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I.1 EMISSIONS INVENTORY FOR THE METROPOLITAN REGION II-1

APPENDIX I : GHG and Primary Pollutants Emissions data for Chile

Table I 1 : Summary by emission sectors. Emissions for the BAU scenario, year 2000.

	CO2 equiv (Gg)	CO2 (Gg)	CH4 (Gg)	N20 (Gg)	CO (Gg)	SO2 (Gg)	Nox (Gg)	COVNM (Gg)
Energy Industry	**14551.47**	**13204.90**	**62.543**	**0.107**	**6.232**	**25.414**	**38.193**	**8.677**
Electricity generation	10,357.51	10,318.00	0.67	0.08	4.27	6.27	28.46	0.68
Oil production and transformation	1,714.06	1,695.00	0.57	0.02	1.54	19.14	6.53	7.90
Natural gas production and transform	2,339.56	1,191.90	54.62	0.00	0.43	0.00	3.20	0.10
Solid fuel production and transformat	140.34	0.00	6.68	0.00	0.00	0.00	0.00	0.00
Process Industry	**13,812.18**	**13,691.20**	**2.72**	**0.21**	**49.84**	**53.85**	**60.24**	**4.60**
Agriculture/Silviculture/Fishing	752.72	740.59	0.43	0.01	2.67	3.25	0.90	0.28
Copper Industry	2,574.96	2,556.73	0.13	0.05	10.21	7.21	29.89	2.38
Cement Industry	691.92	691.29	0.03	0.00	0.98	1.76	0.60	0.03
Steel Industry	1,422.04	1,417.05	0.09	0.01	1.23	0.78	2.75	0.17
Iron Industry	287.72	285.75	0.02	0.01	0.32	2.09	0.87	0.05
Pulp and Paper Industry	436.79	409.33	1.16	0.01	1.56	2.07	2.14	0.13
Petroquimic Industry	1.09	1.09	0.00	0.00	0.00	0.01	0.00	0.00
Sugar Industry	357.32	356.69	0.03	0.00	0.49	3.21	1.04	0.06
Saltpeter Industry	269.36	268.84	0.01	0.00	0.06	0.77	0.57	0.01
Other industries and Mining sources	7,018.26	6,963.84	0.82	0.12	32.32	32.70	21.48	1.49
Transport	**23,648.50**	**22,312.40**	**3.10**	**4.10**	**449.10**	**10.40**	**148.10**	**83.50**
Road Transport	20,059.90	18,728.00	2.90	4.10	441.60	6.20	96.80	81.70
Marine Transport	1,882.30	1,878.10	0.20	0.00	4.40	3.70	43.60	1.30
Air Transport	1,658.80	1,658.80	0.00	0.00	2.70	0.50	6.60	0.40
Railroads	47.50	47.50	0.00	0.00	0.40	0.00	1.10	0.10
Commercial/Inst. y Residential	**5,739.64**	**5,181.96**	**21.98**	**0.31**	**352.08**	**23.46**	**14.12**	**42.33**
Residential Urban	3,980.26	3,760.62	8.54	0.13	133.74	7.88	7.86	16.13
Residential Rural	506.65	181.16	12.99	0.17	216.01	12.43	4.60	25.92
Commercial	1,039.51	1,027.59	0.42	0.01	2.26	2.83	1.37	0.26
Fiscal and municipal	213.22	212.59	0.03	0.00	0.07	0.32	0.29	0.02
Total	**57,751.79**	**54,390.46**	**90.34**	**4.72**	**857.25**	**113.12**	**260.65**	**139.11**

Table I 2 : Summary by principal emission sectors. Emissions for the BAU scenario, year 2000.

