
1999	136000	4.7	639200.00	0.64
2000	110859	4.7	521037.30	0.52
2001	168332	4.7	791160.40	0.79
2002	173736	4.7	816559.20	0.82
2003	161045	4.7	756911.50	0.76
2004	140245	4.7	659151.50	0.66
2005	145950	4.7	685965.00	0.69

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	AMMONIA PRODUCTION			
WORKSHEET	2-6			
SHEET	3 OF 3 NMVOC, CO AND SO_2 EMISSIONS			
COUNTRY				
YEAR				
STEP 3				
year	A	B	C	D
	Amount of Ammonia Produced	Emission Factor	Pollutant Emitted	Pollutant Emitted
	(t)	(kg pollutant/ t ammonia produced)	(kg)	(Gg)
		CO	C = (A x B)	D = C/1 000 000
			0.00	*CO* 0.00
1994	112150	7.9	885985.00	0.89
1995	77190	7.9	609801.00	0.61
1996	97850	7.9	773015.00	0.77
1997	101785	7.9	804101.50	0.80
1998	157200	7.9	1241880.00	1.24
1999	136000	7.9	1074400.00	1.07
2000	110859	7.9	875786.10	0.88
2001	168332	7.9	1329822.80	1.33
2002	173736	7.9	1372514.40	1.37
2003	161045	7.9	1272255.50	1.27
2004	140245	7.9	1107935.50	1.11
2005	145950	7.9	1153005.00	1.15

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	AMMONIA PRODUCTION			
WORKSHEET	2-6			
SHEET	3 OF 3 NMVOC, CO AND SO_2 EMISSIONS			
COUNTRY				
YEAR				
STEP 3				
year	A	B	C	D
	Amount of Ammonia Produced	Emission Factor	Pollutant Emitted	Pollutant Emitted
	(t)	(kg pollutant/ t ammonia produced)	(kg)	(Gg)
		SO2	C = (A x B)	D = C/1,000,000
			0.00	*SO2* 0.00
1994	112150	0.03	3364.50	0.0034
1995	77190	0.03	2315.70	0.0023
1996	97850	0.03	2935.50	0.0029
1997	101785	0.03	3053.55	0.0031
1998	157200	0.03	4716.00	0.0047
1999	136000	0.03	4080.00	0.0041
2000	110859	0.03	3325.77	0.0033
2001	168332	0.03	5049.96	0.0050
2002	173736	0.03	5212.08	0.0052
2003	161045	0.03	4831.35	0.0048
2004	140245	0.03	4207.35	0.0042
2005	145950	0.03	4378.50	0.0044

3.2.1.3. Estimating N_2O , NOx Emitted

To Estimating N_2O , NOx emitted from NITRIC ACID production between 1994-2005 WORKSHEET 2-7 page 2-16 of (IPCC1996) will be used to enter data, and also table (3) for quantity

Methodology

- Obtain an estimate of the Amount of Nitric Acid Produced in tonnes and enter this value in column A.
- Enter the corresponding Emission Factor for each pollutant in kg pollutant per tonne of nitric acid produced in column B. (For the appropriate emission factor N2O 4.5 Kg Table 2-5 and for NOx 15 Kg Table 2-6).
- Multiply column A by column B to obtain Pollutant Emitted in kg and enter this value in column C for each pollutant.
- Divide column C by 10^6 to convert to units of Giga grams for each pollutant, and enter this value in column D.

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	NITRIC ACID PRODUCTION			
WORKSHEET	2-7			
SHEET	I OF 1 N_2O AND NO_x EMISSIONS			
COUNTRY				
YEAR				
	A	B	C	D
	Amount of Nitric Acid Produced	Emission Factor	Pollutant Emitted	Pollutant Emitted
	(t)	(kg pollutant/t nitric acid produced)	(kg)	(Gg)
			C = (A x B)	D = C/1 000 000
Year	Production	N2O	N2O	N2O
1994	66952	4.5	301284	0.30
1995	59985	4.5	269932.50	0.27
1996	78705	4.5	354172.50	0.35
1997	72283	4.5	325273.50	0.33
1998	58977	4.5	265396.50	0.27
1999	66991	4.5	301459.50	0.30
2000	83138	4.5	374121.00	0.37
2001	72943	4.5	328243.50	0.33
2002	64702	4.5	291159.00	0.29
2003	80503	4.5	362263.50	0.36
2004	64702	4.5	291159.00	0.29
2005	77061	4.5	346774.50	0.35

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	NITRIC ACID PRODUCTION			
WORKSHEET	2-7			
SHEET	I OF 1 N_2O AND NO_x EMISSIONS			
COUNTRY				
YEAR				
	A	B	C	D
	Amount of Nitric Acid Produced	Emission Factor	Pollutant Emitted	Pollutant Emitted
	(t)	(kg pollutant/t nitric acid produced)	(kg)	(Gg)
			C = (A x B)	D=C/1,000,000
Year	Production	NOX	NOX	NOX
1994	66952	15	1004280	1.004
1996	59985	15	899775	0.900
1998	78705	15	1180575	1.181
1999	72283	15	1084245	1.084
2000	58977	15	884655	0.885
2001	66991	15	1004865	1.005
2002	83138	15	1247070	1.247
2003	72943	15	1094145	1.094
2004	64702	15	970530	0.971
2005	80503	15	1207545	1.208

3.2.2. Estimating SO2 Emitted from Sulphric Acid

To Estimating SO2 emitted from Sulphric Acid production between 1994-2005 WORKSHEET 2-10 page 2-25 of (IPCC1996)[1] will be used to enter data, and also table (3) for quantity

Methodology

- Obtain an estimate of the Amount of Chemical Produced in tones and enter this value in column A.
- Enter the corresponding (Emission Factor 17.5 kg SO2 from Table 2-10, per tonne of Sulphric Acid produced)[(1)], in column B.
- Multiply column A by column B to obtain SO2 Emitted in kg and enter this value in column C.
- Divide column C by 10^6 to convert to units of Giga grams SO2, and enter this value in column D.
- Sum the values in column D and enter the result in the bottom of that column to obtain the total SO2 emitted.

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	PRODUCTION OF OTHER CHEMICALS			
WORKSHEET	2-10			
SHEET	5 OF 5 SO_2 EMISSIONS			
COUNTRY	#REF!			
YEAR	#REF!			
STEP 5				
	A	B	C	D
Chemical	Amount of Chemical Produced	Emission Factor	SO_2 Emitted	SO_2 Emitted
	(t)	(kg SO_2 /t chemical produced)	(kg)	(Gg)
			C = (A x B)	D = C/1 000 000
Year	H2SO4			
1994	81365	17.5	1423887.50	1.42
1995	217869	17.5	3812707.50	3.81
1996	213536	17.5	3736880.00	3.74
1997	200928	17.5	3516240.00	3.52
1998	192552	17.5	3369660.00	3.37
1999	317519	17.5	5556582.50	5.56
2000	239129	17.5	4184757.50	4.18
2001	343717	17.5	6015047.50	6.02
2002	249820	17.5	4371850.00	4.37
2003	249281	17.5	4362417.50	4.36
2004	330163	17.5	5777852.50	5.78
2005	307107	17.5	5374372.50	5.37

3.2.3. Estimating CH4 Emitted from Coal

To Estimating CH4 emitted from coal production between 1994-2005 WORKSHEET 2-10 page 2-23 of (IPCC1996)[1] will be used to enter data, and by using table (3) for quantity

Methodology

- Obtain an estimate of the Amount of coal Produced in tones and enter this value in column A.
- Enter the corresponding (Emission Factor 0.5 kg CH4 per tonne of coal produced) (1) Table 2-10,, in column B.
- Multiply column A by column B to obtain CH4 Emitted in kg and enter this value in column C.
- Divide column C by 10^6 to convert to units of Giga grams CH4, and enter this value in column D.
- Sum the values in column D and enter the result in the bottom of that column to obtain the total CH4 emitted.

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	CARBIDE PRODUCTION			
WORKSHEET	2-9			
SHEET	2 OF 4 SILICON CARBIDE PRODUCTION - TIER 1a - CH_4 EMISSIONS			
COUNTRY				
YEAR				
STEP 2				
Year	A	B	C	D
	Amount of Petrol Coke Consumed	Emission Factor	CH_4 Emitted	CH_4 Emitted
	(t)	(kg CH_4 / t petrol coke consumed)	(kg)	(Gg)
			C = (A x B)	D = C/1 000 000
1994	153939	0.5	76969.50	0.08
1995	148118	0.5	74059.00	0.07
1996	129228	0.5	64614.00	0.06
1997	126232	0.5	63116.00	0.06
1998	74189	0.5	37094.50	0.04
1999	70000	0.5	35000.00	0.04
2000	93850	0.5	46925.00	0.05
2001	97698	0.5	48849.00	0.05
2002	72539	0.5	36269.50	0.04
2003	78200	0.5	39100.00	0.04
2004	109288	0.5	54644.00	0.05
2005	105115	0.5	52557.50	0.05

3.3. Emissions from Metal Industry

3.3.1. Estimation CO_2 Emission from Iron and Steel Production *Tier 1b*

To Estimating CO2 emitted from iron and steel production between 1994-2005 WORKSHEET 2-11 page 2-35 of (IPCC1996)[1] will be used to enter data, and by using table (4) for quantity

Methodology

- Estimate the Amount of Iron or Steel Produced and enter this value
- in column A in tones.
- Enter the corresponding Emissions Factor 1.6 ton CO2 per ton of iron or steel produced (Table 2-12) in column B.
- Multiply column A by column B to obtain CO2 Emitted in tones of
- CO2 and enter this value in column C.
- Divide column C by 10^3 to convert to units of gigagrams CO2, and
- enter this value in column D.

