

Module **2003 Energy (New Zealand)**
Submodule **CO₂ emissions from energy sources (reference approach)**
Worksheet **1.1 (1-3 of 5)**
Sheet **Emissions from domestic fuel combustion**

Fuel type		Production	Imports	Exports	Inter- national bunkers	Stock change	Apparent consump- tion	Conversion factor (TJ/unit)	Apparent consump- tion (TJ)	Carbon emis fact (t C/TJ)	Carbon content (t C)	Carbon content (Gg)	Carbon stored (Gg)	Net C emissions (Gg)	Fraction of carbon oxidised	Actual C emissions (Gg)	Actual CO ₂ emissions (Gg)
Liquid fossil fuels - primary	Crude oil	49.19	217.66	41.85		5.47	219.52	1,000	219,524.64	17.80	3,907,538.60	3,907.54		3,907.54	0.99	3,868.46	14,184.37
	Orimulsion	0.00	0.00	0.00		0.00	0.00										
	Natural gas liquids	9.60	0.54	1.24		0.38	8.52	1,000	8,523.36	16.47	140,402.98	140.40		140.40	0.99	139.00	509.66
Liquid fossil fuels - secondary	Gasoline - Regular Unleaded		27.50	0.00	0.00	-0.86	28.36	1,000	28,356.89	18.05	511,970.75	511.97		511.97	0.99	506.85	1,858.45
	Gasoline - Premium Unleaded		8.97	0.62	0.00	-2.49	10.83	1,000	10,834.17	18.27	197,969.92	197.97		197.97	0.99	195.99	718.63
	Jet kerosene		8.30	0.00	33.08	-0.93	-23.85	1,000	-23,851.22	18.57	-442,982.13	-442.98		-442.98	0.99	-438.55	-1,608.03
	Av Gas		0.60	0.00	0.00	-0.14	0.74	1,000	744.20	17.73	13,192.64	13.19		13.19	0.99	13.06	47.89
	Other kerosene		0.00	0.00	0.00	0.00	0.00										
	Shale oil		0.00	0.00	0.00	0.00	0.00										
	Gas/diesel oil		15.26	0.30	2.27	-2.70	15.40	1,000	15,396.89	18.95	291,841.07	291.84		291.84	0.99	288.92	1,059.38
	Residual fuel oil		1.17	1.85	8.77	2.83	-12.28	1,000	-12,275.72	19.91	-244,398.45	-244.40		-244.40	0.99	-241.95	-887.17
	LPG		0.00	0.00		0.00	0.00										
	Ethane		0.00	0.00		0.00	0.00										
	Naphtha		0.00	0.00		0.00	0.00										
	Bitumen		6.57	0.00	0.00	0.59	5.98	1,000	5,979.99	20.76	124,144.60	124.14	243.72	-119.57	0.99	-118.38	-434.04
	Lubricants		0.00	0.00	0.00	0.00	0.00										
	Petroleum coke		0.00	0.00		0.00	0.00										
	Refinery feedstocks		17.48	0.00		-1.09	18.57	1,000	18,565.74	17.80	330,470.16	330.47		330.47	0.99	327.17	1,199.61
	Other oil		0.00	0.00		0.00	0.00										
Total liquid fossil fuels		58.80	304.06	45.87	44.11	1.08	271.80		271,798.95		4,830,150.14	4,830.15	243.72	4,586.43		4,540.57	16,648.76
Solid fossil fuels - primary	Anthracite	0	0	0		0	0										
	Coking coal	2249738	0	2210066		39672	0	0.0321	0.00	24.22	0.00	0.00	0.00	0.00	0.98	0.00	0.00
	Other bituminous coal	101283	92253	0	0	0	193536	0.0321	6,212.50	24.22	150,455.55	150.46		150.46	0.98	147.45	540.64
	Sub-bituminous coal	2576555	329436	0	0	0	2905991	0.0226	65,675.41	24.87	1,633,526.46	1,633.53	448.66	1,184.87	0.98	1,161.17	4,257.64
	Lignite	252336	25	0		0	252361	0.015	3,785.42	25.96	98,283.21	98.28		98.28	0.98	96.32	353.16
	Peat	0	0	0		0	0										
Solid fossil fuels - secondary	BKB & patent fuel		0	0		0	0										
	Coke		5225	0		0	5225	0.0279	145.79	27.90	4,067.46	4.07		4.07	0.98	3.99	14.62
Total solid fossil fuels		5179912	426940	2210066	0	39672	3357114		75,819.11		1,886,332.68	1,886.33	448.66	1,437.68		1,408.92	5,166.05
Total gaseous fossil fuels		179	0	0		0	179	1,000	179,274.61	15.83	2,837,550.31	2,837.55	468.69	2,368.86	0.995	2,357.02	8,642.39
Total fossil fuels									526,892.67		9,554,033.13	9,554.03	1,161.06	8,392.97		8,306.51	30,457.20
Total biomass fuels									35,645.00		1,011,124.34	1,011.12		1,011.12		962.53	3,529.29
	Solid biomass	34.06					34.06	1,000	34,059.00	28.41	967,445.90	967.45		967.45	0.95	919.07	3,369.94
	Liquid biomass								ne								ne
	Gas biomass	1.59					1.59	1,000	1,586.00	27.54	43,678.44	43.68		43.68	0.995	43.46	159.35

Liquid and gaseous fossil fuel data are shown initially in petajoules. Solid fossil fuel data are shown initially in tonnes.

