

ANNEX 4

Annex 4: CO₂ reference approach and comparison with sectoral approach, and relevant information on the national energy balance

1.1 Total Emission of CO₂ - Reference approach and comparison with sectorial approach

The total difference of CO₂ emissions between the sectoral approach and the reference approach in 2006 amounted to less than 0.3% which is deemed satisfactory. Difference in energy consumption is due to the non energy use of fuel.

Table 1: Differences in energy consumption (Reference approach/National Approach)

	1986	1990	1995	2000	2002	2003	2004	2005	2006
liquid	-1.15	3.47	1.91	0.07	-0.51	-0.36	0.41	2.21	3.31
solid	0.24	1.76	0.95	0.92	1.77	2.10	1.34	-0.49	0.75
gaseous	4.46	4.52	11.11	15.85	14.34	16.07	14.06	16.49	14.41
total	0.29	2.93	2.92	2.80	2.59	3.26	2.78	3.57	4.10

Table 2: Differences in CO₂ emissions (Reference approach/National Approach)

	1986	1990	1995	2000	2002	2003	2004	2005	2006
liquid	-1.41	3.62	1.63	-0.07	-0.51	-0.38	-0.33	2.29	-0.07
solid	0.17	1.72	0.85	0.96	1.90	2.21	0.83	-1.97	-0.34
gaseous	-4.15	-3.34	-0.57	0.17	-0.04	-0.04	-0.09	0.58	-0.03
total	-0.82	1.74	1.00	0.26	0.52	0.64	-0.06	0.14	-0.37

Table 3: Emissions of CO₂ in Slovenia (reference approach) for the Period 1986 to 2005

Gg CO ₂	1986	1990	1995	2000	2002	2003	2004	2005	2006
Crude Oil	679	710	1610	3	0	0	0	0	0
Lubricants	NE	NE	NE	NE	NE	NE	30	10	0
LPG	123	97	99	230	243	252	239	253	238
Gasoline	1330	1654	2149	2509	2403	2346	2095	2065	2036
Jet Kerosene, Kerosene	1	3	2	3	2	2	2	2	2
Gas Oil	1001	937	1166	1529	1746	1938	2298	2663	3017
Fuel Oil	1486	1815	1799	2693	2491	2321	2260	2147	1971
Petroleum Coke	74	137	94	74	77	84	126	341	176
Total Liquid Fuels	4682	5342	6912	7026	6947	6924	7053	7482	7439
Sub-bituminous coal	NO	NO	475	800	1011	1007	991	1144	986
Other Bitoumnus Coal	123	1	2	0	54	134	110	120	95
Lignite and domestic Brown Coal	7977	6576	5114	4690	5411	5018	5162	4857	5252
Gas Oven/Gas Coke	695	216	176	146	265	189	185	183	62
Anthracite	154	88	54	0	0	0	0	0	0
Solid Fuel Totals	8949	6882	5821	5636	6742	6349	6448	6304	6396
Natural gas	1407	1627	1469	1642	1640	1798	1813	1848	1810
Gaseous Fuel Totals	1407	1627	1469	1642	1640	1798	1813	2084	2084
Fuel wood	1320	1872	1819	1959	1687	1796	1644	1796	1809
Biomass Total	1320	1872	1819	1959	1687	1796	1644	1796	1809
TOTAL (w/o biomass)	15174	13993	14377	14577	15580	15381	15314	15634	15644
Stored carbon:									
Natural gas	125	131	173	258	236	291	257	292	261
Lubricants	10	11	6	14	14	19	15	41	88
TOTAL (w/o biomass)	15174	13993	14377	14577	15580	15381	15314	15634	15644

Note: Some data in the CRF Reference approach table were found to be missing and therefore there is a small difference between this table and totals from CRF.

Year 2001 - in CRF Table – Reference approach Export and Stock changes of Residual Fuel Oil are missing.

Balance of solid, liquid and gas fuels supply, Slovenia, annual.

Domestic lignite (1000 t)	2000	2001	2002	2003	2004	2005	2006
Opening stocks	164	323	93	132	116	356	287
Production	3743	3448	4048	4222	4198	3945	3934
Import	...	...	...	...	...	...	...
Export	1	-	1	-	-	-	-
International Marine Bunkers	...	...	...	...	...	...	...
Stock change	0	0	0	0	0	0	0
Statistical difference	0	0	0	0	0	0	0
Domestic sales	3583	3677	4008	4238	3958	4014	3912
Domestic sales-Transformation-Total	3548	3652	3979	4208	3958	4014	3912
Domestic sales-Transformation-Power plants-Total	3547	3652	3979	4208	3958	4014	3912
Domestic sales-Transformation-Power plants-Main activity producers	3547	3652	3979	4208	3958	4014	3912
Domestic sales-Transformation-Power plants-Autoproducers-Total	-	-	-	-	-	-	-
Domestic sales-Transformation-Power plants-Autoproducers-For electricity	...	...	...	...	...	...	...
Domestic sales-Transformation-Power plants-Autoproducers-For heat	...	...	...	...	...	...	...
Domestic sales-Transformation-Public heat only plants	1	-	-	-	-	-	-
Domestic sales-Trade companies	26	16	17	16	-	-	-
Domestic sales-Final consumers	9	9	12	14	-	-	-
Final consumption-Total	...	...	...	...	...	...	...
Final consumption-Energy sector	...	...	...	...	...	...	...
Final consumption-Manufacturing and construction	...	...	...	...	...	...	...
Final consumption-Transport	...	...	...	...	...	...	...
Final consumption-Households	...	...	...	...	...	...	...
Final consumption-Other consumers	...	...	...	...	...	...	...
Non-energy use	...	...	...	...	...	...	...
Closing stocks	323	93	132	116	356	287	309

Domestic brown coal (1000 t)	2000	2001	2002	2003	2004	2005	2006
Opening stocks	33	28	0	23	14	31	56
Production	736	685	639	608	611	595	588
Import	...	...	...	...	...	...	...
Export	-	-	-	-	-	-	-
International Marine Bunkers	...	...	...	...	...	...	...
Stock change	0	0	0	0	0	0	0
Statistical difference	0	0	0	0	0	0	0
Domestic sales	741	713	616	617	594	570	603
Domestic sales-Transformation-Total	730	709	616	617	594	570	603
Domestic sales-Transformation-Power plants-Total	730	709	616	617	594	570	603
Domestic sales-Transformation-Power plants-Main activity producers	730	709	616	617	594	570	603
Domestic sales-Transformation-Power plants-Autoproducers-Total	-	-	-	-	-	-	-
Domestic sales-Transformation-Power plants-Autoproducers-For electricity	...	...	...	...	...	...	...
Domestic sales-Transformation-Power plants-Autoproducers-For heat	...	...	...	...	...	...	...
Domestic sales-Transformation-Public heat only plants	-	-	-	-	-	-	-
Domestic sales-Trade companies	4	2	-	-	-	-	-
Domestic sales-Final consumers	7	2	-	-	-	-	-
Final consumption-Total	...	...	...	...	...	...	...
Final consumption-Energy sector	...	...	...	...	...	...	...
Final consumption-Manufacturing and construction	...	...	...	...	...	...	...
Final consumption-Transport	...	...	...	...	...	...	...
Final consumption-Households	...	...	...	...	...	...	...
Final consumption-Other consumers	...	...	...	...	...	...	...
Non-energy use	...	...	...	...	...	...	...
Closing stocks	28	0	23	14	31	56	41

Source: Statistical office of the Republic of Slovenia.
Use and publication of data is allowed provided the source is acknowledged.

FUEL:

Domestic lignite (1000 t):
Sulphur from year 2000 to 2006 is 1,36 %.

Domestic brown coal (1000 t):
Sulphur by years: 1.53% (in 2000), 1.53% (in 2001), 2.47% (in 2002),
2.99% (in 2003), 3.07% (in 2004), 2,49 % (in 2005), 2,88 % (in 2006).

Liquefied petroleum gas (1000 t):
Liquefied Petroleum Gases (LPG): LPG are light saturated paraffinic hydrocarbons derived from the refinery processes, crude oil stabilisation and natural gas processing plants. They consist mainly of propane (C₃H₈) and butane (C₄H₁₀) or a combination of the two. They are normally liquefied under pressure for transportation and storage.

Unleaded motor gasoline 95 (1000 t):
Unleaded motor gasoline is motor gasoline where lead compounds have not been added to enhance octane rating. It may contain traces of organic lead. We distinguish between unleaded 95-octane motor gasoline and unleaded 98-octane motor gasoline.

Unleaded motor gasoline 98 (1000 t):
Unleaded motor gasoline is motor gasoline where lead compounds have not been added to enhance octane rating. It may contain traces of organic lead. We distinguish between unleaded 95-octane motor gasoline and unleaded 98-octane motor gasoline.

Diesel oil (1000 t):
Diesel oil for diesel compression ignition (cars, trucks, marine, etc.), is primarily one of medium distillates of Fuel Oil.

Light fuel oil (1000 t):
Fuel oil, light is primarily a medium distillate and is used in heating systems for warmth and heat for industrial and commercial uses

Fuel oil (1000 t):
Fuel oil covers all residual (heavy) fuel oils (including those obtained by blending). Kinematic viscosity is above 10 cSt at 80°C. The flash point is always above 50°C and density is always more than 0.90 kg/l.
Low sulphur content: Heavy fuel oil with sulphur content lower than 1%.
High sulphur content: Heavy fuel oil with sulphur content of 1% or higher.