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	METAL PRODUCTION			
WORKSHEET	2-11			
SHEET	2 OF 11 IRON AND STEEL - TIER 1b - CO_2 EMISSIONS			
COUNTRY				
YEAR				
STEP 2				
	A	B	C	D
	Amount of Iron or Steel Produced	Emission Factor	CO_2 Emitted	CO_2 Emitted
	(t)	(t CO_2/t of iron or steel produced)	(t)	(Gg)
Year			C = (A x B)	D = C/1000
1994	35866	1.6	57385.60	57.39
1995	33144	1.6	53030.40	53.03
1996	60104	1.6	96166.40	96.17
1997	52532	1.6	84051.20	84.05
1998	59515	1.6	95224.00	95.22
1999	51830	1.6	82928.00	82.93
2000	53334	1.6	85334.40	85.33
2001	60055	1.6	96088.00	96.09
2002	48880	1.6	78208.00	78.21
2003	58326	1.6	93321.60	93.32
2004	72705	1.6	116328.00	116.33
2005	75130	1.6	120208.00	120.21

2.3.3. Estimation NOX , NMVOC , CO

To Estimating NOX , N M V O C , C O , SO2 emitted from iron and steel production *Tier 1b* between 1994-2005 WORKSHEET 2-11 page 2-35 of (IPCC1996)[1] will be used to enter data, and also table (4) for quantity

Methodology

- Estimate the Amount of Iron or Steel Produced and enter this value in column A in tones.
- Enter the corresponding Emission Factor (40 g NOx ,30 g NMVOC,1 g CO , 45 g SO2 per ton of iron or steel produced for NOx, NMVOC, CO and SO2,Tables 2-13 and 2-16)(1) in column B
- Multiply column A by column B to obtain Pollutant Emitted in grams
- of pollutant and enter this value in column C.
- Divide column C by 10^9 to convert to units of Giga grams of pollutant, and enter this value in column D.

WORKSHEET	2-11			
SHEET	2 OF 11 IRON AND STEEL - TIER 1b - CO_2 EMISSIONS			
COUNTRY				
YEAR				
STEP 2				
	A	B	C	D
	Amount of Iron or Steel Produced	Emission Factor	NOX Emitted	NOX Emitted
	(t)	(g NOX/t of iron or steel produced)	g	(Gg)
Year		NOX	C = (A x B)	D = C/1,000,000,000
			0.00	0.00
1994	35866	40	1434640	0.0014
1995	33144	40	1325760	0.0013
1996	60104	40	2404160	0.0024
1997	52532	40	2101280	0.0021
1998	59515	40	2380600	0.0024
1999	51830	40	2073200	0.0021
2000	53334	40	2133360	0.0021
2001	60055	40	2402200	0.0024
2002	48880	40	1955200	0.0020
2003	58326	40	2333040	0.0023
2004	72705	40	2908200	0.0029
2005	75130	40	3005200	0.0030

WORKSHEET	2-11			
SHEET	2 OF 11 IRON AND STEEL - TIER 1b - CO_2 EMISSIONS			
COUNTRY				
YEAR				
STEP 2				
	A	B	C	D
	Amount of Iron or Steel Produced	Emission Factor	NMVOC Emitted	NMVOC Emitted
	(t)	(g NMVOC /t of iron or steel produced)		(Gg)
Year		NMVOC	C = (A x B)	D = C/1000000000
			0.00	D = C/1000000001
1994	35866	30	1075980	0.0011
1995	33144	30	994320	0.0010
1996	60104	30	1803120	0.0018
1997	52532	30	1575960	0.0016
1998	59515	30	1785450	0.0018
1999	51830	30	1554900	0.0016
2000	53334	30	1600020	0.0016
2001	60055	30	1801650	0.0018
2002	48880	30	1466400	0.0015
2003	58326	30	1749780	0.0017
2004	72705	30	2181150	0.0022
2005	75130	30	2253900	0.0023

WORKSHEET	2-11			
SHEET	2 OF 11 IRON AND STEEL - TIER 1b - CO_2 EMISSIONS			
COUNTRY				
YEAR				
STEP 2				
	A	B	C	D
	Amount of Iron or Steel Produced	Emission Factor	CO Emitted	CO Emitted
	(t)	(g CO/t of iron or steel produced)	(g)	(Gg)
Year		CO	C = (A x B)	D = C/1000000000
1994	35866	1	35866	3.6E-05
1995	33144	1	33144	3.3E-05
1996	60104	1	60104	6.0E-05
1997	52532	1	52532	5.3E-05
1998	59515	1	59515	6.0E-05
1999	51830	1	51830	5.2E-05
2000	53334	1	53334	5.3E-05
2001	60055	1	60055	6.0E-05
2002	48880	1	48880	4.9E-05
2003	58326	1	58326	5.8E-05
2004	72705	1	72705	7.3E-05
2005	75130	1	75130	7.5E-05

WORKSHEET	2-11			
SHEET	2 OF 11 IRON AND STEEL - TIER 1b - CO_2 EMISSIONS			
COUNTRY				
YEAR				
STEP 2				
	A	B	C	D
	Amount of Iron or Steel Produced	Emission Factor	CO Emitted	CO Emitted
	(t)	(g SO_2/t of iron or steel produced)	(g)	(Gg)
Year		SO_2	C = (A x B)	D = C/1000000000
			0.00	0.00
1994	35866	45	1613970	0.0016
1995	33144	45	1491480	0.0015
1996	60104	45	2704680	0.0027
1997	52532	45	2363940	0.0024
1998	59515	45	2678175	0.0027
1999	51830	45	2332350	0.0023
2000	53334	45	2400030	0.0024
2001	60055	45	2702475	0.0027
2002	48880	45	2199600	0.0022
2003	58326	45	2624670	0.0026
2004	72705	45	3271725	0.0033
2005	75130	45	3380850	0.0034

3.4. Emissions from Other Industry

3.4.1. Estimation NMVOC Emitted from Spirits Production

To Estimating NMVOC emitted from spirits production between 1994-2005 WORKSHEET 2-13 page 2.43 of (IPCC1996)[1] will be used to enter data, and also table (4) for quantity.

Methodology

- Estimate total annual Quantity of Alcoholic Beverage Produced in hectolitres (hl), (broken down into categories of beverages listed in Table 2-25 and enter this value)(1) in column A.
- Enter the corresponding Emission Factor as in Table 2-25, in kilograms NMVOC per hectolitre of beverage produced, in column B.
- Multiply column A by column B to obtain NMVOC Emitted in
- kilograms and enter this value in column C.
- Divide column C by 10^6 to convert to units of gigagrams NMVOC
- and enter this value in column D.
- Sum the values in column D and enter the result in the bottom of
- that column to obtain the total NMVOC emitted.

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	FOOD AND DRINK			
WORKSHEET	2-13			
SHEET	1 OF 2 ALCOHOLIC BEVERAGE PRODUCTION - NMVOC EMISSIONS			
COUNTRY				
STEP 1				
	A	B	C	D
Alcoholic Beverage Type	Quantity of Alcoholic Beverage Produced	Emission Factor (kg NMVOC/hL beverage	NMVOC Emitted	NMVOC Emitted
	(hl)	produced)	(kg)	(Gg)
YEAR	WIN		C = (A x B)	D=C/1,000,000
1994	29050	0.08	2,324	0.0023
1995	35370	0.08	2,830	0.0028
1996	37520	0.08	3,002	0.0030
1997	31370	0.08	2,510	0.0025
1998	34000	0.08	2,720	0.0027
1999	35080	0.08	2,806	0.0028
2000	38230	0.08	3,058	0.0031
2001	37620	0.08	3,010	0.0030
2002	38700	0.08	3,096	0.0031
2003	33410	0.08	2,673	0.0027
2004	41710	0.08	3,337	0.0033
2005	40250	0.08	3,220	0.0032

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	FOOD AND DRINK			
WORKSHEET	2-13			
SHEET	1 OF 2 ALCOHOLIC BEVERAGE PRODUCTION - NMVOC EMISSIONS			
COUNTRY				
STEP 1				
	A	B	C	D
Alcoholic Beverage Type	Quantity of Alcoholic Beverage Produced	Emission Factor	NMVOC Emitted	NMVOC Emitted
	(hl)	(kg NMVOC/hL beverage produced)	(kg)	(Gg)
YEAR	RED WIN		C = (A x B)	D = C/1,000,000
1994	2560	0.08	205	0.00020
1995	2490	0.08	199	0.00020
1996	2760	0.08	221	0.00022
1997	2650	0.08	212	0.00021
1998	2180	0.08	174	0.00017
1999	2010	0.08	161	0.00016
2000	3260	0.08	261	0.00026
2001	3030	0.08	242	0.00024
2002	2960	0.08	237	0.00024
2003	3150	0.08	252	0.00025
2004	2570	0.08	206	0.00021
2005	2250	0.08	180	0.00018