	CO2 equiv (Gg)	CO2 (Gg)	CH4 (Gg)	N20 (Gg)	CO (Gg)	SO2 (Gg)	Nox (Gg)	COVNM (Gg)
Electricity generation	10,357.51	10,318.00	0.67	0.08	4.27	6.27	28.46	0.68
Production and transformation of fuel	4,193.96	2,886.90	61.87	0.03	1.96	19.14	9.73	7.99
Copper Industry	2,574.96	2,556.73	0.13	0.05	10.21	7.21	29.89	2.38
Cement Industry	691.92	691.29	0.03	0.00	0.98	1.76	0.60	0.03
Steel Industry	1,422.04	1,417.05	0.09	0.01	1.23	0.78	2.75	0.17
Other Industries	9,123.26	9,026.13	2.47	0.15	37.42	44.10	27.00	2.02
Road Transport	20,059.90	18,728.00	2.90	4.10	441.60	6.20	96.80	81.70
OtherTransport	3,588.60	3,584.40	0.20	0.00	7.50	4.20	51.30	1.80
Commercial/Inst. y Residential	5,739.64	5,181.96	21.98	0.31	352.08	23.46	14.12	42.33

CO2 eq emission by principal sectors

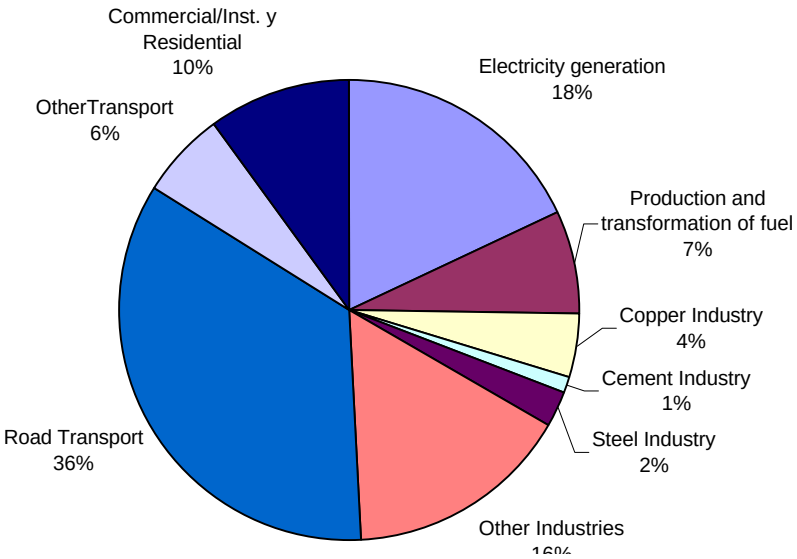


Table I 3 : Summary by principal emission sectors. Emissions for the BAU scenario, year 2005.

	CO2 equiv (Gg)	CO2 (Gg)	CH4 (Gg)	N20 (Gg)	CO (Gg)	SO2 (Gg)	Nox (Gg)	COVNM (Gg)
Electricity generation	8,184.25	8,165.00	0.64	0.02	4.15	0.73	20.32	0.65
Production and transformation of fuel	4,884.25	3,338.90	73.15	0.03	2.37	24.10	11.46	10.04
Copper Industry	2,455.85	2,437.62	0.13	0.05	10.25	3.18	27.74	2.38
Cement Industry	969.10	968.26	0.04	0.00	1.39	3.19	1.06	0.06
Steel Industry	1,868.73	1,860.22	0.11	0.02	1.64	0.86	3.61	0.23
Other Industries	8,944.33	8,828.37	3.16	0.16	41.14	40.27	27.61	2.08
Road Transport	28,522.40	25,827.60	5.80	8.30	468.30	5.20	112.90	77.70
OtherTransport	4,482.70	4,445.40	0.30	0.10	9.00	4.70	57.90	2.10
Commercial/Inst. y Residential	6,885.53	6,374.84	19.89	0.30	318.21	23.14	14.69	38.36

CO2 eq emission by principal sectors

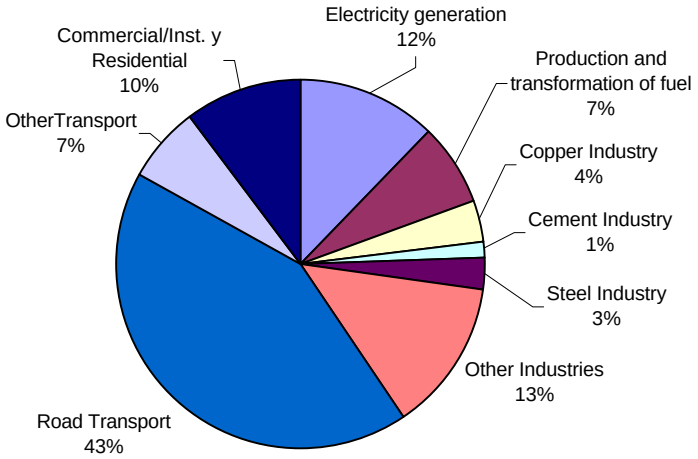


Table I 4 : Summary by principal emission sectors. Emissions for the BAU scenario, year 2010.

