Technical Report No. 1

Air Emissions Inventory for the Greater Metropolitan Region in New South Wales

2008 Calendar Year

Consolidated Natural and Human-Made Emissions: Results

ACKNOWLEDGMENTS

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EXECUTIVE SUMMARY

An air emissions inventory project for natural and human-made sources has taken over 2 years to complete. The base year of the inventory represents activities that took place during the 2008 calendar year and is accompanied by emission projections in yearly increments up to the 2036 calendar year. The area included in the inventory covers the greater Sydney, Newcastle and Wollongong regions, known collectively as the Greater Metropolitan Region (GMR).

The inventory region defined as the GMR measures 210 km (east–west) by 273 km (north–south). The inventory region is presented in Table ES-1 and shown in Figure ES-1.

Table ES-1: Definition of Greater Metropolitan, Sydney, Newcastle and Wollongong regions

Region	South-west corner MGA[1] coordinates		North-east corner MGA coordinates	
	Easting (km)	Northing (km)	Easting (km)	Northing (km)
Greater Metropolitan	210	6159	420	6432
Sydney	261	6201	360	6300
Newcastle	360	6348	408	6372
Wollongong	279	6174	318	6201

The air emissions inventory includes emissions from biogenic (i.e. natural living organisms), geogenic (i.e. natural non-living) and anthropogenic (i.e. human-made) sources, as follows:

- Natural (e.g. bushfires, marine aerosol and vegetation);
- Commercial businesses (e.g. non-EPA licensed[2] printers, quarries and service stations);
- Domestic activities (e.g. residential lawn mowing, portable fuel containers and wood heaters);
- Industrial premises (e.g. EPA licensed[3] coal mines, oil refineries and power stations);
- Off-road vehicles and equipment (e.g. dump trucks, bulldozers, and marine vessels); and
- On-road transport (e.g. registered buses, cars and trucks).

[1] Map Grid of Australia based on the Geocentric Datum of Australia 1994 (GDA94) (ICSM, 2006).
[2] Not a scheduled activity or scheduled development work as defined in the *Protection of the Environment (Operations) Act 1997* (PCO, 2010a).
[3] An activity listed in Schedule 1 of the *Protection of the Environment (Operations) Act 1997* (PCO, 2010a).

Figure ES-1: Definition of Greater Metropolitan, Sydney, Newcastle and Wollongong regions

The pollutants inventoried include criteria pollutants specified in the Ambient Air Quality NEPM (NEPC, 2003), air toxics associated with the National Pollutant Inventory NEPM (NEPC, 2008) and the Air Toxics NEPM (NEPC, 2004), and any other pollutants associated with state-specific programs, i.e. Load Based Licensing (Protection of the Environment Operations (General) Regulation 2009 (PCO, 2010b)) and the Protection of the Environment Operations (Clean Air) Regulation 2010 (PCO, 2011).

This report presents emissions of criteria pollutants referred to in the Ambient Air Quality NEPM (NEPC, 2003), including:

- Carbon monoxide (CO);
- Oxides of nitrogen (NO_x);
- Particulate matter ≤ 10 µm (PM_{10});
- Particulate matter ≤ 2.5 µm ($PM_{2.5}$);
- Sulfur dioxide (SO_2); and
- Total volatile organic compounds (VOC).

More detailed information about source types and emissions of other air pollutants from natural, commercial businesses, domestic activities, industrial premises, off-road vehicles and equipment and on-road transport sources can be found in the individual air emissions inventory reports (EPA, 2012a; EPA, 2012b; EPA, 2012c; EPA, 2012d; EPA, 2012e; and EPA, 2012f), respectively.

Table ES-2 presents total estimated annual emissions of criteria pollutants from natural and human-made sources in the whole GMR and the Sydney, Newcastle and Wollongong regions. Total estimated annual emissions are also presented for the region defined as Non Urban. This region is the area of the GMR minus the combined areas of the Sydney, Newcastle and Wollongong regions.

Table ES-2: Total estimated annual emissions from natural and human-made sources in each region

Substance	Region	Emissions (tonne/year)		
		Human-Made	Natural	Grand Total
CARBON MONOXIDE	Sydney	241,208	5,484	246,692
	Newcastle	60,225	301	60,526
	Wollongong	540,390	603	540,993
	Non Urban	88,937	28,545	117,482
	GMR	930,759	34,934	965,693
OXIDES OF NITROGEN	Sydney	73,427	1,296	74,722
	Newcastle	9,506	126	9,632
	Wollongong	11,708	71	11,779
	Non Urban	214,704	8,319	223,023
	GMR	309,344	9,811	319,156
PARTICULATE MATTER ≤ 10 µm	Sydney	16,543	3,901	20,443
	Newcastle	4,838	689	5,526
	Wollongong	2,690	327	3,017
	Non Urban	65,752	28,719	94,471
	GMR	89,823	33,635	123,458
PARTICULATE MATTER ≤ 2.5 µm	Sydney	10,777	951	11,728
	Newcastle	2,023	121	2,144
	Wollongong	1,869	90	1,959
	Non Urban	17,076	6,176	23,253
	GMR	31,744	7,338	39,083
SULFUR DIOXIDE	Sydney	10,749	50	10,798
	Newcastle	11,593	2.72	11,596
	Wollongong	9,063	5.49	9,068
	Non Urban	257,516	259	257,774
	GMR	288,920	317	289,237
TOTAL VOLATILE ORGANIC COMPOUNDS	Sydney	98,889	32,468	131,356
	Newcastle	7,985	3,404	11,389
	Wollongong	5,205	3,482	8,687
	Non Urban	24,879	130,284	155,163
	GMR	136,957	169,637	306,595

Table ES-3 presents the proportions of total estimated annual emissions of criteria pollutants from natural and human-made sources in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table ES-3: Proportions of total estimated annual emissions from natural and human-made sources in each region

Substance	Region	Proportions (%)	
		Human-Made	Natural
CARBON MONOXIDE	Sydney	97.78	2.22
	Newcastle	99.50	0.50
	Wollongong	99.89	0.11
	Non Urban	75.70	24.30
	GMR	96.38	3.62
OXIDES OF NITROGEN	Sydney	98.27	1.73
	Newcastle	98.69	1.31
	Wollongong	99.40	0.60
	Non Urban	96.27	3.73
	GMR	96.93	3.07
PARTICULATE MATTER ≤ 10 µm	Sydney	80.92	19.08
	Newcastle	87.54	12.46
	Wollongong	89.17	10.83
	Non Urban	69.60	30.40
	GMR	72.76	27.24
PARTICULATE MATTER ≤ 2.5 µm	Sydney	91.89	8.11
	Newcastle	94.37	5.63
	Wollongong	95.40	4.60
	Non Urban	73.44	26.56
	GMR	81.22	18.78
SULFUR DIOXIDE	Sydney	99.54	0.46
	Newcastle	99.98	2.35×10^{-2}
	Wollongong	99.94	6.05×10^{-2}
	Non Urban	99.90	0.10
	GMR	99.89	0.11
TOTAL VOLATILE ORGANIC COMPOUNDS	Sydney	75.28	24.72
	Newcastle	70.11	29.89
	Wollongong	59.92	40.08
	Non Urban	16.03	83.97
	GMR	44.67	55.33

Figure ES-2, Figure ES-3, Figure ES-4, Figure ES-5 and Figure ES-6 show the proportions of total estimated annual emissions of criteria pollutants from natural and human-made sources in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

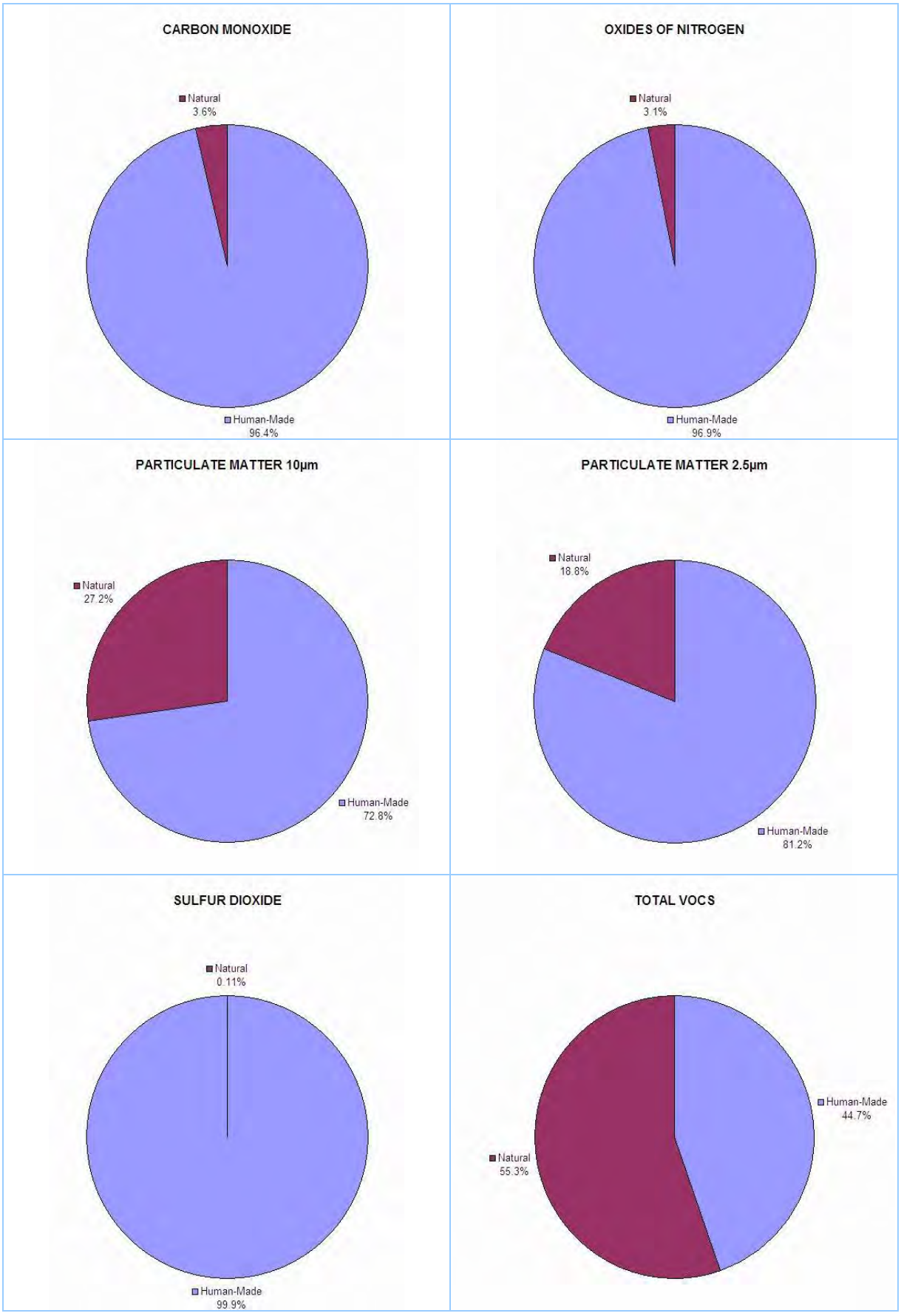

Figure ES-2: Proportions of total estimated annual emissions from natural and human-made sources in the GMR

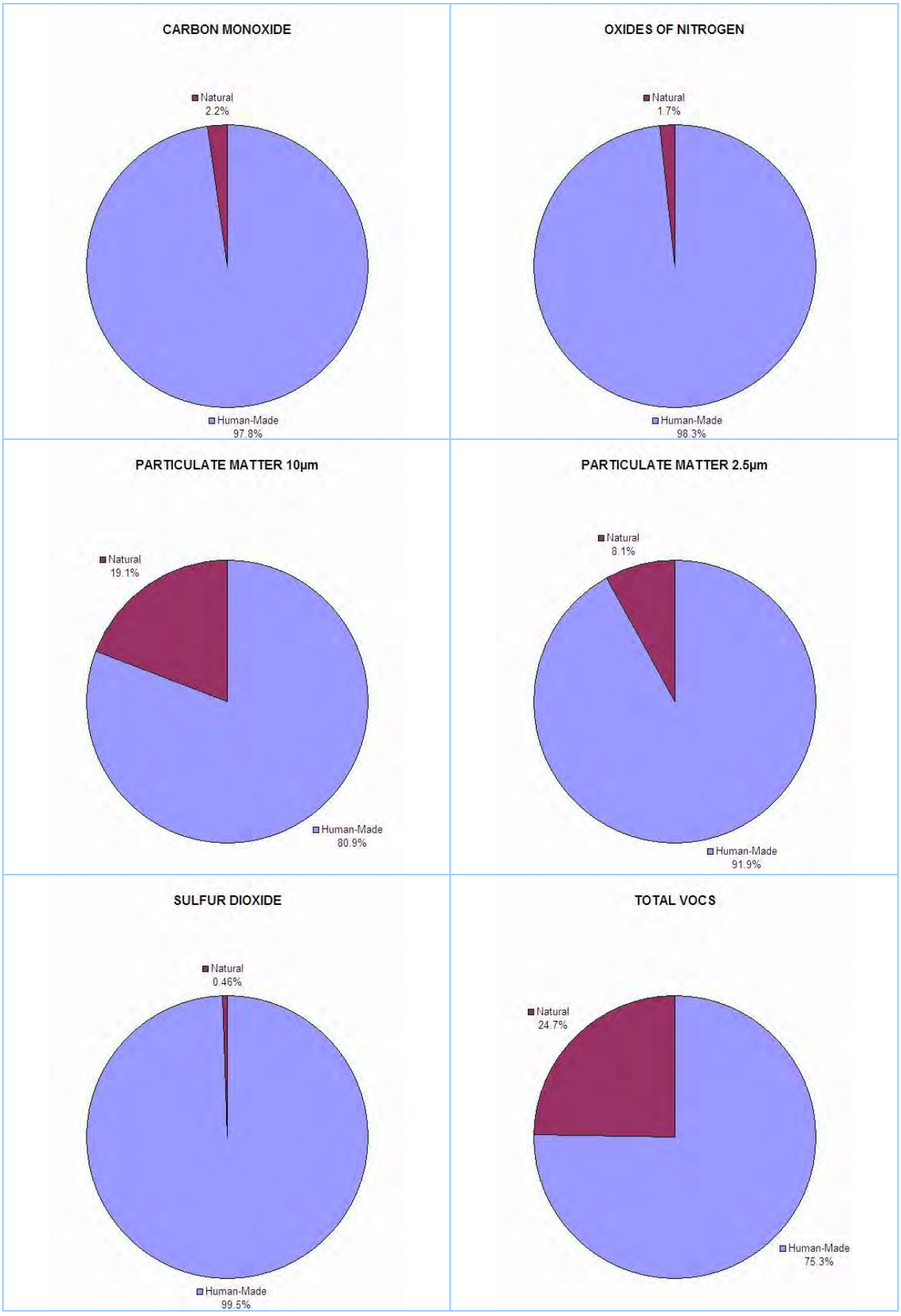

Figure ES-3: Proportions of total estimated annual emissions from natural and human-made sources in the Sydney region

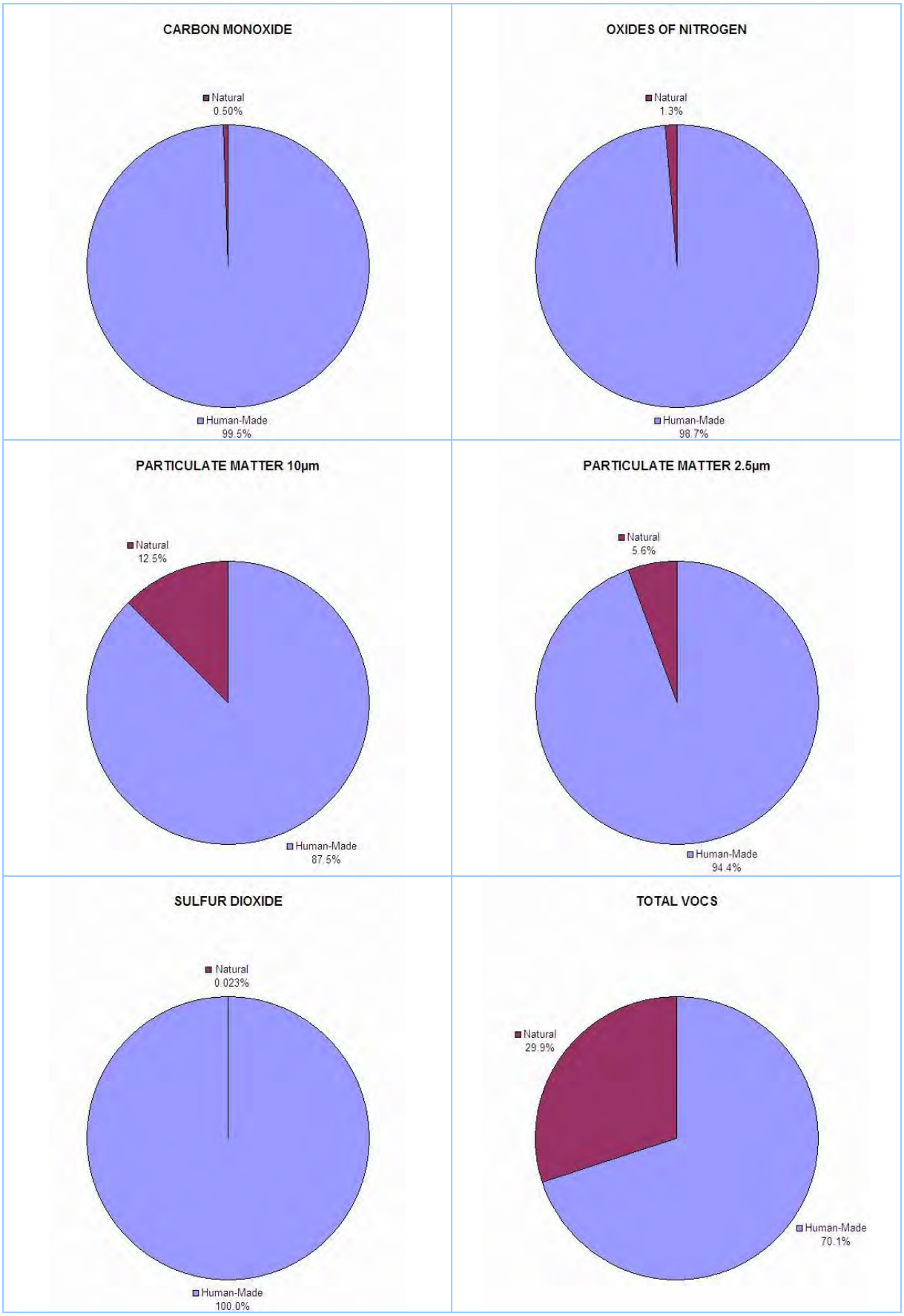

Figure ES-4: Proportions of total estimated annual emissions from natural and human-made sources in the Newcastle region

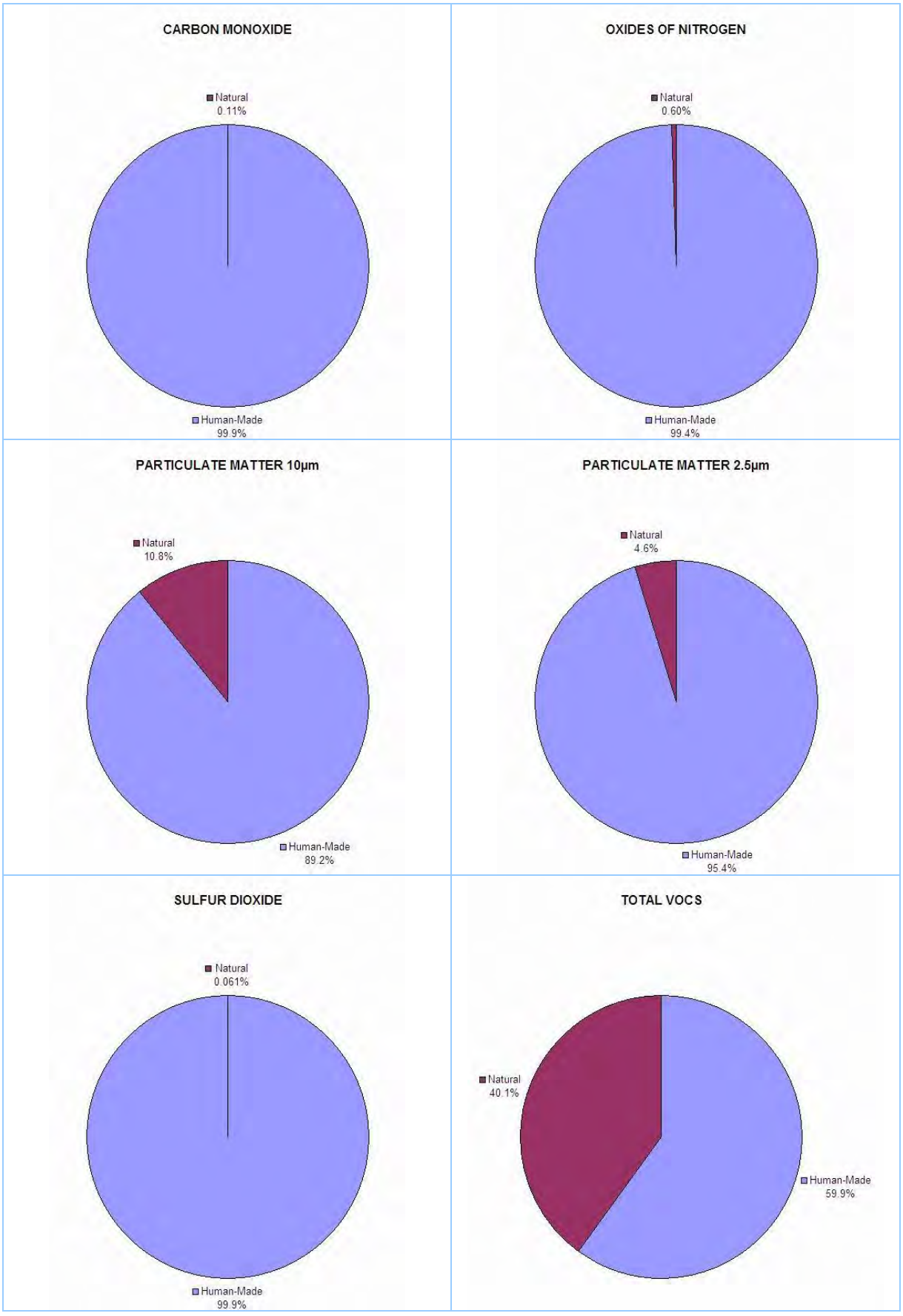

Figure ES-5: Proportions of total estimated annual emissions from natural and human-made sources in the Wollongong region

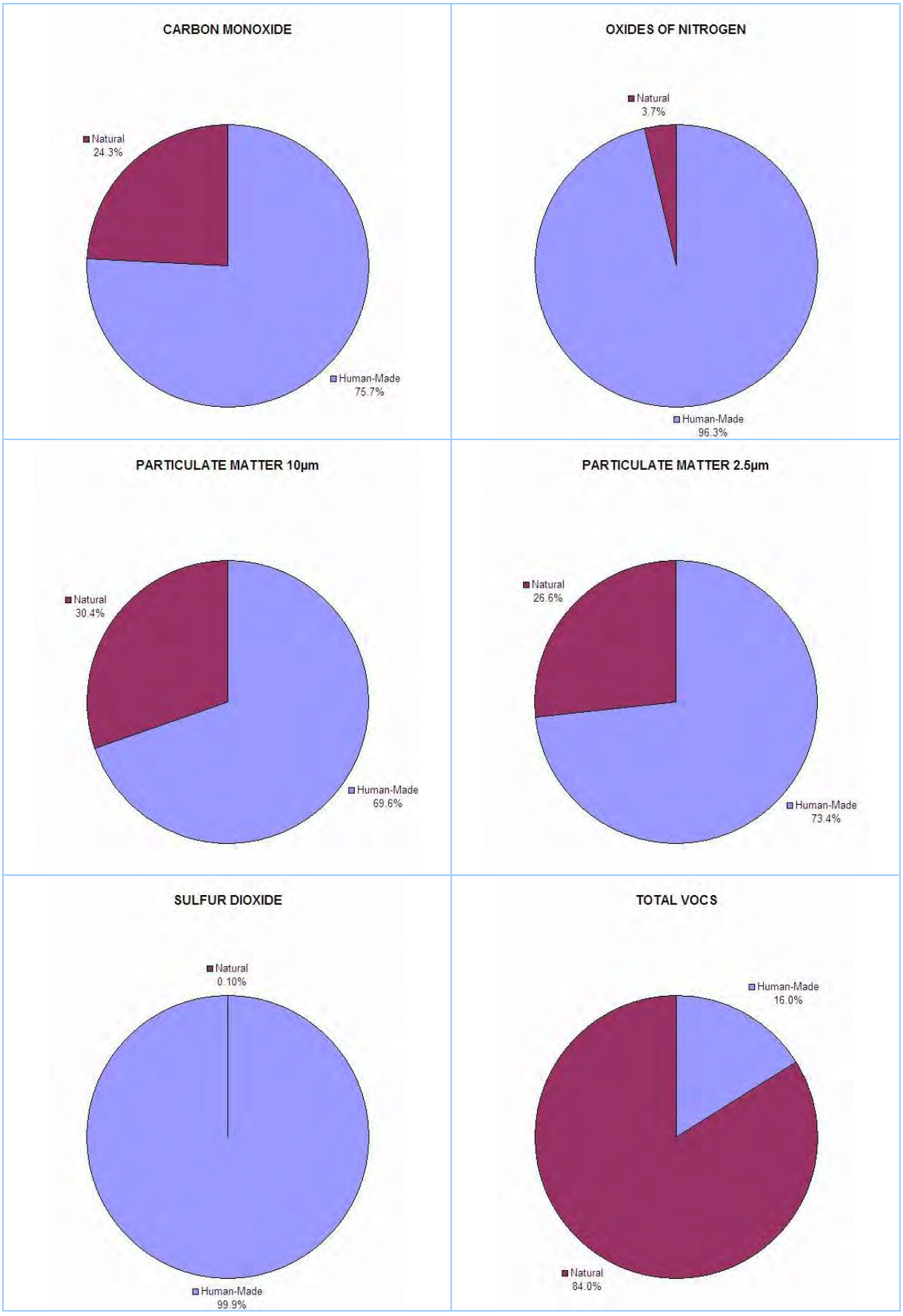

Figure ES-6: Proportions of total estimated annual emissions from natural and human-made sources in the Non Urban region

Table ES-4 presents total estimated annual emissions of criteria pollutants by human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table ES-4: Total estimated annual emissions by human-made source type in each region

Substance	Region	Emissions (tonne/year)					
		Commercial	Domestic-Commercial	Industrial	Off-Road Mobile	On-Road Mobile	Grand Total
CARBON MONOXIDE	Sydney	335	82,186	14,173	20,801	123,712	241,208
	Newcastle	9.20	6,554	41,950	3,343	8,369	60,225
	Wollongong	20	4,412	529,474	1,698	4,786	540,390
	Non Urban	24	16,226	27,768	27,975	16,944	88,937
	GMR	389	109,377	613,365	53,817	153,812	930,759
OXIDES OF NITROGEN	Sydney	344	2,531	8,921	16,238	45,392	73,427
	Newcastle	39	184	1,833	3,548	3,902	9,506
	Wollongong	12	130	7,784	1,598	2,184	11,708
	Non Urban	106	445	172,873	31,826	9,453	214,704
	GMR	501	3,290	191,411	53,210	60,932	309,344
PARTICULATE MATTER ≤ 10 µm	Sydney	1,111	6,088	6,215	1,019	2,110	16,543
	Newcastle	129	504	3,744	284	176	4,838
	Wollongong	48	334	2,099	119	90	2,690
	Non Urban	732	1,262	61,155	2,185	417	65,752
	GMR	2,020	8,189	73,213	3,607	2,793	89,823
PARTICULATE MATTER ≤ 2.5 µm	Sydney	485	5,853	1,935	952	1,553	10,777
	Newcastle	30	485	1,110	266	131	2,023
	Wollongong	14	321	1,354	112	68	1,869
	Non Urban	167	1,214	13,273	2,104	319	17,076
	GMR	695	7,873	17,672	3,433	2,071	31,744
SULFUR DIOXIDE	Sydney	108	131	5,574	4,725	210	10,749
	Newcastle	1.62	11	10,266	1,300	15	11,593
	Wollongong	0.73	7.07	8,494	553	8.13	9,063
	Non Urban	70	26	256,139	1,246	35	257,516
	GMR	180	175	280,472	7,824	269	288,920
TOTAL VOLATILE ORGANIC COMPOUNDS	Sydney	6,652	53,178	8,205	7,341	23,512	98,889
	Newcastle	476	3,757	771	1,303	1,678	7,985
	Wollongong	358	2,660	716	591	879	5,205
	Non Urban	1,689	9,213	1,826	8,715	3,435	24,879
	GMR	9,176	68,809	11,519	17,950	29,504	136,957

Table ES-5 presents the proportions of total estimated annual emissions of criteria pollutants by human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table ES-5: Proportions of total estimated annual emissions by human-made source type in each region

Substance	Region	Proportions (%)				
		Commercial	Domestic-Commercial	Industrial	Off-Road Mobile	On-Road Mobile
CARBON MONOXIDE	Sydney	0.14	34.07	5.88	8.62	51.29
	Newcastle	1.53×10^{-2}	10.88	69.66	5.55	13.90
	Wollongong	3.64×10^{-3}	0.82	97.98	0.31	0.89
	Non Urban	2.73×10^{-2}	18.24	31.22	31.45	19.05
	GMR	4.17×10^{-2}	11.75	65.90	5.78	16.53
OXIDES OF NITROGEN	Sydney	0.47	3.45	12.15	22.11	61.82
	Newcastle	0.41	1.94	19.28	37.32	41.05
	Wollongong	0.10	1.11	66.48	13.65	18.65
	Non Urban	4.93×10^{-2}	0.21	80.52	14.82	4.40
	GMR	0.16	1.06	61.88	17.20	19.70
PARTICULATE MATTER ≤ 10 µm	Sydney	6.72	36.80	37.57	6.16	12.76
	Newcastle	2.67	10.42	77.40	5.87	3.64
	Wollongong	1.77	12.42	78.03	4.42	3.35
	Non Urban	1.11	1.92	93.01	3.32	0.63
	GMR	2.25	9.12	81.51	4.02	3.11
PARTICULATE MATTER ≤ 2.5 µm	Sydney	4.50	54.31	17.95	8.83	14.41
	Newcastle	1.48	23.97	54.89	13.17	6.49
	Wollongong	0.74	17.20	72.44	5.97	3.65
	Non Urban	0.98	7.11	77.73	12.32	1.87
	GMR	2.19	24.80	55.67	10.82	6.52
SULFUR DIOXIDE	Sydney	1.01	1.22	51.86	43.96	1.96
	Newcastle	1.40×10^{-2}	9.06×10^{-2}	88.55	11.21	0.13
	Wollongong	8.01×10^{-3}	7.80×10^{-2}	93.72	6.10	8.97×10^{-2}
	Non Urban	2.71×10^{-2}	1.01×10^{-2}	99.47	0.48	1.36×10^{-2}
	GMR	6.25×10^{-2}	6.05×10^{-2}	97.08	2.71	9.30×10^{-2}
TOTAL VOLATILE ORGANIC COMPOUNDS	Sydney	6.73	53.78	8.30	7.42	23.78
	Newcastle	5.96	47.05	9.66	16.31	21.02
	Wollongong	6.89	51.11	13.76	11.36	16.88
	Non Urban	6.79	37.03	7.34	35.03	13.81
	GMR	6.70	50.24	8.41	13.11	21.54

Figure ES-7, Figure ES-8, Figure ES-9, Figure ES-10 and Figure ES-11 show the proportions of total estimated annual emissions of criteria pollutants by human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

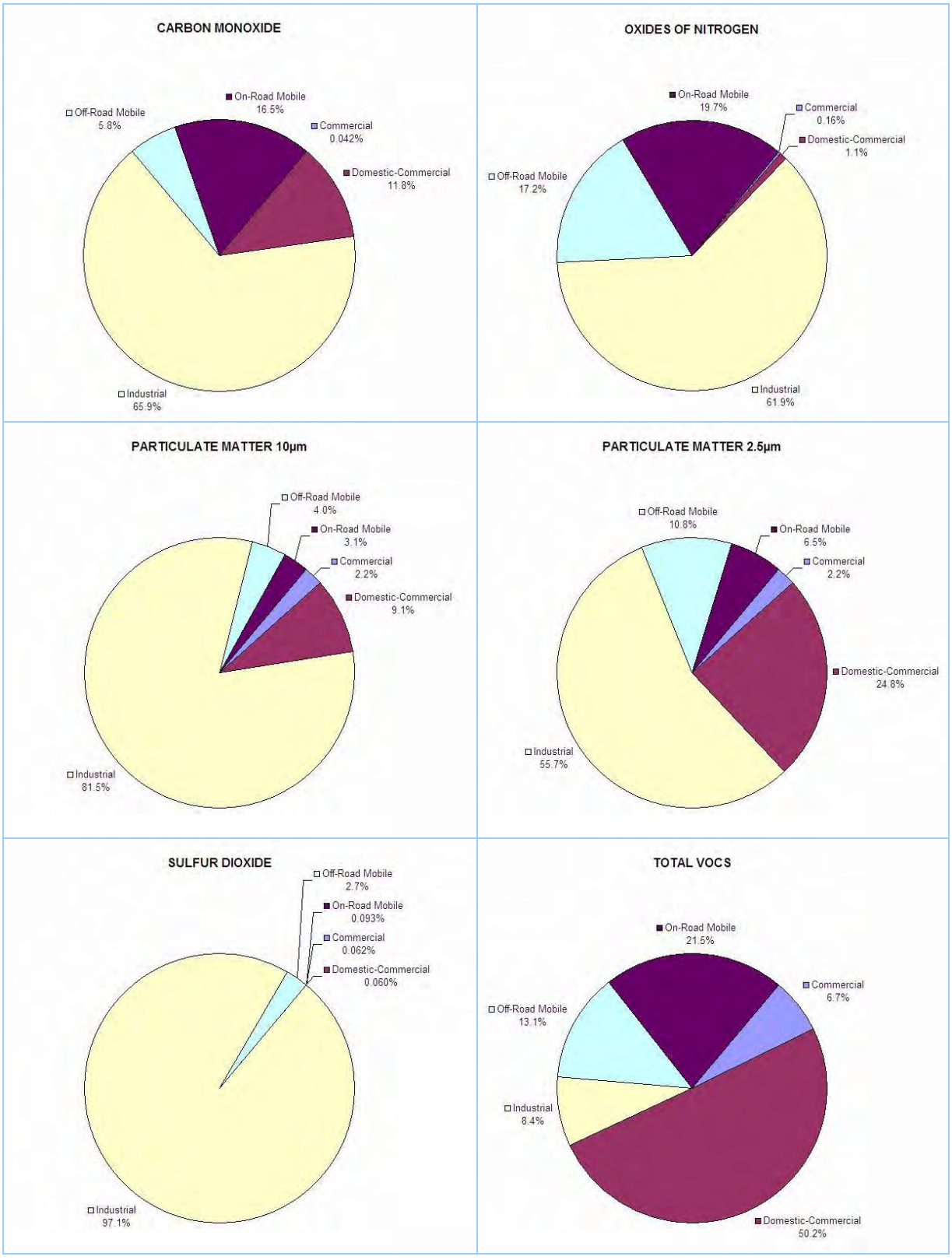

Figure ES-7: Proportions of total estimated annual emissions by human-made source type in the GMR

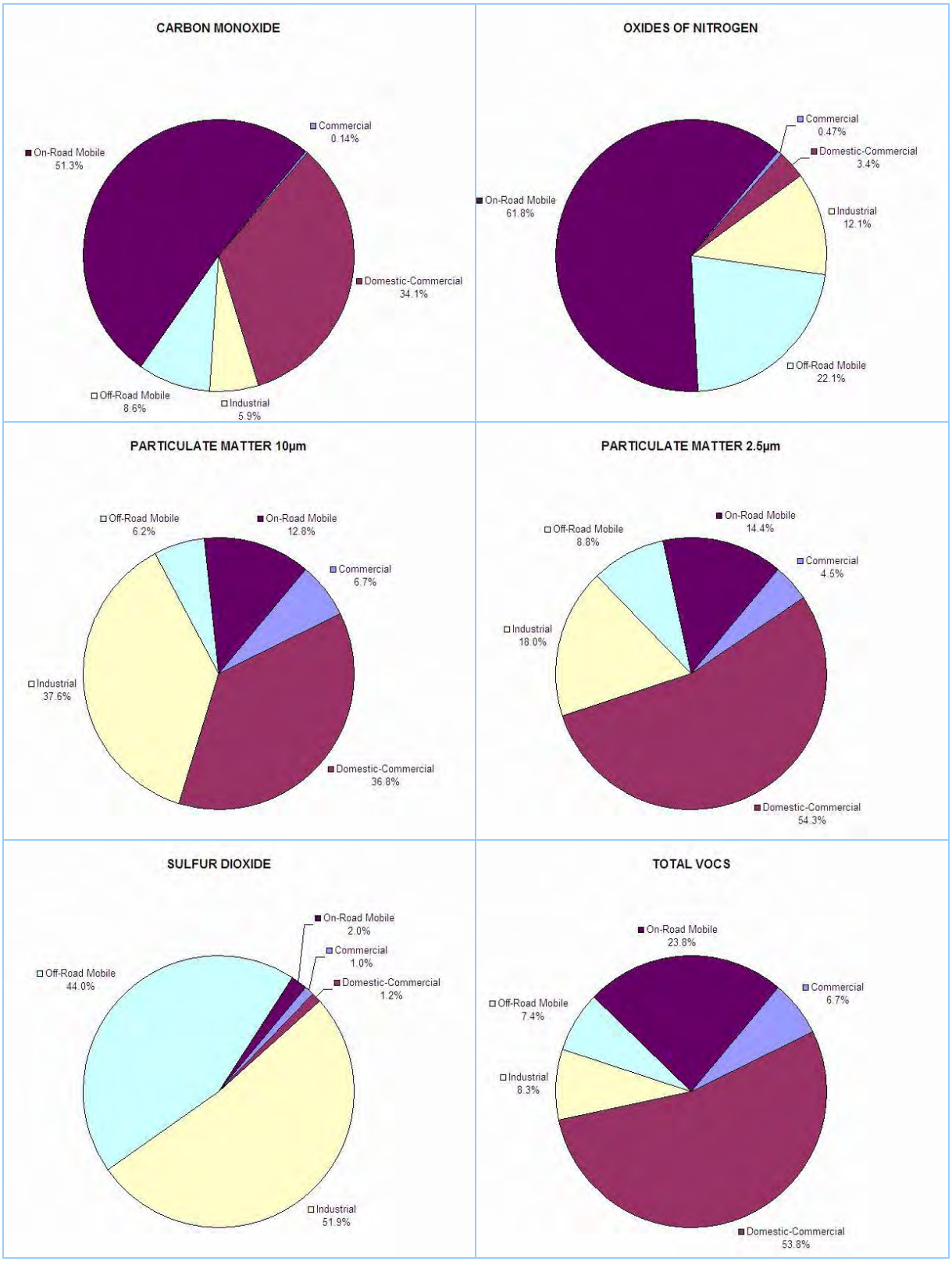

Figure ES-8: Proportions of total estimated annual emissions by human-made source type in the Sydney region

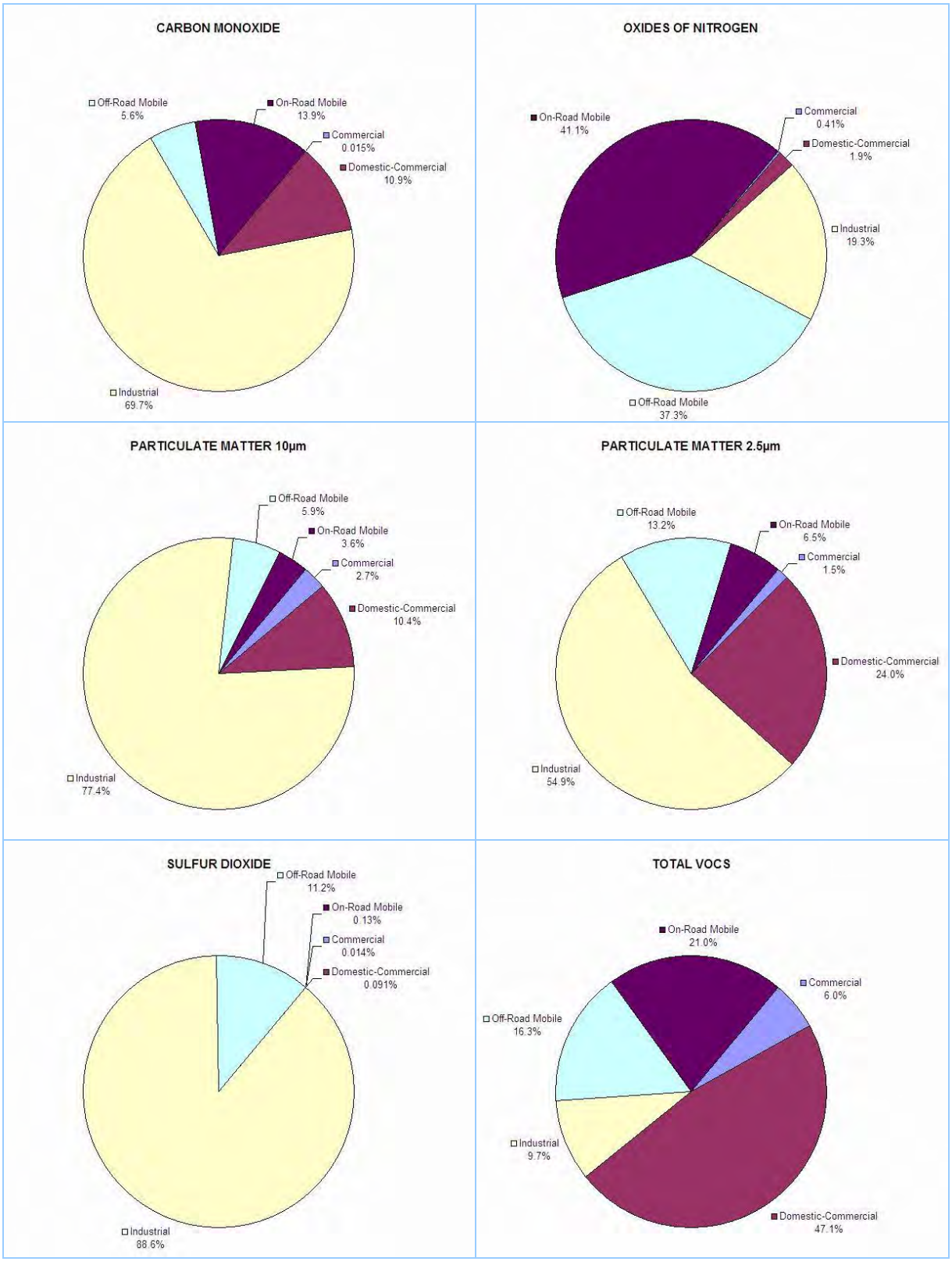

Figure ES-9: Proportions of total estimated annual emissions by human-made source type in the Newcastle region

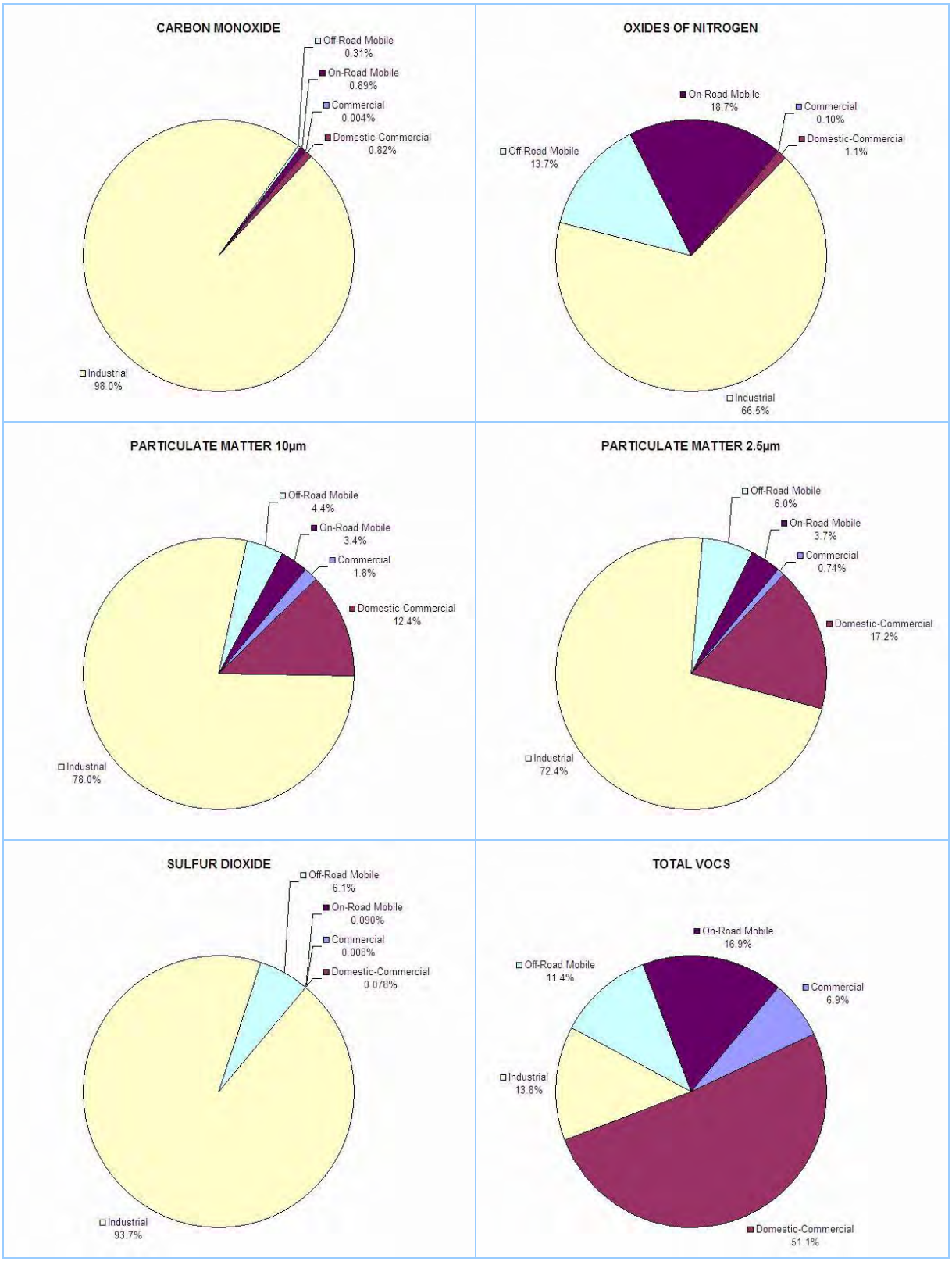

Figure ES-10: Proportions of total estimated annual emissions by human-made source type in the Wollongong region

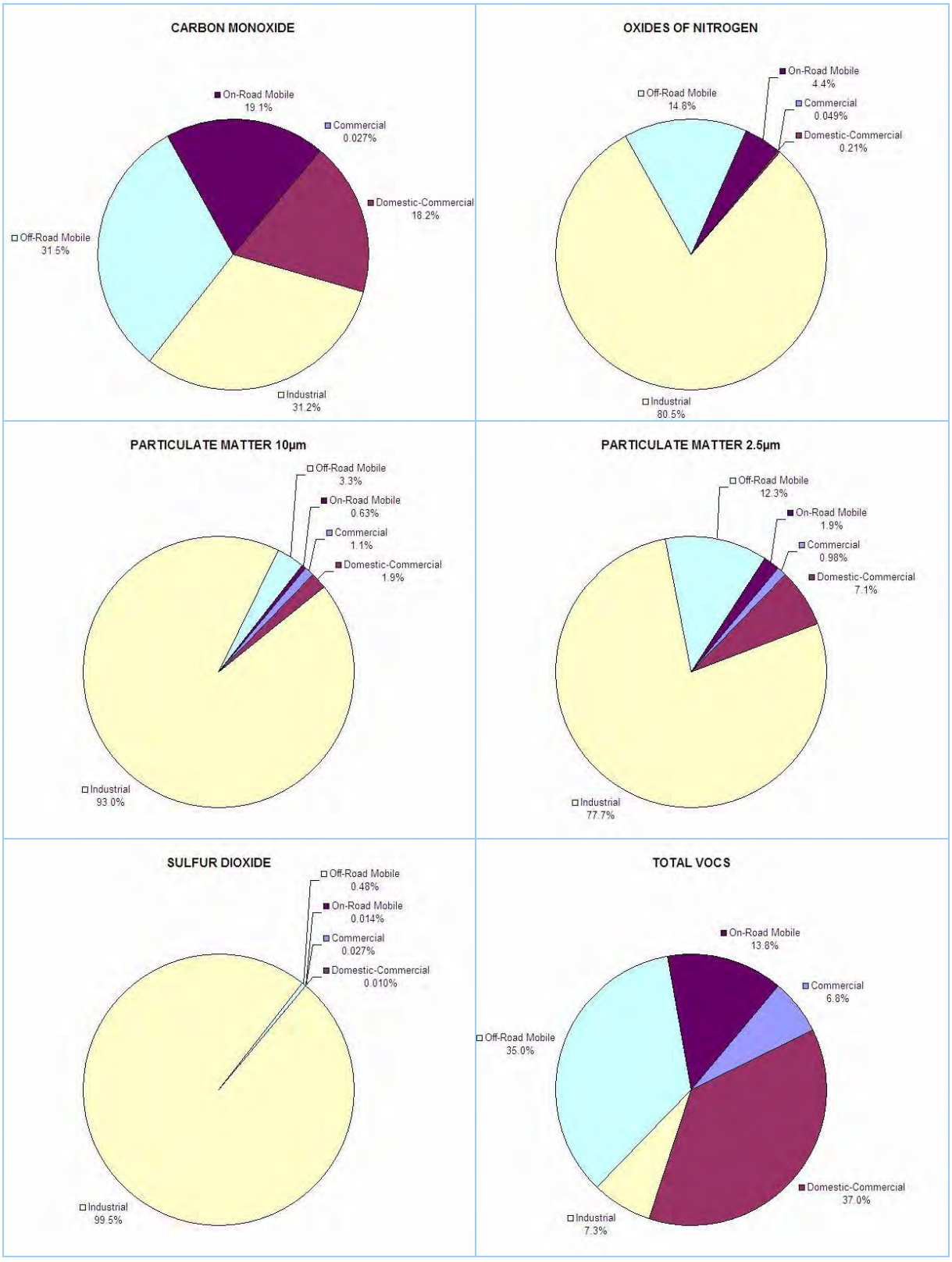

Figure ES-11: Proportions of total estimated annual emissions by human-made source type in the Non Urban region

Table ES-6 presents total estimated annual emissions, proportions and cumulative proportions for the top 10 human-made sources of carbon monoxide in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table ES-6: Top 10 human-made sources of carbon monoxide in each region

Source type	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made CARBON MONOXIDE sources in the GMR				
Industrial	Iron or steel production (iron ore)	527,922	56.72	56.72
On-road mobile	Passenger vehicle petrol – exhaust	93,437	10.04	66.76
Domestic-commercial	Solid fuel burning (domestic)	53,985	5.80	72.56
Industrial	Aluminium production (alumina)	52,994	5.69	78.25
On-road mobile	Light duty commercial petrol – exhaust	48,731	5.24	83.49
Domestic-commercial	Lawn mowing exhaust (domestic)	34,994	3.76	87.25
Off-road mobile	Industrial vehicles and equipment	20,431	2.20	89.44
Domestic-commercial	Lawn mowing exhaust (public open spaces)	19,009	2.04	91.48
Off-road mobile	Recreational boats exhaust	14,585	1.57	93.05
Off-road mobile	Commercial boats exhaust	12,153	1.31	94.36
Human-made	Other	52,518	5.64	100.00
Top 10 human-made CARBON MONOXIDE sources in the Sydney region				
On-road mobile	Passenger vehicle petrol – exhaust	75,067	31.12	31.12
Domestic-commercial	Solid fuel burning (domestic)	40,034	16.60	47.72
On-road mobile	Light duty commercial petrol – exhaust	39,923	16.55	64.27
Domestic-commercial	Lawn mowing exhaust (domestic)	25,951	10.76	75.03
Domestic-commercial	Lawn mowing exhaust (public open spaces)	15,118	6.27	81.30
Off-road mobile	Recreational boats exhaust	6,912	2.87	84.16
Industrial	Iron or steel production (scrap metal)	6,882	2.85	87.01
Off-road mobile	Commercial boats exhaust	5,332	2.21	89.23
On-road mobile	Heavy duty commercial diesel – exhaust	4,081	1.69	90.92
On-road mobile	Others – exhaust	3,691	1.53	92.45
Human-made	Other	18,218	7.55	100.00
Top 10 human-made CARBON MONOXIDE sources in the Newcastle region				
Industrial	Aluminium production (alumina)	39,203	65.09	65.09
On-road mobile	Passenger vehicle petrol – exhaust	4,997	8.30	73.39
Domestic-commercial	Solid fuel burning (domestic)	3,345	5.55	78.95
On-road mobile	Light duty commercial petrol – exhaust	2,650	4.40	83.35
Industrial	Iron or steel production (scrap metal)	2,210	3.67	87.02
Domestic-commercial	Lawn mowing exhaust (domestic)	2,169	3.60	90.62
Off-road mobile	Commercial boats exhaust	1,566	2.60	93.22
Domestic-commercial	Lawn mowing exhaust (public open spaces)	965	1.60	94.82
Off-road mobile	Industrial vehicles and equipment	816	1.35	96.17
Off-road mobile	Recreational boats exhaust	717	1.19	97.37
Human-made	Other	1,586	2.63	100.00

Source type	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made CARBON MONOXIDE sources in the Wollongong region				
Industrial	Iron or steel production (iron ore)	527,922	97.69	97.69
On-road mobile	Passenger vehicle petrol – exhaust	2,861	0.53	98.22
Domestic-commercial	Solid fuel burning (domestic)	2,209	0.41	98.63
On-road mobile	Light duty commercial petrol – exhaust	1,564	0.29	98.92
Domestic-commercial	Lawn mowing exhaust (domestic)	1,432	0.27	99.19
Industrial	Metal plating or coating	1,049	0.19	99.38
Off-road mobile	Industrial vehicles and equipment	770	0.14	99.52
Off-road mobile	Recreational boats exhaust	762	0.14	99.66
Domestic-commercial	Lawn mowing exhaust (public open spaces)	716	0.13	99.80
Industrial	Generation of electrical power from gas	445	8.23×10^{-2}	99.88
Human-made	Other	660	0.12	100.00
Top 10 human-made CARBON MONOXIDE sources in the Non Urban region				
Off-road mobile	Industrial vehicles and equipment	15,361	17.27	17.27
Industrial	Aluminium production (alumina)	13,791	15.51	32.78
On-road mobile	Passenger vehicle petrol – exhaust	10,512	11.82	44.60
Domestic-commercial	Solid fuel burning (domestic)	8,396	9.44	54.04
Industrial	Generation of electrical power from coal	7,535	8.47	62.51
Off-road mobile	Recreational boats exhaust	6,194	6.96	69.48
Domestic-commercial	Lawn mowing exhaust (domestic)	5,443	6.12	75.60
Off-road mobile	Commercial boats exhaust	5,178	5.82	81.42
On-road mobile	Light duty commercial petrol – exhaust	4,595	5.17	86.58
Industrial	Mining for coal	4,497	5.06	91.64
Human-made	Other	7,435	8.36	100.00

Figure ES-12, Figure ES-13, Figure ES-14, Figure ES-15 and Figure ES-16 show the proportions of total estimated annual emissions for the top 10 human-made sources of carbon monoxide in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

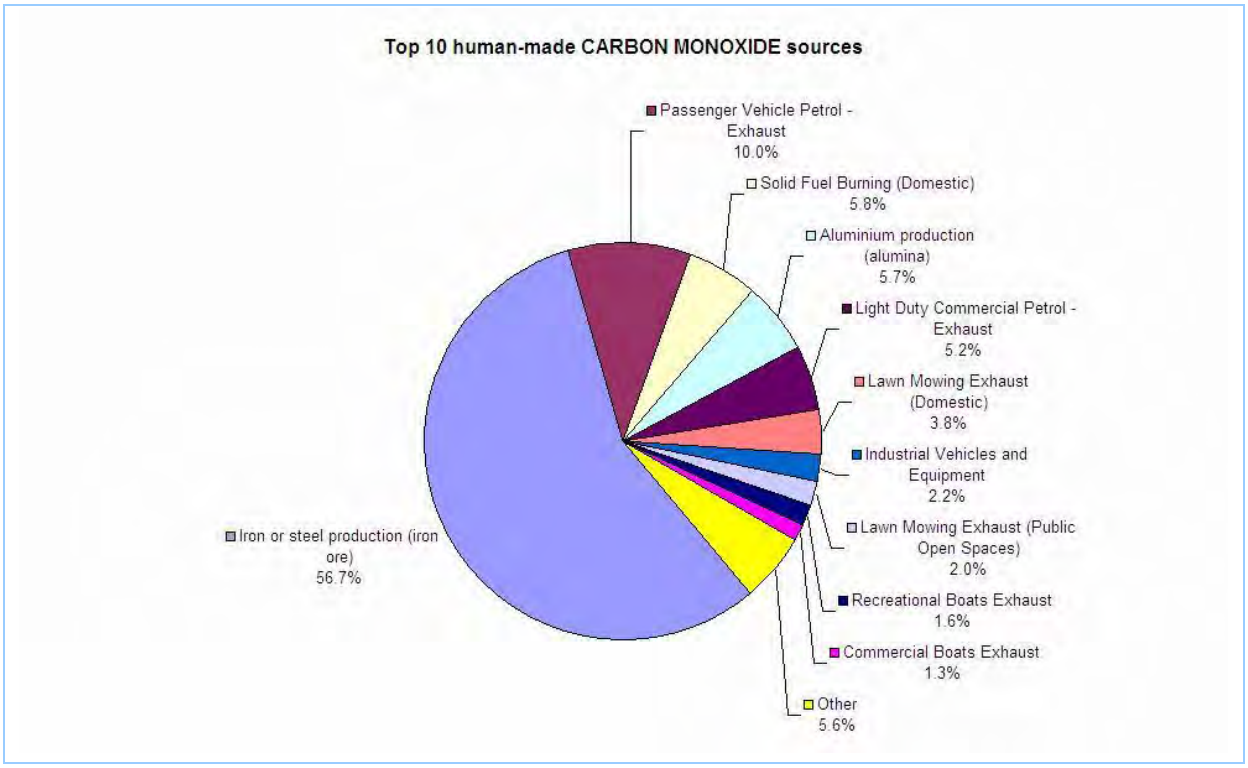

Figure ES-12: Top 10 human-made sources of carbon monoxide in the GMR

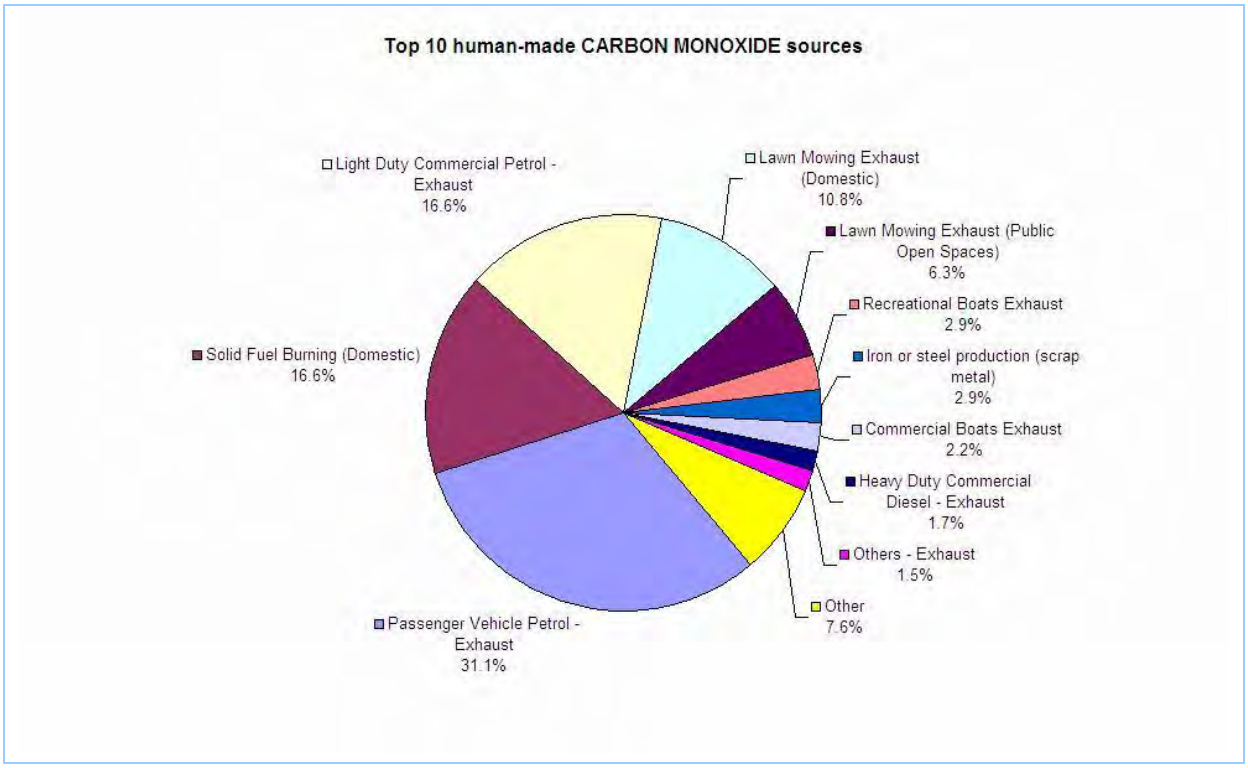

Figure ES-13: Top 10 human-made sources of carbon monoxide in the Sydney region

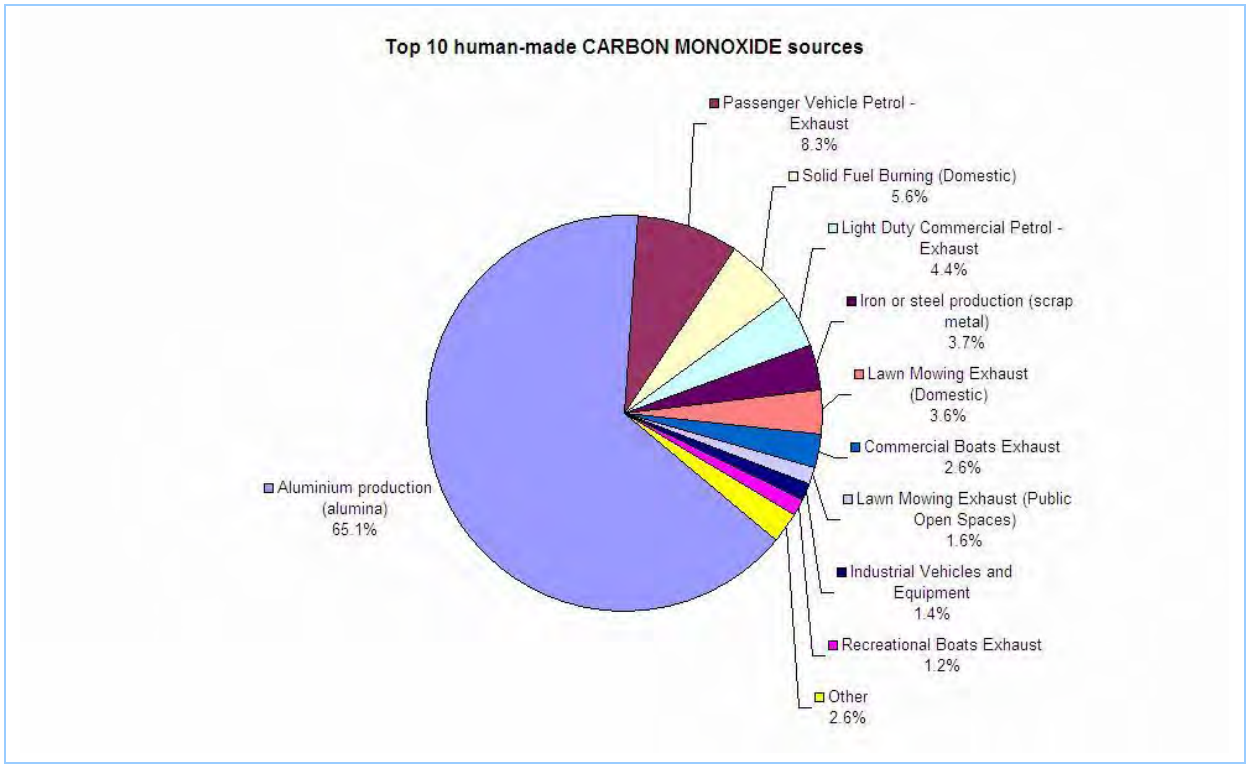

Figure ES-14: Top 10 human-made sources of carbon monoxide in the Newcastle region

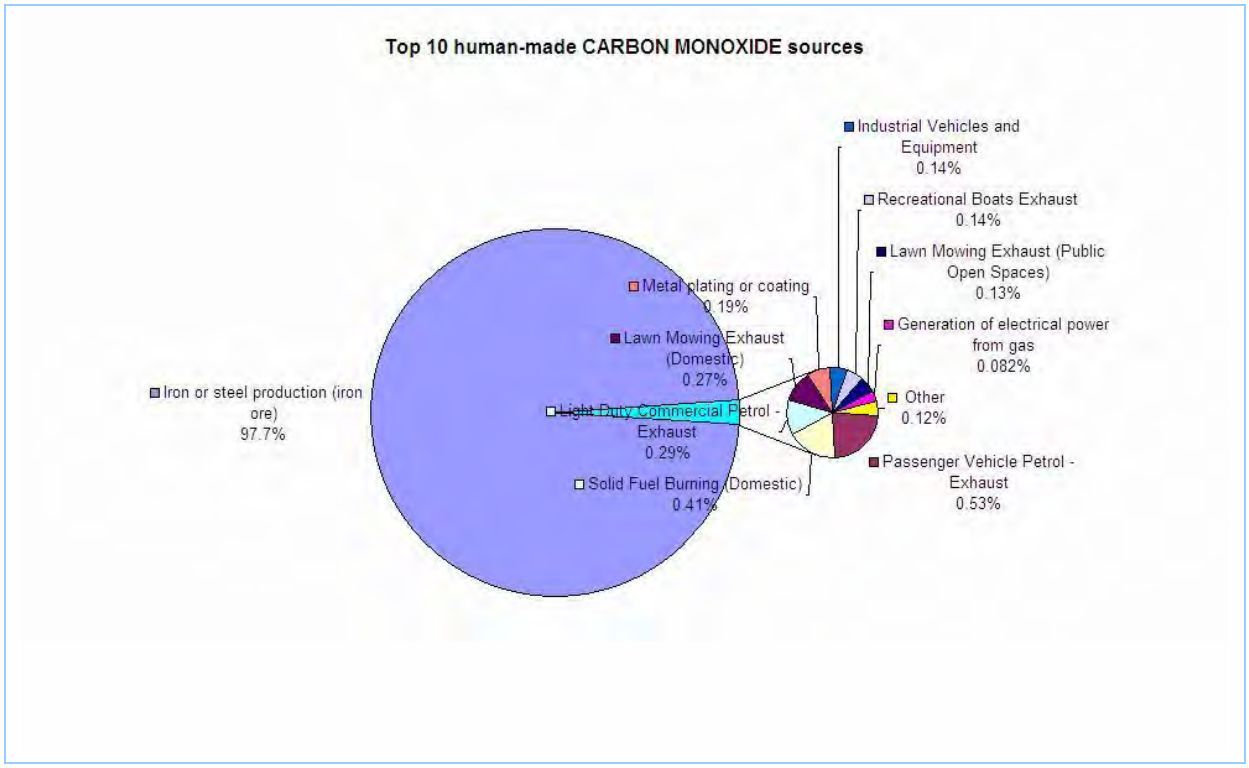

Figure ES-15: Top 10 human-made sources of carbon monoxide in the Wollongong region

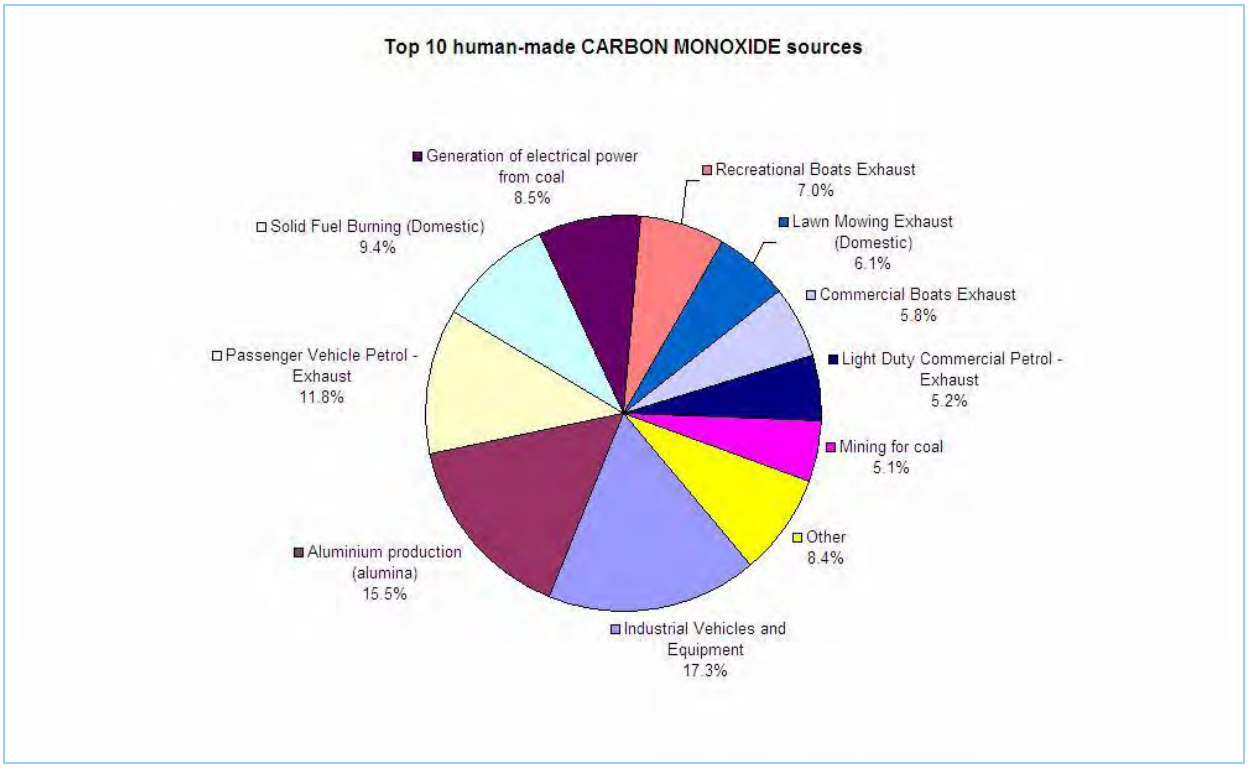

Figure ES-16: Top 10 human-made sources of carbon monoxide in the Non Urban region

Table ES-7 presents total estimated annual emissions, proportions and cumulative proportions for the top 10 human-made sources of oxides of nitrogen in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table ES-7: Top 10 human-made sources of oxides of nitrogen in each region

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made OXIDES OF NITROGEN sources in the GMR				
Industrial	Generation of electrical power from coal	165,956	53.65	53.65
Off-road mobile	Industrial vehicles and equipment	30,716	9.93	63.58
On-road mobile	Passenger vehicle petrol – exhaust	27,515	8.89	72.47
On-road mobile	Heavy duty commercial diesel – exhaust	21,419	6.92	79.40
Off-road mobile	Ships	9,425	3.05	82.44
On-road mobile	Light duty commercial petrol – exhaust	8,679	2.81	85.25
Industrial	Iron or steel production (iron ore)	7,513	2.43	87.68
Off-road mobile	Locomotives	6,087	1.97	89.64
Industrial	Cement or lime production	5,020	1.62	91.27
Off-road mobile	Commercial boats exhaust	4,404	1.42	92.69
Human-made	Other	22,609	7.31	100.00
Top 10 human-made OXIDES OF NITROGEN sources in the Sydney region				
On-road mobile	Passenger vehicle petrol – exhaust	21,575	29.38	29.38
On-road mobile	Heavy duty commercial diesel – exhaust	14,423	19.64	49.03
On-road mobile	Light duty commercial petrol – exhaust	6,799	9.26	58.29
Off-road mobile	Ships	5,138	7.00	65.28
Off-road mobile	Commercial boats exhaust	3,319	4.52	69.80
Off-road mobile	Locomotives	2,927	3.99	73.79
Off-road mobile	Industrial vehicles and equipment	2,600	3.54	77.33
On-road mobile	Light duty diesel – exhaust	2,417	3.29	80.62
Industrial	Generation of electrical power from gas	2,077	2.83	83.45
Industrial	Petroleum products and fuel production	1,891	2.58	86.03
Human-made	Other	10,260	13.97	100.00
Top 10 human-made OXIDES OF NITROGEN sources in the Newcastle region				
On-road mobile	Passenger vehicle petrol – exhaust	1,666	17.52	17.52
Off-road mobile	Ships	1,643	17.28	34.81
On-road mobile	Heavy duty commercial diesel – exhaust	1,511	15.90	50.70
Off-road mobile	Industrial vehicles and equipment	1,305	13.73	64.43
Industrial	Ammonium nitrate production	844	8.88	73.31
On-road mobile	Light duty commercial petrol – exhaust	530	5.57	78.89
Industrial	Aluminium production (alumina)	347	3.65	82.54
Off-road mobile	Locomotives	306	3.22	85.75
Off-road mobile	Commercial boats exhaust	227	2.38	88.14
On-road mobile	Light duty diesel – exhaust	177	1.87	90.00
Human-made	Other	950	10.00	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made OXIDES OF NITROGEN sources in the Wollongong region				
Industrial	Iron or steel production (iron ore)	7,513	64.17	64.17
On-road mobile	Passenger vehicle petrol – exhaust	938	8.02	72.19
On-road mobile	Heavy duty commercial diesel – exhaust	783	6.68	78.87
Off-road mobile	Ships	706	6.03	84.90
Off-road mobile	Industrial vehicles and equipment	607	5.18	90.08
On-road mobile	Light duty commercial petrol – exhaust	346	2.96	93.04
Off-road mobile	Locomotives	252	2.15	95.19
Industrial	Generation of electrical power from gas	178	1.52	96.71
On-road mobile	Light duty diesel – exhaust	107	0.91	97.62
Domestic-commercial	Gaseous fuel burning	78	0.66	98.28
Human-made	Other	201	1.72	100.00
Top 10 human-made OXIDES OF NITROGEN sources in the Non Urban region				
Industrial	Generation of electrical power from coal	165,956	77.30	77.30
Off-road mobile	Industrial vehicles and equipment	26,204	12.20	89.50
On-road mobile	Heavy duty commercial diesel – exhaust	4,702	2.19	91.69
Industrial	Cement or lime production	4,213	1.96	93.65
On-road mobile	Passenger vehicle petrol – exhaust	3,336	1.55	95.21
Off-road mobile	Locomotives	2,602	1.21	96.42
Industrial	Mining for coal	2,313	1.08	97.50
Off-road mobile	Ships	1,938	0.90	98.40
On-road mobile	Light duty commercial petrol – exhaust	1,004	0.47	98.87
Off-road mobile	Commercial boats exhaust	843	0.39	99.26
Human-made	Other	1,593	0.74	100.00