Natural gas (mio Sm³):
Natural gas is a fossil fuel comprised of gases, occurring in underground deposits, whether liquefied or gaseous, consisting mainly of methane. Gas consumption is measured with gas meters in Sm³. GCV = 37862 kJ/Sm³

FUEL:

Natural gas (mio Sm³):
CATEGORY:
Domestic sales-Transformation-Power plants-Autoproducers-Total:
Only fuel use for electricity and heat production for sale is included.

FUEL:

Natural gas (mio Sm³):
CATEGORY:
Non-energy use:
Non-energy use for previous years is included in consumption of other consumers.

1.2 Reference approach – by fuel

1.2.1 Crude Oil

The only importer and processor of crude oil in Slovenia is Nafta Lendava, therefore data on production, import and export of crude oil are taken from its balance sheets.

Table 1: Crude Oil Consumption and Calculation of Emission of CO₂ from Oil Consumption in Slovenia for the Period 1986 to 2005

	1986	1990	2000	2001	2002	2003	2004	2005
	ton	ton	ton	ton	ton	ton	ton	ton
Production (Mg)	2569	2506	859	782	963	0	0	0
Import (Mg)	107031	128357	144598	0	0	0	0	0
- From other YU Rep. (Mg)	369532	412044	0	0	0	0	0	0
Import+ YU Rep. (Mg)	476563	540401	0	0	0	0	0	0
Export (Mg)	269181	304012	0	0	1004	0	0	0
Stock Change (Mg)	-8018	10982	0	26	-41	0	0	0
Consumption (Mg)	217969	227913	859	756	0	0	0	0
NCV (MJ/kg)	42.9	42.9	42.9	42.9	42.9	42.9	42.9	42.9
Consumption (TJ)	9350	9777	37	32	0	0	0	0
Carbon content.(t C/TJ)	20	20	20	20	20	20	20	20
Emission (Gg C)	187	196	1	1	0	0	0	0
Oxidised Fraction	0,99	0,99	0,99	0,99	0,99	0,99	0,99	0,99
Emission (Gg C)	185	194	1	1	0	0	0	0
Conversion factor C - CO ₂	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Emission (Gg CO ₂)	679	710	3	2	0	0	0	0

Data source: Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy, Table Tg/5

Emission Factor Source: Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p.1.13

In IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.16 -I.20), the suggested conversion factors from natural units to Joules range from 40.4 to 43.0 TJ/1000 t, for former Yugoslavia 42.75 TJ/1000 tonnes. LEG documents specify for all those years a conversion factor of 42.9 TJ/1000 t. (Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy, Table Tg/5). Calculations take into account the emission factor of Ministry of the Economy. For the year 2004 we have obtained data from SORS in electronic format (file name E_8_2004.xls).

Emission of CO₂ has been calculated on the basis of the formula and factors from IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.13., I. 30)

Basic sources do not specify any uncertainties. All utilized input data are taken from official inventories, while calculations take into account the factor of calorific value of a fuel as specified by the Ministry of the Economy of the Republic of Slovenia, hence the uncertainties are supposed to be low. For emission factors, the uncertainties are somewhat higher. The

emission factors applied are taken from IPCC methodology (and are not obtained by measurements performed in Slovenia).

Table 2: Estimate of Uncertainty of Utilized Data (in %)

Estimate of Uncertainty of Input Data	5%
Estimate of Uncertainty of Calorific Values	5%
Estimate of Uncertainty of Emission Factors	10%

Source: Author's estimate

1.2.2 Liquefied Petroleum Gas (LPG)

The calculation of consumption of LPG in Slovenia has been done on the basis of data taken from Table Zb/1, Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy. For the year 2004 we have obtained data from SORS in electronic format (file name E_8_2004.xls).

Table 3: Consumption of LPG and Calculation of Emission of CO₂ from Consumption of LPG in Slovenia in the Period 1986 to 2005

(LPG)	1986	1990	2000	2001	2002	2003	2004	2005
	ton	ton	ton	ton	ton	ton	ton	ton
Production (Mg)	0	0	0	0	0	0	0	0
Import (Mg)	41000	400	82000	85400	86400	87818		
- From other YU Rep. (Mg)	0	33100	0	0	0	368		
Import+ YU Rep. (Mg)	41000	33500	82000	85400	86400	88186	86153	87473
Export (Mg)	0	0	0	0	0	5	144	927
Stock Change (Mg)	-1800	-400	2000	-1800	2000	488	2775	-1576
Consumption (Mg)	42800	33900	80000	87200	88400	88669	83234	83234
NCV (MJ/kg)	46.05	46.05	46.05	46.05	46.05	46.05	46.05	46.05
Consumption (TJ)	1971	1561	3684	4016	4071	4083	3833	4055
Carbon content.(t C/TJ)	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2
Emission (Gg C)	34	27	63	69	70	70	70	70
Oxidised Fraction	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Emission (Gg CO ₂)	34	27	63	68	69	70	66	70
Conversion factor C - CO ₂	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Emission (Gg CO ₂)	123	97	230	251	254	255	239	253

Data source: Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy, Table Zb/1

Emission Factor Source: Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p.1.13

IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.21) suggest a conversion factor from natural units to Joules 47.3 TJ/1000 t. LEG documents specify for all these years a conversion factor of 46.05 TJ/1000 tonnes

Emission of CO₂ has been calculated on the basis of the formula and factors from IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.13., I. 30)

Basic sources do not specify any uncertainties. All utilized input data are taken from official inventories, while calculations take into account the factor of calorific value of fuels as specified by the Ministry of the Economy of the Republic of Slovenia, hence the uncertainties are supposed to be low. For emission factors, the uncertainties are somewhat higher. The emission factors applied are specified in IPCC methodology (and are not a result of measurements in Slovenia).

Table 4: Estimate of Uncertainty of Utilized Data (in %)

Estimate of Uncertainty of Input Data	5%
Estimate of Uncertainty of Calorific Values	5%
Estimate of Uncertainty Of Emission Factors	10%

Source: Author's estimate

1.2.3 Gasoline

Preparing consumption balances for this report took a relatively long period, 17 years. During this period, the modes of presentation and aggregation of data on the consumption of gasoline (motor gasoline and primary gasoline), jet kerosene (kerosene), fuel oil, and gas oil have in part undergone a change. Consequently, this necessitated a different approach to the calculation of consumption for individual years.

Balances of consumption for those fuels have been done on the basis of the following presumptions:

PERIOD 1986 to 1990

Gasoline consumption is split into two groups, one comprising auto and primary gasoline, the other aviation gasoline for turboprop and piston engine aircraft.

1. Under the category Purchase for motor gasoline, quantities reported in LEG-85 to 90 are the sum of purchases in other republics of the former Yugoslavia and total production in Slovenia. The balances on pages Tg/1 (LEG) are illogical, since they make it appear as if there was no production of oil products in Slovenia for the period 1986 to 90, which is not correct. It is evident that the category "Purchase" includes the total production of Nafta Lendava (both quantities sold in Slovenia as well as internal consumption and sales in other republics of the former Yugoslavia) from the reports for the period 1991 to 1996, when the entire production has been presented in the category "Production" (compare Tables Tg/1 in LEG 1986 - 1990 to tables Tg/1 in LEG 1991 - 2003).

Not so for the primary gasoline: quantities produced in Nafta Lendava have not been reported in the category Purchase. Consequently, these quantities are not subtracted later (item 3).

2. This is how total available quantities of an individual refined petroleum product in Slovenia have been obtained.

3. From the total available quantity of an individual refined petroleum product in Slovenia, the total final production of Nafta-Lendava, which has been taken into account in category Purchase in LEG, Table Tg/5, is subtracted. Thus:

- production of auto gasoline sold in Slovenia
- production of auto Gasoline exported.

The production of primary gasoline, which is reported under items Processing and Internal Consumption is not taken into account, since these quantities are processed further into other products.

Outline of the Calculation of Consumption of Oil Products 1986 to 1990

Purchase	Purchase in other republics of the former Yugoslavia. This category for the period 1986 to 1990 includes also production in Slovenia
+Import	
=Available quantities	
- Production in Nafta Lendava (i.e. production in Slovenia)	Subtract all quantities of motor gasoline produced in Nafta Lendava (sold in Slovenia, in other republics of the former Yugoslavia or used for internal consumption). These quantities are subtracted because they are reported in the category Purchase (and should not be). Primary gasoline is not reported in the category Purchase, and is therefore not subtracted here (!!!!!).
Real Import	Thus are obtained quantities which are available in Slovenia and the emissions of which are taken into account in the processing of crude oil.
- Real Export	It is necessary to subtract quantities which are not used in Slovenia and which have been taken into account for emissions from the processing of crude oil. This is the quantity that is exported – that part of the production of refined petroleum products of Nafta Lendava, which is sold to other republics of the former Yugoslavia: motor gasoline and primary gasoline. Export is also that quantity of motor gasoline that is sold to other republics of the former Yugoslavia as reported by Elektrogospodarstvo (LEG, Tg/1 and Tg/2) – i.e. sales of Istrabenz in other republics of the former Yugoslavia. For gasoline for the period 1986 to 1991, the sum of both exports is taken into account (from tables Tg/1 and Tg/5). Taken into account is also the export of motor gasoline (emissions from its consumption will be reported by the country which will retail this gasoline) and export of raw gasoline (which will be processed into motor gasoline in the exporting country and reported within the framework of the consumption of motor gasoline in that country). In the same way, the export of fuel oil and gas oil is calculated.
- (+) Stock Change	
Consumption in Slovenia	The result are quantities consumed in Slovenia which have not been taken into account for the processing of crude oil, minus quantities of refined petroleum products, which are exported.