Module 2003 Energy (New Zealand)
Submodule CO₂ emissions from energy sources (reference approach)
Worksheet 1.1 (4-5 of 5)
Sheet Emissions from international bunkers

Fuel type		Quantities delivered	Conversion factor (TJ/unit)	Quantities delivered (TJ)	Carbon emis fact (t C/TJ)	Carbon content (t C)	Carbon content (Gg)	Fraction of carbon stored	Carbon stored (Gg)	Net C emissions (Gg)	Fraction of carbon oxidised	Actual C emissions (Gg)	Actual CO ₂ emissions (Gg)	
Solid fossil fuels	Other bituminous coal	0.00											no	
	Sub-bituminous coal	0.00											no	
Liquid fossil fuels	Gasoline	0.00												
	Jet kerosene	33.08	1,000	33,079.93	18.57	614,384.53	614.38	0.00	0.00	614.38	0.99	608.24	2,230.22	
	Gas/diesel oil	2.27	1,000	2,266.31	18.95	42,956.83	42.96	0.00	0.00	42.96	0.99	42.53	155.93	
	Residual fuel oil	8.77	1,000	8,765.54	19.91	174,513.85	174.51	0.00	0.00	174.51	0.99	172.77	633.49	
	Lubricants	0.00												no
	Bitumen	0.00	1,000	0.00	20.76	0.00	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.00
Total fossil fuels				44,111.77								823.54	3,019.63	

Liquid fossil fuel data are shown initially in petajoules.

Module 2003 Energy (New Zealand)
Submodule CO₂ emissions from energy sources (reference approach)
Worksheet 1.1 (supplemental)
Sheet Estimating the carbon stored in products

Fuel type	Estimated fuel quantities	Conversion factor (TJ/unit)	Estimated quantities (TJ)	Carbon emis fact (t C/TJ)	Carbon content (t C)	Carbon content (Gg)	Fraction of carbon stored	Carbon stored (Gg)
Naphtha	0.00							no
Lubricants	0.00							no
Bitumen	11.74	1,000	11739.69	20.76	243715.86	243.72	1	243.72
Coal oils and tars	0.00	0.0325	0.00	24.24	0.00	0.00	0.75	0.00
Coal ¹	17.56	1,000	17556.77	25.55	448655.30	448.66	1	448.66
Natural gas ²	conf	1,000	conf	conf	conf	conf	conf	468.69
Gas/diesel oil	0.00							no
LPG	0.00							no
Ethane	0.00							no
Other fuels	0.00							no
Total								1161.06

All data are shown initially in petajoules, except coal oils and tars, which is shown in tonnes.

- 1 Refers to coal used in the production of iron and steel. This carbon is emitted but is reported in the industrial processes sector.
- 2 Refers to gas used in the production of methanol, synthetic petrol and urea. Some natural gas data are confidential.

Source and sink categories	Energy consumption (TJ)	Carbon emis fact (t C/TJ)	Carbon content (t C)	Carbon content (Gg)	Fraction of carbon stored ¹	Carbon stored ¹ (t C)	Net C emissions (Gg)	Fraction of carbon oxidised	Actual C emissions (Gg)	Actual CO ₂ emissions (Gg)
Total energy (parts I and II of worksheet)²	452,091.86		8,427,515.84	8,427.52			8,427.52		8,339.86	30,579.47
Total Liquid Fuels	246,390.28		4,566,560.87	4,566.56			4,566.56	0.99	4,520.90	16,576.62
Total Coal	61,610.41		1,512,604.77	1,512.60			1,512.60	0.98	1,482.35	5,435.29
Total Gaseous Fuels	144,091.17		2,348,350.20	2,348.35			2,348.35	0.995	2,336.61	8,567.56
1 Energy industries²	121,091.77		2,090,137.48	2,090.14			2,090.14		2,067.71	7,581.60
a Public electricity and heat	100,730.63		1,759,687.70	1,759.69			1,759.69	9	1,739.19	6,377.05
Total Liquid Fuels	32.68		617.93	0.62			0.62	7	0.61	2.24
Motor gasoline Regular	1.64	18.05	29.66	0.03			0.03	0.99	0.03	0.11
Motor gasoline Premium	0.00	18.27	0.00	0.00			0.00	0.99	0.00	0.00
Diesel	31.04	18.95	588.28	0.59			0.59	0.99	0.58	2.14
Heavy Fuel oil	0.00	20.05	0.00	0.00			0.00	0.99	0.00	0.00
Light Fuel oil	0.00	19.64	0.00	0.00			0.00	0.99	0.00	0.00
Jet Kerosene	0.00	18.57	0.00	0.00			0.00	0.99	0.00	0.00
Av Gas	0.00	17.73	0.00	0.00			0.00	0.99	0.00	0.00
Coal	32,063.00	24.31	779,454.35	779.45			779.45	0.98	763.87	2,800.84
Natural gas	68,634.95	14.27	979,615.41	979.62			979.62	0.995	974.72	3,573.96
Biogas (memo item) ³	922.06	28.41	26,191.14	26.19			26.19	0.995	26.06	95.55
b Petroleum refining	14,001.98		236,443.09	236.44			236.44	4	234.98	861.58
Total Liquid Fuels	2,777.79		56,740.36	56.74			56.74	2	56.17	205.97
Fuel oil	651.61	19.33	12,596.18	12.60			12.60	0.99	12.47	45.72
Asphalt	2,126.18	20.76	44,144.18	44.14			44.14	0.99	43.70	160.24
Total Natural Gas	11,224.19		179,702.73	179.70			179.70	2	178.80	655.62
Refinery gas	11,152.70	16.02	178,638.00	178.64			178.64	0.995	177.74	651.73
Natural gas	71.50	14.89	1,064.73	1.06			1.06	0.995	1.06	3.88
c Solid fuels and other energy	6,359.17		94,006.70	94.01			94.01	2	93.54	342.97
Total Natural Gas	6,359.17		94,006.70	94.01			94.01	2	93.54	342.97
Natural gas in synthetic petrol production	0.00	na	0.00	0.00			0.00	0.995	0.00	0.00
Natural gas in oil and gas extraction	6,359.17	14.78	94,006.70	94.01			94.01	0.995	93.54	342.97