Figure ES-17, Figure ES-18, Figure ES-19, Figure ES-20 and Figure ES-21 show the proportions of total estimated annual emissions for the top 10 human-made sources of oxides of nitrogen in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

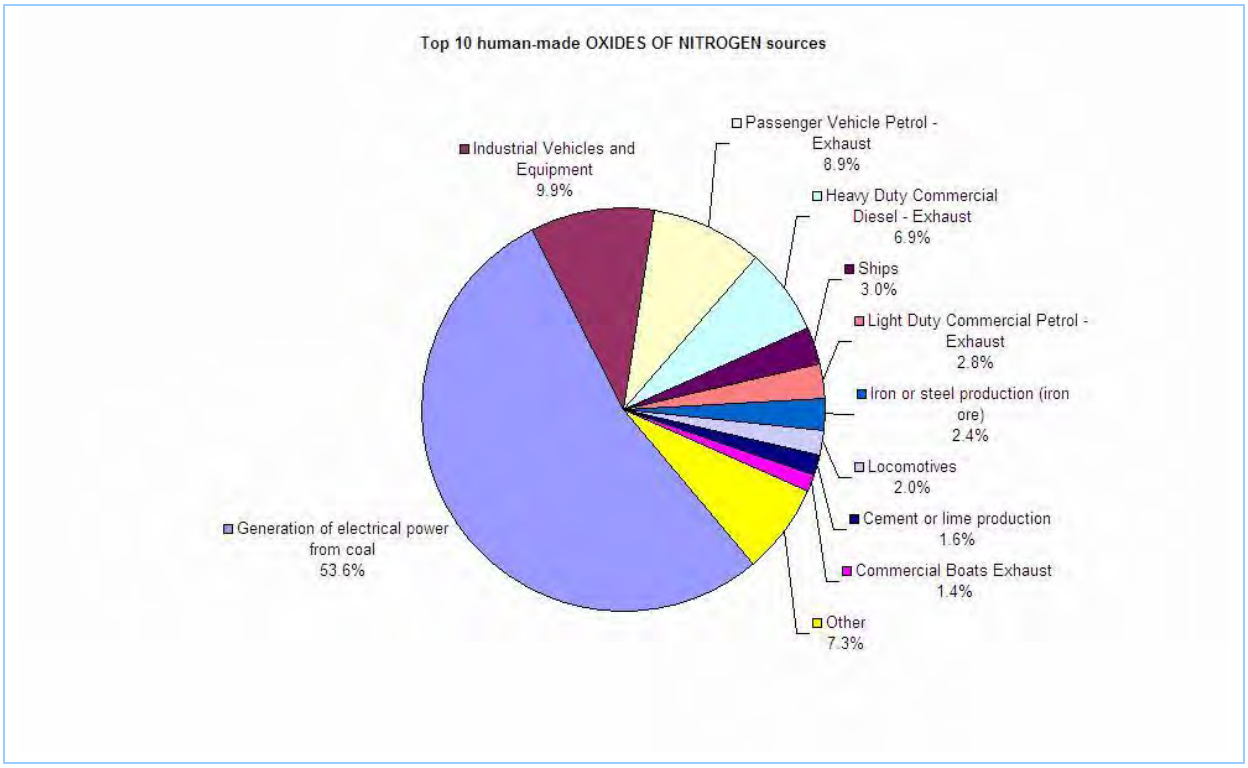

Figure ES-17: Top 10 human-made sources of oxides of nitrogen in the GMR

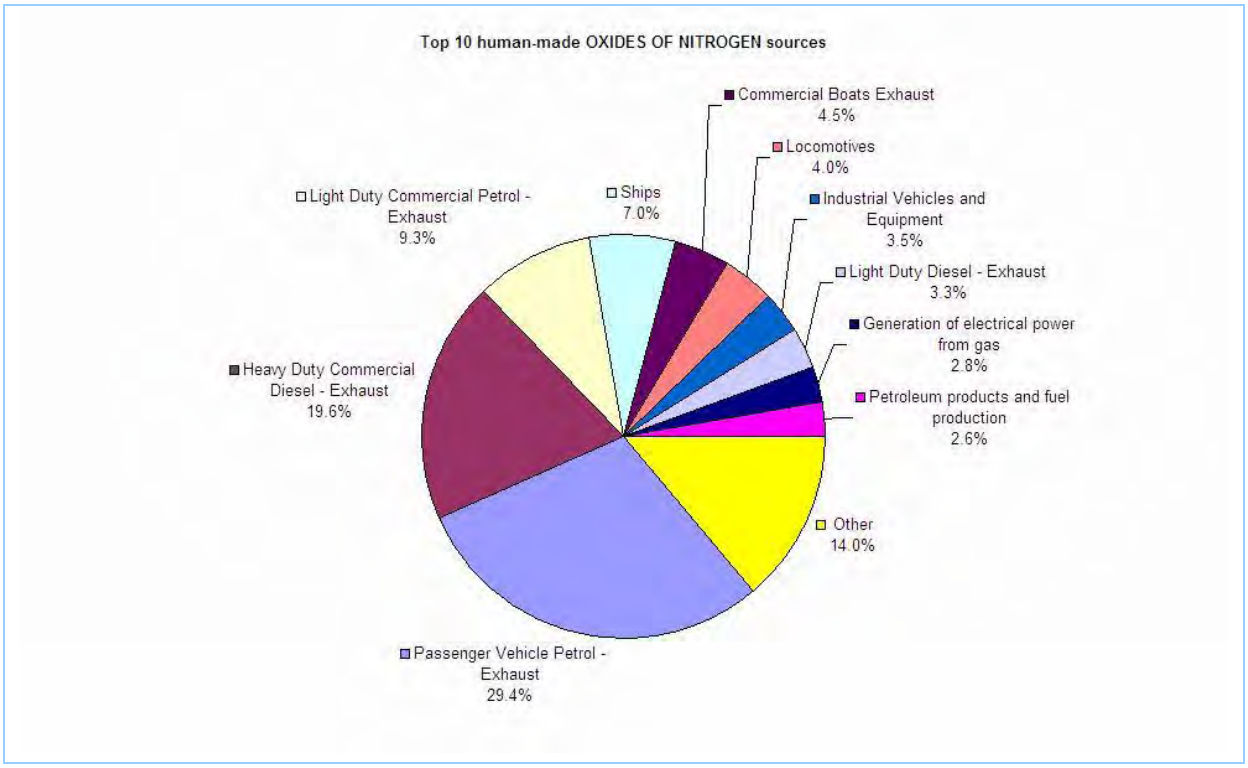

Figure ES-18: Top 10 human-made sources of oxides of nitrogen in the Sydney region

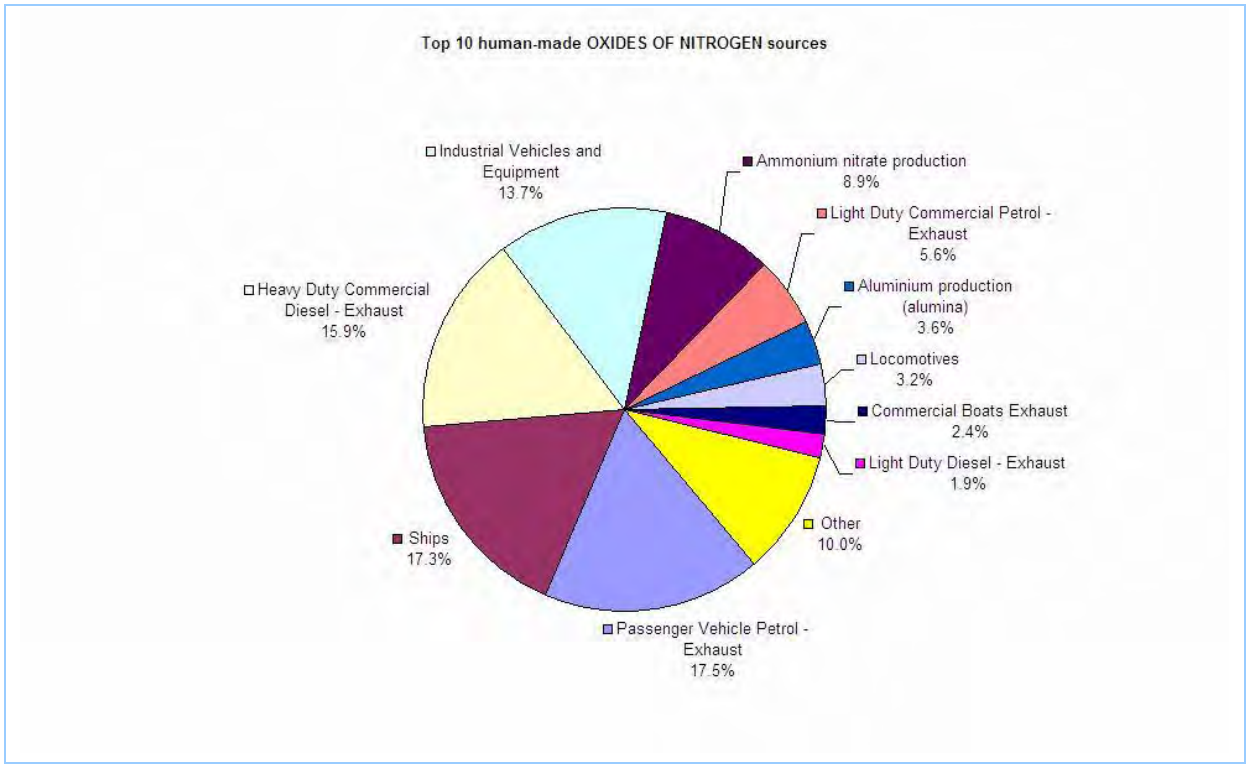

Figure ES-19: Top 10 human-made sources of oxides of nitrogen in the Newcastle region

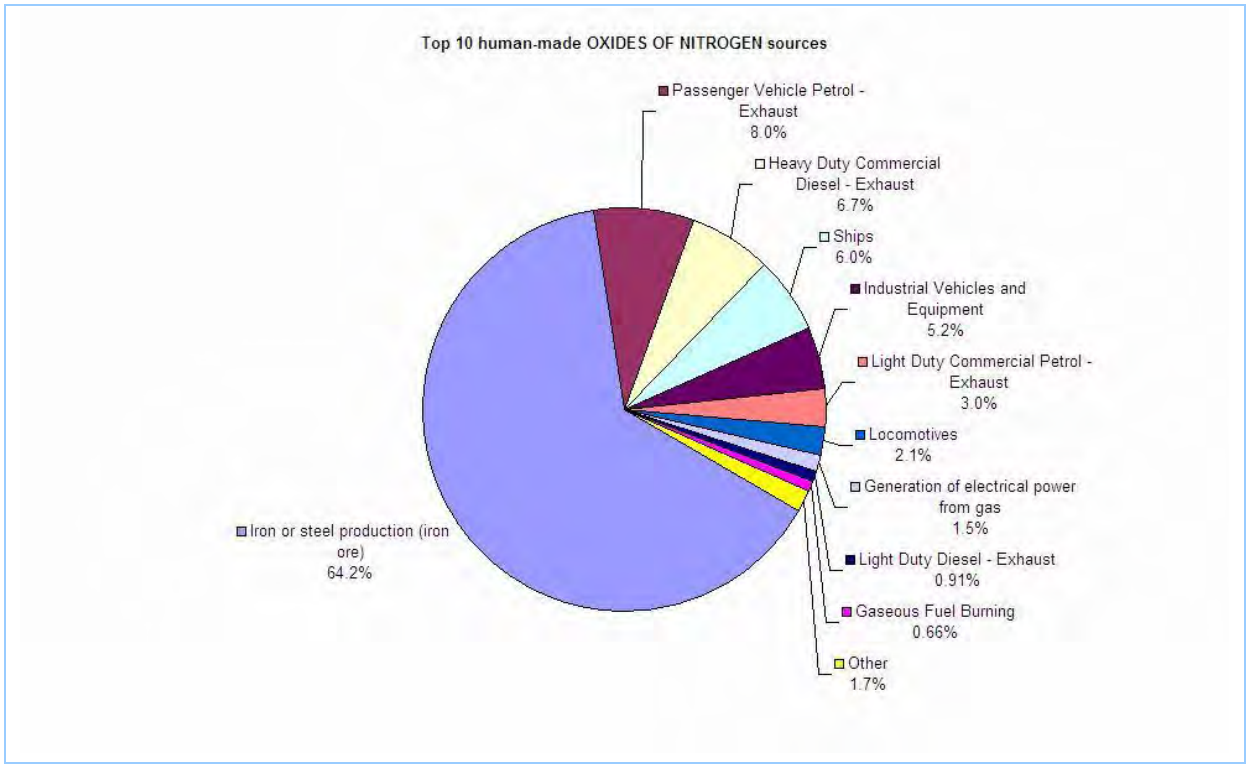

Figure ES-20: Top 10 human-made sources of oxides of nitrogen in the Wollongong region

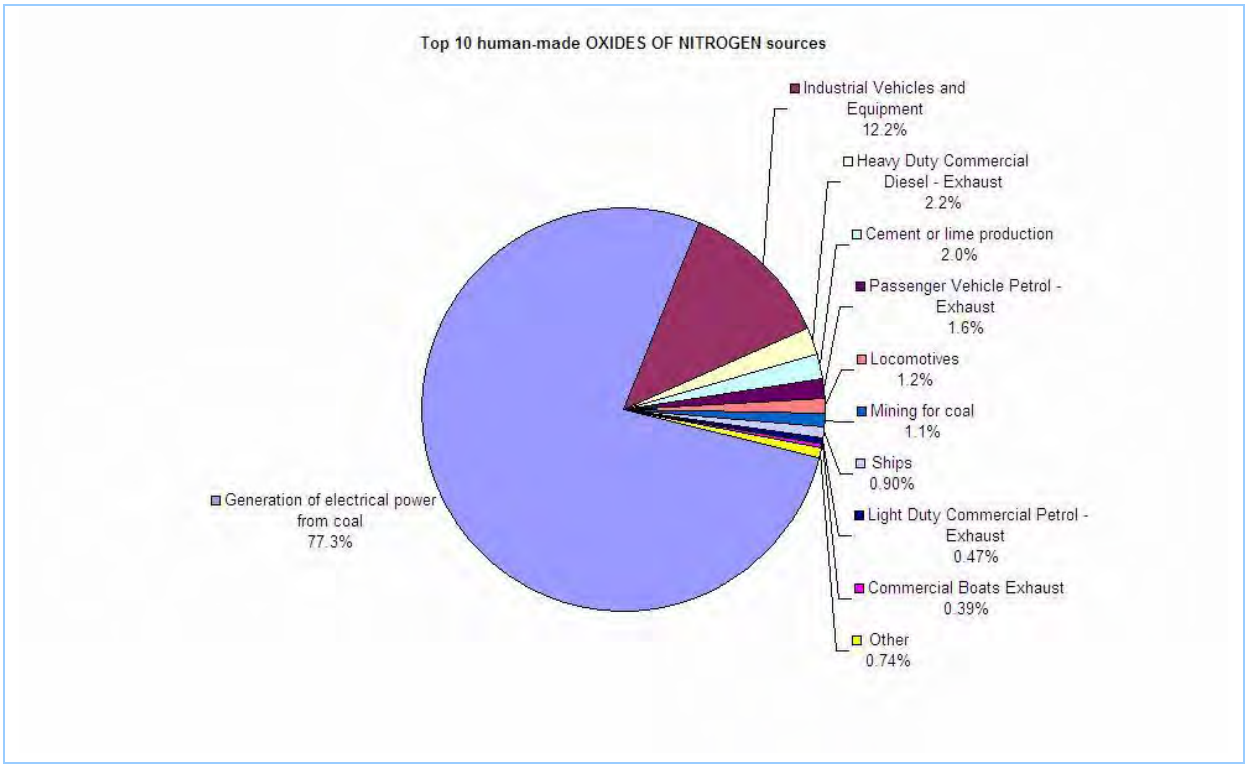

Figure ES-21: Top 10 human-made sources of oxides of nitrogen in the Non Urban region

Table ES-8 presents total estimated annual emissions, proportions and cumulative proportions for the top 10 human-made sources of particulate matter ≤ 10 µm in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table ES-8: Top 10 human-made sources of particulate matter ≤ 10 µm in each region

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made PARTICULATE MATTER ≤ 10 µm sources in the GMR				
Industrial	Mining for coal	52,462	58.41	58.41
Domestic-commercial	Solid fuel burning (domestic)	7,645	8.51	66.92
Industrial	Generation of electrical power from coal	6,515	7.25	74.17
Industrial	Land-based extractive activity	2,802	3.12	77.29
Off-road mobile	Industrial vehicles and equipment	2,094	2.33	79.62
Industrial	Iron or steel production (iron ore)	1,749	1.95	81.57
Industrial	Waste disposal (application to land)	1,592	1.77	83.34
On-road mobile	All non-exhaust particulate matter	1,450	1.61	84.95
Commercial	Gravel and sand quarrying	1,388	1.54	86.50
Industrial	Other land-based extraction	1,363	1.52	88.02
Human-made	Other	10,763	11.98	100.00
Top 10 human-made PARTICULATE MATTER ≤ 10 µm sources in the Sydney region				
Domestic-commercial	Solid fuel burning (domestic)	5,669	34.27	34.27
Industrial	Other land-based extraction	1,300	7.86	42.13
Industrial	Waste disposal (application to land)	1,224	7.40	49.53
On-road mobile	All non-exhaust particulate matter	1,123	6.79	56.32
Industrial	Ceramics production	681	4.12	60.43
Commercial	Gravel and sand quarrying	646	3.91	64.34
On-road mobile	Heavy duty commercial diesel – exhaust	592	3.58	67.91
Off-road mobile	Ships	539	3.26	71.17
Industrial	Mining for coal	410	2.48	73.65
Industrial	Crushing, grinding or separating	372	2.25	75.90
Human-made	Other	3,987	24.10	100.00
Top 10 human-made PARTICULATE MATTER ≤ 10 µm sources in the Newcastle region				
Industrial	Mining for coal	1,747	36.11	36.11
Industrial	Coal works	753	15.57	51.68
Domestic-commercial	Solid fuel burning (domestic)	474	9.79	61.47
Industrial	Ammonium nitrate production	323	6.68	68.15
Industrial	Land-based extractive activity	207	4.27	72.43
Industrial	Aluminium production (alumina)	186	3.84	76.27
Off-road mobile	Ships	159	3.28	79.55
Industrial	Waste disposal (application to land)	158	3.27	82.81
Off-road mobile	Industrial vehicles and equipment	90	1.86	84.67
On-road mobile	All non-exhaust particulate matter	90	1.86	86.53
Human-made	Other	652	13.47	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made PARTICULATE MATTER ≤ 10 µm sources in the Wollongong region				
Industrial	Iron or steel production (iron ore)	1,749	65.02	65.02
Domestic-commercial	Solid fuel burning (domestic)	313	11.63	76.64
Industrial	Mining for coal	86	3.19	79.83
Industrial	Coal works	74	2.74	82.57
Off-road mobile	Ships	68	2.51	85.08
On-road mobile	All non-exhaust particulate matter	44	1.63	86.71
Industrial	Generation of electrical power from gas	36	1.32	88.04
Off-road mobile	Industrial vehicles and equipment	35	1.32	89.36
Commercial	Gravel and sand quarrying	35	1.31	90.66
Industrial	Waste disposal (application to land)	32	1.20	91.86
Human-made	Other	219	8.14	100.00
Top 10 human-made PARTICULATE MATTER ≤ 10 µm sources in the Non Urban region				
Industrial	Mining for coal	50,219	76.38	76.38
Industrial	Generation of electrical power from coal	6,515	9.91	86.29
Industrial	Land-based extractive activity	2,301	3.50	89.79
Off-road mobile	Industrial vehicles and equipment	1,818	2.77	92.55
Domestic-commercial	Solid fuel burning (domestic)	1,189	1.81	94.36
Industrial	Cement or lime production	637	0.97	95.33
Commercial	Gravel and sand quarrying	621	0.94	96.27
Industrial	Mining for minerals	441	0.67	96.94
Industrial	Aluminium production (alumina)	205	0.31	97.25
On-road mobile	All non-exhaust particulate matter	193	0.29	97.55
Human-made	Other	1,612	2.45	100.00

Figure ES-22, Figure ES-23, Figure ES-24, Figure ES-25 and Figure ES-26 show the proportions of total estimated annual emissions for the top 10 human-made sources of particulate matter ≤ 10 µm in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

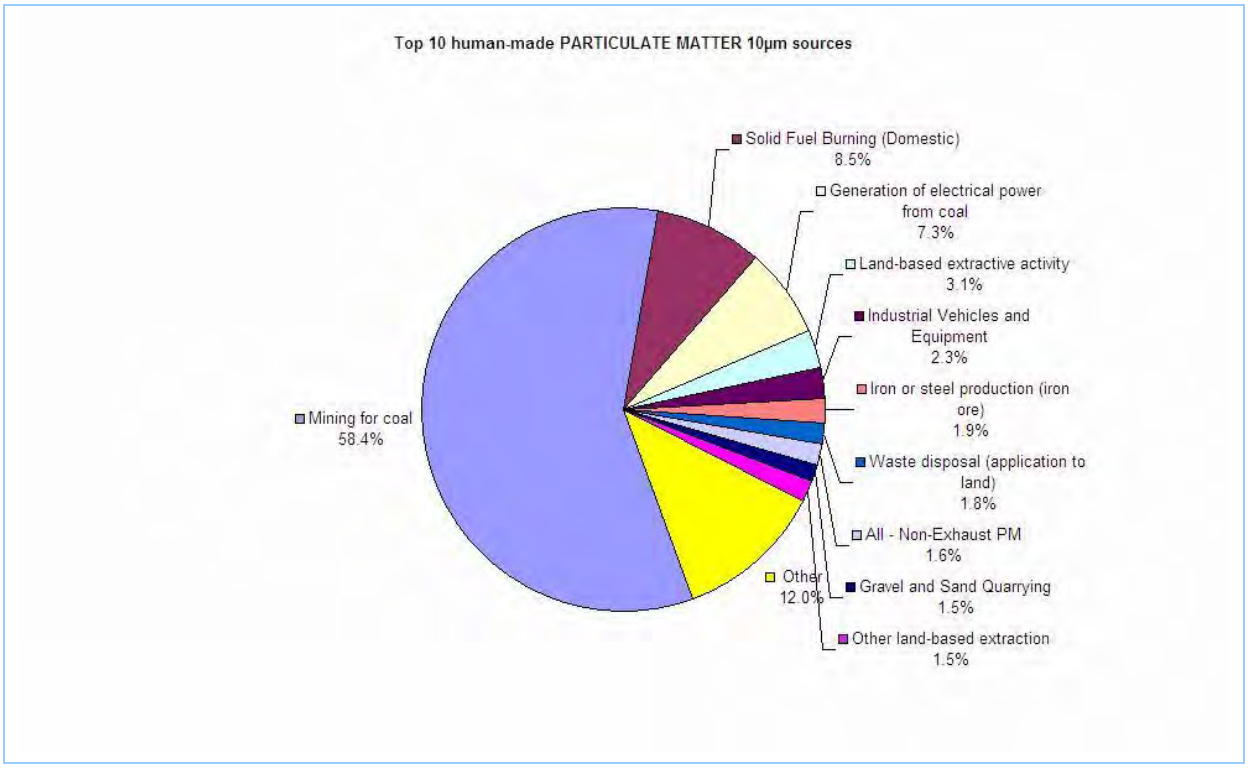

Figure ES-22: Top 10 human-made sources of particulate matter ≤ 10 µm in the GMR

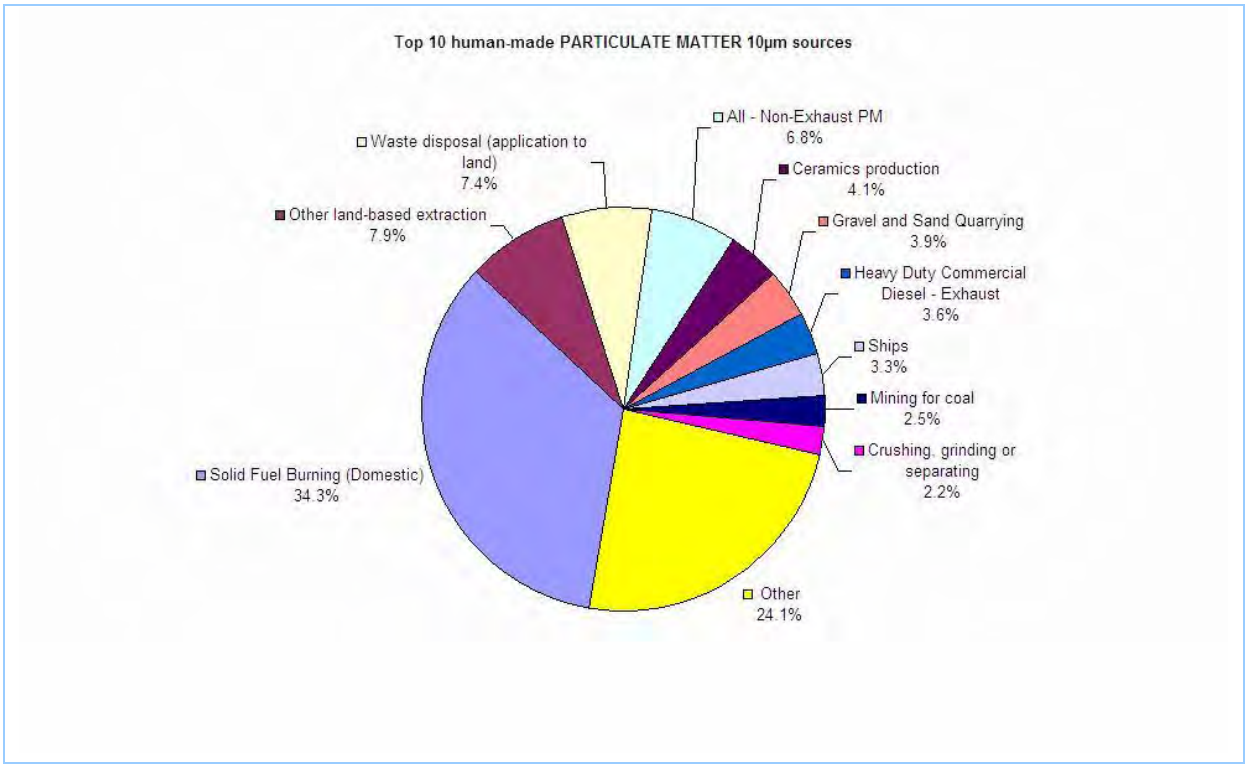

Figure ES-23: Top 10 human-made sources of particulate matter ≤ 10 µm in the Sydney region

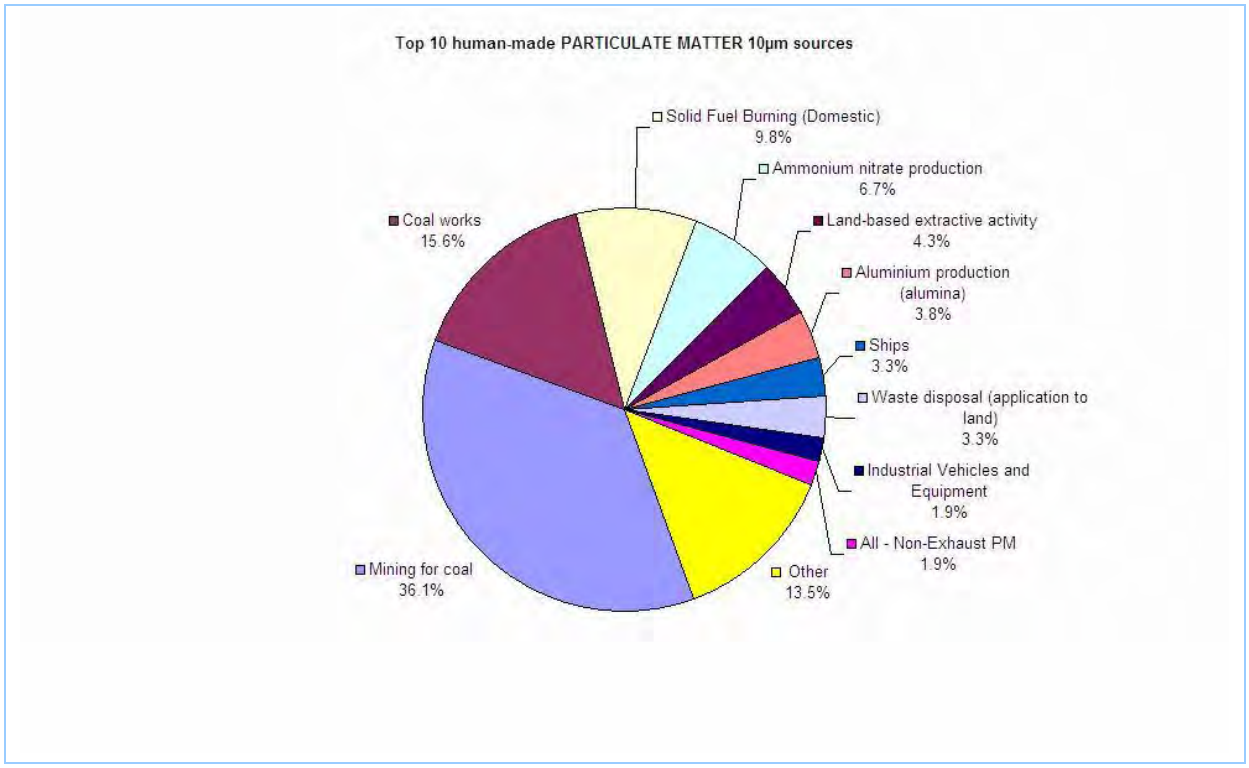

Figure ES-24: Top 10 human-made sources of particulate matter ≤ 10 µm in the Newcastle region

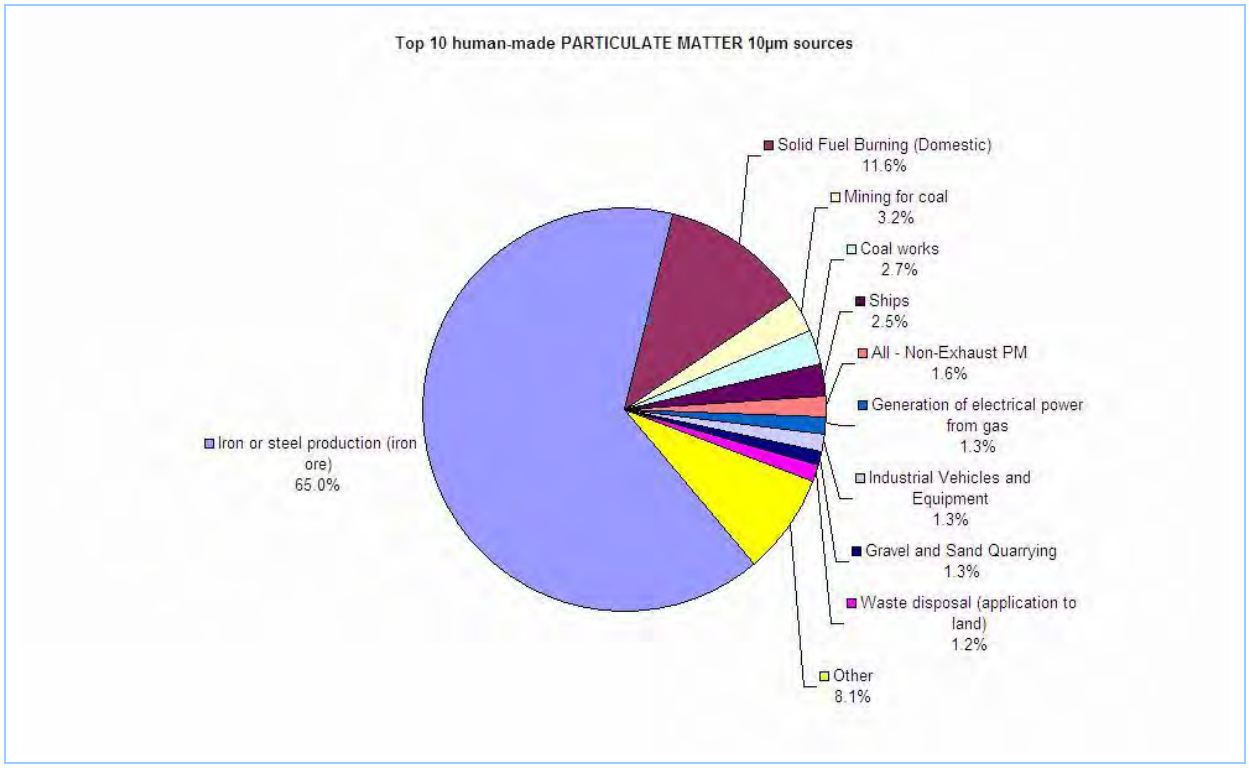

Figure ES-25: Top 10 human-made sources of particulate matter ≤ 10 µm in the Wollongong region

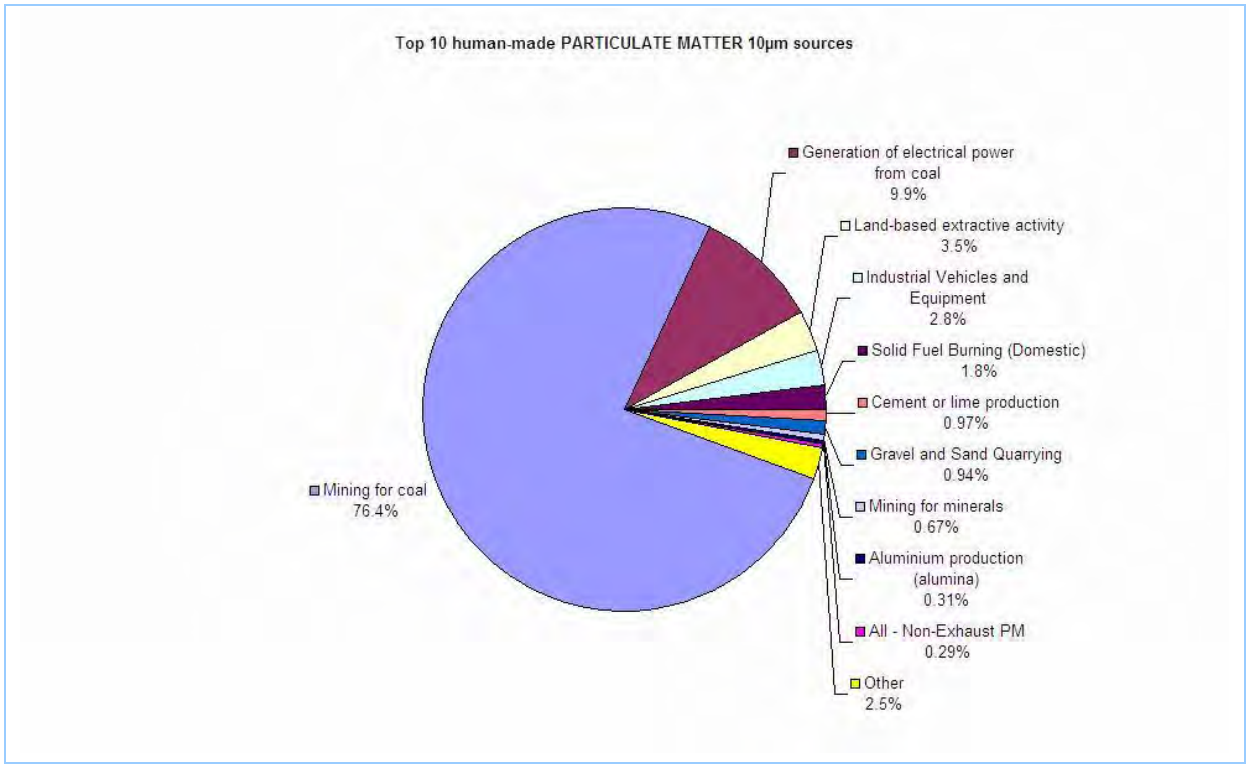

Figure ES-26: Top 10 human-made sources of particulate matter ≤ 10 µm in the Non Urban region

Table ES-9 presents total estimated annual emissions, proportions and cumulative proportions for the top 10 human-made sources of particulate matter ≤ 2.5 µm in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table ES-9: Top 10 human-made sources of particulate matter ≤ 2.5 µm in each region

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made PARTICULATE MATTER ≤ 2.5 µm sources in the GMR				
Industrial	Mining for coal	8,832	27.82	27.82
Domestic-commercial	Solid fuel burning (domestic)	7,359	23.18	51.01
Industrial	Generation of electrical power from coal	3,335	10.51	61.51
Off-road mobile	Industrial vehicles and equipment	2,031	6.40	67.91
Industrial	Iron or steel production (iron ore)	1,223	3.85	71.76
Off-road mobile	Ships	849	2.67	74.44
On-road mobile	Heavy duty commercial diesel – exhaust	816	2.57	77.01
On-road mobile	All non-exhaust particulate matter	771	2.43	79.44
Industrial	Ceramics production	593	1.87	81.30
Industrial	Cement or lime production	582	1.83	83.14
Human-made	Other	5,352	16.86	100.00
Top 10 human-made PARTICULATE MATTER ≤ 2.5 µm sources in the Sydney region				
Domestic-commercial	Solid fuel burning (domestic)	5,457	50.64	50.64
On-road mobile	All non-exhaust particulate matter	597	5.54	56.19
On-road mobile	Heavy duty commercial diesel – exhaust	574	5.33	61.51
Off-road mobile	Ships	496	4.60	66.11
Industrial	Ceramics production	478	4.43	70.55
On-road mobile	Light duty diesel – exhaust	239	2.22	72.77
Industrial	Waste disposal (application to land)	226	2.10	74.87
Commercial	Synthetic resin manufacturing	189	1.75	76.62
Off-road mobile	Industrial vehicles and equipment	146	1.35	77.98
Industrial	Other land-based extraction	145	1.35	79.32
Human-made	Other	2,228	20.68	100.00
Top 10 human-made PARTICULATE MATTER ≤ 2.5 µm sources in the Newcastle region				
Domestic-commercial	Solid fuel burning (domestic)	456	22.54	22.54
Industrial	Ammonium nitrate production	316	15.63	38.17
Industrial	Mining for coal	302	14.91	53.08
Off-road mobile	Ships	146	7.21	60.29
Industrial	Aluminium production (alumina)	119	5.90	66.19
Industrial	Coal works	93	4.61	70.81
Off-road mobile	Industrial vehicles and equipment	87	4.31	75.12
On-road mobile	Heavy duty commercial diesel – exhaust	56	2.74	77.86
Industrial	Iron or steel production (scrap metal)	53	2.60	80.46
Industrial	Boat construction/maintenance (dry/float)	49	2.41	82.88
Human-made	Other	346	17.12	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made PARTICULATE MATTER ≤ 2.5 µm sources in the Wollongong region				
Industrial	Iron or steel production (iron ore)	1,223	65.46	65.46
Domestic-commercial	Solid fuel burning (domestic)	301	16.12	81.57
Off-road mobile	Ships	62	3.33	84.90
Industrial	Generation of electrical power from gas	36	1.90	86.81
Off-road mobile	Industrial vehicles and equipment	34	1.84	88.65
On-road mobile	Heavy duty commercial diesel – exhaust	28	1.50	90.15
Industrial	Coke production	28	1.48	91.63
On-road mobile	All non-exhaust particulate matter	23	1.25	92.88
Industrial	Mining for coal	12	0.63	93.50
Industrial	Coal works	11	0.61	94.11
Human-made	Other	110	5.89	100.00
Top 10 human-made PARTICULATE MATTER ≤ 2.5 µm sources in the Non Urban region				
Industrial	Mining for coal	8,467	49.58	49.58
Industrial	Generation of electrical power from coal	3,335	19.53	69.11
Off-road mobile	Industrial vehicles and equipment	1,764	10.33	79.44
Domestic-commercial	Solid fuel burning (domestic)	1,145	6.70	86.15
Industrial	Cement or lime production	544	3.19	89.33
Industrial	Land-based extractive activity	463	2.71	92.05
On-road mobile	Heavy duty commercial diesel – exhaust	159	0.93	92.98
Off-road mobile	Ships	145	0.85	93.82
Commercial	Gravel and sand quarrying	136	0.80	94.62
Industrial	Aluminium production (alumina)	135	0.79	95.41
Human-made	Other	784	4.59	100.00

Figure ES-27, Figure ES-28, Figure ES-29, Figure ES-30 and Figure ES-31 show the proportions of total estimated annual emissions for the top 10 human-made sources of particulate matter ≤ 2.5 µm in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

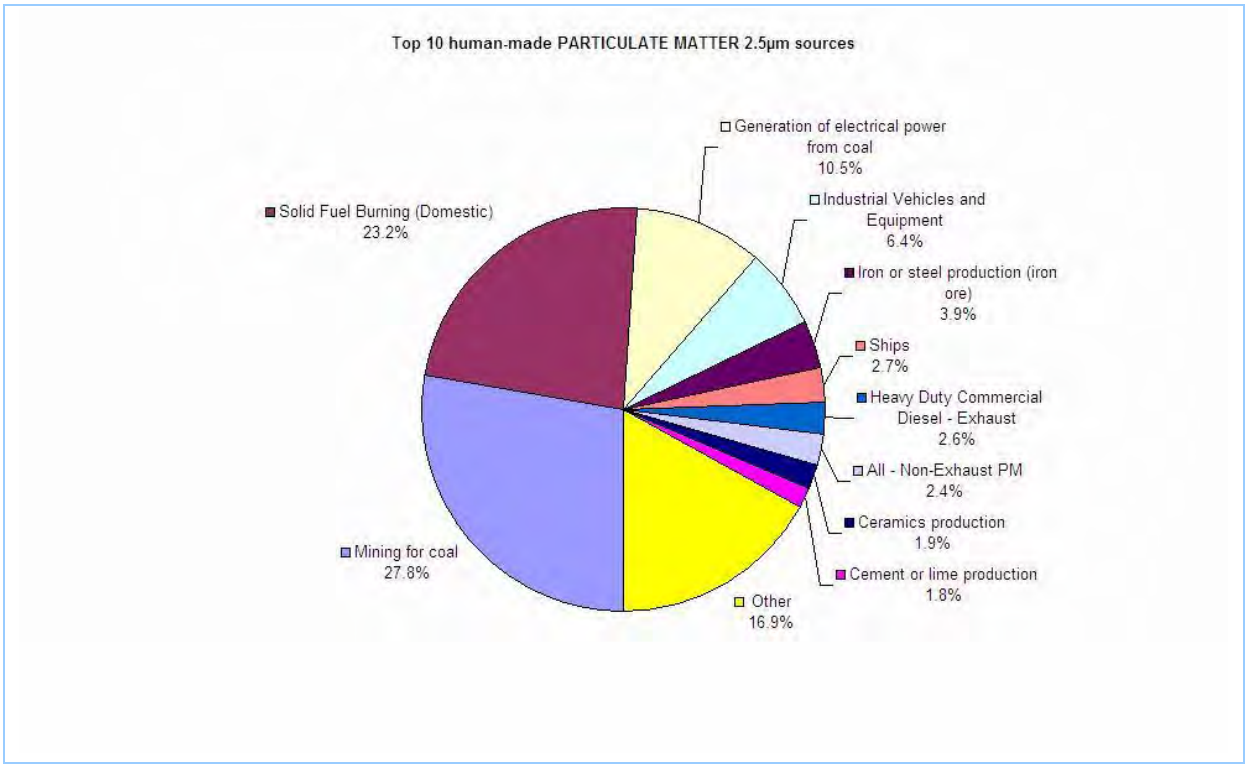

Figure ES-27: Top 10 human-made sources of particulate matter ≤ 2.5 µm in the GMR

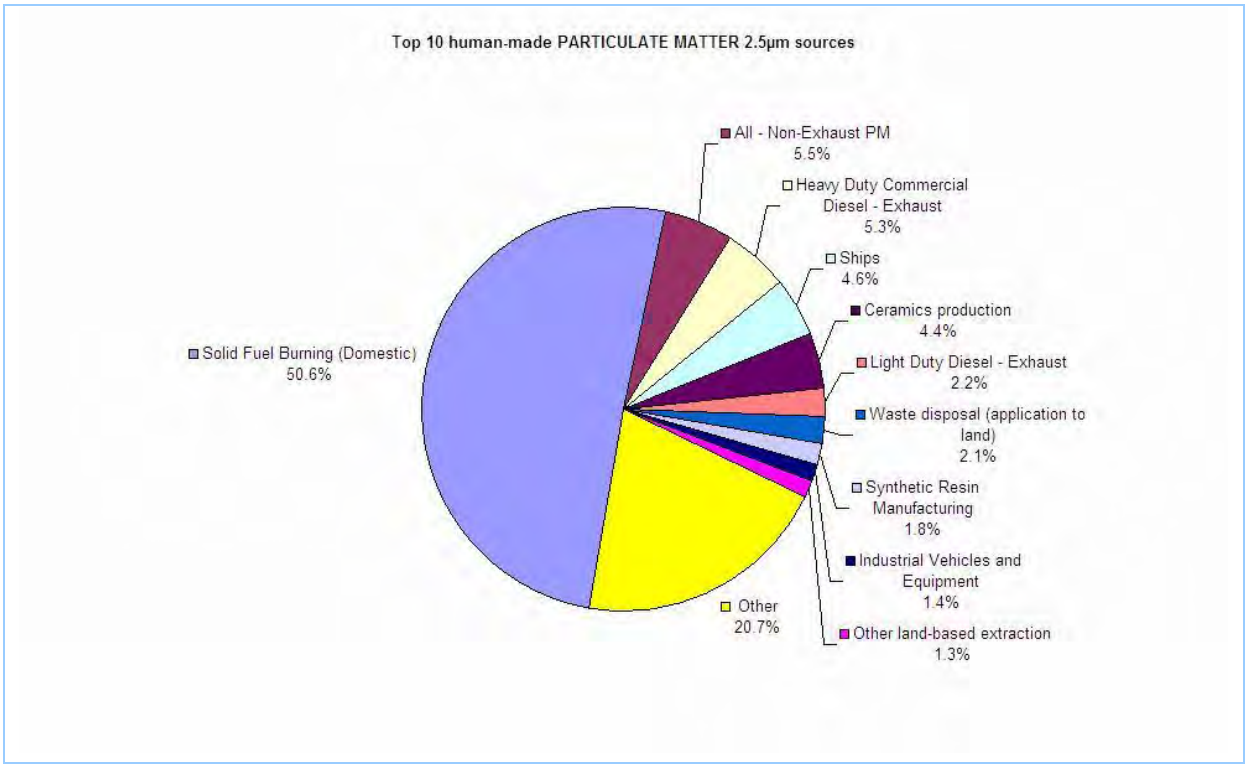

Figure ES-28: Top 10 human-made sources of particulate matter ≤ 2.5 µm in the Sydney region

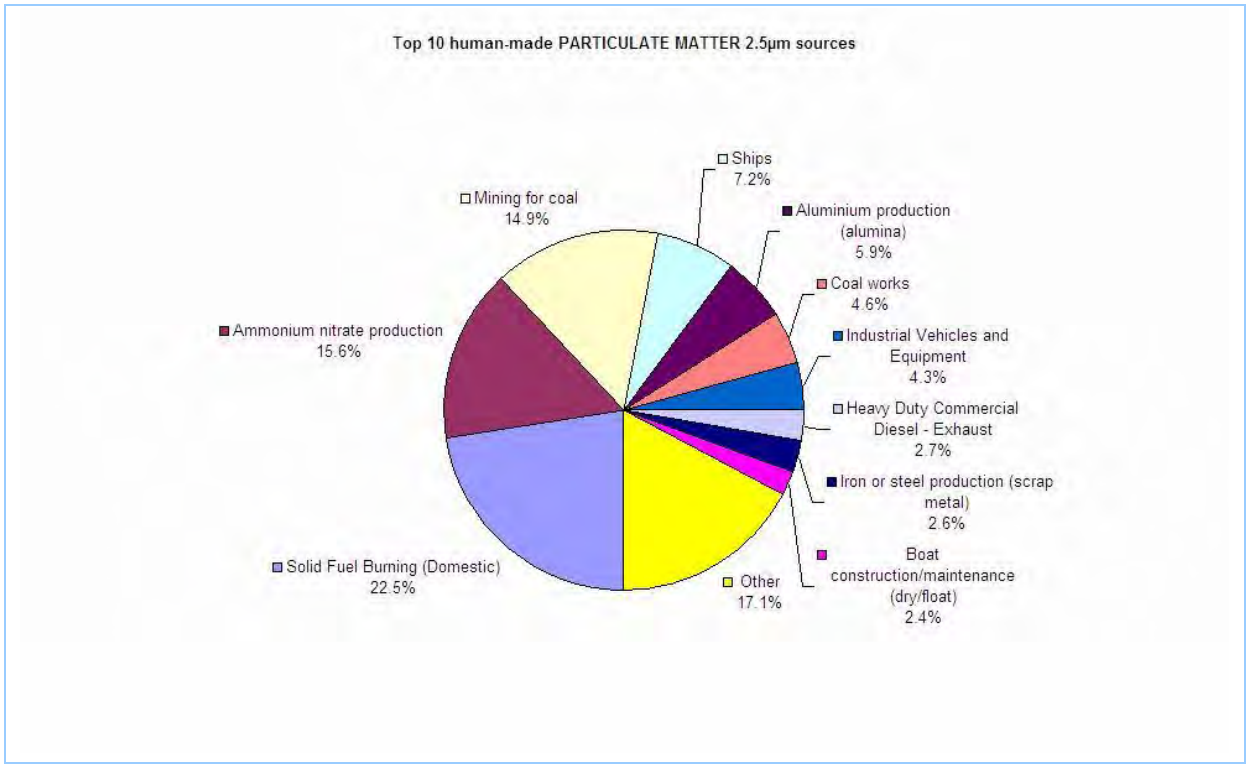

Figure ES-29: Top 10 human-made sources of particulate matter ≤ 2.5 µm in the Newcastle region

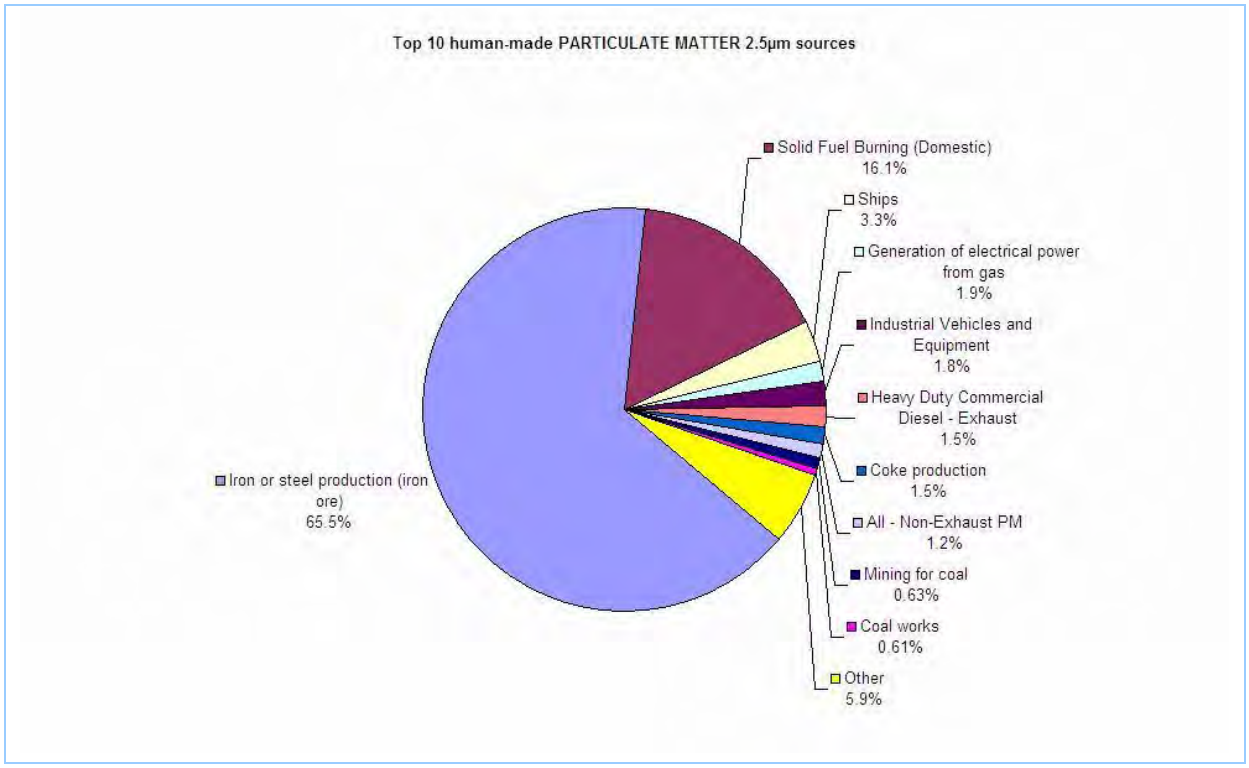

Figure ES-30: Top 10 human-made sources of particulate matter ≤ 2.5 µm in the Wollongong region

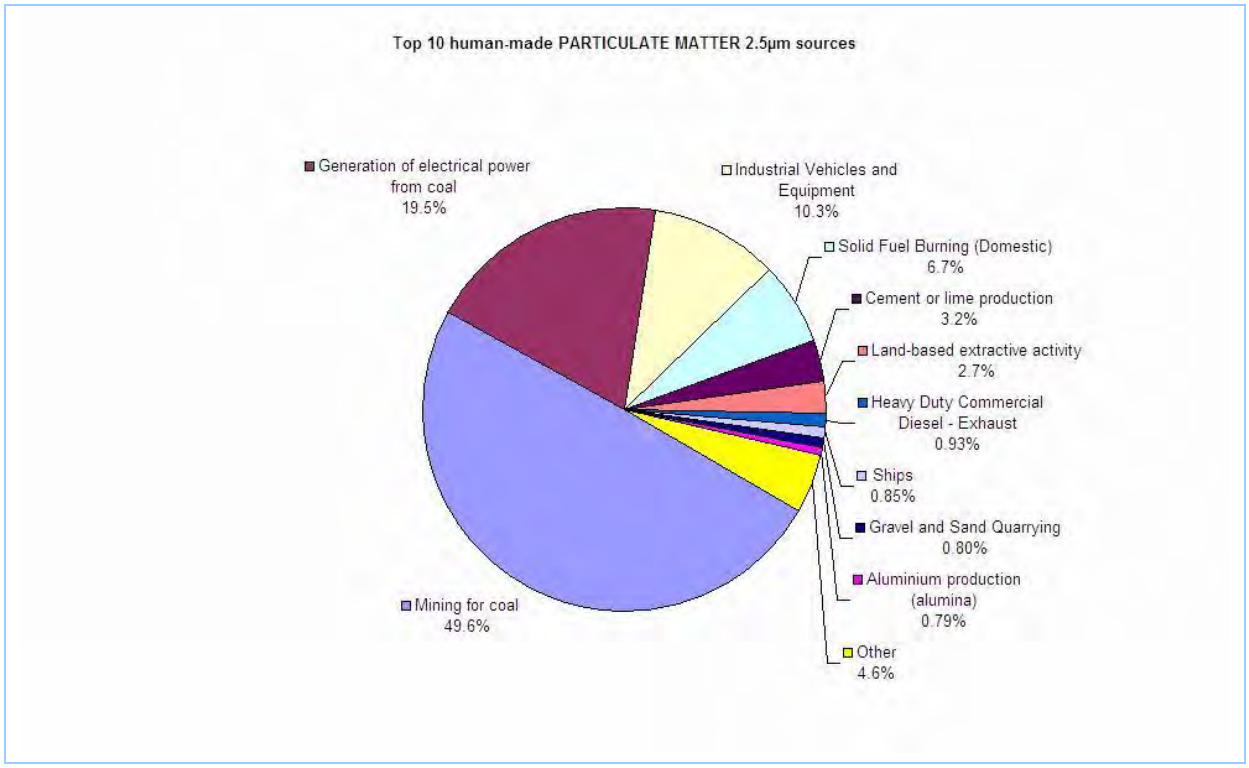

Figure ES-31: Top 10 human-made sources of particulate matter ≤ 2.5 µm in the Non Urban region

Table ES-10 presents total estimated annual emissions, proportions and cumulative proportions for the top 10 human-made sources of sulfur dioxide in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table ES-10: Top 10 human-made sources of sulfur dioxide in each region

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made SULFUR DIOXIDE sources in the GMR				
Industrial	Generation of electrical power from coal	251,437	87.03	87.03
Industrial	Aluminium production (alumina)	13,857	4.80	91.82
Industrial	Iron or steel production (iron ore)	8,216	2.84	94.67
Off-road mobile	Ships	7,557	2.62	97.28
Industrial	Petroleum products and fuel production	3,119	1.08	98.36
Industrial	Petroleum products storage	737	0.26	98.62
Industrial	Ceramics production	581	0.20	98.82
Industrial	Mining for coal	496	0.17	98.99
Industrial	Coke production	455	0.16	99.15
Industrial	Cement or lime production	379	0.13	99.28
Human-made	Other	2,085	0.72	100.00
Top 10 human-made SULFUR DIOXIDE sources in the Sydney region				
Off-road mobile	Ships	4,538	42.22	42.22
Industrial	Petroleum products and fuel production	3,111	28.94	71.17
Industrial	Petroleum products storage	737	6.86	78.03
Industrial	Ceramics production	505	4.69	82.72
Industrial	Glass production (container)	327	3.05	85.77
Industrial	Coke production	237	2.20	87.97
Industrial	Petrochemical production	229	2.13	90.10
Industrial	Glass production (float)	223	2.08	92.18
Off-road mobile	Aircraft (flight operations)	160	1.48	93.66
On-road mobile	Passenger vehicle petrol – exhaust	144	1.34	95.00
Human-made	Other	537	5.00	100.00
Top 10 human-made SULFUR DIOXIDE sources in the Newcastle region				
Industrial	Aluminium production (alumina)	10,119	87.29	87.29
Off-road mobile	Ships	1,292	11.15	98.43
Industrial	Slaughtering or processing of animals	65	0.56	99.00
Industrial	Chemical production	65	0.56	99.55
On-road mobile	Passenger vehicle petrol – exhaust	9.73	8.40×10^{-2}	99.64
Industrial	Iron or steel production (scrap metal)	8.91	7.69×10^{-2}	99.71
Domestic-commercial	Solid fuel burning (domestic)	8.01	6.91×10^{-2}	99.78
Industrial	Bitumen mixing	4.42	3.82×10^{-2}	99.82
Off-road mobile	Aircraft (flight operations)	2.88	2.49×10^{-2}	99.85
Off-road mobile	Industrial vehicles and equipment	2.68	2.31×10^{-2}	99.87
Human-made	Other	15	0.13	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made SULFUR DIOXIDE sources in the Wollongong region				
Industrial	Iron or steel production (iron ore)	8,216	90.65	90.65
Off-road mobile	Ships	551	6.08	96.73
Industrial	Coke production	219	2.41	99.14
Industrial	General chemicals storage	31	0.34	99.49
Industrial	Metal plating or coating	24	0.27	99.76
Domestic-commercial	Solid fuel burning (domestic)	5.29	5.84×10^{-2}	99.81
On-road mobile	Passenger vehicle petrol – exhaust	5.15	5.68×10^{-2}	99.87
Industrial	Generation of electrical power from gas	2.76	3.05×10^{-2}	99.90
Off-road mobile	Industrial vehicles and equipment	1.41	1.55×10^{-2}	99.92
On-road mobile	Light duty commercial petrol – exhaust	1.36	1.50×10^{-2}	99.93
Human-made	Other	6.20	6.85×10^{-2}	100.00
Top 10 human-made SULFUR DIOXIDE sources in the Non Urban region				
Industrial	Generation of electrical power from coal	251,437	97.64	97.64
Industrial	Aluminium production (alumina)	3,738	1.45	99.09
Off-road mobile	Ships	1,176	0.46	99.55
Industrial	Mining for coal	495	0.19	99.74
Industrial	Cement or lime production	371	0.14	99.88
Industrial	Ceramics production	76	2.97×10^{-2}	99.91
Off-road mobile	Industrial vehicles and equipment	53	2.07×10^{-2}	99.93
Commercial	Log sawmilling	49	1.92×10^{-2}	99.95
On-road mobile	Passenger vehicle petrol – exhaust	22	8.46×10^{-3}	99.96
Domestic-commercial	Solid fuel burning (domestic)	20	7.81×10^{-3}	99.97
Human-made	Other	78	3.02×10^{-2}	100.00

Figure ES-32, Figure ES-33, Figure ES-34, Figure ES-35 and Figure ES-36 show the proportions of total estimated annual emissions for the top 10 human-made sources of sulfur dioxide in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

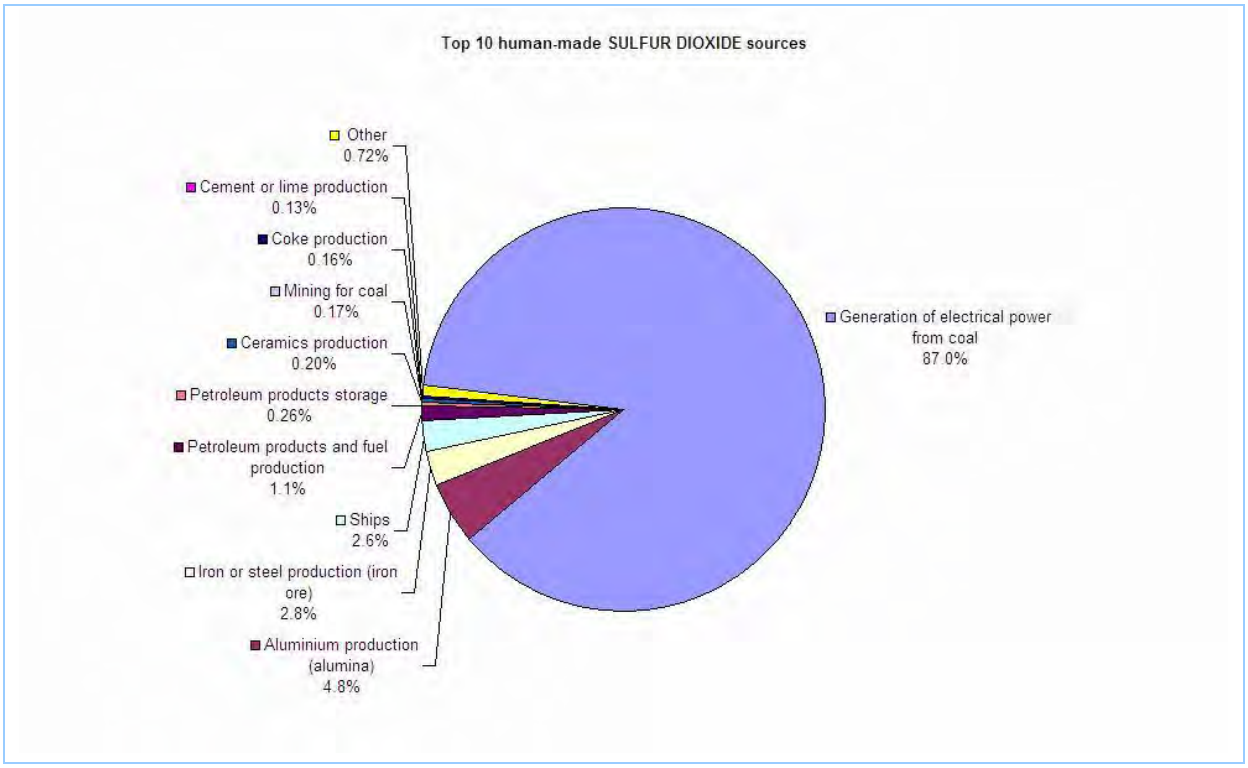

Figure ES-32: Top 10 human-made sources of sulfur dioxide in the GMR

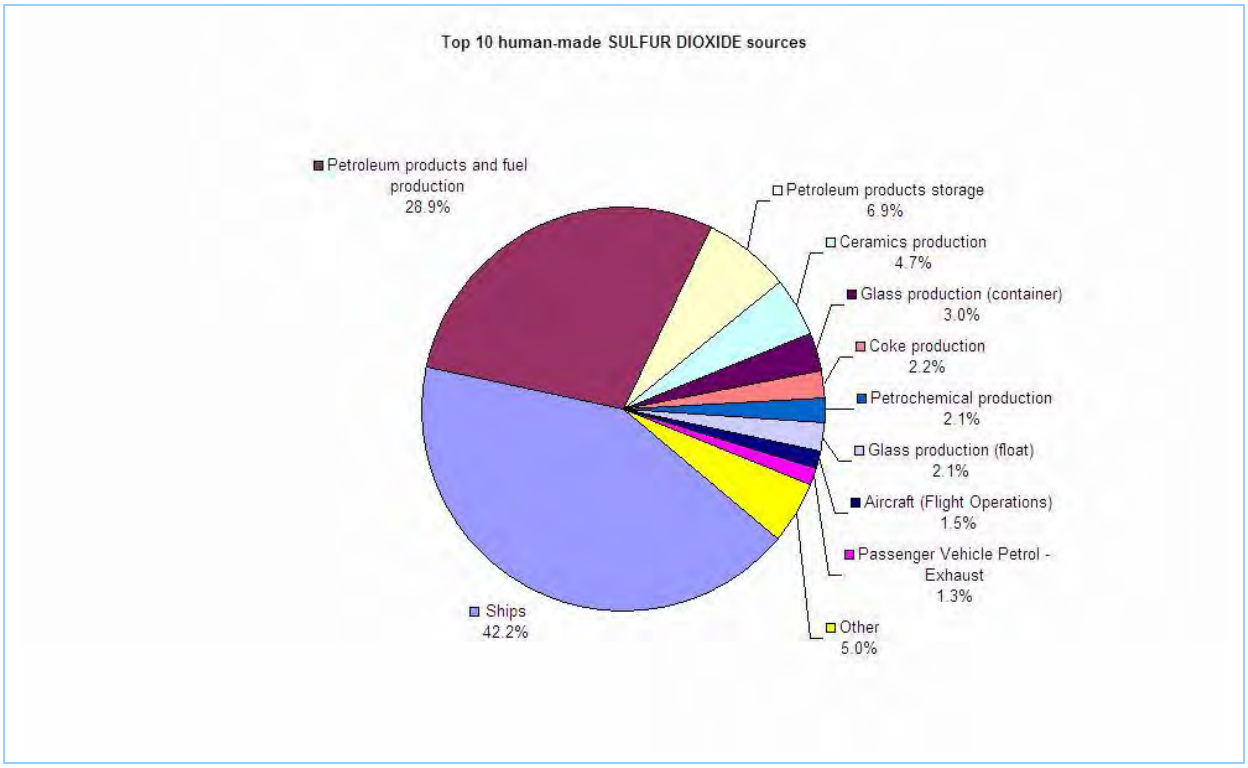

Figure ES-33: Top 10 human-made sources of sulfur dioxide in the Sydney region

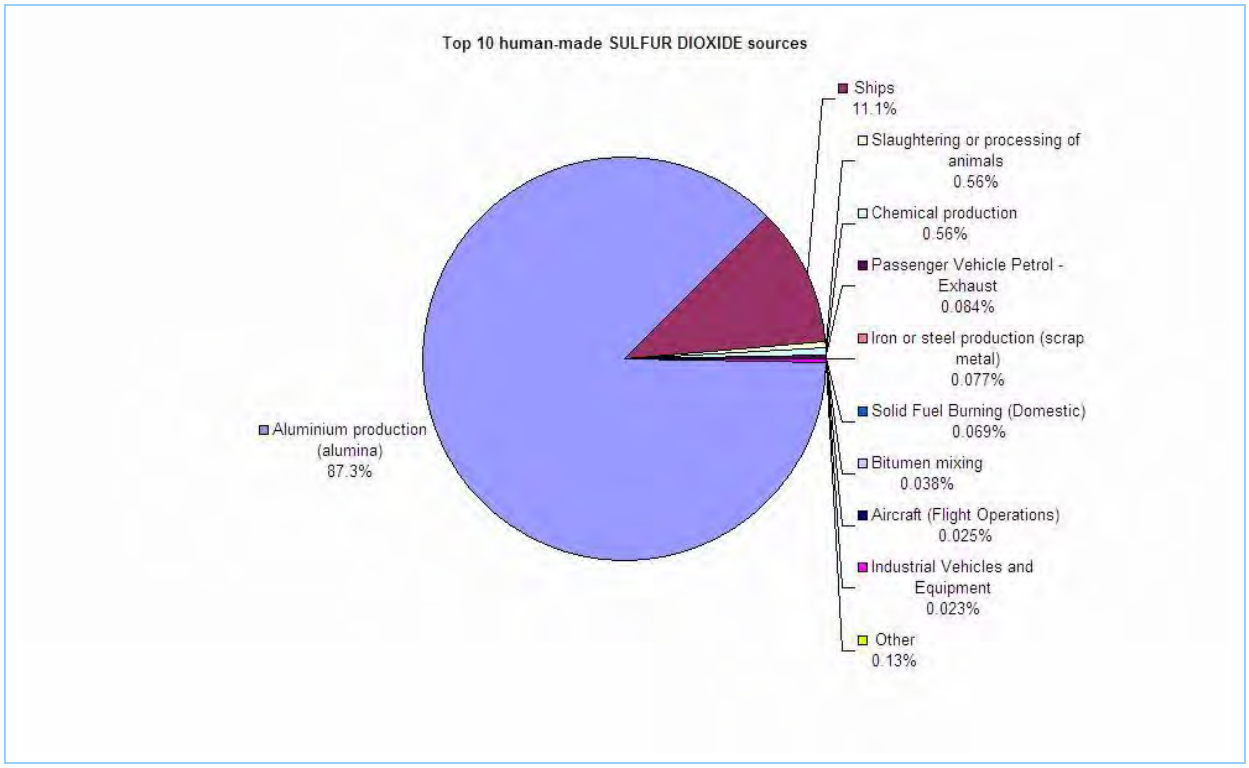

Figure ES-34: Top 10 human-made sources of sulfur dioxide in the Newcastle region

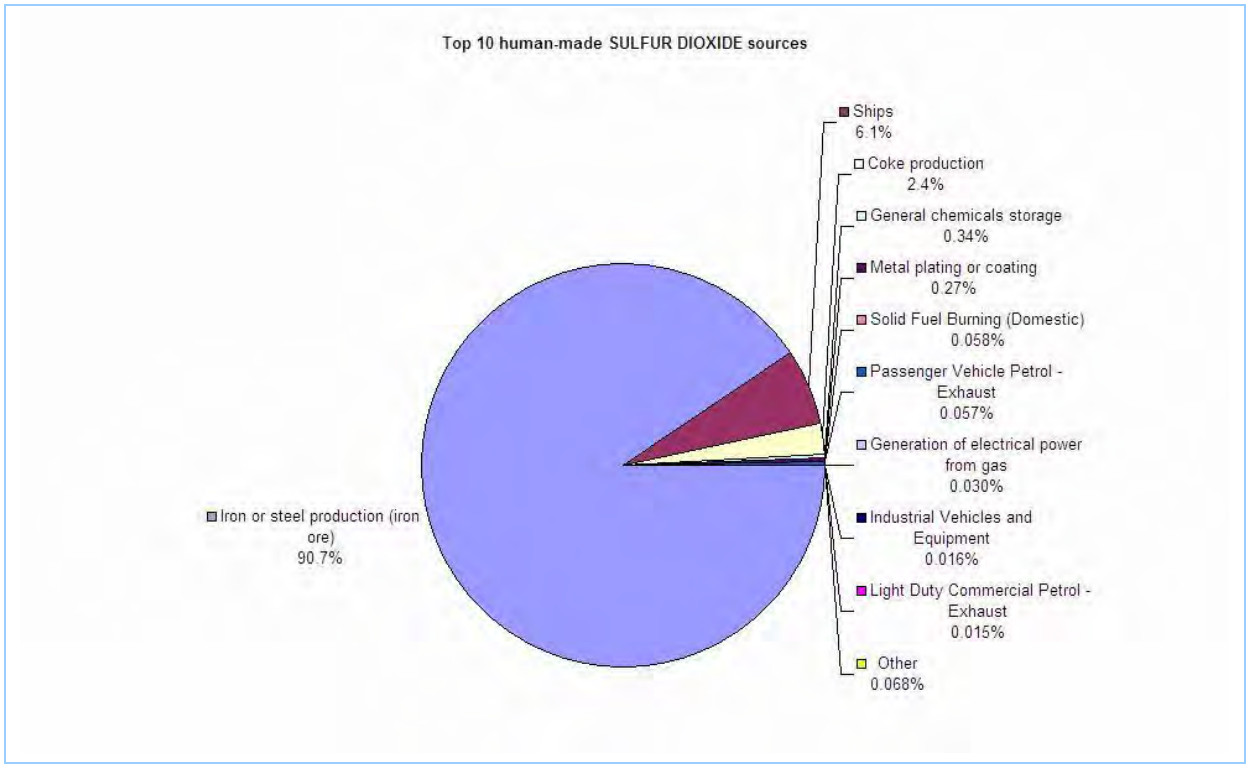

Figure ES-35: Top 10 human-made sources of sulfur dioxide in the Wollongong region