	CO2 equiv (Gg)	CO2 (Gg)	CH4 (Gg)	N20 (Gg)	CO (Gg)	SO2 (Gg)	Nox (Gg)	COVNM (Gg)
Electricity generation	10,764.76	10,743.00	0.68	0.02	5.07	0.73	27.25	0.88
Production and transformation of fuel	5,745.98	3,874.90	88.55	0.04	2.85	30.01	13.51	12.49
Copper Industry	2,507.42	2,489.40	0.12	0.05	12.26	1.69	31.58	2.77
Cement Industry	1,222.95	1,218.80	0.05	0.01	1.76	3.92	1.31	0.08
Steel Industry	2,312.54	2,303.40	0.14	0.02	2.06	0.93	4.47	0.28
Other Industries	8,763.99	8,633.95	3.86	0.16	44.87	36.38	27.83	2.13
Road Transport	38,615.00	34,170.60	9.40	13.70	463.10	6.20	127.40	64.40
OtherTransport	5,385.90	5,348.60	0.30	0.10	10.70	5.30	64.20	2.40
Commercial/Inst. y Residential	7,970.70	7,509.94	17.66	0.29	280.46	19.15	14.32	33.78

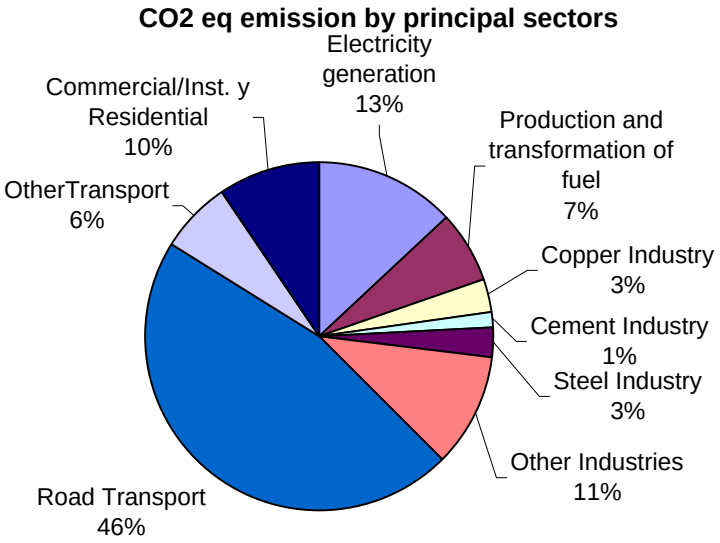


Table I 5 : Summary by principal emission sectors. Emissions for the BAU scenario, year 2015.

	CO2 equiv (Gg)	CO2 (Gg)	CH4 (Gg)	N20 (Gg)	CO (Gg)	SO2 (Gg)	Nox (Gg)	COVNM (Gg)
Electricity generation	10,262.68	10,242.00	0.65	0.02	4.91	0.71	25.99	0.84
Production and transformation of fuel	6,220.92	4,300.90	90.79	0.04	3.23	34.68	15.14	14.42
Copper Industry	3,027.09	3,005.34	0.15	0.06	13.87	3.44	37.16	3.16
Cement Industry	1,439.33	1,434.97	0.06	0.01	2.07	3.72	1.28	0.07
Steel Industry	2,756.34	2,746.57	0.17	0.02	2.47	1.00	5.33	0.34
Other Industries	8,569.60	8,424.66	4.54	0.16	48.54	32.42	28.22	1.18
Road Transport	45,517.40	40,299.10	12.30	16.00	539.90	7.20	146.90	74.30
OtherTransport	6,752.50	6,715.20	0.30	0.10	13.20	6.30	76.30	2.80
Commercial/Inst. y Residential	8,755.88	8,346.89	15.49	0.27	240.79	19.75	15.30	29.01