4. Quantities obtained are the actual import and purchase from other republics of the former Yugoslavia. The produced quantities of auto gasoline are subtracted because CO₂ emissions from them have already have been taken into account in the processing of crude oil. Should they not be subtracted, then they are presented twice: in the category Oil Products (gasoline, gas oil and fuel oil) and Crude Oil Consumption.

5. Subsequently all exported values must be subtracted since these emissions do not arise in Slovenia,

- export or sales outside the Republic of Slovenia, as reported by Nafta-Lendava (Table Tg/5 – for gasoline the export of motor gasoline and primary gasoline is taken into account).
- values that are reported as export by Elektrogospodarstvo: these are the quantities, which are exported by Istrabenz to its agencies abroad.

Export of oil products (gasoline, gas oil and fuel oil) must therefore be subtracted twice: firstly because the quantities consumed have already been reported in the category Purchase, and secondly, because emissions have already been taken into account in the consumption of crude oil.

Stock change is obtained by subtracting the stocks for the end of the period from stock at the beginning of the period.

6. The obtained quantities are taken into account for the calculation of emissions of CO₂.

Data calculated as the consumption of oil products for 1990 in this report differ from those specified in Seljak 1998, where those quantities of refined petroleum products which had been sold by Istrabenz in other republics of the former Yugoslavia or abroad have not been taken into account as export.

YEAR 1991

In calculating the consumption of refined petroleum products in Slovenia for 1991, an error has occurred in LEG. Production of Nafta Lendava has been reported twice: under the category Purchase (as was the case in LEG 1986-1990) and under the category Production (as reported since 1992). Consequently, the quantities of motor gasoline, gas oil, fuel oil and residual fuel oil, which were produced in Nafta Lendava, have been subtracted from the category Purchase (or import from other republics of the former Yugoslavia) of motor gasoline (or gas oil / fuel oil).

Table 5: Calculation of Purchase of Oil Products in other Republics of the Former Yugoslavia in 1991

	Quantities reported in LEG (TG/1)-tonnes	Sales in Slovenia – LEG /Tg/5	Real Purchase in other Republics of the Former Yugoslavia
Motor Gasoline	324000	113932	210068
Gas oil	251401	104717	146684
Fuel Oil and Residual Fuel Oil	494219	235106	259113
Fuel Oil	302524	143885	158577
Residual Fuel Oil	191695	91221	100536

The ratio has been calculated on the basis of reported quantities in column: Reported Quantities in LEG (TG/1): 38.8 % residual fuel oil – 61.2 % fuel oil.

The export of oil products in 1991 is obtained by summing up the export as reported by Nafta Lendava (motor gasoline and primary gasoline) and export as reported by Elektrogospodarstvo (sales of Istrabenz in other republics of the former Yugoslavia).

PERIOD 1992-2003

1. In LEG 1992-1996 under the category Purchase, only those values were reported which had actually been purchased in other republics of the former Yugoslavia (since 1994 these quantities are no more). Under the category Production, the quantities produced in Slovenia

(Nafta Lendava) are reported. Calculations must not take into account the oil products that were produced in Slovenia (since both calorific values as well as emissions of CO₂ have already been taken into account for the consumption of crude oil). Hence, further calculations take into account only quantities either purchased in other republics of the former Yugoslavia or imported.

2. Subtract all export from the obtained quantities. This is the value that was provided by Elektrogospodarstvo as sales into other republics of former Yugoslavia (until 1993) as well as export (since 1994).

Stock changes are obtained by subtracting the stocks for the end of the period from the stocks for the beginning of the period.

3. Thus are obtained the quantities taken into account in calculating emissions of CO₂.

Outline of Consumption of Oil Products 1992-2000

Purchase	Under this category in LEG-91 to 96 the quantities purchased in other republics of the former Yugoslavia have been reported
+Import	Import from other countries
Real Import	Quantities which have been available in Slovenia and which have not been taken into account in processing of crude oil.
- Real Export	Minus quantities which have not been consumed in Slovenia and which have been taken into account for emissions from the processing of crude oil. This quantity is exported. For gasoline, the export of both motor gasoline as well as primary gasoline is subtracted.
- (+) Stock Change	
Consumption in Slovenia	Quantities which have been consumed in Slovenia and which have been taken into account for the processing of crude oil, minus quantities of refined petroleum products that have been exported.

IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.21) suggest a conversion factor from natural units to Joules of 44.8 TJ/1000 t. The factors specified in LEG for individual years ranged from 42.87 to 43.14 TJ/1000 t (Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-1996, Ljubljana: Ministry of the Economy, Table Zb/1). Based on measurements, the emission factor of the Ministry of the Economy has been taken into account in calculations for individual years. For the year 2004 we have obtained data from SORS in electronic format (file name E_8_2004.xls).

The emission of CO₂ has been calculated on the basis of the formula and emission factors from IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.13., I. 30)

Table 6: Consumption of Gasoline and Calculation of Emission of CO₂ from Consumption of Gasoline in Slovenia for the Period 1986 to 2005

	1986	1990	2000	2001	2002	2003	2004	2005
	ton	ton	ton	ton	ton	ton	ton	ton
Purchase (Mg)	445600	497300	34000	0	0	0	0	0
Production of Motor Gasoline (Mg)								
Import (Mg)	5500	78000	868000	805900	777800	781935	717856	726576
Available Quantity in Slovenia (Mg)	451100	575300	902000	805900	777800	781935	717856	726576
- Production of Motor Gasoline by Lendava, sold in Slovenia	17248	40204						
- Export of Gasoline by Lendava								
- Internal Consumption of Gasoline	0	0						
Total production of Motor Gasoline in Slovenia	17248	40204						
Real Import (Mg)	433852	535096	902000	805900	777800	781935	717856	726576
Export, as reported by Elektrogospodarstvo - Sales of Istrabenz Abroad (Mg)	6500	8800						
Export, as Reported by Nafta Lendava (Mg)								
Export – Total (Mg)	6500	8800	78000	29100	20800	26858	29905	59461
Stock Change (Mg)	5300	-223	26000	-25400	-7000	9213	21814	10420
Consumption in Slovenia minus Production of Lendava (Mg)	422052	526519	798000	802200	764000	745864	666137	656695
Factor MJ/kg	43.19	43.07	43.08	43.08	43.08	43.08	43.08	43.08
Consumption (TJ)	18228	22677	34378	34559	32913	32132	28697	28290
Emission Factor (t C/TJ)	20.10	20.09	20.11	20.11	20.11	20.11	20.108	20.108
Emission (Gg C)	366	456	691	695	662	646	577	569
Oxidised Fraction	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Emission (Gg C)	363	451	684	688	655	640	571	569
Conversion of C to CO ₂	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Emission (Gg CO ₂)	1330	1654	2509	2523	2403	2346	2095	2065

Data Source: Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy, Table Tg/1, Tg/5

Source of Emission Factors: Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p.1.13, estimates of an expert group.

Basic sources do not specify any uncertainties. The utilized input data are calculated on the basis of two balances: the balance sheets of Nafta Lendava and Elektrogospodarstvo Slovenije. With regard to the fact that many categories of consumption and of production have not been harmonized, the estimated total uncertainty of input data amounts to 10 %. The uncertainty of input data differs for individual years:

- 5% for the period 1993 to 2004,
- 10 % for the period 1986 to 1990, 1992
- 20 % for year 1991.

Calculations account for the factor of calorific value of fuels issued by the Ministry of the Economy of the Republic of Slovenia, hence the uncertainties are supposed to be low. For emission factors, the uncertainties are somewhat higher. The emission factors applied are taken from IPCC methodology (and are not a result of measurements in Slovenia).

Table 7: Estimate of Uncertainty of Utilized Data (in %)

Estimate of Uncertainty of Input Data for the Period 1993 to 2004	5 %
Estimate of Uncertainty of Input Data for the Period 1986 to 1990, 1992	10%
Estimate of Uncertainty of Input Data for 1991	20 %
Estimate of Uncertainty of Calorific Values	5%
Estimate of Uncertainty of Emission Factors	10%

Source: Author's estimate

1.2.4 Jet kerosene, Kerosene

Calculation of consumption of jet kerosene and kerosene in Slovenia has been done on the basis of data from the tables Tg/1 and Tg/5, Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy. For the year 2004 we have obtained data from SORS in electronic format (file name E_8_2004.xls).