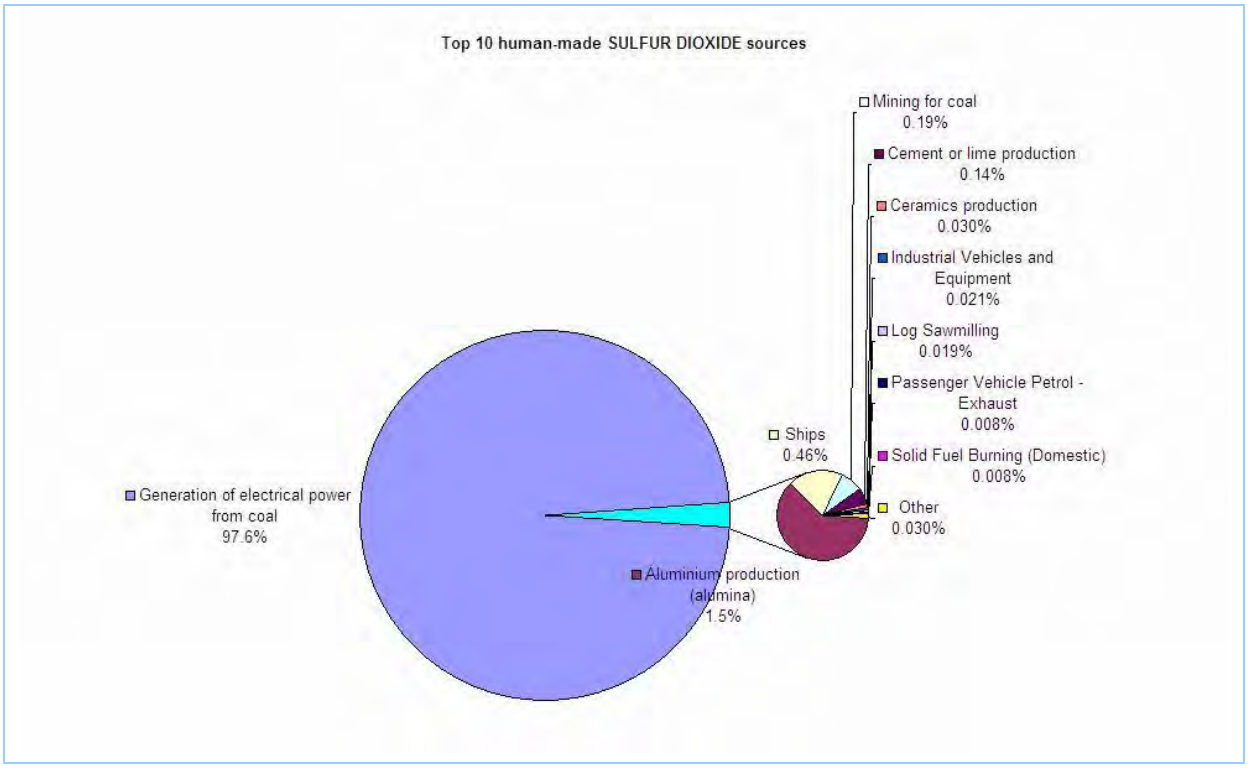

Figure ES-36: Top 10 human-made sources of sulfur dioxide in the Non Urban region

Table ES-11 presents total estimated annual emissions, proportions and cumulative proportions for the top 10 human-made sources of VOC in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table ES-11: Top 10 human-made sources of VOC in each region

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made TOTAL VOLATILE ORGANIC COMPOUNDS sources in the GMR				
Domestic-commercial	Domestic/commercial solvents/aerosols	25,274	18.45	18.45
On-road mobile	All - evaporative	14,632	10.68	29.14
Domestic-commercial	Surface coatings	11,561	8.44	37.58
On-road mobile	Passenger vehicle petrol – exhaust	9,647	7.04	44.62
Domestic-commercial	Solid fuel burning (domestic)	8,027	5.86	50.48
Domestic-commercial	Lawn mowing exhaust (domestic)	7,282	5.32	55.80
Off-road mobile	Recreational boats exhaust	7,139	5.21	61.01
Off-road mobile	Commercial boats exhaust	5,224	3.81	64.83
Domestic-commercial	Lawn mowing evaporative (domestic)	4,917	3.59	68.42
Commercial	Automotive fuel retailing	4,907	3.58	72.00
Human-made	Other	38,347	28.00	100.00
Top 10 human-made TOTAL VOLATILE ORGANIC COMPOUNDS sources in the Sydney region				
Domestic-commercial	Domestic/commercial solvents/aerosols	19,905	20.13	20.13
On-road mobile	All – evaporative	11,512	11.64	31.77
Domestic-commercial	Surface coatings	9,012	9.11	40.88
On-road mobile	Passenger vehicle petrol – exhaust	7,789	7.88	48.76
Domestic-commercial	Solid fuel burning (domestic)	5,952	6.02	54.78
Domestic-commercial	Lawn mowing exhaust (domestic)	5,400	5.46	60.24
Domestic-commercial	Lawn mowing evaporative (domestic)	3,647	3.69	63.93
Domestic-commercial	Lawn mowing exhaust (public open spaces)	3,489	3.53	67.45
Off-road mobile	Recreational boats exhaust	3,383	3.42	70.88
Commercial	Automotive fuel retailing	2,936	2.97	73.85
Human-made	Other	25,864	26.15	100.00
Top 10 human-made TOTAL VOLATILE ORGANIC COMPOUNDS sources in the Newcastle region				
Domestic-commercial	Domestic/commercial solvents/aerosols	1,276	15.98	15.98
On-road mobile	All – evaporative	855	10.71	26.69
Off-road mobile	Commercial boats exhaust	686	8.59	35.27
Domestic-commercial	Surface coatings	622	7.79	43.06
On-road mobile	Passenger vehicle petrol – exhaust	537	6.72	49.78
Domestic-commercial	Solid fuel burning (domestic)	497	6.23	56.01
Domestic-commercial	Lawn mowing exhaust (domestic)	451	5.65	61.66
Commercial	Automotive fuel retailing	389	4.87	66.53
Off-road mobile	Recreational boats exhaust	351	4.40	70.93
Domestic-commercial	Lawn mowing evaporative (domestic)	305	3.82	74.74
Human-made	Other	2,017	25.26	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made TOTAL VOLATILE ORGANIC COMPOUNDS sources in the Wollongong region				
Domestic-commercial	Domestic/commercial solvents/aerosols	940	18.05	18.05
Industrial	Iron or steel production (iron ore)	452	8.69	26.74
Domestic-commercial	Surface coatings	449	8.63	35.38
On-road mobile	All – evaporative	436	8.38	43.76
Off-road mobile	Recreational boats exhaust	373	7.17	50.93
Domestic-commercial	Solid fuel burning (domestic)	328	6.31	57.24
Domestic-commercial	Lawn mowing exhaust (domestic)	298	5.73	62.96
On-road mobile	Passenger vehicle petrol – exhaust	293	5.64	68.60
Commercial	Automotive fuel retailing	292	5.62	74.22
Domestic-commercial	Lawn mowing evaporative (domestic)	201	3.87	78.08
Human-made	Other	1,141	21.92	100.00
Top 10 human-made TOTAL VOLATILE ORGANIC COMPOUNDS sources in the Non Urban region				
Domestic-commercial	Domestic/commercial solvents/aerosols	3,154	12.68	12.68
Off-road mobile	Recreational boats exhaust	3,032	12.19	24.86
Off-road mobile	Industrial vehicles and equipment	2,607	10.48	35.34
Off-road mobile	Commercial boats exhaust	2,264	9.10	44.44
On-road mobile	All – evaporative	1,828	7.35	51.79
Domestic-commercial	Surface coatings	1,478	5.94	57.73
Commercial	Automotive fuel retailing	1,290	5.18	62.91
Domestic-commercial	Solid fuel burning (domestic)	1,248	5.02	67.93
Domestic-commercial	Lawn mowing exhaust (domestic)	1,133	4.55	72.48
On-road mobile	Passenger vehicle petrol – exhaust	1,029	4.13	76.62
Human-made	Other	5,817	23.38	100.00

Figure ES-37, Figure ES-38, Figure ES-39, Figure ES-40 and Figure ES-41 show the proportions of total estimated annual emissions for the top 10 human-made sources of VOC in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

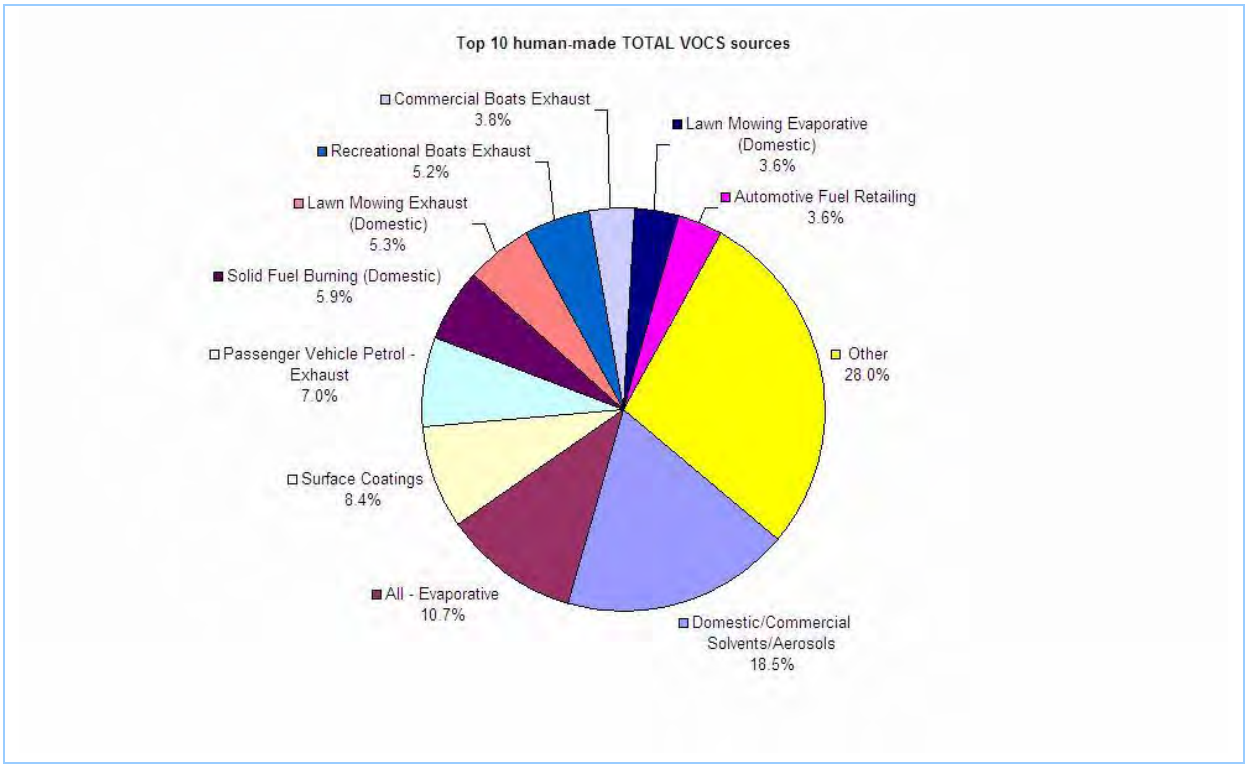

Figure ES-37: Top 10 human-made sources of VOC in the GMR

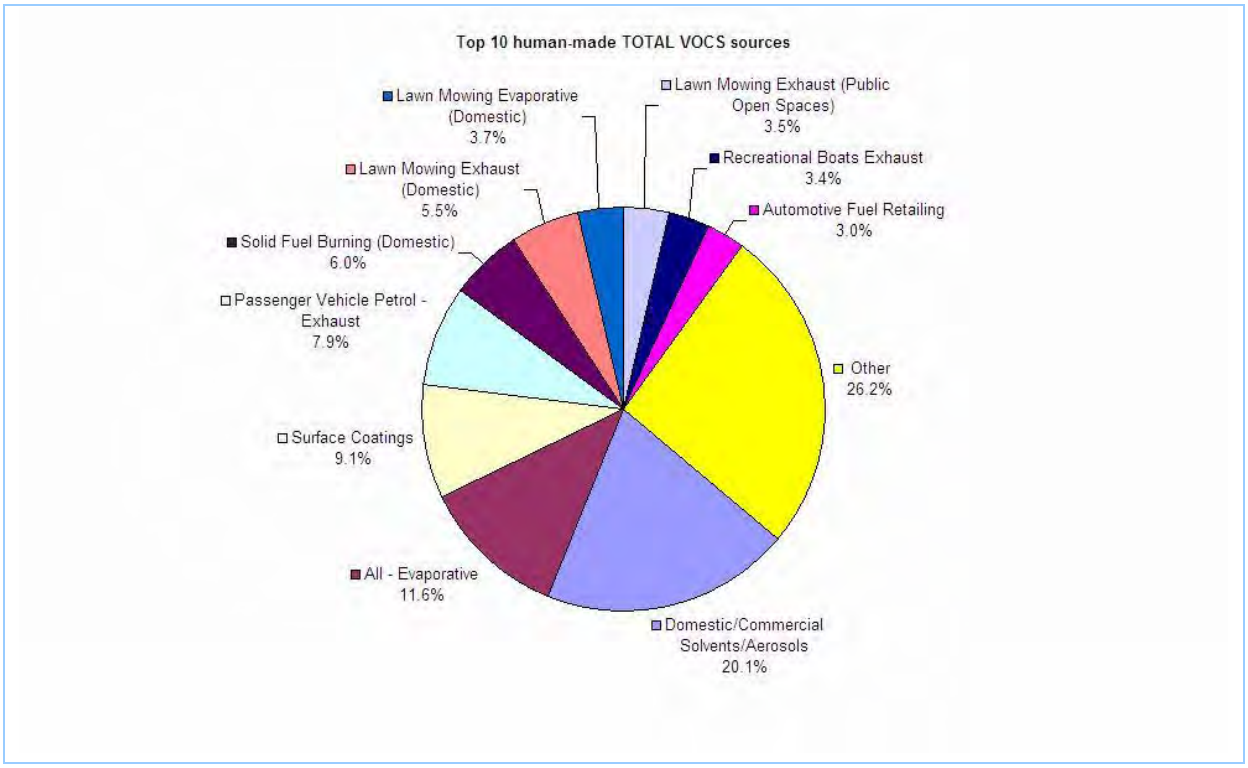

Figure ES-38: Top 10 human-made sources of VOC in the Sydney region

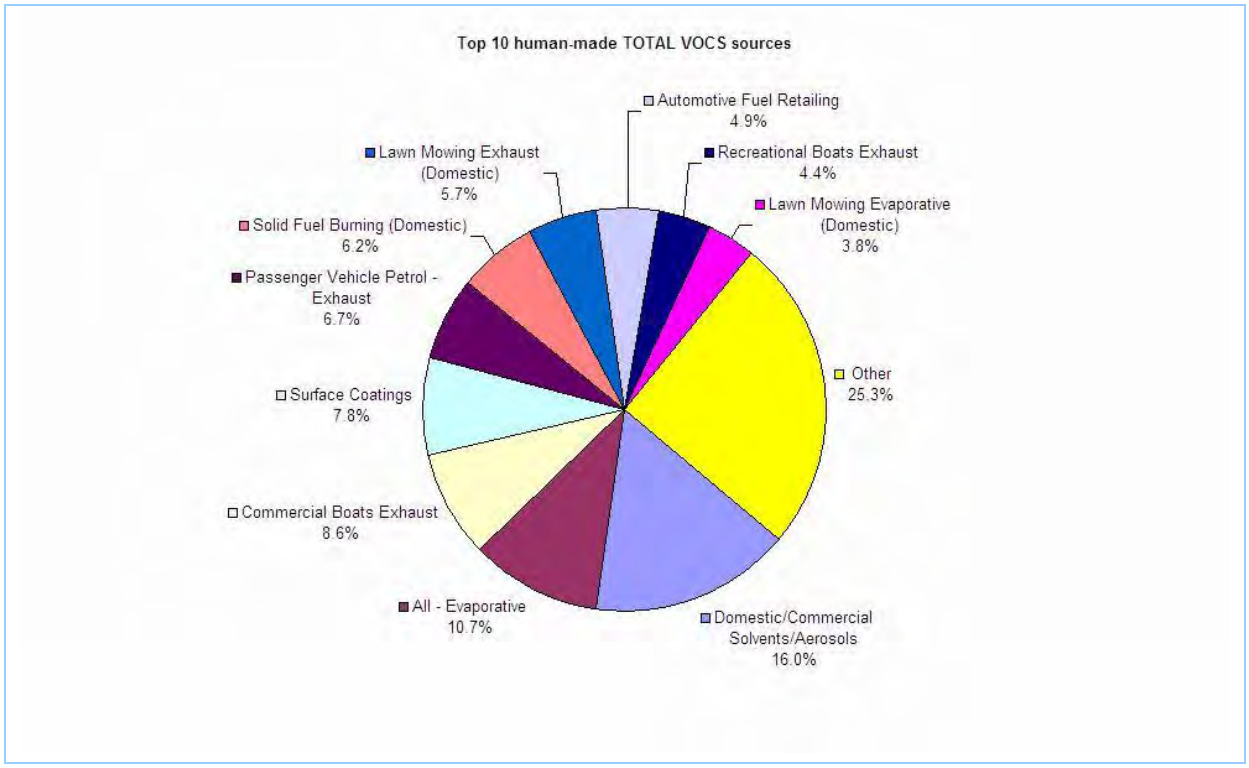

Figure ES-39: Top 10 human-made sources of VOC in the Newcastle region

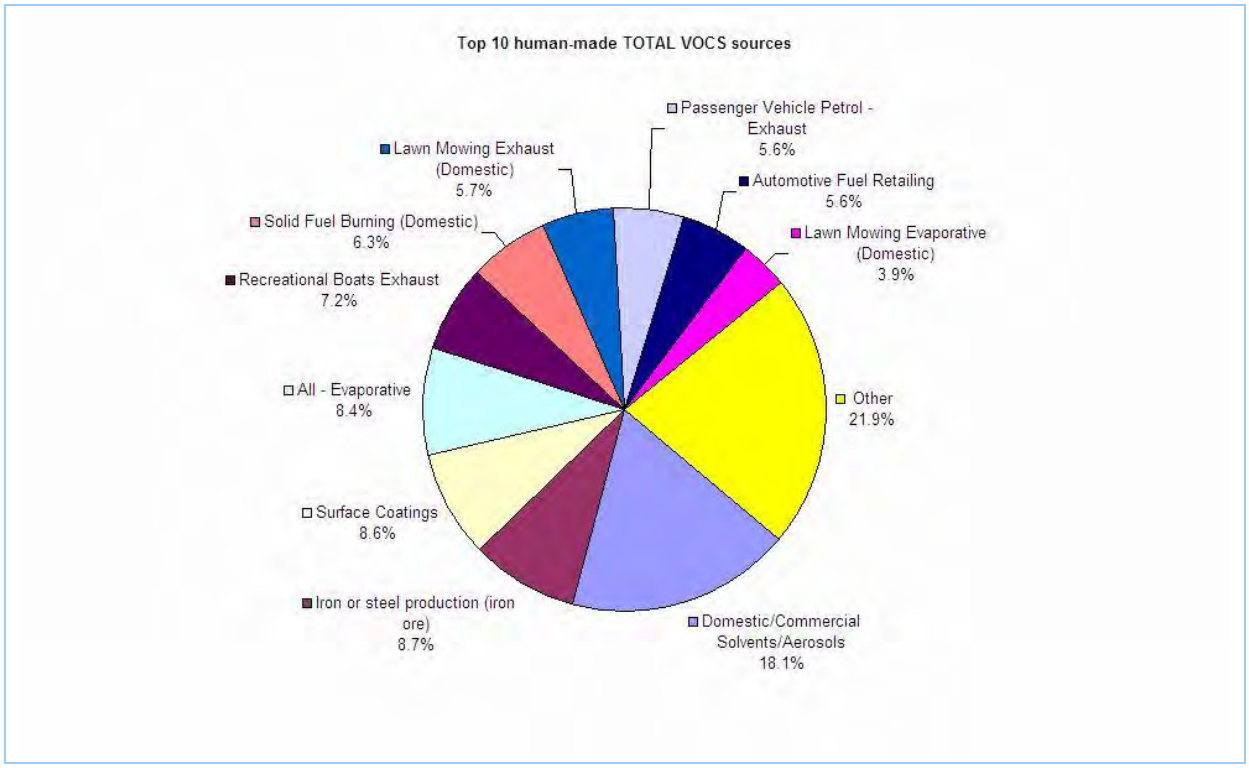

Figure ES-40: Top 10 human-made sources of VOC in the Wollongong region

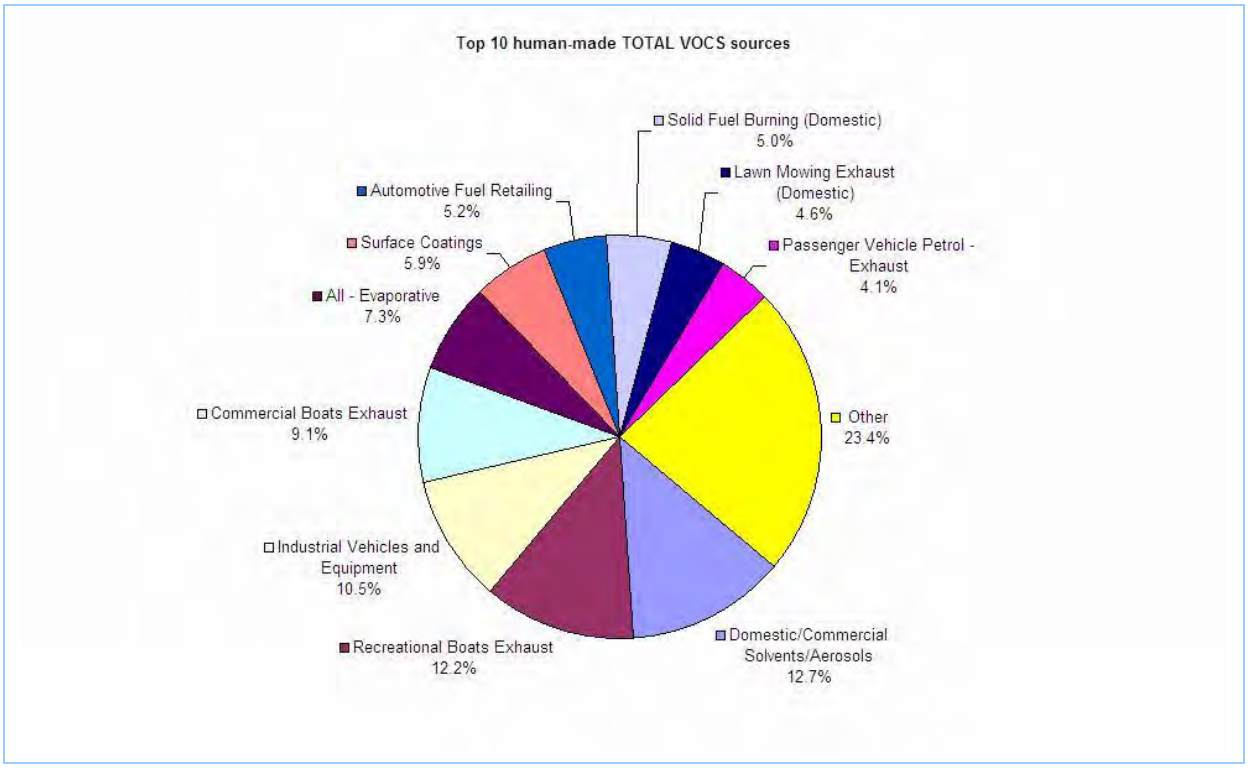

Figure ES-41: Top 10 human-made sources of VOC in the Non Urban region

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LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

An air emissions inventory project for natural and human-made sources has taken over 2 years to complete. The base year of the inventory represents activities that took place during the 2008 calendar year and is accompanied by emission projections in yearly increments up to the 2036 calendar year. The area included in the inventory covers the greater Sydney, Newcastle and Wollongong regions, known collectively as the Greater Metropolitan Region (GMR).

The air emissions inventory includes emissions from biogenic (i.e. natural living organisms), geogenic (i.e. natural non-living) and anthropogenic (i.e. human-made) sources as follows:

- Natural (e.g. bushfires, marine aerosol and vegetation);
- Commercial businesses (e.g. non-EPA licensed[4] printers, quarries and service stations);
- Domestic activities (e.g. residential lawn mowing, portable fuel containers and wood heaters);
- Industrial premises (e.g. EPA licensed[5] coal mines, oil refineries and power stations);
- Off-road vehicles and equipment (e.g. dump trucks, bulldozers, and marine vessels); and
- On-road transport (e.g. registered buses, cars and trucks).

This report presents emissions of criteria pollutants referred to in the Ambient Air Quality NEPM (NEPC, 2003), including:

- Carbon monoxide (CO);
- Oxides of nitrogen (NO_x);
- Particulate matter ≤ 10 µm (PM_{10});
- Particulate matter ≤ 2.5 µm ($PM_{2.5}$);
- Sulfur dioxide (SO_2); and
- Total volatile organic compounds (VOC).

More detailed information about source types and emissions of other air pollutants from natural, commercial businesses, domestic activities, industrial premises, off-road vehicles and equipment and on-road transport sources can be found in the individual air emissions inventory reports (EPA, 2012a; EPA, 2012b; EPA, 2012c; EPA, 2012d; EPA, 2012e; and EPA, 2012f), respectively.

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[4] Not a scheduled activity or scheduled development work as defined in the *Protection of the Environment (Operations) Act 1997* (PCO, 2010a).

[5] An activity listed in Schedule 1 of the *Protection of the Environment (Operations) Act 1997* (PCO, 2010a).

The purpose of this document is to present the results of the air emissions inventory. The information is structured as follows:

- A description of the air emissions inventory specification (Section 2) including:
    - The inventory year (Section 2.1);
    - A description of the inventory region (Section 2.2);
    - A description of the grid coordinate system (Section 2.3);
    - A description of emission sources considered (Section 2.4);
    - A description of the pollutants evaluated (Section 2.5); and
    - A broad discussion of the methodology (Section 2.6).
- An emission summary for criteria pollutants presented by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions (Section 3).
- An emissions summary for criteria pollutants presented for all natural and human-made sources in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions (Section 4).
- A complete list of references (Section 5).

2 INVENTORY SPECIFICATIONS

2.1 The Inventory Year

The air emissions inventory results presented in this report are based on activities that took place in the 2008 calendar year.

2.2 The Inventory Region

The inventory region defined as the GMR measures 210 km (east-west) by 273 km (north-south). The inventory region is presented in Table 2-1 and shown in Figure 2-1.

Table 2-1: Definition of Greater Metropolitan, Sydney, Newcastle and Wollongong regions

Region	South-west corner MGA[6] coordinates		North-east corner MGA coordinates	
	Easting (km)	Northing (km)	Easting (km)	Northing (km)
Greater Metropolitan	210	6159	420	6432
Sydney	261	6201	360	6300
Newcastle	360	6348	408	6372
Wollongong	279	6174	318	6201

[6] Map Grid of Australia based on the Geocentric Datum of Australia 1994 (GDA94) (ICSM, 2006).

Figure 2-1: Definition of Greater Metropolitan, Sydney, Newcastle and Wollongong regions

2.3 Grid Coordinate System

The grid coordinate system used for the air emissions inventory uses 1 km by 1 km grid cells. The grid coordinates start from the bottom left corner having index number with Easting (km) in the horizontal

and Northing (km) in the vertical direction. The grid coordinate system is shown in Figure 2-2.

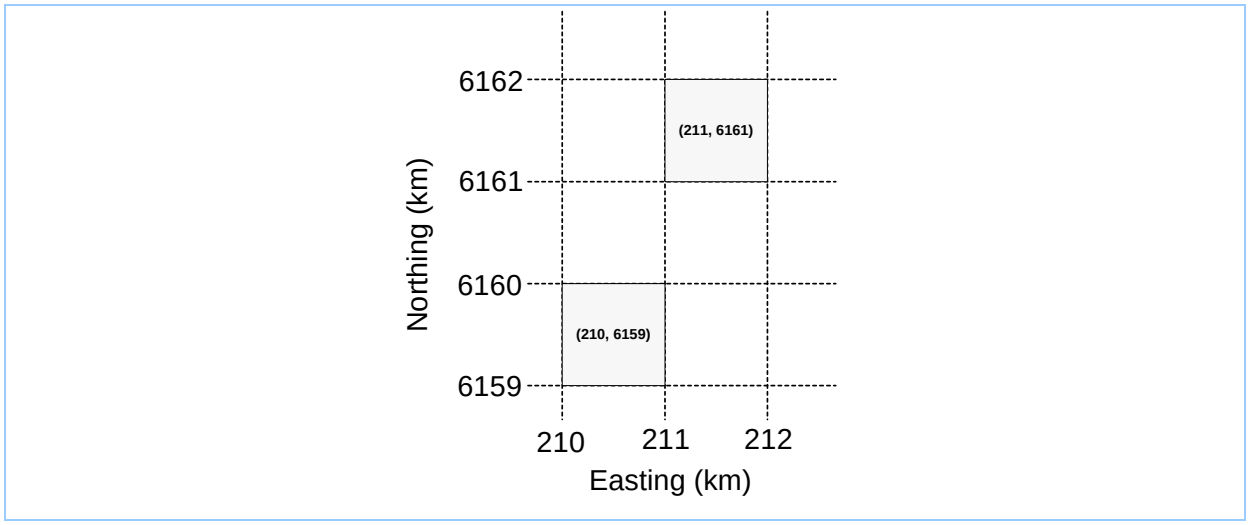

Figure 2-2: Grid coordinate system

2.4 Emission Sources Considered

The air emissions inventory includes emissions from biogenic (i.e. natural living organisms), geogenic (i.e. natural non-living) and anthropogenic (i.e. human-made) sources as follows:

- Natural (e.g. bushfires, marine aerosol and vegetation);
- Commercial businesses (e.g. non-EPA licensed[7] printers, quarries and service stations);
- Domestic activities (e.g. residential lawn mowing, portable fuel containers and wood heaters);
- Industrial premises (e.g. EPA licensed[8] coal mines, oil refineries and power stations);
- Off-road vehicles and equipment (e.g. dump trucks, bulldozers, and marine vessels); and
- On-road transport (e.g. registered buses, cars and trucks).

More detailed information about natural, commercial businesses, domestic activities, industrial premises, off-road vehicles and equipment and on-road transport sources can be found in the individual air emissions inventory reports (EPA, 2012a; EPA, 2012b; EPA, 2012c; EPA, 2012d; EPA, 2012e; and EPA, 2012f), respectively.

[7] Not a scheduled activity or scheduled development work as defined in the *Protection of the Environment (Operations) Act 1997* (PCO, 2010a).

[8] An activity listed in Schedule 1 of the *Protection of the Environment (Operations) Act 1997* (PCO, 2010a).

2.5 Pollutants Evaluated

The following pollutants have been considered:

- Substances included in the *National Environment Protection (National Pollutant Inventory) Measure* (NEPC, 2008);
- Pollutants included in the *National Environment Protection (Ambient Air Quality) Measure* (NEPC, 2003);
- Pollutants included in the *National Environment Protection (Air Toxics) Measure* (NEPC, 2004);
- Pollutants associated with the *Protection of the Environment Operations (Clean Air) Regulation 2010* (PCO, 2011);
- Air pollutants associated with the *Protection of the Environment Operations (General) Regulation 2009* (PCO, 2010b);
- Speciation of oxides of nitrogen (i.e. NO and NO_2) for photochemical modelling (USEPA, 2003)[9];
- Speciated organic compounds for photochemical modelling sourced from Carter (2010);
- Speciated particulate emissions (i.e. TSP (total suspended particulate), PM_{10} (particulate matter with an aerodynamic diameter ≤ 10 µm) and $PM_{2.5}$ (particulate matter with an aerodynamic diameter ≤ 2.5 µm));
- Environment Protection Authority of Victoria air toxic pollutants sourced from Hazardous Air Pollutants - A Review of Studies Performed in Australia and New Zealand (EPAV, 1999);
- Commonwealth Government Air Toxics Program Technical Advisory Group (13 March 2000) priority air pollutants (EA, 2001);
- U.S. Environmental Protection Agency list of 189 Hazardous Air Pollutants (USEPA, 2010);
- Air pollutants included in the Office of Environmental Human Health Assessment (OEHHA)/Air Resources Board (ARB) 'hot spots' list (CARB, 2011);
- EPA regulated pollutants with design ground level concentrations (DEC, 2005);
- USEPA 16 priority polycyclic aromatic hydrocarbons (PAH) (Keith et. al., 1979);
- WHO97 polychlorinated dibenzo-p-dioxins (PCDD), polychlorinated dibenzofurans (PCDF) and polychlorinated biphenyls (PCB) (Van den Berg et. al., 1998); and
- Greenhouse gases (i.e. carbon dioxide, methane and nitrous oxide) included in the National Greenhouse Accounts (NGA) Factors (DCCEE, 2010).

This report presents emissions of criteria pollutants referred to in the Ambient Air Quality NEPM (NEPC, 2003), including:

- Carbon monoxide (CO);
- Oxides of nitrogen (NO_x);

[9] The default NO_x speciation profile used in the inventory is 95% NO and 5% NO_2.

- Particulate matter ≤ 10 µm (PM_{10});
- Particulate matter ≤ 2.5 µm ($PM_{2.5}$);
- Sulfur dioxide (SO_2); and
- Total volatile organic compounds (VOC).

More detailed information about emissions of other air pollutants from natural, commercial businesses, domestic activities, industrial premises, off-road vehicles and equipment and on-road transport sources can be found in the individual air emissions inventory reports (EPA, 2012a; EPA, 2012b; EPA, 2012c; EPA, 2012d; EPA, 2012e; and EPA, 2012f), respectively.

2.6 Methodology Overview

This section contains a broad overview of the methodology used to develop the air emissions inventory. More detailed information about the: estimation methodologies and emission factors; activity, spatial and temporal data; customised relational databases; and emissions projection factors used for natural, commercial businesses, domestic activities, industrial premises, off-road vehicles and equipment and on-road transport sources can be found in the individual air emissions inventory reports (EPA, 2012a; EPA, 2012b; EPA, 2012c; EPA, 2012d; EPA, 2012e; and EPA, 2012f), respectively.

The methodology used to develop the air emissions inventory involves the following steps:

2.6.1 Identify Sources

Natural and human-made sources considered in this report include all sources defined in Section 2.4 with the potential for air emissions in the GMR.

Natural and human-made air emission sources have been identified from a number of different sources, including:

- *ARB's Emissions Inventory*, *Area-Wide Source Methodologies*, *Index of Methodologies by Major Category* (CARB, 2008);
- *EMEP/EEA air pollutant emission inventory guidebook 2009* (EEA, 2009);
- *USEPA AP 42*, *Fifth Edition*, *Compilation of Air Pollutant Emission Factors*, *Volume 1: Stationary Point and Area Sources* (USEPA, 1995);
- *USEPA Emission Inventory Improvement Program*, *EIIP Technical Report Series*, *Volumes 1-10* (USEPA, 2007);
- *USEPA 2008 National Emissions Inventory Data* (USEPA, 2011a); and
- *USEPA Nonroad Engines*, *Equipment*, *and Vehicles* (USEPA, 2011b).

2.6.2 *Select Emission Estimation Methodologies*

Emissions have been estimated by combining activity data with emission factors. The emissions have been allocated spatially to each 1 km by 1 km grid cell, and temporally to months, weekdays/weekend days and hours.

Emission estimation methodologies have been identified from a number of different sources including:

- *ARB's Emissions Inventory, Area-Wide Source Methodologies, Index of Methodologies by Major Category* (CARB, 2008);
- *EMEP/EEA air pollutant emission inventory guidebook 2009* (EEA, 2009);
- *USEPA AP 42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources* (USEPA, 1995);
- *USEPA Emission Inventory Improvement Program, EIIP Technical Report Series, Volumes 1-10* (USEPA, 2007);
- *USEPA 2008 National Emissions Inventory Data* (USEPA, 2011a); and
- *USEPA Nonroad Engines, Equipment, and Vehicles* (USEPA, 2011b).

2.6.3 *Acquire Activity, Spatial and Temporal Data*

Activity, spatial and temporal data have been acquired through a domestic survey of residential households (TR, 2009), an industrial survey of EPA-licensed premises (DECCW, 2009) and from a number of government departments and service providers.

2.6.4 *Design and Implement Emission Estimation Techniques*

All emissions have been calculated within customised relational databases for each natural and human-made source type. They contain all the data necessary for estimating emissions to air from natural and human-made sources, including: activity data; emission factors; particulate matter (PM) and volatile organic compound (VOC) speciation profiles; spatial allocation data; hourly, daily and monthly temporal variation data; and emission projection factors.

In general, emissions have been estimated using Equation 1:

$$E_{i,j} = A_j \times EF_{i,j} \times \left(1 - ER_{i,j} / 100\right) \qquad \textbf{Equation 1}$$

where:			
$E_{i,j}$	=	Emissions of substance I from source j	(kg/year)
A_j	=	Activity rate for source j	(activity unit/year)
$EF_{i,j}$	=	Emission factor for substance i from source j	(kg/activity unit)
$ER_{i,j}$	=	Emission reduction efficiency for substance i for source j	(%)

2.6.5 Derive Source Type Specific Emission Projection Factors

Emission projection factors have been derived based on either:

- Total final energy consumption by industry and fuel, New South Wales (ABARE, 2006);
- Total primary energy consumption by industry and fuel, New South Wales (ABARE, 2006);
- Free standing dwelling growth, Greater Metropolitan Region (TDC, 2009);
- Population growth, Greater Metropolitan Region (TDC, 2009);
- Total dwelling growth, Greater Metropolitan Region (TDC, 2009); and
- Vehicle kilometres travelled growth, Greater Metropolitan Region (TDC, 2009).

Projection factors have been developed for every year from 2009 to 2036 (emissions for the base year 2008 are based on activity data and emission estimation methodologies).

In general, future emissions have been estimated from base year 2008 emissions using Equation 2:

$$\mathbf{E_{i,j,n} = E_{i,j,2008} \times PF_{j,n}} \qquad \textbf{Equation 2}$$

where:			
$E_{i,j,n}$	=	Emission of substance i from source j for year n	(kg/year)
$E_{i,j,2008}$	=	Emission of substance i from source j for the base year, 2008	(kg/year)
$PF_{j,n}$	=	Projection factor for source j for year n (relative to the base year)	(tonne.year^{-1}/ tonne.year^{-1})

3 EMISSION RESULTS

This section presents emission estimates for the 2008 calendar year for the following natural and human-made sources:

- Natural (e.g. bushfires, marine aerosol and vegetation);
- Commercial businesses (e.g. non-EPA licensed[10] printers, quarries and service stations);
- Domestic activities (e.g. residential lawn mowing, portable fuel containers and wood heaters);
- Industrial premises (e.g. EPA licensed[11] coal mines, oil refineries and power stations);
- Off-road vehicles and equipment (e.g. dump trucks, bulldozers, and marine vessels); and
- On-road transport (e.g. registered buses, cars and trucks).

For each pollutant, the information in this section is structured as follows:

- Natural and Human-Made Emissions; and
- Priority Natural and Human-Made Emissions.

Emissions have been estimated by combining activity data with emission factors. The emissions have been allocated spatially to each 1 km by 1 km grid cell, and temporally to months, weekdays/weekend days and hours. Activity, spatial and temporal data have been acquired through a domestic survey of residential households (TR, 2009), an industrial survey of EPA-licensed premises (DECCW, 2009) and from a number of government departments and service providers. All emissions have been calculated within customised relational databases for each natural and human-made source type. They contain all the data necessary for estimating emissions to air from natural and human-made sources, including: activity data; emission factors; particulate matter (PM) and volatile organic compound (VOC) speciation profiles; spatial allocation data; hourly, daily and monthly temporal variation data; and emission projection factors.

Where reference is made to:

- *Combustion products*, this includes CO, NO_x, $PM_{2.5}$, PM_{10}, TSP, SO_2 and VOC (total and speciated); and
- *Particulate matter*, this includes $PM_{2.5}$, PM_{10} and TSP.

[10] Not a scheduled activity or scheduled development work as defined in the *Protection of the Environment (Operations) Act 1997* (PCO, 2010a).
[11] An activity listed in Schedule 1 of the *Protection of the Environment (Operations) Act 1997* (PCO, 2010a).

In this section total estimated emissions are presented for each natural and human-made source type in the whole GMR and the Sydney, Newcastle and Wollongong regions. Total estimated emissions are also presented for the region defined as Non Urban. This region is the area of the GMR minus the combined areas of the Sydney, Newcastle and Wollongong regions. Emissions are presented for the criteria pollutants referred to in the Ambient Air Quality NEPM (NEPC, 2003), including:

- Carbon monoxide (CO);
- Oxides of nitrogen (NO_x);
- Particulate matter ≤ 10 μm (PM_{10});
- Particulate matter ≤ 2.5 μm ($PM_{2.5}$);
- Sulfur dioxide (SO_2); and
- Total volatile organic compounds (VOC).

3.1 Carbon Monoxide

3.1.1 Natural and Human-Made Emissions

Table 3-1 presents total estimated annual emissions of carbon monoxide by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-1: Total estimated annual emissions of carbon monoxide by natural and human-made source type in each region

Substance	Region	Emissions (tonne/year)						
		Biogenic-Geogenic	Commercial	Domestic-Commercial	Industrial	Off-Road Mobile	On-Road Mobile	Grand Total
CARBON MONOXIDE	Sydney	5,484	335	82,186	14,173	20,801	123,712	246,692
	Newcastle	301	9.20	6,554	41,950	3,343	8,369	60,526
	Wollongong	603	20	4,412	529,474	1,698	4,786	540,993
	Non Urban	28,545	24	16,226	27,768	27,975	16,944	117,482
	GMR	34,934	389	109,377	613,365	53,817	153,812	965,693

Table 3-2 presents the proportions of total estimated annual emissions of carbon monoxide by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-2: Proportions of total estimated annual emissions of carbon monoxide by natural and human-made source type in each region

Substance	Region	Proportions (%)					
		Biogenic-Geogenic	Commercial	Domestic-Commercial	Industrial	Off-Road Mobile	On-Road Mobile
CARBON MONOXIDE	Sydney	2.22	0.14	33.32	5.75	8.43	50.15
	Newcastle	0.50	1.52×10^{-2}	10.83	69.31	5.52	13.83
	Wollongong	0.11	3.64×10^{-3}	0.82	97.87	0.31	0.88
	Non Urban	24.30	2.07×10^{-2}	13.81	23.64	23.81	14.42
	GMR	3.62	4.02×10^{-2}	11.33	63.52	5.57	15.93

Figure 3-1, Figure 3-2, Figure 3-3, Figure 3-4 and Figure 3-5 show the proportions of total estimated annual emissions of carbon monoxide by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

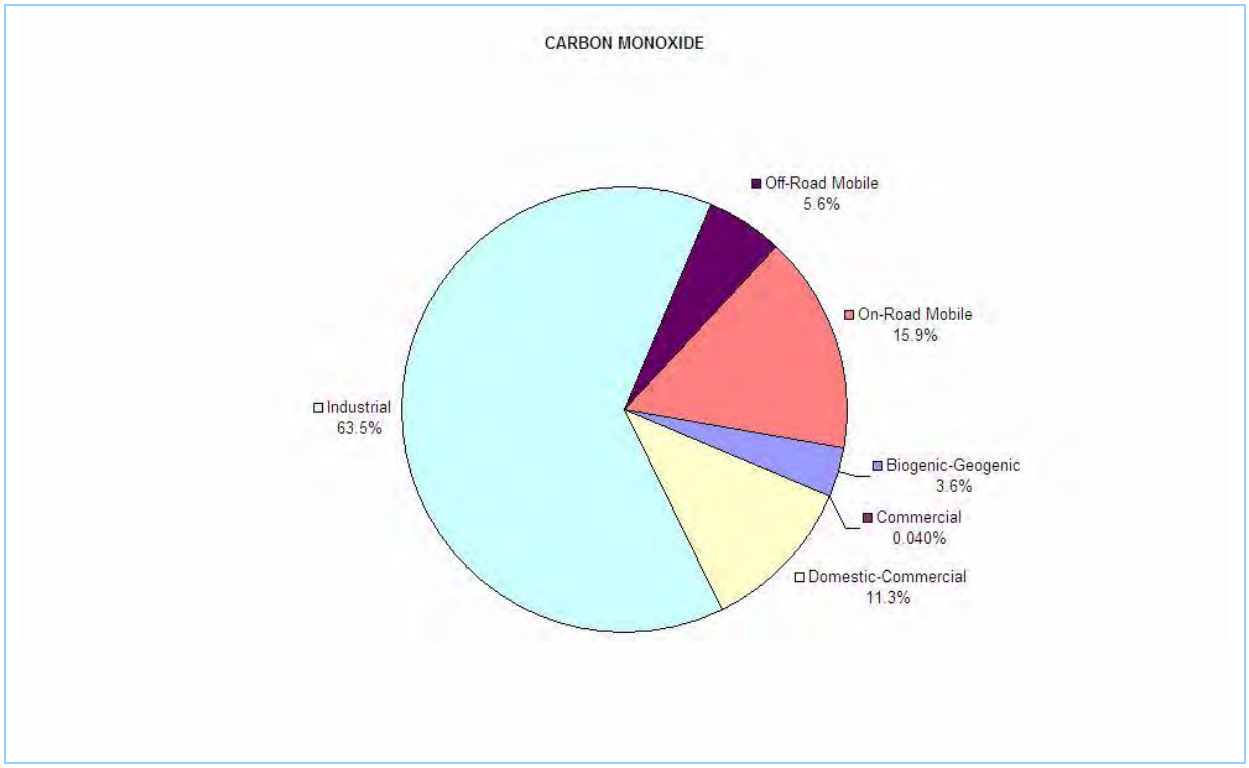

Figure 3-1: Proportions of total estimated annual emissions of carbon monoxide by natural and human-made source type in the GMR

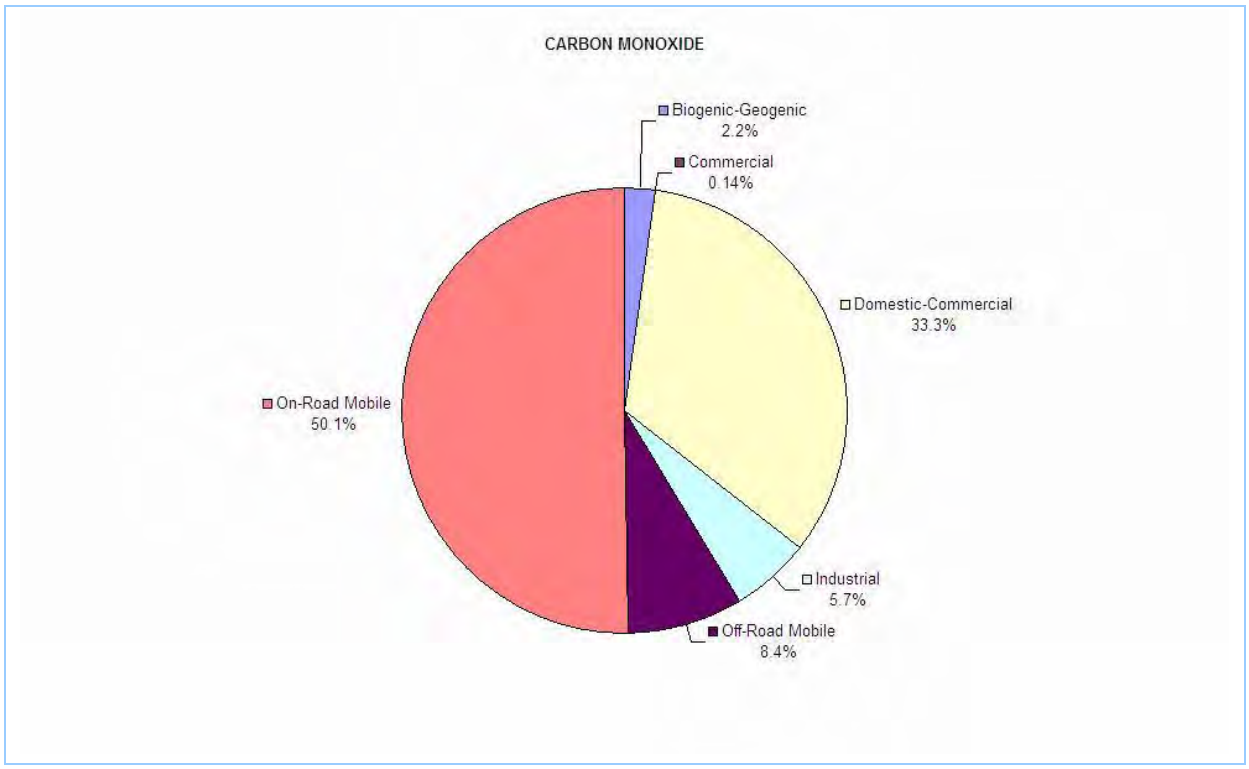

Figure 3-2: Proportions of total estimated annual emissions of carbon monoxide by natural and human-made source type in the Sydney region

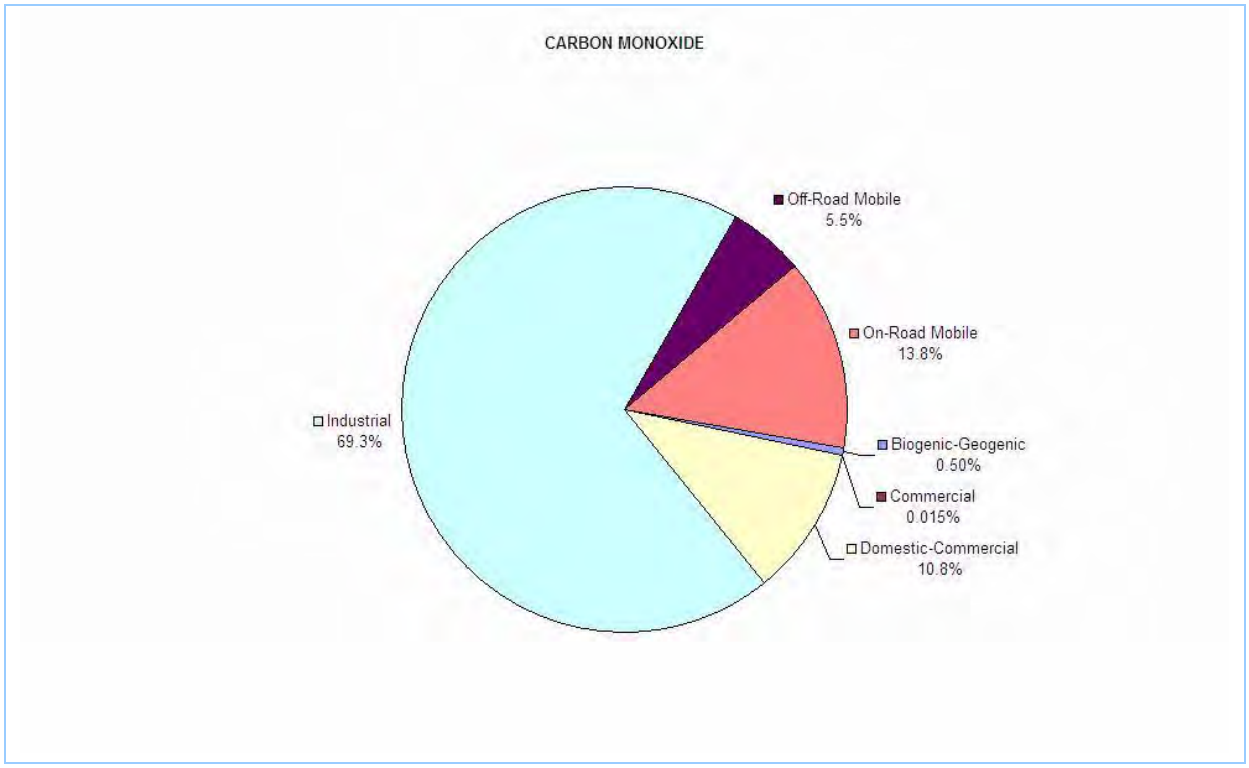

Figure 3-3: Proportions of total estimated annual emissions of carbon monoxide by natural and human-made source type in the Newcastle region

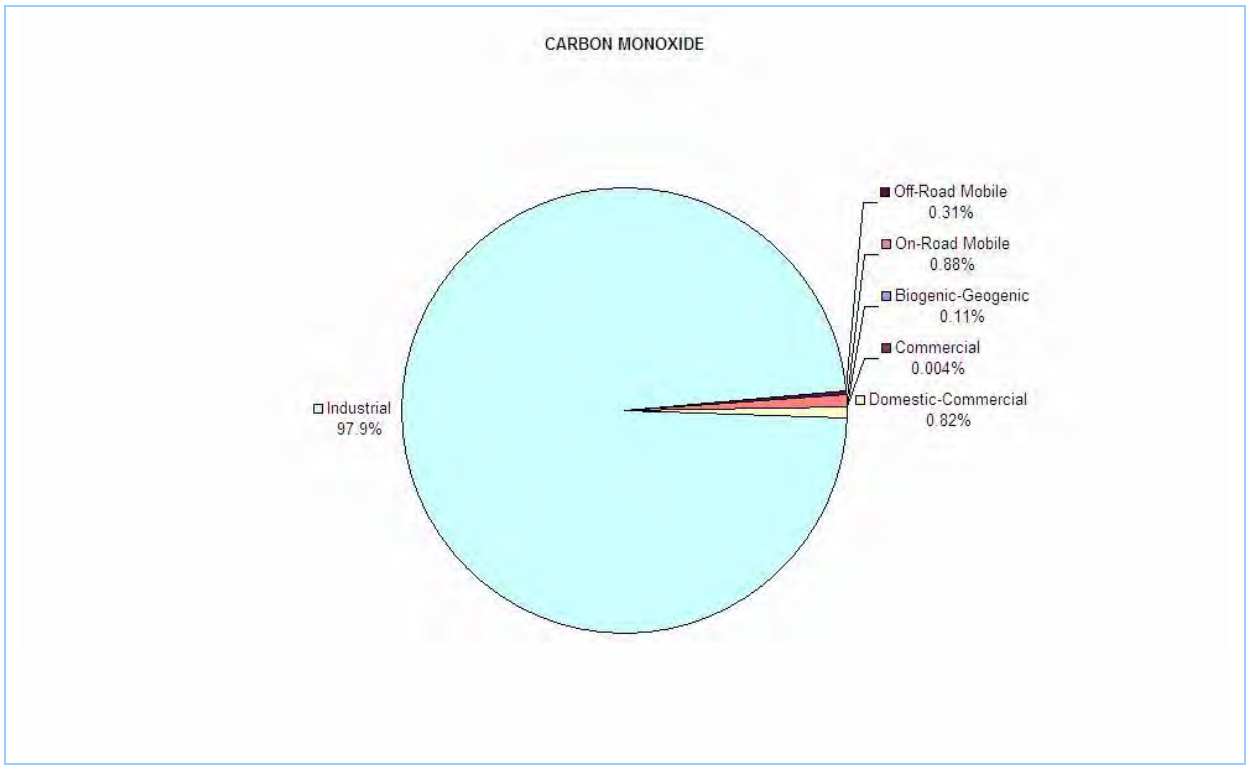

Figure 3-4: Proportions of total estimated annual emissions of carbon monoxide by natural and human-made source type in the Wollongong region

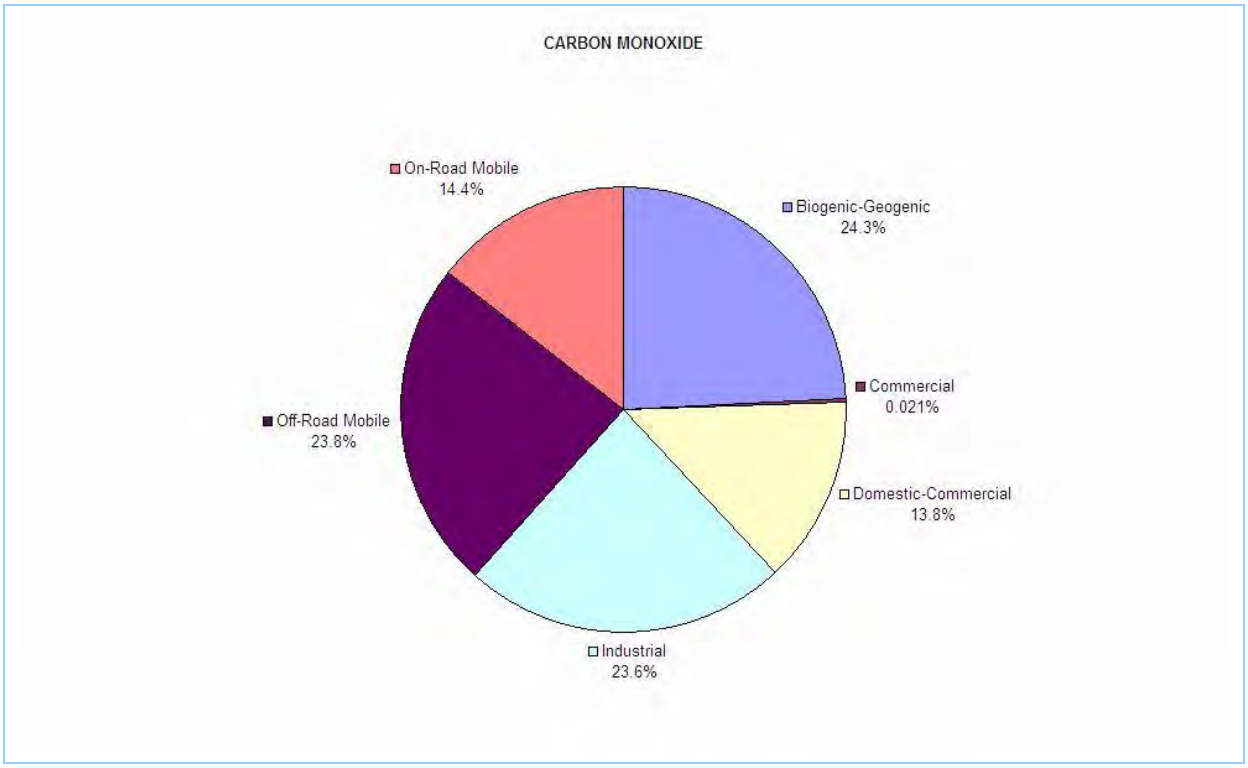

Figure 3-5: Proportions of total estimated annual emissions of carbon monoxide by natural and human-made source type in the Non Urban region

3.1.2 Priority Natural and Human-Made Emissions

Table 3-3 presents total estimated annual emissions, proportions and cumulative proportions of natural and human-made sources of carbon monoxide in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-3: Natural and human-made sources of carbon monoxide in each region

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
CARBON MONOXIDE in the GMR				
Industrial	Iron or steel production (iron ore)	527,922	54.67	54.67
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	93,437	9.68	64.34
Domestic-Commercial	Solid Fuel Burning (Domestic)	53,985	5.59	69.93
Industrial	Aluminium production (alumina)	52,994	5.49	75.42
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	48,731	5.05	80.47
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	34,994	3.62	84.09
Biogenic-Geogenic	Bushfire and Prescribed Burning	34,609	3.58	87.68
Off-Road Mobile	Industrial Vehicles and Equipment	20,431	2.12	89.79
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	19,009	1.97	91.76

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Off-Road Mobile	Recreational Boats Exhaust	14,585	1.51	93.27
Off-Road Mobile	Commercial Boats Exhaust	12,153	1.26	94.53
Industrial	Iron or steel production (scrap metal)	9,092	0.94	95.47
Industrial	Generation of electrical power from coal	7,535	0.78	96.25
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	5,705	0.59	96.84
On-Road Mobile	Others - Exhaust	4,762	0.49	97.33
Industrial	Mining for coal	4,568	0.47	97.81
Off-Road Mobile	Aircraft (Flight Operations)	3,128	0.32	98.13
Industrial	Generation of electrical power from gas	2,216	0.23	98.36
Off-Road Mobile	Aircraft (Ground Operations)	1,895	0.20	98.56
Industrial	Cement or lime production	1,670	0.17	98.73
Industrial	Petroleum products storage	1,465	0.15	98.88
Industrial	Petroleum products and fuel production	1,379	0.14	99.02
On-Road Mobile	Light Duty Diesel - Exhaust	1,176	0.12	99.15
Industrial	Metal plating or coating	1,075	0.11	99.26
Industrial	Ceramics production	935	9.68×10^{-2}	99.35
Off-Road Mobile	Locomotives	906	9.38×10^{-2}	99.45
Domestic-Commercial	Gaseous Fuel Burning	861	8.92×10^{-2}	99.54
Domestic-Commercial	Barbeques	520	5.39×10^{-2}	99.59
Off-Road Mobile	Ships	463	4.79×10^{-2}	99.64
Biogenic-Geogenic	Agricultural Burning	325	3.37×10^{-2}	99.67
Industrial	Generation of electricity not coal or gas	283	2.93×10^{-2}	99.70
Industrial	Non-ferrous metal production (scrap)	281	2.91×10^{-2}	99.73
Industrial	Bitumen mixing	267	2.77×10^{-2}	99.76
Industrial	Ammonium nitrate production	258	2.68×10^{-2}	99.78
Industrial	Petrochemical production	257	2.66×10^{-2}	99.81
Off-Road Mobile	Commercial Vehicles and Equipment	256	2.65×10^{-2}	99.84
Industrial	Crushing, grinding or separating	222	2.30×10^{-2}	99.86
Commercial	Plaster Product Manufacturing	138	1.43×10^{-2}	99.88
Industrial	Metal processing	130	1.34×10^{-2}	99.89
Industrial	Cement or lime handling	98	1.01×10^{-2}	99.90
Industrial	Chemical production	90	9.28×10^{-3}	99.91
Industrial	Aluminium production (scrap metal)	69	7.19×10^{-3}	99.92
Industrial	Paper or pulp production	59	6.16×10^{-3}	99.92
Commercial	Hospitals	54	5.62×10^{-3}	99.93
Industrial	Sewage treatment - large plants	54	5.57×10^{-3}	99.93
Industrial	Waste disposal (application to	43	4.47×10^{-3}	99.94

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
	land)			
Industrial	General agricultural processing	41	4.25×10^{-3}	99.94
Industrial	Glass production (float)	41	4.25×10^{-3}	99.95
Industrial	Glass production (container)	35	3.64×10^{-3}	99.95
Commercial	Port Operators	31	3.24×10^{-3}	99.95
Industrial	Wood or timber milling or processing	31	3.18×10^{-3}	99.96
Industrial	General animal products production	30	3.07×10^{-3}	99.96
Commercial	Ceramic Product Manufacturing	29	2.96×10^{-3}	99.96
Industrial	Plastics resins production	26	2.66×10^{-3}	99.96
Industrial	Composting	25	2.55×10^{-3}	99.97
Industrial	Rendering or fat extraction	22	2.24×10^{-3}	99.97
Industrial	Contaminated soil treatment	18	1.84×10^{-3}	99.97
Industrial	Land-based extractive activity	17	1.73×10^{-3}	99.97
Commercial	Printing	15	1.54×10^{-3}	99.97
Commercial	Bread Manufacturing	13	1.37×10^{-3}	99.98
Commercial	Food Manufacturing n.e.c.	13	1.34×10^{-3}	99.98
Industrial	Dairy processing	11	1.13×10^{-3}	99.98
Industrial	Pharmaceutical and veterinary products production	10	1.04×10^{-3}	99.98
Industrial	Non-thermal treatment of waste	9.35	9.69×10^{-4}	99.98
Commercial	Waste Disposal Services	9.22	9.55×10^{-4}	99.98
Industrial	Slaughtering or processing of animals	8.55	8.86×10^{-4}	99.98
Industrial	Solid waste landfilling	8.38	8.68×10^{-4}	99.98
Industrial	Brewing and distilling	8.22	8.51×10^{-4}	99.98
Industrial	Paints/polishes/adhesives production	8.17	8.46×10^{-4}	99.98
Industrial	Recovery of waste oil	7.73	8.01×10^{-4}	99.99
Industrial	Concrete works	7.73	8.0×10^{-4}	99.99
Domestic-Commercial	Liquid Fuel Burning (Domestic)	7.70	7.97×10^{-4}	99.99
Commercial	Biscuit Manufacturing	6.94	7.19×10^{-4}	99.99
Industrial	Coke production	6.55	6.78×10^{-4}	99.99
Commercial	Basic Iron and Steel Manufacturing	5.42	5.61×10^{-4}	99.99
Industrial	Paper production using recycle materials	5.36	5.55×10^{-4}	99.99
Commercial	Oil and Fat Manufacturing	5.32	5.50×10^{-4}	99.99
Industrial	Other land-based extraction	5.28	5.47×10^{-4}	99.99
Commercial	Metal Coating and Finishing	5.16	5.34×10^{-4}	99.99
Commercial	Corrugated Paperboard Container Manufacturing	4.82	4.99×10^{-4}	99.99
Industrial	Printing, packaging and visual media production	4.79	4.96×10^{-4}	99.99
Commercial	Beer and Malt Manufacturing	4.77	4.94×10^{-4}	99.99

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Chemical Product Manufacturing n.e.c.	4.54	4.70×10^{-4}	99.99
Industrial	Soap and detergent production	4.49	4.65×10^{-4}	99.99
Commercial	Laundries and Dry-Cleaners	3.87	4.0×10^{-4}	99.99
Commercial	Glass and Glass Product Manufacturing	3.72	3.85×10^{-4}	99.99
Commercial	Soft Drink, Cordial and Syrup Manufacturing	3.46	3.58×10^{-4}	99.99
Commercial	Log Sawmilling	3.29	3.40×10^{-4}	99.99
Industrial	General chemicals storage	3.14	3.25×10^{-4}	100.00
Commercial	Gas Supply	3.09	3.20×10^{-4}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	3.07	3.18×10^{-4}	100.00
Commercial	Plastic Injection Moulded Product Manufacturing	2.96	3.07×10^{-4}	100.00
Commercial	Medicinal and Pharmaceutical Product Manufacturing	2.96	3.06×10^{-4}	100.00
Commercial	Fruit and Vegetable Processing	2.49	2.57×10^{-4}	100.00
Commercial	Aircraft Manufacturing	2.35	2.44×10^{-4}	100.00
Commercial	Services to Air Transport	2.24	2.32×10^{-4}	100.00
Industrial	Bird accommodation	1.98	2.05×10^{-4}	100.00
Industrial	Sewage treatment - small plants	1.88	1.94×10^{-4}	100.00
Industrial	Container reconditioning	1.72	1.78×10^{-4}	100.00
Commercial	Fabricated Metal Product Manufacturing n.e.c.	1.64	1.69×10^{-4}	100.00
Industrial	Inert waste landfilling	1.61	1.67×10^{-4}	100.00
Commercial	Furniture Manufacturing n.e.c.	1.59	1.65×10^{-4}	100.00
Commercial	Synthetic Resin Manufacturing	1.46	1.51×10^{-4}	100.00
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	1.40	1.45×10^{-4}	100.00
Commercial	Cake and Pastry Manufacturing	1.34	1.38×10^{-4}	100.00
Commercial	Prepared Animal and Bird Feed Manufacturing	1.30	1.35×10^{-4}	100.00
Commercial	Paper Product Manufacturing n.e.c.	1.22	1.26×10^{-4}	100.00
Commercial	Poultry Farming (Meat)	1.16	1.20×10^{-4}	100.00
Industrial	Agricultural fertiliser (phosphate) production	1.09	1.13×10^{-4}	100.00
Industrial	Sterilisation activities	1.05	1.09×10^{-4}	100.00
Commercial	Milk and Cream Processing	1.03	1.06×10^{-4}	100.00
Commercial	Basic Non-Ferrous Metal Manufacturing n.e.c.	0.94	9.70×10^{-5}	100.00
Commercial	Scientific Research	0.93	9.60×10^{-5}	100.00
Industrial	Recovery of waste	0.61	6.36×10^{-5}	100.00
Commercial	Non-Metallic Mineral Product Manufacturing n.e.c.	0.48	5.02×10^{-5}	100.00
Commercial	Confectionery Manufacturing	0.35	3.65×10^{-5}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Ice Cream Manufacturing	0.29	3.04×10^{-5}	100.00
Industrial	Pesticides and related products production	0.25	2.54×10^{-5}	100.00
Commercial	Automotive Component Manufacturing n.e.c.	0.21	2.18×10^{-5}	100.00
Industrial	Road construction	0.20	2.10×10^{-5}	100.00
Industrial	Explosives production	0.17	1.79×10^{-5}	100.00
Industrial	Waste storage	0.16	1.66×10^{-5}	100.00
Industrial	Chemical storage	0.13	1.32×10^{-5}	100.00
Commercial	Electrical and Equipment Manufacturing n.e.c.	3.68×10^{-2}	3.81×10^{-6}	100.00
Commercial	Organic Industrial Chemical Manufacturing n.e.c.	2.51×10^{-2}	2.60×10^{-6}	100.00
Commercial	Non-Building Construction n.e.c.	2.36×10^{-2}	2.44×10^{-6}	100.00
Industrial	Boat construction/maintenance (dry/float)	2.01×10^{-2}	2.08×10^{-6}	100.00
Industrial	Shipping in bulk	1.40×10^{-2}	1.45×10^{-6}	100.00
Industrial	Animal accommodation	9.22×10^{-3}	9.55×10^{-7}	100.00
Industrial	Rubber products/tyre production	8.51×10^{-3}	8.81×10^{-7}	100.00
Commercial	Non-Ferrous Metal Casting	7.20×10^{-3}	7.46×10^{-7}	100.00
Commercial	Rubber Product Manufacturing n.e.c.	7.20×10^{-3}	7.46×10^{-7}	100.00
Commercial	Spring and Wire Product Manufacturing	5.12×10^{-3}	5.30×10^{-7}	100.00
Commercial	Ceramic Product Manufacturing n.e.c.	4.80×10^{-3}	4.97×10^{-7}	100.00
Commercial	Industrial Gas Manufacturing	1.88×10^{-3}	1.95×10^{-7}	100.00
Commercial	Wood Product Manufacturing n.e.c.	5.0×10^{-4}	5.18×10^{-8}	100.00
Industrial	Coal works	3.12×10^{-4}	3.23×10^{-8}	100.00
Commercial	Wine Manufacturing	2.41×10^{-4}	2.49×10^{-8}	100.00
CARBON MONOXIDE in the Sydney region				
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	75,067	30.43	30.43
Domestic-Commercial	Solid Fuel Burning (Domestic)	40,034	16.23	46.66
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	39,923	16.18	62.84
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	25,951	10.52	73.36
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	15,118	6.13	79.49
Off-Road Mobile	Recreational Boats Exhaust	6,912	2.80	82.29
Industrial	Iron or steel production (scrap metal)	6,882	2.79	85.08
Biogenic-Geogenic	Bushfire and Prescribed Burning	5,456	2.21	87.29
Off-Road Mobile	Commercial Boats Exhaust	5,332	2.16	89.45
On-Road Mobile	Heavy Duty Commercial Diesel -	4,081	1.65	91.11

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
	Exhaust			
On-Road Mobile	Others - Exhaust	3,691	1.50	92.60
Off-Road Mobile	Industrial Vehicles and Equipment	3,484	1.41	94.02
Off-Road Mobile	Aircraft (Flight Operations)	2,407	0.98	94.99
Off-Road Mobile	Aircraft (Ground Operations)	1,823	0.74	95.73
Industrial	Generation of electrical power from gas	1,645	0.67	96.40
Industrial	Petroleum products storage	1,465	0.59	96.99
Industrial	Petroleum products and fuel production	1,376	0.56	97.55
On-Road Mobile	Light Duty Diesel - Exhaust	951	0.39	97.93
Industrial	Ceramics production	767	0.31	98.25
Domestic-Commercial	Gaseous Fuel Burning	671	0.27	98.52
Off-Road Mobile	Locomotives	436	0.18	98.69
Domestic-Commercial	Barbeques	406	0.16	98.86
Industrial	Generation of electricity not coal or gas	282	0.11	98.97
Industrial	Non-ferrous metal production (scrap)	281	0.11	99.09
Off-Road Mobile	Ships	271	0.11	99.20
Industrial	Petrochemical production	257	0.10	99.30
Industrial	Crushing, grinding or separating	221	8.97×10^{-2}	99.39
Industrial	Bitumen mixing	204	8.28×10^{-2}	99.47
Commercial	Plaster Product Manufacturing	138	5.60×10^{-2}	99.53
Off-Road Mobile	Commercial Vehicles and Equipment	136	5.53×10^{-2}	99.59
Industrial	Cement or lime handling	97	3.94×10^{-2}	99.62
Industrial	Metal processing	84	3.39×10^{-2}	99.66
Industrial	Paper or pulp production	59	2.41×10^{-2}	99.68
Industrial	Sewage treatment - large plants	52	2.13×10^{-2}	99.70
Industrial	Chemical production	49	2.0×10^{-2}	99.72
Industrial	Cement or lime production	47	1.91×10^{-2}	99.74
Industrial	Aluminium production (scrap metal)	47	1.90×10^{-2}	99.76
Industrial	Glass production (float)	41	1.66×10^{-2}	99.78
Commercial	Hospitals	38	1.54×10^{-2}	99.79
Industrial	Glass production (container)	35	1.43×10^{-2}	99.81
Commercial	Port Operators	31	1.27×10^{-2}	99.82
Industrial	Waste disposal (application to land)	29	1.18×10^{-2}	99.83
Biogenic-Geogenic	Agricultural Burning	28	1.14×10^{-2}	99.84
Industrial	General animal products production	27	1.10×10^{-2}	99.86
Industrial	Plastics resins production	26	1.04×10^{-2}	99.87
Industrial	Composting	25	9.98×10^{-3}	99.88