Module **2003 Energy (New Zealand)**
 Sub-module **CO₂ emissions from fuel combustion by source categories (tier 1)**
 Worksheets **1.2 (part II)**

Source and sink categories	Energy consumption (TJ)	Carbon emis fact (t C/TJ)	Carbon content (t C)	Carbon content (Gg)	Fraction of carbon stored ¹	Carbon stored ¹ (t C)	Net C emissions (Gg)	Fraction of carbon oxidised	Actual C emissions (Gg)	Actual CO ₂ emissions (Gg)
2 Manufacturing and construction²	73,112.98		1,610,766.15	1,610.77			1,610.77	1	1,592.78	5,840.19
a Iron and Steel	2,491.15		35,513.94	35.51			35.51		35.34	129.57
Natural gas	2,491.15	14.26	35,513.94	35.51			35.51	0.995	35.34	129.57
c Chemicals (methanol production)	conf	conf	271,466.78	271.47			271.47	1	270.11	990.40
Natural gas in methanol production ⁴	conf	conf	271,466.78	271.47			271.47	0.995	270.11	990.40
f Other	70,621.83		1,303,785.43	1,303.79			1,303.79		1,287.33	4,720.22
Total Liquid Fuels	11,051.43		203,446.67	203.45			203.45		201.41	738.51
Petrol Regular	81.80	18.05	1,476.84	1.48			1.48	0.99	1.46	5.36
Petrol Premium	57.21	18.27	1,045.32	1.05			1.05	0.99	1.03	3.79
Diesel	6,686.41	18.95	126,737.89	126.74			126.74	0.99	125.47	460.06
Heavy Fuel oil	313.31	20.05	6,280.45	6.28			6.28	0.99	6.22	22.80
Light Fuel oil	964.34	19.64	18,936.08	18.94			18.94	0.99	18.75	68.74
Jet Kerosene	183.78	18.57	3,413.25	3.41			3.41	0.99	3.38	12.39
Av Gas	13.20	17.73	233.94	0.23			0.23	0.99	0.23	0.85
LPG	2,751.39	16.47	45,322.89	45.32			45.32	0.99	44.87	164.52
Other liquid	0.00	19.88	0.00	0.00			0.00	0.99	0.00	0.00
Coal	23,977.48	24.79	594,404.14	594.40			594.40	0.98	582.52	2,135.89
Total Natural Gas	35,592.92		505,934.62	505.93			505.93	2	503.40	1,845.82
Autoproduction	16,913.83	14.17	239,644.57	239.64			239.64	0.995	238.45	874.30
Other natural gas	18,679.09	14.26	266,290.05	266.29			266.29	0.995	264.96	971.51
Total Biomass	31,187.20		885,447.32	885.45			885.45	2	885.38	3,246.39
Wood (memo item) ³	30,695.78	28.41	871,913.56	871.91			871.91	1	871.91	3,197.02
Biogas - Autoproduction (memo item) ³	491.42	27.54	13,533.76	13.53			13.53	0.995	13.47	49.38

Module **2003 Energy (New Zealand)**
Sub-module **CO₂ emissions from fuel combustion by source categories (tier 1)**
Worksheets **1.2 (part III)**