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	FOOD AND DRINK			
WORKSHEET	2-13			
SHEET	1 OF 2 ALCOHOLIC BEVERAGE PRODUCTION - NMVOC EMISSIONS			
COUNTRY				
YEAR				
STEP 1				
	A	B	C	D
Alcoholic Beverage Type	Quantity of Alcoholic Beverage Produced	Emission Factor	NMVOC Emitted	NMVOC Emitted
	(hl)	(kg NMVOC/hL beverage produced)	(kg)	(Gg)
YEAR	BEER		C = (A x B)	D=C/1,000,000
1994	102430	0.035	3585	0.0036
1995	102430	0.035	3585	0.0036
1996	102650	0.035	3593	0.0036
1997	96980	0.035	3394	0.0034
1998	97440	0.035	3410	0.0034
1999	120620	0.035	4222	0.0042
2000	90780	0.035	3177	0.0032
2001	99500	0.035	3483	0.0035
2002	103700	0.035	3630	0.0036
2003	100130	0.035	3505	0.0035
2004	108550	0.035	3799	0.0038
2005	110730	0.035	3876	0.0039

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	FOOD AND DRINK			
WORKSHEET	2-13			
SHEET	1 OF 2 ALCOHOLIC BEVERAGE PRODUCTION - NMVOC EMISSIONS			
COUNTRY				
YEAR				
STEP 1				
	A	B	C	D
Alcoholic Beverage Type	Quantity of Alcoholic Beverage Produced	Emission Factor	NMVOC Emitted	NMVOC Emitted
	(hl)	(kg NMVOC/hL beverage produced)	(kg)	(Gg)
YEAR	SPIRITS(unspecified)		C = (A x B)	D=C/1,000,000
1994	18270	15	274050	0.27
1995	13070	15	196050	0.20
1996	8990	15	134850	0.13
1997	8180	15	122700	0.12
1998	7830	15	117450	0.12
1999	6350	15	95250	0.10
2000	11870	15	178050	0.18
2001	12480	15	187200	0.19
2002	14430	15	216450	0.22
2003	15350	15	230250	0.23
2004	22930	15	343950	0.34
2005	34600	15	519000	0.52

3.4.2 Estimation NMVOC emitted from Spirits Production

To Estimating NMVOC emitted from Food production between 1994-2005 WORKSHEET 2-13 page 2.43 of (IPCC1996)[1] will be used to enter data, and also table (4) for quantity.

Methodology

- Estimate total annual Quantity of Food Produced, in tones, broken down into categories of food manufacturing processes (listed in Table 2-26)[(1)] and enter into column A.
- Enter the corresponding Emission Factor in kilograms NMVOC per tonne of food produced table 2-26, in column B.
- Multiply column A by column B to obtain NMVOC Emitted in kilograms and enter this value in column C.
- Divide column C by 10^6 to convert to units of gigagrams NMVOC and enter this value in column D.
- Sum the values in column D and enter the result in the bottom of that column to obtain the total NMVOC Emitted.

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	FOOD AND DRINK			
WORKSHEET	2-13			
SHEET	2 OF 2 BREAD AND OTHER FOOD PRODUCTION - NMVOC EMISSIONS			
STEP 2				
	A	B	C	D
Food Production Type(Cakes, biscuits and breakfast cereals)	Quantity of Food Produced	Emission Factor	NMVOC Emitted	NMVOC Emitted
	(t)	(kg NMVOC/t food processed)	(kg)	(Gg)
YEAR	Produced		C = (A x B)	D = C/1 000 000
1994	13892	1	13892	0.014
1995	14041	1	14041	0.014
1996	12625	1	12625	0.013
1997	11648	1	11648	0.012
1998	11462	1	11462	0.011
1999	11517	1	11517	0.012
2000	13079	1	13079	0.013
2001	13672	1	13672	0.014
2002	17361	1	17361	0.017
2003	17681	1	17681	0.018
2004	19479	1	19479	0.019
2005	19826	1	19826	0.020

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	FOOD AND DRINK			
WORKSHEET	2-13			
SHEET	2 OF 2 BREAD AND OTHER FOOD PRODUCTION - NMVOC EMISSIONS			
STEP 2				
	A	B	C	D
Food Production Type(Bread)	Quantity of Food Produced	Emission Factor (kg NMVOC/t	NMVOC Emitted	NMVOC Emitted
	(t)	food processed)	(kg)	(Gg)
YEAR	Produced		C = (A x B)	D = C/1 000 000
1994	654000	8	5232000	5.23
1995	1531000	8	12248000	12.25
1996	1568000	8	12544000	12.54
1997	1671000	8	13368000	13.37
1998	1753000	8	14024000	14.02
1999	1783000	8	14264000	14.26
2000	1896000	8	15168000	15.17
2001	2336000	8	18688000	18.69
2002	2457000	8	19656000	19.66
2003	2597000	8	20776000	20.78
2004	3232000	8	25856000	25.86
2005	3373000	8	26984000	26.98

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	FOOD AND DRINK			
WORKSHEET	2-13			
SHEET	2 OF 2 BREAD AND OTHER FOOD PRODUCTION - NMVOC EMISSIONS			
STEP 2				
	A	B	C	D
Food Production Type(Sugar)	Quantity of Food Produced	Emission Factor	NMVOC Emitted	NMVOC Emitted
	(t)	(kg NMVOC/t food processed)	(kg)	(Gg)
YEAR	Produced		C = (A x B)	D=C/1,000,000
1994	180000	10	1800000	1.80
1995	158000	10	1580000	1.58
1996	181000	10	1810000	1.81
1997	176000	10	1760000	1.76
1998	89000	10	890000	0.89
1999	158000	10	1580000	1.58
2000	109000	10	1090000	1.09
2001	121000	10	1210000	1.21
2002	214000	10	2140000	2.14
2003	123000	10	1230000	1.23
2004	231000	10	2310000	2.31
2005	148000	10	1480000	1.48

MODULE	INDUSTRIAL PROCESSES			
SUBMODULE	FOOD AND DRINK			
WORKSHEET	2-13			
SHEET	2 OF 2 BREAD AND OTHER FOOD PRODUCTION - NMVOC EMISSIONS			
STEP 2				
	A	B	C	D
Food Production Type(Margarine and solid cooking fats)	Quantity of Food Produced	Emission Factor (kg NMVOC/t	NMVOC Emitted	NMVOC Emitted
	(t)	food processed)	(kg)	(Gg)
YEAR	Produced		C = (A x B)	D=C/1,000,000
1994	4806	10	48060	0.048
1995	5182	10	51820	0.052
1996	2934	10	29340	0.029
1997	1406	10	14060	0.014
1998	946	10	9460	0.009
1999	941	10	9410	0.009
2000	975	10	9750	0.010
2001	1169	10	11690	0.012
2002	1091	10	10910	0.011
2003	1054	10	10540	0.011
2004	926	10	9260	0.009
2005	774	10	7740	0.008

4. Primary and Secondary Gases Categories

After the estimation of greenhouse gases in Syria is finished , one can be classified the industries quantified and qualified of its importance of contribution in greenhouses phenomena .

In Syria ,industry emit these gases CO2, CH_4 , NMVOC, SO_2 CO, NO_X , N_2O, three of them CO2, CH_4 ,N_2O are essential and are precursors of greenhouses phenomena and ozone depletion. The interest will be for essential gases and the industries that emitted.

Carbon dioxide is considered the first gas from the point of quantity , the industries that emitted is mainly cement industry followed ammonia ,steel and metal finely using soda ash in different industrial uses. The second gas is sulpher dioxide that emit from sulpher acid industry ,the third gas is methane from petroleum coke , table (7) clarify the quantity of gases emitted from these industries.

To estimate the contribution of every gases in greenhouses phenomena as caobon dioxide, GHW was used, the arrangement became : cement, ammonia, steel, sulpher acid, soda ash uses finely petroleum coke.

Table 7. Emissions from Main Categories 1994-2005

Year	CO_2 Equal (Gg)		CO_2 (Gg)			
	Nitric acid	Petroleum coke	Soda ash	Steel	Ammonia	Cement
1994	81.05	1.77	6.67	57.39	168.23	2165.48
1995	72.61	1.70	6.55	53.03	115.79	2394.79
1996	95.27	1.49	10.07	96.17	146.78	2401.27
1997	87.50	1.45	10.29	84.05	152.68	2411.74
1998	71.39	0.85	9.96	95.22	235.80	2500.48
1999	81.09	0.81	10.25	82.93	204.00	2559.30
2000	100.64	1.08	10.43	85.33	166.29	2308.55
2001	88.30	1.12	10.90	96.09	252.50	2705.86
2002	78.32	0.83	12.14	78.21	260.60	2691.40
2003	97.45	0.90	11.30	93.32	241.57	2604.16
2004	78.32	1.26	11.57	116.33	210.37	2541.35
2005	93.28	1.21	10.21	120.21	218.93	2601.17

5. Emissions from Industry Section

The main three greenhouses gases that emitted from industries in Syria will be illustrate according IPPC classification of industry.

5.1. Emissions from Mineral Industry

Table(8) illustrates all gases emitted from mineral industries between 1994-2005 , the main gas was carbon dioxide it emits from cement and soda ash ,the other gases NMVOC, SO_2, CO are precursors of greenhouses phenomena.