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	General agricultural processing	23	9.46×10^{-3}	99.89
Industrial	Metal plating or coating	21	8.39×10^{-3}	99.89
Industrial	Contaminated soil treatment	18	7.18×10^{-3}	99.90
Industrial	Rendering or fat extraction	18	7.13×10^{-3}	99.91
Commercial	Ceramic Product Manufacturing	16	6.35×10^{-3}	99.91
Commercial	Printing	15	6.04×10^{-3}	99.92
Commercial	Bread Manufacturing	12	4.70×10^{-3}	99.92
Industrial	Pharmaceutical and veterinary products production	10	4.06×10^{-3}	99.93
Commercial	Waste Disposal Services	9.22	3.74×10^{-3}	99.93
Industrial	Non-thermal treatment of waste	8.52	3.45×10^{-3}	99.94
Industrial	Brewing and distilling	8.22	3.33×10^{-3}	99.94
Industrial	Paints/polishes/adhesives production	8.17	3.31×10^{-3}	99.94
Industrial	Dairy processing	8.10	3.28×10^{-3}	99.95
Commercial	Biscuit Manufacturing	6.94	2.81×10^{-3}	99.95
Commercial	Food Manufacturing n.e.c.	6.90	2.80×10^{-3}	99.95
Industrial	Solid waste landfilling	6.47	2.62×10^{-3}	99.95
Domestic-Commercial	Liquid Fuel Burning (Domestic)	6.00	2.43×10^{-3}	99.96
Industrial	Recovery of waste oil	5.66	2.29×10^{-3}	99.96
Industrial	Paper production using recycle materials	5.36	2.17×10^{-3}	99.96
Commercial	Oil and Fat Manufacturing	5.32	2.15×10^{-3}	99.96
Industrial	Other land-based extraction	5.02	2.03×10^{-3}	99.97
Industrial	Slaughtering or processing of animals	4.96	2.01×10^{-3}	99.97
Commercial	Corrugated Paperboard Container Manufacturing	4.82	1.95×10^{-3}	99.97
Industrial	Printing, packaging and visual media production	4.79	1.94×10^{-3}	99.97
Commercial	Beer and Malt Manufacturing	4.77	1.93×10^{-3}	99.97
Industrial	Concrete works	4.62	1.87×10^{-3}	99.98
Commercial	Chemical Product Manufacturing n.e.c.	4.54	1.84×10^{-3}	99.98
Industrial	Soap and detergent production	4.49	1.82×10^{-3}	99.98
Commercial	Laundries and Dry-Cleaners	3.87	1.57×10^{-3}	99.98
Commercial	Glass and Glass Product Manufacturing	3.71	1.50×10^{-3}	99.98
Commercial	Soft Drink, Cordial and Syrup Manufacturing	3.46	1.40×10^{-3}	99.98
Industrial	Coke production	3.45	1.40×10^{-3}	99.98
Commercial	Gas Supply	3.09	1.25×10^{-3}	99.99
Commercial	Plastic Injection Moulded Product Manufacturing	2.96	1.20×10^{-3}	99.99
Commercial	Metal Coating and Finishing	2.70	1.10×10^{-3}	99.99
Commercial	Fruit and Vegetable Processing	2.49	1.01×10^{-3}	99.99

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Medicinal and Pharmaceutical Product Manufacturing	2.44	9.89×10^{-4}	99.99
Commercial	Aircraft Manufacturing	2.35	9.53×10^{-4}	99.99
Commercial	Services to Air Transport	2.24	9.10×10^{-4}	99.99
Commercial	Funeral Directors, Crematoria and Cemeteries	1.95	7.89×10^{-4}	99.99
Industrial	Container reconditioning	1.72	6.98×10^{-4}	99.99
Industrial	Bird accommodation	1.40	5.68×10^{-4}	99.99
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	1.40	5.67×10^{-4}	99.99
Commercial	Cake and Pastry Manufacturing	1.34	5.42×10^{-4}	100.00
Commercial	Poultry Farming (Meat)	1.16	4.69×10^{-4}	100.00
Commercial	Paper Product Manufacturing n.e.c.	1.14	4.61×10^{-4}	100.00
Industrial	Sterilisation activities	1.05	4.26×10^{-4}	100.00
Commercial	Milk and Cream Processing	1.03	4.17×10^{-4}	100.00
Commercial	Basic Non-Ferrous Metal Manufacturing n.e.c.	0.94	3.80×10^{-4}	100.00
Commercial	Scientific Research	0.93	3.76×10^{-4}	100.00
Commercial	Synthetic Resin Manufacturing	0.90	3.65×10^{-4}	100.00
Commercial	Fabricated Metal Product Manufacturing n.e.c.	0.87	3.53×10^{-4}	100.00
Commercial	Basic Iron and Steel Manufacturing	0.85	3.46×10^{-4}	100.00
Industrial	Sewage treatment - small plants	0.69	2.79×10^{-4}	100.00
Commercial	Non-Metallic Mineral Product Manufacturing n.e.c.	0.48	1.97×10^{-4}	100.00
Commercial	Confectionery Manufacturing	0.35	1.43×10^{-4}	100.00
Commercial	Ice Cream Manufacturing	0.29	1.19×10^{-4}	100.00
Industrial	Pesticides and related products production	0.25	9.94×10^{-5}	100.00
Commercial	Automotive Component Manufacturing n.e.c.	0.21	8.42×10^{-5}	100.00
Industrial	Road construction	0.20	8.22×10^{-5}	100.00
Industrial	Waste storage	0.16	6.52×10^{-5}	100.00
Industrial	Chemical storage	0.13	5.18×10^{-5}	100.00
Industrial	Mining for coal	6.85×10^{-2}	2.78×10^{-5}	100.00
Commercial	Electrical and Equipment Manufacturing n.e.c.	3.68×10^{-2}	1.49×10^{-5}	100.00
Commercial	Organic Industrial Chemical Manufacturing n.e.c.	2.51×10^{-2}	1.02×10^{-5}	100.00
Commercial	Non-Building Construction n.e.c.	1.65×10^{-2}	6.68×10^{-6}	100.00
Industrial	Shipping in bulk	1.40×10^{-2}	5.69×10^{-6}	100.00
Industrial	Rubber products/tyre production	8.51×10^{-3}	3.45×10^{-6}	100.00
Commercial	Spring and Wire Product Manufacturing	4.52×10^{-3}	1.83×10^{-6}	100.00
Commercial	Industrial Gas Manufacturing	1.88×10^{-3}	7.63×10^{-7}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Prepared Animal and Bird Feed Manufacturing	1.44×10^{-3}	5.84×10^{-7}	100.00
Commercial	Wood Product Manufacturing n.e.c.	5.0×10^{-4}	2.03×10^{-7}	100.00
Commercial	Wine Manufacturing	2.41×10^{-4}	9.76×10^{-8}	100.00
CARBON MONOXIDE in the Newcastle region				
Industrial	Aluminium production (alumina)	39,203	64.77	64.77
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	4,997	8.26	73.03
Domestic-Commercial	Solid Fuel Burning (Domestic)	3,345	5.53	78.55
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	2,650	4.38	82.93
Industrial	Iron or steel production (scrap metal)	2,210	3.65	86.58
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	2,169	3.58	90.17
Off-Road Mobile	Commercial Boats Exhaust	1,566	2.59	92.75
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	965	1.59	94.35
Off-Road Mobile	Industrial Vehicles and Equipment	816	1.35	95.70
Off-Road Mobile	Recreational Boats Exhaust	717	1.19	96.88
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	375	0.62	97.50
Biogenic-Geogenic	Bushfire and Prescribed Burning	295	0.49	97.99
On-Road Mobile	Others - Exhaust	280	0.46	98.45
Industrial	Ammonium nitrate production	258	0.43	98.88
Industrial	Generation of electrical power from gas	86	0.14	99.02
Off-Road Mobile	Ships	79	0.13	99.15
Industrial	Mining for coal	70	0.12	99.27
On-Road Mobile	Light Duty Diesel - Exhaust	66	0.11	99.38
Off-Road Mobile	Aircraft (Ground Operations)	60	9.94×10^{-2}	99.48
Domestic-Commercial	Gaseous Fuel Burning	46	7.65×10^{-2}	99.55
Off-Road Mobile	Locomotives	46	7.52×10^{-2}	99.63
Off-Road Mobile	Aircraft (Flight Operations)	41	6.79×10^{-2}	99.70
Industrial	Chemical production	38	6.32×10^{-2}	99.76
Industrial	Metal processing	36	5.88×10^{-2}	99.82
Domestic-Commercial	Barbeques	28	4.62×10^{-2}	99.87
Off-Road Mobile	Commercial Vehicles and Equipment	18	2.94×10^{-2}	99.90
Industrial	Bitumen mixing	17	2.73×10^{-2}	99.92
Industrial	General agricultural processing	13	2.11×10^{-2}	99.94
Biogenic-Geogenic	Agricultural Burning	6.13	1.01×10^{-2}	99.95
Industrial	Metal plating or coating	5.76	9.51×10^{-3}	99.96
Commercial	Hospitals	4.66	7.71×10^{-3}	99.97
Industrial	Waste disposal (application to	4.59	7.58×10^{-3}	99.98

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
	land)			
Industrial	Slaughtering or processing of animals	3.59	5.93×10^{-3}	99.98
Industrial	Dairy processing	2.82	4.66×10^{-3}	99.99
Commercial	Metal Coating and Finishing	2.46	4.06×10^{-3}	99.99
Commercial	Bread Manufacturing	1.68	2.78×10^{-3}	100.00
Industrial	Agricultural fertiliser (phosphate) production	1.09	1.81×10^{-3}	100.00
Domestic-Commercial	Liquid Fuel Burning (Domestic)	0.41	6.84×10^{-4}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	0.38	6.29×10^{-4}	100.00
Industrial	Cement or lime handling	0.35	5.84×10^{-4}	100.00
Industrial	Other land-based extraction	0.26	4.37×10^{-4}	100.00
Industrial	Non-thermal treatment of waste	4.17×10^{-2}	6.88×10^{-5}	100.00
Industrial	Boat construction/maintenance (dry/float)	2.01×10^{-2}	3.32×10^{-5}	100.00
Industrial	Contaminated soil treatment	7.80×10^{-3}	1.29×10^{-5}	100.00
Commercial	Waste Disposal Services	6.13×10^{-3}	1.01×10^{-5}	100.00
Commercial	Ceramic Product Manufacturing n.e.c.	4.80×10^{-3}	7.93×10^{-6}	100.00
Industrial	Crushing, grinding or separating	3.85×10^{-6}	6.36×10^{-9}	100.00
CARBON MONOXIDE in the Wollongong region				
Industrial	Iron or steel production (iron ore)	527,922	97.58	97.58
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	2,861	0.53	98.11
Domestic-Commercial	Solid Fuel Burning (Domestic)	2,209	0.41	98.52
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	1,564	0.29	98.81
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	1,432	0.26	99.07
Industrial	Metal plating or coating	1,049	0.19	99.27
Off-Road Mobile	Industrial Vehicles and Equipment	770	0.14	99.41
Off-Road Mobile	Recreational Boats Exhaust	762	0.14	99.55
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	716	0.13	99.68
Biogenic-Geogenic	Bushfire and Prescribed Burning	603	0.11	99.80
Industrial	Generation of electrical power from gas	445	8.22×10^{-2}	99.88
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	184	3.41×10^{-2}	99.91
On-Road Mobile	Others - Exhaust	140	2.58×10^{-2}	99.94
Off-Road Mobile	Commercial Boats Exhaust	77	1.43×10^{-2}	99.95
On-Road Mobile	Light Duty Diesel - Exhaust	38	7.06×10^{-3}	99.96
Off-Road Mobile	Locomotives	37	6.92×10^{-3}	99.97
Industrial	Bitumen mixing	37	6.90×10^{-3}	99.97
Off-Road Mobile	Ships	37	6.77×10^{-3}	99.98

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Domestic-Commercial	Gaseous Fuel Burning	33	6.19×10^{-3}	99.99
Domestic-Commercial	Barbeques	20	3.74×10^{-3}	99.99
Off-Road Mobile	Aircraft (Flight Operations)	13	2.43×10^{-3}	99.99
Commercial	Ceramic Product Manufacturing	13	2.38×10^{-3}	99.99
Industrial	Metal processing	10	1.91×10^{-3}	100.00
Commercial	Basic Iron and Steel Manufacturing	4.57	8.45×10^{-4}	100.00
Industrial	General chemicals storage	3.12	5.77×10^{-4}	100.00
Industrial	Coke production	3.10	5.73×10^{-4}	100.00
Industrial	Waste disposal (application to land)	2.30	4.25×10^{-4}	100.00
Commercial	Hospitals	2.10	3.88×10^{-4}	100.00
Off-Road Mobile	Commercial Vehicles and Equipment	1.38	2.54×10^{-4}	100.00
Industrial	Chemical production	1.16	2.15×10^{-4}	100.00
Industrial	Sewage treatment - large plants	0.82	1.51×10^{-4}	100.00
Industrial	Non-thermal treatment of waste	0.47	8.70×10^{-5}	100.00
Domestic-Commercial	Liquid Fuel Burning (Domestic)	0.30	5.53×10^{-5}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	0.12	2.18×10^{-5}	100.00
Commercial	Rubber Product Manufacturing n.e.c.	7.20×10^{-3}	1.33×10^{-6}	100.00
Commercial	Automotive Component Manufacturing n.e.c.	2.69×10^{-3}	4.97×10^{-7}	100.00
Industrial	Container reconditioning	1.92×10^{-3}	3.55×10^{-7}	100.00
Commercial	Synthetic Resin Manufacturing	1.48×10^{-3}	2.73×10^{-7}	100.00
Commercial	Spring and Wire Product Manufacturing	6.0×10^{-4}	1.11×10^{-7}	100.00
CARBON MONOXIDE in the Non Urban region				
Biogenic-Geogenic	Bushfire and Prescribed Burning	28,254	24.05	24.05
Off-Road Mobile	Industrial Vehicles and Equipment	15,361	13.08	37.13
Industrial	Aluminium production (alumina)	13,791	11.74	48.86
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	10,512	8.95	57.81
Domestic-Commercial	Solid Fuel Burning (Domestic)	8,396	7.15	64.96
Industrial	Generation of electrical power from coal	7,535	6.41	71.37
Off-Road Mobile	Recreational Boats Exhaust	6,194	5.27	76.64
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	5,443	4.63	81.28
Off-Road Mobile	Commercial Boats Exhaust	5,178	4.41	85.68
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	4,595	3.91	89.60
Industrial	Mining for coal	4,497	3.83	93.42
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	2,209	1.88	95.30

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Cement or lime production	1,623	1.38	96.69
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	1,065	0.91	97.59
Off-Road Mobile	Aircraft (Flight Operations)	667	0.57	98.16
On-Road Mobile	Others - Exhaust	651	0.55	98.71
Off-Road Mobile	Locomotives	387	0.33	99.04
Biogenic-Geogenic	Agricultural Burning	291	0.25	99.29
Industrial	Ceramics production	168	0.14	99.43
On-Road Mobile	Light Duty Diesel - Exhaust	121	0.10	99.54
Domestic-Commercial	Gaseous Fuel Burning	110	9.37×10^{-2}	99.63
Off-Road Mobile	Commercial Vehicles and Equipment	100	8.55×10^{-2}	99.72
Off-Road Mobile	Ships	76	6.48×10^{-2}	99.78
Domestic-Commercial	Barbeques	67	5.66×10^{-2}	99.84
Industrial	Generation of electrical power from gas	40	3.43×10^{-2}	99.87
Industrial	Wood or timber milling or processing	31	2.62×10^{-2}	99.90
Industrial	Aluminium production (scrap metal)	23	1.92×10^{-2}	99.92
Industrial	Land-based extractive activity	17	1.42×10^{-2}	99.93
Off-Road Mobile	Aircraft (Ground Operations)	11	9.72×10^{-3}	99.94
Commercial	Hospitals	9.51	8.09×10^{-3}	99.95
Industrial	Bitumen mixing	8.94	7.61×10^{-3}	99.96
Industrial	Waste disposal (application to land)	7.19	6.12×10^{-3}	99.96
Commercial	Food Manufacturing n.e.c.	6.05	5.15×10^{-3}	99.97
Industrial	General agricultural processing	4.97	4.23×10^{-3}	99.97
Industrial	Rendering or fat extraction	4.05	3.44×10^{-3}	99.98
Commercial	Log Sawmilling	3.29	2.80×10^{-3}	99.98
Industrial	Concrete works	3.10	2.64×10^{-3}	99.98
Industrial	Petroleum products and fuel production	2.88	2.45×10^{-3}	99.98
Industrial	General animal products production	2.42	2.06×10^{-3}	99.99
Industrial	Recovery of waste oil	2.08	1.77×10^{-3}	99.99
Industrial	Solid waste landfilling	1.91	1.62×10^{-3}	99.99
Industrial	Inert waste landfilling	1.61	1.37×10^{-3}	99.99
Commercial	Furniture Manufacturing n.e.c.	1.59	1.36×10^{-3}	99.99
Commercial	Prepared Animal and Bird Feed Manufacturing	1.30	1.11×10^{-3}	99.99
Industrial	Sewage treatment - small plants	1.19	1.01×10^{-3}	99.99
Domestic-Commercial	Liquid Fuel Burning (Domestic)	0.98	8.38×10^{-4}	99.99
Commercial	Fabricated Metal Product Manufacturing n.e.c.	0.77	6.52×10^{-4}	100.00
Industrial	Chemical production	0.76	6.46×10^{-4}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Funeral Directors, Crematoria and Cemeteries	0.63	5.33×10^{-4}	100.00
Industrial	Recovery of waste	0.61	5.23×10^{-4}	100.00
Industrial	Bird accommodation	0.57	4.89×10^{-4}	100.00
Commercial	Synthetic Resin Manufacturing	0.55	4.72×10^{-4}	100.00
Commercial	Medicinal and Pharmaceutical Product Manufacturing	0.52	4.42×10^{-4}	100.00
Industrial	Sewage treatment - large plants	0.51	4.31×10^{-4}	100.00
Industrial	Generation of electricity not coal or gas	0.42	3.61×10^{-4}	100.00
Industrial	Crushing, grinding or separating	0.42	3.55×10^{-4}	100.00
Industrial	Non-thermal treatment of waste	0.33	2.77×10^{-4}	100.00
Industrial	Explosives production	0.17	1.47×10^{-4}	100.00
Commercial	Paper Product Manufacturing n.e.c.	8.11×10^{-2}	6.90×10^{-5}	100.00
Industrial	General chemicals storage	1.75×10^{-2}	1.49×10^{-5}	100.00
Industrial	Animal accommodation	9.22×10^{-3}	7.85×10^{-6}	100.00
Commercial	Non-Ferrous Metal Casting	7.20×10^{-3}	6.13×10^{-6}	100.00
Commercial	Non-Building Construction n.e.c.	7.09×10^{-3}	6.03×10^{-6}	100.00
Commercial	Glass and Glass Product Manufacturing	4.42×10^{-3}	3.76×10^{-6}	100.00
Industrial	Metal plating or coating	2.96×10^{-3}	2.52×10^{-6}	100.00
Industrial	Coal works	3.12×10^{-4}	2.66×10^{-7}	100.00
Commercial	Printing	3.49×10^{-5}	2.97×10^{-8}	100.00

Figure 3-6, Figure 3-7, Figure 3-8, Figure 3-9 and Figure 3-10 show the proportions of total estimated annual emissions for the top 15 natural and human-made sources of carbon monoxide in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

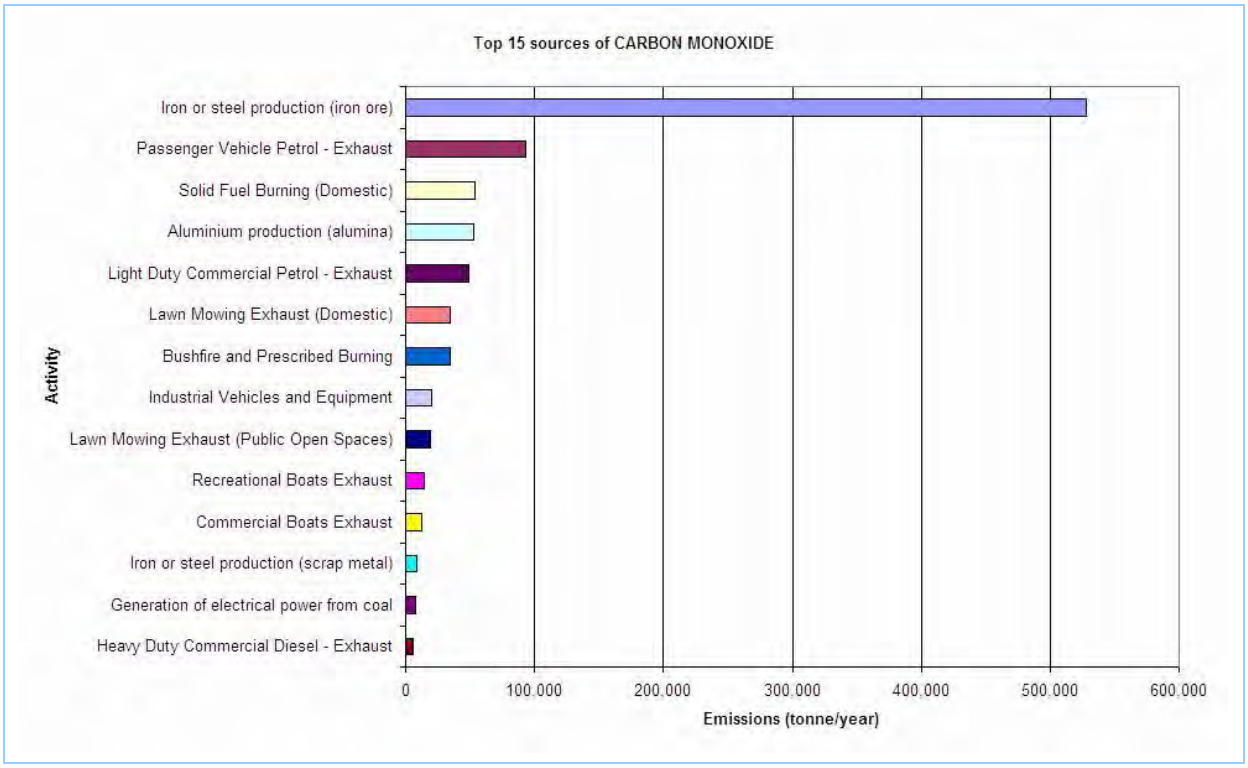

Figure 3-6: Top 15 natural and human-made sources of carbon monoxide in the GMR

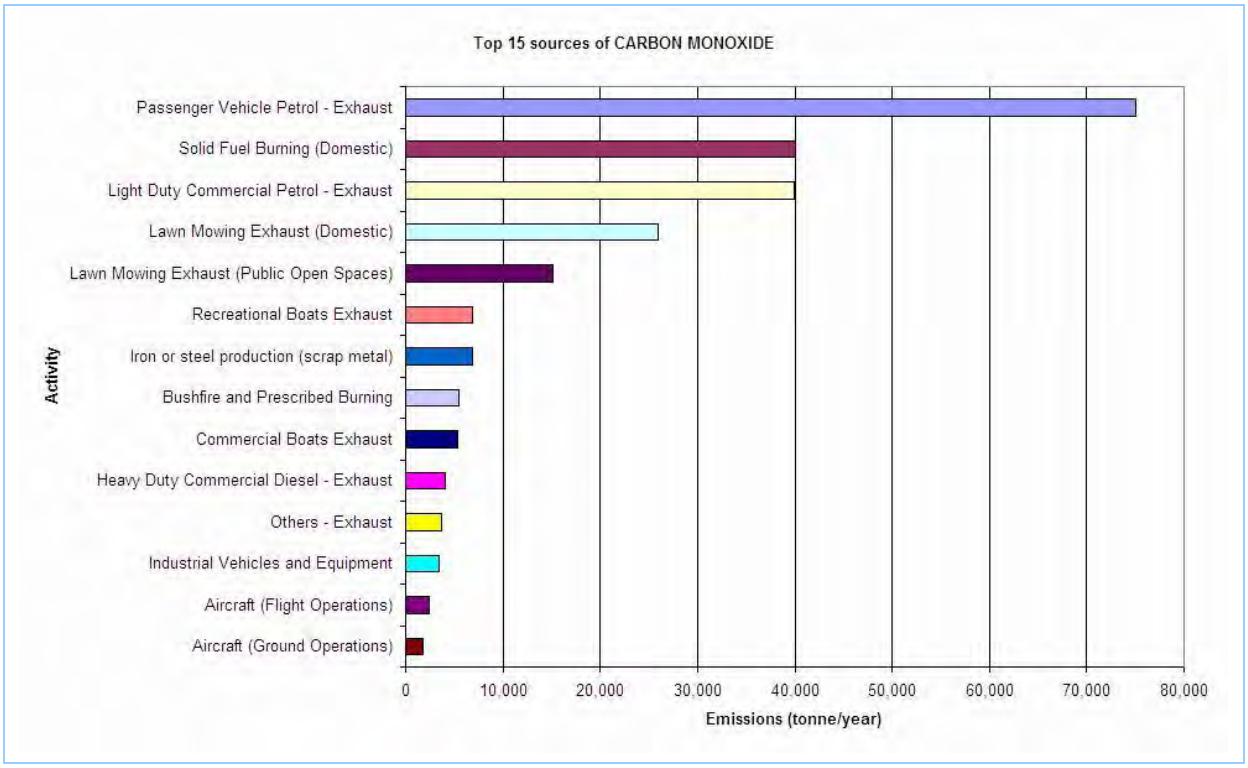

Figure 3-7: Top 15 natural and human-made sources of carbon monoxide in the Sydney region

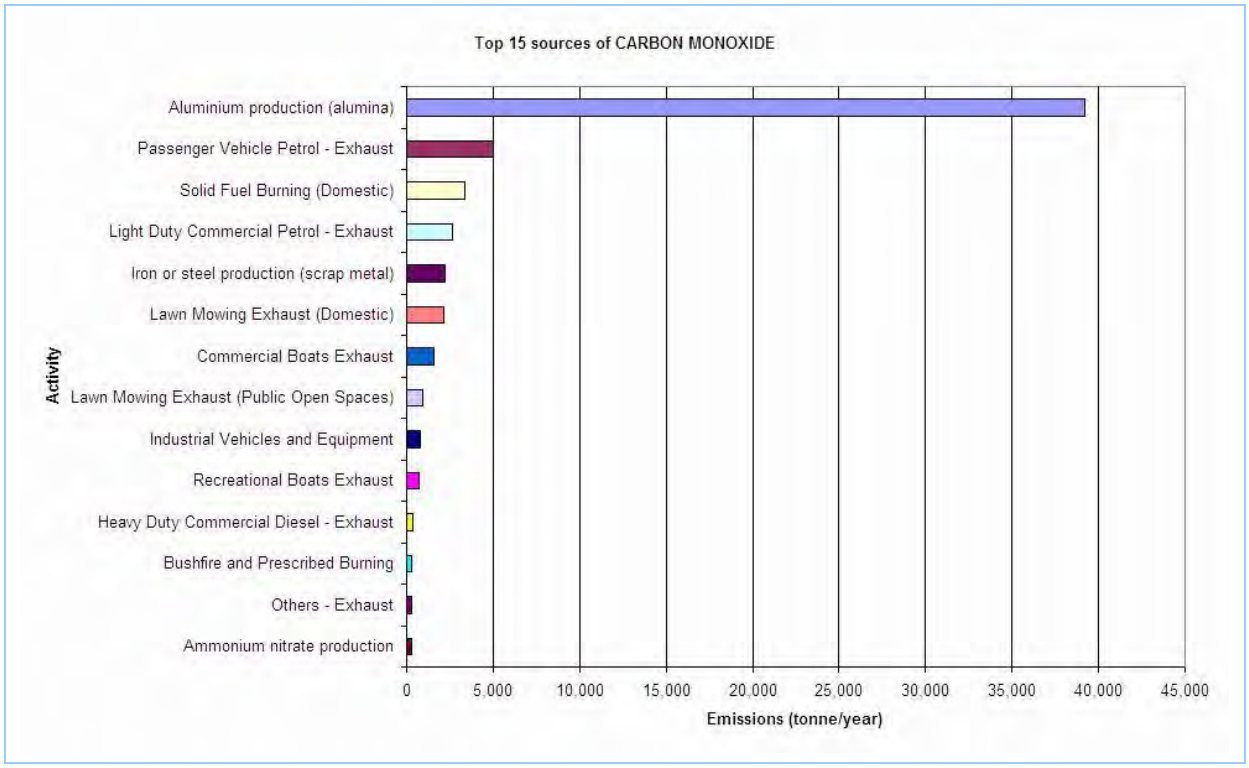

Figure 3-8: Top 15 natural and human-made sources of carbon monoxide in the Newcastle region

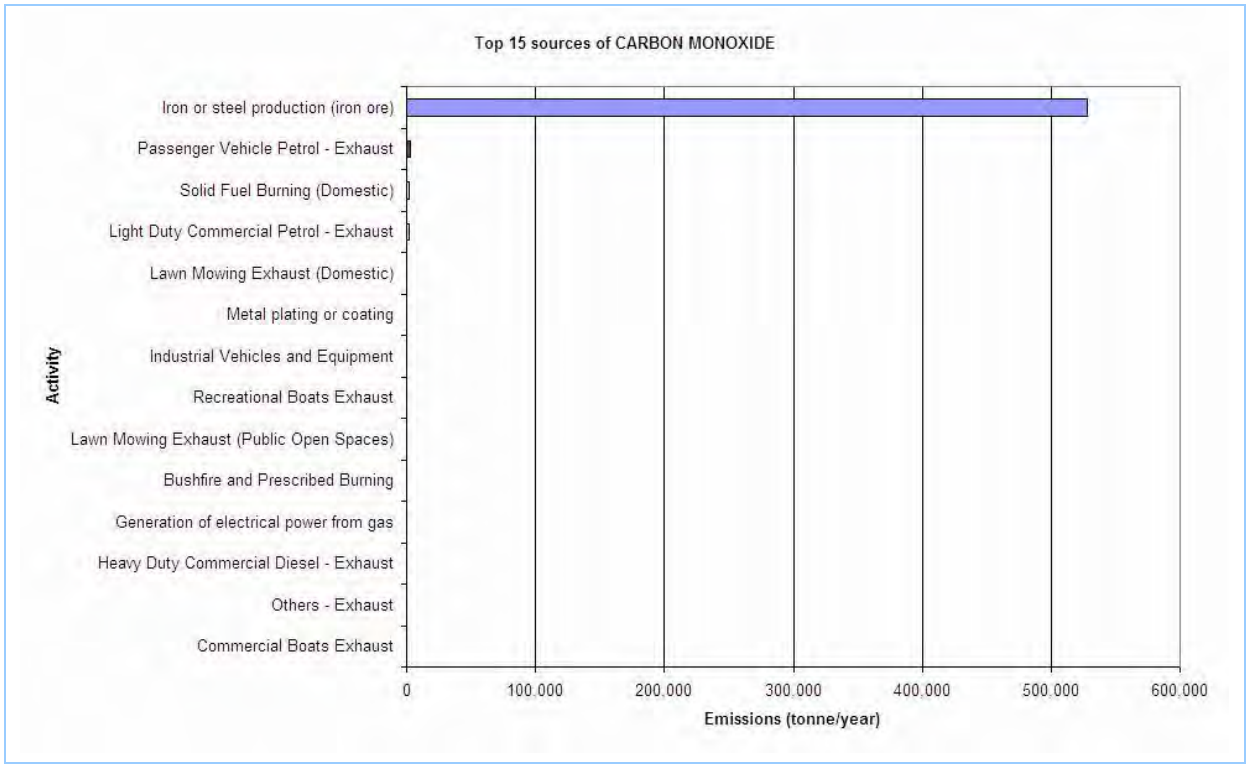

Figure 3-9: Top 15 natural and human-made sources of carbon monoxide in the Wollongong region

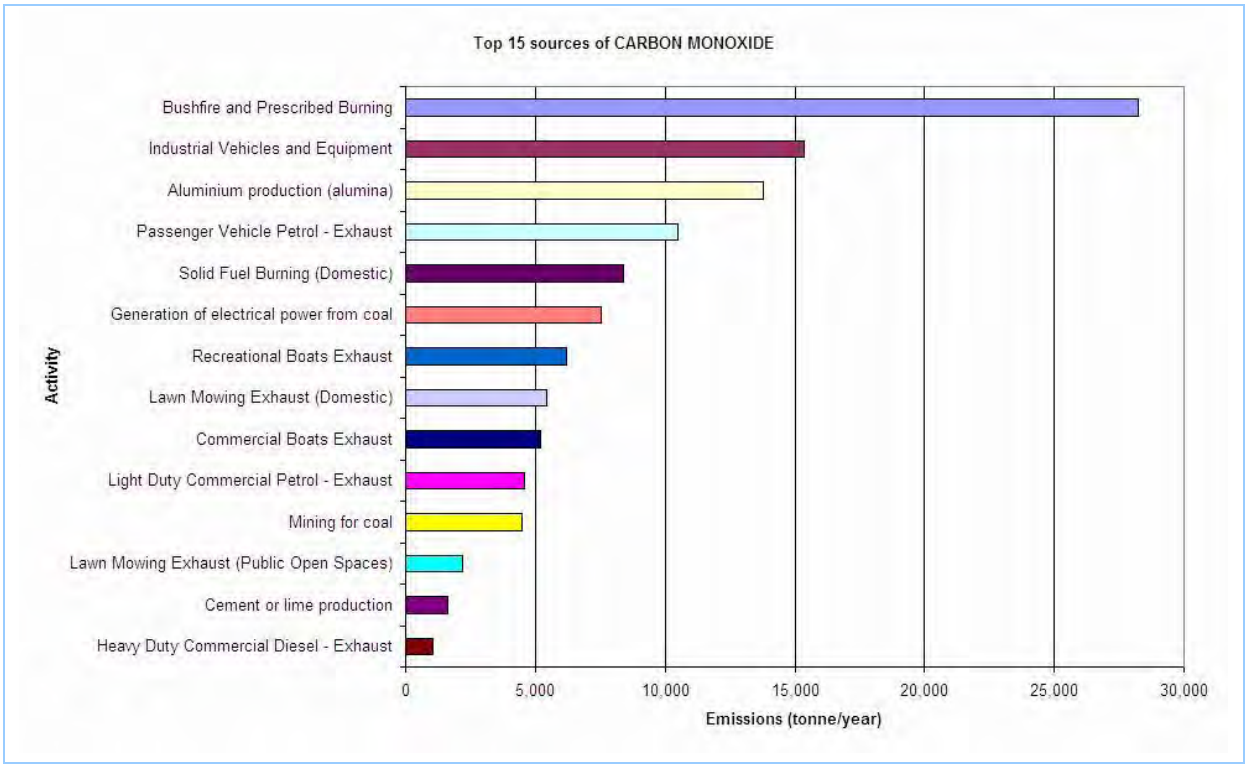

Figure 3-10: Top 15 natural and human-made sources of carbon monoxide in the Non Urban region

3.2 Oxides of Nitrogen

3.2.1 Natural and Human-Made Emissions

Table 3-4 presents total estimated annual emissions of oxides of nitrogen by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-4: Total estimated annual emissions of oxides of nitrogen by natural and human-made source type in each region

Substance	Emissions (tonne/year)							
	Region	Biogenic-Geogenic	Commercial	Domestic-Commercial	Industrial	Off-Road Mobile	On-Road Mobile	Grand Total
OXIDES OF NITROGEN	Sydney	1,296	344	2,531	8,921	16,238	45,392	74,722
	Newcastle	126	39	184	1,833	3,548	3,902	9,632
	Wollongong	71	12	130	7,784	1,598	2,184	11,779
	Non Urban	8,319	106	445	172,873	31,826	9,453	223,023
	GMR	9,811	501	3,290	191,411	53,210	60,932	319,156

Table 3-5 presents the proportions of total estimated annual emissions of oxides of nitrogen by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-5: Proportions of total estimated annual emissions of oxides of nitrogen by natural and human-made source type in each region

Substance	Proportions (%)						
	Region	Biogenic-Geogenic	Commercial	Domestic-Commercial	Industrial	Off-Road Mobile	On-Road Mobile
OXIDES OF NITROGEN	Sydney	1.73	0.46	3.39	11.94	21.73	60.75
	Newcastle	1.31	0.40	1.91	19.03	36.84	40.52
	Wollongong	0.60	0.10	1.10	66.09	13.57	18.54
	Non Urban	3.73	4.74×10^{-2}	0.20	77.51	14.27	4.24
	GMR	3.07	0.16	1.03	59.97	16.67	19.09

Figure 3-11, Figure 3-12, Figure 3-13, Figure 3-14 and Figure 3-15 show the proportions of total estimated annual emissions of oxides of nitrogen by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

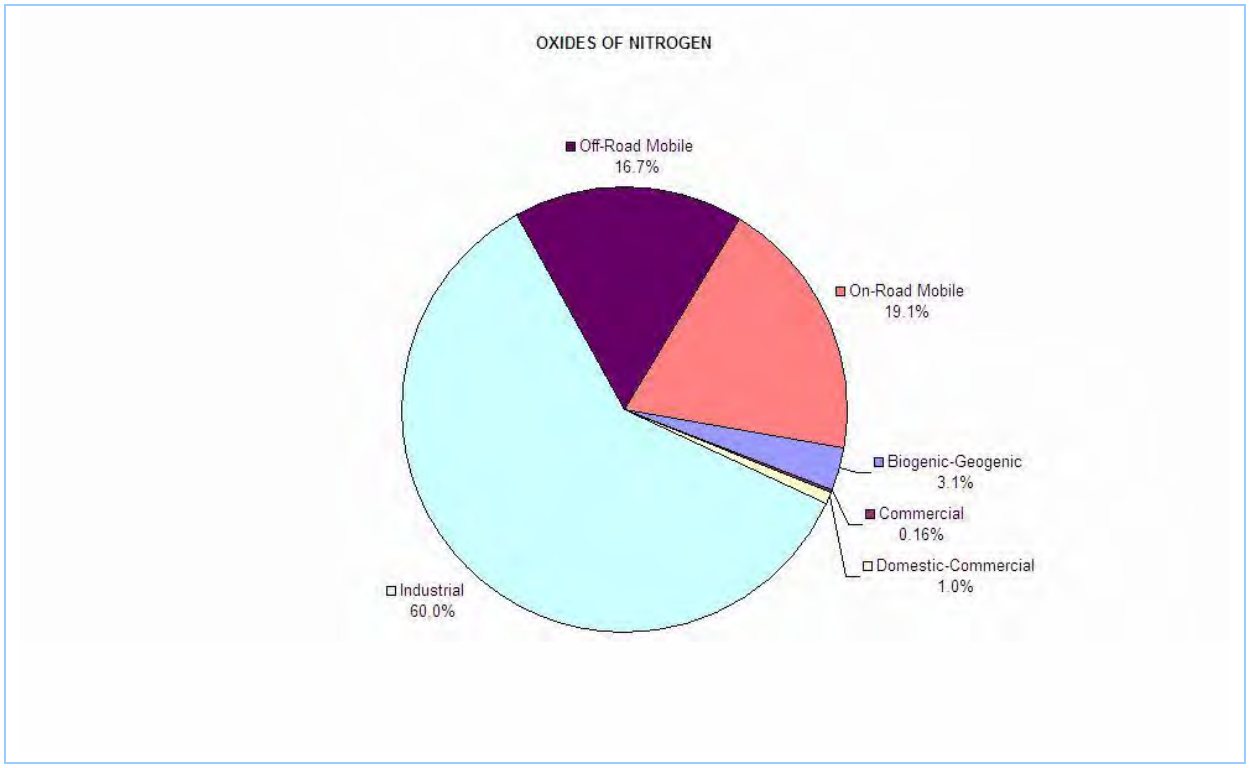

Figure 3-11: Proportions of total estimated annual emissions of oxides of nitrogen by natural and human-made source type in the GMR

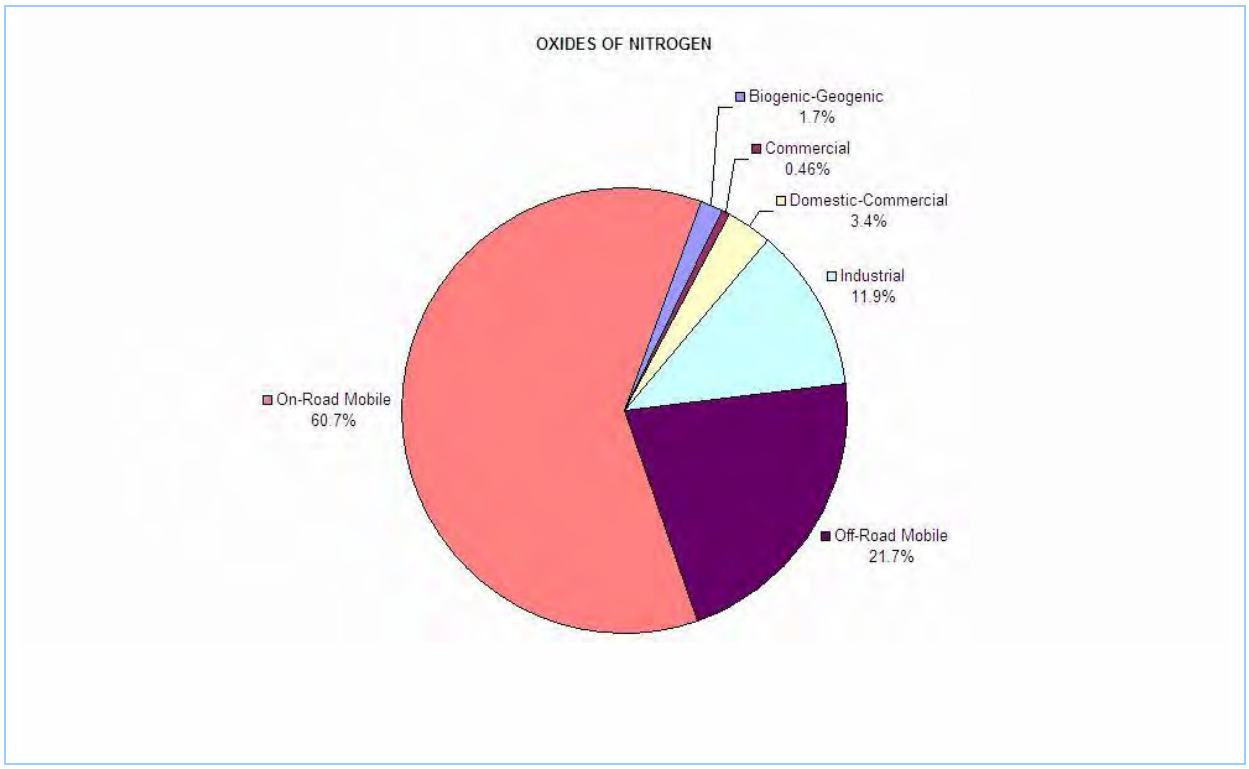

Figure 3-12: Proportions of total estimated annual emissions of oxides of nitrogen by natural and human-made source type in the Sydney region

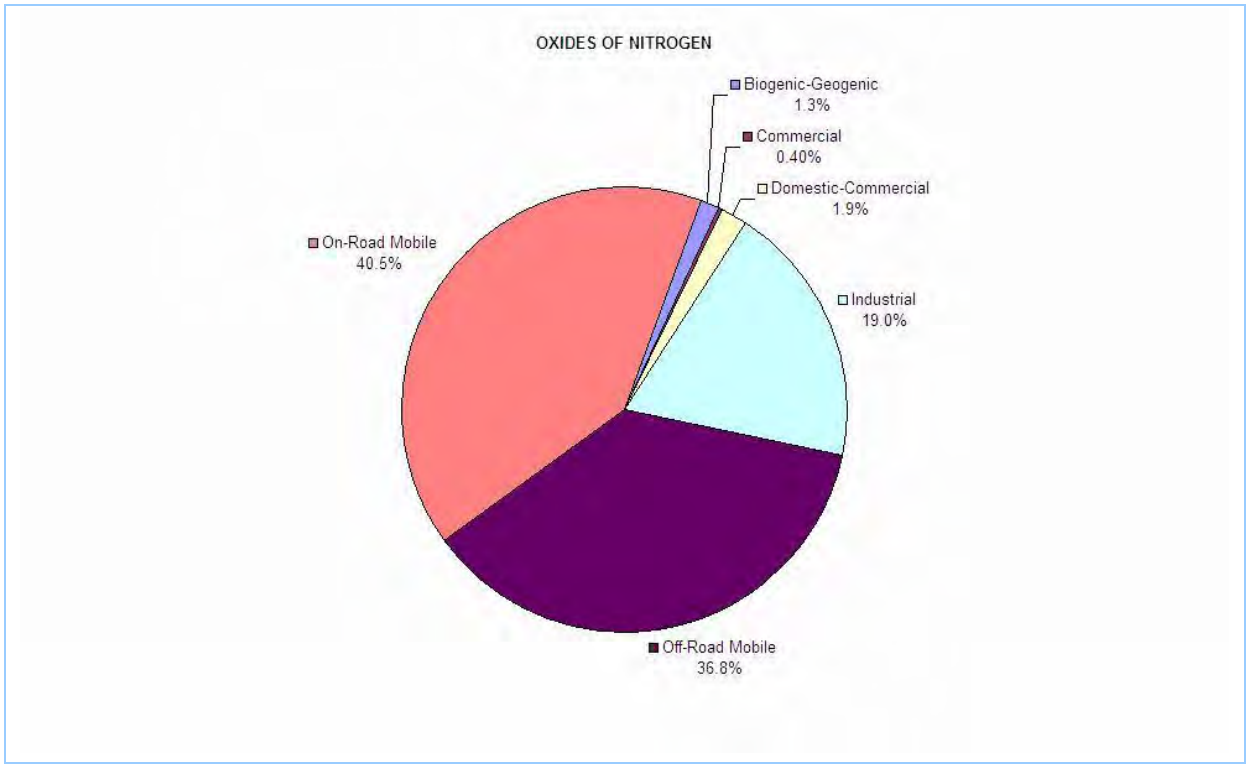

Figure 3-13: Proportions of total estimated annual emissions of oxides of nitrogen by natural and human-made source type in the Newcastle region

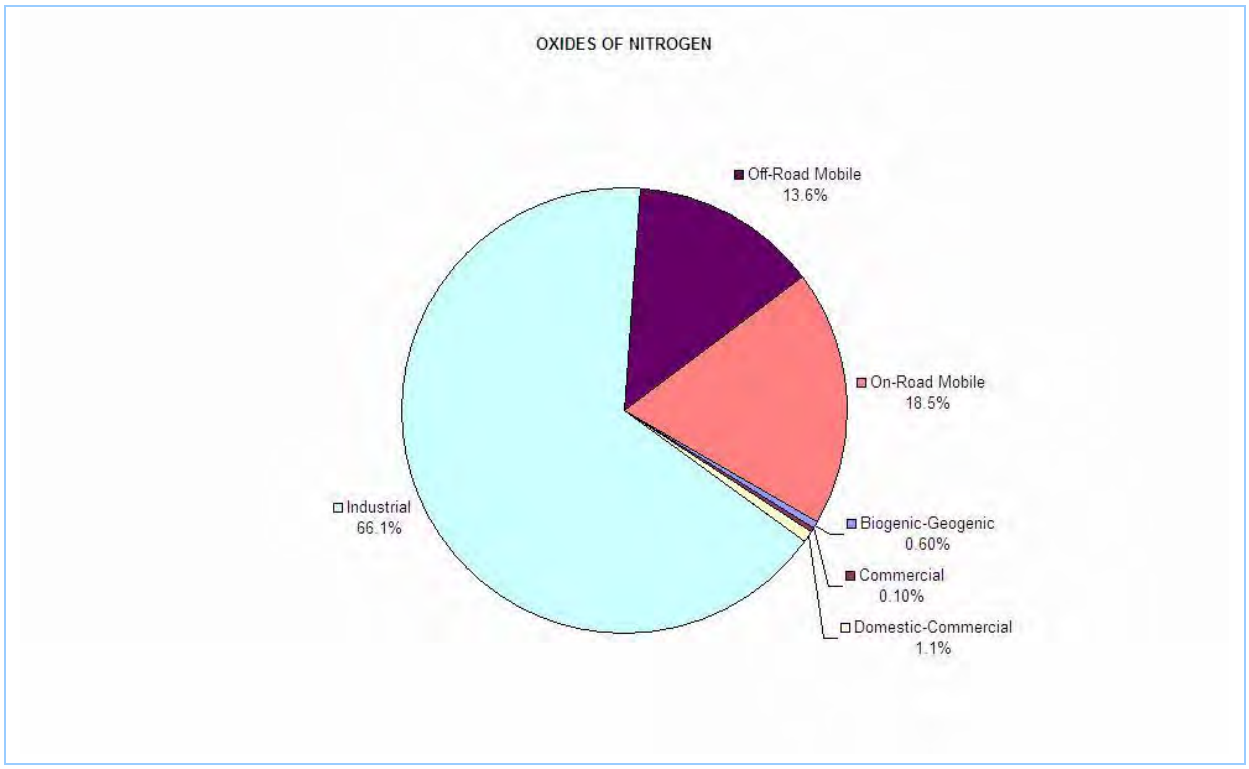

Figure 3-14: Proportions of total estimated annual emissions of oxides of nitrogen by natural and human-made source type in the Wollongong region

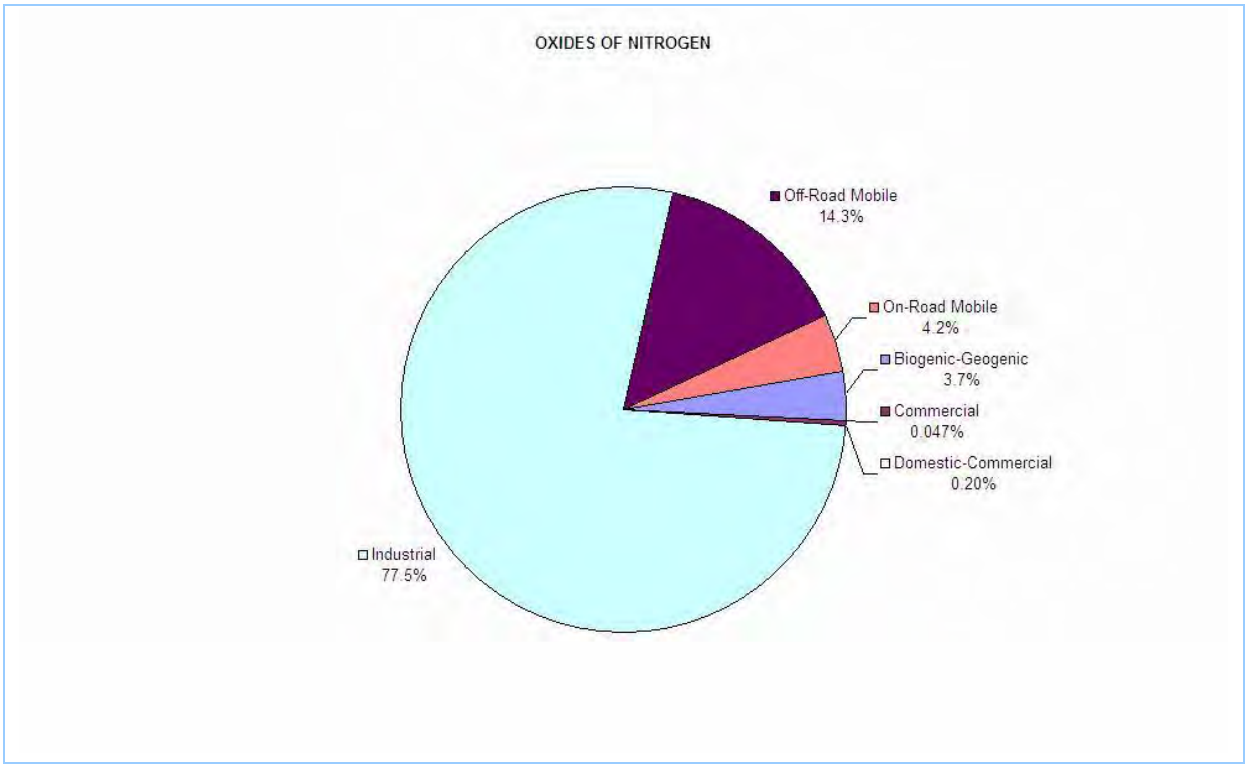

Figure 3-15: Proportions of total estimated annual emissions of oxides of nitrogen by natural and human-made source type in the Non Urban region

3.2.2 Priority Natural and Human-Made Emissions

Table 3-6 presents total estimated annual emissions, proportions and cumulative proportions of natural and human-made sources of oxides of nitrogen in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-6: Natural and human-made sources of oxides of nitrogen in each region

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
OXIDES OF NITROGEN in the GMR				
Industrial	Generation of electrical power from coal	165,956	52.00	52.00
Off-Road Mobile	Industrial Vehicles and Equipment	30,716	9.62	61.62
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	27,515	8.62	70.24
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	21,419	6.71	76.95
Off-Road Mobile	Ships	9,425	2.95	79.91
Biogenic-Geogenic	Soil	8,778	2.75	82.66
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	8,679	2.72	85.38
Industrial	Iron or steel production (iron ore)	7,513	2.35	87.73
Off-Road Mobile	Locomotives	6,087	1.91	89.64
Industrial	Cement or lime production	5,020	1.57	91.21

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Off-Road Mobile	Commercial Boats Exhaust	4,404	1.38	92.59
On-Road Mobile	Light Duty Diesel - Exhaust	3,060	0.96	93.55
Industrial	Mining for coal	2,461	0.77	94.32
Industrial	Generation of electrical power from gas	2,364	0.74	95.06
Domestic-Commercial	Gaseous Fuel Burning	1,996	0.63	95.69
Industrial	Petroleum products and fuel production	1,899	0.60	96.28
Off-Road Mobile	Aircraft (Flight Operations)	1,850	0.58	96.86
Industrial	Petrochemical production	1,096	0.34	97.21
Industrial	Glass production (container)	1,090	0.34	97.55
Biogenic-Geogenic	Bushfire and Prescribed Burning	1,022	0.32	97.87
Industrial	Ammonium nitrate production	844	0.26	98.13
Domestic-Commercial	Solid Fuel Burning (Domestic)	811	0.25	98.39
Industrial	Petroleum products storage	533	0.17	98.55
Industrial	Aluminium production (alumina)	511	0.16	98.71
Off-Road Mobile	Recreational Boats Exhaust	301	9.44×10^{-2}	98.81
Industrial	Ceramics production	296	9.26×10^{-2}	98.90
Off-Road Mobile	Aircraft (Ground Operations)	265	8.31×10^{-2}	98.98
On-Road Mobile	Others - Exhaust	259	8.10×10^{-2}	99.06
Industrial	Glass production (float)	225	7.04×10^{-2}	99.13
Industrial	Chemical production	221	6.91×10^{-2}	99.20
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	205	6.43×10^{-2}	99.27
Industrial	Iron or steel production (scrap metal)	168	5.28×10^{-2}	99.32
Off-Road Mobile	Commercial Vehicles and Equipment	162	5.08×10^{-2}	99.37
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	151	4.72×10^{-2}	99.42
Industrial	Paper or pulp production	135	4.23×10^{-2}	99.46
Industrial	Generation of electricity not coal or gas	130	4.08×10^{-2}	99.50
Industrial	Sewage treatment - large plants	116	3.64×10^{-2}	99.54
Commercial	Port Operators	102	3.21×10^{-2}	99.57
Domestic-Commercial	Barbeques	100	3.12×10^{-2}	99.60
Industrial	Metal plating or coating	93	2.92×10^{-2}	99.63
Industrial	Metal processing	85	2.67×10^{-2}	99.66
Commercial	Hospitals	67	2.08×10^{-2}	99.68
Commercial	Log Sawmilling	65	2.03×10^{-2}	99.70
Industrial	General animal products production	54	1.69×10^{-2}	99.72
Industrial	Land-based extractive activity	52	1.64×10^{-2}	99.73
Industrial	General agricultural processing	49	1.53×10^{-2}	99.75
Industrial	Slaughtering or processing of animals	48	1.51×10^{-2}	99.76
Industrial	Rendering or fat extraction	46	1.44×10^{-2}	99.78

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Aluminium production (scrap metal)	45	1.40×10^{-2}	99.79
Industrial	Contaminated soil treatment	40	1.26×10^{-2}	99.80
Industrial	Composting	39	1.23×10^{-2}	99.82
Industrial	Crushing, grinding or separating	38	1.19×10^{-2}	99.83
Commercial	Plaster Product Manufacturing	37	1.17×10^{-2}	99.84
Commercial	Metal Coating and Finishing	32	1.02×10^{-2}	99.85
Commercial	Food Manufacturing n.e.c.	29	9.15×10^{-3}	99.86
Domestic-Commercial	Liquid Fuel Burning (Domestic)	28	8.68×10^{-3}	99.87
Industrial	Bitumen mixing	27	8.58×10^{-3}	99.88
Commercial	Printing	26	8.14×10^{-3}	99.88
Industrial	Coke production	25	7.73×10^{-3}	99.89
Industrial	Cement or lime handling	24	7.38×10^{-3}	99.90
Industrial	Non-thermal treatment of waste	22	6.96×10^{-3}	99.91
Industrial	Brewing and distilling	19	5.84×10^{-3}	99.91
Industrial	Non-ferrous metal production (scrap)	16	5.09×10^{-3}	99.92
Commercial	Bread Manufacturing	16	4.95×10^{-3}	99.92
Industrial	Recovery of waste oil	15	4.69×10^{-3}	99.93
Industrial	Pharmaceutical and veterinary products production	15	4.63×10^{-3}	99.93
Commercial	Waste Disposal Services	13	4.07×10^{-3}	99.94
Industrial	Paper production using recycle materials	12	3.81×10^{-3}	99.94
Industrial	Dairy processing	12	3.75×10^{-3}	99.94
Biogenic-Geogenic	Agricultural Burning	12	3.63×10^{-3}	99.95
Commercial	Oil and Fat Manufacturing	11	3.56×10^{-3}	99.95
Industrial	Concrete works	9.33	2.92×10^{-3}	99.95
Commercial	Basic Iron and Steel Manufacturing	8.60	2.70×10^{-3}	99.96
Commercial	Biscuit Manufacturing	8.26	2.59×10^{-3}	99.96
Industrial	Scrap metal processing	7.93	2.48×10^{-3}	99.96
Industrial	Plastics resins production	7.23	2.27×10^{-3}	99.96
Commercial	Funeral Directors, Crematoria and Cemeteries	6.73	2.11×10^{-3}	99.97
Commercial	Ceramic Product Manufacturing	6.44	2.02×10^{-3}	99.97
Industrial	Printing, packaging and visual media production	6.13	1.92×10^{-3}	99.97
Commercial	Corrugated Paperboard Container Manufacturing	5.74	1.80×10^{-3}	99.97
Commercial	Beer and Malt Manufacturing	5.68	1.78×10^{-3}	99.97
Commercial	Chemical Product Manufacturing n.e.c.	5.54	1.73×10^{-3}	99.97
Industrial	Bird accommodation	4.82	1.51×10^{-3}	99.98
Commercial	Laundries and Dry-Cleaners	4.68	1.47×10^{-3}	99.98
Industrial	Soap and detergent production	4.34	1.36×10^{-3}	99.98

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Soft Drink, Cordial and Syrup Manufacturing	4.12	1.29×10^{-3}	99.98
Commercial	Glass and Glass Product Manufacturing	3.92	1.23×10^{-3}	99.98
Industrial	General chemicals storage	3.86	1.21×10^{-3}	99.98
Commercial	Gas Supply	3.68	1.15×10^{-3}	99.98
Commercial	Medicinal and Pharmaceutical Product Manufacturing	3.61	1.13×10^{-3}	99.98
Commercial	Plastic Injection Moulded Product Manufacturing	3.54	1.11×10^{-3}	99.99
Commercial	Fabricated Metal Product Manufacturing n.e.c.	3.41	1.07×10^{-3}	99.99
Commercial	Aircraft Manufacturing	2.80	8.77×10^{-4}	99.99
Commercial	Services to Air Transport	2.67	8.37×10^{-4}	99.99
Industrial	Paints/polishes/adhesives production	2.55	7.98×10^{-4}	99.99
Industrial	Container reconditioning	2.22	6.96×10^{-4}	99.99
Commercial	Ice Cream Manufacturing	2.08	6.52×10^{-4}	99.99
Industrial	Sewage treatment - small plants	1.98	6.21×10^{-4}	99.99
Commercial	Furniture Manufacturing n.e.c.	1.90	5.95×10^{-4}	99.99
Commercial	Synthetic Resin Manufacturing	1.73	5.43×10^{-4}	99.99
Commercial	Paper Product Manufacturing n.e.c.	1.73	5.42×10^{-4}	99.99
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	1.66	5.21×10^{-4}	99.99
Industrial	Wood or timber milling or processing	1.60	5.01×10^{-4}	99.99
Commercial	Cake and Pastry Manufacturing	1.59	4.99×10^{-4}	99.99
Commercial	Prepared Animal and Bird Feed Manufacturing	1.55	4.87×10^{-4}	99.99
Commercial	Fruit and Vegetable Processing	1.48	4.64×10^{-4}	100.00
Commercial	Confectionery Manufacturing	1.41	4.42×10^{-4}	100.00
Commercial	Poultry Farming (Meat)	1.38	4.31×10^{-4}	100.00
Industrial	Sterilisation activities	1.23	3.85×10^{-4}	100.00
Commercial	Milk and Cream Processing	1.22	3.84×10^{-4}	100.00
Commercial	Basic Non-Ferrous Metal Manufacturing n.e.c.	1.12	3.49×10^{-4}	100.00
Industrial	Road construction	0.94	2.95×10^{-4}	100.00
Commercial	Spring and Wire Product Manufacturing	0.78	2.45×10^{-4}	100.00
Commercial	Steel Pipe and Tube Manufacturing	0.74	2.33×10^{-4}	100.00
Industrial	Recovery of waste	0.73	2.29×10^{-4}	100.00
Industrial	Boat construction/maintenance (general)	0.58	1.81×10^{-4}	100.00
Commercial	Non-Metallic Mineral Product Manufacturing n.e.c.	0.58	1.81×10^{-4}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Scientific Research	0.55	1.73×10^{-4}	100.00
Industrial	Other land-based extraction	0.53	1.66×10^{-4}	100.00
Industrial	Agricultural fertiliser (phosphate) production	0.50	1.57×10^{-4}	100.00
Commercial	Electrical and Equipment Manufacturing n.e.c.	0.42	1.32×10^{-4}	100.00
Industrial	Pesticides and related products production	0.39	1.21×10^{-4}	100.00
Commercial	Automotive Component Manufacturing n.e.c.	0.25	7.85×10^{-5}	100.00
Industrial	Waste storage	0.25	7.69×10^{-5}	100.00
Industrial	Explosives production	0.18	5.55×10^{-5}	100.00
Commercial	Non-Building Construction n.e.c.	0.17	5.35×10^{-5}	100.00
Industrial	Chemical storage	0.15	4.76×10^{-5}	100.00
Commercial	Lifting and Material Handling Equipment Manufacturing	0.12	3.88×10^{-5}	100.00
Industrial	Shipping in bulk	6.53×10^{-2}	2.04×10^{-5}	100.00
Industrial	Animal accommodation	4.28×10^{-2}	1.34×10^{-5}	100.00
Industrial	Boat construction/maintenance (dry/float)	4.02×10^{-2}	1.26×10^{-5}	100.00
Commercial	Ceramic Product Manufacturing n.e.c.	3.48×10^{-2}	1.09×10^{-5}	100.00
Commercial	Organic Industrial Chemical Manufacturing n.e.c.	2.99×10^{-2}	9.37×10^{-6}	100.00
Commercial	Rubber Product Manufacturing n.e.c.	2.88×10^{-2}	9.02×10^{-6}	100.00
Commercial	Non-Ferrous Metal Casting	2.88×10^{-2}	9.02×10^{-6}	100.00
Industrial	Rubber products/tyre production	2.0×10^{-2}	6.27×10^{-6}	100.00
Commercial	Industrial Gas Manufacturing	1.36×10^{-2}	4.27×10^{-6}	100.00
Commercial	Wine Manufacturing	1.75×10^{-3}	5.47×10^{-7}	100.00
Industrial	Coal works	1.45×10^{-3}	4.54×10^{-7}	100.00
Commercial	Wood Product Manufacturing n.e.c.	5.95×10^{-4}	1.86×10^{-7}	100.00
OXIDES OF NITROGEN in the Sydney region				
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	21,575	28.87	28.87
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	14,423	19.30	48.18
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	6,799	9.10	57.27
Off-Road Mobile	Ships	5,138	6.88	64.15
Off-Road Mobile	Commercial Boats Exhaust	3,319	4.44	68.59
Off-Road Mobile	Locomotives	2,927	3.92	72.51
Off-Road Mobile	Industrial Vehicles and Equipment	2,600	3.48	75.99
On-Road Mobile	Light Duty Diesel - Exhaust	2,417	3.23	79.22
Industrial	Generation of electrical power from gas	2,077	2.78	82.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Petroleum products and fuel production	1,891	2.53	84.53
Off-Road Mobile	Aircraft (Flight Operations)	1,771	2.37	86.91
Domestic-Commercial	Gaseous Fuel Burning	1,556	2.08	88.99
Biogenic-Geogenic	Soil	1,133	1.52	90.50
Industrial	Petrochemical production	1,096	1.47	91.97
Industrial	Glass production (container)	1,090	1.46	93.43
Industrial	Cement or lime production	808	1.08	94.51
Domestic-Commercial	Solid Fuel Burning (Domestic)	601	0.80	95.31
Industrial	Petroleum products storage	533	0.71	96.03
Off-Road Mobile	Aircraft (Ground Operations)	255	0.34	96.37
Industrial	Ceramics production	227	0.30	96.67
Industrial	Glass production (float)	225	0.30	96.97
On-Road Mobile	Others - Exhaust	178	0.24	97.21
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	163	0.22	97.43
Biogenic-Geogenic	Bushfire and Prescribed Burning	161	0.22	97.65
Off-Road Mobile	Recreational Boats Exhaust	143	0.19	97.84
Industrial	Paper or pulp production	135	0.18	98.02
Industrial	Generation of electricity not coal or gas	129	0.17	98.19
Industrial	Sewage treatment - large plants	115	0.15	98.34
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	112	0.15	98.49
Commercial	Port Operators	102	0.14	98.63
Off-Road Mobile	Commercial Vehicles and Equipment	84	0.11	98.74
Domestic-Commercial	Barbeques	78	0.10	98.85
Industrial	Chemical production	69	9.30×10^{-2}	98.94
Industrial	General animal products production	51	6.79×10^{-2}	99.01
Commercial	Hospitals	46	6.11×10^{-2}	99.07
Industrial	Contaminated soil treatment	40	5.38×10^{-2}	99.12
Industrial	Composting	39	5.26×10^{-2}	99.18
Industrial	Rendering or fat extraction	39	5.22×10^{-2}	99.23
Industrial	Crushing, grinding or separating	37	5.01×10^{-2}	99.28
Commercial	Plaster Product Manufacturing	37	4.99×10^{-2}	99.33
Industrial	Aluminium production (scrap metal)	34	4.53×10^{-2}	99.37
Industrial	General agricultural processing	28	3.73×10^{-2}	99.41
Industrial	Metal plating or coating	27	3.67×10^{-2}	99.45
Industrial	Iron or steel production (scrap metal)	26	3.49×10^{-2}	99.48
Commercial	Printing	26	3.48×10^{-2}	99.52
Industrial	Cement or lime handling	23	3.10×10^{-2}	99.55
Domestic-Commercial	Liquid Fuel Burning (Domestic)	22	2.89×10^{-2}	99.58
Industrial	Non-thermal treatment of waste	21	2.81×10^{-2}	99.61

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Brewing and distilling	19	2.50×10^{-2}	99.63
Industrial	Non-ferrous metal production (scrap)	16	2.17×10^{-2}	99.65
Industrial	Bitumen mixing	16	2.09×10^{-2}	99.67
Industrial	Pharmaceutical and veterinary products production	15	1.98×10^{-2}	99.69
Commercial	Bread Manufacturing	14	1.85×10^{-2}	99.71
Commercial	Waste Disposal Services	13	1.74×10^{-2}	99.73
Industrial	Coke production	13	1.71×10^{-2}	99.75
Industrial	Paper production using recycle materials	12	1.63×10^{-2}	99.76
Commercial	Oil and Fat Manufacturing	11	1.52×10^{-2}	99.78
Industrial	Dairy processing	8.61	1.15×10^{-2}	99.79
Industrial	Metal processing	8.33	1.11×10^{-2}	99.80
Commercial	Biscuit Manufacturing	8.26	1.11×10^{-2}	99.81
Commercial	Food Manufacturing n.e.c.	8.22	1.10×10^{-2}	99.82
Industrial	Plastics resins production	7.23	9.67×10^{-3}	99.83
Industrial	Recovery of waste oil	6.76	9.05×10^{-3}	99.84
Industrial	Slaughtering or processing of animals	6.30	8.43×10^{-3}	99.85
Industrial	Printing, packaging and visual media production	6.13	8.21×10^{-3}	99.86
Commercial	Corrugated Paperboard Container Manufacturing	5.74	7.68×10^{-3}	99.87
Commercial	Beer and Malt Manufacturing	5.68	7.60×10^{-3}	99.87
Industrial	Concrete works	5.64	7.54×10^{-3}	99.88
Commercial	Chemical Product Manufacturing n.e.c.	5.54	7.41×10^{-3}	99.89
Industrial	Scrap metal processing	4.81	6.44×10^{-3}	99.89
Commercial	Laundries and Dry-Cleaners	4.68	6.26×10^{-3}	99.90
Industrial	Soap and detergent production	4.34	5.80×10^{-3}	99.91
Commercial	Funeral Directors, Crematoria and Cemeteries	4.27	5.71×10^{-3}	99.91
Commercial	Soft Drink, Cordial and Syrup Manufacturing	4.12	5.51×10^{-3}	99.92
Commercial	Glass and Glass Product Manufacturing	3.88	5.20×10^{-3}	99.92
Commercial	Metal Coating and Finishing	3.83	5.12×10^{-3}	99.93
Commercial	Gas Supply	3.68	4.92×10^{-3}	99.93
Industrial	Bird accommodation	3.67	4.92×10^{-3}	99.94
Commercial	Plastic Injection Moulded Product Manufacturing	3.54	4.74×10^{-3}	99.94
Commercial	Basic Iron and Steel Manufacturing	3.16	4.23×10^{-3}	99.95
Commercial	Medicinal and Pharmaceutical Product Manufacturing	2.99	4.0×10^{-3}	99.95
Commercial	Aircraft Manufacturing	2.80	3.75×10^{-3}	99.95

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Services to Air Transport	2.67	3.58×10^{-3}	99.96
Commercial	Ceramic Product Manufacturing	2.57	3.43×10^{-3}	99.96
Industrial	Paints/polishes/adhesives production	2.55	3.41×10^{-3}	99.96
Industrial	Container reconditioning	2.21	2.96×10^{-3}	99.97
Commercial	Fabricated Metal Product Manufacturing n.e.c.	2.08	2.79×10^{-3}	99.97
Commercial	Ice Cream Manufacturing	2.08	2.78×10^{-3}	99.97
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	1.66	2.23×10^{-3}	99.98
Commercial	Cake and Pastry Manufacturing	1.59	2.13×10^{-3}	99.98
Commercial	Fruit and Vegetable Processing	1.48	1.98×10^{-3}	99.98
Commercial	Confectionery Manufacturing	1.41	1.89×10^{-3}	99.98
Commercial	Poultry Farming (Meat)	1.38	1.84×10^{-3}	99.98
Commercial	Paper Product Manufacturing n.e.c.	1.35	1.81×10^{-3}	99.99
Industrial	Sterilisation activities	1.23	1.64×10^{-3}	99.99
Commercial	Milk and Cream Processing	1.22	1.64×10^{-3}	99.99
Commercial	Basic Non-Ferrous Metal Manufacturing n.e.c.	1.12	1.49×10^{-3}	99.99
Commercial	Synthetic Resin Manufacturing	1.07	1.43×10^{-3}	99.99
Biogenic-Geogenic	Agricultural Burning	1.00	1.34×10^{-3}	99.99
Industrial	Road construction	0.94	1.26×10^{-3}	99.99
Commercial	Steel Pipe and Tube Manufacturing	0.74	9.95×10^{-4}	99.99
Industrial	Sewage treatment - small plants	0.69	9.29×10^{-4}	100.00
Commercial	Non-Metallic Mineral Product Manufacturing n.e.c.	0.58	7.73×10^{-4}	100.00
Commercial	Scientific Research	0.55	7.39×10^{-4}	100.00
Commercial	Electrical and Equipment Manufacturing n.e.c.	0.42	5.65×10^{-4}	100.00
Industrial	Pesticides and related products production	0.39	5.18×10^{-4}	100.00
Commercial	Automotive Component Manufacturing n.e.c.	0.25	3.31×10^{-4}	100.00
Industrial	Waste storage	0.25	3.28×10^{-4}	100.00
Industrial	Mining for coal	0.16	2.15×10^{-4}	100.00
Industrial	Chemical storage	0.15	2.03×10^{-4}	100.00
Commercial	Lifting and Material Handling Equipment Manufacturing	0.12	1.66×10^{-4}	100.00
Commercial	Non-Building Construction n.e.c.	0.12	1.60×10^{-4}	100.00
Industrial	Shipping in bulk	6.53×10^{-2}	8.73×10^{-5}	100.00
Commercial	Organic Industrial Chemical Manufacturing n.e.c.	2.99×10^{-2}	4.0×10^{-5}	100.00
Industrial	Rubber products/tyre production	2.0×10^{-2}	2.68×10^{-5}	100.00
Commercial	Industrial Gas Manufacturing	1.36×10^{-2}	1.83×10^{-5}	100.00
Commercial	Prepared Animal and Bird Feed	5.76×10^{-3}	7.71×10^{-6}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
	Manufacturing			
Commercial	Spring and Wire Product Manufacturing	5.38×10^{-3}	7.19×10^{-6}	100.00
Industrial	Other land-based extraction	1.92×10^{-3}	2.57×10^{-6}	100.00
Commercial	Wine Manufacturing	1.75×10^{-3}	2.34×10^{-6}	100.00
Commercial	Wood Product Manufacturing n.e.c.	5.95×10^{-4}	7.97×10^{-7}	100.00
OXIDES OF NITROGEN in the Newcastle region				
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	1,666	17.30	17.30
Off-Road Mobile	Ships	1,643	17.06	34.35
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	1,511	15.69	50.04
Off-Road Mobile	Industrial Vehicles and Equipment	1,305	13.55	63.59
Industrial	Ammonium nitrate production	844	8.76	72.35
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	530	5.50	77.85
Industrial	Aluminium production (alumina)	347	3.60	81.46
Off-Road Mobile	Locomotives	306	3.18	84.63
Off-Road Mobile	Commercial Boats Exhaust	227	2.35	86.99
On-Road Mobile	Light Duty Diesel - Exhaust	177	1.84	88.83
Industrial	Chemical production	147	1.53	90.36
Industrial	Mining for coal	147	1.53	91.89
Industrial	Iron or steel production (scrap metal)	142	1.48	93.36
Biogenic-Geogenic	Soil	117	1.21	94.58
Domestic-Commercial	Gaseous Fuel Burning	107	1.11	95.69
Industrial	Metal processing	64	0.66	96.36
Industrial	Generation of electrical power from gas	62	0.64	97.00
Domestic-Commercial	Solid Fuel Burning (Domestic)	50	0.52	97.52
Industrial	Slaughtering or processing of animals	42	0.43	97.95
Off-Road Mobile	Aircraft (Flight Operations)	32	0.33	98.29
Commercial	Metal Coating and Finishing	29	0.30	98.58
On-Road Mobile	Others - Exhaust	18	0.19	98.77
Industrial	General agricultural processing	15	0.16	98.93
Off-Road Mobile	Recreational Boats Exhaust	15	0.15	99.08
Off-Road Mobile	Commercial Vehicles and Equipment	12	0.12	99.21
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	10	0.11	99.32
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	9.34	9.70×10^{-2}	99.41
Biogenic-Geogenic	Bushfire and Prescribed Burning	8.72	9.06×10^{-2}	99.50
Off-Road Mobile	Aircraft (Ground Operations)	8.42	8.74×10^{-2}	99.59
Industrial	Metal plating or coating	7.04	7.31×10^{-2}	99.66