Table 8: Consumption of Jet Kerosene and Calculation of Emission of CO₂ from Consumption of Jet Kerosene in Slovenia for the Period 1986 to 2005

	1986	2000	2001	2002	2003	2004	2005
Purchase (Mg)	22300	0	0	0	0	0	0
Import (Mg)	10300	24622	27458	33342	28422	22864	20619
Real Import (Mg)	32600	24622	27458	33342	28422	22864	20619
Real Export (Mg)	0	237	922	5943	2367	610	254
Stock Change (Mg)	600	231	-427	-363	232	1954	-736
Consumption Abroad (Mg)	31800	23230	26207	27009	25050	19679	21163
Consumption in Slovenia (Mg)	200	924	756	753	772	621	-62
Factor MJ/kg	43.5	43.5	43.5	43.5	43.5	43.5	43.5
Consumption (TJ)	9	40	33	33	34	27	-3
Emission Factor (t C/TJ)	19.5	19.5	19.5	19.5	19.5	19.5	19.5
Emission (Gg C)	0	1	1	1	1	1	0
Oxidised Fraction	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Emission (Gg C)	0	1	1	1	1	1	0
Conversion of C to CO ₂	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Emission (Gg CO ₂)	1	3	2	2	2	2	0

IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.21) suggest a factor of 44.6 TJ/1000 tonnes. LEG documents specify for all those years a conversion factor of 42.8 TJ/1000 tonnes (Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy, Table Zb/1). Based on measurements, the emission factor of the Ministry of the Economy has been taken into account in calculations.

Emission of CO₂ has been calculated on the basis of the formula and factors from IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.13., I. 30)

Most jet kerosene is consumed outside the territory of Slovenia in international transport in the so-called international bunkers, and that is why these quantities are not included in the calculation of national emissions for Slovenia. Quantities, which are specified in LEG under

the category of aviation gasoline for turboprop engines, are considered as being consumed in international transport, while quantities under the Aviation Gasoline for Piston Engine Aircraft category is considered as consumption in Slovenia. After independence, the consumption of jet kerosene in international transport fell strongly (likewise the number of transported passengers diminished from 1.7 million in 1987 to 0.55 million in 1995 – Source: Statistical Office of the Republic of Slovenia: Letni pregled prometa in zvez, Ljubljana: Statistical Office of the Republic of Slovenia 1995).

Data Source: Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy, Table Tg/2, Tg/4
 Source of Emission Factors: Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p.1.13

Basic sources do not specify any uncertainties. All utilized input data are taken from official inventories, while calculations take into account the factor of calorific value of a fuel as specified by the Ministry of the Economy of the Republic of Slovenia, hence the uncertainties are supposed to be low. For emission factors, the uncertainties are somewhat higher. The emission factors applied are specified in IPCC methodology (and are not a result of measurements in Slovenia).

Table 9: Estimate of Uncertainty of Utilized Data (in %)

Estimate of Uncertainty of Input Data	5%
Estimate of Uncertainty of Calorific Values	5%
Estimate of Uncertainty of Emission Factors	10%

Source: Author's estimate

1.2.5 Gas oil

The calculation of consumption of gas oil in Slovenia has been done on the basis of data from tables Tg/1 and Tg/5, Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy. Consumption has been calculated on the basis of presumptions, which for secondary fuels are presented in the chapter on gasoline. For the year 2004 we have obtained data from SORS in electronic format (file name E_8_2004.xls).

IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I. 21) specify a factor of 43.3 TJ/1000 t. For all those years, a conversion factor of 42.7 TJ/1000 tonnes has been specified in LEG reports (Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-1996, Ljubljana: Ministry of the Economy, Table Zb/1). Based on measurements, the emission factor of the Ministry of the Economy has been taken into account in calculations.

Emission of CO₂ has been calculated on the basis of the formula and emission factors from IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.13., I. 30)

Table 10: Consumption of Gas Oil and Calculation of Emission of CO₂ from Consumption of Gas Oil in Slovenia for the Period 1986 to 2005

	1986	1990	2000	2001	2002	2003	2004	2005
	ton	ton	ton	ton	ton	ton	ton	ton
Purchase (Mg)	336000	348700	30000	0	0	0	0	0
Production (Mg)	0	0	0	0	0	0	0	0
Import (Mg)	45200	7000	519000	578318	630100	688670	829622	981288
Purchase +Import (Mg)	381200	355700	549000	578318	630100	688670	829622	981288
- Production of Lendava, sold in Slovenia	53469	48451						
- Export Lendava								
- Internal Consumption (Mg)	0	169						
Total Production in Slovenia (Mg)	53469	48620	0	0	0	0	0	0
Real Import (Mg)	327731	307080	549000	578318	630100	688670	829622	981288
Export, as reported by Elektrogospodarstvo - Sales of Istrabenz abroad (Mg)	4100	9400						
Export, as reported by Nafta Lendava (Mg)	0	0	0	0	0	0	0	0
Export - Total (Mg)	4100	9400	87000	74079	73298	49280	60699	132452
Stock Change (Mg)	5500	-180	-24000	-11699	1759	23175	38407	2116
Consumption in Slovenia minus Production of Lendava (Mg)	318131	297860	486000	515938	555043	616215	730516	846720
Factor MJ/kg	42.7	42.7	42.7	42.7	42.7	42.7	42.7	42.7
Consumption (TJ)	13584	12719	20752	22031	23700	26312	31193	36155
Emission Factor (t C/TJ)	20.29	20.3	20.3	20.3	20.3	20.3	20.3	20.3
Emission (Gg C)	276	258	421	447	481	534	633	734
Oxidised Fraction	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Emission (Gg CO ₂)	273	255	417	443	476	529	627	734
Conversion of C to CO ₂	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Emission (Gg CO ₂)	1001	937	1529	1623	1746	1938	2298	2663

Data Source: Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy, Table Tg/1, Tg/5

Source of Emission Factors: Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p.1.13

Basic sources do not specify any uncertainties. The utilized input data are calculated on the basis of two sources: the balance sheets of Nafta Lendava and Ministry of the Economy, hence the input data uncertainties are higher. Calculations take into account the factor of calorific value of fuels specified by the Ministry of the Economy of the Republic of Slovenia, hence the uncertainties are low. For emission factors, the uncertainties are higher. The emission factors applied are specified in IPCC methodology (and are not a result of measurements in Slovenia).

Table 11: Estimate of Uncertainty of Utilized of Data (in %)

Estimate of Uncertainty of Input Data for the Period 1993 to 1996	5 %
Estimate of Uncertainty of Input Data for the Period 1986 to 1990, 1992	10%
Estimate of Uncertainty of Input Data for 1991	20 %
Estimate of Uncertainty of Calorific Values	5%
Estimate of Uncertainty of Emission Factors	10%

Source: Author's estimate

1.2.6 Fuel Oil

Table 12: Consumption of Fuel Oil and Calculation of Emission of CO₂ from Consumption of Fuel Oil in Slovenia for the Period 1986 to 2004

	1986	1990	2000	2001	2002	2003	2004	2005
	ton	ton	ton	ton	ton	ton	ton	ton
Purchase (Mg)	264900	370800						
Production (Mg)			31000					
Import (Mg)	0	37800	762000	787440	746743	704867	741583	725725
Purchase +Import (Mg)	264900	408600	793000	787440	746743	704867	741583	725725
– Production Lendava, sold in Slovenia								
– Export Lendava								
– Internal Consumption (Mg)								
Total Production in Slovenia (Mg)								
Real Import (Mg)	264900	408600	793000	787440	746743	704867	741583	725725
Export as reported by Elektrogospodarstvo - Sales of Istrabenz abroad (Mg)	1800	4100						
Export as reported by Nafta Lendava (Mg)								
Export - Total (Mg)	1800	4100	43000	47006	13502	6114	21620	9492
Stock Change (Mg)	2100	3400	22000	-5784	23400	3786	-15761	17308
Consumption in Slovenia minus Production of Lendava (Mg)	261000	401100	728000	746218	709841	694968	735724	698925
Factor MJ/kg	41.82	41.87	41.9	41.9	41.9	41.9	41.77	41.77
Consumption (TJ)	10915	16794	30503	31267	29742	29119	30731	29194
Emission Factor (t C/TJ)	20.2	20.2	20.2	20.2	20.2	20.2	20.26	20.26
Emission (Gg C)	220	339	616	632	601	588	623	591
Oxidised Fraction	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Emission (Gg CO ₂)	218	336	610	625	595	582	616	591
Conversion of C to CO ₂	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Emission (Gg CO ₂)	800	1232	2237	2293	2181	2135	2260	2147

Data Source: Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy, Table Tg/1, Tg/5 For the year 2004 we have obtained data from SORS in electronic format (file name E_8_2004.xls).