Source and sink categories	Energy Consumption (TJ)	Carbon emis fact (t C/TJ)	Carbon content (t C)	Carbon content (Gg)	Fraction of carbon stored ¹	Carbon stored ¹ (t C)	Net C emissions (Gg)	Fraction of carbon oxidised	Actual C emissions (Gg)	Actual CO ₂ emissions (Gg)
3 Transport	205,553.09		3,798,369.87	3,798.37			3,798.37	11	3,760.40	13,788.13
a Civil aviation	17,208.24		319,100.10	319.10			319.10	2	315.91	1,158.33
Jet Kerosene	16,612.31	18.57	308,535.84	308.54			308.54	0.99	305.45	1,119.99
Av Gas	595.93	17.73	10,564.26	10.56			10.56	0.99	10.46	38.35
b Road transport	180,816.62		3,331,851.48	3,331.85			3,331.85	5	3,298.55	12,094.67
Total Liquid Fuels	180,634.62		3,329,256.88	3,329.26			3,329.26		3,295.96	12,085.20
Petrol Regular	83,987.81	18.05	1,516,361.65	1,516.36			1,516.36	0.99	1,501.20	5,504.39
Petrol Premium	23,829.44	18.27	435,428.84	435.43			435.43	0.99	431.07	1,580.61
Diesel	71,707.75	18.95	1,359,187.89	1,359.19			1,359.19	0.99	1,345.60	4,933.85
LPG	1,109.62	16.47	18,278.49	18.28			18.28	0.99	18.10	66.35
CNG	182.00	14.26	2,594.60	2.59			2.59	0.995	2.58	9.47
c Rail transport (diesel)	2,386.35	18.95	45,232.15	45.23			45.23	0.99	44.78	164.19
d National navigation (fuel oil and diesel)	5,141.89		102,186.13	102.19			102.19	3	101.16	370.94
Diesel	0.00	18.95	0.00	0.00			0.00	0.99	0.00	0.00
Heavy Fuel oil	2,977.84	20.05	59,692.14	59.69			59.69	0.99	59.10	216.68
Light Fuel oil	2,164.05	19.64	42,493.99	42.49			42.49	0.99	42.07	154.25
Marine bunkers (memo item)³	11,031.84		218,458.12	218.46			218.46		216.27	793.00
Diesel	2,266.31	18.95	42,956.83	42.96			42.96	0.99	42.53	155.93
Heavy Fuel oil	8,257.46	20.05	165,524.52	165.52			165.52	0.99	163.87	600.85
Light Fuel oil	508.08	19.64	9,976.78	9.98			9.98	0.99	9.88	36.22
Aviation bunkers (memo item)³	33,079.93	0.00	614,384.53	614.38			614.38	1	608.24	2,230.22
Av Fuels	33,079.93	18.57	614,384.53	614.38			614.38	0.99	608.24	2,230.22

Module **2003 Energy (New Zealand)**
Sub-module **CO₂ emissions from fuel combustion by source categories (tier 1)**
Worksheets **1.2 (part IV)**

Source and sink categories	Energy Consumption (TJ)	Carbon emis fact (t C/TJ)	Carbon content (t C)	Carbon content (Gg)	Fraction of carbon stored ¹	Carbon stored ¹ (t C)	Net C emissions (Gg)	Fraction of carbon oxidised	Actual C emissions (Gg)	Actual CO ₂ emissions (Gg)
4 Other sectors	52,334.02		928,242.34	928.24			928.24		918.97	3,369.56
a Commercial/institutional	22,118.70		382,032.09	382.03			382.03	10	378.08	1,386.30
Total Liquid Fuels	5,203.98		96,771.42	96.77			96.77	8	95.80	351.28
Petrol Regular	77.90	18.05	1,406.52	1.41			1.41	0.99	1.39	5.11
Petrol Premium	14.44	18.27	263.92	0.26			0.26	0.99	0.26	0.96
Diesel	2,270.81	18.95	43,042.25	43.04			43.04	0.99	42.61	156.24
Heavy Fuel oil	777.75	20.05	15,590.29	15.59			15.59	0.99	15.43	56.59
Light Fuel oil	370.17	19.64	7,268.87	7.27			7.27	0.99	7.20	26.39
Jet Kerosene	614.96	18.57	11,421.52	11.42			11.42	0.99	11.31	41.46
Av Gas	17.17	17.73	304.38	0.30			0.30	0.99	0.30	1.10
LPG	1,060.76	16.47	17,473.67	17.47			17.47	0.99	17.30	63.43
Coal	4,178.93	24.81	103,698.58	103.70			103.70	0.98	101.62	372.62
Natural gas	12,735.79	14.26	181,562.10	181.56			181.56	0.995	180.65	662.40
Biogas (memo item) ³	171.20	27.54	4,714.94	4.71			4.71	0.995	4.69	17.20
b Residential	9,629.54		150,946.04	150.95			150.95	10	149.71	548.95
Total Liquid Fuels	1,923.81		31,705.72	31.71			31.71	8	31.39	115.09
Petrol Regular	3.33	18.05	60.16	0.06			0.06	0.99	0.06	0.22
Petrol Premium	0.00	18.27	0.00	0.00			0.00	0.99	0.00	0.00
Diesel	3.63	18.95	68.85	0.07			0.07	0.99	0.07	0.25
Heavy Fuel oil	0.00	20.05	0.00	0.00			0.00	0.99	0.00	0.00
Light Fuel oil	0.00	19.64	0.00	0.00			0.00	0.99	0.00	0.00
Jet Kerosene	0.23	18.57	4.31	0.00			0.00	0.99	0.00	0.02
Av Gas	0.43	17.73	7.55	0.01			0.01	0.99	0.01	0.03
LPG	1,916.19	16.47	31,564.86	31.56			31.56	0.99	31.25	114.58
Coal	834.73	25.50	21,286.99	21.29			21.29	0.98	20.86	76.49
Natural gas	6,871.00	14.26	97,953.33	97.95			97.95	0.995	97.46	357.37
Wood (memo item) ³	2,560.69	28.41	72,736.26	72.74			72.74	1	72.74	266.70
c Agriculture/forestry/fishing	20,585.78		395,264.21	395.26			395.26	8	391.17	1,434.30
Total Liquid Fuels	20,029.50		381,503.50	381.50			381.50	7	377.69	1,384.86
Petrol Regular	1,058.41	18.05	19,109.15	19.11			19.11	0.99	18.92	69.37
Petrol Premium	174.07	18.27	3,180.80	3.18			3.18	0.99	3.15	11.55
Diesel	15,140.16	18.95	286,974.76	286.97			286.97	0.99	284.11	1,041.72
Heavy Fuel oil	1,630.45	20.05	32,683.12	32.68			32.68	0.99	32.36	118.64
Light Fuel oil	1,834.06	19.64	36,014.35	36.01			36.01	0.99	35.65	130.73
Jet Kerosene	155.55	18.57	2,888.97	2.89			2.89	0.99	2.86	10.49
Av Gas	36.80	17.73	652.35	0.65			0.65	0.99	0.65	2.37
Coal	556.27	24.74	13,760.71	13.76			13.76	0.98	13.49	49.45