CO2 eq emission by principal sectors

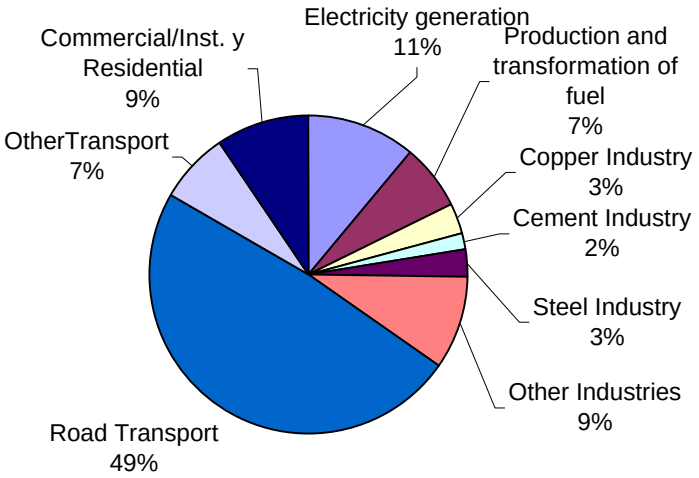


Table I 6 : Summary by principal emission sectors. Emissions for the BAU scenario, year 2020.

	CO2 equiv (Gg)	CO2 (Gg)	CH4 (Gg)	N20 (Gg)	CO (Gg)	SO2 (Gg)	Nox (Gg)	COVNM (Gg)
Electricity generation	10,956.26	10,935.00	0.66	0.02	5.16	0.71	27.85	0.91
Production and transformation of fuel	6,773.33	4,743.90	95.91	0.05	3.62	39.52	16.83	16.42
Copper Industry	3,380.62	3,355.35	0.17	0.07	15.66	3.60	42.93	3.59
Cement Industry	1,609.75	1,608.70	0.05	0.00	2.29	2.39	0.91	0.05
Steel Industry	3,203.25	3,189.75	0.20	0.03	2.89	1.07	6.18	0.39
Other Industries	8,379.36	8,217.25	5.21	0.17	52.16	28.35	28.59	2.21
Road Transport	52,359.50	46,394.10	15.40	18.20	611.30	8.10	167.10	83.50
OtherTransport	8,185.20	8,145.80	0.40	0.10	15.90	7.30	88.40	3.30
Commercial/Inst. y Residential	9,862.77	9,534.34	13.13	0.17	198.94	18.02	15.76	23.99

CO2 eq emission by principal sectors

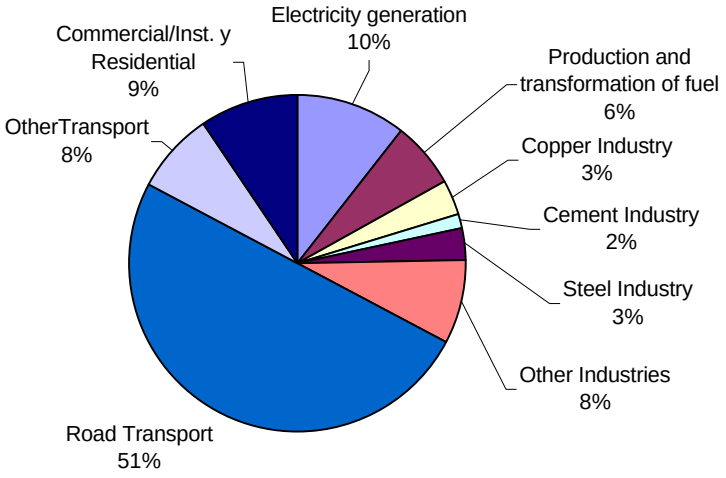


Table I 7 : Summary by principal emission sectors. Emissions for the CP scenario, year 2000.

	CO2 equiv (Gg)	CO2 (Gg)	CH4 (Gg)	N20 (Gg)	CO (Gg)	SO2 (Gg)	Nox (Gg)	COVNM (Gg)
Electricity generation	10,198.85	10,160.00	0.67	0.08	4.24	6.08	27.95	0.68
Production and transformation of fuel	4,194.84	2,886.90	61.91	0.03	1.96	19.14	9.73	8.01
Copper Industry	2,574.96	2,556.73	0.13	0.05	10.25	7.21	29.89	2.38
Cement Industry	691.92	691.29	0.03	0.00	0.98	1.76	0.60	0.03
Steel Industry	1,422.04	1,417.05	0.09	0.01	1.23	0.78	2.75	0.17
Other Industries	9,121.40	9,026.13	2.47	0.14	37.42	44.10	27.00	2.02
Road Transport	20,059.90	18,728.00	2.90	4.10	441.60	6.20	96.80	81.70
OtherTransport	3,588.60	3,584.40	0.20	0.00	7.50	4.20	51.30	1.80
Commercial/Inst. y Residential	5,734.20	5,181.72	21.88	0.30	351.63	22.05	13.31	42.23