Table 8. Quantity Gases Emissions from Mineral Industries (Gg)

Year	Cement		Paving asphalt	Roofing Asphalt	Roofing Asphalt	Glass	Soda ash
	CO_2	SO_2	NMVOC	NMVOC	CO	NMVOC	CO_2
1994	2165.48	1.30	87.65	0.00078	0.00016	0.24	6.67
1995	2394.79	1.44	101.19	0.00077	0.00016	0.32	6.55
1996	2401.27	1.45	133.49	0.00071	0.00014	0.26	10.07
1997	2411.74	1.45	141.36	0.00071	0.00014	0.31	10.29
1998	2500.48	1.50	158.84	0.00072	0.00015	0.26	9.96
1999	2559.30	1.54	166.75	0.00077	0.00015	0.31	10.25
2000	2308.55	1.39	146.73	0.00072	0.00015	0.31	10.43
2001	2705.86	1.63	158.72	0.00079	0.00016	0.33	10.90
2002	2691.40	1.62	177.39	0.00081	0.00016	0.36	12.14
2003	2604.16	1.57	177.30	0.00097	0.00020	0.35	11.30
2004	2541.35	1.53	193.57	0.00109	0.00022	0.38	11.57
2005	2601.17	1.57	194.48	0.00087	0.00018	0.38	10.21

CO2 Emission from Cement Industry

Figure (1) clarifies the changes of CO2 emission from cement industry between 1994-2005, the changes are little since the cement factories work in its high capacity .

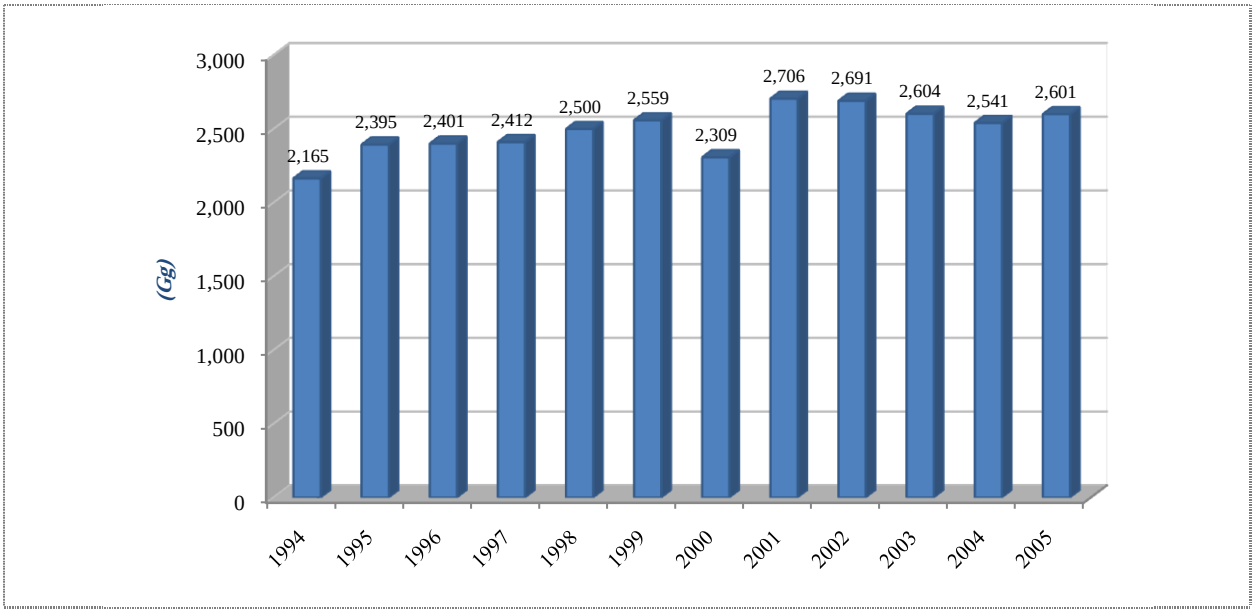

Figure .1. Changes of CO_2 Emission from Cement Industry

CO2 Emission from Soda Ash Uses

Figure (2) clarifies the changes of CO2 emission from soda ash uses between 1994-2005, there is a change in quantity since 1996 because of the expansion of usage in industrial field.

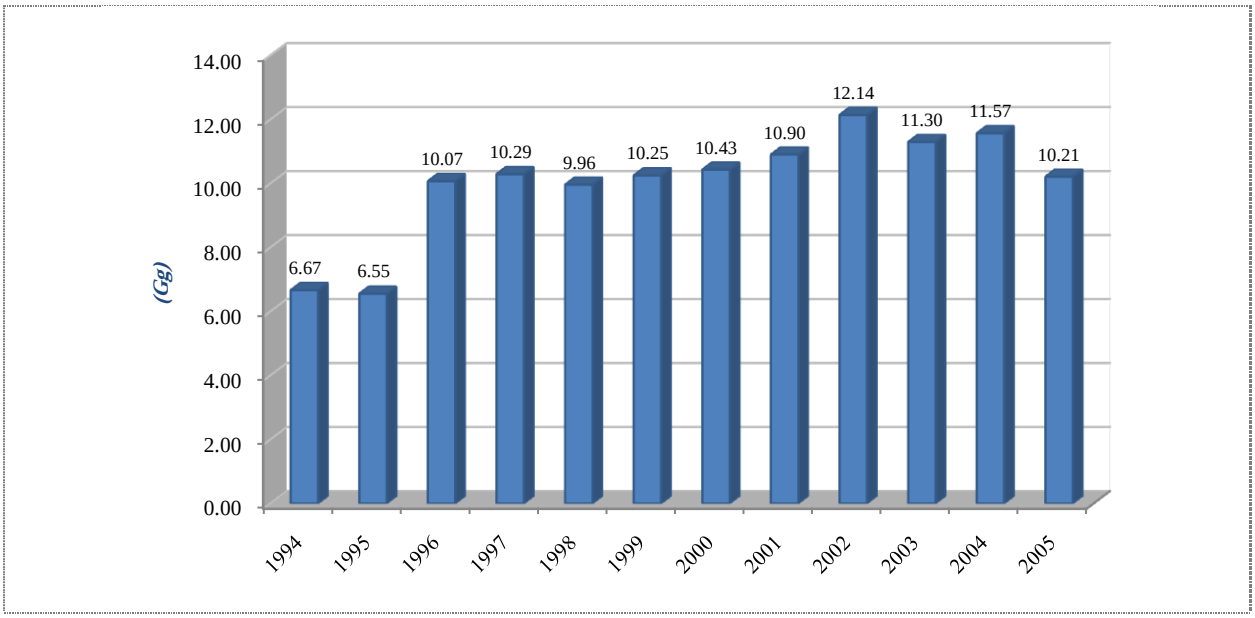

Figure 2. Changes of CO2 Emission from Soda Ash Uses

5.2. Gases Emissions from Chemical Industries

Table (9) illustrates all gases emitted from chemical industries between 1994-2005 , the main gases are CO2, N_2O , CH_4 ,the other gases NMVOC, SO_2, NO_X ,CO are precursors of greenhouses phenomena.

Table 9. All Gases Emitted from Chemical Industries between 1994-2005

Year	Petroleum coke	Ammonia				Nitric acid		Sulphric acid
Gg	CH_4	CO_2	CO	SO_2	NMVOC	N_2O	NO_X	SO_2
1994	0.08	168.23	0.89	0.0034	0.53	0.30	1.004	1.42
1995	0.07	115.79	0.61	0.0023	0.36	0.27	0.900	3.81
1996	0.06	146.78	0.77	0.0029	0.46	0.35	1.181	3.74
1997	0.06	152.68	0.80	0.0031	0.48	0.33	1.084	3.52
1998	0.04	235.80	1.24	0.0047	0.74	0.27	0.885	3.37
1999	0.04	204.00	1.07	0.0041	0.64	0.30	1.005	5.56
2000	0.05	166.29	0.88	0.0033	0.52	0.37	1.247	4.18
2001	0.05	252.50	1.33	0.0050	0.79	0.33	1.094	6.02
2002	0.04	260.60	1.37	0.0052	0.82	0.29	0.971	4.37
2003	0.04	241.57	1.27	0.0048	0.76	0.36	1.208	4.36
2004	0.05	210.37	1.11	0.0042	0.66	0.29	0.971	5.78
2005	0.05	218.93	1.15	0.0044	0.69	0.35	1.156	5.37

CO2 Emission from Ammonia Industry

Figure (3) clarifies the changes of CO2 emission from Ammonia Industry, the change is relate to the works days and capacity, because ammonia factory is single one and work in its high capacity .