Sheets 1-16 of worksheet 1-2 have been combined. Only New Zealand relevant source and sink categories have been included.

1 Energy containing carbon which is later stored is not included in the energy consumption reported here.

2 Does not include energy use for methanol production.

3 Data are included only as memo items and do not contribute to the data totals

4 Natural gas consumption data for methanol production is confidential.

Module **2003 Energy (New Zealand)**
Submodule **CO₂ from fuel combustion by source category (tier 1)**
Worksheet **1.2 overview (totals)**

	Total liquid fossil TJ	Total solid fossil	Total gaseous fossil ¹	Total biomass fuels ²	Total all fuels
Total energy consumption	246,390	61,610	144,091	34,841	452,092
Energy industries	2,810	32,063	86,218	922	121,092
Manufacturing industries and construction	11,051	23,977	38,084	31,187	73,113
Transport	17,208				17,208
Civil aviation					
Road	180,635		182	no	180,817
Railways	2,386	ne			2,386
Navigation	5,142	ne			5,142
Other sectors	5,204	4,179	12,736	171	22,119
Commercial/institutional					
Residential	1,924	835	6,871	2,561	9,630
Ag/forest/fish	20,030	556	ne	ne	20,586
International marine bunkers (memo item)	11,032	ne			11,032
International aviation bunkers (memo item)	33,080				33,080
Total CO₂ emissions	16,577	5,435	8,568	3,626	30,579
Energy industries	208	2,801	4,573	96	7,582
Manufacturing industries and construction	739	2,136	2,966	3,246	5,840
Transport	1,158				1,158
Civil aviation					
Road	12,085		9	no	12,095
Railways	164	ne			164
Navigation	371	ne			371
Other sectors	351	373	662	17	1,386
Commercial/institutional					
Residential	115	76	357	267	549
Ag/forest/fish	1,385	49	ne	ne	1,434
International marine bunkers (memo item)	793	ne			793
International aviation bunkers (memo item)	2,230				2,230

1 The figures for 'Manufacturing industries and construction' and total gaseous fuels do not include gas used for methanol production, which is confidential.

2 Emissions from biomass (wood and biogas) are included as memo items only and are not included in totals.

Module **2003 Energy (New Zealand)**
Submodule **Non-CO₂ emissions from fuel combustion by source categories (tier 1)**
Worksheets **1.3 (part I)**