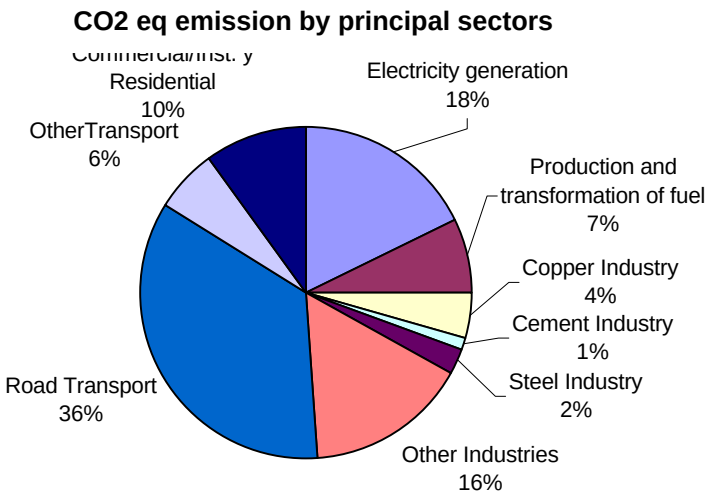


Table I 8 : Summary by principal emission sectors. Emissions for the CP scenario, year 2005.

	CO2 equiv (Gg)	CO2 (Gg)	CH4 (Gg)	N20 (Gg)	CO (Gg)	SO2 (Gg)	Nox (Gg)	COVNM (Gg)
Electricity generation	8,098.20	8,079.00	0.63	0.02	4.12	0.73	20.09	0.65
Production and transformation of fuel	4,812.79	3,282.90	72.41	0.03	2.32	23.47	11.25	9.79
Copper Industry	2,404.29	2,386.27	0.12	0.05	10.72	3.14	27.18	2.41
Cement Industry	969.10	968.26	0.04	0.00	1.39	3.19	1.06	0.06
Steel Industry	1,679.59	1,674.39	0.10	0.01	1.48	0.75	3.25	0.20
Other Industries	8,503.20	8,398.27	2.93	0.14	38.55	37.70	25.96	1.95
Road Transport	27,829.60	25,201.00	5.60	8.10	460.30	5.10	110.20	76.50
OtherTransport	4,482.70	4,445.40	0.30	0.10	9.00	4.70	57.90	2.10
Commercial/Inst. y Residential	6,072.48	5,561.37	19.91	0.30	318.22	22.20	15.12	38.32

CO2 eq emission by principal sectors

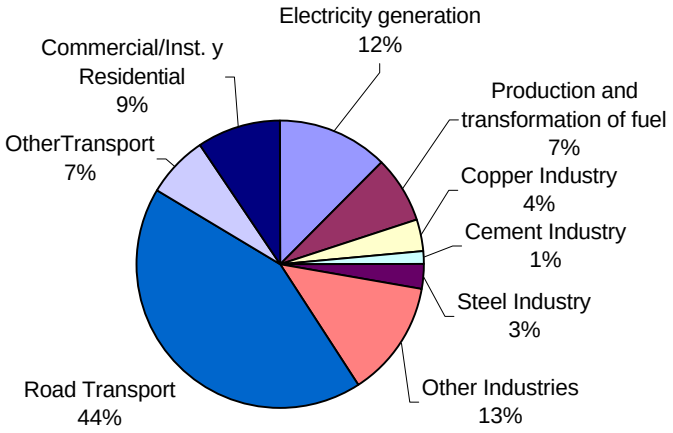


Table I 9 : Summary by principal emission sectors. Emissions for the CP scenario, year 2010.