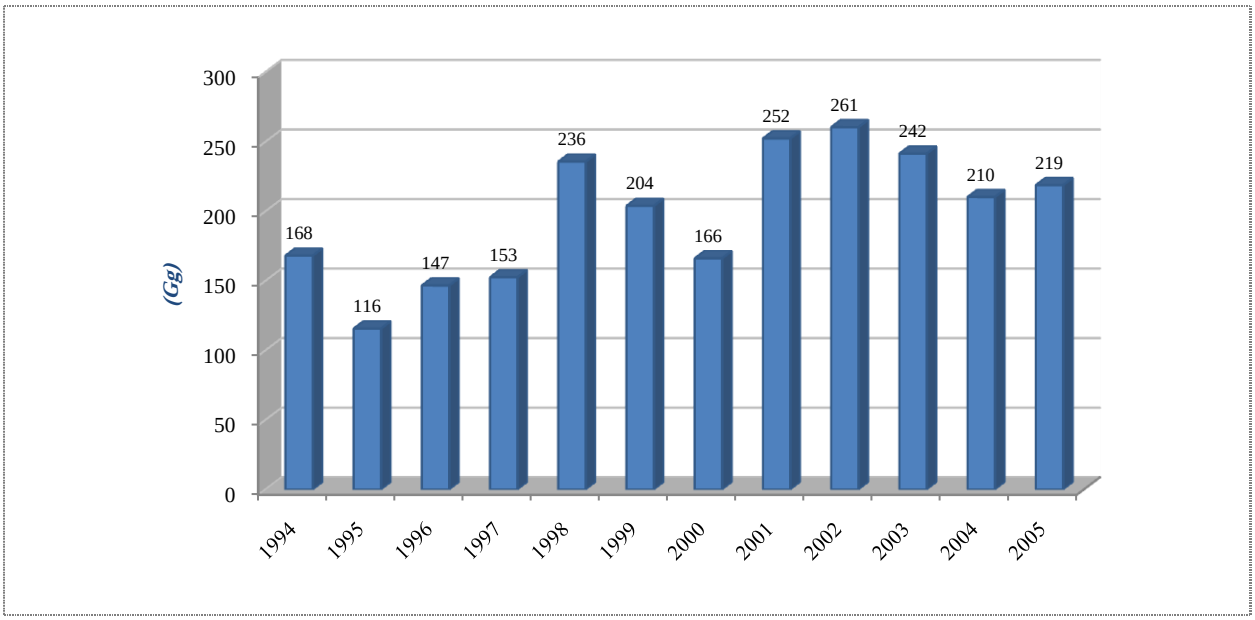

Figure 3. Changes of CO_2 Emission from Ammonia Industry

N2O Emission from sulpher acid Industry

Figure (4) clarifies the changes of N2O emission from sulpher acid Industry, the change is little ,it relates to the works days , capacity and the production way , also sulpher acid factory is single one in Syria .

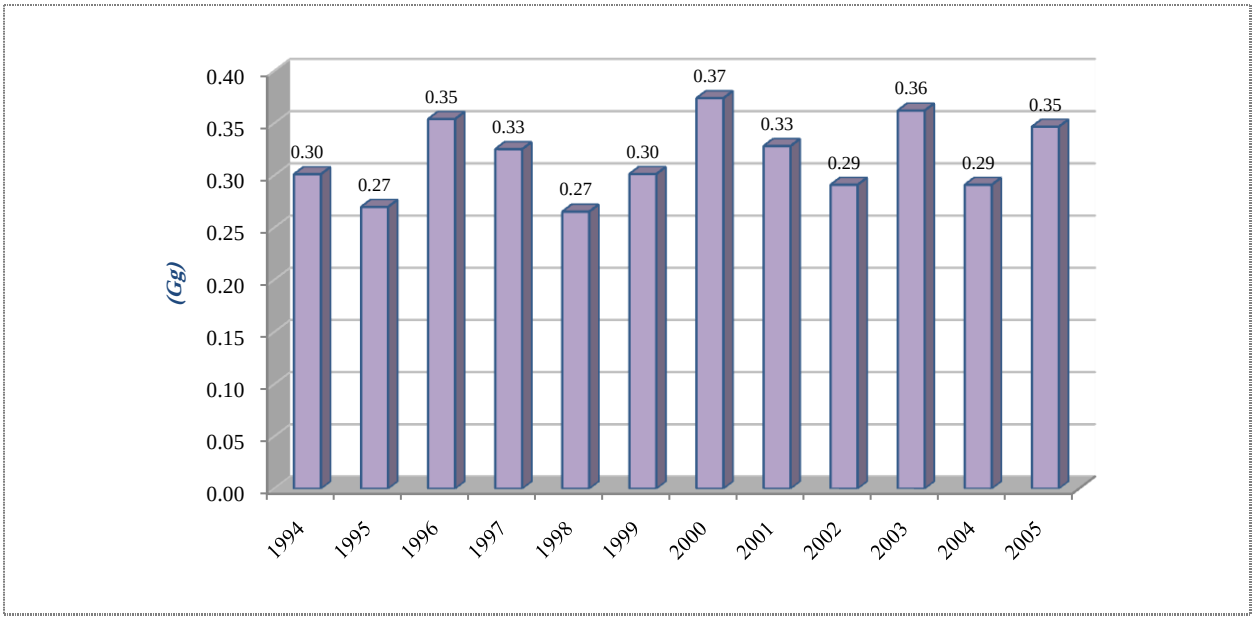

Figure 4. Changes of N2O Emission from Sulpher Acid Industry

CH4Emission from petroleum coke Industry

Figure (5) clarifies the changes of CH4 emission from petroleum coke Industry, there is decrease in quantity of gas emission because petroleum coke is lowered , that relates of the change of crude oil refined.

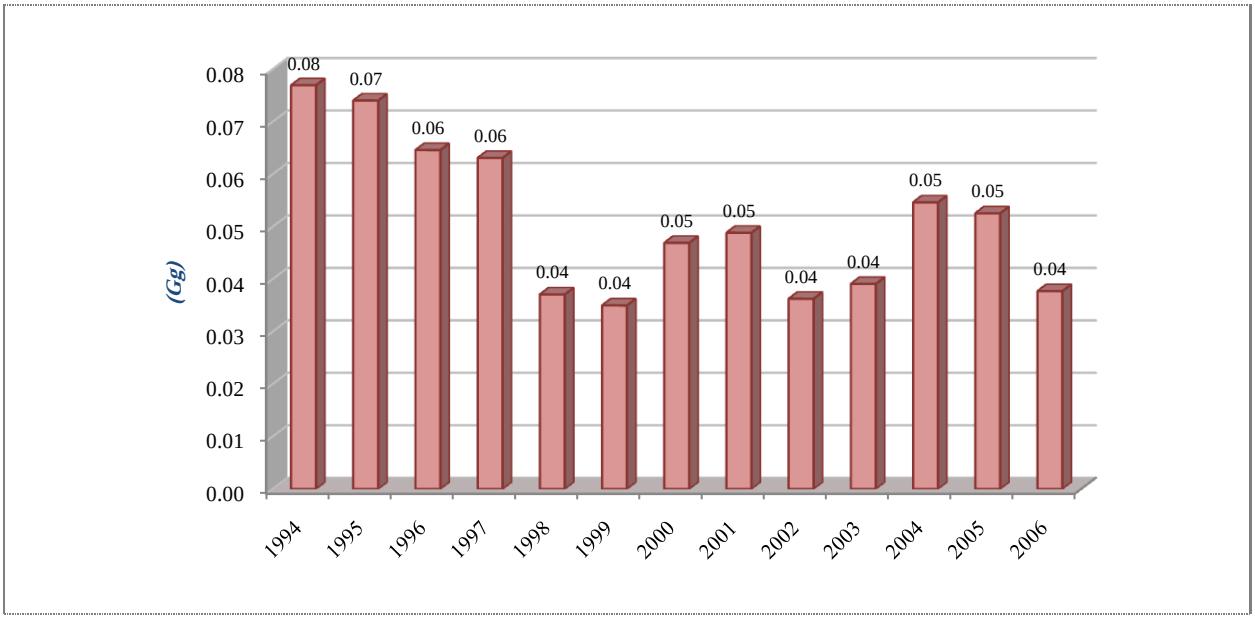

Figure 5. Changes of CH4 Emission from Petroleum Coke

To estimate total CO2 emit from chemical industry , methane gas and dioxide nitrogen converted to CO2 by using converter agent [1]. Figure (6) clarifies the CO_2 emissions changes which are little since it relate to products quantity and the way of production

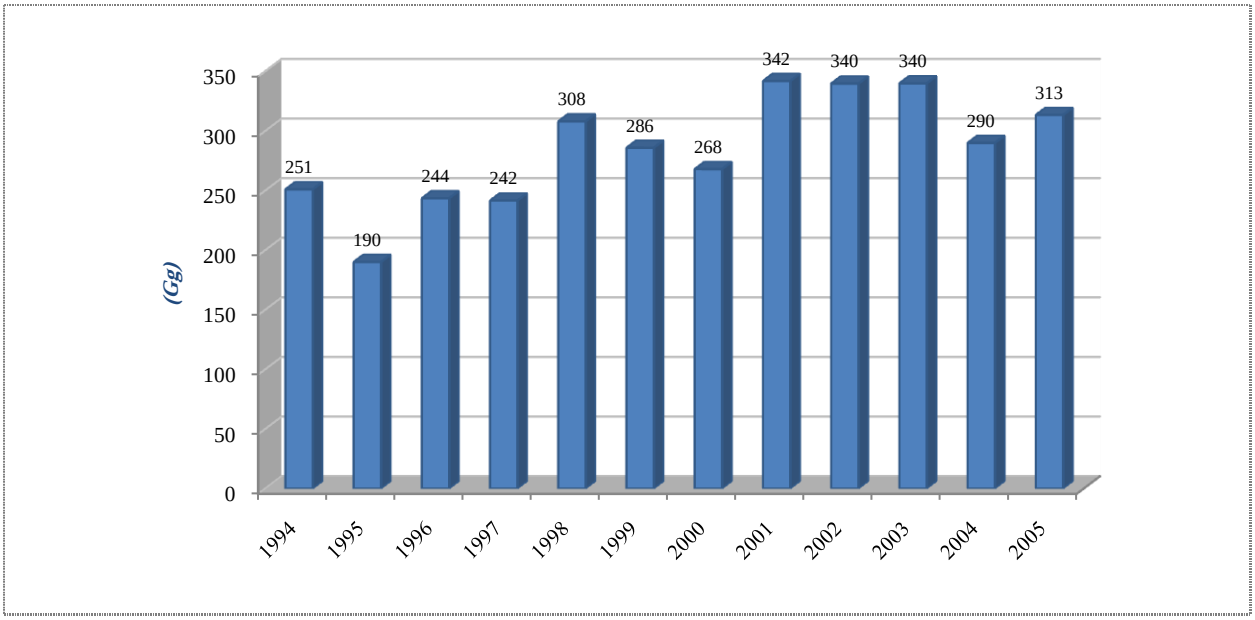

Figure 6. CO_2 Emissions Changes from Chemical Industry

The contribution of ammonia, nitric acid, petroleum coke in greenhouse phenomena in 1994 and 2005 clarify in figure (7) after converting all gases as CO_2 emissions ,it appears ammonia is the first, followed nitric acid and methane , the difference of contribution between tow years is low because no new plants.