Source and sink categories	Energy consumption (TJ)	CH ₄	N ₂ O	NO _x	CO	NMVOC	CH ₄	N ₂ O	NO _x	CO	NMVOC
		Emission Factor (t CH ₄ /TJ)	Emission Factor (t N ₂ O/TJ)	Emission Factor (t NO _x /TJ)	Emission Factor (t CO/TJ)	Emission Factor (t NMVOC/TJ)	Emissions t CH ₄	Emissions t N ₂ O	Emissions t NO _x	Emissions t CO	Emissions t NMVOC
Total energy (parts I and II of worksheet)¹	486,933.33						4417.11	807.84	163142.01	585051.06	112383.70
1 Energy industries	122,013.83						241.84	58.61	29615.35	2580.99	557.78
a Public electricity and heat	101,652.69						210.93	56.22	25209.10	2260.76	465.46
Total Liquid Fuels	32.68						0.03	0.01	6.83	0.50	0.16
Distillate	32.68	0.00086	0.00038	0.20900	0.01520	0.00475	0.03	0.01	6.83	0.50	0.16
Residual	0.00	0.00086	0.00029	0.19000	0.01400	0.00475	0.00	0.00	0.00	0.00	0.00
Coal	32,063.00	0.00067	0.00150	0.36100	0.00860	0.00475	21.48	48.09	11574.74	275.74	152.30
Natural Gas	68,634.95	0.00275	0.00009	0.19800	0.02880	0.00450	188.40	6.18	13589.72	1976.69	308.86
Bio Gas	922.06	0.00110	0.00210	0.04100	0.00850	0.00450	1.01	1.94	37.80	7.84	4.15
b Petroleum refining	14,001.98						22.65	1.82	2975.44	218.48	63.70
Oil	2,777.79	0.00290	0.00029	0.16200	0.01400	0.00475	8.06	0.81	450.00	38.89	13.19
Gas	11,224.19						14.59	1.01	2525.44	179.59	50.51
Natural Gas	71.50	0.00130	0.00009	0.22500	0.01600	0.00450	0.09	0.01	16.09	1.14	0.32
Refinery Gas	11,152.70	0.00130	0.00009	0.22500	0.01600	0.00450	14.50	1.00	2509.36	178.44	50.19
c Solid fuels and other energy	6,359.17						8.27	0.57	1430.81	101.75	28.62
Natural Gas in synthetic petrol prodn	0.00	0.00130	0.00009	0.22500	0.01600	0.00450	0.00	0.00	0.00	0.00	0.00
Natural Gas in oil and Gas extraction	6,359.17	0.00130	0.00009	0.22500	0.01600	0.00450	8.27	0.57	1430.81	101.75	28.62
2 Manufacturing and construction¹	104,300.10						555.59	169.54	29306.90	19163.76	2311.88
a Iron and Steel	2,491.15						3.24	0.22	560.51	39.86	11.21
Natural Gas	2,491.15	0.00130	0.00009	0.22500	0.01600	0.00450	3.24	0.22	560.51	39.86	11.21
c Chemicals (methanol production)²	conf						49.74	3.44	8608.88	612.19	172.18
Natural Gas	conf	conf	conf	conf	conf	conf	49.74	3.44	8608.88	612.19	172.18
f Other	101,808.95						502.61	165.87	20137.52	18511.71	2128.49
Total Liquid Fuels	11,051.43						8.46	3.98	785.88	149.16	52.49
Distillate	6,825.42	0.00019	0.00029	0.06200	0.01500	0.00475	1.30	1.98	423.18	102.38	32.42
Residual	1,474.62	0.00290	0.00029	0.16200	0.01400	0.00475	4.28	0.43	238.89	20.64	7.00
LPG	2,751.39	0.00105	0.00057	0.04500	0.00950	0.00475	2.89	1.57	123.81	26.14	13.07
Total Coal	23,977.48						17.59	34.87	9419.95	568.60	455.57
Lime and Cement	5,457.72	0.00095	0.00130	0.50100	0.07500	0.01900	5.18	7.10	2734.32	409.33	103.70
Other	18,519.76	0.00067	0.00150	0.36100	0.00860	0.01900	12.41	27.78	6685.63	159.27	351.88
natural gas	35,592.92	0.00130	0.00009	0.22500	0.01600	0.00450	46.27	3.20	8008.41	569.49	160.17
Total Biomass	31,187.12						430.28	123.81	1923.28	17224.46	1460.26
Wood	30,695.70	0.01400	0.00400	0.06200	0.56100	0.04750	429.74	122.78	1903.13	17220.29	1458.05
Biogas	491.42	0.00110	0.00210	0.04100	0.00850	0.00450	0.54	1.03	20.15	4.18	2.21

Module **2003 Energy (New Zealand)**
Submodule **Non-CO₂ emissions from fuel combustion by source categories (tier 1)**
Worksheets **1.3 (part II)**