	CO2 equiv (Gg)	CO2 (Gg)	CH4 (Gg)	N20 (Gg)	CO (Gg)	SO2 (Gg)	Nox (Gg)	COVNM (Gg)
Electricity generation	10,109.05	10,089.00	0.62	0.02	4.87	0.70	25.66	0.83
Production and transformation of fuel	5,555.84	3,719.90	86.91	0.04	2.70	28.26	12.91	11.77
Copper Industry	2,597.33	2,579.10	0.13	0.05	11.73	3.22	30.65	2.65
Cement Industry	1,222.95	1,218.80	0.05	0.01	1.76	3.92	1.31	0.08
Steel Industry	1,941.46	1,932.74	0.12	0.02	1.73	0.74	3.75	0.24
Other Industries	7,895.84	7,784.14	3.40	0.13	39.87	31.70	24.96	1.90
Road Transport	36,204.00	32,022.30	8.70	12.90	436.60	5.80	118.20	60.50
OtherTransport	5,416.70	5,379.40	0.30	0.10	10.70	5.50	65.00	2.40
Commercial/Inst. y Residential	6,925.58	6,468.08	17.80	0.27	280.77	20.96	15.19	33.81

CO2 eq emission by principal sectors

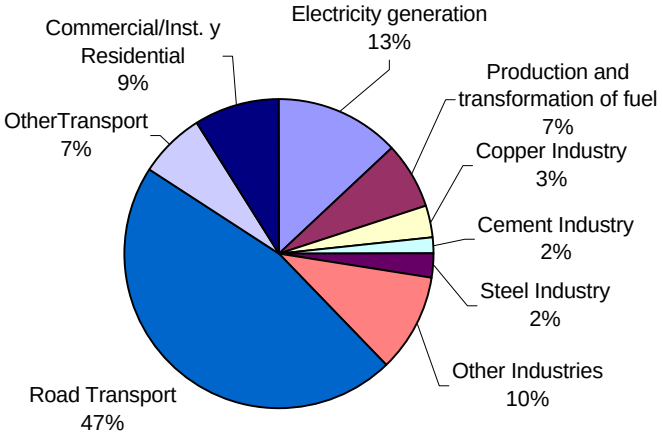


Table I 10 : Summary by principal emission sectors. Emissions for the CP scenario, year 2015.

	CO2 equiv (Gg)	CO2 (Gg)	CH4 (Gg)	N20 (Gg)	CO (Gg)	SO2 (Gg)	Nox (Gg)	COVNM (Gg)
Electricity generation	8,820.69	8,802.00	0.58	0.02	4.42	0.69	22.24	0.72
Production and transformation of fuel	5,849.33	4,008.90	87.06	0.04	2.96	31.38	14.01	13.06
Copper Industry	2,815.15	2,793.61	0.14	0.06	12.86	3.30	34.48	2.93
Cement Industry	1,439.33	1,434.97	0.06	0.01	2.07	3.72	1.28	0.07
Steel Industry	2,200.22	2,191.08	0.14	0.02	1.98	0.73	4.25	0.27
Other Industries	7,291.63	7,166.75	3.88	0.14	41.12	25.63	23.95	1.84
Road Transport	40,712.40	36,011.10	11.30	14.40	484.90	6.40	130.50	66.60
OtherTransport	6,803.40	6,766.10	0.30	0.10	13.30	6.70	77.50	2.80
Commercial/Inst. y Residential	7,432.98	7,037.02	15.46	0.23	240.73	18.56	15.04	29.02