Source of Emission Factors: Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p.1.13

Because of the differing definitions for individual categories within the category “Fuel Oil” (extra light, light, residual) a direct presentation of separate data for the production of fuel oil and residual fuel oil is not possible. Those data after 1992 are not even necessary for the presentation of consumption in the reference approach. For the period 1986 to 1991, an estimation is necessary. LEG (Table TG/5) brings only data for the total production of fuel oil and residual fuel oil in Nafta Lendava. The Statistical Office of the Republic of Slovenia (Statistical Office of the Republic of Slovenia: SL-86 to 91) publishes data on the production of fuel oil in its publications. However, data on the production of residual fuel oil are reported under the category Fuel Oil (cf. data on production for the period 1992 to 2002 in LEG and SL-96, p. 287). For the period 1986 to 1991 data have been estimated:

1.2.7 Residual Fuel Oil

Table 13: Consumption of Residual Fuel Oil and Calculation of Emission of CO₂ from Consumption of Residual Fuel Oil in Slovenia for the Period 1986 to 2005

	1986	1990	2000	2001	2002	2003	2004	2005
	ton	ton	ton	ton	ton	ton	ton	ton
Purchase (Mg)	306900	257700						
Production (Mg)			42000					
Import (Mg)	80700	65300	109000	111085	97300	62745	55884	65256
Purchase +Import (Mg)	387600	323000	151000	111085	97300	62745	55884	65256
– Production Lendava sold in Slovenia	162492	99244	0	0	0	0	0	0
– Export Lendava								
– Internal Consumption (Mg)								
Total Production in Slovenia (Mg)	162492	99244	0					
Real Import (Mg)	225108	223756	151000	111085	97300	62745	55884	65256
Export as reported by Elektrogospodarstvo - Sales of Istrabenz abroad (Mg)								
Export as reported by Nafta Lendava (Mg)								
Export – Total (Mg)	0	0	3000	515	0	0	1838	
Stock Change (Mg)	0	32300	-1000	-997	-4000	2188	-1360	-3341
Consumption in Slovenia minus Production Lendava (Mg)	225108	191456	149000	111567	101300	60557	50395	68422
Factor MJ/kg	39.74	39.8	40	40	40	40	40	40
Consumption (TJ)	8946	7620	5960	4463	4052	2422	2016	2737
Emission Factor (t C/TJ)	21.1	21.1	21.1	21.1	21.1	21.1	21.1	21.1
Emission (Gg C)	189	161	126	94	85	51	43	58
Oxidised Fraction	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Emission (Gg C)	187	159	124	93	85	51	42	58
Conversion of C to CO ₂	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Emission (Gg CO ₂)	685	584	457	342	310	186	154	210

Data Source: Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy, Table Tg/1, Tg/5

Source of Emission Factors: Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p.1.13

Basic sources do not specify any uncertainties. The utilized input data are calculated on the basis of two sources: the balance sheets of Nafta Lendava and Ministry of the Economy, hence the input data uncertainties are higher. Calculations take into account the factor of calorific value of fuels specified by the Ministry of the Economy of the Republic of Slovenia, hence the uncertainties are low. For emission factors, the uncertainties are higher. The emission factors applied are specified in IPCC methodology (and are not a result of measurements in Slovenia).

Table 14: Estimate of Uncertainty of Utilized Data (in %)

Estimate of Uncertainty of Input Data for the Period 1993 to 2004	5 %
Estimate of Uncertainty of Input Data for the Period 1986 to 1990	10%
Estimate of Uncertainty of input data for years 1991, 1992	20 %
Estimate of Uncertainty of Calorific Values	5%
Estimate of Uncertainty of Emission Factors	10%

Source: Author's estimate

1.2.8 Bitumen and Lubricants

IPCC methodology (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.21) enables reporting the consumption of secondary fuels or products only in the case of their being imported. In Slovenia, there are no exact data on the import of bitumen and lubricants. This section takes into account the presumption that all consumed quantities of bitumen have been imported (or produced from imported raw materials), since there are no reports on the production of bitumen in Slovenia (Statistical Office of the Republic of Slovenia: Annual Industry Survey 1986-2003). The consumption of imported bitumen has no influence on the final emissions of CO₂. The imported quantities of bitumen have no influence on emissions of CO₂: they have to be added up in the chapter on the consumption of bitumen and subtracted in the chapter on carbon, which was stored in products.

For the consumption of lubricants, only imported quantities should be specified, since emissions of other quantities have already been taken into account for the processing of crude oil. Since these data (on import) are available in Slovenia only for 2004 in satisfactory quality, the quantities on the consumption of lubricants are not specified for other years. Imported quantities of lubricants have no influence on emissions of CO₂: they have to be added up in the chapter on the consumption of lubricants and subtracted in the chapter on stored carbon. The chapter on stored carbon therefore reports only the consumed quantities of lubricants that have been produced in Slovenia.

1.2.9 Petroleum Coke

The calculation of consumption of petroleum coke in Slovenia has been done on the basis of data from the research of the Institute of Metals and Technology (Breskvar, Torkar 1999) and the report of the Treibacher Schleifmittel d.o.o. (Nekrep 1999). No adequate data are available for Slovenia, which would enable presentation similar to that for other secondary liquid fuels. Most petroleum coke is consumed in Talum, Kidričevo for the production of electrodes, whereas until 1994 small quantities were used in the production of silicon carbide by Tovarna Dušika Ruše. The balance for Slovenia has been done on the basis of the reports of those two enterprises. For the year 2004 we have obtained data from SORS in electronic format (file name E_8_2004.xls).

Table 15: Consumption of Petroleum Coke and Calculation of Emission of CO₂ from Consumption of Petroleum Coke in Slovenia for the Period 1986 to 2005

	1986	1990	2000	2001	2002	2003	2004	2005
Production (Mg)	0	0	0	0	0	0	0	0
Import (Mg)	24019	44273	23931	27124	24799	27228	40654	110290
Purchase (Mg)	0	0	0	0	0	0	0	0
Import + Purchase (Mg)	24019	44273	23931	27124	24799	27228	40654	110290
Export (Mg)	0	0	0	0	0	0	0	0
Stock Change (Mg)	0	0	0	0	0	0	0	0
Consumption (Mg)	24019	44273	23931	27124	24799	27228	40654	110290
Factor MJ/kg	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00
Consumption (TJ)	745	1372	742	841	769	844	1260	3419
Emission Factor (t C/TJ)	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5
Emission (Gg C)	20	38	20	23	21	23	35	94
Oxidised Fraction	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Emission (Gg C)	20.3	37.4	20.2	22.9	20.9	23.0	34	94
Conversion of C to CO ₂	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Emission (Gg CO ₂)	74	137	74	84	77	84	126	341

Data Source:

Breskvar B., Torkar M.: Določitev emisij toplogrednih plinov v proizvodnji aluminija, železa in jekla ter ferozlitin, Institute of Metals and Technology, Ljubljana 1999

Nekrep K: CO₂ Emisije v proizvodnji SiC (working material), Treibacher Schleifmittel, Ruše 1999

Reports from enterprises

Source of Emission Factors: Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p.1.13, 1. 23

In IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. 1.13 and 1. 23), the suggested conversion factor from natural units to Joules amounts to 31.00 TJ/1000 t, and the emission factor amounts to 27.5 t C/TJ.

The emission of CO₂ has been calculated on the basis of the formula and emission factors from IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. 1.13., 1. 30)

Basic sources do not specify any uncertainties. All utilized input data are taken from reports of the enterprises using petroleum coke; hence, the uncertainty is somewhat higher. The calorific values of fuels and emission factors are specified in IPCC methodology (and are not a result of measurements in Slovenia); hence, the uncertainty is also somewhat higher than for other secondary fuels.

Table 16: Estimate of Uncertainty of Utilized Data (in %)

Estimate of Uncertainty of Input Data	10%
Estimate of Uncertainty of Calorific Values	10%
Estimate of Uncertainty of Emission Factors	10%

Source: Author's estimate

1.2.10 Hard Coal

The calculation of the consumption of hard coal in Slovenia has been done on the basis of data from Table P/1, Statistični letopis energetskega gospodarstva republike Slovenije 1986-1996, Ljubljana: Ministry of the Economy.

IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. 1.14 -1.20) suggest a conversion factor from natural units to Joules from 18.00 to 33.5 TJ/1000 t, for the former Yugoslavia from 23.6 to 30.7 TJ/1000 tonnes. LEG reports specify for different years emission factors from 25 to 27.86 TJ/1000 tonnes (Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy, Table Zb/1). Based on measurements, the emission factor of the Ministry of the Economy has been taken into account in calculations for individual years.

Table 17: Consumption of Black Coal and Calculation of Emission of CO₂ from Consumption of Black Coal in Slovenia for the Period 1986 to 2005

	1986	1990	2000	2001	2002	2003	2004	2005
Production (Mg)	0	0	0	0	0	0	0	0
Import (Mg)	62700	500	0	0	21817	54200	44197	48598
Purchase (Mg)	0	0	0	0	0	0	0	0
Import + Purchase (Mg)	62700	500	0	0	21817	54200	44197	48598
Export (Mg)	15100	0	0	0	0	0	0	0
Stock Change (Mg)	-600	0	0	0	0	0	0	0
Consumption (Mg)	48200	500	0	0	21817	54200	44197	48598
Factor MJ/kg	27.57	27.57	25.00	25.00	25.00	25.00	25.00	25.00
Consumption (TJ)	1329	14	0	0	545	1355	1105	1215
Emission Factor (t C/TJ)	25.8	25.8	25.8	25.8	27.6	27.6	27.6	27.6
Emission (Gg C)	34	0	0	0	15	37	30	34
Oxidised Fraction	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Emission (Gg CO ₂)	33.6	0.3	0.0	0.0	14.8	36.7	30	34
Conversion of C to CO ₂	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Emission (Gg CO ₂)	123	1	0	0	54	134	110	120

Data Source: Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy, Table Pr/1

Source of Emission Factors: Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p.1.13

Emission of CO₂ has been calculated based on the formula and factors from IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. 1.13., I. 30)

Basic sources do not specify any uncertainties. All utilized input data are taken from official inventories, while calculations take into account the factor of calorific value of a fuel as specified by the Ministry of the Economy of the Republic of Slovenia, hence the uncertainties are supposed to be low. For emission factors, the uncertainties are somewhat higher. The emission factors applied are taken from IPCC methodology (and are not a result of measurements in Slovenia).