Source and sink categories	Energy consumption (TJ)	CH ₄	N ₂ O	NO _x	CO	NM VOC	CH ₄	N ₂ O	NO _x	CO	NM VOC
		Emission Factor (t CH ₄ /TJ)	Emission Factor (t N ₂ O/TJ)	Emission Factor (t NO _x /TJ)	Emission Factor (t CO/TJ)	Emission Factor (t NMVOC/TJ)	Emissions t CH ₄	Emissions t N ₂ O	Emissions t NO _x	Emissions t CO	Emissions t NMVOC
3 Transport	205,553.09						2477.88	470.36	84066.76	521821.88	104209.74
a Civil aviation	17,208.24						32.70	32.70	4749.47	1961.74	292.54
Jet Kerosene	16,612.31	0.00190	0.00190	0.27600	0.11400	0.01700	31.56	31.56	4585.00	1893.80	282.41
Av Gas	595.93	0.00190	0.00190	0.27600	0.11400	0.01700	1.13	1.13	164.48	67.94	10.13
b Road transport	180,816.62						2401.93	419.07	68997.40	518257.82	103421.84
Total Liquid Fuels	180,634.62						2298.73	419.05	68935.16	518139.88	103407.10
Petrol	107,817.24	0.01850	0.00142	0.21000	4.59000	0.88500	1994.62	153.10	22641.62	494881.15	95418.26
Diesel	71,707.75	0.00380	0.00370	0.64000	0.30300	0.10200	272.49	265.32	45892.96	21727.45	7314.19
LPG	1,109.62	0.02850	0.00057	0.36100	1.38000	0.60800	31.62	0.63	400.57	1531.28	674.65
CNG	182.00	0.56700	0.00009	0.34200	0.64800	0.08100	103.19	0.02	62.24	117.94	14.74
c Rail transport (diesel)	2,386.35	0.00380	0.00370	0.64000	0.30300	0.10200	9.07	8.83	1527.26	723.06	243.41
d National navigation (fuel oil and diesel)	5,141.89						34.19	9.77	8792.62	879.26	251.95
Diesel	0.00	0.00665	0.00190	1.71000	0.17100	0.04900	0.00	0.00	0.00	0.00	0.00
Fuel oil	5,141.89	0.00665	0.00190	1.71000	0.17100	0.04900	34.19	9.77	8792.62	879.26	251.95
Aviation bunkers	33,079.93	0.00150	0.00190	0.28000	0.11000	0.01700	49.62	62.85	9262.38	3638.79	562.36
Marine bunkers	11,031.84						77.22	22.06	18864.45	1886.45	540.56
Diesel	2,266.31	0.00700	0.00200	1.71000	0.17100	0.04900	15.86	4.53	3875.39	387.54	111.05
Fuel Oil	8,765.54	0.00700	0.00200	1.71000	0.17100	0.04900	61.36	17.53	14989.07	1498.91	429.51
4 Other sectors	55,066.30						1141.80	109.33	20153.00	41484.44	5304.29
a Commercial/institutional	22,290.30						58.86	34.56	4331.34	974.69	876.80
Total Liquid Fuels	5,203.98						4.96	2.02	505.96	70.98	24.72
Distillate Fuel oil	2,363.16	0.00067	0.00038	0.06200	0.01500	0.00475	1.58	0.90	146.52	35.45	11.23
Residual Fuel oil	1,780.05	0.00130	0.00029	0.16200	0.01400	0.00475	2.31	0.52	288.37	24.92	8.46
LPG	1,060.76	0.00100	0.00057	0.06700	0.01000	0.00475	1.06	0.60	71.07	10.61	5.04
Coal	4,178.93	0.00950	0.00130	0.22800	0.19000	0.19000	39.70	5.43	952.80	794.00	794.00
Natural Gas	12,735.79	0.00110	0.00210	0.22500	0.00850	0.00450	14.01	26.75	2865.55	108.25	57.31
Biogas	171.60	0.00110	0.00210	0.04100	0.00850	0.00450	0.19	0.36	7.04	1.46	0.77
b Residential	12,190.22						975.80	12.53	827.03	29694.08	1658.25
Total Liquid Fuels	1,923.81						1.92	1.09	86.77	18.32	9.14
Distillate Fuel oil	6.96	0.00067	0.00019	0.06200	0.01500	0.00475	0.00	0.00	0.43	0.10	0.03
Residual Fuel oil	0.66	0.00000	0.00019	0.16150	0.01425	0.00475	0.00	0.00	0.11	0.01	0.00
LPG	1,916.19	0.00100	0.00057	0.04500	0.00950	0.00475	1.92	1.09	86.23	18.20	9.10
Coal	834.73	0.28500	0.00130	0.21900	3.42000	0.19000	237.90	1.09	182.81	2854.77	158.60
Natural Gas	6,871.00	0.00090	0.00009	0.04200	0.00900	0.00450	6.18	0.62	288.58	61.84	30.92
Wood	2,560.69	0.28500	0.00380	0.10500	10.45000	0.57000	729.80	9.73	268.87	26759.16	1459.59
c Agriculture/forestry/fishing	20,585.78						107.14	62.25	14994.63	10815.67	2769.25
Total Liquid Fuels	20,029.50						101.86	61.53	14867.80	10709.98	2663.55
Distillate Fuel oil - Stationary	818.63	0.00380	0.00038	0.06200	0.35200	0.00475	3.11	0.31	50.76	288.16	3.89
Residual Fuel oil - Stationary	403.29	0.00380	0.00038	0.06200	0.35200	0.00475	1.53	0.15	25.00	141.96	1.92
Petrol - Mobile	1,170.86	0.01850	0.00142	0.21000	4.59000	0.88500	21.66	1.66	245.88	5374.25	1036.21
Diesel - Mobile	14,383.15	0.00380	0.00370	0.64000	0.30300	0.10200	54.66	53.22	9205.21	4358.09	1467.08
Fuel Oil - Mobile	3,098.30	0.00665	0.00190	1.71000	0.17100	0.04900	20.60	5.89	5298.09	529.81	151.82
Aviation fuels - Mobile	155.27	0.00190	0.00190	0.27600	0.11400	0.01700	0.30	0.30	42.86	17.70	2.64
Coal	556.27	0.00950	0.00130	0.22800	0.19000	0.19000	5.28	0.72	126.83	105.69	105.69

Only New Zealand relevant source and sink categories have been included.