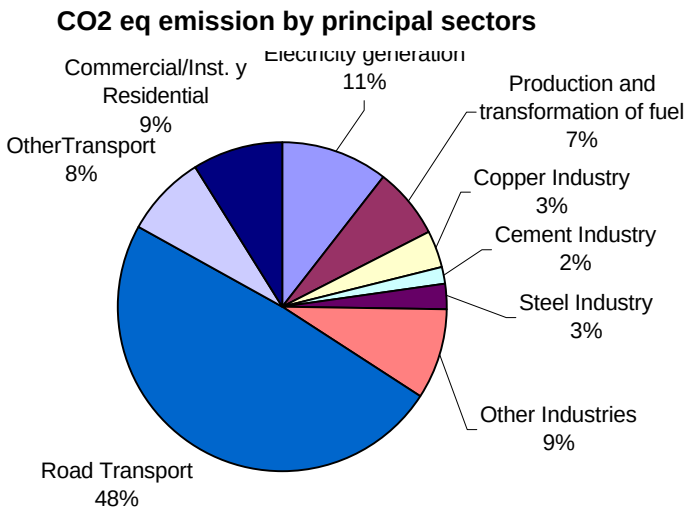
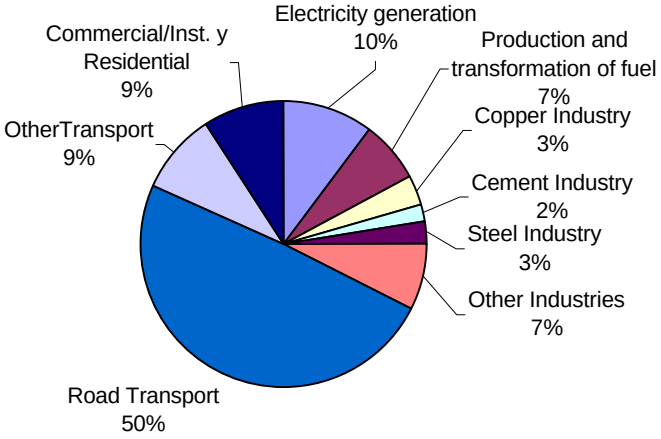


Table I 11 : Summary by principal emission sectors. Emissions for the CP scenario, year 2020.

	CO2 equiv (Gg)	CO2 (Gg)	CH4 (Gg)	N20 (Gg)	CO (Gg)	SO2 (Gg)	Nox (Gg)	COVNM (Gg)
Electricity generation	9,341.90	9,323.00	0.59	0.02	4.60	0.69	23.64	0.77
Production and transformation of fuel	6,215.79	4,283.90	91.36	0.04	3.20	34.32	15.06	14.28
Copper Industry	3,056.05	3,031.20	0.15	0.07	14.10	3.39	38.68	3.23
Cement Industry	1,609.75	1,608.70	0.05		2.29	2.39	0.91	0.05
Steel Industry	2,458.77	2,449.42	0.15	0.02	2.22	0.73	4.75	0.30
Other Industries	6,668.22	6,536.37	4.33	0.13	42.32	19.84	23.08	1.80
Road Transport	44,558.00	39,459.00	14.00	15.50	522.30	6.80	142.20	71.10
OtherTransport	8,258.70	8,219.30	0.40	0.10	16.00	7.90	90.10	3.30
Commercial/Inst. y Residential	8,208.78	7,869.84	13.04	0.21	198.80	16.64	15.22	23.99

CO2 eq emission by principal sectors



Appendix II Emission and Concentration Data in Santiago

I.1 Emissions inventory for the Metropolitan Region

Table II 1: 1997 Emission inventory for Santiago

Source Type	Source name	PM10 Ton/yr	CO Ton/yr	NOx Ton/yr	COV Ton/yr	SO2 Ton/yr
Stationary Sources	Industrial Processes	1467	1222	5391	65	7827
	Industrial Boilers	1486	2791	5075	165	8735
	Heating Boilers	190	241	418	9	427
	Bakeries	33	49	75	1	49
	TOTAL STATIONARY SOURCES	**3175**	**4303**	**10959**	**241**	**17037**
Other Sources	Residential combustion (1)	1359	5134	1567	3543	975
	Evaporative emissions (2)				14076	
	Domestic solvents				1316	
	Fuel distribution (3)				4959	
	Biogenic emissions			218	8722	
	Forest fires	1467	9083	140	873	
	Biomass burning	65	410	1	74	
	TOTAL OF OTHER SOURCES	**2891**	**14627**	**1926**	**33563**	**975**
Mobile Sources	Cars	225	113123	9478	13575	277
	Light duty vehicles	326	62810	5292	7560	411
	Taxis	54	25628	1947	2971	111
	Trucks	953	18859	8727	2759	1348
	Buses	1173	4854	5490	1322	1010
	Motorcycles		718	9	229	
	TOTAL MOBILE SOURCES	**2730**	**225992**	**30943**	**28417**	**3157**
	SUBTOTAL	**8798**	**244921**	**43828**	**62221**	**21169**
Resuspended Street dust	Paved Roads	28524				
	Unpaved Roads	4462				
	TOTAL Resuspended Particles	**32986**				
	TOTAL	**41784**	**244921**	**43828**	**62221**	**21169**

Source: (CENMA 1997, in Spanish)

(1) Includes emissions from residential combustion of wood, kerosene, LPG and synthetic gas.