Table 18: Estimate of Uncertainty of Utilized Data (in %)

Estimate of Uncertainty of Input Data	5%
Estimate of Uncertainty of Calorific Values	5%
Estimate of Uncertainty of Emission Factors	10%

Source: Author's estimate

1.2.11 Lignite and Brown Coal

The calculation of consumption of brown coal and lignite in Slovenia has been done on the basis of data from Table Zb/1. , Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy. For the year 2004 we have obtained data from SORS in electronic format (file nameS: E_10_2004.xls, E_11_2004.xls).

Lignite (CRF) = Lignite (LEG) + Domestic Brown Coal (LEG)

Sub bitumnu coal (CRF) = Imported Brown Coal (LEG)

IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.14 -I.20) suggest a conversion factor from natural units to Joules from 7.8 to 20.0 TJ/1000 t, for former Yugoslavia from 8.9 to 16.7 TJ/1000 t.

LEG reports for individual years specify a calorific value from 9.39 to 10.66 TJ/1000 t for lignite, from 11.25 to 12.76 for domestic brown coal, whereas no factors are specified for imported brown coal. (Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy, Tables Zb/1, Pr/1 and EL/7-0).

Calorific values for domestic coal have been taken from SORS.

For imported brown coal (from America, Russia, Indonesia and the Czech Republic), calorific values have been calculated on the basis of data from main importers.

The imported coal has thus been disaggregated into three consumption segments. Data for the biggest consumer of imported coal, the combined heat and power plant Ljubljana, have been obtained directly from this consumer.

In industry, imported coal is practically used by only one enterprise; consequently, data for the net calorific value (NCV) as reported by that enterprise have been taken into account. For lesser quantities of coal, consumed in general consumption, average net calorific values as reported by the providers to the Statistical Office of the Republic of Slovenia have been considered.

1.2.12 Lignite (CRF)

Table 19: Consumption of Lignite (CRF) and Calculation of Emission of CO₂ from Consumption of Lignite in Slovenia for the Period 1986 to 2005

	1986	1990	2000	2001	2002	2003	2004	2005
Production (Mg)	6790500	5582500	4479500	4818000	4663038	4829513	4809058	4539555
Import (Mg)	160400	20300	0	0	0	0	804	0
Purchase (Mg)	780600	210200	0	0	0	0	0	0
Import + Purchase (Mg)	941000	230500	0	0	0	0	0	0
Export (Mg)	167800	66400	0	700	900	0	0	0
Stock Change (Mg)	-15400	-308700	-33805	78607	-369042	71433	1616	15600
Consumption (Mg)	7579100	6055300	4513304,9	4738693	5031180	4758080	4808246	4523955
Factor MJ/kg	10,00	10,53	10,36	10,71	10,47	10,32	10,502	10,502
Consumption (TJ)	75781	63751	46779	50755	52672	49081	50494	47509
Emission Factor (t C/TJ)	29.29	28.71	27.90	28.86	28.59	28.45	28.45	28.45
Emission (Gg C)	2220	1830	1305	1465	1506	1397	1437	1352
Oxidised Fraction	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Emission (Gg CO ₂)	2175.4	1793.6	1279	1436	1476	1369	1408	1352
Conversion of C to CO ₂	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Emission (Gg CO ₂)	7977	6577	4690	5265	5412	5019	5162	4857

Data Source: Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-1996, Ljubljana: Ministry of the Economy, Table Zb/1

Source of Emission Factors: National emission factors for domestic lignite for the period 1986-2003, Elektroinštitut Milan Vidmar, 2004

All factors for Lignite (CRF) totals have been calculated on the basis of the weighted arithmetic mean for Lignite (LEG) and Imported brown coal (LEG).

Basic sources do not specify any uncertainties. All utilized input data are taken from official inventories, while calculations take into account the factor of calorific value of a fuel as specified by the Ministry of the Economy of the Republic of Slovenia, hence the uncertainties are supposed to be low.

Table 20: Estimate of Uncertainty of Utilized Data (in %)

Estimate of Uncertainty of Input Data	5%
Estimate of Uncertainty of Calorific Values	5%
Estimate of Uncertainty of Emission Factors	10%

Source: Author's estimate

1.2.13 Sub bituminous coal

Table 21: Consumption Sub bituminous coal and Calculation of Emission of CO₂ from Sub bituminous coal in Slovenia for the Period 1986 to 2005

	1986	1990	2000	2001	2002	2003	2004	2005
Production (Mg)	0	0	0	0	0	0	0	0
Import (Mg)			455000	437900	534100	514152	583882	543596
Purchase (Mg)			0	0	0	0	0	0
Import + Purchase (Mg)			455000	437900	534100	514152	583882	543596
Export (Mg)	0	0	0	0	0	10757	49026	0
Stock Change (Mg)	0	0	31952	-48824	-16900	-42617	0	-19492
Consumption (Mg)			423048	486723	551000	546012	534856	562998
Factor MJ/kg			19.06	19.15	18.51	18.587	18.676	20.48
Consumption (TJ)			8064	9322	10197	10149	9989	11530
Emission Factor (t C/TJ)			27.6	27.6	27.6	27.6	27.6	27.6
Emission (Gg C)			223	257	281	280	276	318
Oxidised Fraction			0.98	0.98	0.98	0.98	0.98	0.98
Emission (Gg C)			218.1	252.2	275.8	274.5	270.2	318
Conversion of C to CO ₂			3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Emission (Gg CO ₂)			800	925	1011	1007	991	1144

Data Source: Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-1996, Ljubljana: Ministry of the Economy, Table Zb/1

Source of Emission Factors: Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p.1.13

Basic sources do not specify any uncertainties. All utilized input data are taken from official inventories, while calculations take into account the factor of calorific value of a fuel as specified by the Ministry of the Economy of the Republic of Slovenia, hence the uncertainties are supposed to be low.

Table 22: Estimate of Uncertainty of Utilized Data (in %)

Estimate of Uncertainty of Input Data	5%
Estimate of Uncertainty of Calorific Values	5%
Estimate of Uncertainty of Emission Factors	10%

Source: Author's estimate

1.2.14 Coke

The calculation of the consumption of coke in Slovenia was done on the basis of data from Table Pr/1, Statistični letopis energetskega gospodarstva republike Slovenije 1986-1996, Ljubljana: Ministry of the Economy. This chapter takes into account the total consumed quantities of coke: both those consumed in production processes as well as those consumed in power generation.

In IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.14 -I.20) the suggested conversion factors from natural units to Joules range from 20.8 to 30.1 TJ/1000 t, for former Yugoslavia 26.9 TJ/1000 t. LEG reports specify for all those years a conversion factor of 29.3 TJ/1000 t (Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy, Table Zb/1). Since the conversion factor is specified on the basis of measurements, the calculations take into account the factor of the Ministry of the Economy. For the year 2004 we have obtained data from SORS in electronic format (file name E_10_2004.xls).

Table 23: Consumption of Coke and Calculation of Emission of CO₂ from Consumption of Coke in Slovenia for the Period 1986 to 2005

	1986	1990	2000	2001	2002	2003	2004	2005
	ton	ton	ton	ton	ton	ton	ton	ton
Production (Mg)	0	0	0	0	0			
Import (Mg)	6700	0	48095	81700	85200	57012	59600	56465
Purchase (Mg)	218700	67600	0	0	0			
Import + Purchase (Mg)	225400	67600	48095	81700	85200	57012	59600	56465
Export (Mg)	0	0	0	0	0	0	0	0
Stock Change (Mg)	1600	-2000	1000	-3600	-100	-3973	-21	-2482
Consumption (Mg)	223800	69600	47095	85300	85300	60985	59621	58947
Factor MJ/kg	29.3	29.3	29.31	29.31	29.31	29.31	29.31	29.31
Consumption (TJ)	6557	2039	1380	2500	2500	1787	1747	1728
Emission Factor (t C/TJ)	29.5	29.5	29.5	29.5	29.5	29.5	29.5	29.5
Emission (Gg C)	193	60	41	74	74	53	52	51
Oxidised Fraction	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Emission (Gg C)	189.6	59.0	39.9	72.3	72.3	51.7	51.5	51
Conversion of C to CO ₂	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Emission (Gg CO ₂)	695	216	146	265	265	189	185	183

Data Source: Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-1996, Ljubljana: Ministry of the Economy, Table Pr/1

Source of Emission Factors: Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p.1.13

Emission of CO₂ has been calculated on the basis of the formula and factors from IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.13., I. 30)

Basic sources do not specify any uncertainties. All utilized input data are taken from official inventories, whilst calorific values are in the majority of cases the results of measurements. For the consumption of coke, the major problem is the consumption of petroleum coke, which in some inventories is accounted for while in others it is not. Consequently, the uncertainty is higher than for other solid fuels. The emission factors applied have been taken from IPCC methodology (and are not a result of measurements in Slovenia).

Table 24: Estimate of Uncertainty of Utilized Data (in %)

Estimate of Uncertainty of Input Data	10%
Estimate of Uncertainty of Calorific Values	5%
Estimate of Uncertainty of Emission Factors	10%

Source: Author's estimate

1.2.15 Anthracite

The calculation of the consumption of anthracite in Slovenia has been done on the basis of data from Table Pr/1, Statistični letopis energetskega gospodarstva republike Slovenije 1986-1996, Ljubljana: Ministry of the Economy. This chapter takes into account the total consumed quantities of anthracite: both those consumed in production processes, as well as those consumed in power generation.

In IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.14 -I.20) the suggested conversion factors from natural units to Joules range from 20.8 to 30.1 TJ/1000 t, for former Yugoslavia 26.9 TJ/1000 t. Emission factors specified in LEG range from 29.3 to 31.9 TJ/1000 t (Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy, Table Zb/1). Based on measurements, the emission factor of the Ministry of the Economy has been taken into account in calculations. For the year 2004 we have obtained data from SORS in electronic format (file name E_10_2004.xls).

Emission of CO₂ has been calculated on the basis of the formula and factors from IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.13., I. 30)

Table 25: Consumption of Anthracite and Calculation of Emission of CO₂ from Consumption of Anthracite in Slovenia for the Period of 1986 to 2005

	1986	1990	2000	2001	2002	2003	2004	2005
	ton	ton	ton	ton	ton	ton	ton	ton
Production (Mg)	0	0	0	0	0	0	0	0
Import (Mg)	45000	20800	0	0	0	0	0	0
Purchase (Mg)	0	1200	0	0	0	0	0	0
Import + Purchase (Mg)	45000	22000	0	0	0	0	0	0
Export (Mg)	0	0	-0,1	-0,1	-0,1	-0,1	0	0
Stock Change (Mg)	-9500	-9200	0	0	0	0	0	0
Consumption (Mg)	54500	31200	0,1	0,1	0,1	0,1	0	0
	38428	19721						
	16072	11479	0,1	0,1	0,1	0,1	0	0
Factor MJ/kg	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3
Consumption – Total (TJ)	1594	913	0	0	0	0	0	0
Emission Factor (t C/TJ)	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
Emission (Gg C)	43	24	0	0	0	0	0	0
Oxidised Fraction	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Emission (Gg C)	41.9	24.0	0.0	0.0	0.0	0.0	0.0	0.0
Conversion of C to CO ₂	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Emission (Gg CO ₂)	154	88	0	0	0	0	0	0

Data Source: Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-1996, Ljubljana: Ministry of the Economy, Table Pr/1
Source of Emission Factors: Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p.1.13

Basic sources do not specify any uncertainties. All utilized input data are taken from official inventories, while calculations take into account the factor of calorific value of a fuel as specified by the Ministry of the Economy of the Republic of Slovenia, hence the uncertainties are supposed to be low. For emission factors, the uncertainties are somewhat higher. The emission factors applied are taken from IPCC methodology (and are not a result of measurements in Slovenia).

Table 26: Estimate of Uncertainty of Utilized Data (in %)

Estimate of Uncertainty of Input Data	5%
Estimate of Uncertainty of Calorific Values	5%
Estimate of Uncertainty of Emission Factors	10%

Source: Author's estimate

1.2.16 Natural Gas

The calculation of the consumption of natural gas in Slovenia has been done on the basis of data from Table Z/1, Statistični letopis energetskega gospodarstva republike Slovenije 1986-2003, Ljubljana: Ministry of the Economy. For the year 2004 we have obtained data from SORS in electronic format (file name E_9_2004.xls).

Table 27: Consumption of Natural Gas and Calculation of Emission of CO₂ from Consumption of Natural Gas in Slovenia for the Period of 1986 to 2004

	1986	1990	2000	2001	2002	2003	2004	2005
	ton	ton	ton	ton	ton	ton	ton	ton
Production (kSm ³)	7371	24800	6000	6100	5600	4919	5040	4335
Import (kSm ³)	824211	880100	1007000	1037400	994900	1108876	1099000	1137093
Purchase (kSm ³)	0	8300	0	0	0	0	0	0
Import + Purchase (kSm ³)	824211	888400	1007000	1037400	994900	1108876	1099000	1137093
Export (kSm ³)	0	0	0	0	0	0	0	0
Stock Change (kSm ³)	0	-23900	0	0	0	0	0	0
Consumption (kSm ³)	831582	937100	1013000	1043500	1000500	1113795	1104040	1141428
Factor MJ/Sm ³	33.5	34.10	34.08	34.08	34.08	34.08	34.08	34.08
Consumption (TJ)	27858	31955	34523	35562	34097	37958	37626	38900
Emission Factor (t C/TJ)	15.074	15.074	15.074	15.074	15.074	15.074	15.070	15.070
Emission (Gg C)	420	482	520	536	514	572	497	586
Oxidised Fraction	0.995	0.995	0.995	0.995	0.995	0.995	0.995	0.995
Emission (Gg C)	417.8	479.3	517.8	533.4	511.4	569.3	494	571
Conversion of C to CO ₂	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Emission (Gg CO ₂)	1532	1758	1899	1956	1875	2088	1813	2084

Data Source: Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-1996, Ljubljana: Ministry of the Economy, Table Zb/1
Source of Emission Factors: Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p.1.13

IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996) have required from the very

beginning inventories to be compiled in Joules and therefore suggested no conversion factors from natural units to Joules. The factors of calorific value specified in LEG range from 33.5 to 34.1 TJ/1000 t (Ministry of the Economy: Statistični letopis energetskega gospodarstva republike Slovenije 1986-2002, Ljubljana: Ministry of the Economy, Table Zb/1). Based on measurements, the emission factor of the Ministry of the Economy has been taken into account in calculations.

Emission of CO₂ has been calculated on the basis of the formula from IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.13., I. 30). Emission factors have been taken from the documents of the Institute of Energy Industries (Gasperič M., Dornik M.: Določitev emisijskega faktorja CO₂ pri energetski izrabi ter emisijskega faktorja CH₄ pri transportu in distribuciji zemeljskega plina, Ljubljana: Institute of Energy Industries, 1998).

Basic sources do not specify any uncertainties. All utilized input data are taken from official inventories, while calculations take into account the factor of calorific value of a fuel as specified by the Ministry of the Economy of the Republic of Slovenia, hence the uncertainties are supposed to be low. For emission factors, the uncertainty is low since they are the result of measurements in Slovenia.

Table 28: Estimate of Uncertainty of Utilized Data (in %)

Estimate of Uncertainty of Input Data	5%
Estimate of Uncertainty of Calorific Values	5%
Estimate of Uncertainty of Emission Factors	5%

Source: Author's estimate

1.2.17 Gas Works Gas and Mixed Gas

Production and consumption of gas works gas and mixed gas in Slovenia is reported here for the period 1986 to 1993 (Tables Pg/1, Statistični letopis energetskega gospodarstva republike Slovenije 1986-1996, Ljubljana: Ministry of the Economy; Letopisi energetskega gospodarstva 1986-1996). After 1994 there was no consumption of gas works gas and mixed gas in Slovenia.

All consumed quantities of gas works gas and mixed gas in Slovenia was produced in Slovenia (and belong to the group of secondary fuels), therefore they do not contribute to total emissions of CO₂ according to IPCC methodology. In IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996) there is no suggested special category of fuels for gas works gas and mixed gas.

Consequently, the reference approach will not present quantities of gas works gas and mixed gas that are consumed in Slovenia. They will only be taken into account in the sectoral approach in the Consumer Goods category.

1.2.18 Biomass

There are no precise data on the consumption of fuel wood for the monitored period in Slovenia. Various expert estimates for individual areas have been done. Here, data from the following sources have been used:

- For the consumption of biomass in general consumption (residential and commercial/institutional): Gasperič M., Dornik M.: Disagregacija porabe goriv na komercialno institucionalni sektor in gospodinjstva, Ljubljana: Institute of Energy Industries, 1998;
- For the consumption of biomass in industry for the period 1986-1999: Simončič P., Kobler A., Robek R., Žgajnar L.: Ocena emisij oz. ponora TGP za gozdarstvo ter spremembe rabe zemljišč, Slovenian Forestry Institute, Ljubljana 1999 and Statistical office of the Republic of Slovenia (JQ Renewables) from 1999 on.
- For the consumption of biomass in power cogeneration plants: Statistični letopis energetskega gospodarstva republike Slovenije 1986-1996, Ljubljana: Ministry of the Economy; Letopisi energetskega gospodarstva 1986-1999 (Tables Dt/1-0). and Statistical office of the Republic of Slovenia (JQ Renewables) from 1999 on.
- Desegregation and total consumption of biomass for year 2000-2004, Statistical office of the Republic of Slovenia - JQ Renewables

Table 29: Consumption of Biomass in Slovenia for the Period of 1986 to 2005

	1986	1990	2000	2001	2002	2003	2004	2005
Power Heat Plants (Mg)	13000	13000	26869	26048	24651	25801	35320	IE
Industry (Mg)	414000	287000	347000	267954	293509	388907	257355	282741
Residential (Mg)	1115283	1115283	1115283	1115283	1115283	1115283	1107985	1245611
Commercial/Institutional (Mg)	182000	182000	182000	6327	5752	2301	2286	IE
Total Wood Consumption (Mg)	1724283	1597283	1671153	1415612	1439195	1532293	1402946	1532399

Table 30: Consumption of Biomass and Calculation of Emission of CO₂ from Consumption of Biomass in Slovenia for the Period 1986 to 2005