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Bitumen mixing	6.78	7.04×10^{-2}	99.73
Commercial	Hospitals	6.63	6.88×10^{-2}	99.80
Domestic-Commercial	Barbeques	5.35	5.56×10^{-2}	99.86
Industrial	Dairy processing	3.36	3.49×10^{-2}	99.89
Industrial	Scrap metal processing	3.11	3.23×10^{-2}	99.93
Commercial	Bread Manufacturing	2.00	2.08×10^{-2}	99.95
Domestic-Commercial	Liquid Fuel Burning (Domestic)	1.49	1.55×10^{-2}	99.96
Commercial	Funeral Directors, Crematoria and Cemeteries	0.83	8.67×10^{-3}	99.97
Industrial	Boat construction/maintenance (general)	0.58	6.0×10^{-3}	99.98
Industrial	Other land-based extraction	0.53	5.49×10^{-3}	99.98
Industrial	Agricultural fertiliser (phosphate) production	0.50	5.20×10^{-3}	99.99
Industrial	Cement or lime handling	0.42	4.37×10^{-3}	99.99
Commercial	Fabricated Metal Product Manufacturing n.e.c.	0.41	4.29×10^{-3}	100.00
Biogenic-Geogenic	Agricultural Burning	0.22	2.26×10^{-3}	100.00
Industrial	Non-thermal treatment of waste	4.96×10^{-2}	5.15×10^{-4}	100.00
Industrial	Boat construction/maintenance (dry/float)	4.02×10^{-2}	4.18×10^{-4}	100.00
Industrial	Contaminated soil treatment	3.63×10^{-2}	3.76×10^{-4}	100.00
Commercial	Ceramic Product Manufacturing n.e.c.	3.48×10^{-2}	3.61×10^{-4}	100.00
Commercial	Waste Disposal Services	7.30×10^{-3}	7.58×10^{-5}	100.00
Industrial	Crushing, grinding or separating	3.30×10^{-6}	3.42×10^{-8}	100.00
OXIDES OF NITROGEN in the Wollongong region				
Industrial	Iron or steel production (iron ore)	7,513	63.79	63.79
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	938	7.97	71.76
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	783	6.64	78.40
Off-Road Mobile	Ships	706	5.99	84.39
Off-Road Mobile	Industrial Vehicles and Equipment	607	5.15	89.54
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	346	2.94	92.48
Off-Road Mobile	Locomotives	252	2.14	94.62
Industrial	Generation of electrical power from gas	178	1.51	96.13
On-Road Mobile	Light Duty Diesel - Exhaust	107	0.90	97.04
Domestic-Commercial	Gaseous Fuel Burning	78	0.66	97.70
Industrial	Metal plating or coating	59	0.50	98.19
Biogenic-Geogenic	Soil	53	0.45	98.64
Domestic-Commercial	Solid Fuel Burning (Domestic)	33	0.28	98.92
Biogenic-Geogenic	Bushfire and Prescribed Burning	18	0.15	99.07
Off-Road Mobile	Commercial Boats Exhaust	16	0.14	99.21

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Off-Road Mobile	Recreational Boats Exhaust	16	0.13	99.34
Industrial	Metal processing	13	0.11	99.45
Industrial	Coke production	12	0.10	99.55
On-Road Mobile	Others - Exhaust	9.92	8.42×10^{-2}	99.64
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	7.74	6.57×10^{-2}	99.70
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	6.17	5.24×10^{-2}	99.75
Commercial	Basic Iron and Steel Manufacturing	5.44	4.62×10^{-2}	99.80
Commercial	Ceramic Product Manufacturing	3.87	3.29×10^{-2}	99.83
Domestic-Commercial	Barbeques	3.87	3.28×10^{-2}	99.87
Industrial	General chemicals storage	3.84	3.26×10^{-2}	99.90
Industrial	Bitumen mixing	2.85	2.42×10^{-2}	99.92
Commercial	Hospitals	2.50	2.12×10^{-2}	99.94
Off-Road Mobile	Commercial Vehicles and Equipment	1.85	1.57×10^{-2}	99.96
Industrial	Chemical production	1.38	1.18×10^{-2}	99.97
Domestic-Commercial	Liquid Fuel Burning (Domestic)	1.08	9.14×10^{-3}	99.98
Industrial	Sewage treatment - large plants	0.78	6.59×10^{-3}	99.99
Off-Road Mobile	Aircraft (Flight Operations)	0.57	4.82×10^{-3}	99.99
Industrial	Non-thermal treatment of waste	0.56	4.75×10^{-3}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	0.26	2.19×10^{-3}	100.00
Commercial	Rubber Product Manufacturing n.e.c.	2.88×10^{-2}	2.45×10^{-4}	100.00
Industrial	Container reconditioning	7.68×10^{-3}	6.52×10^{-5}	100.00
Commercial	Spring and Wire Product Manufacturing	4.35×10^{-3}	3.69×10^{-5}	100.00
Commercial	Automotive Component Manufacturing n.e.c.	3.20×10^{-3}	2.72×10^{-5}	100.00
Commercial	Synthetic Resin Manufacturing	1.76×10^{-3}	1.49×10^{-5}	100.00
OXIDES OF NITROGEN in the Non Urban region				
Industrial	Generation of electrical power from coal	165,956	74.41	74.41
Off-Road Mobile	Industrial Vehicles and Equipment	26,204	11.75	86.16
Biogenic-Geogenic	Soil	7,474	3.35	89.51
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	4,702	2.11	91.62
Industrial	Cement or lime production	4,213	1.89	93.51
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	3,336	1.50	95.01
Off-Road Mobile	Locomotives	2,602	1.17	96.17
Industrial	Mining for coal	2,313	1.04	97.21
Off-Road Mobile	Ships	1,938	0.87	98.08
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	1,004	0.45	98.53
Off-Road Mobile	Commercial Boats Exhaust	843	0.38	98.91

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Biogenic-Geogenic	Bushfire and Prescribed Burning	835	0.37	99.28
On-Road Mobile	Light Duty Diesel - Exhaust	359	0.16	99.44
Domestic-Commercial	Gaseous Fuel Burning	255	0.11	99.56
Industrial	Aluminium production (alumina)	164	7.35×10^{-2}	99.63
Off-Road Mobile	Recreational Boats Exhaust	128	5.74×10^{-2}	99.69
Domestic-Commercial	Solid Fuel Burning (Domestic)	126	5.65×10^{-2}	99.74
Industrial	Ceramics production	69	3.09×10^{-2}	99.78
Commercial	Log Sawmilling	65	2.90×10^{-2}	99.80
Off-Road Mobile	Commercial Vehicles and Equipment	64	2.88×10^{-2}	99.83
Industrial	Land-based extractive activity	52	2.35×10^{-2}	99.86
On-Road Mobile	Others - Exhaust	52	2.33×10^{-2}	99.88
Industrial	Generation of electrical power from gas	47	2.11×10^{-2}	99.90
Off-Road Mobile	Aircraft (Flight Operations)	46	2.05×10^{-2}	99.92
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	24	1.07×10^{-2}	99.93
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	23	1.05×10^{-2}	99.94
Commercial	Food Manufacturing n.e.c.	21	9.41×10^{-3}	99.95
Domestic-Commercial	Barbeques	13	5.70×10^{-3}	99.96
Commercial	Hospitals	12	5.28×10^{-3}	99.96
Industrial	Aluminium production (scrap metal)	11	4.85×10^{-3}	99.97
Biogenic-Geogenic	Agricultural Burning	10	4.64×10^{-3}	99.97
Industrial	Petroleum products and fuel production	8.52	3.82×10^{-3}	99.98
Industrial	Recovery of waste oil	8.20	3.68×10^{-3}	99.98
Industrial	Rendering or fat extraction	7.10	3.18×10^{-3}	99.98
Industrial	General agricultural processing	5.91	2.65×10^{-3}	99.99
Industrial	Concrete works	3.70	1.66×10^{-3}	99.99
Domestic-Commercial	Liquid Fuel Burning (Domestic)	3.54	1.59×10^{-3}	99.99
Industrial	General animal products production	3.12	1.40×10^{-3}	99.99
Industrial	Chemical production	2.31	1.04×10^{-3}	99.99
Industrial	Bitumen mixing	2.12	9.51×10^{-4}	99.99
Commercial	Furniture Manufacturing n.e.c.	1.90	8.51×10^{-4}	99.99
Off-Road Mobile	Aircraft (Ground Operations)	1.60	7.17×10^{-4}	99.99
Industrial	Wood or timber milling or processing	1.60	7.16×10^{-4}	99.99
Commercial	Prepared Animal and Bird Feed Manufacturing	1.55	6.94×10^{-4}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	1.37	6.16×10^{-4}	100.00
Industrial	Sewage treatment - small plants	1.29	5.78×10^{-4}	100.00
Industrial	Bird accommodation	1.15	5.16×10^{-4}	100.00
Commercial	Fabricated Metal Product	0.91	4.09×10^{-4}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
	Manufacturing n.e.c.			
Industrial	Generation of electricity not coal or gas	0.80	3.57×10^{-4}	100.00
Commercial	Spring and Wire Product Manufacturing	0.77	3.46×10^{-4}	100.00
Industrial	Recovery of waste	0.73	3.28×10^{-4}	100.00
Commercial	Synthetic Resin Manufacturing	0.66	2.96×10^{-4}	100.00
Commercial	Medicinal and Pharmaceutical Product Manufacturing	0.62	2.77×10^{-4}	100.00
Industrial	Non-thermal treatment of waste	0.57	2.55×10^{-4}	100.00
Industrial	Crushing, grinding or separating	0.50	2.22×10^{-4}	100.00
Industrial	Sewage treatment - large plants	0.47	2.11×10^{-4}	100.00
Commercial	Paper Product Manufacturing n.e.c.	0.38	1.69×10^{-4}	100.00
Industrial	Explosives production	0.18	7.95×10^{-5}	100.00
Commercial	Non-Building Construction n.e.c.	5.14×10^{-2}	2.30×10^{-5}	100.00
Industrial	Animal accommodation	4.28×10^{-2}	1.92×10^{-5}	100.00
Commercial	Glass and Glass Product Manufacturing	3.56×10^{-2}	1.60×10^{-5}	100.00
Commercial	Non-Ferrous Metal Casting	2.88×10^{-2}	1.29×10^{-5}	100.00
Industrial	General chemicals storage	2.08×10^{-2}	9.33×10^{-6}	100.00
Industrial	Metal plating or coating	3.52×10^{-3}	1.58×10^{-6}	100.00
Industrial	Coal works	1.45×10^{-3}	6.50×10^{-7}	100.00
Commercial	Printing	4.16×10^{-5}	1.87×10^{-8}	100.00

Figure 3-16, Figure 3-17, Figure 3-18, Figure 3-19 and Figure 3-20 show the proportions of total estimated annual emissions for the top 15 natural and human-made sources of oxides of nitrogen in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

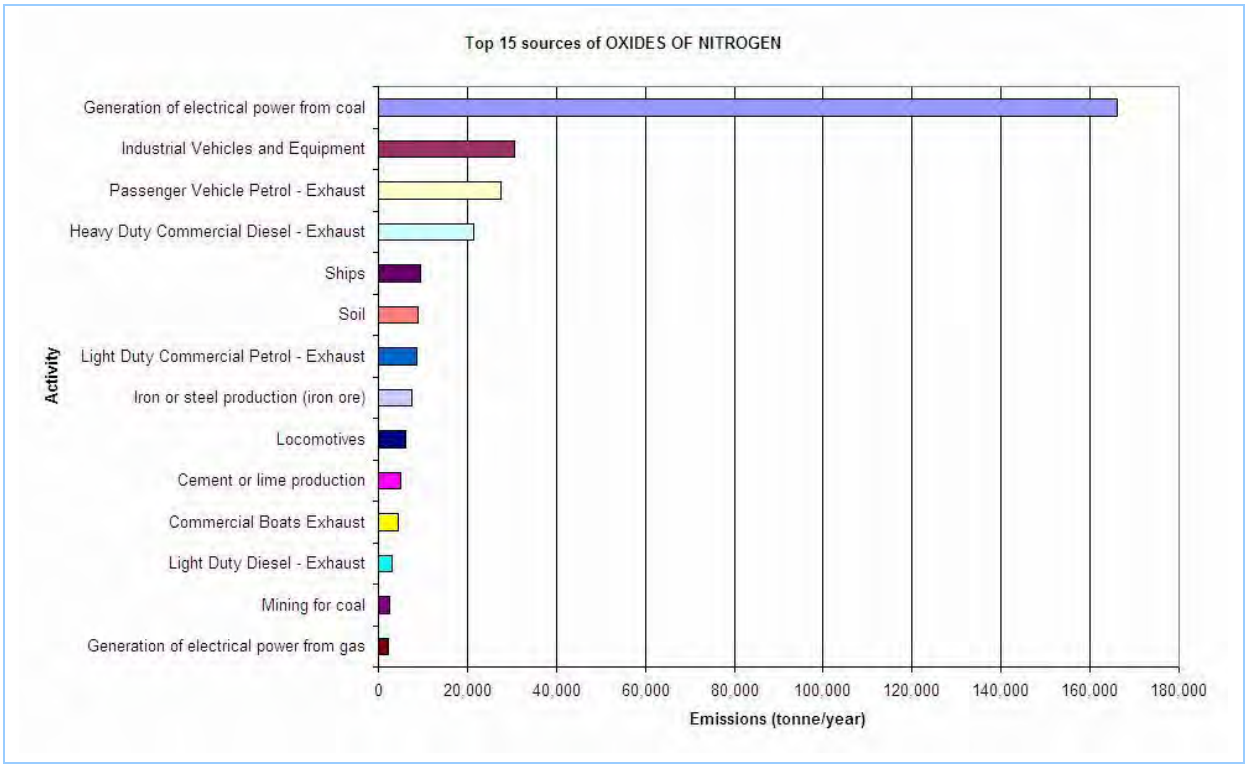

Figure 3-16: Top 15 natural and human-made sources of oxides of nitrogen in the GMR

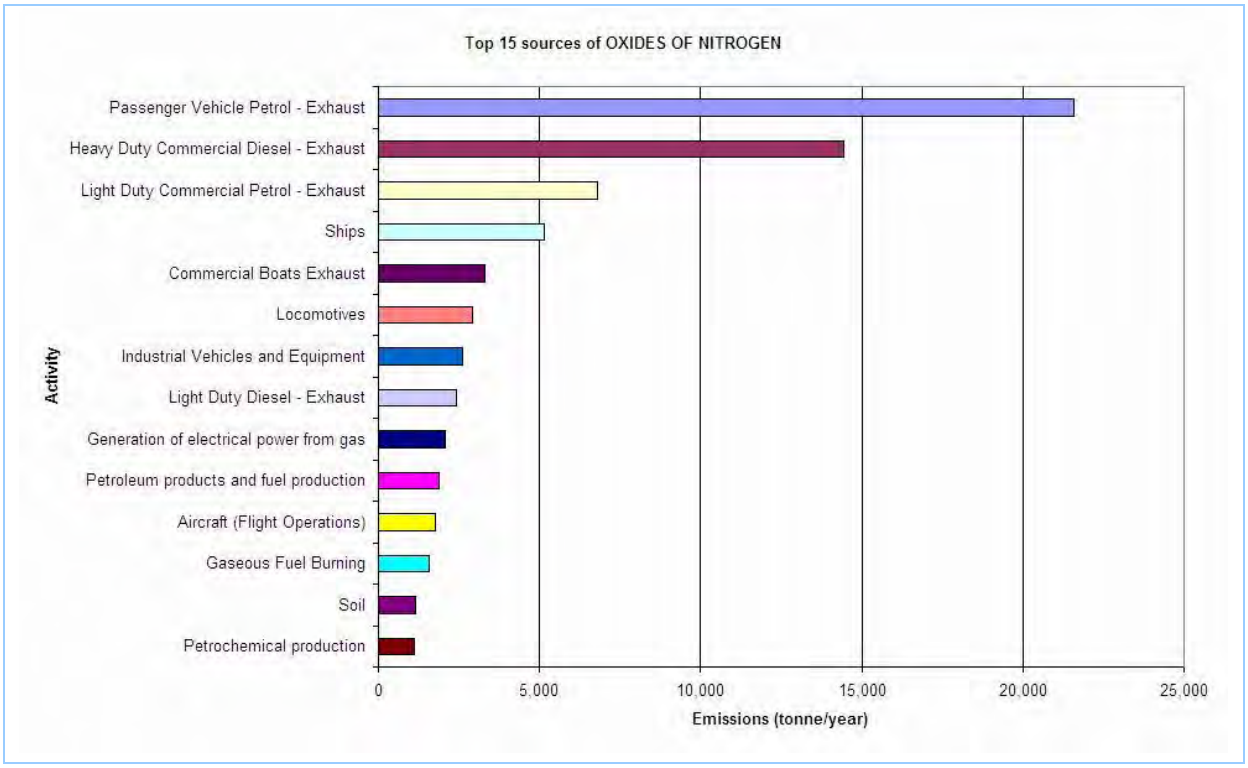

Figure 3-17: Top 15 natural and human-made sources of oxides of nitrogen in the Sydney region

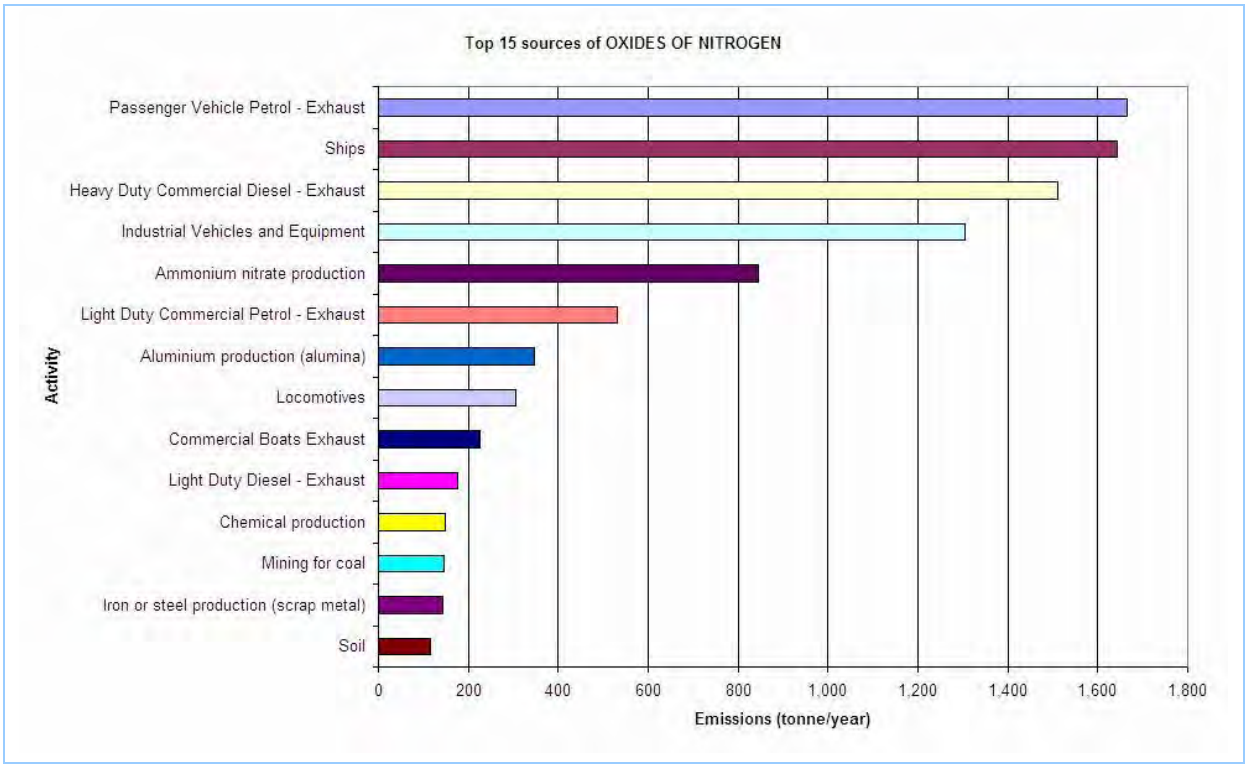

Figure 3-18: Top 15 natural and human-made sources of oxides of nitrogen in the Newcastle region

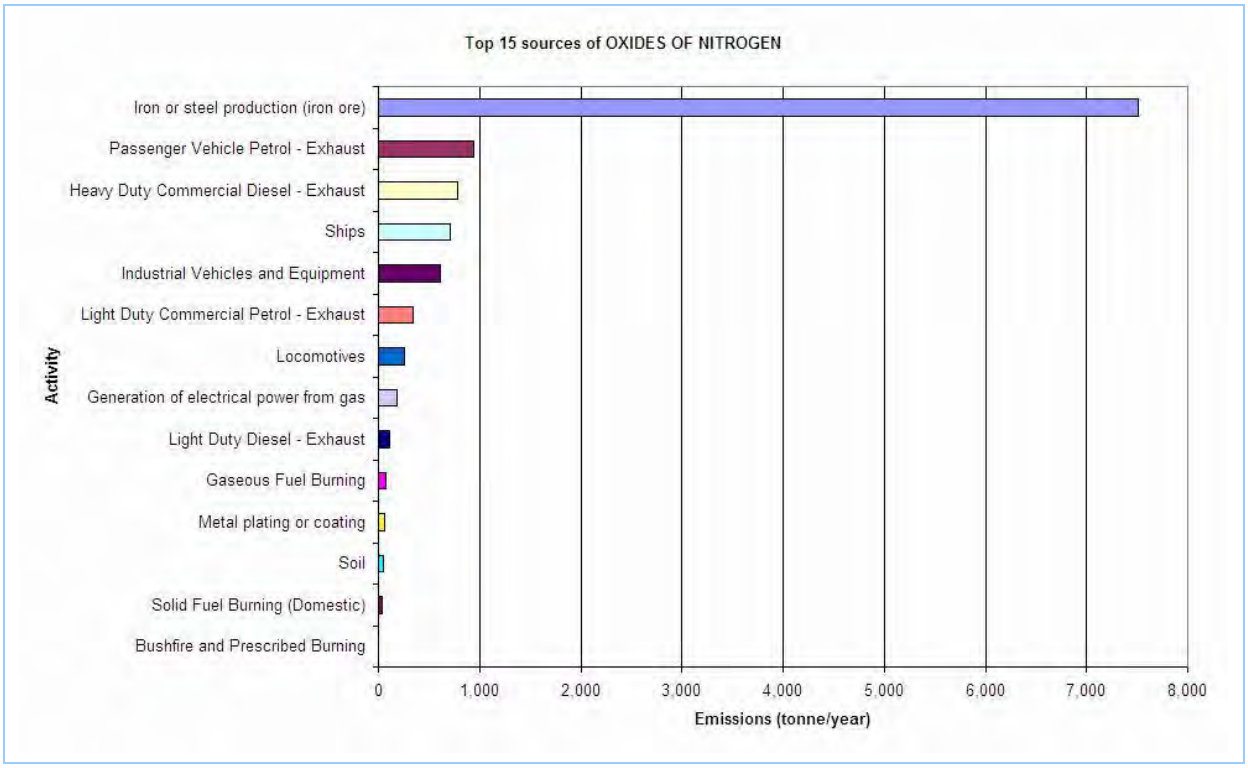

Figure 3-19: Top 15 natural and human-made sources of oxides of nitrogen in the Wollongong region

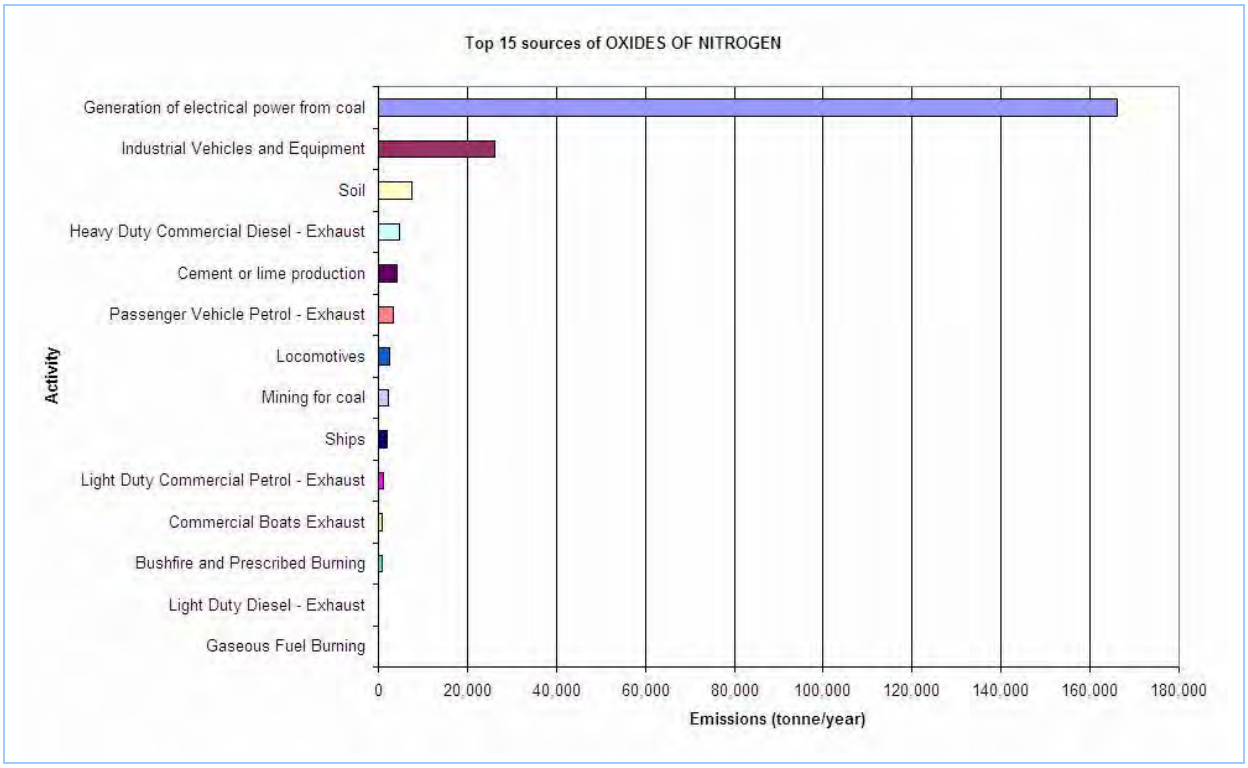

Figure 3-20: Top 15 natural and human-made sources of oxides of nitrogen in the Non Urban region

3.3 Particulate Matter ≤ 10 µm

3.3.1 Natural and Human-Made Emissions

Table 3-7 presents total estimated annual emissions of particulate matter ≤ 10 µm by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-7: Total estimated annual emissions of particulate matter ≤ 10 µm by natural and human-made source type in each region

Substance	Emissions (tonne/year)							
	Region	Biogenic-Geogenic	Commercial	Domestic-Commercial	Industrial	Off-Road Mobile	On-Road Mobile	Grand Total
PARTICULATE MATTER ≤ 10 µm	Sydney	3,901	1,111	6,088	6,215	1,019	2,110	20,443
	Newcastle	689	129	504	3,744	284	176	5,526
	Wollongong	327	48	334	2,099	119	90	3,017
	Non Urban	28,719	732	1,262	61,155	2,185	417	94,471
	GMR	33,635	2,020	8,189	73,213	3,607	2,793	123,458

Table 3-8 presents the proportions of total estimated annual emissions of particulate matter ≤ 10 µm by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-8: Proportions of total estimated annual emissions of particulate matter ≤ 10 µm by natural and human-made source type in each region

Substance	Proportions (%)						
	Region	Biogenic-Geogenic	Commercial	Domestic-Commercial	Industrial	Off-Road Mobile	On-Road Mobile
PARTICULATE MATTER ≤ 10 µm	Sydney	19.08	5.44	29.78	30.40	4.98	10.32
	Newcastle	12.46	2.34	9.12	67.76	5.14	3.19
	Wollongong	10.83	1.58	11.08	69.58	3.94	2.99
	Non Urban	30.40	0.77	1.34	64.73	2.31	0.44
	GMR	27.24	1.64	6.63	59.30	2.92	2.26

Figure 3-21, Figure 3-22, Figure 3-23, Figure 3-24 and Figure 3-25 show the proportions of total estimated annual emissions of particulate matter ≤ 10 µm by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

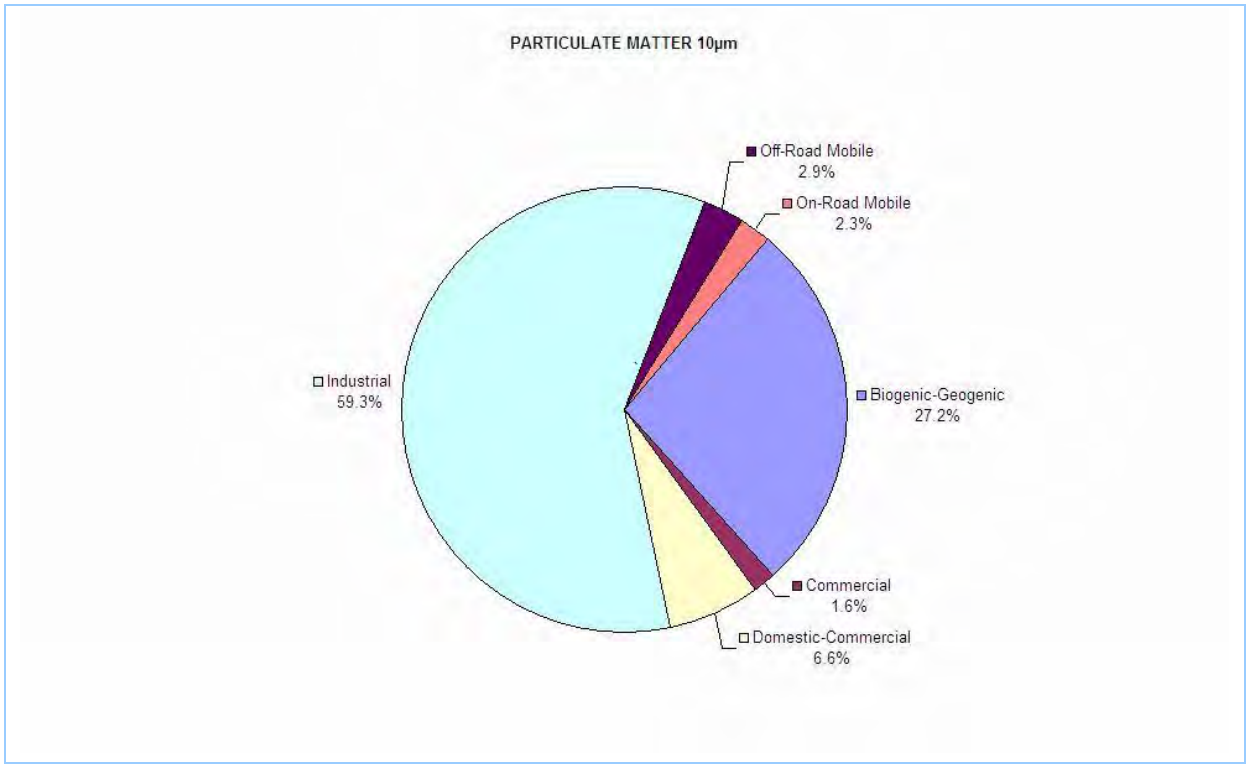

Figure 3-21: Proportions of total estimated annual emissions of particulate matter ≤ 10 µm by natural and human-made source type in the GMR

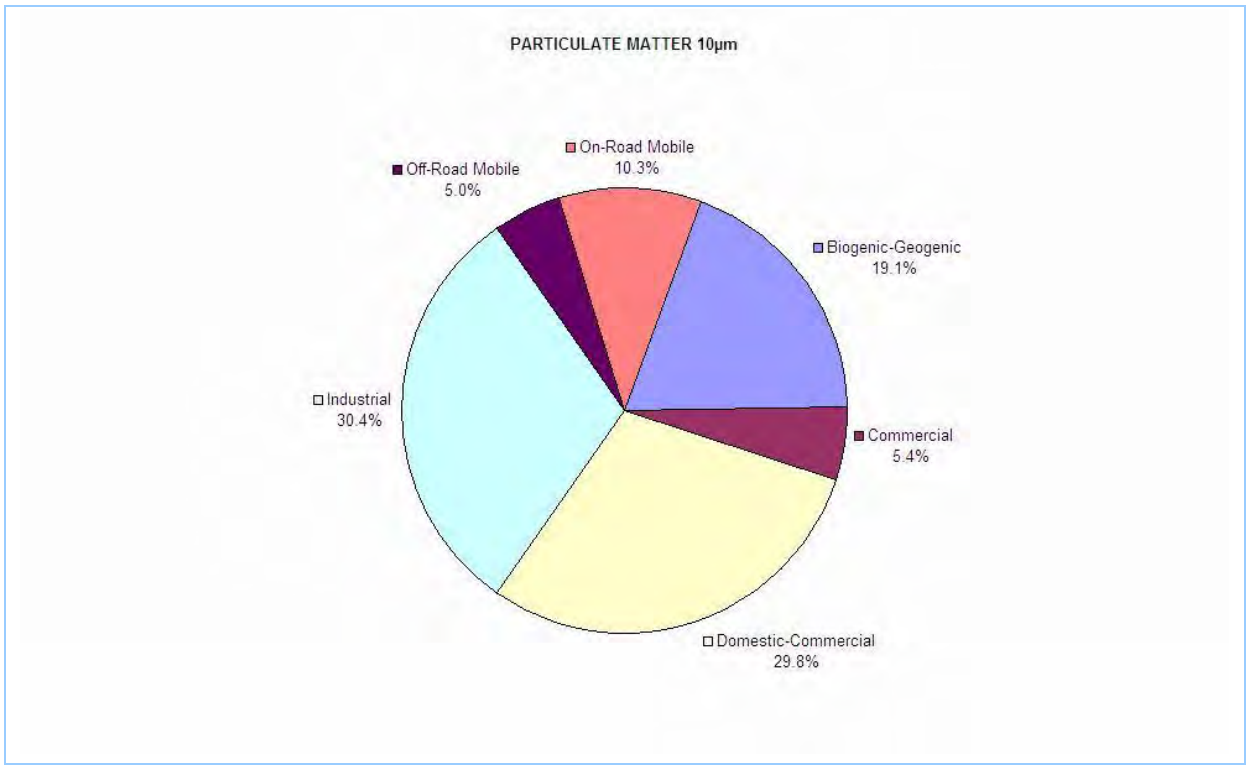

Figure 3-22: Proportions of total estimated annual emissions of particulate matter ≤ 10 µm by natural and human-made source type in the Sydney region

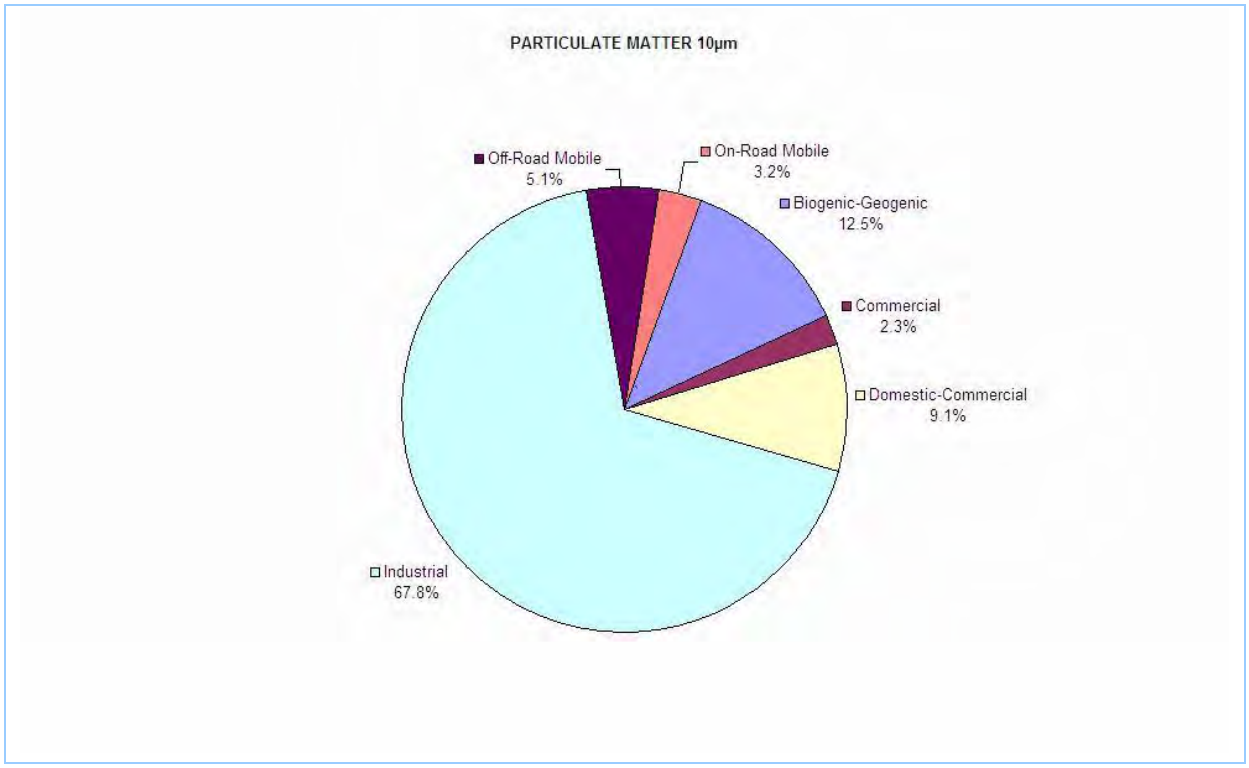

Figure 3-23: Proportions of total estimated annual emissions of particulate matter ≤ 10 µm by natural and human-made source type in the Newcastle region

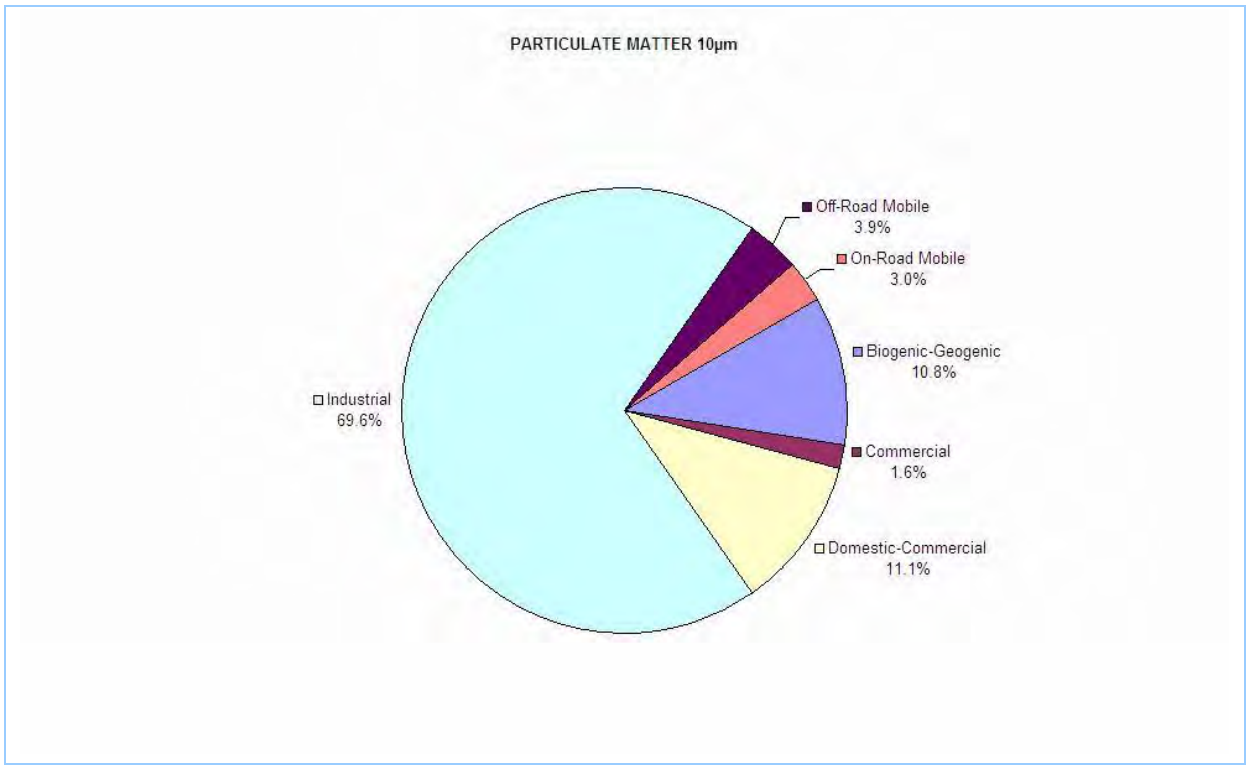

Figure 3-24: Proportions of total estimated annual emissions of particulate matter ≤ 10 µm by natural and human-made source type in the Wollongong region

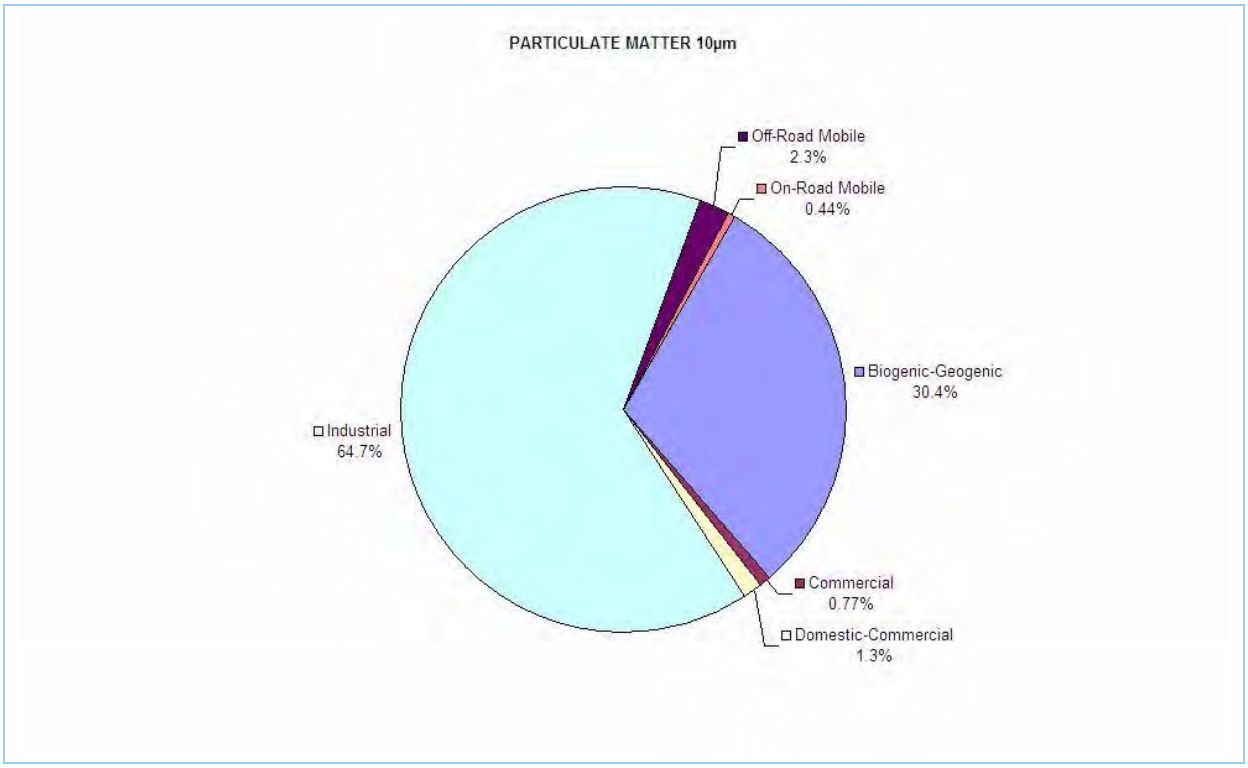

Figure 3-25: Proportions of total estimated annual emissions of particulate matter ≤ 10 µm by natural and human-made source type in the Non Urban region

3.3.2 Priority Natural and Human-Made Emissions

Table 3-9 presents total estimated annual emissions, proportions and cumulative proportions of natural and human-made sources of particulate matter ≤ 10 µm in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-9: Natural and human-made sources of particulate matter ≤ 10 µm in each region

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
PARTICULATE MATTER ≤ 10 µm in the GMR				
Industrial	Mining for coal	52,462	42.49	42.49
Biogenic-Geogenic	Marine Aerosol	28,435	23.03	65.53
Domestic-Commercial	Solid Fuel Burning (Domestic)	7,645	6.19	71.72
Industrial	Generation of electrical power from coal	6,515	5.28	77.00
Biogenic-Geogenic	Bushfire and Prescribed Burning	3,486	2.82	79.82
Industrial	Land-based extractive activity	2,802	2.27	82.09
Off-Road Mobile	Industrial Vehicles and Equipment	2,094	1.70	83.78
Industrial	Iron or steel production (iron ore)	1,749	1.42	85.20
Biogenic-Geogenic	Fugitive-Windborne	1,673	1.35	86.56
Industrial	Waste disposal (application to land)	1,592	1.29	87.85
On-Road Mobile	All - Non-Exhaust PM	1,450	1.17	89.02

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Gravel and Sand Quarrying	1,388	1.12	90.14
Industrial	Other land-based extraction	1,363	1.10	91.25
Industrial	Coal works	1,000	0.81	92.06
Off-Road Mobile	Ships	922	0.75	92.80
Industrial	Ceramics production	855	0.69	93.50
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	841	0.68	94.18
Industrial	Cement or lime production	679	0.55	94.73
Industrial	Mining for minerals	441	0.36	95.09
Industrial	Crushing, grinding or separating	405	0.33	95.41
Industrial	Aluminium production (alumina)	391	0.32	95.73
Industrial	Ammonium nitrate production	323	0.26	95.99
Industrial	Bird accommodation	319	0.26	96.25
On-Road Mobile	Light Duty Diesel - Exhaust	308	0.25	96.50
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	202	0.16	96.66
Off-Road Mobile	Commercial Boats Exhaust	193	0.16	96.82
Commercial	Synthetic Resin Manufacturing	191	0.15	96.98
Industrial	Petroleum products and fuel production	180	0.15	97.12
Industrial	Composting	176	0.14	97.26
Off-Road Mobile	Locomotives	171	0.14	97.40
Domestic-Commercial	Gaseous Fuel Burning	159	0.13	97.53
Industrial	Iron or steel production (scrap metal)	149	0.12	97.65
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	145	0.12	97.77
Off-Road Mobile	Recreational Boats Exhaust	143	0.12	97.89
Commercial	Poultry Farming (Meat)	132	0.11	97.99
Industrial	Concrete works	129	0.10	98.10
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	121	9.79×10^{-2}	98.20
Industrial	Glass production (container)	118	9.52×10^{-2}	98.29
Industrial	General agricultural processing	101	8.16×10^{-2}	98.37
Industrial	Recovery of waste	95	7.71×10^{-2}	98.45
Industrial	Non-thermal treatment of waste	93	7.53×10^{-2}	98.52
Industrial	Bitumen mixing	91	7.40×10^{-2}	98.60
Industrial	Generation of electrical power from gas	85	6.88×10^{-2}	98.67
Industrial	Railway systems activities	80	6.45×10^{-2}	98.73
Industrial	Coke production	72	5.80×10^{-2}	98.79
Industrial	Slaughtering or processing of animals	68	5.52×10^{-2}	98.84
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	64	5.16×10^{-2}	98.90
Industrial	Solid waste landfilling	60	4.90×10^{-2}	98.95
Off-Road Mobile	Aircraft (Flight Operations)	58	4.73×10^{-2}	98.99
Industrial	Cement or lime handling	58	4.71×10^{-2}	99.04

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Boat construction/maintenance (dry/float)	57	4.64×10^{-2}	99.09
Industrial	Scrap metal processing	53	4.27×10^{-2}	99.13
Industrial	Metal plating or coating	52	4.23×10^{-2}	99.17
Commercial	Poultry Farming (Eggs)	50	4.09×10^{-2}	99.21
Commercial	Construction Material Mining n.e.c.	50	4.07×10^{-2}	99.25
Industrial	Petroleum products storage	45	3.67×10^{-2}	99.29
Industrial	Shipping in bulk	45	3.64×10^{-2}	99.33
Biogenic-Geogenic	Agricultural Burning	42	3.39×10^{-2}	99.36
Industrial	Agricultural fertiliser (phosphate) production	40	3.24×10^{-2}	99.39
Industrial	Metal processing	36	2.91×10^{-2}	99.42
Industrial	Dairy processing	36	2.88×10^{-2}	99.45
Industrial	Inert waste landfilling	36	2.88×10^{-2}	99.48
Domestic-Commercial	Barbeques	34	2.77×10^{-2}	99.51
Industrial	Glass production (float)	32	2.56×10^{-2}	99.53
Commercial	Ceramic Product Manufacturing	31	2.50×10^{-2}	99.56
Industrial	Chemical production	29	2.37×10^{-2}	99.58
Commercial	Paint Manufacturing	29	2.37×10^{-2}	99.60
Industrial	Road construction	26	2.07×10^{-2}	99.63
Industrial	Petrochemical production	24	1.94×10^{-2}	99.64
Industrial	Aluminium production (scrap metal)	24	1.93×10^{-2}	99.66
Industrial	Dairy animal accommodation	23	1.90×10^{-2}	99.68
Industrial	Sewage treatment - small plants	21	1.71×10^{-2}	99.70
Industrial	Hazardous, industrial or group A waste disposal	21	1.71×10^{-2}	99.72
Industrial	Waste storage	20	1.59×10^{-2}	99.73
Commercial	Log Sawmilling	18	1.49×10^{-2}	99.75
Industrial	Coal washery reject or slag landfilling	17	1.34×10^{-2}	99.76
Industrial	Contaminated soil treatment	16	1.33×10^{-2}	99.77
Off-Road Mobile	Aircraft (Ground Operations)	15	1.19×10^{-2}	99.79
Commercial	Metal Coating and Finishing	15	1.19×10^{-2}	99.80
Commercial	Plaster Product Manufacturing	14	1.10×10^{-2}	99.81
Industrial	General chemicals storage	13	1.05×10^{-2}	99.82
Industrial	Boat construction/maintenance (general)	13	1.04×10^{-2}	99.83
Off-Road Mobile	Commercial Vehicles and Equipment	11	8.67×10^{-3}	99.84
Industrial	Animal accommodation	10	8.49×10^{-3}	99.85
Industrial	Water-based extractive activity	10	8.38×10^{-3}	99.86
Industrial	Paints/polishes/adhesives production	10	8.31×10^{-3}	99.86
Commercial	Basic Non-Ferrous Metal	10	8.14×10^{-3}	99.87

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
	Manufacturing n.e.c.			
Commercial	Basic Iron and Steel Manufacturing	9.91	8.03×10^{-3}	99.88
Commercial	Chemical Product Manufacturing n.e.c.	9.52	7.71×10^{-3}	99.89
On-Road Mobile	Others - Exhaust	9.39	7.61×10^{-3}	99.90
Commercial	Port Operators	8.95	7.25×10^{-3}	99.90
Commercial	Glass and Glass Product Manufacturing	8.41	6.81×10^{-3}	99.91
Industrial	Miscellaneous licensed discharges to waters (at any time)	8.11	6.57×10^{-3}	99.92
Industrial	Wood or timber milling or processing	7.81	6.32×10^{-3}	99.92
Commercial	Concrete Slurry Manufacturing	7.06	5.72×10^{-3}	99.93
Commercial	Plastic Injection Moulded Product Manufacturing	5.96	4.83×10^{-3}	99.93
Industrial	Paper or pulp production	5.86	4.75×10^{-3}	99.94
Commercial	Hospitals	5.00	4.05×10^{-3}	99.94
Commercial	Fabricated Metal Product Manufacturing n.e.c.	4.85	3.92×10^{-3}	99.95
Commercial	Steel Pipe and Tube Manufacturing	4.78	3.87×10^{-3}	99.95
Industrial	Sewage treatment - large plants	4.25	3.44×10^{-3}	99.95
Industrial	Non-ferrous metal production (scrap)	4.00	3.24×10^{-3}	99.96
Industrial	Battery production	3.94	3.19×10^{-3}	99.96
Industrial	Rendering or fat extraction	3.78	3.06×10^{-3}	99.96
Domestic-Commercial	Liquid Fuel Burning (Domestic)	3.66	2.97×10^{-3}	99.97
Commercial	Road and Bridge Construction	3.50	2.84×10^{-3}	99.97
Commercial	Beer and Malt Manufacturing	3.39	2.75×10^{-3}	99.97
Industrial	General animal products production	2.91	2.36×10^{-3}	99.97
Industrial	Generation of electricity not coal or gas	2.04	1.65×10^{-3}	99.98
Industrial	Pesticides and related products production	1.94	1.57×10^{-3}	99.98
Commercial	Waste Disposal Services	1.70	1.38×10^{-3}	99.98
Commercial	Food Manufacturing n.e.c.	1.65	1.34×10^{-3}	99.98
Commercial	Bread Manufacturing	1.53	1.24×10^{-3}	99.98
Commercial	Chemical Wholesaling	1.52	1.23×10^{-3}	99.98
Commercial	Printing	1.46	1.18×10^{-3}	99.98
Industrial	Paper production using recycle materials	1.31	1.06×10^{-3}	99.98
Industrial	Brewing and distilling	1.24	1.01×10^{-3}	99.99
Industrial	Container reconditioning	1.23	9.98×10^{-4}	99.99
Commercial	Electric Cable and Wire Manufacturing	1.22	9.92×10^{-4}	99.99

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Spring and Wire Product Manufacturing	1.16	9.39×10^{-4}	99.99
Industrial	Recovery of waste oil	1.08	8.72×10^{-4}	99.99
Industrial	Pharmaceutical and veterinary products production	1.05	8.50×10^{-4}	99.99
Commercial	Plastic Bag and Film Manufacturing	0.90	7.28×10^{-4}	99.99
Industrial	Plastics resins production	0.80	6.49×10^{-4}	99.99
Commercial	Industrial Gas Manufacturing	0.75	6.07×10^{-4}	99.99
Commercial	Soap and Other Detergent Manufacturing	0.66	5.39×10^{-4}	99.99
Commercial	Biscuit Manufacturing	0.63	5.09×10^{-4}	99.99
Commercial	Ink Manufacturing	0.62	5.01×10^{-4}	99.99
Industrial	Printing, packaging and visual media production	0.54	4.40×10^{-4}	99.99
Commercial	Petroleum Product Wholesaling	0.50	4.08×10^{-4}	99.99
Commercial	Oil and Fat Manufacturing	0.48	3.91×10^{-4}	99.99
Industrial	Soap and detergent production	0.48	3.89×10^{-4}	99.99
Commercial	Non-Building Construction n.e.c.	0.48	3.87×10^{-4}	100.00
Commercial	Corrugated Paperboard Container Manufacturing	0.44	3.53×10^{-4}	100.00
Commercial	Electrical and Equipment Manufacturing n.e.c.	0.43	3.48×10^{-4}	100.00
Commercial	Structural Steel Fabricating	0.40	3.24×10^{-4}	100.00
Commercial	Laundries and Dry-Cleaners	0.36	2.89×10^{-4}	100.00
Commercial	Soft Drink, Cordial and Syrup Manufacturing	0.31	2.53×10^{-4}	100.00
Commercial	Gas Supply	0.28	2.27×10^{-4}	100.00
Commercial	Medicinal and Pharmaceutical Product Manufacturing	0.27	2.19×10^{-4}	100.00
Commercial	Automotive Component Manufacturing n.e.c.	0.25	2.02×10^{-4}	100.00
Commercial	Non-Ferrous Metal Casting	0.24	1.97×10^{-4}	100.00
Commercial	Wood Product Manufacturing n.e.c.	0.23	1.88×10^{-4}	100.00
Commercial	Fruit and Vegetable Processing	0.22	1.82×10^{-4}	100.00
Commercial	Aircraft Manufacturing	0.21	1.72×10^{-4}	100.00
Commercial	Services to Air Transport	0.20	1.64×10^{-4}	100.00
Industrial	Explosives production	0.20	1.61×10^{-4}	100.00
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	0.19	1.57×10^{-4}	100.00
Industrial	Boat mooring and storage	0.15	1.22×10^{-4}	100.00
Commercial	Furniture Manufacturing n.e.c.	0.15	1.18×10^{-4}	100.00
Commercial	Paper Product Manufacturing n.e.c.	0.13	1.05×10^{-4}	100.00
Commercial	Cake and Pastry Manufacturing	0.12	9.80×10^{-5}	100.00
Commercial	Prepared Animal and Bird Feed	0.12	9.56×10^{-5}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
	Manufacturing			
Commercial	Ice Cream Manufacturing	9.64×10^{-2}	7.80×10^{-5}	100.00
Industrial	Sterilisation activities	9.62×10^{-2}	7.79×10^{-5}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	9.55×10^{-2}	7.73×10^{-5}	100.00
Commercial	Milk and Cream Processing	9.30×10^{-2}	7.53×10^{-5}	100.00
Commercial	Scientific Research	8.39×10^{-2}	6.80×10^{-5}	100.00
Commercial	Rubber Product Manufacturing n.e.c.	7.69×10^{-2}	6.23×10^{-5}	100.00
Commercial	Confectionery Manufacturing	7.08×10^{-2}	5.74×10^{-5}	100.00
Commercial	Aluminium Rolling, Drawing, Extruding	7.05×10^{-2}	5.71×10^{-5}	100.00
Industrial	Rubber products/tyre production	4.96×10^{-2}	4.02×10^{-5}	100.00
Commercial	Non-Metallic Mineral Product Manufacturing n.e.c.	4.39×10^{-2}	3.55×10^{-5}	100.00
Commercial	Lifting and Material Handling Equipment Manufacturing	2.45×10^{-2}	1.98×10^{-5}	100.00
Industrial	Chemical storage	1.76×10^{-2}	1.43×10^{-5}	100.00
Industrial	Pig accommodation	1.69×10^{-2}	1.37×10^{-5}	100.00
Commercial	Structural Metal Product Manufacturing n.e.c.	7.0×10^{-3}	5.67×10^{-6}	100.00
Industrial	Recovery of waste tyres	2.57×10^{-3}	2.08×10^{-6}	100.00
Commercial	Organic Industrial Chemical Manufacturing n.e.c.	2.27×10^{-3}	1.84×10^{-6}	100.00
Industrial	Hazardous, industrial or group A waste generation	1.61×10^{-3}	1.31×10^{-6}	100.00
Commercial	Mining and Construction Machinery Manufacturing	1.14×10^{-3}	9.21×10^{-7}	100.00
Commercial	Ceramic Product Manufacturing n.e.c.	1.08×10^{-3}	8.75×10^{-7}	100.00
Commercial	Wine Manufacturing	5.42×10^{-5}	4.39×10^{-8}	100.00
PARTICULATE MATTER ≤ 10 μm in the Sydney region				
Domestic-Commercial	Solid Fuel Burning (Domestic)	5,669	27.73	27.73
Biogenic-Geogenic	Marine Aerosol	3,074	15.04	42.77
Industrial	Other land-based extraction	1,300	6.36	49.13
Industrial	Waste disposal (application to land)	1,224	5.99	55.11
On-Road Mobile	All - Non-Exhaust PM	1,123	5.49	60.61
Industrial	Ceramics production	681	3.33	63.94
Commercial	Gravel and Sand Quarrying	646	3.16	67.10
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	592	2.89	69.99
Biogenic-Geogenic	Bushfire and Prescribed Burning	550	2.69	72.68
Off-Road Mobile	Ships	539	2.64	75.32
Industrial	Mining for coal	410	2.01	77.32
Industrial	Crushing, grinding or separating	372	1.82	79.14

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Land-based extractive activity	294	1.44	80.58
Biogenic-Geogenic	Fugitive-Windborne	273	1.34	81.92
On-Road Mobile	Light Duty Diesel - Exhaust	247	1.21	83.13
Industrial	Bird accommodation	238	1.16	84.29
Commercial	Synthetic Resin Manufacturing	191	0.93	85.23
Industrial	Petroleum products and fuel production	179	0.88	86.10
Industrial	Composting	156	0.77	86.87
Off-Road Mobile	Industrial Vehicles and Equipment	150	0.74	87.60
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	150	0.73	88.34
Domestic-Commercial	Gaseous Fuel Burning	124	0.61	88.95
Industrial	Glass production (container)	118	0.58	89.52
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	115	0.56	90.08
Off-Road Mobile	Commercial Boats Exhaust	114	0.56	90.64
Industrial	Concrete works	100	0.49	91.13
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	92	0.45	91.58
Industrial	Iron or steel production (scrap metal)	90	0.44	92.02
Industrial	Non-thermal treatment of waste	89	0.44	92.46
Industrial	Recovery of waste	88	0.43	92.89
Industrial	General agricultural processing	86	0.42	93.31
Off-Road Mobile	Locomotives	82	0.40	93.71
Industrial	Railway systems activities	80	0.39	94.10
Off-Road Mobile	Recreational Boats Exhaust	68	0.33	94.43
Commercial	Poultry Farming (Meat)	64	0.31	94.75
Industrial	Bitumen mixing	59	0.29	95.04
Industrial	Scrap metal processing	53	0.26	95.29
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	49	0.24	95.54
Industrial	Generation of electrical power from gas	49	0.24	95.78
Industrial	Cement or lime handling	49	0.24	96.02
Off-Road Mobile	Aircraft (Flight Operations)	46	0.23	96.24
Commercial	Poultry Farming (Eggs)	45	0.22	96.46
Industrial	Petroleum products storage	45	0.22	96.69
Industrial	Coke production	43	0.21	96.90
Industrial	Cement or lime production	41	0.20	97.10
Industrial	Dairy processing	35	0.17	97.27
Industrial	Glass production (float)	32	0.15	97.42
Commercial	Paint Manufacturing	29	0.14	97.57
Industrial	Metal plating or coating	28	0.14	97.70
Domestic-Commercial	Barbeques	27	0.13	97.83
Industrial	Petrochemical production	24	0.12	97.95
Industrial	Dairy animal accommodation	23	0.11	98.06
Commercial	Ceramic Product Manufacturing	23	0.11	98.18

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Hazardous, industrial or group A waste disposal	21	0.10	98.28
Industrial	Road construction	20	9.61×10^{-2}	98.38
Industrial	Slaughtering or processing of animals	19	9.53×10^{-2}	98.47
Industrial	Solid waste landfilling	18	9.0×10^{-2}	98.56
Industrial	Waste storage	16	7.90×10^{-2}	98.64
Industrial	Sewage treatment - small plants	16	7.72×10^{-2}	98.72
Off-Road Mobile	Aircraft (Ground Operations)	14	6.90×10^{-2}	98.79
Commercial	Plaster Product Manufacturing	14	6.64×10^{-2}	98.85
Industrial	Boat construction/maintenance (general)	13	6.16×10^{-2}	98.92
Industrial	General chemicals storage	13	6.13×10^{-2}	98.98
Industrial	Chemical production	13	6.12×10^{-2}	99.04
Industrial	Paints/polishes/adhesives production	10	5.02×10^{-2}	99.09
Commercial	Basic Non-Ferrous Metal Manufacturing n.e.c.	10	4.92×10^{-2}	99.14
Commercial	Metal Coating and Finishing	9.85	4.82×10^{-2}	99.19
Industrial	Aluminium production (scrap metal)	9.56	4.68×10^{-2}	99.23
Commercial	Chemical Product Manufacturing n.e.c.	9.51	4.65×10^{-2}	99.28
Commercial	Basic Iron and Steel Manufacturing	9.45	4.62×10^{-2}	99.33
Commercial	Port Operators	8.95	4.38×10^{-2}	99.37
Industrial	Contaminated soil treatment	8.55	4.18×10^{-2}	99.41
Commercial	Glass and Glass Product Manufacturing	8.40	4.11×10^{-2}	99.45
Industrial	Miscellaneous licensed discharges to waters (at any time)	8.11	3.97×10^{-2}	99.49
On-Road Mobile	Others - Exhaust	6.99	3.42×10^{-2}	99.53
Industrial	Metal processing	5.97	2.92×10^{-2}	99.56
Commercial	Plastic Injection Moulded Product Manufacturing	5.96	2.92×10^{-2}	99.58
Industrial	Paper or pulp production	5.86	2.87×10^{-2}	99.61
Off-Road Mobile	Commercial Vehicles and Equipment	5.34	2.61×10^{-2}	99.64
Commercial	Fabricated Metal Product Manufacturing n.e.c.	4.54	2.22×10^{-2}	99.66
Commercial	Concrete Slurry Manufacturing	4.52	2.21×10^{-2}	99.68
Industrial	Non-ferrous metal production (scrap)	4.00	1.96×10^{-2}	99.70
Industrial	Battery production	3.94	1.93×10^{-2}	99.72
Biogenic-Geogenic	Agricultural Burning	3.63	1.78×10^{-2}	99.74
Commercial	Hospitals	3.44	1.68×10^{-2}	99.76
Commercial	Road and Bridge Construction	3.44	1.68×10^{-2}	99.77

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Beer and Malt Manufacturing	3.39	1.66×10^{-2}	99.79
Industrial	Rendering or fat extraction	3.33	1.63×10^{-2}	99.81
Industrial	Sewage treatment - large plants	3.25	1.59×10^{-2}	99.82
Domestic-Commercial	Liquid Fuel Burning (Domestic)	2.86	1.40×10^{-2}	99.84
Industrial	General animal products production	2.53	1.24×10^{-2}	99.85
Industrial	Shipping in bulk	2.43	1.19×10^{-2}	99.86
Industrial	Generation of electricity not coal or gas	1.99	9.71×10^{-3}	99.87
Industrial	Pesticides and related products production	1.84	8.99×10^{-3}	99.88
Commercial	Waste Disposal Services	1.70	8.32×10^{-3}	99.89
Commercial	Printing	1.46	7.14×10^{-3}	99.90
Industrial	Paper production using recycle materials	1.31	6.40×10^{-3}	99.90
Commercial	Chemical Wholesaling	1.29	6.33×10^{-3}	99.91
Commercial	Steel Pipe and Tube Manufacturing	1.27	6.20×10^{-3}	99.91
Industrial	Brewing and distilling	1.24	6.09×10^{-3}	99.92
Industrial	Container reconditioning	1.21	5.94×10^{-3}	99.93
Industrial	Pharmaceutical and veterinary products production	1.05	5.14×10^{-3}	99.93
Commercial	Bread Manufacturing	1.05	5.13×10^{-3}	99.94
Commercial	Plastic Bag and Film Manufacturing	0.90	4.40×10^{-3}	99.94
Industrial	Recovery of waste oil	0.86	4.21×10^{-3}	99.94
Industrial	Plastics resins production	0.80	3.92×10^{-3}	99.95
Commercial	Industrial Gas Manufacturing	0.75	3.67×10^{-3}	99.95
Commercial	Soap and Other Detergent Manufacturing	0.66	3.25×10^{-3}	99.96
Commercial	Food Manufacturing n.e.c.	0.64	3.14×10^{-3}	99.96
Commercial	Biscuit Manufacturing	0.63	3.07×10^{-3}	99.96
Commercial	Ink Manufacturing	0.62	3.03×10^{-3}	99.97
Industrial	Printing, packaging and visual media production	0.54	2.65×10^{-3}	99.97
Commercial	Oil and Fat Manufacturing	0.48	2.36×10^{-3}	99.97
Industrial	Soap and detergent production	0.48	2.35×10^{-3}	99.97
Commercial	Non-Building Construction n.e.c.	0.48	2.33×10^{-3}	99.97
Commercial	Corrugated Paperboard Container Manufacturing	0.44	2.13×10^{-3}	99.98
Commercial	Electrical and Equipment Manufacturing n.e.c.	0.43	2.10×10^{-3}	99.98
Commercial	Structural Steel Fabricating	0.40	1.96×10^{-3}	99.98
Commercial	Laundries and Dry-Cleaners	0.36	1.74×10^{-3}	99.98
Commercial	Petroleum Product Wholesaling	0.34	1.67×10^{-3}	99.98
Commercial	Soft Drink, Cordial and Syrup Manufacturing	0.31	1.53×10^{-3}	99.99

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Gas Supply	0.28	1.37×10^{-3}	99.99
Commercial	Automotive Component Manufacturing n.e.c.	0.25	1.22×10^{-3}	99.99
Commercial	Fruit and Vegetable Processing	0.22	1.10×10^{-3}	99.99
Commercial	Medicinal and Pharmaceutical Product Manufacturing	0.22	1.09×10^{-3}	99.99
Commercial	Aircraft Manufacturing	0.21	1.04×10^{-3}	99.99
Commercial	Wood Product Manufacturing n.e.c.	0.21	1.01×10^{-3}	99.99
Commercial	Services to Air Transport	0.20	9.93×10^{-4}	99.99
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	0.15	7.49×10^{-4}	99.99
Commercial	Cake and Pastry Manufacturing	0.12	5.92×10^{-4}	100.00
Commercial	Paper Product Manufacturing n.e.c.	0.10	5.03×10^{-4}	100.00
Commercial	Ice Cream Manufacturing	9.64×10^{-2}	4.71×10^{-4}	100.00
Industrial	Sterilisation activities	9.62×10^{-2}	4.70×10^{-4}	100.00
Commercial	Milk and Cream Processing	9.30×10^{-2}	4.55×10^{-4}	100.00
Industrial	Water-based extractive activity	9.18×10^{-2}	4.49×10^{-4}	100.00
Commercial	Scientific Research	8.39×10^{-2}	4.10×10^{-4}	100.00
Industrial	Boat mooring and storage	7.60×10^{-2}	3.72×10^{-4}	100.00
Commercial	Confectionery Manufacturing	7.08×10^{-2}	3.46×10^{-4}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	6.05×10^{-2}	2.96×10^{-4}	100.00
Industrial	Rubber products/tyre production	4.96×10^{-2}	2.42×10^{-4}	100.00
Commercial	Spring and Wire Product Manufacturing	4.68×10^{-2}	2.29×10^{-4}	100.00
Commercial	Non-Metallic Mineral Product Manufacturing n.e.c.	4.39×10^{-2}	2.15×10^{-4}	100.00
Industrial	Boat construction/maintenance (dry/float)	3.17×10^{-2}	1.55×10^{-4}	100.00
Commercial	Lifting and Material Handling Equipment Manufacturing	2.45×10^{-2}	1.20×10^{-4}	100.00
Industrial	Chemical storage	1.76×10^{-2}	8.62×10^{-5}	100.00
Industrial	Pig accommodation	1.69×10^{-2}	8.26×10^{-5}	100.00
Commercial	Structural Metal Product Manufacturing n.e.c.	7.0×10^{-3}	3.42×10^{-5}	100.00
Commercial	Rubber Product Manufacturing n.e.c.	5.78×10^{-3}	2.83×10^{-5}	100.00
Industrial	Recovery of waste tyres	2.57×10^{-3}	1.26×10^{-5}	100.00
Commercial	Organic Industrial Chemical Manufacturing n.e.c.	2.27×10^{-3}	1.11×10^{-5}	100.00
Industrial	Hazardous, industrial or group A waste generation	5.58×10^{-4}	2.73×10^{-6}	100.00
Commercial	Prepared Animal and Bird Feed Manufacturing	3.12×10^{-4}	1.53×10^{-6}	100.00
Commercial	Furniture Manufacturing n.e.c.	1.65×10^{-4}	8.09×10^{-7}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Wine Manufacturing	5.42×10^{-5}	2.65×10^{-7}	100.00
PARTICULATE MATTER ≤ 10 μm in the Newcastle region				
Industrial	Mining for coal	1,747	31.61	31.61
Industrial	Coal works	753	13.63	45.24
Biogenic-Geogenic	Marine Aerosol	586	10.60	55.84
Domestic-Commercial	Solid Fuel Burning (Domestic)	474	8.57	64.41
Industrial	Ammonium nitrate production	323	5.85	70.26
Industrial	Land-based extractive activity	207	3.74	74.00
Industrial	Aluminium production (alumina)	186	3.36	77.36
Off-Road Mobile	Ships	159	2.87	80.23
Industrial	Waste disposal (application to land)	158	2.86	83.09
Off-Road Mobile	Industrial Vehicles and Equipment	90	1.63	84.72
On-Road Mobile	All - Non-Exhaust PM	90	1.62	86.34
Commercial	Gravel and Sand Quarrying	86	1.55	87.89
Biogenic-Geogenic	Fugitive-Windborne	73	1.31	89.20
Industrial	Iron or steel production (scrap metal)	59	1.06	90.27
Industrial	Boat construction/maintenance (dry/float)	57	1.04	91.30
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	57	1.04	92.34
Industrial	Slaughtering or processing of animals	49	0.88	93.22
Industrial	Agricultural fertiliser (phosphate) production	40	0.72	93.94
Commercial	Construction Material Mining n.e.c.	34	0.61	94.55
Industrial	Shipping in bulk	33	0.59	95.14
Biogenic-Geogenic	Bushfire and Prescribed Burning	30	0.54	95.68
Industrial	Inert waste landfilling	26	0.48	96.16
Industrial	Other land-based extraction	26	0.46	96.62
Off-Road Mobile	Commercial Boats Exhaust	18	0.32	96.94
On-Road Mobile	Light Duty Diesel - Exhaust	17	0.31	97.26
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	13	0.23	97.48
Industrial	Crushing, grinding or separating	12	0.22	97.70
Industrial	General agricultural processing	9.17	0.17	97.86
Industrial	Bitumen mixing	9.03	0.16	98.03
Industrial	Metal processing	8.60	0.16	98.18
Off-Road Mobile	Locomotives	8.59	0.16	98.34
Domestic-Commercial	Gaseous Fuel Burning	8.57	0.15	98.49
Industrial	Contaminated soil treatment	7.80	0.14	98.63
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	7.36	0.13	98.77
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	7.27	0.13	98.90