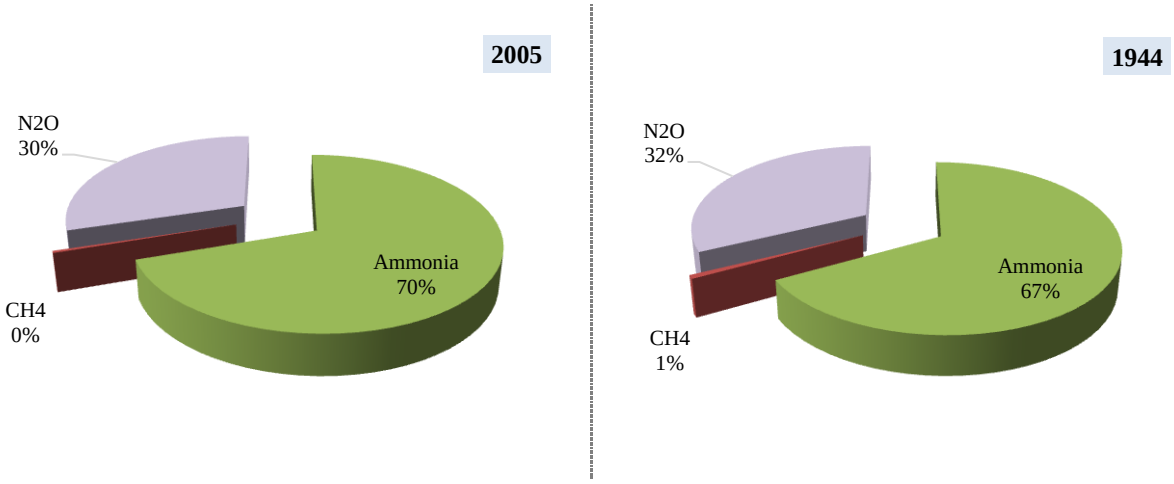

Figure 7. Emission Contribution of Three Industries of Chemical Industries

5.3. Emission from Metal Industry

Table (10) clarifies all emissions from metal industry CO_2 and other precursors gases, NMVOC, CO, NO_X between 1994-2005.

Table 10. All Emissions from Metal Industry (Gg)

Year	NOX	CO	NMVOC	CO2
1994	0.0014	3.6E-05	0.0011	57.39
1995	0.0013	3.3E-05	0.0010	53.03
1996	0.0024	6.0E-05	0.0018	96.17
1997	0.0021	5.3E-05	0.0016	84.05
1998	0.0024	6.0E-05	0.0018	95.22
1999	0.0021	5.2E-05	0.0016	82.93
2000	0.0021	5.3E-05	0.0016	85.33
2001	0.0024	6.0E-05	0.0018	96.09
2002	0.0020	4.9E-05	0.0015	78.21
2003	0.0023	5.8E-05	0.0017	93.32
2004	0.0029	7.3E-05	0.0022	116.33
2005	0.0030	7.5E-05	0.0023	120.21

CO_2 Emission from Iron and Steel Production

Figure (8) clarifies quantity changes of CO_2 emission from iron and steel production between 1994-2005 ,CO_2 emission relate to billet production .

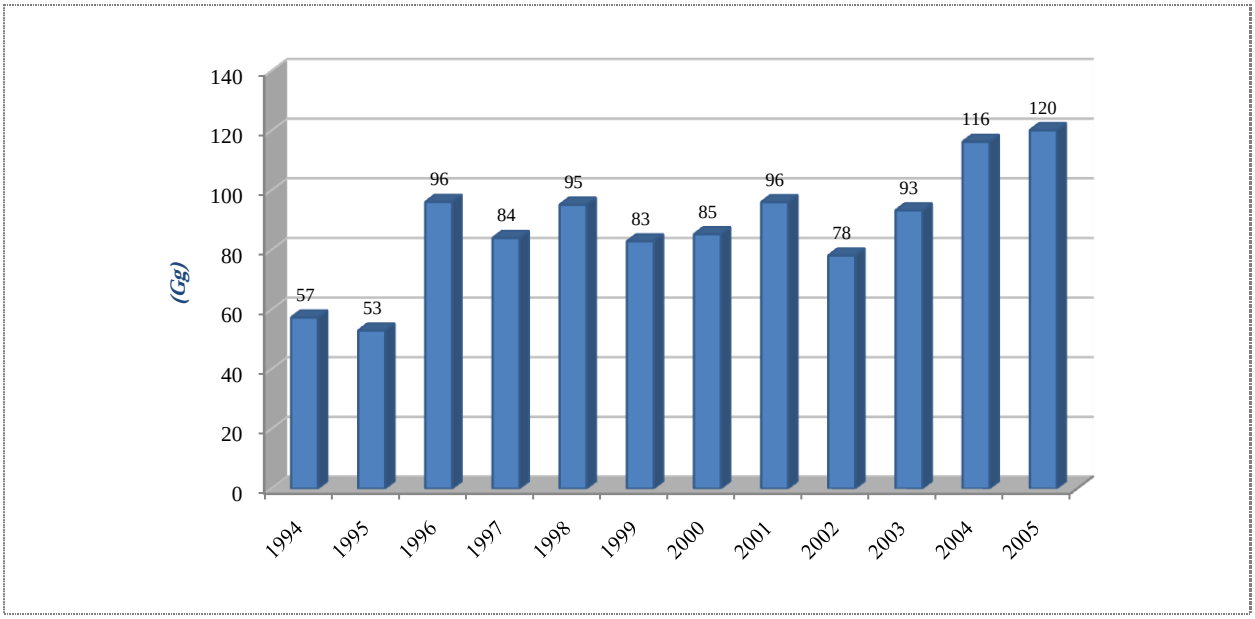

Figure 8. CO_2 Emission from Iron and Steel Production

5.4. Emissions from Other Industries

Table (11) clarifies all emissions from Other Industries, it clarifies all emissions are precursors gases NMVOC.

Table 11. Emissions Quantities from Other Industries1994-2005

Gg	Wine	Red wine	Bear	Spirit drinks	Bread	Sugar	Fat	Biscuit
	NMVOC	NMVOC	NMVOC	NMVOC	NMVOC	NMVOC	NMVOC	NMVOC
1994	0.00232	0.00020	0.00359	0.27405	5.232	1.800	0.048	0.014
1995	0.00283	0.00020	0.00359	0.19605	12.248	1.580	0.052	0.014
1996	0.00300	0.00022	0.00359	0.13485	12.544	1.810	0.029	0.013
1997	0.00251	0.00021	0.00339	0.12270	13.368	1.760	0.014	0.012
1998	0.00272	0.00017	0.00341	0.11745	14.024	0.890	0.009	0.011
1999	0.00281	0.00016	0.00422	0.09525	14.264	1.580	0.009	0.012
2000	0.00306	0.00026	0.00318	0.17805	15.168	1.090	0.010	0.013
2001	0.00301	0.00024	0.00348	0.18720	18.688	1.210	0.012	0.014
2002	0.00310	0.00024	0.00363	0.21645	19.656	2.140	0.011	0.017
2003	0.00267	0.00025	0.00350	0.23025	20.776	1.230	0.011	0.018
2004	0.00334	0.00021	0.00380	0.34395	25.856	2.310	0.009	0.019
2005	0.00322	0.00018	0.00388	0.51900	26.984	1.480	0.008	0.020

6. Total Emissions Inventory From Industry Section OF 1994 year

Table (12) 1,2 Clarifies All Emissions, Essential and Precursors Gases from Industrial Section in 1994

Table 12-1. All Emissions Gases from Mineral and Chemical and Metal Industries in 1994

Country Syrian Arab Republic
Inventory Year 1994

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

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)													
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	NO_x	CO	NMVOC	SO_2	HFCs		PFCs		SF_6	
								P	A	P	A	P	A
Total Industrial Processes	0	0	0	0	0	0	0	0	0	0	0	0	0
A Mineral Products	2172.19	0	0	0		87.89	1.30	0	0	0	0	0	0
1- Cement Production	2165.48						1.30						
2-Lime Production													
3- Limestone and Dolomite Use	0												
4- Soda Ash Production and Use	6.67												
5-Asphalt Roofing					0.00016	0.00078							
6- Road Paving with Asphalt						87.65							
7-Other (please specify)	0	0	0	0	0	0	0	0	0	0	0	0	0
8- Glass Production						0.24							
10- Concrete Pumice Stone							0						
B Chemical Industry	168.23	0.08	0.30	1.004	0.89	0.53	1.42						0
1- Ammonia Production	168.23				0.89	0.53	0.0034						
2-Nitric Acid Production			0.30	1.004									
3- Adipic Acid Production			0	0	0	0							
4-Carbide Production	0	0											
5 Other (please specify) petroleum coal Sulpher acid		0.08		0	0	0	1.42						
C Metal Production	57.39	0	0	0.0014	3.6E-05	0.0011	0	0	0	0	0	0	0
1-Iron and Steel Production	57.39			0.0014	3.6E-05	0.0011	0						
2- Ferroalloys Production	0												
3-Aluminium Production	0			0	0		0				0		
4- SF_6 Used in Aluminum and Magnesium Foundries													0
5- 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.