1 Does not include energy use for methanol production.

2 Natural gas consumption data for methanol production is confidential.

Module
Submodule
Worksheet

2003 Energy (New Zealand)
SO₂ emissions from fuel combustion by source categories (tier 1)
1.4

Fuel type		Fuel consumption (TJ)	Sulphur content (%)	Sulphur retention in ash (%)	Abatement efficiency (%)	Gross cal. value (TJ/kt)	SO ₂ emis fact (kg/TJ)	SO ₂ emissions (t)	SO ₂ emissions (Gg)
Total		334,419						63,656	63,656
Coal	Low ¹	4,795	0.30%	12.50%	0.00%	15.0	350.0	1,678	1,678
	Medium ²	46,113	0.50%	12.50%	0.00%	22.6	387.2	17,854	17,854
	High ³	10,702	1.10%	2.50%	0.00%	32.1	668.2	7,151	7,151
Heavy fuel oil	Low							no	no
	Medium ⁴	6,351	2.30%	0.00%	0.00%	44.06	1,044.0	6,631	6,631
	High							no	no
Light fuel oil	Low ⁵	5,333	1.75%	0.00%	0.00%	44.46	787.2	4,198	4,198
	High							no	no
Diesel		98,226	0.24%	0.00%	0.00%	45.98	104.4	10,254	10,254
Petrol		109,286	0.01%	0.00%	0.00%	46.93	2.1	233	0.233
Jet kerosene		18,230	0.01%	0.00%	0.00%	46.4	4.3	79	0.079
Asphalt ⁶		2,126	4.50%	0.00%	0.00%	41.9	2,148.0	4,567	4,567
LPG			0.00%					no	no
Natural gas			0.00%					no	no
Municipal Waste								ne	ne
Industrial Waste								ne	ne
Black Liquor								ne	ne
Fuelwood		33,256	0.20%	0.00%	0.00%	12.1	331.1	11,012	11,012
Other Biomass								ne	ne
Marine bunkers (memo item)	HFO	8,257	2.30%	0.00%	0.00%	44.06	1,044.0	8,621	8,621
	LFO	508	1.75%	0.00%	0.00%	44.46	787.2	400	0.400
	Diesel	2,266	0.24%	0.00%	0.00%	45.98	104.4	237	0.237
Aviation bunkers (memo item)	Jet kero	33,080	0.01%	0.00%	0.00%	46.4	4.3	143	0.143

1 Lignite coal.

2 Sub-bituminous coal.

3 Bituminous coal.

4 All HFO assumed to be medium sulphur.

5 All LFO assumed to be low sulphur.

6 Includes other liquids in manufacturing and construction.

Module 2003 Energy (New Zealand)
Submodule Fugitive emissions from coal mining and handling (tier 1)
Worksheet 1.6 (adapted)

Category	Coal production (Mt)	CH ₄ emis fact (Gg/Mt)	CH ₄ emissions (Gg)
Total	5.18		15.82
Underground mines			
Mining	0.81		10.87
Bituminous	0.22	16.75	3.71
Sub-bituminous	0.59	12.1	7.15
Post-mining		1.6	1.30
Surface mines			
Mining	4.37	0.77	3.36
Post-mining		0.067	0.29

Module 2003 Energy (New Zealand)
Submodule Fugitive emissions from geothermal activities (tier 1)
Worksheet NZ 1a (additional)

Category	Fuel quantity (TJ)	CO ₂ emis fact (kg/GJ)	CH ₄ emis fact (kg/GJ)	CO ₂ emissions (Gg)	CH ₄ emissions (Gg)
Elec. generation and heat	69,187	3.890	0.035	269.11	2.43

Module 2003 Energy (New Zealand)
Submodule Ozone precursors and SO₂ from oil refining
Worksheet 1.8 (3 of 4)
Sheet SO₂ from sulphur recovery plants (tier 2)

Quantity of sulphur recovered (t)	Emission factor (kg/t)	Emissions (kg)	Emissions (Gg)
26,476	139	3,680,164	3.68

Module 2003 Energy (New Zealand)
Submodule Fugitive emissions from oil and gas handling (tier 1)
Worksheet 1.7 (adapted)

Category	Fuel quantity (TJ)	CO ₂ emis fact (kg/TJ)	CH ₄ emis fact (kg/TJ)	CO ₂ emissions (Gg)	CH ₄ emissions (Gg)
Total				380.929	17.37
Oil					
Exploration				ne	ne
Production of crude oil				ne	ne
Transport of crude oil	49,195		0.745	ne	0.04
Refining/storage	220,103		0.885	ne	0.19
Distribution of oil products				ne	ne
Gas					
Production/processing				ne	ne
Transmission / Distribution	65,910	21.6	249.38	1.42	16.44
Other leakage	ne	ne	ne	ne	ne
Venting and flaring from oil and gas prod.	1,708		412.83	379.51	0.71

Module 2003 Energy (New Zealand)
Submodule Ozone precursors and SO₂ from oil refining
Worksheet 1.8 (additional)
Sheet NMVOC emissions from oil refining (tier 1)

Crude oil Throughput (m3)	Emission factor (kg/m3)	Emissions (t)	Emissions (Gg)
5,643,657	0.53	2,991	2.99

Module 2003 Energy (New Zealand)
Submodule Ozone precursors and SO₂ from oil refining
Worksheet 1.8 (4 of 4)
Sheet NMVOC emissions from storage and handling (tier 2)

Storage type	Crude oil throughput (kt)	Emission factor (kg/t)	Emissions (t)	Emissions (Gg)
Floating roof (primary seals)	4,837	0.70	3,386	3.39