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Off-Road Mobile	Recreational Boats Exhaust	7.04	0.13	99.03
Industrial	Recovery of waste	6.99	0.13	99.15
Industrial	Concrete works	6.71	0.12	99.27
Industrial	Metal plating or coating	5.50	9.96×10^{-2}	99.37
Commercial	Metal Coating and Finishing	4.79	8.68×10^{-2}	99.46
Industrial	Chemical production	4.11	7.45×10^{-2}	99.53
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	3.91	7.07×10^{-2}	99.61
Industrial	Sewage treatment - small plants	3.37	6.09×10^{-2}	99.67
Industrial	Non-thermal treatment of waste	3.25	5.88×10^{-2}	99.72
Industrial	Cement or lime handling	2.38	4.30×10^{-2}	99.77
Commercial	Poultry Farming (Meat)	2.35	4.25×10^{-2}	99.81
Domestic-Commercial	Barbeques	1.84	3.33×10^{-2}	99.84
Commercial	Concrete Slurry Manufacturing	1.03	1.86×10^{-2}	99.86
Industrial	Water-based extractive activity	0.89	1.61×10^{-2}	99.88
Off-Road Mobile	Aircraft (Flight Operations)	0.80	1.44×10^{-2}	99.89
Off-Road Mobile	Commercial Vehicles and Equipment	0.79	1.43×10^{-2}	99.91
Biogenic-Geogenic	Agricultural Burning	0.79	1.43×10^{-2}	99.92
Industrial	Dairy processing	0.62	1.12×10^{-2}	99.93
On-Road Mobile	Others - Exhaust	0.59	1.07×10^{-2}	99.94
Commercial	Hospitals	0.50	8.97×10^{-3}	99.95
Commercial	Bread Manufacturing	0.48	8.63×10^{-3}	99.96
Off-Road Mobile	Aircraft (Ground Operations)	0.47	8.42×10^{-3}	99.97
Industrial	Sewage treatment - large plants	0.31	5.58×10^{-3}	99.97
Industrial	Boat construction/maintenance (general)	0.26	4.64×10^{-3}	99.98
Commercial	Fabricated Metal Product Manufacturing n.e.c.	0.24	4.29×10^{-3}	99.98
Commercial	Chemical Wholesaling	0.22	3.99×10^{-3}	99.99
Domestic-Commercial	Liquid Fuel Burning (Domestic)	0.20	3.57×10^{-3}	99.99
Industrial	Scrap metal processing	0.19	3.39×10^{-3}	99.99
Industrial	General chemicals storage	0.13	2.29×10^{-3}	100.00
Industrial	Waste storage	6.57×10^{-2}	1.19×10^{-3}	100.00
Commercial	Road and Bridge Construction	3.26×10^{-2}	5.90×10^{-4}	100.00
Industrial	Petroleum products storage	2.15×10^{-2}	3.90×10^{-4}	100.00
Industrial	Generation of electrical power from gas	2.09×10^{-2}	3.78×10^{-4}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	1.18×10^{-2}	2.14×10^{-4}	100.00
Commercial	Spring and Wire Product Manufacturing	5.0×10^{-3}	9.05×10^{-5}	100.00
Industrial	Printing, packaging and visual media production	1.95×10^{-3}	3.52×10^{-5}	100.00
Commercial	Aluminium Rolling, Drawing, Extruding	1.20×10^{-3}	2.17×10^{-5}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Ceramic Product Manufacturing n.e.c.	1.08×10^{-3}	1.95×10^{-5}	100.00
Industrial	Hazardous, industrial or group A waste generation	1.06×10^{-3}	1.91×10^{-5}	100.00
Commercial	Waste Disposal Services	5.55×10^{-4}	1.0×10^{-5}	100.00
Commercial	Mining and Construction Machinery Manufacturing	2.01×10^{-4}	3.63×10^{-6}	100.00
PARTICULATE MATTER ≤ 10 μm in the Wollongong region				
Industrial	Iron or steel production (iron ore)	1,749	57.98	57.98
Domestic-Commercial	Solid Fuel Burning (Domestic)	313	10.37	68.34
Biogenic-Geogenic	Marine Aerosol	264	8.75	77.10
Industrial	Mining for coal	86	2.84	79.94
Industrial	Coal works	74	2.44	82.38
Off-Road Mobile	Ships	68	2.24	84.62
Biogenic-Geogenic	Bushfire and Prescribed Burning	61	2.01	86.64
On-Road Mobile	All - Non-Exhaust PM	44	1.45	88.09
Industrial	Generation of electrical power from gas	36	1.18	89.27
Off-Road Mobile	Industrial Vehicles and Equipment	35	1.18	90.45
Commercial	Gravel and Sand Quarrying	35	1.16	91.61
Industrial	Waste disposal (application to land)	32	1.07	92.68
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	29	0.96	93.64
Industrial	Coke production	28	0.94	94.58
Industrial	Metal processing	21	0.71	95.29
Industrial	Metal plating or coating	19	0.61	95.90
Industrial	Coal washery reject or slag landfilling	17	0.55	96.45
Industrial	Bitumen mixing	11	0.36	96.81
On-Road Mobile	Light Duty Diesel - Exhaust	10	0.34	97.16
Industrial	Shipping in bulk	9.84	0.33	97.48
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	8.28	0.27	97.76
Commercial	Ceramic Product Manufacturing	7.54	0.25	98.01
Off-Road Mobile	Recreational Boats Exhaust	7.48	0.25	98.25
Off-Road Mobile	Locomotives	7.06	0.23	98.49
Domestic-Commercial	Gaseous Fuel Burning	6.19	0.21	98.69
Industrial	Road construction	5.90	0.20	98.89
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	5.46	0.18	99.07
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	4.14	0.14	99.21
Commercial	Steel Pipe and Tube Manufacturing	3.51	0.12	99.32
Industrial	Waste storage	3.39	0.11	99.44
Industrial	Concrete works	3.29	0.11	99.54

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	2.58	8.54×10^{-2}	99.63
Biogenic-Geogenic	Fugitive-Windborne	1.86	6.18×10^{-2}	99.69
Industrial	Crushing, grinding or separating	1.53	5.06×10^{-2}	99.74
Industrial	Cement or lime production	1.37	4.54×10^{-2}	99.79
Domestic-Commercial	Barbeques	1.33	4.41×10^{-2}	99.83
Industrial	Cement or lime handling	0.99	3.29×10^{-2}	99.86
Off-Road Mobile	Commercial Boats Exhaust	0.98	3.23×10^{-2}	99.90
Commercial	Poultry Farming (Meat)	0.59	1.96×10^{-2}	99.92
Commercial	Basic Iron and Steel Manufacturing	0.46	1.52×10^{-2}	99.93
On-Road Mobile	Others - Exhaust	0.31	1.04×10^{-2}	99.94
Industrial	General chemicals storage	0.29	9.72×10^{-3}	99.95
Off-Road Mobile	Aircraft (Flight Operations)	0.22	7.19×10^{-3}	99.96
Industrial	Sewage treatment - large plants	0.21	7.03×10^{-3}	99.97
Commercial	Hospitals	0.19	6.29×10^{-3}	99.97
Off-Road Mobile	Commercial Vehicles and Equipment	0.15	5.13×10^{-3}	99.98
Domestic-Commercial	Liquid Fuel Burning (Domestic)	0.14	4.72×10^{-3}	99.98
Industrial	Non-thermal treatment of waste	0.13	4.34×10^{-3}	99.99
Industrial	Chemical production	0.11	3.49×10^{-3}	99.99
Commercial	Concrete Slurry Manufacturing	8.40×10^{-2}	2.78×10^{-3}	99.99
Commercial	Rubber Product Manufacturing n.e.c.	7.11×10^{-2}	2.36×10^{-3}	99.99
Commercial	Aluminium Rolling, Drawing, Extruding	6.93×10^{-2}	2.30×10^{-3}	100.00
Industrial	Contaminated soil treatment	5.94×10^{-2}	1.97×10^{-3}	100.00
Industrial	Container reconditioning	1.82×10^{-2}	6.04×10^{-4}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	3.66×10^{-3}	1.21×10^{-4}	100.00
Industrial	Scrap metal processing	3.48×10^{-4}	1.15×10^{-5}	100.00
Commercial	Automotive Component Manufacturing n.e.c.	2.43×10^{-4}	8.06×10^{-6}	100.00
Commercial	Spring and Wire Product Manufacturing	1.35×10^{-4}	4.47×10^{-6}	100.00
Commercial	Synthetic Resin Manufacturing	1.34×10^{-4}	4.43×10^{-6}	100.00
PARTICULATE MATTER ≤ 10 μm in the Non Urban region				
Industrial	Mining for coal	50,219	53.16	53.16
Biogenic-Geogenic	Marine Aerosol	24,511	25.95	79.10
Industrial	Generation of electrical power from coal	6,515	6.90	86.00
Biogenic-Geogenic	Bushfire and Prescribed Burning	2,846	3.01	89.01
Industrial	Land-based extractive activity	2,301	2.44	91.45
Off-Road Mobile	Industrial Vehicles and Equipment	1,818	1.92	93.37
Biogenic-Geogenic	Fugitive-Windborne	1,325	1.40	94.78

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Domestic-Commercial	Solid Fuel Burning (Domestic)	1,189	1.26	96.03
Industrial	Cement or lime production	637	0.67	96.71
Commercial	Gravel and Sand Quarrying	621	0.66	97.37
Industrial	Mining for minerals	441	0.47	97.83
Industrial	Aluminium production (alumina)	205	0.22	98.05
On-Road Mobile	All - Non-Exhaust PM	193	0.20	98.25
Industrial	Waste disposal (application to land)	177	0.19	98.44
Industrial	Ceramics production	174	0.18	98.63
Industrial	Coal works	173	0.18	98.81
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	163	0.17	98.98
Off-Road Mobile	Ships	157	0.17	99.15
Industrial	Bird accommodation	81	8.58×10^{-2}	99.23
Off-Road Mobile	Locomotives	73	7.73×10^{-2}	99.31
Commercial	Poultry Farming (Meat)	65	6.87×10^{-2}	99.38
Off-Road Mobile	Recreational Boats Exhaust	61	6.43×10^{-2}	99.44
Off-Road Mobile	Commercial Boats Exhaust	61	6.41×10^{-2}	99.51
Industrial	Solid waste landfilling	42	4.45×10^{-2}	99.55
Biogenic-Geogenic	Agricultural Burning	37	3.96×10^{-2}	99.59
Industrial	Other land-based extraction	37	3.92×10^{-2}	99.63
On-Road Mobile	Light Duty Diesel - Exhaust	34	3.55×10^{-2}	99.67
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	31	3.33×10^{-2}	99.70
Domestic-Commercial	Gaseous Fuel Burning	20	2.16×10^{-2}	99.72
Industrial	Composting	20	2.11×10^{-2}	99.74
Industrial	Crushing, grinding or separating	19	2.06×10^{-2}	99.76
Industrial	Concrete works	19	2.02×10^{-2}	99.78
Commercial	Log Sawmilling	18	1.95×10^{-2}	99.80
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	17	1.82×10^{-2}	99.82
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	17	1.78×10^{-2}	99.84
Commercial	Construction Material Mining n.e.c.	16	1.73×10^{-2}	99.86
Industrial	Aluminium production (scrap metal)	14	1.51×10^{-2}	99.87
Industrial	Chemical production	13	1.33×10^{-2}	99.89
Industrial	Bitumen mixing	12	1.30×10^{-2}	99.90
Off-Road Mobile	Aircraft (Flight Operations)	11	1.17×10^{-2}	99.91
Industrial	Animal accommodation	10	1.11×10^{-2}	99.92
Industrial	Water-based extractive activity	9.36	9.91×10^{-3}	99.93
Industrial	Inert waste landfilling	9.15	9.68×10^{-3}	99.94
Industrial	Wood or timber milling or processing	7.81	8.26×10^{-3}	99.95
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	7.73	8.19×10^{-3}	99.96
Industrial	Cement or lime handling	5.71	6.04×10^{-3}	99.96

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	General agricultural processing	5.69	6.03×10^{-3}	99.97
Commercial	Poultry Farming (Eggs)	5.12	5.42×10^{-3}	99.98
Off-Road Mobile	Commercial Vehicles and Equipment	4.42	4.68×10^{-3}	99.98
Domestic-Commercial	Barbeques	4.38	4.63×10^{-3}	99.98
Industrial	Sewage treatment - small plants	2.00	2.12×10^{-3}	99.99
On-Road Mobile	Others - Exhaust	1.49	1.58×10^{-3}	99.99
Commercial	Concrete Slurry Manufacturing	1.43	1.51×10^{-3}	99.99
Commercial	Electric Cable and Wire Manufacturing	1.22	1.30×10^{-3}	99.99
Commercial	Spring and Wire Product Manufacturing	1.11	1.17×10^{-3}	99.99
Commercial	Food Manufacturing n.e.c.	1.01	1.07×10^{-3}	99.99
Commercial	Hospitals	0.88	9.32×10^{-4}	99.99
Industrial	Petroleum products and fuel production	0.69	7.30×10^{-4}	100.00
Industrial	Sewage treatment - large plants	0.48	5.08×10^{-4}	100.00
Domestic-Commercial	Liquid Fuel Burning (Domestic)	0.47	4.96×10^{-4}	100.00
Industrial	Rendering or fat extraction	0.45	4.79×10^{-4}	100.00
Industrial	Recovery of waste	0.45	4.74×10^{-4}	100.00
Industrial	General animal products production	0.39	4.09×10^{-4}	100.00
Industrial	Non-thermal treatment of waste	0.38	4.06×10^{-4}	100.00
Commercial	Non-Ferrous Metal Casting	0.24	2.58×10^{-4}	100.00
Industrial	Recovery of waste oil	0.22	2.29×10^{-4}	100.00
Industrial	Metal plating or coating	0.21	2.23×10^{-4}	100.00
Industrial	Explosives production	0.20	2.11×10^{-4}	100.00
Commercial	Petroleum Product Wholesaling	0.16	1.72×10^{-4}	100.00
Commercial	Furniture Manufacturing n.e.c.	0.15	1.54×10^{-4}	100.00
Commercial	Prepared Animal and Bird Feed Manufacturing	0.12	1.25×10^{-4}	100.00
Industrial	Pesticides and related products production	0.11	1.14×10^{-4}	100.00
Off-Road Mobile	Aircraft (Ground Operations)	8.84×10^{-2}	9.36×10^{-5}	100.00
Industrial	Slaughtering or processing of animals	8.50×10^{-2}	9.0×10^{-5}	100.00
Industrial	Boat mooring and storage	7.48×10^{-2}	7.92×10^{-5}	100.00
Commercial	Fabricated Metal Product Manufacturing n.e.c.	6.93×10^{-2}	7.34×10^{-5}	100.00
Commercial	Synthetic Resin Manufacturing	5.38×10^{-2}	5.70×10^{-5}	100.00
Industrial	Generation of electricity not coal or gas	4.97×10^{-2}	5.26×10^{-5}	100.00
Commercial	Medicinal and Pharmaceutical Product Manufacturing	4.71×10^{-2}	4.99×10^{-5}	100.00
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	4.09×10^{-2}	4.33×10^{-5}	100.00
Commercial	Road and Bridge Construction	3.25×10^{-2}	3.44×10^{-5}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Paper Product Manufacturing n.e.c.	2.65×10^{-2}	2.81×10^{-5}	100.00
Commercial	Wood Product Manufacturing n.e.c.	2.54×10^{-2}	2.69×10^{-5}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	1.95×10^{-2}	2.06×10^{-5}	100.00
Industrial	Generation of electrical power from gas	9.80×10^{-3}	1.04×10^{-5}	100.00
Commercial	Glass and Glass Product Manufacturing	8.95×10^{-3}	9.48×10^{-6}	100.00
Commercial	Chemical Product Manufacturing n.e.c.	7.86×10^{-3}	8.32×10^{-6}	100.00
Industrial	General chemicals storage	6.08×10^{-3}	6.43×10^{-6}	100.00
Commercial	Non-Building Construction n.e.c.	1.59×10^{-3}	1.69×10^{-6}	100.00
Commercial	Mining and Construction Machinery Manufacturing	9.37×10^{-4}	9.91×10^{-7}	100.00
Industrial	Pharmaceutical and veterinary products production	1.34×10^{-4}	1.42×10^{-7}	100.00
Commercial	Printing	3.16×10^{-6}	3.35×10^{-9}	100.00

Figure 3-26, Figure 3-27, Figure 3-28, Figure 3-29 and Figure 3-30 show the proportions of total estimated annual emissions for the top 15 natural and human-made sources of particulate matter ≤ 10 µm in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

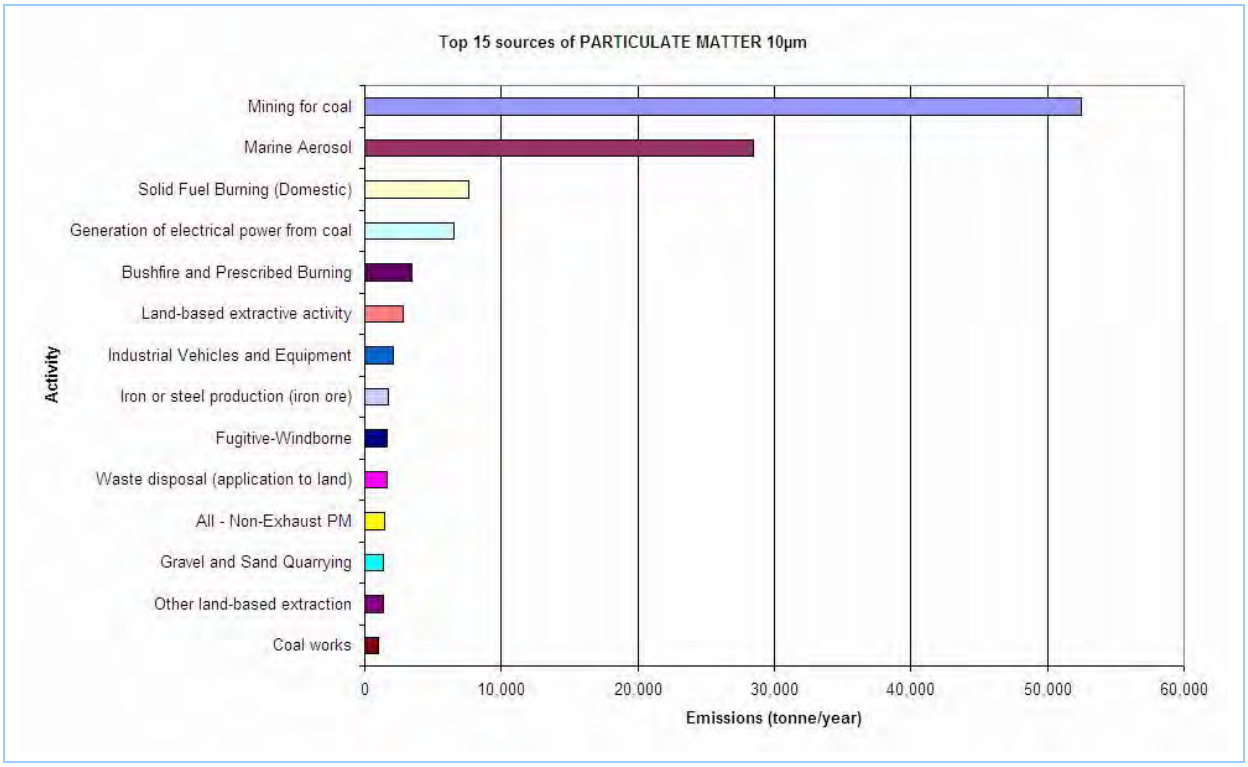

Figure 3-26: Top 15 natural and human-made sources of particulate matter ≤ 10 µm in the GMR

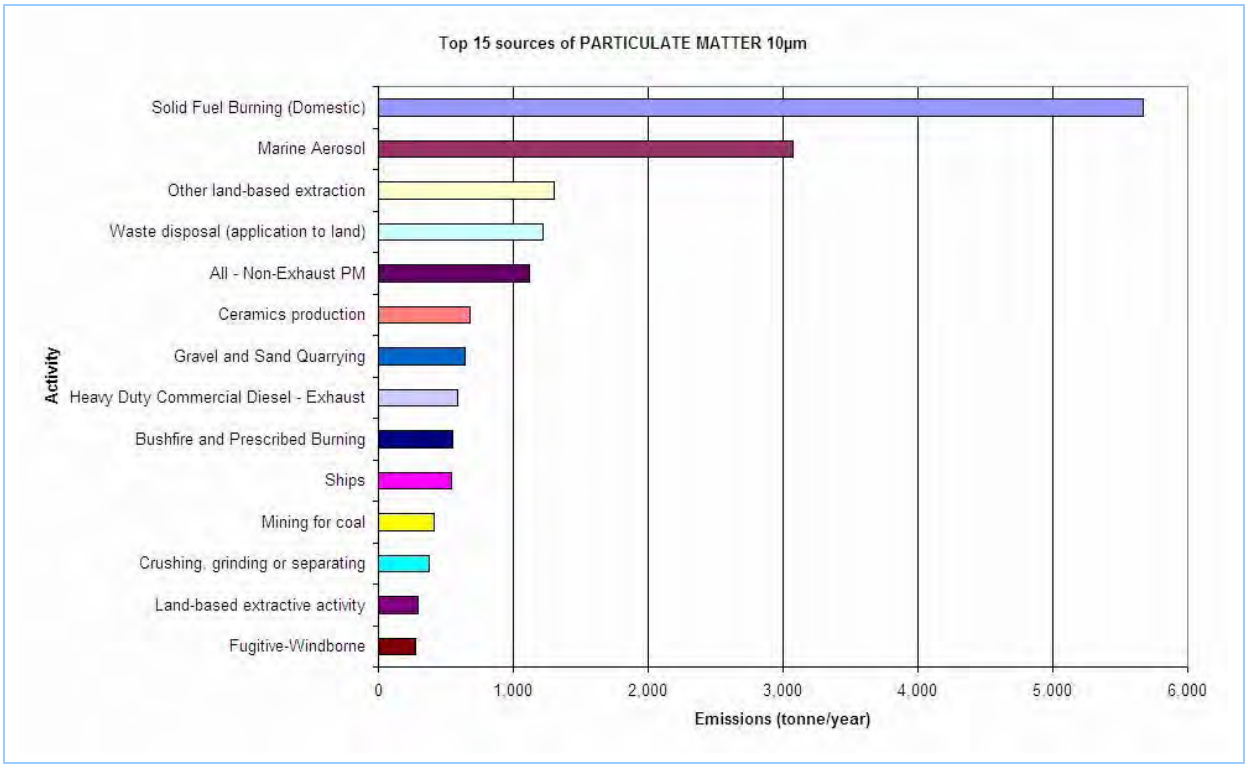

Figure 3-27: Top 15 natural and human-made sources of particulate matter ≤ 10 µm in the Sydney region

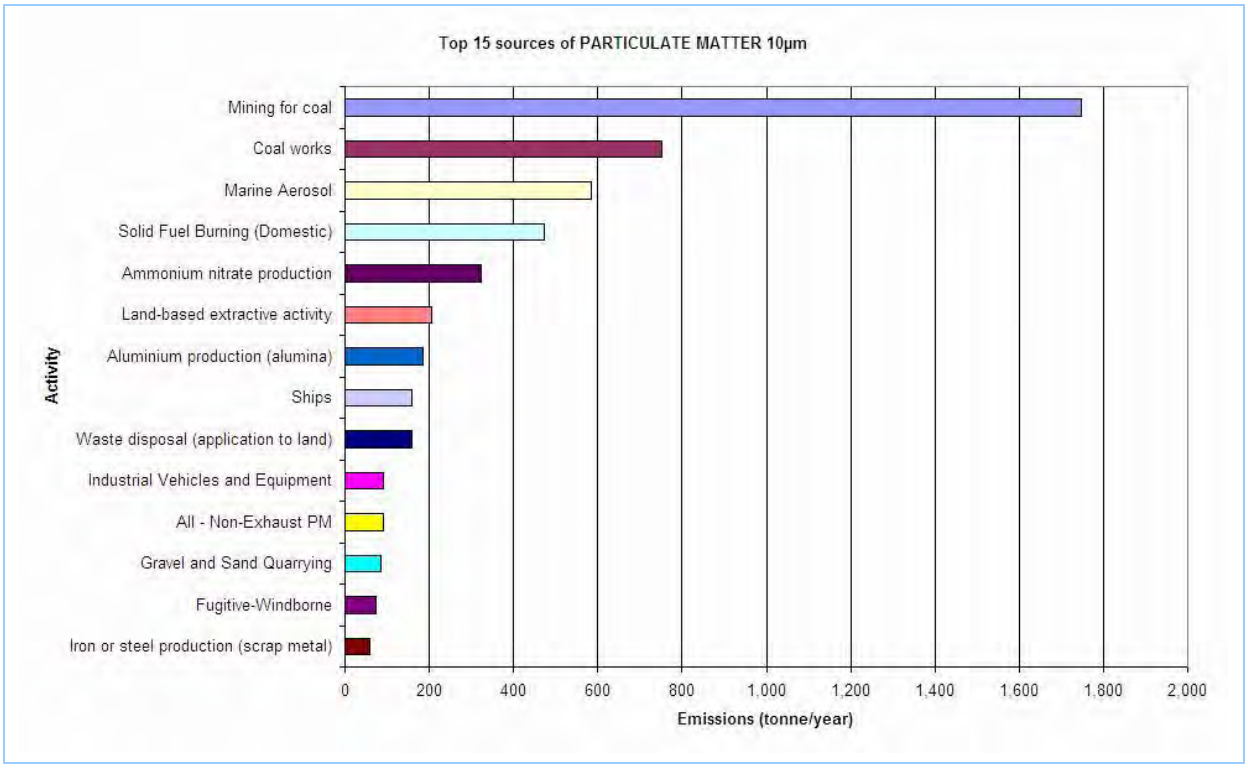

Figure 3-28: Top 15 natural and human-made sources of particulate matter ≤ 10 µm in the Newcastle region

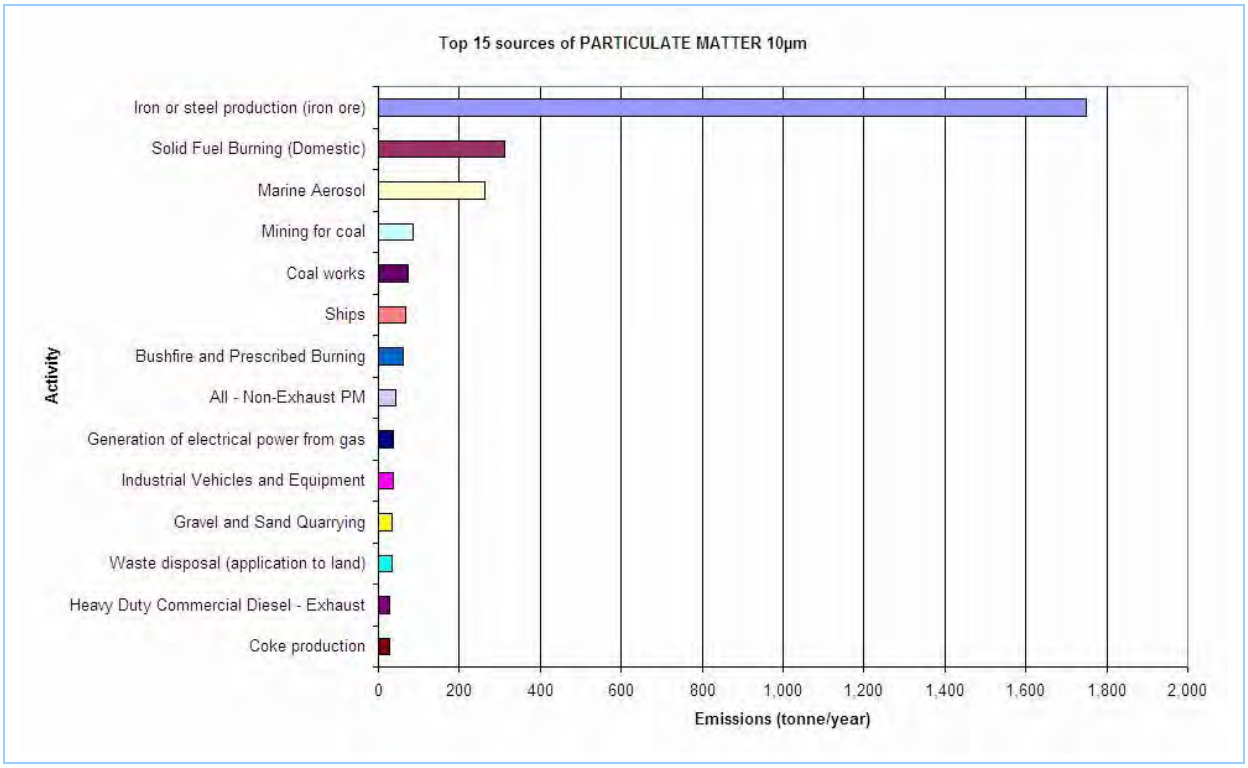

Figure 3-29: Top 15 natural and human-made sources of particulate matter ≤ 10 µm in the Wollongong region

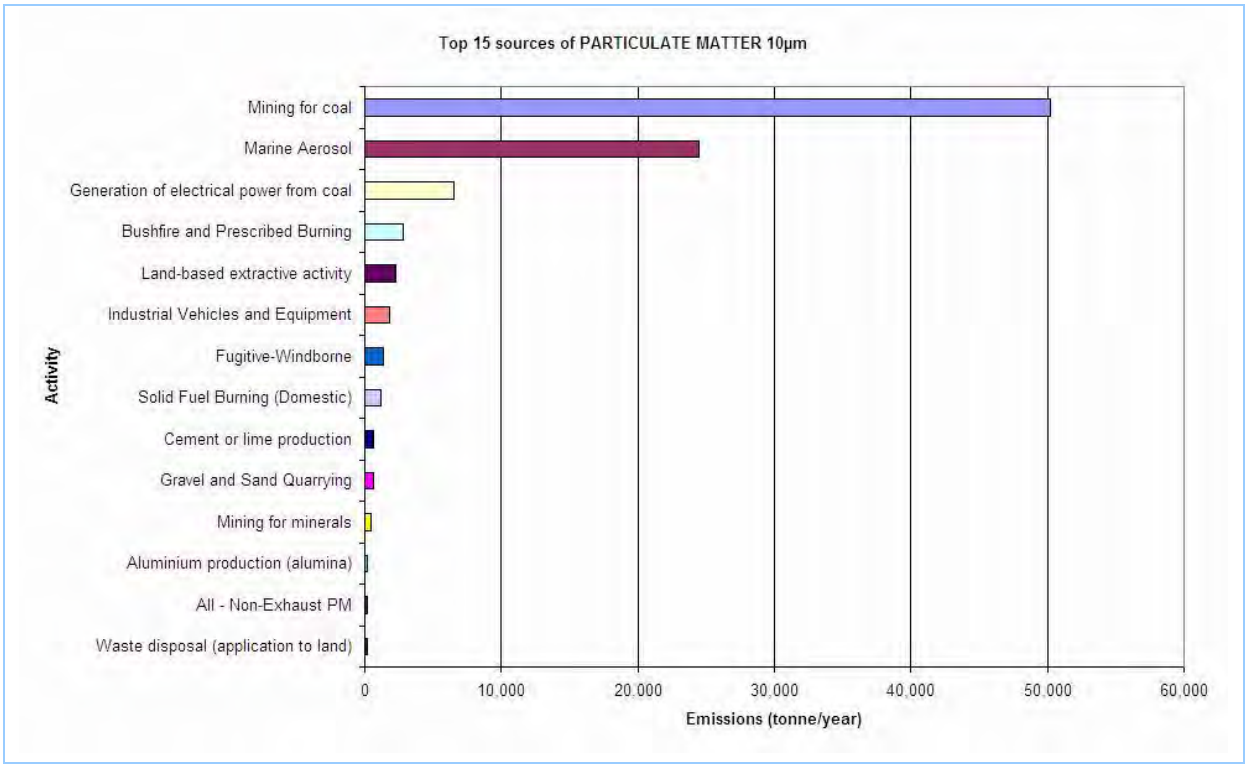

Figure 3-30: Top 15 natural and human-made sources of particulate matter ≤ 10 µm in the Non Urban region

3.4 Particulate Matter ≤ 2.5 µm

3.4.1 *Natural and Human-Made Emissions*

Table 3-10 presents total estimated annual emissions of particulate matter ≤ 2.5 µm by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-10: Total estimated annual emissions of particulate matter ≤ 2.5 µm by natural and human-made source type in each region

Substance	Emissions (tonne/year)							
	Region	Biogenic-Geogenic	Commercial	Domestic-Commercial	Industrial	Off-Road Mobile	On-Road Mobile	Grand Total
PARTICULATE MATTER ≤ 2.5 µm	Sydney	951	485	5,853	1,935	952	1,553	11,728
	Newcastle	121	30	485	1,110	266	131	2,144
	Wollongong	90	14	321	1,354	112	68	1,959
	Non Urban	6,176	167	1,214	13,273	2,104	319	23,253
	GMR	7,338	695	7,873	17,672	3,433	2,071	39,083

Table 3-11 presents the proportions of total estimated annual emissions of particulate matter ≤ 2.5 µm by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-11: Proportions of total estimated annual emissions of particulate matter ≤ 2.5 µm by natural and human-made source type in each region

Substance	Proportions (%)						
	Region	Biogenic-Geogenic	Commercial	Domestic-Commercial	Industrial	Off-Road Mobile	On-Road Mobile
PARTICULATE MATTER ≤ 2.5 µm	Sydney	8.11	4.13	49.91	16.50	8.11	13.24
	Newcastle	5.63	1.40	22.62	51.80	12.43	6.12
	Wollongong	4.60	0.71	16.41	69.11	5.70	3.48
	Non Urban	26.56	0.72	5.22	57.08	9.05	1.37
	GMR	18.78	1.78	20.14	45.22	8.79	5.30

Figure 3-31, Figure 3-32, Figure 3-33, Figure 3-34 and Figure 3-35 show the proportions of total estimated annual emissions of particulate matter ≤ 2.5 µm by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

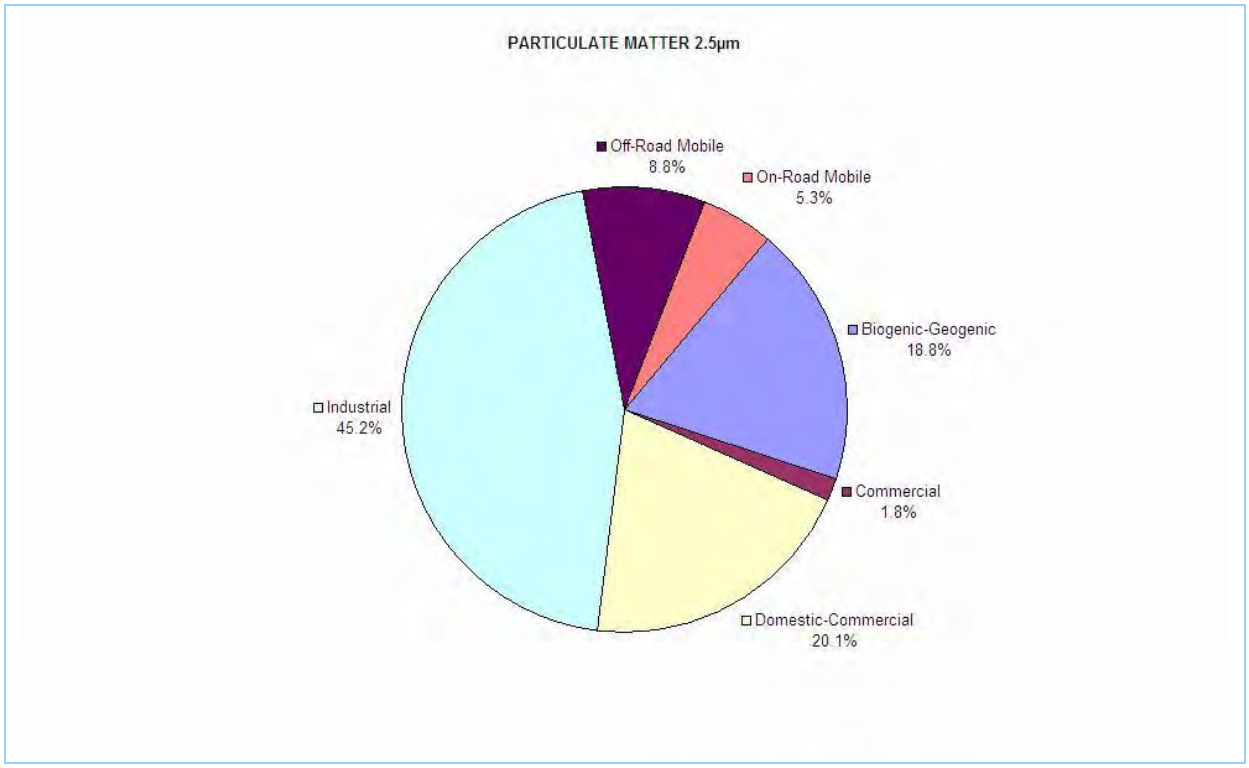

Figure 3-31: Proportions of total estimated annual emissions of particulate matter ≤ 2.5 µm by natural and human-made source type in the GMR

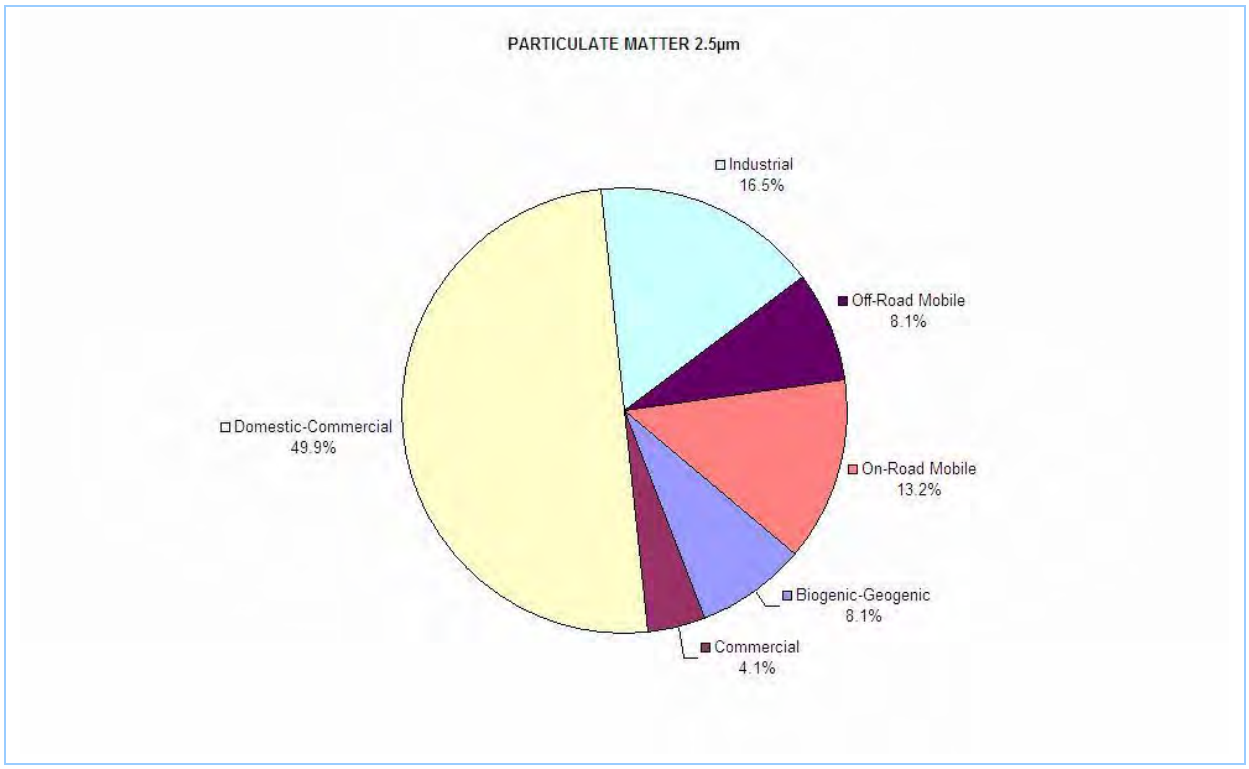

Figure 3-32: Proportions of total estimated annual emissions of particulate matter ≤ 2.5 µm by natural and human-made source type in the Sydney region

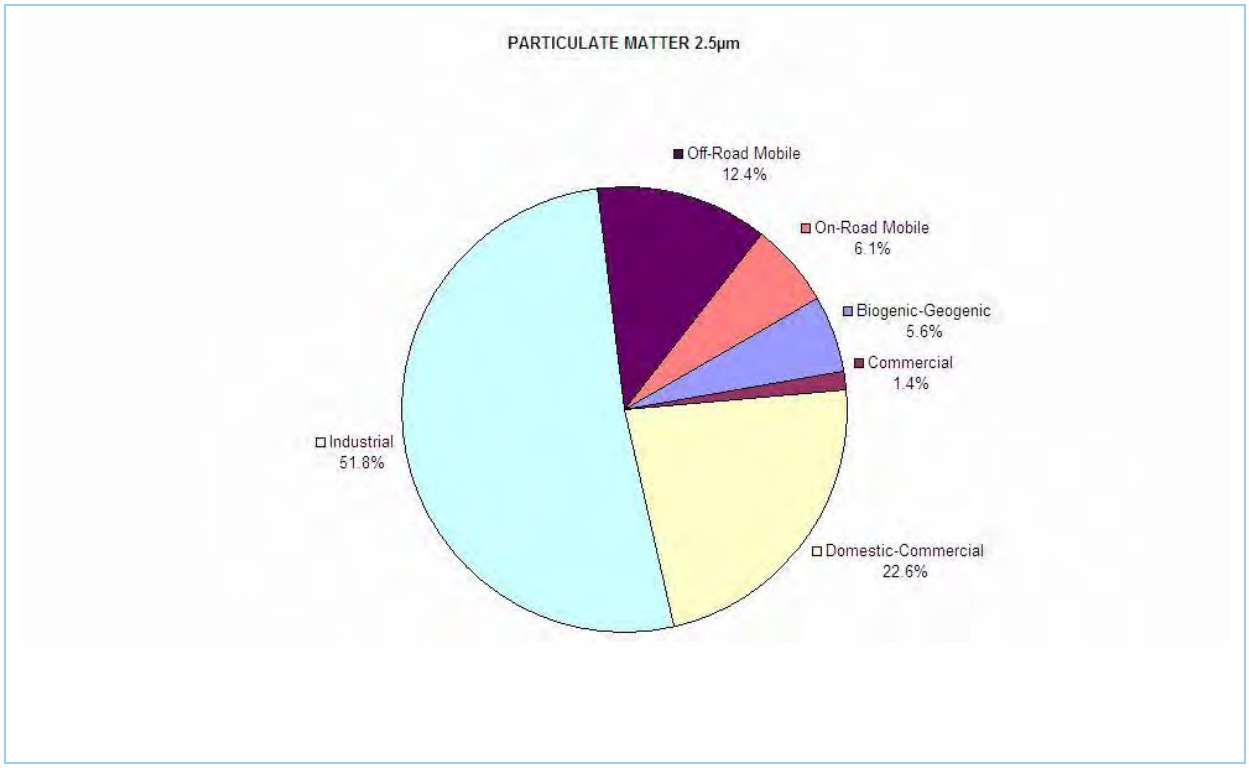

Figure 3-33: Proportions of total estimated annual emissions of particulate matter ≤ 2.5 µm by natural and human-made source type in the Newcastle region

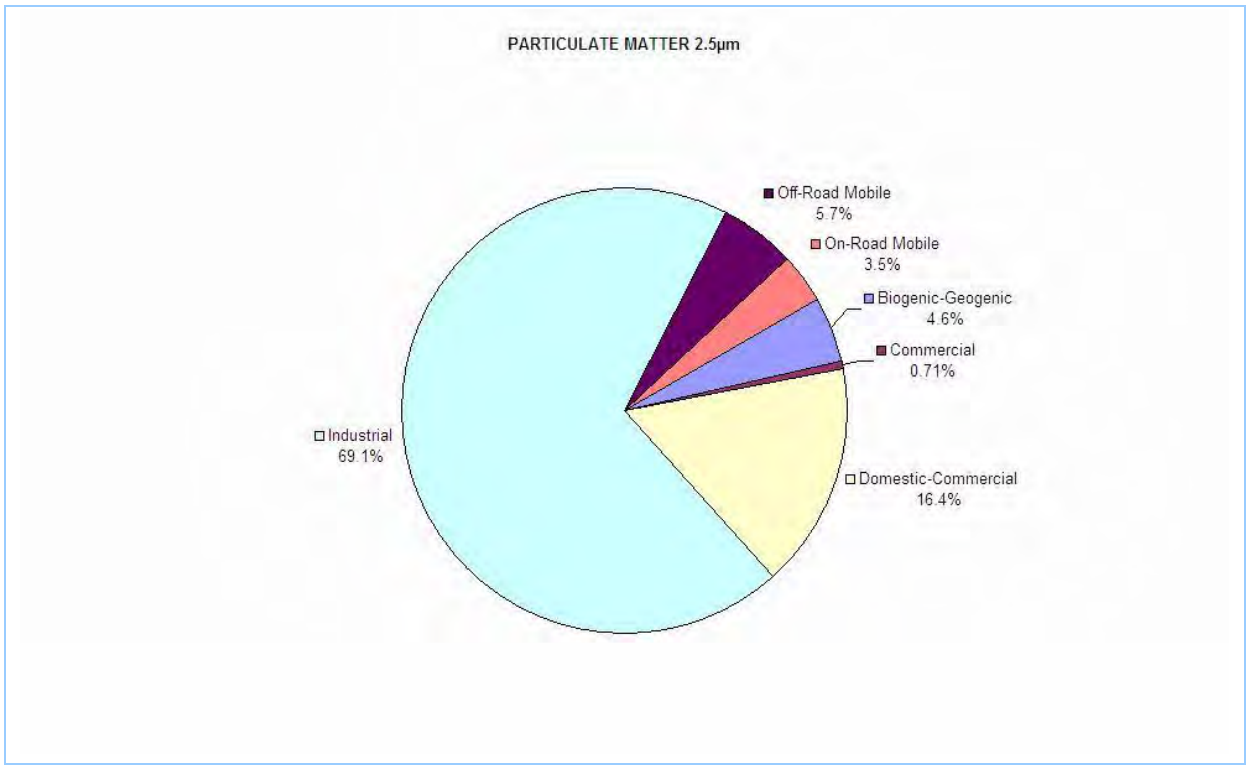

Figure 3-34: Proportions of total estimated annual emissions of particulate matter ≤ 2.5 µm by natural and human-made source type in the Wollongong region

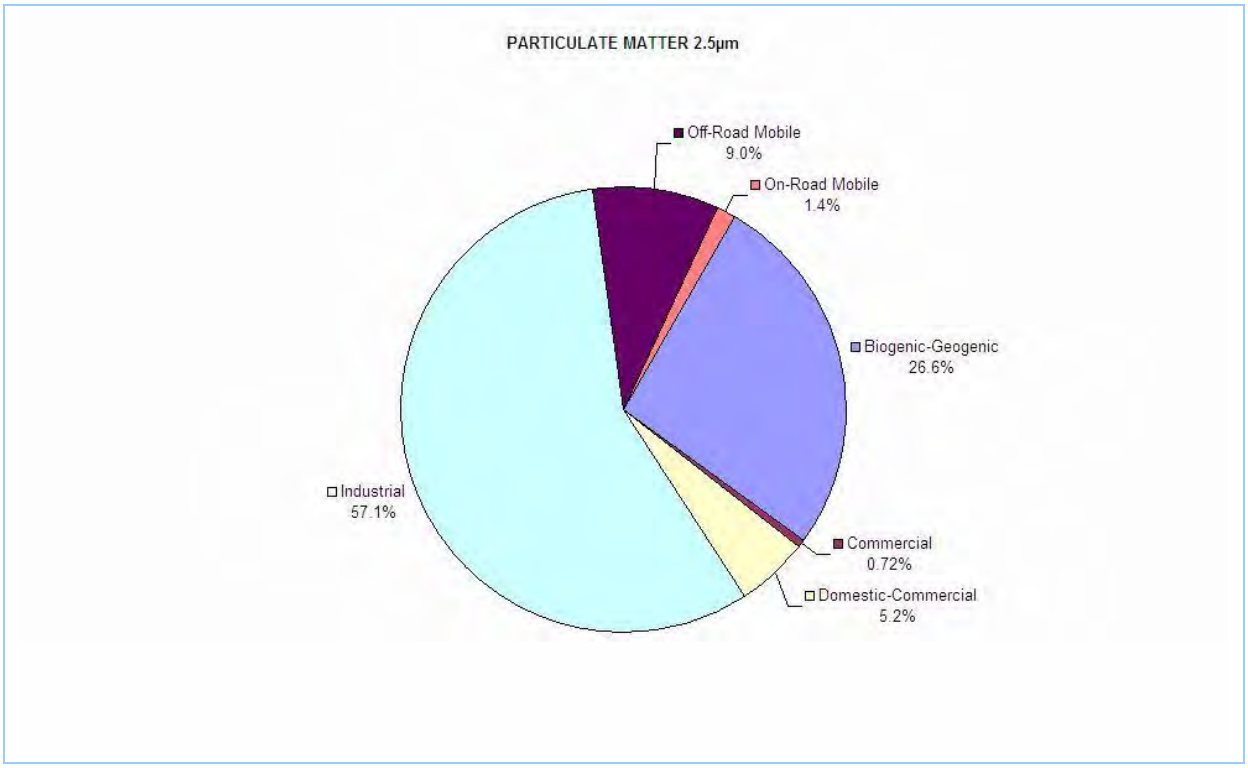

Figure 3-35: Proportions of total estimated annual emissions of particulate matter ≤ 2.5 µm by natural and human-made source type in the Non Urban region

3.4.2 Priority Natural and Human-Made Emissions

Table 3-12 presents total estimated annual emissions, proportions and cumulative proportions of natural and human-made sources of particulate matter ≤ 2.5 µm in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-12: Natural and human-made sources of particulate matter ≤ 2.5 µm in each region

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
PARTICULATE MATTER 2.5µm in the GMR				
Industrial	Mining for coal	8,832	22.60	22.60
Domestic-Commercial	Solid Fuel Burning (Domestic)	7,359	18.83	41.43
Biogenic-Geogenic	Marine Aerosol	4,114	10.53	51.96
Industrial	Generation of electrical power from coal	3,335	8.53	60.49
Biogenic-Geogenic	Bushfire and Prescribed Burning	2,958	7.57	68.06
Off-Road Mobile	Industrial Vehicles and Equipment	2,031	5.20	73.26
Industrial	Iron or steel production (iron ore)	1,223	3.13	76.39
Off-Road Mobile	Ships	849	2.17	78.56
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	816	2.09	80.64
On-Road Mobile	All - Non-Exhaust PM	771	1.97	82.62
Industrial	Ceramics production	593	1.52	84.13

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Cement or lime production	582	1.49	85.62
Industrial	Land-based extractive activity	569	1.46	87.08
Industrial	Ammonium nitrate production	316	0.81	87.89
Commercial	Gravel and Sand Quarrying	306	0.78	88.67
On-Road Mobile	Light Duty Diesel - Exhaust	299	0.76	89.44
Industrial	Waste disposal (application to land)	297	0.76	90.20
Industrial	Aluminium production (alumina)	255	0.65	90.85
Biogenic-Geogenic	Fugitive-Windborne	226	0.58	91.43
Commercial	Synthetic Resin Manufacturing	189	0.48	91.91
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	186	0.48	92.39
Off-Road Mobile	Commercial Boats Exhaust	182	0.47	92.86
Off-Road Mobile	Locomotives	166	0.42	93.28
Domestic-Commercial	Gaseous Fuel Burning	159	0.41	93.69
Industrial	Other land-based extraction	152	0.39	94.08
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	134	0.34	94.42
Off-Road Mobile	Recreational Boats Exhaust	132	0.34	94.76
Industrial	Iron or steel production (scrap metal)	128	0.33	95.08
Industrial	Coal works	126	0.32	95.41
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	115	0.29	95.70
Industrial	Glass production (container)	114	0.29	95.99
Industrial	Petroleum products and fuel production	99	0.25	96.25
Industrial	Crushing, grinding or separating	87	0.22	96.47
Industrial	Generation of electrical power from gas	85	0.22	96.69
Industrial	Mining for minerals	79	0.20	96.89
Industrial	Bird accommodation	71	0.18	97.07
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	61	0.16	97.23
Industrial	Coke production	59	0.15	97.38
Industrial	Bitumen mixing	54	0.14	97.52
Off-Road Mobile	Aircraft (Flight Operations)	49	0.13	97.64
Industrial	Boat construction/maintenance (dry/float)	49	0.13	97.77
Industrial	General agricultural processing	46	0.12	97.89
Industrial	Petroleum products storage	43	0.11	98.00
Industrial	Metal plating or coating	41	0.10	98.10
Biogenic-Geogenic	Agricultural Burning	40	0.10	98.20
Industrial	Scrap metal processing	39	0.10	98.30
Industrial	Agricultural fertiliser (phosphate) production	38	9.84×10^{-2}	98.40
Industrial	Composting	32	8.12×10^{-2}	98.48
Domestic-Commercial	Barbeques	31	7.86×10^{-2}	98.56

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Poultry Farming (Meat)	30	7.77×10^{-2}	98.64
Commercial	Paint Manufacturing	28	7.25×10^{-2}	98.71
Industrial	Glass production (float)	28	7.08×10^{-2}	98.78
Industrial	Non-thermal treatment of waste	23	5.98×10^{-2}	98.84
Commercial	Ceramic Product Manufacturing	23	5.93×10^{-2}	98.90
Industrial	Metal processing	23	5.88×10^{-2}	98.96
Industrial	Concrete works	22	5.62×10^{-2}	99.02
Industrial	Aluminium production (scrap metal)	19	4.96×10^{-2}	99.07
Industrial	Petrochemical production	17	4.47×10^{-2}	99.11
Industrial	Slaughtering or processing of animals	17	4.39×10^{-2}	99.16
Industrial	Recovery of waste	15	3.88×10^{-2}	99.19
Industrial	Shipping in bulk	15	3.82×10^{-2}	99.23
Off-Road Mobile	Aircraft (Ground Operations)	14	3.69×10^{-2}	99.27
Industrial	Cement or lime handling	14	3.53×10^{-2}	99.30
Commercial	Metal Coating and Finishing	12	3.19×10^{-2}	99.34
Industrial	Boat construction/maintenance (general)	12	3.0×10^{-2}	99.37
Industrial	Solid waste landfilling	12	2.98×10^{-2}	99.40
Commercial	Poultry Farming (Eggs)	12	2.96×10^{-2}	99.43
Industrial	Chemical production	11	2.87×10^{-2}	99.45
Off-Road Mobile	Commercial Vehicles and Equipment	10	2.66×10^{-2}	99.48
Commercial	Construction Material Mining n.e.c.	10	2.63×10^{-2}	99.51
Industrial	Dairy processing	9.35	2.39×10^{-2}	99.53
Industrial	Railway systems activities	9.14	2.34×10^{-2}	99.55
On-Road Mobile	Others - Exhaust	8.95	2.29×10^{-2}	99.58
Commercial	Port Operators	8.95	2.29×10^{-2}	99.60
Commercial	Basic Iron and Steel Manufacturing	8.32	2.13×10^{-2}	99.62
Commercial	Glass and Glass Product Manufacturing	8.26	2.11×10^{-2}	99.64
Commercial	Plaster Product Manufacturing	7.81	2.0×10^{-2}	99.66
Industrial	Paints/polishes/adhesives production	7.63	1.95×10^{-2}	99.68
Commercial	Basic Non-Ferrous Metal Manufacturing n.e.c.	7.55	1.93×10^{-2}	99.70
Commercial	Log Sawmilling	7.42	1.90×10^{-2}	99.72
Industrial	Inert waste landfilling	7.07	1.81×10^{-2}	99.74
Industrial	Paper or pulp production	5.51	1.41×10^{-2}	99.75
Commercial	Hospitals	5.00	1.28×10^{-2}	99.77
Commercial	Steel Pipe and Tube Manufacturing	4.56	1.17×10^{-2}	99.78
Industrial	Battery production	3.94	1.01×10^{-2}	99.79

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Contaminated soil treatment	3.72	9.53×10^{-3}	99.80
Industrial	Road construction	3.66	9.37×10^{-3}	99.81
Industrial	Waste storage	3.60	9.21×10^{-3}	99.82
Commercial	Fabricated Metal Product Manufacturing n.e.c.	3.48	8.90×10^{-3}	99.82
Commercial	Beer and Malt Manufacturing	3.39	8.67×10^{-3}	99.83
Industrial	Non-ferrous metal production (scrap)	3.37	8.63×10^{-3}	99.84
Industrial	General chemicals storage	3.35	8.58×10^{-3}	99.85
Industrial	Coal washery reject or slag landfilling	3.29	8.42×10^{-3}	99.86
Domestic-Commercial	Liquid Fuel Burning (Domestic)	3.28	8.39×10^{-3}	99.87
Industrial	Dairy animal accommodation	3.00	7.68×10^{-3}	99.87
Industrial	Sewage treatment - small plants	2.99	7.64×10^{-3}	99.88
Industrial	Sewage treatment - large plants	2.96	7.56×10^{-3}	99.89
Industrial	Wood or timber milling or processing	2.92	7.48×10^{-3}	99.90
Industrial	General animal products production	2.74	7.01×10^{-3}	99.90
Industrial	Rendering or fat extraction	2.32	5.93×10^{-3}	99.91
Industrial	Hazardous, industrial or group A waste disposal	2.11	5.41×10^{-3}	99.92
Industrial	Generation of electricity not coal or gas	2.01	5.15×10^{-3}	99.92
Commercial	Chemical Product Manufacturing n.e.c.	1.92	4.91×10^{-3}	99.93
Industrial	Water-based extractive activity	1.84	4.72×10^{-3}	99.93
Industrial	Pesticides and related products production	1.67	4.29×10^{-3}	99.93
Commercial	Waste Disposal Services	1.67	4.28×10^{-3}	99.94
Commercial	Printing	1.46	3.74×10^{-3}	99.94
Commercial	Bread Manufacturing	1.39	3.57×10^{-3}	99.95
Commercial	Food Manufacturing n.e.c.	1.37	3.50×10^{-3}	99.95
Industrial	Animal accommodation	1.35	3.45×10^{-3}	99.95
Industrial	Paper production using recycle materials	1.31	3.34×10^{-3}	99.96
Industrial	Brewing and distilling	1.14	2.92×10^{-3}	99.96
Commercial	Concrete Slurry Manufacturing	1.12	2.86×10^{-3}	99.96
Industrial	Pharmaceutical and veterinary products production	0.94	2.42×10^{-3}	99.97
Industrial	Recovery of waste oil	0.87	2.24×10^{-3}	99.97
Industrial	Miscellaneous licensed discharges to waters (at any time)	0.85	2.17×10^{-3}	99.97
Commercial	Plastic Injection Moulded Product Manufacturing	0.84	2.15×10^{-3}	99.97
Commercial	Plastic Bag and Film Manufacturing	0.83	2.13×10^{-3}	99.97

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Electric Cable and Wire Manufacturing	0.72	1.85×10^{-3}	99.98
Commercial	Biscuit Manufacturing	0.63	1.61×10^{-3}	99.98
Commercial	Ink Manufacturing	0.61	1.56×10^{-3}	99.98
Industrial	Plastics resins production	0.51	1.30×10^{-3}	99.98
Commercial	Oil and Fat Manufacturing	0.48	1.23×10^{-3}	99.98
Industrial	Printing, packaging and visual media production	0.48	1.23×10^{-3}	99.98
Commercial	Corrugated Paperboard Container Manufacturing	0.44	1.12×10^{-3}	99.98
Commercial	Electrical and Equipment Manufacturing n.e.c.	0.43	1.10×10^{-3}	99.98
Industrial	Soap and detergent production	0.43	1.09×10^{-3}	99.99
Commercial	Road and Bridge Construction	0.41	1.04×10^{-3}	99.99
Commercial	Spring and Wire Product Manufacturing	0.38	9.79×10^{-4}	99.99
Commercial	Chemical Wholesaling	0.37	9.38×10^{-4}	99.99
Commercial	Laundries and Dry-Cleaners	0.36	9.12×10^{-4}	99.99
Commercial	Soft Drink, Cordial and Syrup Manufacturing	0.31	8.01×10^{-4}	99.99
Industrial	Container reconditioning	0.28	7.23×10^{-4}	99.99
Commercial	Gas Supply	0.28	7.16×10^{-4}	99.99
Commercial	Medicinal and Pharmaceutical Product Manufacturing	0.27	6.90×10^{-4}	99.99
Commercial	Fruit and Vegetable Processing	0.22	5.76×10^{-4}	99.99
Commercial	Aircraft Manufacturing	0.21	5.44×10^{-4}	99.99
Commercial	Services to Air Transport	0.20	5.20×10^{-4}	99.99
Commercial	Non-Ferrous Metal Casting	0.18	4.68×10^{-4}	99.99
Commercial	Furniture Manufacturing n.e.c.	0.14	3.70×10^{-4}	100.00
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	0.14	3.56×10^{-4}	100.00
Commercial	Paper Product Manufacturing n.e.c.	0.13	3.30×10^{-4}	100.00
Commercial	Cake and Pastry Manufacturing	0.12	3.10×10^{-4}	100.00
Commercial	Non-Building Construction n.e.c.	0.12	3.06×10^{-4}	100.00
Commercial	Prepared Animal and Bird Feed Manufacturing	0.12	3.02×10^{-4}	100.00
Commercial	Structural Steel Fabricating	0.10	2.67×10^{-4}	100.00
Commercial	Petroleum Product Wholesaling	9.88×10^{-2}	2.53×10^{-4}	100.00
Industrial	Sterilisation activities	9.58×10^{-2}	2.45×10^{-4}	100.00
Commercial	Ice Cream Manufacturing	9.38×10^{-2}	2.40×10^{-4}	100.00
Commercial	Milk and Cream Processing	9.30×10^{-2}	2.38×10^{-4}	100.00
Commercial	Industrial Gas Manufacturing	8.68×10^{-2}	2.22×10^{-4}	100.00
Commercial	Scientific Research	8.39×10^{-2}	2.15×10^{-4}	100.00
Commercial	Automotive Component Manufacturing n.e.c.	7.71×10^{-2}	1.97×10^{-4}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Aluminium Rolling, Drawing, Extruding	7.05×10^{-2}	1.80×10^{-4}	100.00
Commercial	Confectionery Manufacturing	7.02×10^{-2}	1.80×10^{-4}	100.00
Commercial	Soap and Other Detergent Manufacturing	6.74×10^{-2}	1.73×10^{-4}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	6.36×10^{-2}	1.63×10^{-4}	100.00
Commercial	Wood Product Manufacturing n.e.c.	5.61×10^{-2}	1.43×10^{-4}	100.00
Industrial	Rubber products/tyre production	4.52×10^{-2}	1.16×10^{-4}	100.00
Commercial	Non-Metallic Mineral Product Manufacturing n.e.c.	4.39×10^{-2}	1.12×10^{-4}	100.00
Industrial	Boat mooring and storage	3.65×10^{-2}	9.33×10^{-5}	100.00
Industrial	Explosives production	3.15×10^{-2}	8.06×10^{-5}	100.00
Commercial	Lifting and Material Handling Equipment Manufacturing	2.45×10^{-2}	6.26×10^{-5}	100.00
Industrial	Chemical storage	1.29×10^{-2}	3.29×10^{-5}	100.00
Commercial	Rubber Product Manufacturing n.e.c.	1.11×10^{-2}	2.85×10^{-5}	100.00
Commercial	Structural Metal Product Manufacturing n.e.c.	7.0×10^{-3}	1.79×10^{-5}	100.00
Industrial	Pig accommodation	4.09×10^{-3}	1.05×10^{-5}	100.00
Commercial	Organic Industrial Chemical Manufacturing n.e.c.	2.27×10^{-3}	5.81×10^{-6}	100.00
Commercial	Ceramic Product Manufacturing n.e.c.	1.07×10^{-3}	2.74×10^{-6}	100.00
Industrial	Recovery of waste tyres	6.22×10^{-4}	1.59×10^{-6}	100.00
Commercial	Mining and Construction Machinery Manufacturing	4.27×10^{-4}	1.09×10^{-6}	100.00
Industrial	Hazardous, industrial or group A waste generation	3.90×10^{-4}	9.99×10^{-7}	100.00
Commercial	Wine Manufacturing	5.37×10^{-5}	1.37×10^{-7}	100.00
PARTICULATE MATTER 2.5µm in the Sydney region				
Domestic-Commercial	Solid Fuel Burning (Domestic)	5,457	46.54	46.54
On-Road Mobile	All - Non-Exhaust PM	597	5.09	51.63
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	574	4.89	56.52
Off-Road Mobile	Ships	496	4.23	60.75
Industrial	Ceramics production	478	4.07	64.83
Biogenic-Geogenic	Bushfire and Prescribed Burning	466	3.98	68.80
Biogenic-Geogenic	Marine Aerosol	445	3.79	72.59
On-Road Mobile	Light Duty Diesel - Exhaust	239	2.04	74.64
Industrial	Waste disposal (application to land)	226	1.93	76.57
Commercial	Synthetic Resin Manufacturing	189	1.61	78.18
Off-Road Mobile	Industrial Vehicles and Equipment	146	1.24	79.42

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Other land-based extraction	145	1.24	80.66
Commercial	Gravel and Sand Quarrying	145	1.23	81.89
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	138	1.18	83.07
Domestic-Commercial	Gaseous Fuel Burning	124	1.06	84.13
Industrial	Glass production (container)	114	0.98	85.10
Off-Road Mobile	Commercial Boats Exhaust	108	0.92	86.02
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	107	0.91	86.93
Industrial	Petroleum products and fuel production	98	0.84	87.77
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	88	0.75	88.52
Industrial	Crushing, grinding or separating	81	0.69	89.21
Off-Road Mobile	Locomotives	80	0.68	89.89
Industrial	Iron or steel production (scrap metal)	75	0.64	90.53
Off-Road Mobile	Recreational Boats Exhaust	62	0.53	91.07
Industrial	Land-based extractive activity	61	0.52	91.59
Industrial	Bird accommodation	54	0.46	92.05
Industrial	Mining for coal	52	0.44	92.49
Industrial	Generation of electrical power from gas	49	0.42	92.91
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	47	0.40	93.31
Industrial	Petroleum products storage	43	0.37	93.68
Industrial	General agricultural processing	41	0.35	94.03
Off-Road Mobile	Aircraft (Flight Operations)	41	0.35	94.38
Industrial	Scrap metal processing	39	0.33	94.71
Industrial	Cement or lime production	38	0.32	95.03
Biogenic-Geogenic	Fugitive-Windborne	37	0.31	95.35
Industrial	Coke production	32	0.27	95.62
Industrial	Bitumen mixing	29	0.25	95.86
Commercial	Paint Manufacturing	28	0.24	96.11
Industrial	Composting	28	0.24	96.35
Industrial	Glass production (float)	28	0.24	96.58
Industrial	Metal plating or coating	27	0.23	96.81
Domestic-Commercial	Barbeques	24	0.20	97.02
Industrial	Non-thermal treatment of waste	22	0.19	97.21
Commercial	Ceramic Product Manufacturing	21	0.18	97.39
Industrial	Petrochemical production	17	0.15	97.54
Industrial	Concrete works	17	0.14	97.68
Commercial	Poultry Farming (Meat)	15	0.13	97.81
Off-Road Mobile	Aircraft (Ground Operations)	14	0.12	97.93
Industrial	Recovery of waste	14	0.12	98.04
Industrial	Cement or lime handling	12	0.10	98.15
Industrial	Boat construction/maintenance (general)	12	9.83×10^{-2}	98.25

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Poultry Farming (Eggs)	10	8.87×10^{-2}	98.34
Commercial	Metal Coating and Finishing	9.28	7.91×10^{-2}	98.41
Industrial	Aluminium production (scrap metal)	9.18	7.83×10^{-2}	98.49
Industrial	Railway systems activities	9.14	7.80×10^{-2}	98.57
Industrial	Dairy processing	9.01	7.68×10^{-2}	98.65
Commercial	Port Operators	8.95	7.63×10^{-2}	98.72
Commercial	Glass and Glass Product Manufacturing	8.25	7.04×10^{-2}	98.79
Commercial	Basic Iron and Steel Manufacturing	7.86	6.70×10^{-2}	98.86
Commercial	Plaster Product Manufacturing	7.81	6.66×10^{-2}	98.93
Industrial	Paints/polishes/adhesives production	7.63	6.50×10^{-2}	98.99
Commercial	Basic Non-Ferrous Metal Manufacturing n.e.c.	7.55	6.43×10^{-2}	99.06
On-Road Mobile	Others - Exhaust	6.67	5.68×10^{-2}	99.11
Industrial	Paper or pulp production	5.51	4.70×10^{-2}	99.16
Off-Road Mobile	Commercial Vehicles and Equipment	5.18	4.42×10^{-2}	99.21
Industrial	Metal processing	4.94	4.21×10^{-2}	99.25
Industrial	Slaughtering or processing of animals	4.78	4.07×10^{-2}	99.29
Industrial	Chemical production	4.39	3.74×10^{-2}	99.33
Industrial	Battery production	3.94	3.36×10^{-2}	99.36
Industrial	Solid waste landfilling	3.59	3.06×10^{-2}	99.39
Biogenic-Geogenic	Agricultural Burning	3.46	2.95×10^{-2}	99.42
Commercial	Hospitals	3.44	2.93×10^{-2}	99.45
Commercial	Beer and Malt Manufacturing	3.39	2.89×10^{-2}	99.48
Industrial	Non-ferrous metal production (scrap)	3.37	2.87×10^{-2}	99.51
Industrial	Waste storage	3.25	2.77×10^{-2}	99.53
Commercial	Fabricated Metal Product Manufacturing n.e.c.	3.21	2.73×10^{-2}	99.56
Industrial	General chemicals storage	3.03	2.59×10^{-2}	99.59
Industrial	Dairy animal accommodation	3.00	2.56×10^{-2}	99.61
Domestic-Commercial	Liquid Fuel Burning (Domestic)	2.56	2.18×10^{-2}	99.63
Industrial	General animal products production	2.48	2.11×10^{-2}	99.66
Industrial	Sewage treatment - large plants	2.46	2.10×10^{-2}	99.68
Industrial	Contaminated soil treatment	2.43	2.07×10^{-2}	99.70
Industrial	Road construction	2.39	2.04×10^{-2}	99.72
Industrial	Hazardous, industrial or group A waste disposal	2.11	1.80×10^{-2}	99.74
Industrial	Generation of electricity not coal or gas	1.96	1.67×10^{-2}	99.75
Commercial	Chemical Product Manufacturing	1.91	1.63×10^{-2}	99.77

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
	n.e.c.			
Industrial	Rendering or fat extraction	1.91	1.63×10^{-2}	99.79
Industrial	Sewage treatment - small plants	1.74	1.49×10^{-2}	99.80
Commercial	Waste Disposal Services	1.67	1.42×10^{-2}	99.81
Industrial	Pesticides and related products production	1.63	1.39×10^{-2}	99.83
Commercial	Printing	1.46	1.24×10^{-2}	99.84
Industrial	Paper production using recycle materials	1.31	1.11×10^{-2}	99.85
Industrial	Brewing and distilling	1.14	9.73×10^{-3}	99.86
Commercial	Bread Manufacturing	1.05	8.94×10^{-3}	99.87
Commercial	Steel Pipe and Tube Manufacturing	1.05	8.92×10^{-3}	99.88
Industrial	Pharmaceutical and veterinary products production	0.94	8.05×10^{-3}	99.89
Industrial	Miscellaneous licensed discharges to waters (at any time)	0.85	7.23×10^{-3}	99.89
Commercial	Plastic Injection Moulded Product Manufacturing	0.84	7.15×10^{-3}	99.90
Commercial	Plastic Bag and Film Manufacturing	0.83	7.10×10^{-3}	99.91
Commercial	Concrete Slurry Manufacturing	0.72	6.11×10^{-3}	99.92
Industrial	Recovery of waste oil	0.66	5.64×10^{-3}	99.92
Commercial	Food Manufacturing n.e.c.	0.63	5.36×10^{-3}	99.93
Commercial	Biscuit Manufacturing	0.63	5.35×10^{-3}	99.93
Commercial	Ink Manufacturing	0.61	5.21×10^{-3}	99.94
Industrial	Plastics resins production	0.51	4.34×10^{-3}	99.94
Commercial	Oil and Fat Manufacturing	0.48	4.11×10^{-3}	99.95
Industrial	Printing, packaging and visual media production	0.48	4.10×10^{-3}	99.95
Commercial	Corrugated Paperboard Container Manufacturing	0.44	3.72×10^{-3}	99.95
Commercial	Electrical and Equipment Manufacturing n.e.c.	0.43	3.66×10^{-3}	99.96
Industrial	Soap and detergent production	0.43	3.63×10^{-3}	99.96
Commercial	Road and Bridge Construction	0.39	3.36×10^{-3}	99.96
Commercial	Laundries and Dry-Cleaners	0.36	3.04×10^{-3}	99.97
Commercial	Chemical Wholesaling	0.31	2.67×10^{-3}	99.97
Commercial	Soft Drink, Cordial and Syrup Manufacturing	0.31	2.67×10^{-3}	99.97
Commercial	Gas Supply	0.28	2.38×10^{-3}	99.97
Industrial	Container reconditioning	0.28	2.37×10^{-3}	99.98
Industrial	Shipping in bulk	0.25	2.10×10^{-3}	99.98
Commercial	Fruit and Vegetable Processing	0.22	1.92×10^{-3}	99.98
Commercial	Medicinal and Pharmaceutical Product Manufacturing	0.22	1.90×10^{-3}	99.98
Commercial	Aircraft Manufacturing	0.21	1.81×10^{-3}	99.98