	1986	1990	2000	2001	2002	2003	2004	2005
	ton	ton	ton	ton	ton	ton	ton	ton
Production (Mg)	1724283	1597283	1671153	1415612	1439195	1532293	1402946	1532399
Import (Mg)	0	0	0	0	0	0	0	0
Purchase (Mg)	0	0	0	0	0	0	0	0
Import + Purchase (Mg)	0	0	0	0	0	0	0	0
Export (Mg)	0	0	0	0	0	0	0	0
Stock Change (Mg)	0	0	0	0	0	0	0	0
Consumption (Mg)	1724283	1597283	1671153	1415612	1439195	1532293	1402946	1532399
Factor MJ/kg	12.2	12.2	12.2	12.2	12.2	12.2	12.2	12.2
Consumption (TJ)	20985	19439	20338	17228	17515	18648	16644	18649
Emission Factor (t C/TJ)	26.8	26.8	26.8	26.8	26.8	26.8	26.8	26.8
Emission (Gg C)	562	521	545	462	469	500	446	500
Oxidised Fraction	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Emission (Gg CO ₂)	551.1	510.5	534.2	452.5	460.0	489.8	437.1	500
Conversion of C to CO ₂	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Emission (Gg CO ₂)	2021	1872	1959	1659	1687	1796	1603	1796

Data Source:

Gasperič M., Dornik M.: Disagregacija porabe goriv na komercialno institucionalni sektor in gospodinjstva, Ljubljana: Institute of Energy Industries, 1998,
Simončič P., Kobler A., Robek R., Žgajnar L.: Ocena emisij oz. ponora TGP za gozdarstvo ter spremembe rabe zemljišč, Slovenian Forestry Institute, Ljubljana 1999,

Statistični letopis energetskega gospodarstva republike Slovenije 1986-1996, Ljubljana: Ministry of the Economy; Letopisi energetskega gospodarstva 1986-1996 (Tables Dt/1-0) Statistical office of the Republic of Slovenia – IEA Renewables Questionnaire/Woodweg

IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996) suggest no conversion factors from natural units to Joules. Sources of data for the consumption of biomass specify emission factors for different type of fuel wood from 9 to 18 MJ/kg of wood. In this report, the emission factor of 12.17 MJ/kg of dry matter has been applied, calculated as the weighted arithmetic mean of the consumption of various types of biomass in Slovenia for 1994, taken from the following source: Žgajnar L., Bitenc B.: Nekateri pomembnejši kazalci rabe lesa v slovenski energetiki, in Biomasa - vir energije za Slovenijo (anthology of papers from a symposium), Ministry of the Economy, Ministry of Agriculture and Forestry, Ministry of the Environment and Physical Planning, Brdo pri Kranju 1996.

There are no comparable data on the import and export of biomass in Slovenia in the monitored period. Therefore, it is assumed in this report that there was no import or export of biomass in the period in question.

Emission of CO₂ has been calculated on the basis of the formula and factors from IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.13., I. 30)

Source of emission factors: Žgajnar L., Bitenc B.: Nekateri pomembnejši kazalci rabe Lesa v slovenski energetiki, in Biomasa - vir energije za Slovenijo (anthology of papers from a symposium), Ministry of the Economy, Ministry of Agriculture and Forestry, Ministry of the Environment and Physical Planning, Brdo pri Kranju 1996.

Source of Emission Factors: Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p.1.13

Basic sources do not specify any uncertainties. Utilized input data are the result of estimates and this author's calculation, consequently, the uncertainty is relatively high.

Table 31: Estimate of Uncertainty of Utilized Data (in %)

Estimate of Uncertainty of Input Data	30%
Estimate of Uncertainty of Calorific Values	20%
Estimate of Uncertainty of Emission Factors	10%

Source: Author's estimate

1.2.19 Estimate of Stored Carbon

Minor quantities of fuels are used as raw materials for the production of certain non-energy products. The carbon stored in these products is not emitted right away, but in a longer time. Consequently, the quantities of carbon stored in such products are supposed to be subtracted from the total emitted quantities calculated in previous items. In Slovenia, data on the consumption of fuels for the production of non-energy feedstocks is available only for some products.

Products or raw materials, which are consumed in their production, will be included in calculations, in cases when there are data on the basis of which it is possible to estimate these quantities.

1.2.20 Natural Gas

No data on the amount of natural gas consumed for the production of various products (particularly methanol) in which the carbon is stored, are available. An utmost conservative presumption would be that these are all the quantities of natural gas which have been consumed in the sector of production of basic chemicals and which are reported in publications of the Statistical Office of the Republic of Slovenia as consumption of natural gas as a feedstock (and not for the consumption in power cogeneration plants, public heat plants or thermal power plants).

The problem of adequate inventories occurs particularly for the consumption of Nafta Lendava. Nafta Lendava reports its consumption of natural gas partly in the production of refined petroleum products sector and partly in production of basic chemicals sector. Data on the consumption of natural gas in that factory differ greatly for different sources. As the fundamental source (according to this author's and the expert group's estimates) the Statistical Office of the Republic of Slovenia has been chosen since by definition the category of consumption of natural gas as a feedstock is closest to the category which is required by IPCC for the consumption of products with stored carbon. (Source: Statistical Office of the Republic of Slovenia: Annual Industry Survey (research results), Ljubljana: Statistical Office of the Republic of Slovenia, 1986-2004).

Emission of CO₂ has been calculated on the basis of the formula and factors from IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.13., I. 30)

CO₂ stored in products has been calculated on the basis of the formula from IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.28., I. 23, I.13).

Table 32: Consumption of Natural Gas as a Raw Material and Stored Carbon for the Period 1986 – 2005.

	1986	1990	2000	2001	2002	2003	2004	2005
Consumption (kSm ³)	67666	69524	136740	146069	125528	154302	136356	164407
Factor (MJ/Sm ³)	33.50	34.10	34.08	34.08	34.08	34.08	34.08	34.08
Consumption (TJ)	2266.81	2371	4660	4978	4278	5259	4647	5290
Emission Factor (t C/TJ)	15.075	15.075	15.075	15.075	15.075	15.075	15.075	15.075
Emission (Gg C)	34	36	70	75	64	79	70	80
Fraction of Carbon Stored	1	1	1	1	1	1	1	1
Stored carbon (Gg C)	34	36	70	75	64	79	70	80
Conversion of C to CO ₂	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Stored CO ₂ (Gg CO ₂)	125.3	131.0	257.6	275.2	236.5	290.7	256.9	292.4
Source of AD	LPI-86, str.372	LPI-90, str.192	LEG Tg/6-3	LEG Tg/6-3	LEG Tg/6-3	LEG Tg/6-3	SORS	SORS

Table 33: Estimate of Uncertainty of Utilized Data (in %)

Estimate of Uncertainty of Input Data	20%
Estimate of Uncertainty of Calorific Values	5%
Estimate of Uncertainty of Emission Factors	5%

Source: Author's estimate

1.2.21 Lubricants

In the chapter on the consumption of lubricants (Chapter 1.7) only the quantities, which have been imported, should be specified, since emissions of other quantities have been already accounted for in the processing of crude oil. Data on import and export of lubricants in Slovenia are not available in satisfactory quality. Consequently, those quantities are not specified in the chapter on the consumption of lubricants. Therefore, it is not necessary to specify all quantities of lubricants consumed in Slovenia in this chapter, but on the contrary, only those quantities that are both produced and consumed in Slovenia. With regard to the fact that the quantities, which are produced in Slovenia, are relatively small, it is considered that lubricants are not being exported from Slovenia.

Therefore, as the consumption of lubricants which are produced (and the emissions of which are taken into account in the emissions from the production or processing of crude oil) and consumed in Slovenia, those quantities of engine oils and lubricants have been specified, which have been produced in the Production of Oil Products sector (Source: Statistical Office of the Republic of Slovenia: Annual Industry Survey (research results), Ljubljana: Statistical Office of the Republic of Slovenia, 1986-2004).

Stored CO₂ has been calculated on the basis of the formula from IPCC guidelines (Intergovernmental Panel on Climate Change: Greenhouse Gas Inventory - Reference manual, UNEP-OECD-IEA-IPCC, Bracknell 1996, p. I.28., I. 23, I.13).

Table 34: Consumption of Engine Oils and Other Lubricating Oils and Stored Carbon for the Period 1986 - 2005

	1986	1990	2000	2001	2002	2003	2004	2005
Consumption (tonnes)	6592	7201	9805	9701	9363	12636	28623	27870
Factor TJ/1000 tonnes	40.2	40.2	40.2	40.2	40.2	40.2	40.2	40.2
Consumption (TJ)	265	289	394	390	376	508	1151	1120
Emission Factor (t C/TJ)	20	20	20	20	20	20	20	20
Emission (Gg C)	5	6	8	8	8	10	22	22
Fraction of Carbon Stored	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Stored Carbon (Gg C)	2.65	2.89	3.94	3.90	3.76	5.08	11.20	11.20
Conversion of C to CO ₂	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667	3.6667
Stored CO ₂ (Gg)	9.7	10.6	14.5	14.3	13.8	18.6	41.2	41.1
Source 1:	LPI-86, str.190	LPI-90, str.74	SORS	SORS	SORS	SORS	SORS	SORS
Source 2:	IPCC, str. I.13, I.23	IPCC, str. I.13, I.23	IPCC, str. I.13, I.23	IPCC, str. I.13, I.23	IPCC, str. I.13, I.23	IPCC, str. I.13, I.23	IPCC, str. I.13, I.23	IPCC, str. I.13, I.23

Table 35: Estimate of Uncertainty of Utilized Data (in %)

Estimate of Uncertainty of Input Data	20%
Estimate of Uncertainty of Calorific Values	5%
Estimate of Uncertainty of Emission Factors	5%

Source: Author's estimate