(2) Includes dry cleaning stores, painting booths and painting of houses and buildings.

(3) Includes evaporative losses from large storage tanks, storage and selling in gas stations.

Table II 2: Summary of model parameters for equation (4)

		STATION A RESULTS				STATION B RESULTS				STATION C RESULTS				STATION D RESULTS			
	COEFFICIENTS:	**Value**	**Std. Error**	**t value**	**Pr (>|t|)**	**Value**	**Std. Error**	**t value**	**Pr (>|t|)**	**Value**	**Std. Error**	**t value**	**Pr (>|t|)**	**Value**	**Std. Error**	**t value**	**Pr (>|t|)**
PM10	Intercept	46.95	7.07	6.64	0	40.0	9.1	4.4	0	37.46	5.83	6.43	0	54.64	10.09	5.41	0
	SO2AV (b)	627.89	164.54	3.82	0.0002	552.7	131.4	4.2	0	1314.9	132.86	9.90	0	1521.9	243.72	6.24	0
	COAV (a)	10.25	1.29	7.96	0	10.0	0.9	11.2	0	19.57	1.46	13.39	0	7.78	1.22	6.39	0
	VMEDM1 (<1/u>)	11.89	2.80	4.25	0	27.2	9.1	3.0	0.0029	10.32	3.92	2.63	0.0087	9.23	2.95	3.13	0.002
	PREVM1 (<p><1/u>)	-2.06	0.42	-4.96	0	-2.3	0.9	-2.5	0.0122	-1.44	0.34	-4.25	0	-1.15	0.51	-2.27	0.0244
	Degrees of Freedom	314.00				331.0				478.00				199.00			
	Residual Standard Error	40.05				38.6				37.77				48.20			
	Múltiple R^2	0.57				0.5				0.58				0.60			
FINE	Intercept	28.79	5.40	5.33	0	29.8	7.5	4.0	0.0001	17.76	4.40	4.03	0.0001	29.68	7.73	3.84	0.0002
	SO2AV (b)	378.74	125.66	3.01	0.0028	602.1	107.9	5.6	0	1102.0	100.40	10.98	0	1327.3	186.74	7.11	0
	COAV (a)	7.46	0.98	7.59	0	5.7	0.7	7.8	0	10.19	1.10	9.23	0	5.86	0.93	6.27	0
	VMEDM1 (<1/u>)	6.87	2.14	3.22	0.0014	19.7	7.4	2.6	0.0087	10.83	2.96	3.66	0.0003	6.21	2.26	2.75	0.0065
	PREVM1 (<p><1/u>)	-1.11	0.32	-3.50	0.0005	-1.3	0.8	-1.7	0.0831	-0.70	0.26	-2.75	0.0063	-0.70	0.39	-1.81	0.0725
	Degrees of Freedom	324.00				331.0				473.00				199.00			
	Residual Standard Error	30.58				31.7				28.54				36.93			
	Múltiple R^2	0.49				0.4				0.51				0.60			
COARSE	Intercept	18.16	2.98	6.09	0	10.2	4.1	2.5	0.0129	19.70	2.58	7.64	0	24.96	4.10	6.09	0
	SO2AV (b)	249.15	69.37	3.59	0.0004	-49.4	58.7	-0.8	0.4	212.9	58.81	3.62	0.0003	194.6	98.90	1.97	0.0505
	COAV (a)	2.79	0.54	5.13	0	4.3	0.4	10.8	0	9.38	0.65	14.50	0	1.92	0.49	3.89	0.0001
	VMEDM1 (<1/u>)	5.02	1.18	4.25	0	7.6	4.1	1.9	0.0619	-0.51	1.74	-0.29	0.7703	3.02	1.20	2.52	0.0125
	PREVM1 (<p><1/u>)	-0.95	0.18	-5.41	0	-1.0	0.4	-2.4	0.0149	-0.74	0.15	-4.92	0	-0.45	0.21	-2.18	0.0305
	Degrees of Freedom	314.00				331.0				473.00				199.00			
	Residual Standard Error	16.88				17.3				16.72				19.56			
	Múltiple R^2	0.46				0.4				0.49				0.32			