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Services to Air Transport	0.20	1.73×10^{-3}	99.99
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	0.13	1.10×10^{-3}	99.99
Commercial	Cake and Pastry Manufacturing	0.12	1.03×10^{-3}	99.99
Commercial	Non-Building Construction n.e.c.	0.12	1.01×10^{-3}	99.99
Commercial	Structural Steel Fabricating	0.10	8.89×10^{-4}	99.99
Commercial	Paper Product Manufacturing n.e.c.	0.10	8.77×10^{-4}	99.99
Industrial	Sterilisation activities	9.58×10^{-2}	8.17×10^{-4}	99.99
Commercial	Ice Cream Manufacturing	9.38×10^{-2}	8.0×10^{-4}	99.99
Commercial	Milk and Cream Processing	9.30×10^{-2}	7.93×10^{-4}	99.99
Commercial	Industrial Gas Manufacturing	8.68×10^{-2}	7.40×10^{-4}	99.99
Commercial	Scientific Research	8.39×10^{-2}	7.15×10^{-4}	100.00
Commercial	Petroleum Product Wholesaling	8.25×10^{-2}	7.03×10^{-4}	100.00
Commercial	Automotive Component Manufacturing n.e.c.	7.68×10^{-2}	6.55×10^{-4}	100.00
Commercial	Confectionery Manufacturing	7.02×10^{-2}	5.98×10^{-4}	100.00
Commercial	Soap and Other Detergent Manufacturing	6.74×10^{-2}	5.75×10^{-4}	100.00
Commercial	Wood Product Manufacturing n.e.c.	4.99×10^{-2}	4.26×10^{-4}	100.00
Industrial	Rubber products/tyre production	4.52×10^{-2}	3.85×10^{-4}	100.00
Commercial	Non-Metallic Mineral Product Manufacturing n.e.c.	4.39×10^{-2}	3.74×10^{-4}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	4.03×10^{-2}	3.44×10^{-4}	100.00
Commercial	Lifting and Material Handling Equipment Manufacturing	2.45×10^{-2}	2.09×10^{-4}	100.00
Industrial	Boat mooring and storage	1.84×10^{-2}	1.57×10^{-4}	100.00
Industrial	Chemical storage	1.29×10^{-2}	1.10×10^{-4}	100.00
Commercial	Spring and Wire Product Manufacturing	1.16×10^{-2}	9.93×10^{-5}	100.00
Industrial	Water-based extractive activity	9.18×10^{-3}	7.83×10^{-5}	100.00
Industrial	Boat construction/maintenance (dry/float)	7.66×10^{-3}	6.53×10^{-5}	100.00
Commercial	Structural Metal Product Manufacturing n.e.c.	7.0×10^{-3}	5.97×10^{-5}	100.00
Industrial	Pig accommodation	4.09×10^{-3}	3.48×10^{-5}	100.00
Commercial	Organic Industrial Chemical Manufacturing n.e.c.	2.27×10^{-3}	1.94×10^{-5}	100.00
Industrial	Recovery of waste tyres	6.22×10^{-4}	5.31×10^{-6}	100.00
Commercial	Prepared Animal and Bird Feed Manufacturing	3.10×10^{-4}	2.64×10^{-6}	100.00
Industrial	Hazardous, industrial or group A waste generation	1.35×10^{-4}	1.15×10^{-6}	100.00
Commercial	Wine Manufacturing	5.37×10^{-5}	4.58×10^{-7}	100.00
Commercial	Furniture Manufacturing n.e.c.	4.0×10^{-5}	3.41×10^{-7}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Rubber Product Manufacturing n.e.c.	0.0×10^0	0.0×10^0	100.00
PARTICULATE MATTER 2.5µm in the Newcastle region				
Domestic-Commercial	Solid Fuel Burning (Domestic)	456	21.28	21.28
Industrial	Ammonium nitrate production	316	14.75	36.02
Industrial	Mining for coal	302	14.07	50.09
Off-Road Mobile	Ships	146	6.81	56.90
Industrial	Aluminium production (alumina)	119	5.57	62.46
Industrial	Coal works	93	4.36	66.82
Off-Road Mobile	Industrial Vehicles and Equipment	87	4.07	70.89
Biogenic-Geogenic	Marine Aerosol	85	3.95	74.84
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	56	2.59	77.43
Industrial	Iron or steel production (scrap metal)	53	2.46	79.89
Industrial	Boat construction/maintenance (dry/float)	49	2.28	82.16
On-Road Mobile	All - Non-Exhaust PM	48	2.23	84.39
Industrial	Land-based extractive activity	45	2.08	86.47
Industrial	Agricultural fertiliser (phosphate) production	38	1.79	88.27
Industrial	Waste disposal (application to land)	29	1.37	89.64
Biogenic-Geogenic	Bushfire and Prescribed Burning	25	1.18	90.82
Commercial	Gravel and Sand Quarrying	18	0.86	91.68
On-Road Mobile	Light Duty Diesel - Exhaust	17	0.78	92.46
Off-Road Mobile	Commercial Boats Exhaust	17	0.77	93.23
Industrial	Shipping in bulk	13	0.59	93.82
Industrial	Slaughtering or processing of animals	12	0.58	94.40
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	12	0.54	94.94
Biogenic-Geogenic	Fugitive-Windborne	9.94	0.46	95.40
Domestic-Commercial	Gaseous Fuel Burning	8.57	0.40	95.80
Industrial	Metal processing	8.42	0.39	96.19
Off-Road Mobile	Locomotives	8.33	0.39	96.58
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	6.93	0.32	96.91
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	6.81	0.32	97.22
Commercial	Construction Material Mining n.e.c.	6.58	0.31	97.53
Off-Road Mobile	Recreational Boats Exhaust	6.48	0.30	97.83
Industrial	Bitumen mixing	5.57	0.26	98.09
Industrial	Inert waste landfilling	5.27	0.25	98.34
Industrial	Chemical production	3.80	0.18	98.52
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	3.72	0.17	98.69

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	General agricultural processing	3.56	0.17	98.86
Commercial	Metal Coating and Finishing	3.19	0.15	99.00
Industrial	Metal plating or coating	2.97	0.14	99.14
Industrial	Other land-based extraction	2.86	0.13	99.28
Industrial	Crushing, grinding or separating	2.35	0.11	99.39
Domestic-Commercial	Barbeques	1.65	7.70×10^{-2}	99.46
Industrial	Recovery of waste	1.40	6.55×10^{-2}	99.53
Industrial	Contaminated soil treatment	1.28	5.99×10^{-2}	99.59
Industrial	Concrete works	1.04	4.87×10^{-2}	99.64
Off-Road Mobile	Commercial Vehicles and Equipment	0.77	3.58×10^{-2}	99.67
Biogenic-Geogenic	Agricultural Burning	0.75	3.51×10^{-2}	99.71
Off-Road Mobile	Aircraft (Flight Operations)	0.71	3.29×10^{-2}	99.74
Industrial	Sewage treatment - small plants	0.59	2.74×10^{-2}	99.77
On-Road Mobile	Others - Exhaust	0.56	2.63×10^{-2}	99.79
Industrial	Cement or lime handling	0.55	2.55×10^{-2}	99.82
Commercial	Poultry Farming (Meat)	0.54	2.52×10^{-2}	99.84
Industrial	Non-thermal treatment of waste	0.53	2.48×10^{-2}	99.87
Commercial	Hospitals	0.49	2.31×10^{-2}	99.89
Off-Road Mobile	Aircraft (Ground Operations)	0.46	2.13×10^{-2}	99.91
Commercial	Bread Manufacturing	0.35	1.61×10^{-2}	99.93
Industrial	Dairy processing	0.34	1.60×10^{-2}	99.95
Commercial	Fabricated Metal Product Manufacturing n.e.c.	0.20	9.46×10^{-3}	99.96
Industrial	Boat construction/maintenance (general)	0.18	8.55×10^{-3}	99.96
Industrial	Water-based extractive activity	0.18	8.24×10^{-3}	99.97
Domestic-Commercial	Liquid Fuel Burning (Domestic)	0.18	8.23×10^{-3}	99.98
Commercial	Concrete Slurry Manufacturing	0.16	7.53×10^{-3}	99.99
Industrial	Sewage treatment - large plants	6.80×10^{-2}	3.17×10^{-3}	99.99
Commercial	Chemical Wholesaling	5.34×10^{-2}	2.49×10^{-3}	99.99
Industrial	Scrap metal processing	4.54×10^{-2}	2.12×10^{-3}	100.00
Industrial	General chemicals storage	3.07×10^{-2}	1.43×10^{-3}	100.00
Industrial	Generation of electrical power from gas	2.09×10^{-2}	9.75×10^{-4}	100.00
Industrial	Waste storage	1.59×10^{-2}	7.42×10^{-4}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	7.89×10^{-3}	3.68×10^{-4}	100.00
Commercial	Road and Bridge Construction	6.56×10^{-3}	3.06×10^{-4}	100.00
Commercial	Spring and Wire Product Manufacturing	5.0×10^{-3}	2.33×10^{-4}	100.00
Industrial	Petroleum products storage	4.10×10^{-3}	1.91×10^{-4}	100.00
Commercial	Aluminium Rolling, Drawing, Extruding	1.20×10^{-3}	5.60×10^{-5}	100.00
Commercial	Ceramic Product Manufacturing n.e.c.	1.07×10^{-3}	4.99×10^{-5}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Waste Disposal Services	5.55×10^{-4}	2.59×10^{-5}	100.00
Industrial	Printing, packaging and visual media production	4.71×10^{-4}	2.20×10^{-5}	100.00
Industrial	Hazardous, industrial or group A waste generation	2.55×10^{-4}	1.19×10^{-5}	100.00
Commercial	Mining and Construction Machinery Manufacturing	2.01×10^{-4}	9.36×10^{-6}	100.00
PARTICULATE MATTER 2.5µm in the Wollongong region				
Industrial	Iron or steel production (iron ore)	1,223	62.45	62.45
Domestic-Commercial	Solid Fuel Burning (Domestic)	301	15.38	77.82
Off-Road Mobile	Ships	62	3.18	81.00
Biogenic-Geogenic	Bushfire and Prescribed Burning	52	2.63	83.63
Biogenic-Geogenic	Marine Aerosol	38	1.95	85.58
Industrial	Generation of electrical power from gas	36	1.82	87.40
Off-Road Mobile	Industrial Vehicles and Equipment	34	1.76	89.16
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	28	1.43	90.59
Industrial	Coke production	28	1.41	92.00
On-Road Mobile	All - Non-Exhaust PM	23	1.19	93.19
Industrial	Mining for coal	12	0.60	93.79
Industrial	Coal works	11	0.58	94.37
Industrial	Metal plating or coating	11	0.54	94.91
On-Road Mobile	Light Duty Diesel - Exhaust	10	0.52	95.43
Industrial	Metal processing	9.63	0.49	95.92
Industrial	Bitumen mixing	9.32	0.48	96.40
Commercial	Gravel and Sand Quarrying	7.62	0.39	96.78
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	7.61	0.39	97.17
Off-Road Mobile	Recreational Boats Exhaust	6.89	0.35	97.53
Off-Road Mobile	Locomotives	6.85	0.35	97.88
Domestic-Commercial	Gaseous Fuel Burning	6.19	0.32	98.19
Industrial	Waste disposal (application to land)	5.95	0.30	98.49
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	5.06	0.26	98.75
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	3.95	0.20	98.95
Commercial	Steel Pipe and Tube Manufacturing	3.51	0.18	99.13
Industrial	Coal washery reject or slag landfilling	3.29	0.17	99.30
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	2.46	0.13	99.43
Industrial	Shipping in bulk	1.95	9.97×10^{-2}	99.53
Commercial	Ceramic Product Manufacturing	1.90	9.71×10^{-2}	99.62
Industrial	Road construction	1.27	6.49×10^{-2}	99.69
Domestic-Commercial	Barbeques	1.19	6.09×10^{-2}	99.75

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Off-Road Mobile	Commercial Boats Exhaust	0.91	4.66×10^{-2}	99.80
Industrial	Concrete works	0.51	2.58×10^{-2}	99.82
Commercial	Basic Iron and Steel Manufacturing	0.46	2.33×10^{-2}	99.85
Industrial	Waste storage	0.34	1.73×10^{-2}	99.86
On-Road Mobile	Others - Exhaust	0.30	1.53×10^{-2}	99.88
Industrial	General chemicals storage	0.29	1.46×10^{-2}	99.89
Industrial	Crushing, grinding or separating	0.27	1.37×10^{-2}	99.91
Biogenic-Geogenic	Fugitive-Windborne	0.25	1.26×10^{-2}	99.92
Industrial	Cement or lime production	0.23	1.15×10^{-2}	99.93
Industrial	Sewage treatment - large plants	0.21	1.08×10^{-2}	99.94
Commercial	Hospitals	0.19	9.68×10^{-3}	99.95
Off-Road Mobile	Aircraft (Flight Operations)	0.15	7.77×10^{-3}	99.96
Off-Road Mobile	Commercial Vehicles and Equipment	0.15	7.66×10^{-3}	99.97
Commercial	Poultry Farming (Meat)	0.14	6.94×10^{-3}	99.97
Domestic-Commercial	Liquid Fuel Burning (Domestic)	0.13	6.51×10^{-3}	99.98
Industrial	Cement or lime handling	0.12	5.94×10^{-3}	99.99
Industrial	Chemical production	0.11	5.37×10^{-3}	99.99
Commercial	Aluminium Rolling, Drawing, Extruding	6.93×10^{-2}	3.54×10^{-3}	99.99
Industrial	Non-thermal treatment of waste	6.39×10^{-2}	3.26×10^{-3}	100.00
Commercial	Concrete Slurry Manufacturing	1.34×10^{-2}	6.85×10^{-4}	100.00
Industrial	Contaminated soil treatment	1.14×10^{-2}	5.82×10^{-4}	100.00
Commercial	Rubber Product Manufacturing n.e.c.	1.11×10^{-2}	5.69×10^{-4}	100.00
Industrial	Container reconditioning	4.72×10^{-3}	2.41×10^{-4}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	2.44×10^{-3}	1.24×10^{-4}	100.00
Commercial	Automotive Component Manufacturing n.e.c.	2.43×10^{-4}	1.24×10^{-5}	100.00
Commercial	Synthetic Resin Manufacturing	1.34×10^{-4}	6.83×10^{-6}	100.00
Commercial	Spring and Wire Product Manufacturing	1.34×10^{-4}	6.83×10^{-6}	100.00
Industrial	Scrap metal processing	8.42×10^{-5}	4.30×10^{-6}	100.00
PARTICULATE MATTER 2.5µm in the Non Urban region				
Industrial	Mining for coal	8,467	36.41	36.41
Biogenic-Geogenic	Marine Aerosol	3,546	15.25	51.67
Industrial	Generation of electrical power from coal	3,335	14.34	66.01
Biogenic-Geogenic	Bushfire and Prescribed Burning	2,415	10.39	76.39
Off-Road Mobile	Industrial Vehicles and Equipment	1,764	7.59	83.98
Domestic-Commercial	Solid Fuel Burning (Domestic)	1,145	4.92	88.90
Industrial	Cement or lime production	544	2.34	91.24
Industrial	Land-based extractive activity	463	1.99	93.24

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Biogenic-Geogenic	Fugitive-Windborne	179	0.77	94.01
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	159	0.68	94.69
Off-Road Mobile	Ships	145	0.62	95.31
Commercial	Gravel and Sand Quarrying	136	0.58	95.89
Industrial	Aluminium production (alumina)	135	0.58	96.48
Industrial	Ceramics production	115	0.49	96.97
On-Road Mobile	All - Non-Exhaust PM	103	0.44	97.41
Industrial	Mining for minerals	79	0.34	97.75
Off-Road Mobile	Locomotives	71	0.30	98.06
Off-Road Mobile	Commercial Boats Exhaust	57	0.24	98.30
Off-Road Mobile	Recreational Boats Exhaust	56	0.24	98.54
Biogenic-Geogenic	Agricultural Burning	36	0.15	98.69
Industrial	Waste disposal (application to land)	35	0.15	98.85
On-Road Mobile	Light Duty Diesel - Exhaust	33	0.14	98.99
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	29	0.12	99.11
Industrial	Coal works	22	9.26×10^{-2}	99.20
Domestic-Commercial	Gaseous Fuel Burning	20	8.76×10^{-2}	99.29
Industrial	Bird accommodation	18	7.55×10^{-2}	99.37
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	16	7.04×10^{-2}	99.44
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	16	6.71×10^{-2}	99.50
Commercial	Poultry Farming (Meat)	15	6.40×10^{-2}	99.57
Industrial	Aluminium production (scrap metal)	10	4.38×10^{-2}	99.61
Industrial	Bitumen mixing	9.75	4.19×10^{-2}	99.65
Industrial	Solid waste landfilling	8.05	3.46×10^{-2}	99.69
Off-Road Mobile	Aircraft (Flight Operations)	7.87	3.38×10^{-2}	99.72
Commercial	Log Sawmilling	7.42	3.19×10^{-2}	99.75
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	7.37	3.17×10^{-2}	99.79
Off-Road Mobile	Commercial Vehicles and Equipment	4.29	1.85×10^{-2}	99.80
Industrial	Other land-based extraction	4.19	1.80×10^{-2}	99.82
Domestic-Commercial	Barbeques	3.93	1.69×10^{-2}	99.84
Commercial	Construction Material Mining n.e.c.	3.69	1.59×10^{-2}	99.86
Industrial	Composting	3.58	1.54×10^{-2}	99.87
Industrial	Concrete works	3.45	1.48×10^{-2}	99.89
Industrial	Crushing, grinding or separating	3.38	1.46×10^{-2}	99.90
Industrial	Wood or timber milling or processing	2.92	1.26×10^{-2}	99.91
Industrial	Chemical production	2.91	1.25×10^{-2}	99.93
Industrial	General agricultural processing	1.92	8.25×10^{-3}	99.93
Industrial	Inert waste landfilling	1.80	7.75×10^{-3}	99.94

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Water-based extractive activity	1.66	7.13×10^{-3}	99.95
On-Road Mobile	Others - Exhaust	1.42	6.12×10^{-3}	99.95
Industrial	Animal accommodation	1.35	5.79×10^{-3}	99.96
Commercial	Poultry Farming (Eggs)	1.17	5.05×10^{-3}	99.97
Commercial	Hospitals	0.88	3.78×10^{-3}	99.97
Industrial	Cement or lime handling	0.86	3.68×10^{-3}	99.97
Commercial	Food Manufacturing n.e.c.	0.74	3.17×10^{-3}	99.98
Commercial	Electric Cable and Wire Manufacturing	0.72	3.11×10^{-3}	99.98
Industrial	Sewage treatment - small plants	0.66	2.82×10^{-3}	99.98
Industrial	Petroleum products and fuel production	0.65	2.82×10^{-3}	99.98
Domestic-Commercial	Liquid Fuel Burning (Domestic)	0.42	1.80×10^{-3}	99.99
Industrial	Rendering or fat extraction	0.41	1.75×10^{-3}	99.99
Commercial	Spring and Wire Product Manufacturing	0.37	1.57×10^{-3}	99.99
Industrial	Non-thermal treatment of waste	0.29	1.26×10^{-3}	99.99
Industrial	General animal products production	0.26	1.12×10^{-3}	99.99
Commercial	Concrete Slurry Manufacturing	0.23	9.82×10^{-4}	99.99
Industrial	Sewage treatment - large plants	0.22	9.36×10^{-4}	99.99
Industrial	Recovery of waste oil	0.21	9.14×10^{-4}	99.99
Commercial	Non-Ferrous Metal Casting	0.18	7.87×10^{-4}	100.00
Industrial	Recovery of waste	0.17	7.32×10^{-4}	100.00
Commercial	Furniture Manufacturing n.e.c.	0.14	6.21×10^{-4}	100.00
Commercial	Prepared Animal and Bird Feed Manufacturing	0.12	5.06×10^{-4}	100.00
Off-Road Mobile	Aircraft (Ground Operations)	8.68×10^{-2}	3.73×10^{-4}	100.00
Commercial	Fabricated Metal Product Manufacturing n.e.c.	6.93×10^{-2}	2.98×10^{-4}	100.00
Commercial	Synthetic Resin Manufacturing	5.38×10^{-2}	2.31×10^{-4}	100.00
Industrial	Generation of electricity not coal or gas	4.91×10^{-2}	2.11×10^{-4}	100.00
Commercial	Medicinal and Pharmaceutical Product Manufacturing	4.70×10^{-2}	2.02×10^{-4}	100.00
Industrial	Metal plating or coating	4.32×10^{-2}	1.86×10^{-4}	100.00
Industrial	Pesticides and related products production	4.06×10^{-2}	1.74×10^{-4}	100.00
Industrial	Explosives production	3.15×10^{-2}	1.36×10^{-4}	100.00
Commercial	Paper Product Manufacturing n.e.c.	2.63×10^{-2}	1.13×10^{-4}	100.00
Industrial	Boat mooring and storage	1.81×10^{-2}	7.78×10^{-5}	100.00
Commercial	Petroleum Product Wholesaling	1.63×10^{-2}	7.0×10^{-5}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	1.30×10^{-2}	5.58×10^{-5}	100.00
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	9.90×10^{-3}	4.26×10^{-5}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Generation of electrical power from gas	9.80×10^{-3}	4.21×10^{-5}	100.00
Industrial	Slaughtering or processing of animals	8.50×10^{-3}	3.66×10^{-5}	100.00
Commercial	Road and Bridge Construction	6.51×10^{-3}	2.80×10^{-5}	100.00
Commercial	Wood Product Manufacturing n.e.c.	6.14×10^{-3}	2.64×10^{-5}	100.00
Commercial	Chemical Product Manufacturing n.e.c.	5.69×10^{-3}	2.45×10^{-5}	100.00
Industrial	General chemicals storage	2.67×10^{-3}	1.15×10^{-5}	100.00
Commercial	Glass and Glass Product Manufacturing	1.96×10^{-3}	8.44×10^{-6}	100.00
Commercial	Non-Building Construction n.e.c.	1.58×10^{-3}	6.79×10^{-6}	100.00
Commercial	Mining and Construction Machinery Manufacturing	2.27×10^{-4}	9.74×10^{-7}	100.00
Industrial	Pharmaceutical and veterinary products production	3.24×10^{-5}	1.39×10^{-7}	100.00
Commercial	Printing	3.16×10^{-6}	1.36×10^{-8}	100.00

Figure 3-36, Figure 3-37, Figure 3-38, Figure 3-39 and Figure 3-40 show the proportions of total estimated annual emissions for the top 15 natural and human-made sources of particulate matter ≤ 2.5 µm in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

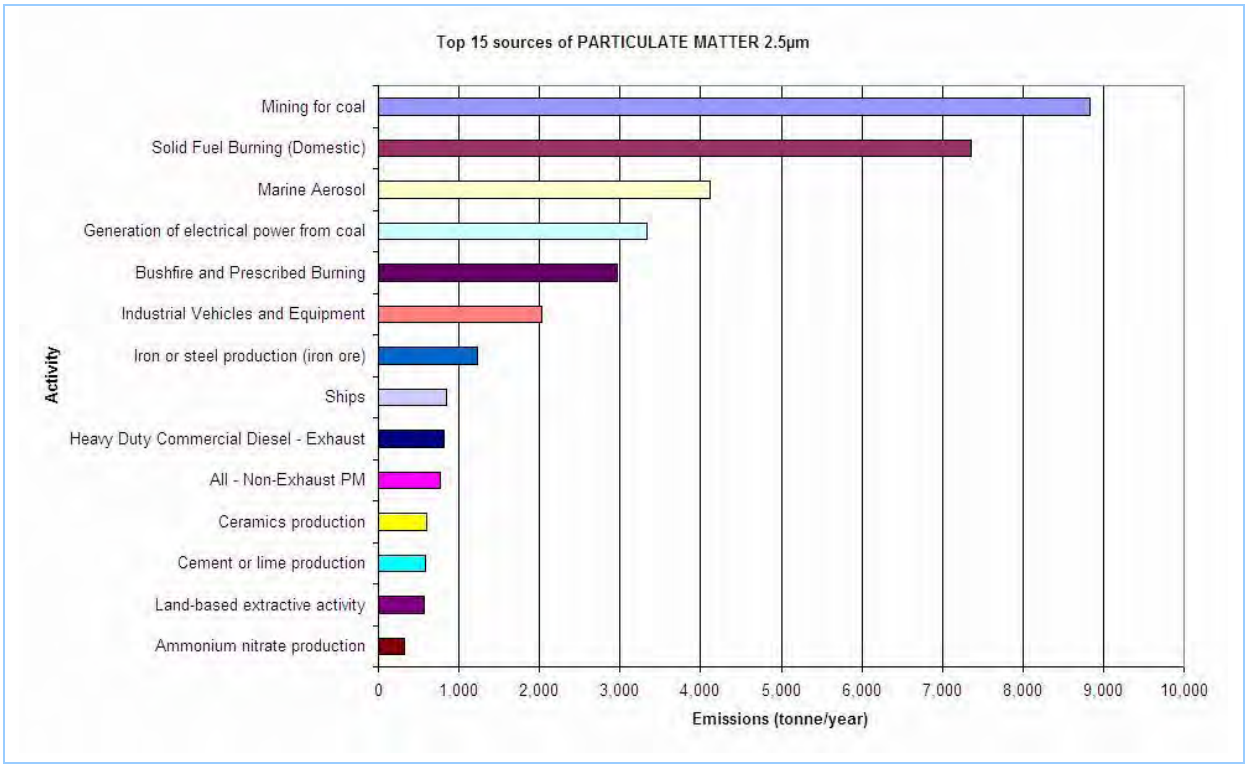

Figure 3-36: Top 15 natural and human-made sources of particulate matter ≤ 2.5 µm in the GMR

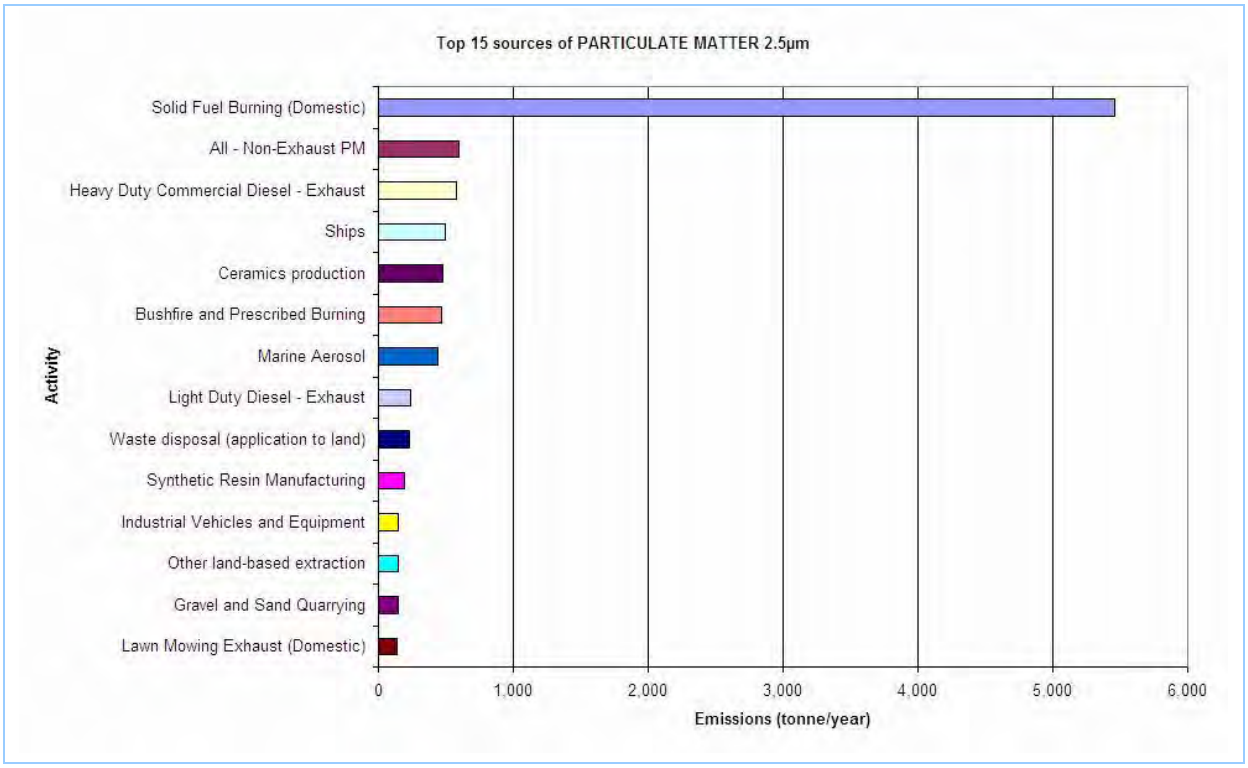

Figure 3-37: Top 15 natural and human-made sources of particulate matter ≤ 2.5 µm in the Sydney region

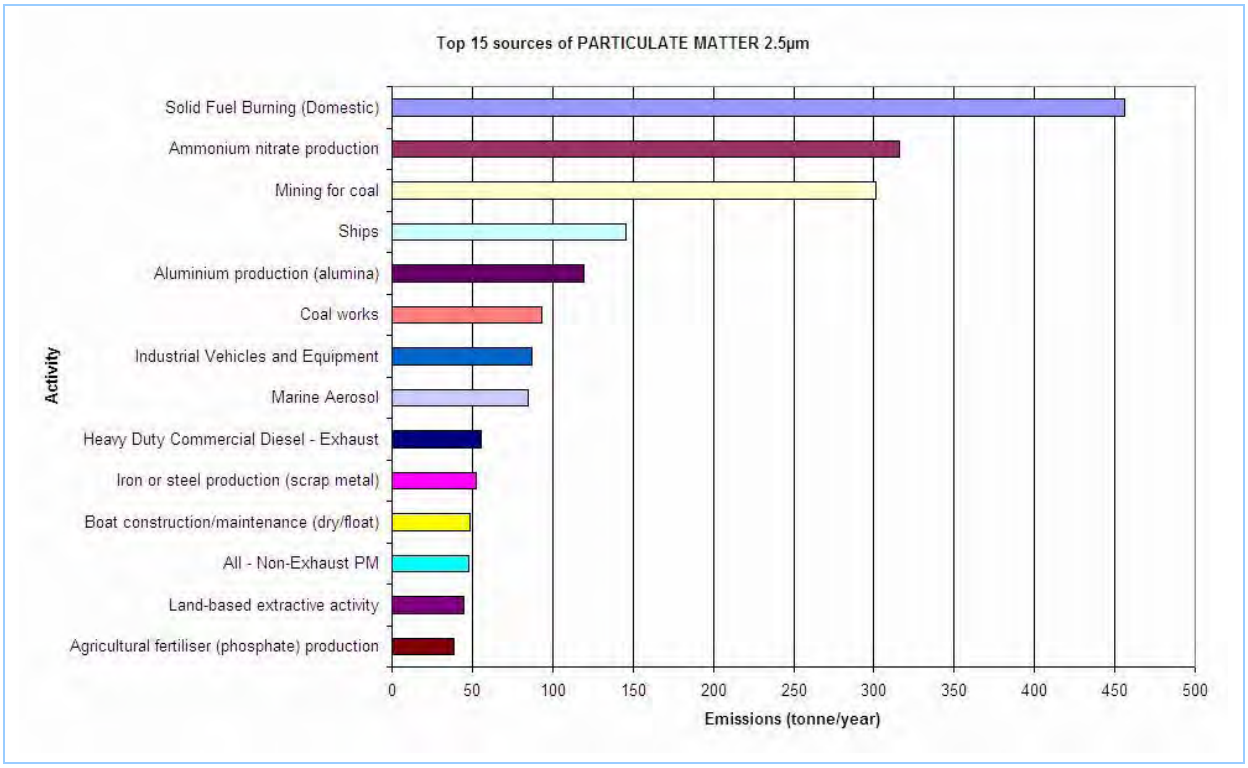

Figure 3-38: Top 15 natural and human-made sources of particulate matter ≤ 2.5 µm in the Newcastle region

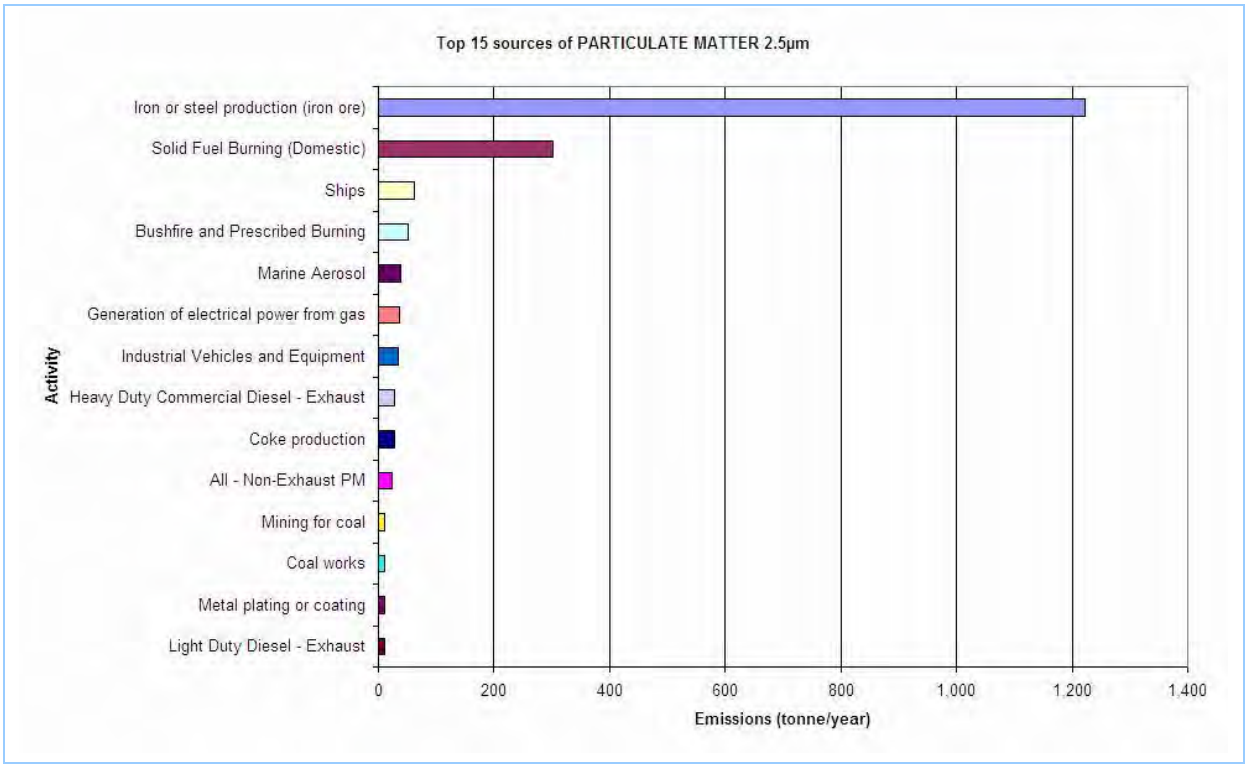

Figure 3-39: Top 15 natural and human-made sources of particulate matter ≤ 2.5 µm in the Wollongong region

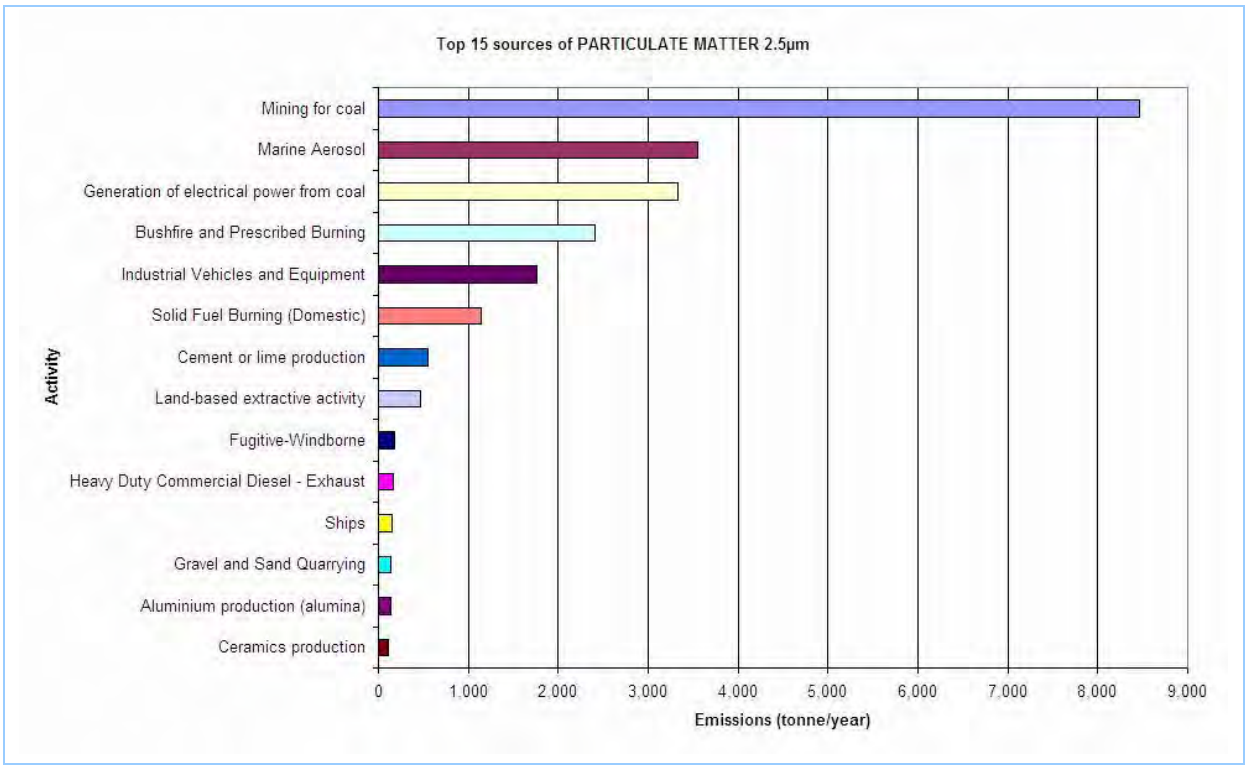

Figure 3-40: Top 15 natural and human-made sources of particulate matter ≤ 2.5 µm in the Non Urban region

3.5 Sulfur Dioxide

3.5.1 *Natural and Human-Made Emissions*

Table 3-13 presents total estimated annual emissions of sulfur dioxide by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-13: Total estimated annual emissions of sulfur dioxide by natural and human-made source type in each region

Substance	Emissions (tonne/year)							
	Region	Biogenic-Geogenic	Commercial	Domestic-Commercial	Industrial	Off-Road Mobile	On-Road Mobile	Grand Total
SULFUR DIOXIDE	Sydney	50	108	131	5,574	4,725	210	10,798
	Newcastle	2.72	1.62	11	10,266	1,300	15	11,596
	Wollongong	5.49	0.73	7.07	8,494	553	8.13	9,068
	Non Urban	259	70	26	256,139	1,246	35	257,774
	GMR	317	180	175	280,472	7,824	269	289,237

Table 3-14 presents the proportions of total estimated annual emissions of sulfur dioxide by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-14: Proportions of total estimated annual emissions of sulfur dioxide by natural and human-made source type in each region

Substance	Proportions (%)						
	Region	Biogenic-Geogenic	Commercial	Domestic-Commercial	Industrial	Off-Road Mobile	On-Road Mobile
SULFUR DIOXIDE	Sydney	0.46	1.00	1.21	51.62	43.75	1.95
	Newcastle	2.35×10^{-2}	1.40×10^{-2}	9.06×10^{-2}	88.53	11.21	0.13
	Wollongong	6.05×10^{-2}	8.01×10^{-3}	7.80×10^{-2}	93.66	6.10	8.97×10^{-2}
	Non Urban	0.10	2.71×10^{-2}	1.01×10^{-2}	99.37	0.48	1.36×10^{-2}
	GMR	0.11	6.24×10^{-2}	6.04×10^{-2}	96.97	2.70	9.29×10^{-2}

Figure 3-41, Figure 3-42, Figure 3-43, Figure 3-44 and Figure 3-45 show the proportions of total estimated annual emissions of sulfur dioxide by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

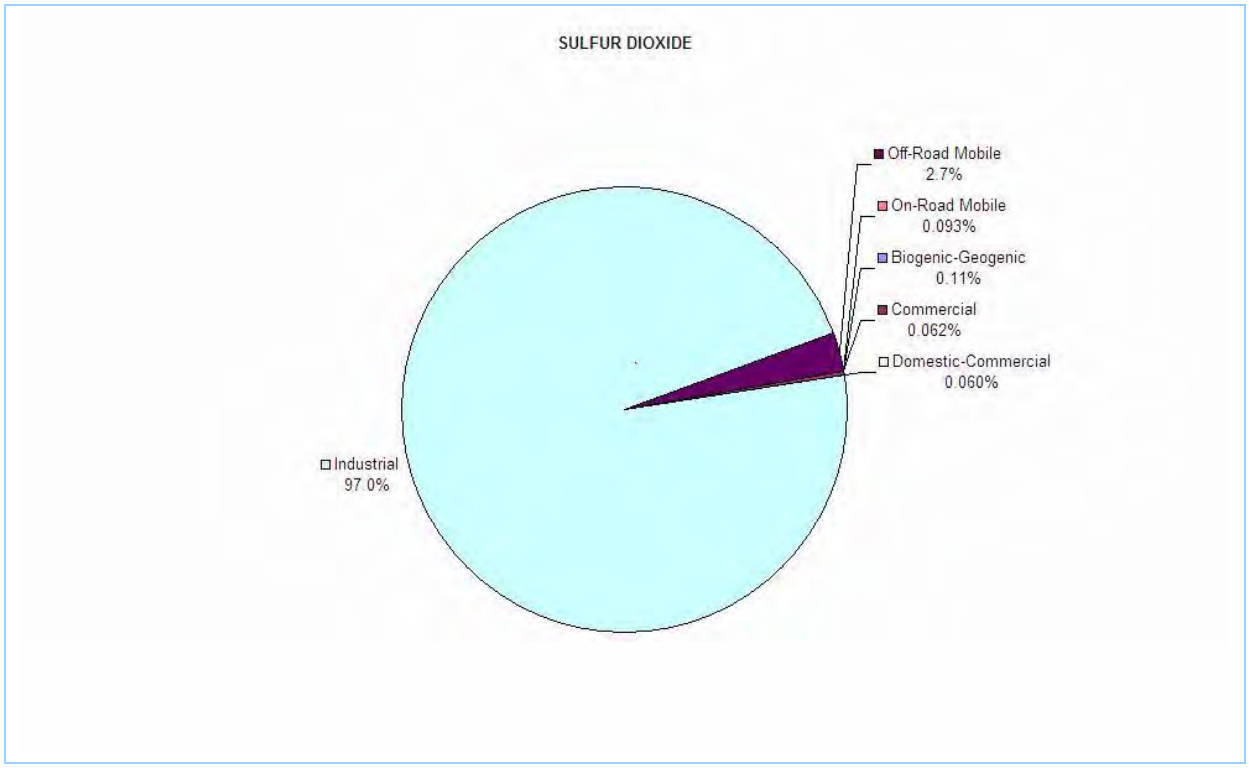

Figure 3-41: Proportions of total estimated annual emissions of sulfur dioxide by natural and human-made source type in the GMR

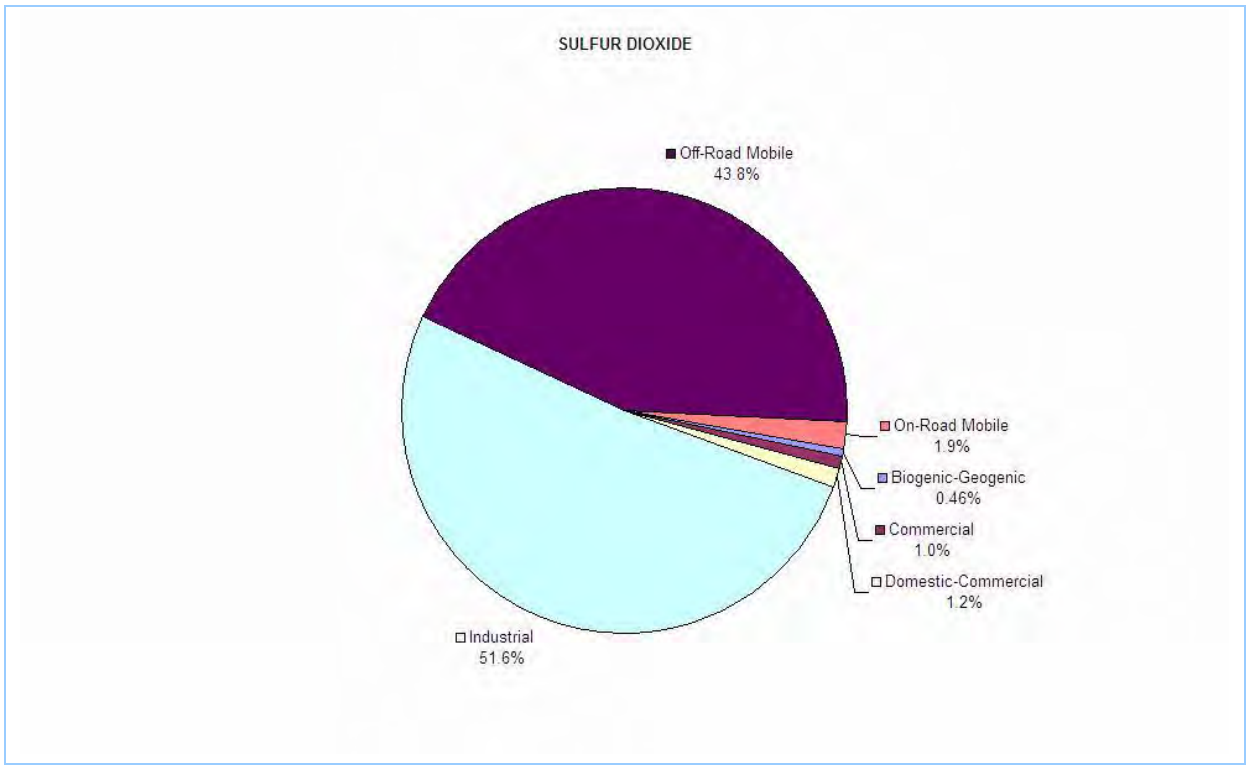

Figure 3-42: Proportions of total estimated annual emissions of sulfur dioxide by natural and human-made source type in the Sydney region

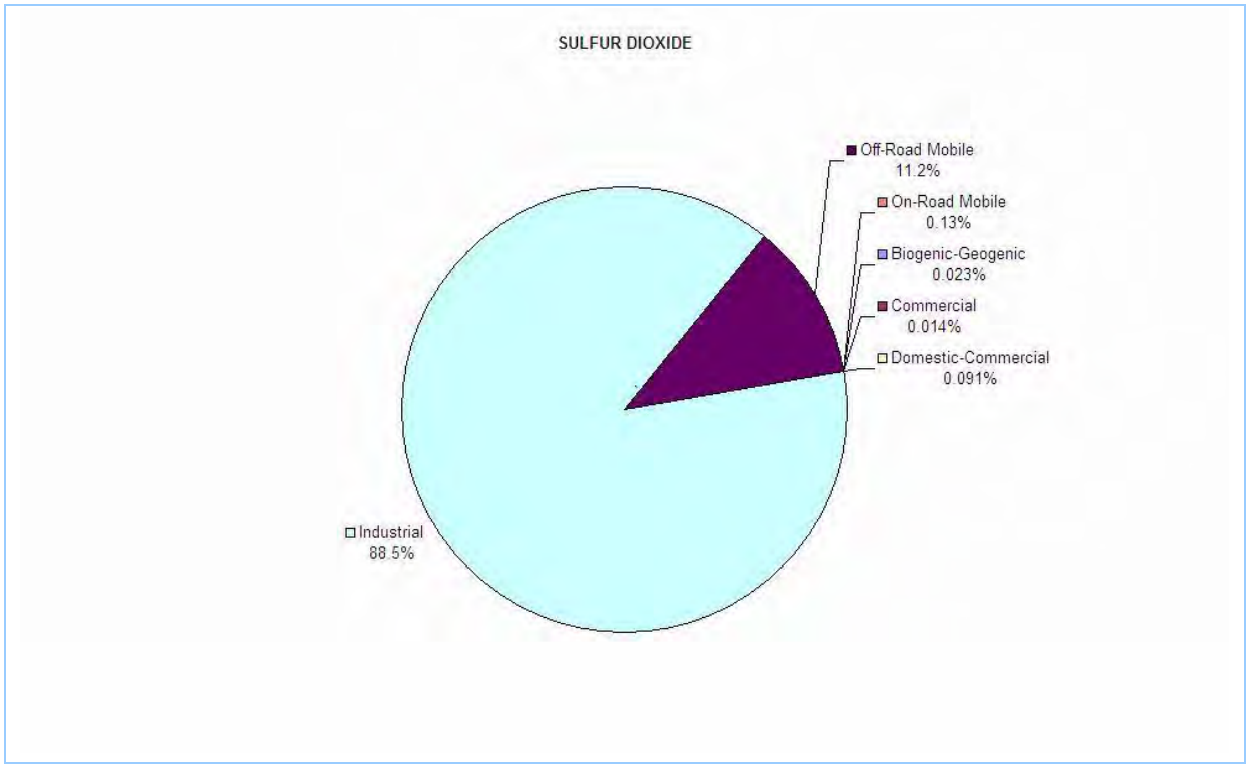

Figure 3-43: Proportions of total estimated annual emissions of sulfur dioxide by natural and human-made source type in the Newcastle region

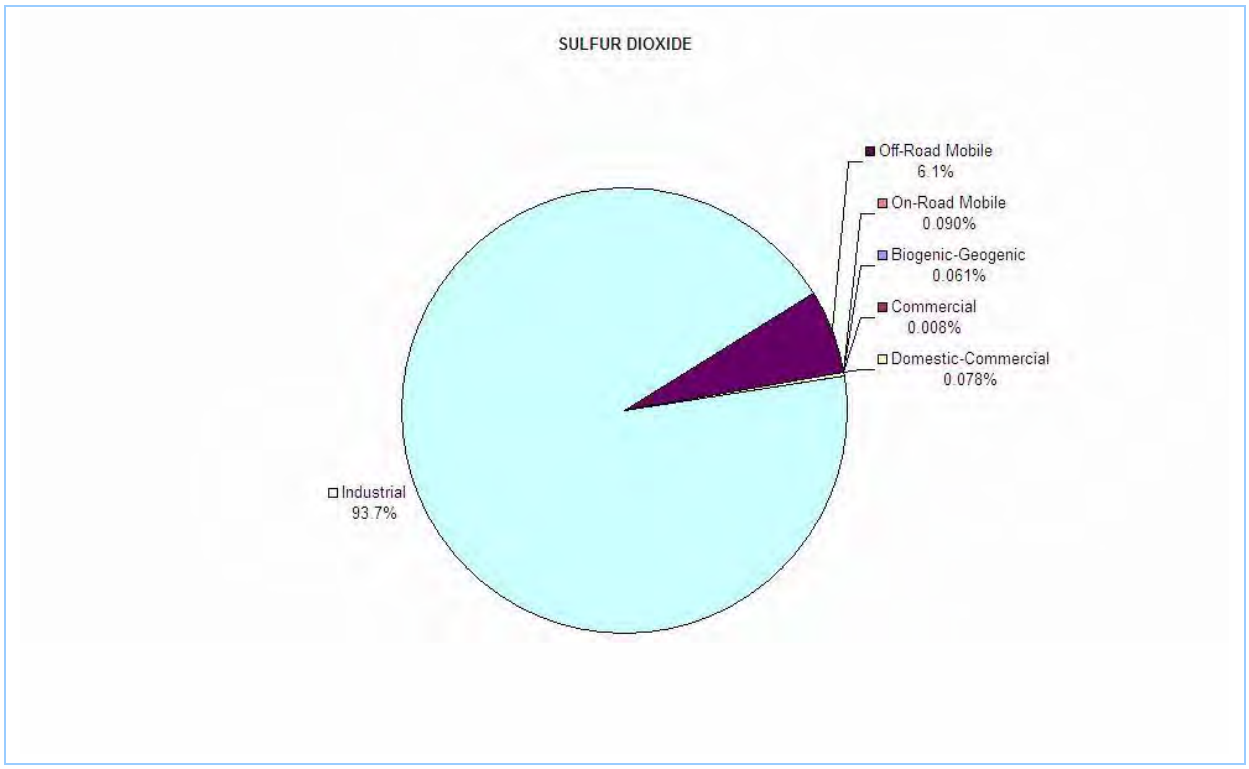

Figure 3-44: Proportions of total estimated annual emissions of sulfur dioxide by natural and human-made source type in the Wollongong region

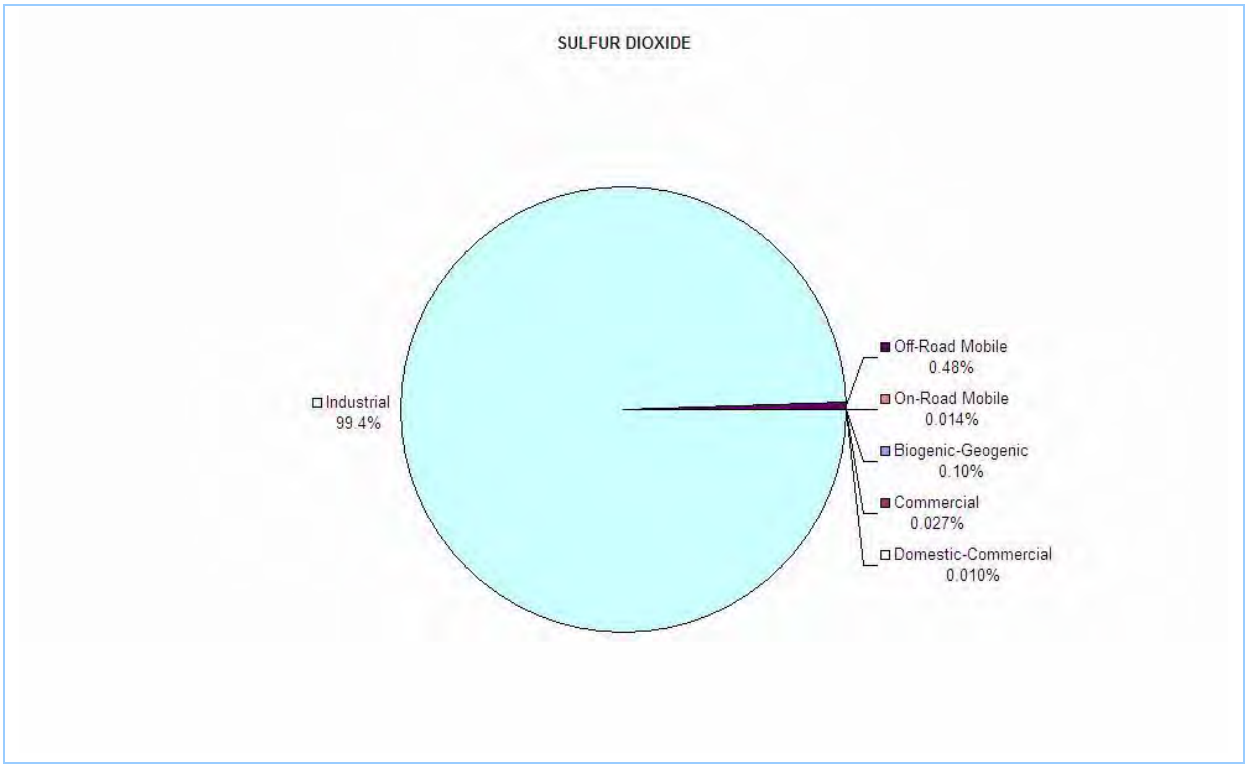

Figure 3-45: Proportions of total estimated annual emissions of sulfur dioxide by natural and human-made source type in the Non Urban region

3.5.2 Priority Natural and Human-Made Emissions

Table 3-15 presents total estimated annual emissions, proportions and cumulative proportions of natural and human-made sources of sulfur dioxide in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-15: Natural and human-made sources of sulfur dioxide in each region

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
SULFUR DIOXIDE in the GMR				
Industrial	Generation of electrical power from coal	251,437	86.93	86.93
Industrial	Aluminium production (alumina)	13,857	4.79	91.72
Industrial	Iron or steel production (iron ore)	8,216	2.84	94.56
Off-Road Mobile	Ships	7,557	2.61	97.18
Industrial	Petroleum products and fuel production	3,119	1.08	98.25
Industrial	Petroleum products storage	737	0.25	98.51
Industrial	Ceramics production	581	0.20	98.71
Industrial	Mining for coal	496	0.17	98.88
Industrial	Coke production	455	0.16	99.04
Industrial	Cement or lime production	379	0.13	99.17
Industrial	Glass production (container)	327	0.11	99.28

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Biogenic-Geogenic	Bushfire and Prescribed Burning	315	0.11	99.39
Industrial	Petrochemical production	229	7.92×10^{-2}	99.47
Industrial	Glass production (float)	223	7.72×10^{-2}	99.55
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	181	6.25×10^{-2}	99.61
Off-Road Mobile	Aircraft (Flight Operations)	167	5.78×10^{-2}	99.67
Industrial	Non-ferrous metal production (scrap)	130	4.49×10^{-2}	99.71
Domestic-Commercial	Solid Fuel Burning (Domestic)	129	4.47×10^{-2}	99.76
Industrial	Chemical production	66	2.27×10^{-2}	99.78
Industrial	Slaughtering or processing of animals	65	2.26×10^{-2}	99.80
Off-Road Mobile	Industrial Vehicles and Equipment	64	2.20×10^{-2}	99.83
Commercial	Log Sawmilling	49	1.71×10^{-2}	99.84
Commercial	Ceramic Product Manufacturing	48	1.65×10^{-2}	99.86
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	41	1.42×10^{-2}	99.87
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	36	1.25×10^{-2}	99.89
Industrial	General chemicals storage	31	1.08×10^{-2}	99.90
Commercial	Chemical Product Manufacturing n.e.c.	30	1.02×10^{-2}	99.91
Industrial	Aluminium production (scrap metal)	27	9.42×10^{-3}	99.92
Industrial	Metal plating or coating	24	8.41×10^{-3}	99.92
Commercial	Food Manufacturing n.e.c.	18	6.16×10^{-3}	99.93
Industrial	Generation of electrical power from gas	18	6.15×10^{-3}	99.94
Off-Road Mobile	Commercial Boats Exhaust	15	5.25×10^{-3}	99.94
Domestic-Commercial	Gaseous Fuel Burning	13	4.46×10^{-3}	99.95
Commercial	Funeral Directors, Crematoria and Cemeteries	12	4.10×10^{-3}	99.95
Domestic-Commercial	Barbeques	11	3.95×10^{-3}	99.95
Domestic-Commercial	Liquid Fuel Burning (Domestic)	11	3.78×10^{-3}	99.96
Industrial	Generation of electricity not coal or gas	11	3.77×10^{-3}	99.96
Off-Road Mobile	Locomotives	11	3.67×10^{-3}	99.97
Industrial	Iron or steel production (scrap metal)	11	3.65×10^{-3}	99.97
Commercial	Port Operators	9.94	3.44×10^{-3}	99.97
Industrial	Bitumen mixing	9.69	3.35×10^{-3}	99.98
On-Road Mobile	Light Duty Diesel - Exhaust	9.01	3.11×10^{-3}	99.98
Commercial	Beer and Malt Manufacturing	8.91	3.08×10^{-3}	99.98
Off-Road Mobile	Recreational Boats Exhaust	7.46	2.58×10^{-3}	99.98
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	7.25	2.51×10^{-3}	99.99

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Recovery of waste oil	6.17	2.13×10^{-3}	99.99
Industrial	Crushing, grinding or separating	5.88	2.03×10^{-3}	99.99
Commercial	Plaster Product Manufacturing	3.40	1.17×10^{-3}	99.99
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	2.93	1.01×10^{-3}	99.99
Industrial	Cement or lime handling	2.52	8.72×10^{-4}	99.99
Industrial	Non-thermal treatment of waste	2.29	7.91×10^{-4}	100.00
Off-Road Mobile	Aircraft (Ground Operations)	1.97	6.80×10^{-4}	100.00
Industrial	Metal processing	1.91	6.59×10^{-4}	100.00
Biogenic-Geogenic	Agricultural Burning	1.79	6.18×10^{-4}	100.00
On-Road Mobile	Others - Exhaust	1.49	5.16×10^{-4}	100.00
Industrial	Ammonium nitrate production	0.92	3.19×10^{-4}	100.00
Industrial	Soap and detergent production	0.79	2.73×10^{-4}	100.00
Commercial	Hospitals	0.47	1.62×10^{-4}	100.00
Off-Road Mobile	Commercial Vehicles and Equipment	0.41	1.41×10^{-4}	100.00
Industrial	Paper or pulp production	0.37	1.28×10^{-4}	100.00
Commercial	Waste Disposal Services	0.35	1.22×10^{-4}	100.00
Industrial	General agricultural processing	0.32	1.12×10^{-4}	100.00
Industrial	Land-based extractive activity	0.23	7.84×10^{-5}	100.00
Industrial	General animal products production	0.19	6.46×10^{-5}	100.00
Commercial	Glass and Glass Product Manufacturing	0.18	6.10×10^{-5}	100.00
Industrial	Sewage treatment - large plants	0.15	5.14×10^{-5}	100.00
Industrial	Rendering or fat extraction	0.14	4.81×10^{-5}	100.00
Commercial	Basic Non-Ferrous Metal Manufacturing n.e.c.	0.13	4.64×10^{-5}	100.00
Industrial	Contaminated soil treatment	0.11	3.82×10^{-5}	100.00
Industrial	Paints/polishes/adhesives production	0.10	3.55×10^{-5}	100.00
Commercial	Printing	9.33×10^{-2}	3.22×10^{-5}	100.00
Commercial	Bread Manufacturing	8.26×10^{-2}	2.85×10^{-5}	100.00
Industrial	Dairy processing	6.80×10^{-2}	2.35×10^{-5}	100.00
Industrial	Pharmaceutical and veterinary products production	6.48×10^{-2}	2.24×10^{-5}	100.00
Industrial	Brewing and distilling	5.13×10^{-2}	1.77×10^{-5}	100.00
Industrial	Concrete works	4.94×10^{-2}	1.71×10^{-5}	100.00
Industrial	Composting	4.58×10^{-2}	1.58×10^{-5}	100.00
Commercial	Biscuit Manufacturing	4.32×10^{-2}	1.49×10^{-5}	100.00
Commercial	Basic Iron and Steel Manufacturing	3.37×10^{-2}	1.17×10^{-5}	100.00
Industrial	Paper production using recycle materials	3.34×10^{-2}	1.16×10^{-5}	100.00
Commercial	Oil and Fat Manufacturing	3.31×10^{-2}	1.15×10^{-5}	100.00
Commercial	Metal Coating and Finishing	3.21×10^{-2}	1.11×10^{-5}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Paper Product Manufacturing n.e.c.	3.19×10^{-2}	1.10×10^{-5}	100.00
Commercial	Corrugated Paperboard Container Manufacturing	3.0×10^{-2}	1.04×10^{-5}	100.00
Industrial	Printing, packaging and visual media production	2.97×10^{-2}	1.03×10^{-5}	100.00
Industrial	Bird accommodation	2.57×10^{-2}	8.90×10^{-6}	100.00
Commercial	Laundries and Dry-Cleaners	2.45×10^{-2}	8.47×10^{-6}	100.00
Commercial	Plastic Injection Moulded Product Manufacturing	2.18×10^{-2}	7.53×10^{-6}	100.00
Commercial	Non-Ferrous Metal Casting	2.17×10^{-2}	7.51×10^{-6}	100.00
Commercial	Soft Drink, Cordial and Syrup Manufacturing	2.15×10^{-2}	7.44×10^{-6}	100.00
Commercial	Gas Supply	1.92×10^{-2}	6.65×10^{-6}	100.00
Commercial	Medicinal and Pharmaceutical Product Manufacturing	1.83×10^{-2}	6.33×10^{-6}	100.00
Commercial	Fruit and Vegetable Processing	1.55×10^{-2}	5.35×10^{-6}	100.00
Commercial	Aircraft Manufacturing	1.46×10^{-2}	5.06×10^{-6}	100.00
Industrial	Plastics resins production	1.42×10^{-2}	4.89×10^{-6}	100.00
Commercial	Services to Air Transport	1.40×10^{-2}	4.83×10^{-6}	100.00
Industrial	Sewage treatment - small plants	1.26×10^{-2}	4.36×10^{-6}	100.00
Industrial	Container reconditioning	1.17×10^{-2}	4.05×10^{-6}	100.00
Commercial	Rubber Product Manufacturing n.e.c.	1.02×10^{-2}	3.53×10^{-6}	100.00
Commercial	Prepared Animal and Bird Feed Manufacturing	1.01×10^{-2}	3.50×10^{-6}	100.00
Commercial	Fabricated Metal Product Manufacturing n.e.c.	1.01×10^{-2}	3.49×10^{-6}	100.00
Commercial	Furniture Manufacturing n.e.c.	9.91×10^{-3}	3.43×10^{-6}	100.00
Commercial	Synthetic Resin Manufacturing	9.05×10^{-3}	3.13×10^{-6}	100.00
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	8.69×10^{-3}	3.01×10^{-6}	100.00
Commercial	Cake and Pastry Manufacturing	8.32×10^{-3}	2.88×10^{-6}	100.00
Industrial	Wood or timber milling or processing	7.50×10^{-3}	2.59×10^{-6}	100.00
Commercial	Poultry Farming (Meat)	7.19×10^{-3}	2.49×10^{-6}	100.00
Industrial	Sterilisation activities	6.58×10^{-3}	2.27×10^{-6}	100.00
Commercial	Milk and Cream Processing	6.40×10^{-3}	2.21×10^{-6}	100.00
Commercial	Ice Cream Manufacturing	6.39×10^{-3}	2.21×10^{-6}	100.00
Commercial	Scientific Research	5.77×10^{-3}	1.99×10^{-6}	100.00
Commercial	Confectionery Manufacturing	4.81×10^{-3}	1.66×10^{-6}	100.00
Industrial	Other land-based extraction	3.86×10^{-3}	1.34×10^{-6}	100.00
Industrial	Recovery of waste	3.82×10^{-3}	1.32×10^{-6}	100.00
Commercial	Non-Metallic Mineral Product Manufacturing n.e.c.	3.02×10^{-3}	1.04×10^{-6}	100.00
Industrial	Agricultural fertiliser (phosphate)	2.62×10^{-3}	9.05×10^{-7}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
	production			
Industrial	Pesticides and related products production	1.43×10^{-3}	4.94×10^{-7}	100.00
Commercial	Automotive Component Manufacturing n.e.c.	1.31×10^{-3}	4.53×10^{-7}	100.00
Industrial	Road construction	1.10×10^{-3}	3.80×10^{-7}	100.00
Industrial	Waste storage	9.87×10^{-4}	3.41×10^{-7}	100.00
Industrial	Chemical storage	7.94×10^{-4}	2.75×10^{-7}	100.00
Industrial	Boat construction/maintenance (dry/float)	2.93×10^{-4}	1.01×10^{-7}	100.00
Commercial	Electrical and Equipment Manufacturing n.e.c.	2.29×10^{-4}	7.92×10^{-8}	100.00
Industrial	Explosives production	1.70×10^{-4}	5.88×10^{-8}	100.00
Commercial	Organic Industrial Chemical Manufacturing n.e.c.	1.56×10^{-4}	5.40×10^{-8}	100.00
Industrial	Rubber products/tyre production	1.11×10^{-4}	3.84×10^{-8}	100.00
Industrial	Shipping in bulk	7.61×10^{-5}	2.63×10^{-8}	100.00
Industrial	Animal accommodation	5.0×10^{-5}	1.73×10^{-8}	100.00
Commercial	Spring and Wire Product Manufacturing	2.81×10^{-5}	9.72×10^{-9}	100.00
Commercial	Wood Product Manufacturing n.e.c.	3.11×10^{-6}	1.08×10^{-9}	100.00
Industrial	Coal works	1.69×10^{-6}	5.85×10^{-10}	100.00
Commercial	Non-Building Construction n.e.c.	8.83×10^{-7}	3.05×10^{-10}	100.00
Commercial	Ceramic Product Manufacturing n.e.c.	1.80×10^{-7}	6.22×10^{-11}	100.00
Commercial	Industrial Gas Manufacturing	7.06×10^{-8}	2.44×10^{-11}	100.00
Commercial	Wine Manufacturing	9.03×10^{-9}	3.12×10^{-12}	100.00
SULFUR DIOXIDE in the Sydney region				
Off-Road Mobile	Ships	4,538	42.03	42.03
Industrial	Petroleum products and fuel production	3,111	28.81	70.84
Industrial	Petroleum products storage	737	6.83	77.67
Industrial	Ceramics production	505	4.67	82.34
Industrial	Glass production (container)	327	3.03	85.37
Industrial	Coke production	237	2.19	87.56
Industrial	Petrochemical production	229	2.12	89.68
Industrial	Glass production (float)	223	2.07	91.75
Off-Road Mobile	Aircraft (Flight Operations)	160	1.48	93.23
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	144	1.34	94.56
Industrial	Non-ferrous metal production (scrap)	130	1.20	95.77
Domestic-Commercial	Solid Fuel Burning (Domestic)	96	0.89	96.66
Biogenic-Geogenic	Bushfire and Prescribed Burning	50	0.46	97.12
Commercial	Ceramic Product Manufacturing	48	0.44	97.56

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	33	0.31	97.86
Commercial	Chemical Product Manufacturing n.e.c.	30	0.27	98.14
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	25	0.23	98.37
Industrial	Aluminium production (scrap metal)	22	0.21	98.57
Industrial	Generation of electrical power from gas	15	0.14	98.71
Industrial	Generation of electricity not coal or gas	11	0.10	98.81
Domestic-Commercial	Gaseous Fuel Burning	10	9.31×10^{-2}	98.90
Commercial	Port Operators	9.94	9.20×10^{-2}	98.99
Off-Road Mobile	Commercial Boats Exhaust	9.89	9.15×10^{-2}	99.09
Commercial	Beer and Malt Manufacturing	8.91	8.25×10^{-2}	99.17
Domestic-Commercial	Barbeques	8.91	8.25×10^{-2}	99.25
Domestic-Commercial	Liquid Fuel Burning (Domestic)	8.52	7.89×10^{-2}	99.33
Industrial	Cement or lime production	8.19	7.59×10^{-2}	99.41
Commercial	Funeral Directors, Crematoria and Cemeteries	7.51	6.96×10^{-2}	99.47
On-Road Mobile	Light Duty Diesel - Exhaust	7.25	6.71×10^{-2}	99.54
Off-Road Mobile	Industrial Vehicles and Equipment	6.10	5.64×10^{-2}	99.60
Industrial	Crushing, grinding or separating	5.88	5.45×10^{-2}	99.65
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	5.38	4.98×10^{-2}	99.70
Off-Road Mobile	Locomotives	5.10	4.73×10^{-2}	99.75
Off-Road Mobile	Recreational Boats Exhaust	3.54	3.28×10^{-2}	99.78
Commercial	Plaster Product Manufacturing	3.40	3.15×10^{-2}	99.81
Industrial	Bitumen mixing	3.01	2.78×10^{-2}	99.84
Industrial	Cement or lime handling	2.52	2.33×10^{-2}	99.87
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	2.33	2.16×10^{-2}	99.89
Off-Road Mobile	Aircraft (Ground Operations)	1.89	1.75×10^{-2}	99.90
Industrial	Iron or steel production (scrap metal)	1.63	1.51×10^{-2}	99.92
Industrial	Non-thermal treatment of waste	1.29	1.19×10^{-2}	99.93
On-Road Mobile	Others - Exhaust	1.13	1.05×10^{-2}	99.94
Industrial	Chemical production	0.92	8.52×10^{-3}	99.95
Industrial	Metal processing	0.91	8.42×10^{-3}	99.96
Industrial	Soap and detergent production	0.79	7.32×10^{-3}	99.97
Industrial	Paper or pulp production	0.37	3.43×10^{-3}	99.97
Commercial	Waste Disposal Services	0.35	3.27×10^{-3}	99.97
Commercial	Hospitals	0.26	2.37×10^{-3}	99.98
Off-Road Mobile	Commercial Vehicles and	0.21	1.98×10^{-3}	99.98