Table 12-2. All Emissions Gases from Other Industries in 1994

TABLE 2 SECTORAL REPORT FOR INDUSTRIAL PROCESSES

(Sheet 2 of 2)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)													
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	NO_x	CO	NMVOC	SO_2	HFCs		PFCs		SF_6	
								P	A	P	A	P	A
D Other Production	0	0	0	0	0	7.37	0	0	0	0	0	0	0
1-Pulp and Paper				0	0		0						
2.Food and Drink						7.37							
E Production of Halocarbons and Sulphur Hexauoride	0	0	0	0	0	0	0	0	0	0	0	0	0
1- By-product Emissions									0		0		
2- Fugitive Emissions									0		0		
3- Other (please specify)													
F and Sulphur Consumption of Halocarbons Hexafluoride	0	0	0	0	0	0	0	0	0	0	0	0	0
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)													

Table (13) 1,2 clarifies all emissions, essential and precursors gases from industrial section in 2005 year .

Table 13-1. All Emissions Gases from Mineral and Chemical and Metal Industries in 2005

Country Syrian Arab Republic
Inventory Year 2005

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

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)													
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	NO_x	CO	NMVOC	SO_2	HFCs		PFCs		SF_6	
								P	A	P	A	P	A
Total Industrial Processes	0	0	0	0	0	0	0	0	0	0	0	0	0
A Mineral Products	2611.38	0	0	0	0.00018	194.86	1.30	0	0	0	0	0	0
1- Cement Production	2601.17						1.30						
2-Lime Production													
3- Limestone and Dolomite Use	0												
4- Soda Ash Production and Use	10.21												
5-Asphalt Roofing					0.00018	0.00087							
6- Road Paving with Asphalt						194.48							
7-Other (please specify)	0	0	0	0	0	0	0	0	0	0	0	0	0
8- Glass Production						0.38							
10- Concrete Pumice Stone							0						
B Chemical Industry	218.93	0.05	0.35	1.156	1.15	0.53	6.94						0
1- Ammonia Production	218.93				1.15	0.53	1.57						
2-Nitric Acid Production			0.35	1.156									
3- Adipic Acid Production			0	0	0	0							
4-Carbide Production	0	0											
5 Other (please specify) petroleum coal Sulpher acid		0.05		0	0	0	5.37						
C Metal Production	120.21	0	0	0.0030	7.5E-05	0.0011	0	0	0	0	0	0	0
1-Iron and Steel Production	120.21			0.0030	7.5E-05	0.0011	0						
2- Ferroalloys Production	0												
3-Aluminium Production	0			0	0		0				0		
4- SF_6 Used in Aluminium and Magnesium Foundries													0
5- 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.

Table 13-2. All Emissions Gases from Other Industries in 2005

TABLE 2 SECTORAL REPORT FOR INDUSTRIAL PROCESSES

(Sheet 2 of 2)

SECTORAL REPORT FOR NATIONAL GREENHOUSE GAS INVENTORIES (Gg)													
GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2	CH_4	N_2O	NO_x	CO	NMVOC	SO_2	HFCs		PFCs		SF_6	
								P	A	P	A	P	A
D Other Production	0	0	0	0	0	29.02	0	0	0	0	0	0	0
1-Pulp and Paper				0	0		0						
2. Food and Drink						29.0178							
E Production of Halocarbons and Sulphur Hexauoride	0	0	0	0	0	0	0	0	0	0	0	0	0
1- By-product Emisions									0		0		
2- Fugitive Emissions									0		0		
3- Other (please specify)													
F.and Sulphur Consumption of Halocarbons Hexafluoride	0	0	0	0	0	0	0	0	0	0	0	0	0
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)													

CO_2 Emissions from Industrial Section

In Syria CO2 emits from cement , ammonia ,iron and steel production in addition of soda ash usage. Figure(9) clarifies emissions changes from industrial section between 1994-2005, where seems little since relate to production quantity.

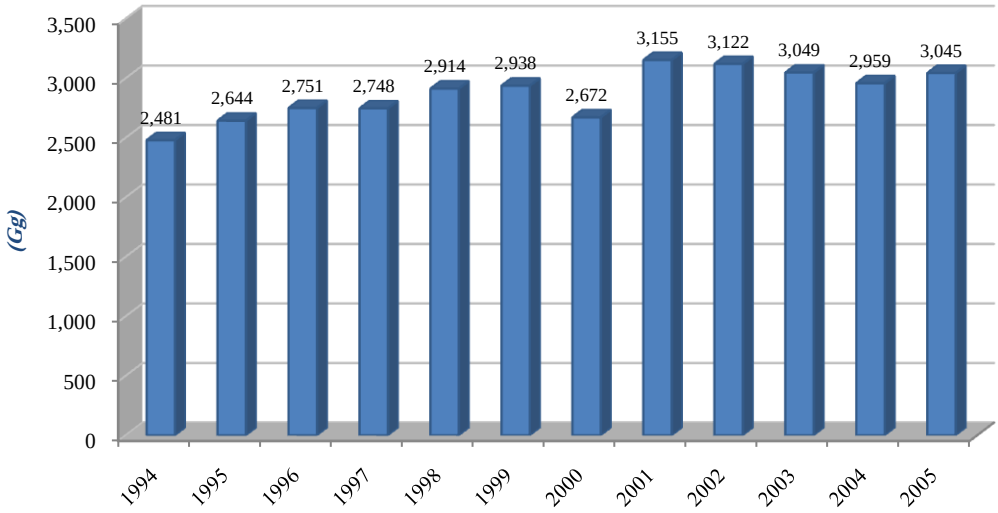

Figure 9. Changes of CO_2 from Industry Section 1994-2005

Figure (10) clarifies the distribution of CO_2 emit from cement, ammonia, iron and steel production and soda ash usage between 1994-2005 , it seems the big source of CO_2 in 1994 is cement 91% followed ammonia 7% and iron and steel 3% . The change distribution in 2005 is little limited between cement and steel production.

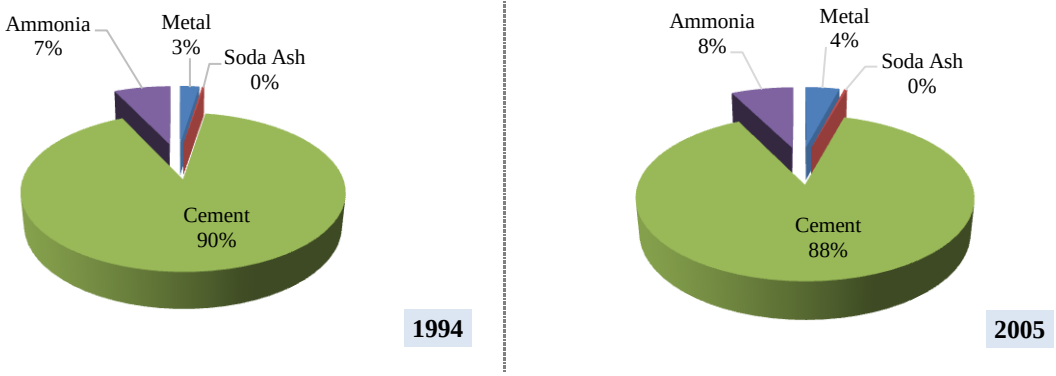

Figure 10. CO_2 Distribution According Source Emissions

Methane Emission

Figure (11) clarifies the CH_4emission changes in industrial section between 1994-2005 , CH_4 emit only from petroleum coke production, the emission is lowered because coke production decreased as a consequent of crude oil kind change .

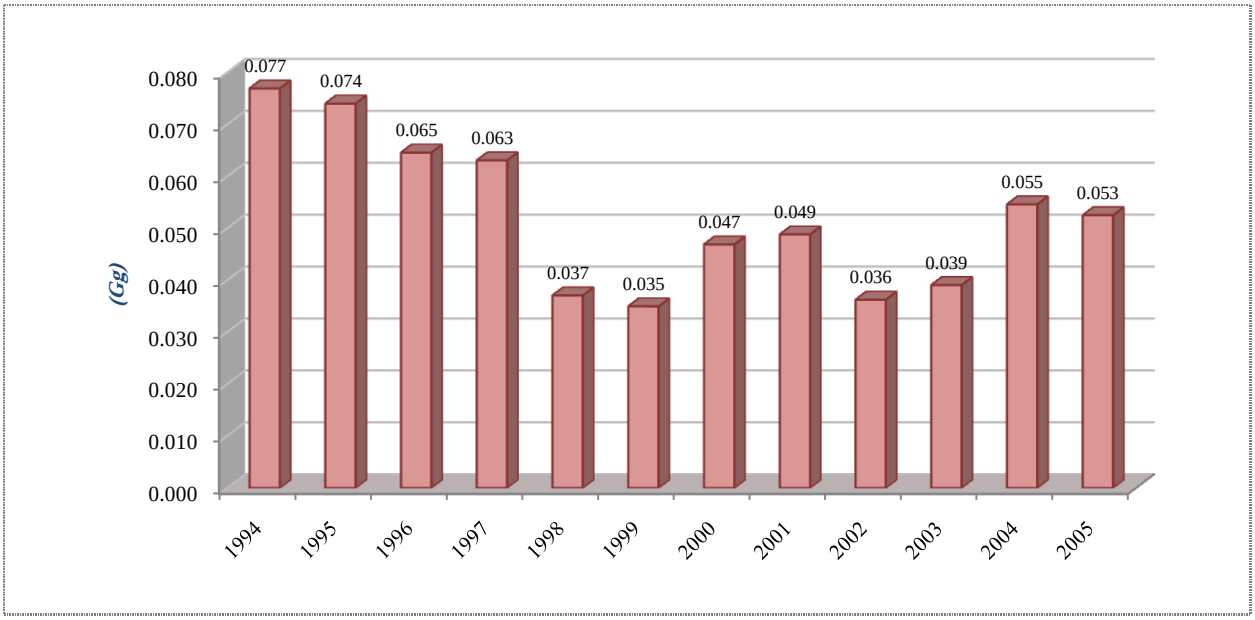

Figure 11. CH_4 Emission Changes Between 1994-2005

Oxide Nitrous Emission

Figure (12) clarifies the N_2O emission changes in industrial section between 1994-2005 , N_2O emit only from nitric acid production, the emission change according production change .

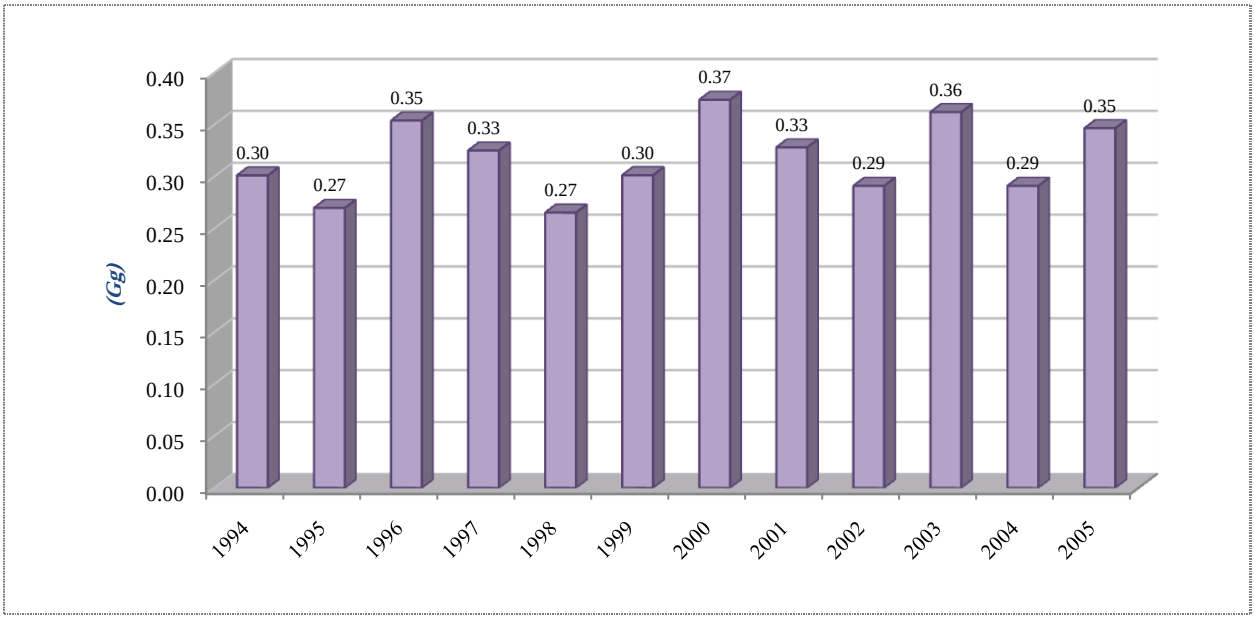

Figure 12. N_2O Emission Changes Between 1994-2005

Figure (13) clarifies CO_2distribution emission directly and equivalent from industrial section between 1994-2005 of cement , ammonia , steel and iron ,soda ash, petroleum coke , nitric acid . the most important emitter is cement 88% followed ammonia 7%, oxide nitrous 3% , iron and steel 2% , finely petroleum coke and soda ash usage. The changes between 1994 and 2005 is little and limited between cement and steel industries.

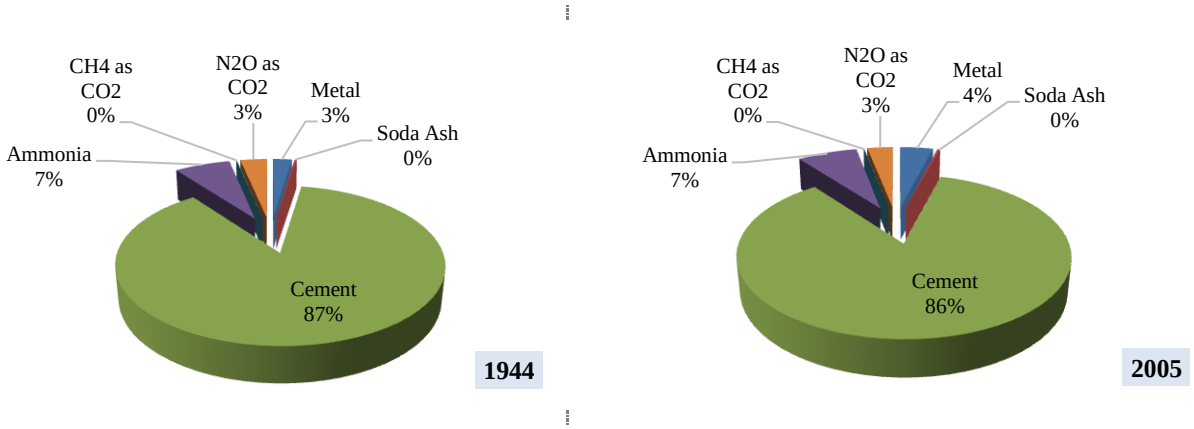

Figure 13. Clarifies CO_2 Distribution Emission Directly and Equivalent

Figure (14) clarifies total greenhouse gases emissions of N_2O, CO_2, CH_4 which studied in this report after convert all gases as co_2 emission, one see the change emissions is very little but tends to increased, that can be returned to there are no new factories and most of them works on high capacities.

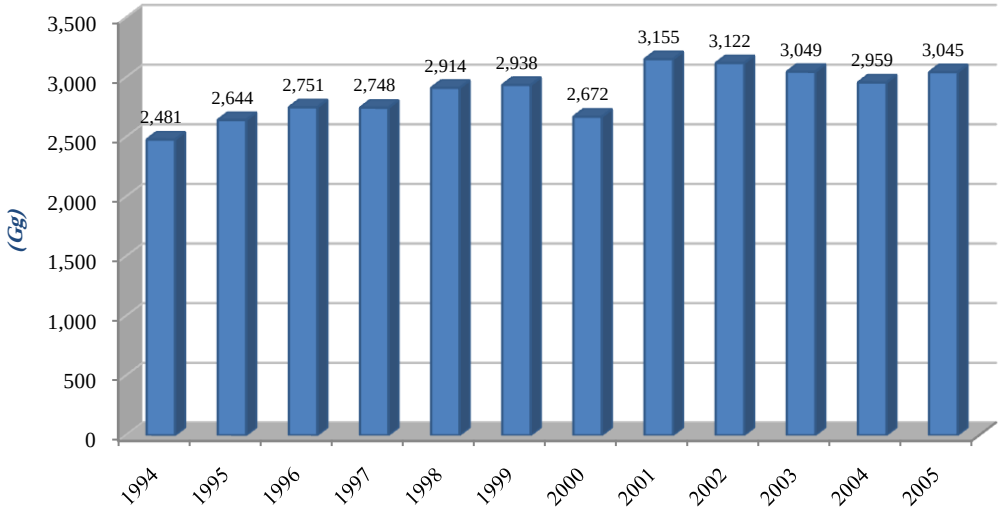

Figure 14. Clarifies Total Green House Gases Emissions as CO_2

Difficulties and Certainty

Certainty in estimating greenhouses gases of industrial section depends on two agents: precision in estimating production or usage material quantity and appropriate emission factor.

In this report most quantity has been taken from centric statistical bureau that after Some comparison between the data of bureau with the data has provided from industrial ministry and its establishments and founded no significant difference between them , but some productive has be available in centric statistical bureau they taken from its sources as roofing asphalt, nitric acid and sulphric acid.

Some products is produced in privet sector , there are difficulties to obtain data from as lime production and uses also calcium and sodium carbides.

The emission factors mention in IPPU-1996 are used in emissions estimation after conditioning according production way and product specification : emission factor for nitric acid production determined after making communication with factory to know production way, also for cement factory making communication to know product specification and lime percentage in product

In metal industry ,communication has been done with factory to know process then emission factor and estimation way are determined . The same case for paper factory in Der Al Zor the communication let us know factory only recycling paper there is no pulp, and no gases emission .for drinks ,the kinds of drinks and alcoholic percentage has been realized before determine appropriate emissions factor.

For HFC_S PFC_S, and FS_6 solutions no available data about quantity imported and ways of consumption .

Greenhouse gases Emissions for industry sector in Syria has been done for 18 industry products available with good certainty for product quantity emission factor ,so the precision and certainty for Syrian first national repot is realized in industrial sector .

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