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
	Equipment			
Industrial	General agricultural processing	0.21	1.98×10^{-3}	99.98
Commercial	Glass and Glass Product Manufacturing	0.17	1.61×10^{-3}	99.98
Industrial	General animal products production	0.17	1.57×10^{-3}	99.98
Biogenic-Geogenic	Agricultural Burning	0.16	1.44×10^{-3}	99.98
Industrial	Sewage treatment - large plants	0.14	1.30×10^{-3}	99.99
Commercial	Basic Non-Ferrous Metal Manufacturing n.e.c.	0.13	1.24×10^{-3}	99.99
Industrial	Metal plating or coating	0.13	1.24×10^{-3}	99.99
Industrial	Rendering or fat extraction	0.11	1.06×10^{-3}	99.99
Industrial	Contaminated soil treatment	0.11	1.02×10^{-3}	99.99
Industrial	Paints/polishes/adhesives production	0.10	9.50×10^{-4}	99.99
Commercial	Printing	9.33×10^{-2}	8.64×10^{-4}	99.99
Commercial	Bread Manufacturing	7.21×10^{-2}	6.68×10^{-4}	99.99
Industrial	Pharmaceutical and veterinary products production	6.48×10^{-2}	6.0×10^{-4}	99.99
Industrial	Recovery of waste oil	5.36×10^{-2}	4.97×10^{-4}	99.99
Industrial	Brewing and distilling	5.13×10^{-2}	4.75×10^{-4}	99.99
Industrial	Dairy processing	5.04×10^{-2}	4.67×10^{-4}	99.99
Industrial	Composting	4.58×10^{-2}	4.24×10^{-4}	99.99
Commercial	Biscuit Manufacturing	4.32×10^{-2}	4.0×10^{-4}	100.00
Commercial	Food Manufacturing n.e.c.	4.29×10^{-2}	3.98×10^{-4}	100.00
Industrial	Paper production using recycle materials	3.34×10^{-2}	3.10×10^{-4}	100.00
Commercial	Oil and Fat Manufacturing	3.31×10^{-2}	3.07×10^{-4}	100.00
Industrial	Slaughtering or processing of animals	3.11×10^{-2}	2.88×10^{-4}	100.00
Industrial	Concrete works	3.01×10^{-2}	2.79×10^{-4}	100.00
Commercial	Corrugated Paperboard Container Manufacturing	3.0×10^{-2}	2.78×10^{-4}	100.00
Industrial	Printing, packaging and visual media production	2.97×10^{-2}	2.75×10^{-4}	100.00
Commercial	Laundries and Dry-Cleaners	2.45×10^{-2}	2.27×10^{-4}	100.00
Commercial	Plastic Injection Moulded Product Manufacturing	2.18×10^{-2}	2.02×10^{-4}	100.00
Commercial	Soft Drink, Cordial and Syrup Manufacturing	2.15×10^{-2}	1.99×10^{-4}	100.00
Commercial	Gas Supply	1.92×10^{-2}	1.78×10^{-4}	100.00
Industrial	Bird accommodation	1.74×10^{-2}	1.61×10^{-4}	100.00
Commercial	Metal Coating and Finishing	1.68×10^{-2}	1.56×10^{-4}	100.00
Commercial	Fruit and Vegetable Processing	1.55×10^{-2}	1.43×10^{-4}	100.00
Commercial	Medicinal and Pharmaceutical Product Manufacturing	1.51×10^{-2}	1.40×10^{-4}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Aircraft Manufacturing	1.46×10^{-2}	1.35×10^{-4}	100.00
Industrial	Plastics resins production	1.42×10^{-2}	1.31×10^{-4}	100.00
Commercial	Services to Air Transport	1.40×10^{-2}	1.29×10^{-4}	100.00
Industrial	Container reconditioning	1.15×10^{-2}	1.06×10^{-4}	100.00
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	8.69×10^{-3}	8.05×10^{-5}	100.00
Commercial	Cake and Pastry Manufacturing	8.32×10^{-3}	7.70×10^{-5}	100.00
Commercial	Poultry Farming (Meat)	7.19×10^{-3}	6.66×10^{-5}	100.00
Commercial	Paper Product Manufacturing n.e.c.	7.07×10^{-3}	6.55×10^{-5}	100.00
Industrial	Sterilisation activities	6.58×10^{-3}	6.09×10^{-5}	100.00
Commercial	Milk and Cream Processing	6.40×10^{-3}	5.92×10^{-5}	100.00
Commercial	Ice Cream Manufacturing	6.39×10^{-3}	5.92×10^{-5}	100.00
Commercial	Scientific Research	5.77×10^{-3}	5.34×10^{-5}	100.00
Commercial	Synthetic Resin Manufacturing	5.60×10^{-3}	5.18×10^{-5}	100.00
Commercial	Fabricated Metal Product Manufacturing n.e.c.	5.32×10^{-3}	4.93×10^{-5}	100.00
Commercial	Basic Iron and Steel Manufacturing	5.30×10^{-3}	4.91×10^{-5}	100.00
Commercial	Confectionery Manufacturing	4.81×10^{-3}	4.45×10^{-5}	100.00
Industrial	Sewage treatment - small plants	4.30×10^{-3}	3.98×10^{-5}	100.00
Commercial	Non-Metallic Mineral Product Manufacturing n.e.c.	3.02×10^{-3}	2.79×10^{-5}	100.00
Commercial	Prepared Animal and Bird Feed Manufacturing	2.04×10^{-3}	1.89×10^{-5}	100.00
Industrial	Pesticides and related products production	1.43×10^{-3}	1.32×10^{-5}	100.00
Commercial	Automotive Component Manufacturing n.e.c.	1.29×10^{-3}	1.20×10^{-5}	100.00
Industrial	Road construction	1.10×10^{-3}	1.02×10^{-5}	100.00
Industrial	Waste storage	9.87×10^{-4}	9.14×10^{-6}	100.00
Industrial	Mining for coal	8.95×10^{-4}	8.28×10^{-6}	100.00
Industrial	Chemical storage	7.94×10^{-4}	7.35×10^{-6}	100.00
Commercial	Electrical and Equipment Manufacturing n.e.c.	2.29×10^{-4}	2.12×10^{-6}	100.00
Commercial	Organic Industrial Chemical Manufacturing n.e.c.	1.56×10^{-4}	1.45×10^{-6}	100.00
Industrial	Rubber products/tyre production	1.11×10^{-4}	1.03×10^{-6}	100.00
Industrial	Shipping in bulk	7.61×10^{-5}	7.05×10^{-7}	100.00
Commercial	Spring and Wire Product Manufacturing	2.81×10^{-5}	2.60×10^{-7}	100.00
Industrial	Other land-based extraction	1.0×10^{-5}	9.29×10^{-8}	100.00
Commercial	Wood Product Manufacturing n.e.c.	3.11×10^{-6}	2.88×10^{-8}	100.00
Commercial	Non-Building Construction n.e.c.	6.18×10^{-7}	5.72×10^{-9}	100.00
Commercial	Industrial Gas Manufacturing	7.06×10^{-8}	6.53×10^{-10}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Wine Manufacturing	9.03×10^{-9}	8.36×10^{-11}	100.00
SULFUR DIOXIDE in the Newcastle region				
Industrial	Aluminium production (alumina)	10,119	87.26	87.26
Off-Road Mobile	Ships	1,292	11.14	98.41
Industrial	Slaughtering or processing of animals	65	0.56	98.97
Industrial	Chemical production	65	0.56	99.53
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	9.73	8.39×10^{-2}	99.61
Industrial	Iron or steel production (scrap metal)	8.91	7.69×10^{-2}	99.69
Domestic-Commercial	Solid Fuel Burning (Domestic)	8.01	6.91×10^{-2}	99.76
Industrial	Bitumen mixing	4.42	3.81×10^{-2}	99.80
Off-Road Mobile	Aircraft (Flight Operations)	2.88	2.49×10^{-2}	99.82
Biogenic-Geogenic	Bushfire and Prescribed Burning	2.69	2.32×10^{-2}	99.85
Off-Road Mobile	Industrial Vehicles and Equipment	2.68	2.31×10^{-2}	99.87
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	2.53	2.18×10^{-2}	99.89
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	2.27	1.96×10^{-2}	99.91
Commercial	Funeral Directors, Crematoria and Cemeteries	1.47	1.27×10^{-2}	99.92
Industrial	Mining for coal	1.36	1.17×10^{-2}	99.93
Off-Road Mobile	Commercial Boats Exhaust	1.16	1.0×10^{-2}	99.94
Industrial	Metal processing	0.93	8.04×10^{-3}	99.95
Industrial	Ammonium nitrate production	0.92	7.96×10^{-3}	99.96
Domestic-Commercial	Gaseous Fuel Burning	0.69	5.98×10^{-3}	99.97
Domestic-Commercial	Barbeques	0.61	5.30×10^{-3}	99.97
Domestic-Commercial	Liquid Fuel Burning (Domestic)	0.59	5.07×10^{-3}	99.98
Off-Road Mobile	Locomotives	0.53	4.60×10^{-3}	99.98
On-Road Mobile	Light Duty Diesel - Exhaust	0.50	4.35×10^{-3}	99.99
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	0.45	3.87×10^{-3}	99.99
Off-Road Mobile	Recreational Boats Exhaust	0.37	3.17×10^{-3}	99.99
Industrial	Generation of electrical power from gas	0.16	1.37×10^{-3}	99.99
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	0.15	1.28×10^{-3}	100.00
Commercial	Hospitals	0.12	1.06×10^{-3}	100.00
On-Road Mobile	Others - Exhaust	9.07×10^{-2}	7.82×10^{-4}	100.00
Industrial	General agricultural processing	7.94×10^{-2}	6.85×10^{-4}	100.00
Off-Road Mobile	Aircraft (Ground Operations)	6.25×10^{-2}	5.39×10^{-4}	100.00
Industrial	Metal plating or coating	3.58×10^{-2}	3.09×10^{-4}	100.00
Biogenic-Geogenic	Agricultural Burning	3.37×10^{-2}	2.91×10^{-4}	100.00
Off-Road Mobile	Commercial Vehicles and	2.99×10^{-2}	2.58×10^{-4}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
	Equipment			
Industrial	Dairy processing	1.76×10^{-2}	1.51×10^{-4}	100.00
Commercial	Metal Coating and Finishing	1.53×10^{-2}	1.32×10^{-4}	100.00
Commercial	Bread Manufacturing	1.05×10^{-2}	9.02×10^{-5}	100.00
Industrial	Other land-based extraction	3.85×10^{-3}	3.32×10^{-5}	100.00
Industrial	Agricultural fertiliser (phosphate) production	2.62×10^{-3}	2.26×10^{-5}	100.00
Industrial	Cement or lime handling	2.20×10^{-3}	1.90×10^{-5}	100.00
Industrial	Boat construction/maintenance (dry/float)	2.93×10^{-4}	2.52×10^{-6}	100.00
Industrial	Non-thermal treatment of waste	2.59×10^{-4}	2.23×10^{-6}	100.00
Industrial	Contaminated soil treatment	4.23×10^{-5}	3.65×10^{-7}	100.00
Commercial	Waste Disposal Services	3.82×10^{-5}	3.29×10^{-7}	100.00
Commercial	Ceramic Product Manufacturing n.e.c.	1.80×10^{-7}	1.55×10^{-9}	100.00
Industrial	Crushing, grinding or separating	2.25×10^{-8}	1.94×10^{-10}	100.00
SULFUR DIOXIDE in the Wollongong region				
Industrial	Iron or steel production (iron ore)	8,216	90.60	90.60
Off-Road Mobile	Ships	551	6.07	96.67
Industrial	Coke production	219	2.41	99.08
Industrial	General chemicals storage	31	0.34	99.43
Industrial	Metal plating or coating	24	0.27	99.69
Biogenic-Geogenic	Bushfire and Prescribed Burning	5.49	6.05×10^{-2}	99.76
Domestic-Commercial	Solid Fuel Burning (Domestic)	5.29	5.84×10^{-2}	99.81
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	5.15	5.68×10^{-2}	99.87
Industrial	Generation of electrical power from gas	2.76	3.04×10^{-2}	99.90
Off-Road Mobile	Industrial Vehicles and Equipment	1.41	1.55×10^{-2}	99.92
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	1.36	1.50×10^{-2}	99.93
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	1.30	1.43×10^{-2}	99.95
Industrial	Bitumen mixing	1.03	1.14×10^{-2}	99.96
Domestic-Commercial	Gaseous Fuel Burning	0.50	5.53×10^{-3}	99.96
Commercial	Funeral Directors, Crematoria and Cemeteries	0.45	5.01×10^{-3}	99.97
Domestic-Commercial	Barbeques	0.44	4.90×10^{-3}	99.97
Off-Road Mobile	Locomotives	0.44	4.84×10^{-3}	99.98
Domestic-Commercial	Liquid Fuel Burning (Domestic)	0.42	4.69×10^{-3}	99.98
Off-Road Mobile	Recreational Boats Exhaust	0.39	4.30×10^{-3}	99.99
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	0.30	3.27×10^{-3}	99.99
On-Road Mobile	Light Duty Diesel - Exhaust	0.28	3.09×10^{-3}	99.99
Commercial	Ceramic Product Manufacturing	0.22	2.43×10^{-3}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	0.11	1.22×10^{-3}	100.00
Off-Road Mobile	Commercial Boats Exhaust	6.87×10^{-2}	7.58×10^{-4}	100.00
Industrial	Metal processing	6.43×10^{-2}	7.09×10^{-4}	100.00
Off-Road Mobile	Aircraft (Flight Operations)	6.15×10^{-2}	6.78×10^{-4}	100.00
On-Road Mobile	Others - Exhaust	4.58×10^{-2}	5.05×10^{-4}	100.00
Commercial	Basic Iron and Steel Manufacturing	2.84×10^{-2}	3.13×10^{-4}	100.00
Commercial	Hospitals	1.30×10^{-2}	1.44×10^{-4}	100.00
Commercial	Rubber Product Manufacturing n.e.c.	1.02×10^{-2}	1.12×10^{-4}	100.00
Industrial	Chemical production	7.23×10^{-3}	7.97×10^{-5}	100.00
Industrial	Sewage treatment - large plants	4.87×10^{-3}	5.38×10^{-5}	100.00
Off-Road Mobile	Commercial Vehicles and Equipment	3.99×10^{-3}	4.40×10^{-5}	100.00
Industrial	Non-thermal treatment of waste	2.93×10^{-3}	3.23×10^{-5}	100.00
Industrial	Container reconditioning	2.72×10^{-4}	3.0×10^{-6}	100.00
Commercial	Automotive Component Manufacturing n.e.c.	1.67×10^{-5}	1.84×10^{-7}	100.00
Commercial	Synthetic Resin Manufacturing	9.20×10^{-6}	1.01×10^{-7}	100.00
Commercial	Spring and Wire Product Manufacturing	2.25×10^{-8}	2.48×10^{-10}	100.00
SULFUR DIOXIDE in the Non Urban region				
Industrial	Generation of electrical power from coal	251,437	97.54	97.54
Industrial	Aluminium production (alumina)	3,738	1.45	98.99
Off-Road Mobile	Ships	1,176	0.46	99.45
Industrial	Mining for coal	495	0.19	99.64
Industrial	Cement or lime production	371	0.14	99.78
Biogenic-Geogenic	Bushfire and Prescribed Burning	257	9.98×10^{-2}	99.88
Industrial	Ceramics production	76	2.97×10^{-2}	99.91
Off-Road Mobile	Industrial Vehicles and Equipment	53	2.07×10^{-2}	99.93
Commercial	Log Sawmilling	49	1.92×10^{-2}	99.95
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	22	8.45×10^{-3}	99.96
Domestic-Commercial	Solid Fuel Burning (Domestic)	20	7.80×10^{-3}	99.97
Commercial	Food Manufacturing n.e.c.	18	6.89×10^{-3}	99.98
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	7.77	3.01×10^{-3}	99.98
Industrial	Petroleum products and fuel production	7.62	2.95×10^{-3}	99.98
Industrial	Recovery of waste oil	6.11	2.37×10^{-3}	99.98
Industrial	Aluminium production (scrap metal)	5.08	1.97×10^{-3}	99.99
Off-Road Mobile	Aircraft (Flight Operations)	4.62	1.79×10^{-3}	99.99

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Off-Road Mobile	Locomotives	4.54	1.76×10^{-3}	99.99
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	4.24	1.65×10^{-3}	99.99
Off-Road Mobile	Commercial Boats Exhaust	4.07	1.58×10^{-3}	99.99
Off-Road Mobile	Recreational Boats Exhaust	3.17	1.23×10^{-3}	99.99
Commercial	Funeral Directors, Crematoria and Cemeteries	2.42	9.38×10^{-4}	100.00
Domestic-Commercial	Gaseous Fuel Burning	1.65	6.40×10^{-4}	100.00
Biogenic-Geogenic	Agricultural Burning	1.60	6.20×10^{-4}	100.00
Domestic-Commercial	Barbeques	1.46	5.67×10^{-4}	100.00
Domestic-Commercial	Liquid Fuel Burning (Domestic)	1.40	5.42×10^{-4}	100.00
Industrial	Bitumen mixing	1.23	4.76×10^{-4}	100.00
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	1.13	4.37×10^{-4}	100.00
Industrial	Non-thermal treatment of waste	1.00	3.86×10^{-4}	100.00
On-Road Mobile	Light Duty Diesel - Exhaust	0.97	3.78×10^{-4}	100.00
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	0.34	1.32×10^{-4}	100.00
Industrial	Land-based extractive activity	0.23	8.79×10^{-5}	100.00
On-Road Mobile	Others - Exhaust	0.22	8.68×10^{-5}	100.00
Off-Road Mobile	Commercial Vehicles and Equipment	0.16	6.19×10^{-5}	100.00
Commercial	Hospitals	7.76×10^{-2}	3.01×10^{-5}	100.00
Industrial	Generation of electrical power from gas	7.47×10^{-2}	2.90×10^{-5}	100.00
Industrial	Chemical production	6.39×10^{-2}	2.48×10^{-5}	100.00
Industrial	General agricultural processing	3.09×10^{-2}	1.20×10^{-5}	100.00
Industrial	Generation of electricity not coal or gas	2.56×10^{-2}	9.94×10^{-6}	100.00
Industrial	Rendering or fat extraction	2.52×10^{-2}	9.76×10^{-6}	100.00
Commercial	Paper Product Manufacturing n.e.c.	2.48×10^{-2}	9.62×10^{-6}	100.00
Commercial	Non-Ferrous Metal Casting	2.17×10^{-2}	8.43×10^{-6}	100.00
Industrial	Concrete works	1.93×10^{-2}	7.49×10^{-6}	100.00
Industrial	General animal products production	1.76×10^{-2}	6.82×10^{-6}	100.00
Off-Road Mobile	Aircraft (Ground Operations)	1.19×10^{-2}	4.60×10^{-6}	100.00
Commercial	Furniture Manufacturing n.e.c.	9.91×10^{-3}	3.85×10^{-6}	100.00
Industrial	Bird accommodation	8.37×10^{-3}	3.25×10^{-6}	100.00
Industrial	Sewage treatment - small plants	8.30×10^{-3}	3.22×10^{-6}	100.00
Commercial	Prepared Animal and Bird Feed Manufacturing	8.09×10^{-3}	3.14×10^{-6}	100.00
Industrial	Wood or timber milling or processing	7.50×10^{-3}	2.91×10^{-6}	100.00
Commercial	Fabricated Metal Product Manufacturing n.e.c.	4.77×10^{-3}	1.85×10^{-6}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Recovery of waste	3.82×10^{-3}	1.48×10^{-6}	100.00
Commercial	Synthetic Resin Manufacturing	3.45×10^{-3}	1.34×10^{-6}	100.00
Commercial	Medicinal and Pharmaceutical Product Manufacturing	3.23×10^{-3}	1.25×10^{-6}	100.00
Industrial	Sewage treatment - large plants	3.08×10^{-3}	1.20×10^{-6}	100.00
Commercial	Glass and Glass Product Manufacturing	2.80×10^{-3}	1.09×10^{-6}	100.00
Industrial	Crushing, grinding or separating	2.59×10^{-3}	1.01×10^{-6}	100.00
Industrial	Explosives production	1.70×10^{-4}	6.59×10^{-8}	100.00
Industrial	General chemicals storage	1.09×10^{-4}	4.22×10^{-8}	100.00
Industrial	Animal accommodation	5.0×10^{-5}	1.94×10^{-8}	100.00
Industrial	Metal plating or coating	1.84×10^{-5}	7.13×10^{-9}	100.00
Industrial	Coal works	1.69×10^{-6}	6.56×10^{-10}	100.00
Commercial	Non-Building Construction n.e.c.	2.66×10^{-7}	1.03×10^{-10}	100.00
Commercial	Printing	2.17×10^{-7}	8.43×10^{-11}	100.00

Figure 3-46, Figure 3-47, Figure 3-48, Figure 3-49 and Figure 3-50 show the proportions of total estimated annual emissions for the top 15 natural and human-made sources of sulfur dioxide in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

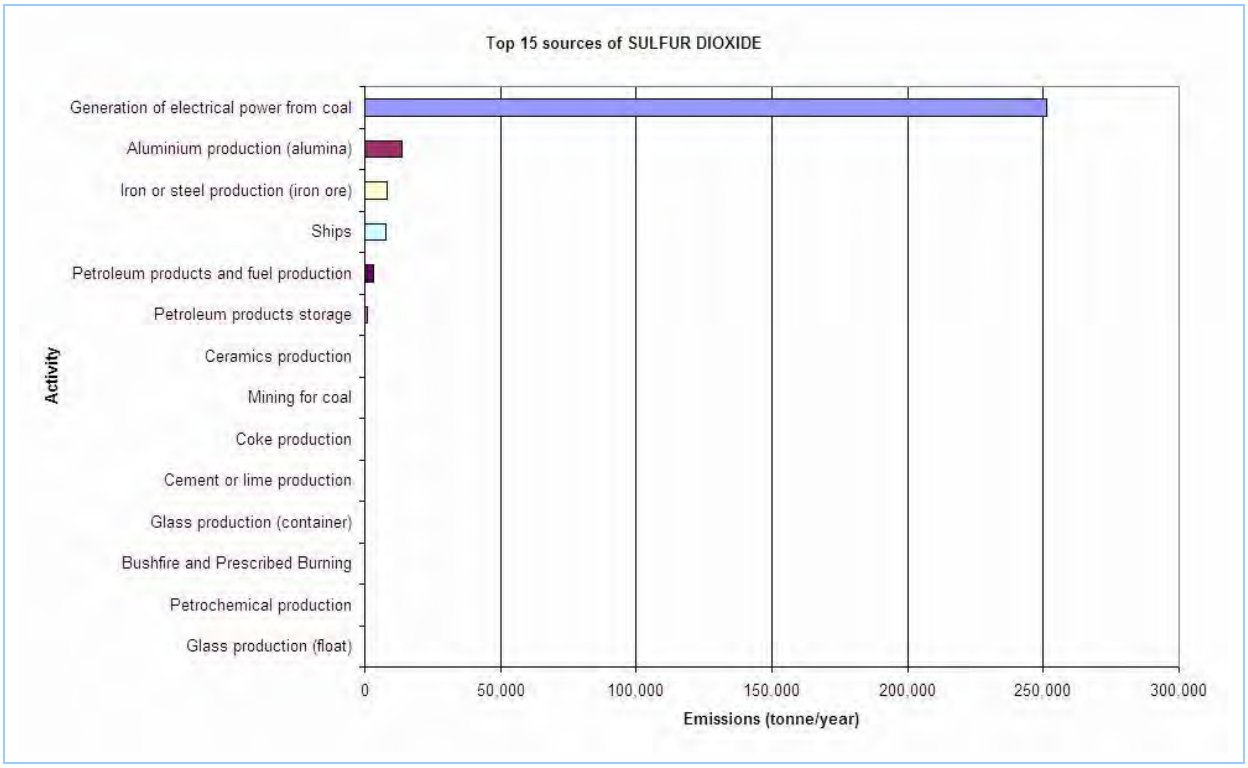

Figure 3-46: Top 15 natural and human-made sources of sulfur dioxide in the GMR

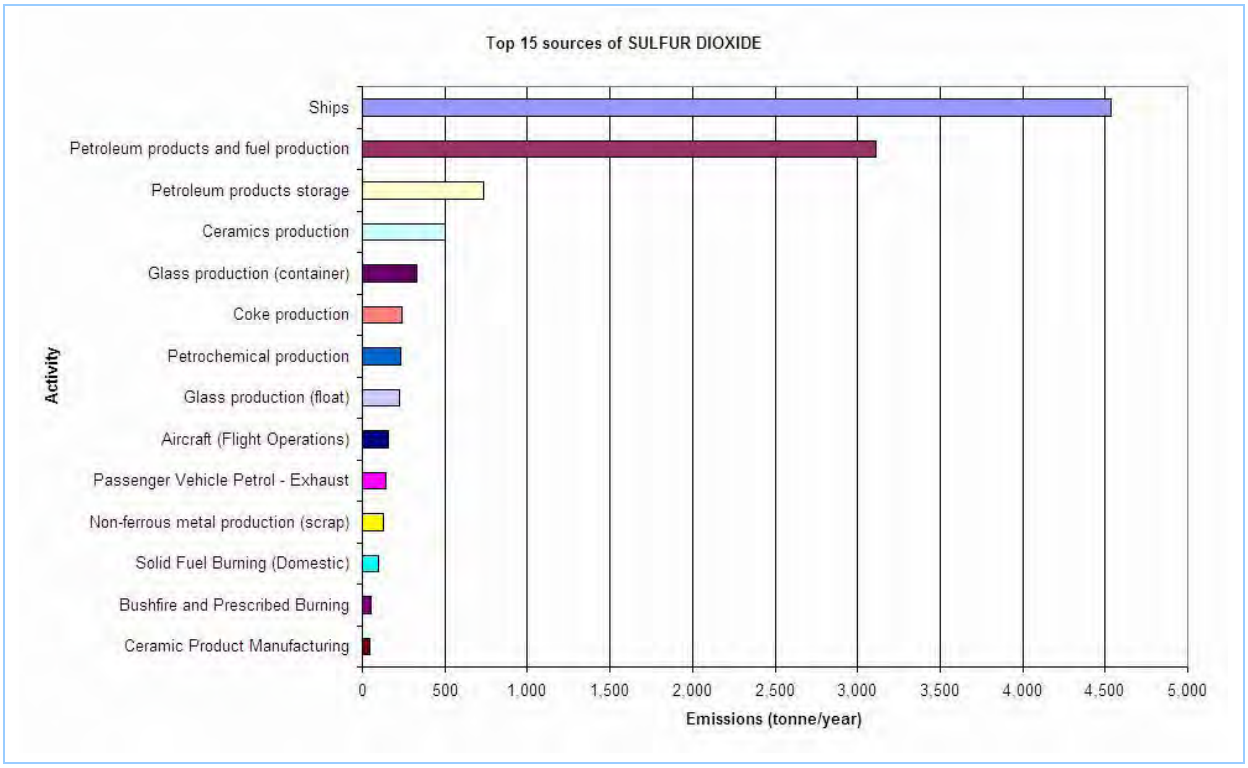

Figure 3-47: Top 15 natural and human-made sources of sulfur dioxide in the Sydney region

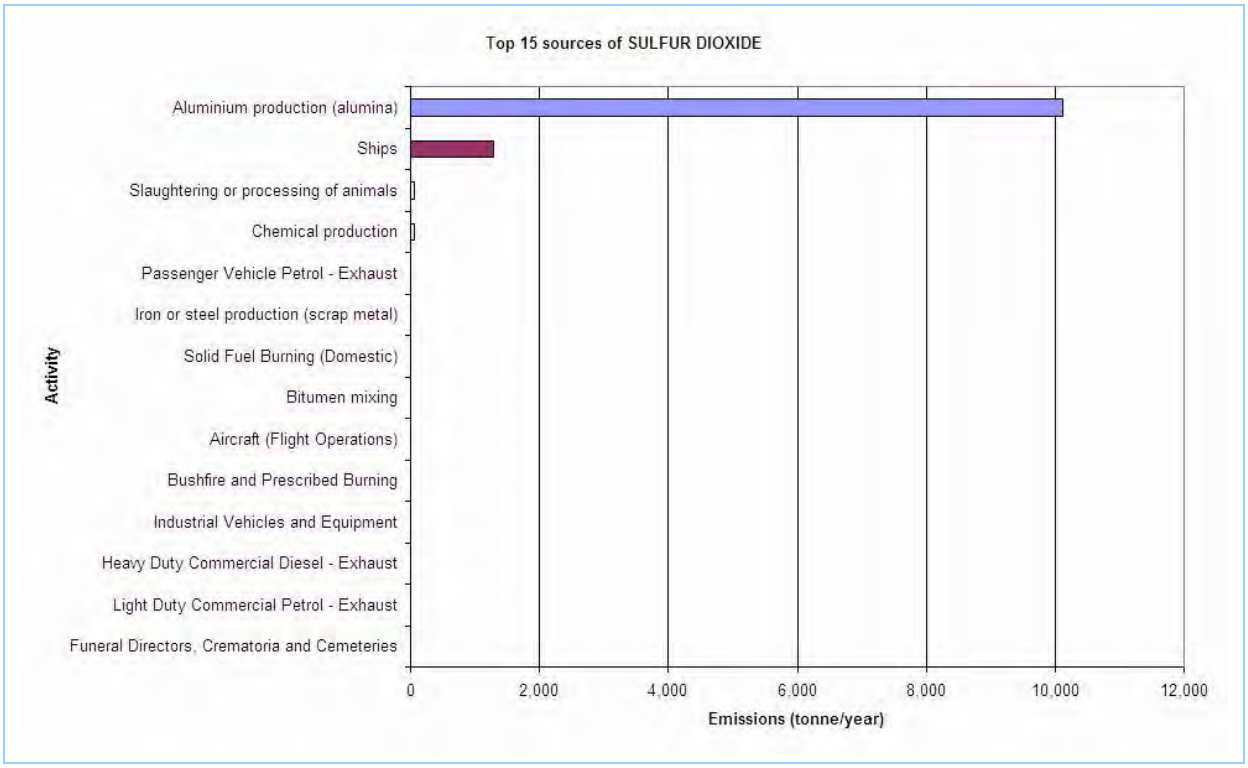

Figure 3-48: Top 15 natural and human-made sources of sulfur dioxide in the Newcastle region

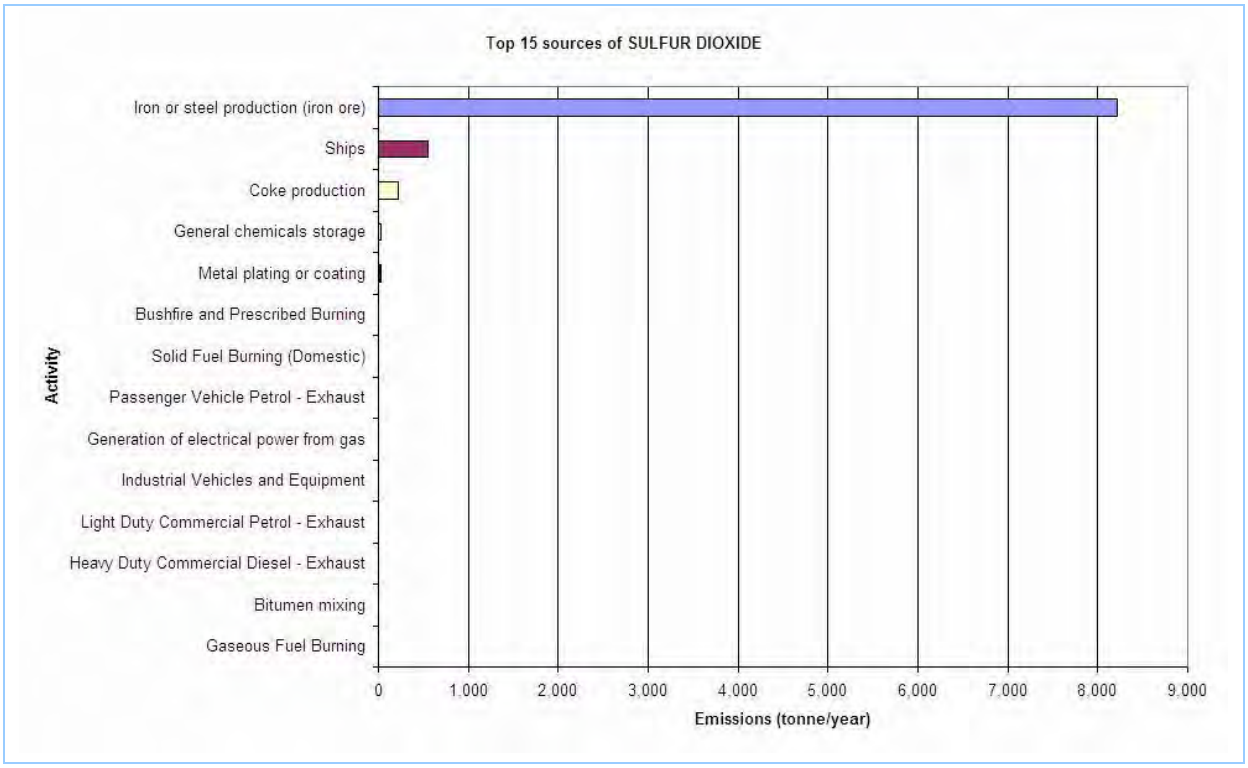

Figure 3-49: Top 15 natural and human-made sources of sulfur dioxide in the Wollongong region

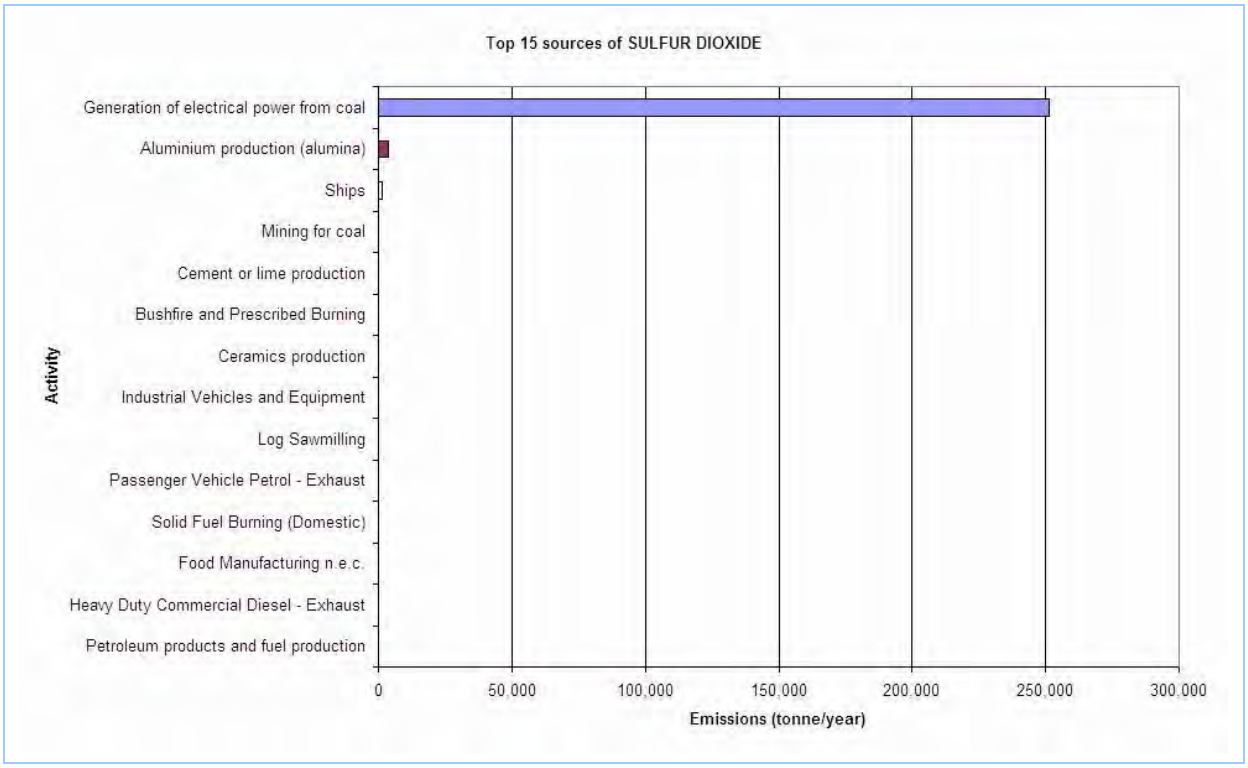

Figure 3-50: Top 15 natural and human-made sources of sulfur dioxide in the Non Urban region

3.6 Total Volatile Organic Compounds

3.6.1 *Natural and Human-Made Emissions*

Table 3-16 presents total estimated annual emissions of VOC by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-16: Total estimated annual emissions of VOC by natural and human-made source type in each region

Substance	Emissions (tonne/year)							
	Region	Biogenic-Geogenic	Commercial	Domestic-Commercial	Industrial	Off-Road Mobile	On-Road Mobile	Grand Total
TOTAL VOLATILE ORGANIC COMPOUNDS	Sydney	32,468	6,652	53,178	8,205	7,341	23,512	131,356
	Newcastle	3,404	476	3,757	771	1,303	1,678	11,389
	Wollongong	3,482	358	2,660	716	591	879	8,687
	Non Urban	130,284	1,689	9,213	1,826	8,715	3,435	155,163
	GMR	169,637	9,176	68,809	11,519	17,950	29,504	306,595

Table 3-17 presents the proportions of total estimated annual emissions of VOC by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-17: Proportions of total estimated annual emissions of VOC by natural and human-made source type in each region

Substance	Proportions (%)						
	Region	Biogenic-Geogenic	Commercial	Domestic-Commercial	Industrial	Off-Road Mobile	On-Road Mobile
TOTAL VOLATILE ORGANIC COMPOUNDS	Sydney	24.72	5.06	40.48	6.25	5.59	17.90
	Newcastle	29.89	4.18	32.99	6.77	11.44	14.74
	Wollongong	40.08	4.13	30.63	8.25	6.81	10.11
	Non Urban	83.97	1.09	5.94	1.18	5.62	2.21
	GMR	55.33	2.99	22.44	3.76	5.85	9.62

Figure 3-51, Figure 3-52, Figure 3-53, Figure 3-54 and Figure 3-55 show the proportions of total estimated annual emissions of VOC by natural and human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

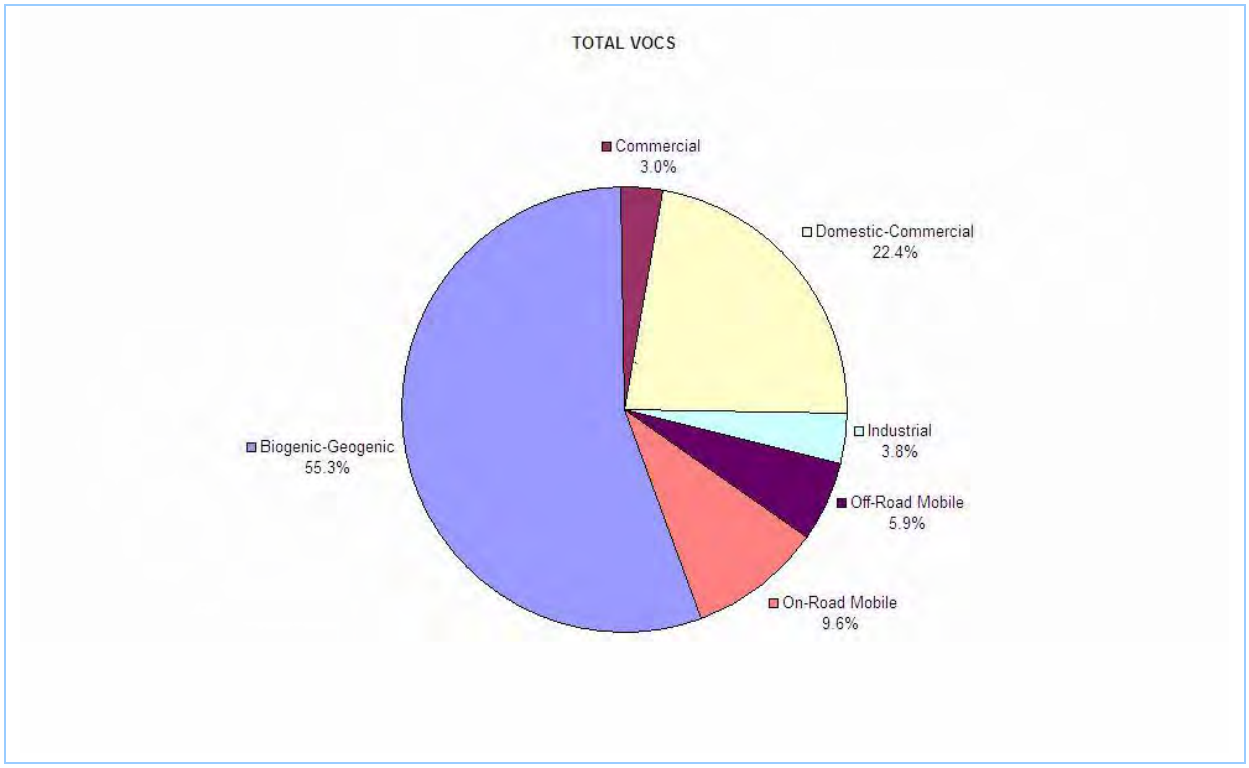

Figure 3-51: Proportions of total estimated annual emissions of VOC by natural and human-made source type in the GMR

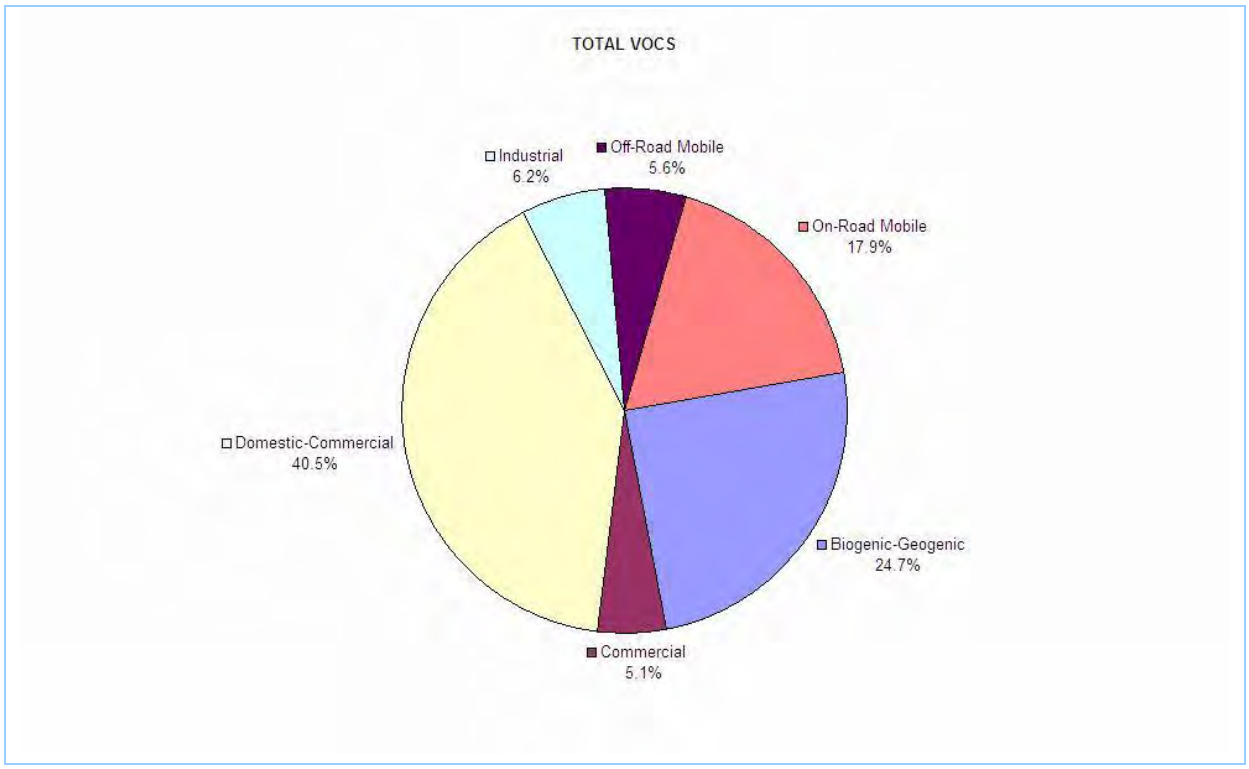

Figure 3-52: Proportions of total estimated annual emissions of VOC by natural and human-made source type in the Sydney region

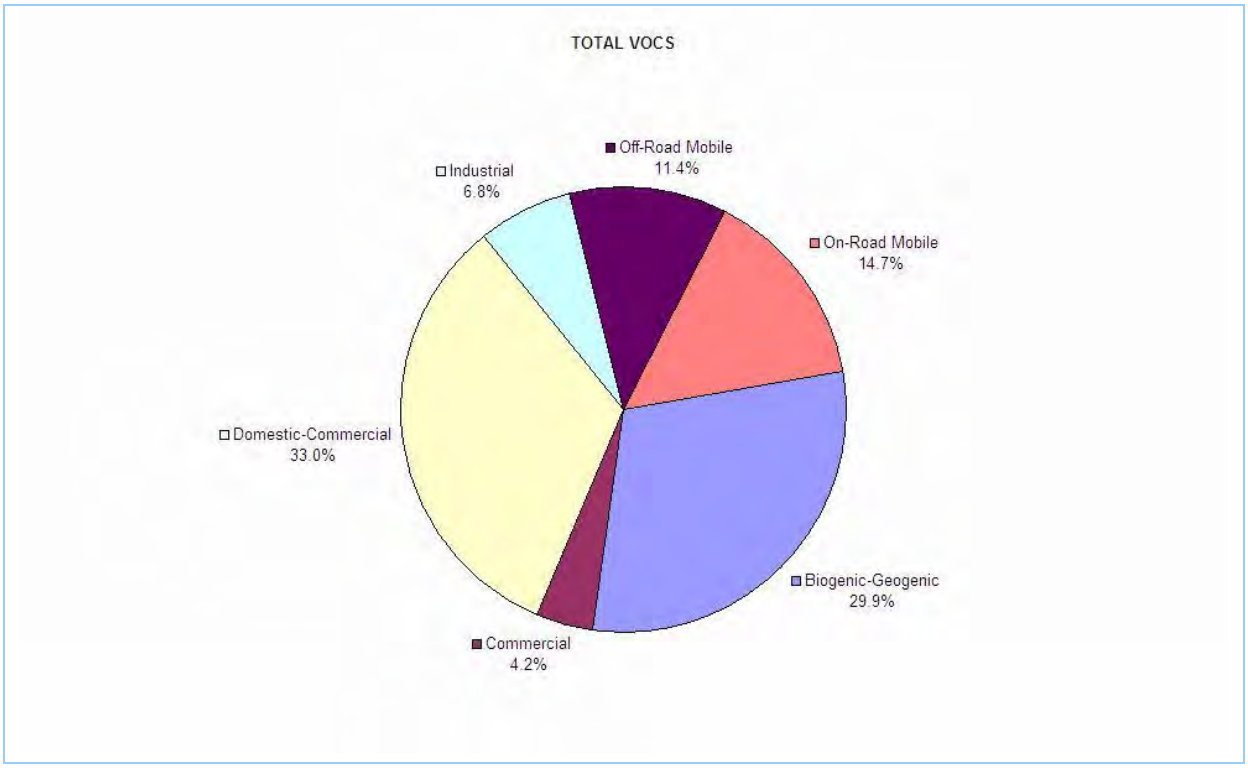

Figure 3-53: Proportions of total estimated annual emissions of VOC by natural and human-made source type in the Newcastle region

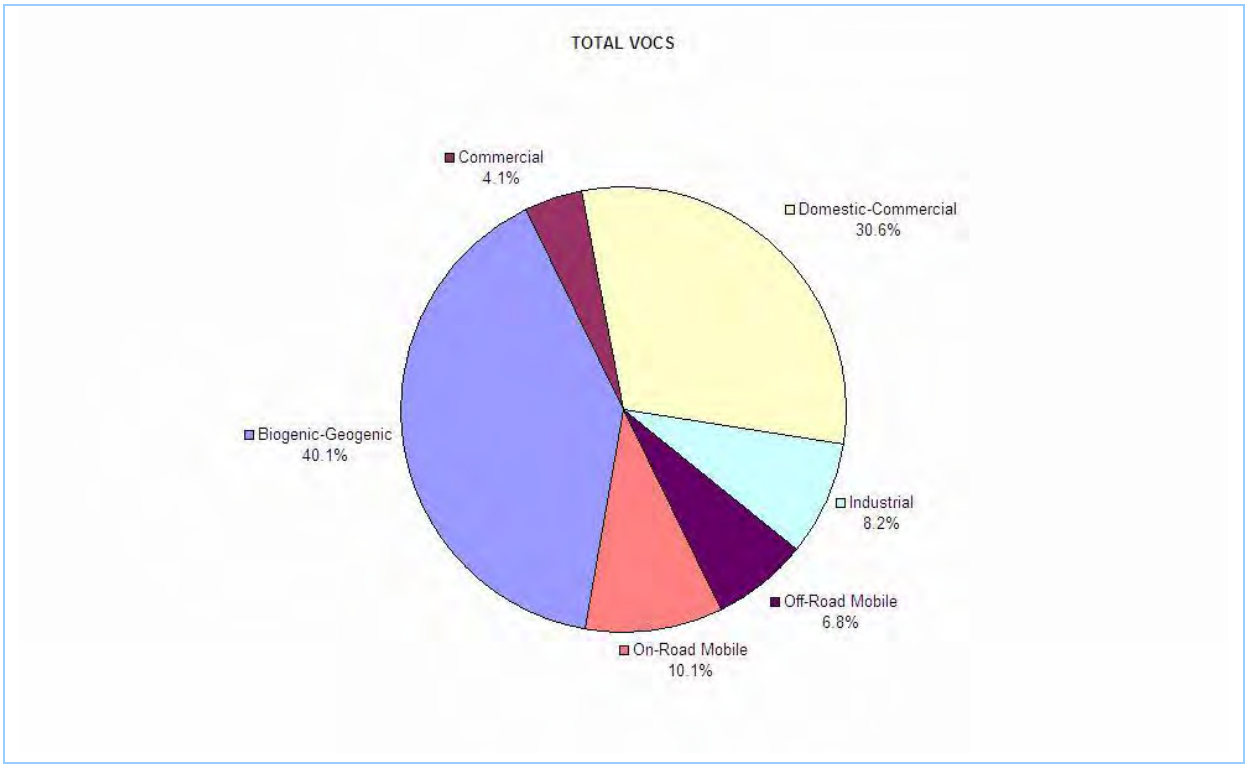

Figure 3-54: Proportions of total estimated annual emissions of VOC by natural and human-made source type in the Wollongong region

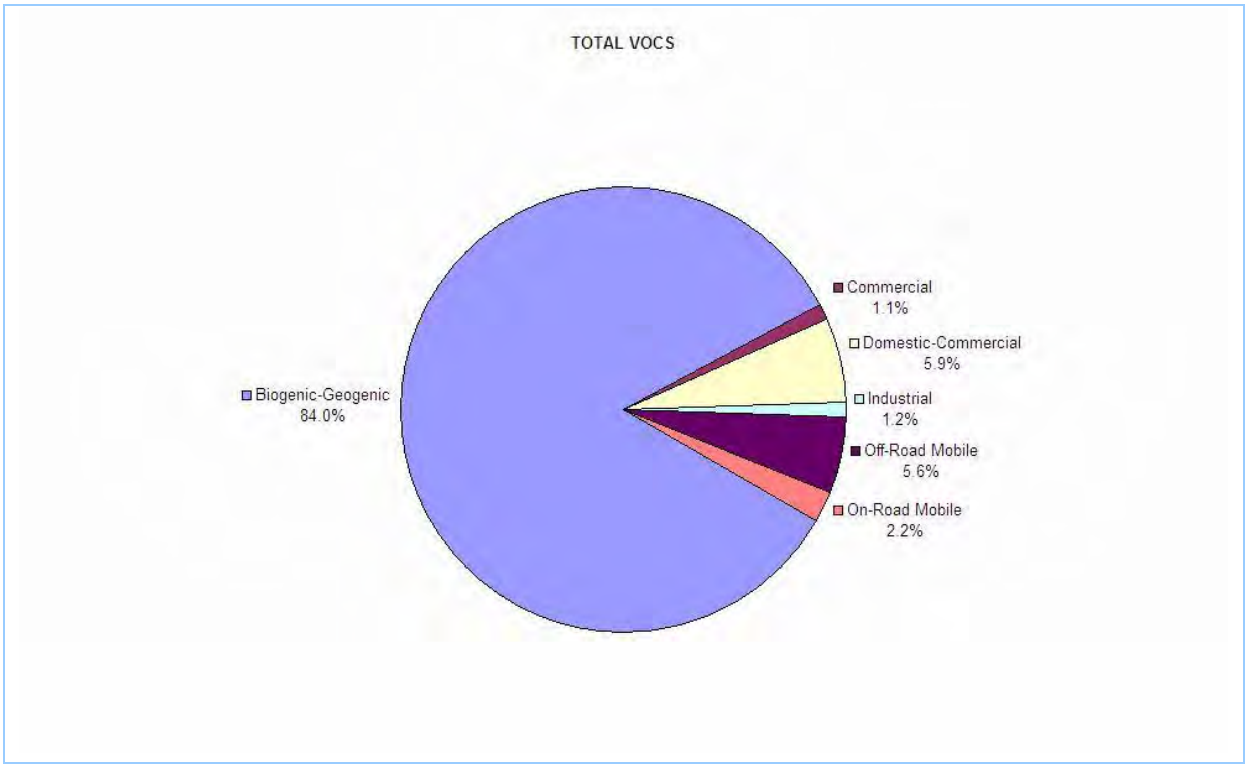

Figure 3-55: Proportions of total estimated annual emissions of VOC by natural and human-made source type in the Non Urban region

3.6.2 Priority Natural and Human-Made Emissions

Table 3-18 presents total estimated annual emissions, proportions and cumulative proportions of natural and human-made sources of VOC in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 3-18: Natural and human-made sources of VOC in each region

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
TOTAL VOLATILE ORGANIC COMPOUNDS in the GMR				
Biogenic-Geogenic	Vegetation	167,191	54.53	54.53
Domestic-Commercial	Domestic/Commercial Solvents/Aerosols	25,274	8.24	62.77
On-Road Mobile	All - Evaporative	14,632	4.77	67.55
Domestic-Commercial	Surface Coatings	11,561	3.77	71.32
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	9,647	3.15	74.46
Domestic-Commercial	Solid Fuel Burning (Domestic)	8,027	2.62	77.08
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	7,282	2.38	79.46
Off-Road Mobile	Recreational Boats Exhaust	7,139	2.33	81.79
Off-Road Mobile	Commercial Boats Exhaust	5,224	1.70	83.49
Domestic-Commercial	Lawn Mowing Evaporative (Domestic)	4,917	1.60	85.09
Commercial	Automotive Fuel Retailing	4,907	1.60	86.69

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	4,386	1.43	88.13
Domestic-Commercial	Graphic Arts	3,475	1.13	89.26
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	3,331	1.09	90.34
Off-Road Mobile	Industrial Vehicles and Equipment	3,195	1.04	91.39
Domestic-Commercial	Natural/Town Gas Leakage	2,973	0.97	92.36
Biogenic-Geogenic	Bushfire and Prescribed Burning	2,423	0.79	93.15
Industrial	Printing, packaging and visual media production	1,828	0.60	93.74
Industrial	Petroleum products and fuel production	1,419	0.46	94.21
Off-Road Mobile	Recreational Boats Evaporative	1,336	0.44	94.64
Commercial	Printing	1,315	0.43	95.07
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	1,173	0.38	95.45
Industrial	Composting	1,120	0.37	95.82
Industrial	Generation of electrical power from coal	904	0.29	96.11
Industrial	Petroleum products storage	864	0.28	96.40
Industrial	Waste disposal (application to land)	831	0.27	96.67
Industrial	Petrochemical production	699	0.23	96.89
Commercial	Chemical Product Manufacturing n.e.c.	520	0.17	97.06
On-Road Mobile	Others - Exhaust	518	0.17	97.23
Commercial	Laundries and Dry-Cleaners	474	0.15	97.39
Industrial	Metal plating or coating	467	0.15	97.54
Domestic-Commercial	Lawn Mowing Evaporative (Public Open Spaces)	467	0.15	97.69
Industrial	Chemical production	452	0.15	97.84
Industrial	Iron or steel production (iron ore)	452	0.15	97.99
Industrial	Generation of electrical power from gas	411	0.13	98.12
Commercial	Smash Repairing	393	0.13	98.25
Industrial	Iron or steel production (scrap metal)	385	0.13	98.37
Off-Road Mobile	Locomotives	358	0.12	98.49
Off-Road Mobile	Aircraft (Flight Operations)	274	8.93×10^{-2}	98.58
Commercial	Synthetic Resin Manufacturing	270	8.79×10^{-2}	98.67
Industrial	Cement or lime handling	213	6.95×10^{-2}	98.74
Off-Road Mobile	Ships	204	6.66×10^{-2}	98.80
On-Road Mobile	Light Duty Diesel - Exhaust	203	6.63×10^{-2}	98.87
Industrial	Mining for coal	199	6.48×10^{-2}	98.94
Domestic-Commercial	Cutback Bitumen	169	5.50×10^{-2}	98.99
Domestic-Commercial	Barbeques	162	5.28×10^{-2}	99.04

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Bread Manufacturing	143	4.65×10^{-2}	99.09
Industrial	Ammonium nitrate production	132	4.31×10^{-2}	99.13
Industrial	Plastics resins production	128	4.16×10^{-2}	99.17
Commercial	Petroleum Product Wholesaling	125	4.07×10^{-2}	99.22
Commercial	Paint Manufacturing	124	4.04×10^{-2}	99.26
Industrial	Solid waste landfilling	118	3.86×10^{-2}	99.29
Domestic-Commercial	Gaseous Fuel Burning	115	3.76×10^{-2}	99.33
Off-Road Mobile	Aircraft (Ground Operations)	113	3.70×10^{-2}	99.37
Commercial	Non-Metallic Mineral Product Manufacturing n.e.c.	106	3.45×10^{-2}	99.40
Commercial	Fabricated Metal Product Manufacturing n.e.c.	105	3.42×10^{-2}	99.44
Industrial	Paints/polishes/adhesives production	100	3.26×10^{-2}	99.47
Industrial	Metal processing	92	2.99×10^{-2}	99.50
Commercial	Log Sawmilling	90	2.93×10^{-2}	99.53
Commercial	Electric Cable and Wire Manufacturing	84	2.74×10^{-2}	99.56
Commercial	Chemical Wholesaling	81	2.65×10^{-2}	99.58
Off-Road Mobile	Commercial Boats Evaporative	75	2.45×10^{-2}	99.61
Industrial	Container reconditioning	73	2.39×10^{-2}	99.63
Commercial	Services to Air Transport	71	2.33×10^{-2}	99.66
Industrial	Sewage treatment - large plants	70	2.29×10^{-2}	99.68
Industrial	Soap and detergent production	69	2.26×10^{-2}	99.70
Commercial	Spirit Manufacturing	67	2.18×10^{-2}	99.72
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	43	1.42×10^{-2}	99.74
Industrial	Boat construction/maintenance (general)	41	1.33×10^{-2}	99.75
Industrial	Glass production (container)	35	1.15×10^{-2}	99.76
Industrial	Aluminium production (scrap metal)	35	1.14×10^{-2}	99.77
Industrial	Generation of electricity not coal or gas	34	1.12×10^{-2}	99.78
Commercial	Waste Disposal Services	33	1.08×10^{-2}	99.79
Industrial	Sewage treatment - small plants	33	1.08×10^{-2}	99.81
Industrial	Ceramics production	33	1.06×10^{-2}	99.82
Off-Road Mobile	Commercial Vehicles and Equipment	32	1.05×10^{-2}	99.83
Industrial	Bitumen mixing	29	9.56×10^{-3}	99.84
Industrial	Pharmaceutical and veterinary products production	26	8.64×10^{-3}	99.84
Industrial	Non-thermal treatment of waste	25	8.25×10^{-3}	99.85
Biogenic-Geogenic	Agricultural Burning	24	7.90×10^{-3}	99.86
Commercial	Wine Manufacturing	24	7.87×10^{-3}	99.87
Industrial	Shipping in bulk	23	7.35×10^{-3}	99.88

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Beer and Malt Manufacturing	22	7.13×10^{-3}	99.88
Commercial	Metal Coating and Finishing	22	7.02×10^{-3}	99.89
Industrial	Brewing and distilling	19	6.14×10^{-3}	99.90
Industrial	Inert waste landfilling	18	5.97×10^{-3}	99.90
Commercial	Plastic Bag and Film Manufacturing	18	5.78×10^{-3}	99.91
Industrial	Boat construction/maintenance (dry/float)	17	5.45×10^{-3}	99.91
Industrial	Aluminium production (alumina)	16	5.15×10^{-3}	99.92
Commercial	Solid Paperboard Container Manufacturing	15	4.99×10^{-3}	99.92
Commercial	Automotive Component Manufacturing n.e.c.	14	4.56×10^{-3}	99.93
Commercial	Port Operators	14	4.48×10^{-3}	99.93
Commercial	Basic Iron and Steel Manufacturing	12	4.01×10^{-3}	99.94
Commercial	Cake and Pastry Manufacturing	12	3.99×10^{-3}	99.94
Commercial	Ink Manufacturing	11	3.47×10^{-3}	99.94
Industrial	Pesticides and related products production	10	3.42×10^{-3}	99.95
Industrial	Crushing, grinding or separating	9.03	2.94×10^{-3}	99.95
Industrial	General chemicals storage	8.83	2.88×10^{-3}	99.95
Industrial	Concrete works	8.64	2.82×10^{-3}	99.96
Commercial	Furniture Manufacturing n.e.c.	7.24	2.36×10^{-3}	99.96
Industrial	Slaughtering or processing of animals	6.98	2.28×10^{-3}	99.96
Industrial	Cement or lime production	6.84	2.23×10^{-3}	99.96
Industrial	Land-based extractive activity	6.55	2.14×10^{-3}	99.97
Commercial	Food Manufacturing n.e.c.	6.21	2.02×10^{-3}	99.97
Industrial	Paper or pulp production	6.14	2.0×10^{-3}	99.97
Industrial	General agricultural processing	6.14	2.0×10^{-3}	99.97
Commercial	Industrial Gas Manufacturing	5.82	1.90×10^{-3}	99.97
Industrial	Recovery of waste	5.78	1.88×10^{-3}	99.98
Commercial	Wood Product Manufacturing n.e.c.	5.42	1.77×10^{-3}	99.98
Industrial	Glass production (float)	5.37	1.75×10^{-3}	99.98
Commercial	Organic Industrial Chemical Manufacturing n.e.c.	4.54	1.48×10^{-3}	99.98
Commercial	Electrical and Equipment Manufacturing n.e.c.	4.18	1.36×10^{-3}	99.98
Industrial	Dairy processing	3.83	1.25×10^{-3}	99.98
Commercial	Hospitals	3.79	1.24×10^{-3}	99.98
Industrial	Rubber products/tyre production	3.65	1.19×10^{-3}	99.99
Commercial	Plaster Product Manufacturing	3.41	1.11×10^{-3}	99.99
Industrial	General animal products production	3.21	1.05×10^{-3}	99.99

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Boat mooring and storage	3.06	9.98×10^{-4}	99.99
Commercial	Glass and Glass Product Manufacturing	2.86	9.33×10^{-4}	99.99
Industrial	Other land-based extraction	2.71	8.83×10^{-4}	99.99
Commercial	Structural Metal Product Manufacturing n.e.c.	2.49	8.11×10^{-4}	99.99
Commercial	Soft Drink, Cordial and Syrup Manufacturing	2.24	7.31×10^{-4}	99.99
Industrial	Non-ferrous metal production (scrap)	2.16	7.06×10^{-4}	99.99
Industrial	Rendering or fat extraction	2.04	6.66×10^{-4}	99.99
Commercial	Medicinal and Pharmaceutical Product Manufacturing	2.04	6.66×10^{-4}	99.99
Commercial	Wooden Furniture and Upholstered Seat Manufacturing	1.77	5.78×10^{-4}	99.99
Commercial	Confectionery Manufacturing	1.35	4.41×10^{-4}	99.99
Industrial	Recovery of waste oil	1.32	4.31×10^{-4}	100.00
Commercial	Mining and Construction Machinery Manufacturing	1.28	4.18×10^{-4}	100.00
Industrial	Contaminated soil treatment	1.23	4.0×10^{-4}	100.00
Domestic-Commercial	Liquid Fuel Burning (Domestic)	1.10	3.58×10^{-4}	100.00
Commercial	Basic Non-Ferrous Metal Manufacturing n.e.c.	0.96	3.15×10^{-4}	100.00
Industrial	Waste storage	0.79	2.57×10^{-4}	100.00
Commercial	Lifting and Material Handling Equipment Manufacturing	0.75	2.43×10^{-4}	100.00
Commercial	Ceramic Product Manufacturing	0.63	2.05×10^{-4}	100.00
Industrial	Coke production	0.58	1.89×10^{-4}	100.00
Commercial	Paper Product Manufacturing n.e.c.	0.50	1.62×10^{-4}	100.00
Commercial	Biscuit Manufacturing	0.45	1.48×10^{-4}	100.00
Commercial	Plastic Injection Moulded Product Manufacturing	0.44	1.44×10^{-4}	100.00
Industrial	Paper production using recycle materials	0.44	1.43×10^{-4}	100.00
Commercial	Ice Cream Manufacturing	0.44	1.43×10^{-4}	100.00
Industrial	Coal works	0.40	1.31×10^{-4}	100.00
Industrial	Water-based extractive activity	0.40	1.30×10^{-4}	100.00
Commercial	Spring and Wire Product Manufacturing	0.38	1.24×10^{-4}	100.00
Commercial	Oil and Fat Manufacturing	0.35	1.14×10^{-4}	100.00
Commercial	Corrugated Paperboard Container Manufacturing	0.32	1.03×10^{-4}	100.00
Industrial	Railway systems activities	0.30	9.71×10^{-5}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	0.28	9.24×10^{-5}	100.00
Industrial	Bird accommodation	0.26	8.64×10^{-5}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Recovery of waste tyres	0.26	8.53×10^{-5}	100.00
Commercial	Gas Supply	0.20	6.60×10^{-5}	100.00
Industrial	Wood or timber milling or processing	0.17	5.39×10^{-5}	100.00
Commercial	Fruit and Vegetable Processing	0.16	5.31×10^{-5}	100.00
Industrial	Explosives production	0.16	5.27×10^{-5}	100.00
Commercial	Aircraft Manufacturing	0.15	5.02×10^{-5}	100.00
Commercial	Gravel and Sand Quarrying	0.10	3.42×10^{-5}	100.00
Commercial	Prepared Animal and Bird Feed Manufacturing	8.53×10^{-2}	2.78×10^{-5}	100.00
Commercial	Poultry Farming (Meat)	7.57×10^{-2}	2.47×10^{-5}	100.00
Industrial	Sterilisation activities	6.92×10^{-2}	2.26×10^{-5}	100.00
Industrial	Road construction	6.89×10^{-2}	2.25×10^{-5}	100.00
Commercial	Milk and Cream Processing	6.73×10^{-2}	2.20×10^{-5}	100.00
Commercial	Scientific Research	6.07×10^{-2}	1.98×10^{-5}	100.00
Industrial	Mining for minerals	5.91×10^{-2}	1.93×10^{-5}	100.00
Commercial	Railway Equipment Manufacturing	5.80×10^{-2}	1.89×10^{-5}	100.00
Industrial	Pig accommodation	4.45×10^{-2}	1.45×10^{-5}	100.00
Commercial	Soap and Other Detergent Manufacturing	2.89×10^{-2}	9.42×10^{-6}	100.00
Industrial	Agricultural fertiliser (phosphate) production	2.88×10^{-2}	9.39×10^{-6}	100.00
Industrial	Animal accommodation	2.87×10^{-2}	9.35×10^{-6}	100.00
Industrial	Dairy animal accommodation	2.46×10^{-2}	8.01×10^{-6}	100.00
Industrial	Chemical storage	2.34×10^{-2}	7.62×10^{-6}	100.00
Industrial	Miscellaneous licensed discharges to waters (at any time)	2.30×10^{-2}	7.49×10^{-6}	100.00
Commercial	Explosive Manufacturing	2.13×10^{-2}	6.96×10^{-6}	100.00
Commercial	Road and Bridge Construction	1.49×10^{-2}	4.85×10^{-6}	100.00
Industrial	Scrap metal processing	8.29×10^{-3}	2.70×10^{-6}	100.00
Commercial	Rubber Product Manufacturing n.e.c.	6.87×10^{-3}	2.24×10^{-6}	100.00
Commercial	Construction Material Mining n.e.c.	6.03×10^{-3}	1.97×10^{-6}	100.00
Commercial	Non-Building Construction n.e.c.	4.12×10^{-3}	1.34×10^{-6}	100.00
Industrial	Helicopter-related activity	3.24×10^{-3}	1.06×10^{-6}	100.00
Commercial	Rail Transport	1.26×10^{-3}	4.11×10^{-7}	100.00
Commercial	Steel Pipe and Tube Manufacturing	1.23×10^{-3}	4.01×10^{-7}	100.00
Commercial	Ceramic Product Manufacturing n.e.c.	8.40×10^{-4}	2.74×10^{-7}	100.00
Commercial	Non-Ferrous Metal Casting	6.40×10^{-4}	2.09×10^{-7}	100.00
Commercial	Agricultural Machinery Manufacturing	2.30×10^{-4}	7.50×10^{-8}	100.00
Commercial	Concrete Slurry Manufacturing	5.85×10^{-5}	1.91×10^{-8}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
TOTAL VOLATILE ORGANIC COMPOUNDS in the Sydney region				
Biogenic-Geogenic	Vegetation	32,084	24.42	24.42
Domestic-Commercial	Domestic/Commercial Solvents/Aerosols	19,905	15.15	39.58
On-Road Mobile	All - Evaporative	11,512	8.76	48.34
Domestic-Commercial	Surface Coatings	9,012	6.86	55.20
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	7,789	5.93	61.13
Domestic-Commercial	Solid Fuel Burning (Domestic)	5,952	4.53	65.66
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	5,400	4.11	69.77
Domestic-Commercial	Lawn Mowing Evaporative (Domestic)	3,647	2.78	72.55
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	3,489	2.66	75.21
Off-Road Mobile	Recreational Boats Exhaust	3,383	2.58	77.78
Commercial	Automotive Fuel Retailing	2,936	2.24	80.02
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	2,768	2.11	82.12
Domestic-Commercial	Graphic Arts	2,737	2.08	84.21
Domestic-Commercial	Natural/Town Gas Leakage	2,318	1.76	85.97
Off-Road Mobile	Commercial Boats Exhaust	2,240	1.71	87.68
Industrial	Printing, packaging and visual media production	1,741	1.33	89.00
Industrial	Petroleum products and fuel production	1,417	1.08	90.08
Commercial	Printing	1,296	0.99	91.07
Industrial	Composting	900	0.69	91.75
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	866	0.66	92.41
Industrial	Petrochemical production	699	0.53	92.95
Off-Road Mobile	Recreational Boats Evaporative	633	0.48	93.43
Industrial	Petroleum products storage	630	0.48	93.91
Industrial	Waste disposal (application to land)	578	0.44	94.35
Commercial	Chemical Product Manufacturing n.e.c.	510	0.39	94.74
On-Road Mobile	Others - Exhaust	409	0.31	95.05
Biogenic-Geogenic	Bushfire and Prescribed Burning	382	0.29	95.34
Off-Road Mobile	Industrial Vehicles and Equipment	372	0.28	95.62
Commercial	Laundries and Dry-Cleaners	372	0.28	95.90
Domestic-Commercial	Lawn Mowing Evaporative (Public Open Spaces)	371	0.28	96.19
Industrial	Chemical production	370	0.28	96.47
Industrial	Generation of electrical power from gas	352	0.27	96.74
Industrial	Iron or steel production (scrap metal)	350	0.27	97.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Smash Repairing	308	0.23	97.24
Commercial	Synthetic Resin Manufacturing	268	0.20	97.44
Off-Road Mobile	Aircraft (Flight Operations)	253	0.19	97.64
Industrial	Cement or lime handling	213	0.16	97.80
Off-Road Mobile	Locomotives	172	0.13	97.93
On-Road Mobile	Light Duty Diesel - Exhaust	168	0.13	98.06
Commercial	Bread Manufacturing	132	0.10	98.16
Domestic-Commercial	Cutback Bitumen	132	0.10	98.26
Industrial	Plastics resins production	128	9.71×10^{-2}	98.35
Domestic-Commercial	Barbeques	126	9.61×10^{-2}	98.45
Commercial	Paint Manufacturing	124	9.44×10^{-2}	98.54
Off-Road Mobile	Ships	117	8.91×10^{-2}	98.63
Industrial	Metal plating or coating	111	8.46×10^{-2}	98.72
Commercial	Non-Metallic Mineral Product Manufacturing n.e.c.	106	8.04×10^{-2}	98.80
Commercial	Fabricated Metal Product Manufacturing n.e.c.	103	7.87×10^{-2}	98.88
Industrial	Paints/polishes/adhesives production	100	7.60×10^{-2}	98.95
Off-Road Mobile	Aircraft (Ground Operations)	99	7.55×10^{-2}	99.03
Domestic-Commercial	Gaseous Fuel Burning	90	6.83×10^{-2}	99.10
Commercial	Chemical Wholesaling	81	6.20×10^{-2}	99.16
Industrial	Solid waste landfilling	73	5.59×10^{-2}	99.22
Commercial	Services to Air Transport	71	5.44×10^{-2}	99.27
Industrial	Container reconditioning	70	5.29×10^{-2}	99.32
Industrial	Soap and detergent production	69	5.27×10^{-2}	99.38
Commercial	Spirit Manufacturing	67	5.08×10^{-2}	99.43
Off-Road Mobile	Commercial Boats Evaporative	56	4.24×10^{-2}	99.47
Commercial	Petroleum Product Wholesaling	53	4.03×10^{-2}	99.51
Industrial	Sewage treatment - large plants	37	2.83×10^{-2}	99.54
Industrial	Glass production (container)	35	2.68×10^{-2}	99.56
Industrial	Generation of electricity not coal or gas	34	2.62×10^{-2}	99.59
Industrial	Aluminium production (scrap metal)	34	2.59×10^{-2}	99.62
Industrial	Boat construction/maintenance (general)	31	2.35×10^{-2}	99.64
Industrial	Ceramics production	29	2.25×10^{-2}	99.66
Industrial	Pharmaceutical and veterinary products production	26	2.02×10^{-2}	99.68
Industrial	Metal processing	25	1.94×10^{-2}	99.70
Commercial	Beer and Malt Manufacturing	22	1.67×10^{-2}	99.72
Commercial	Metal Coating and Finishing	21	1.59×10^{-2}	99.73
Industrial	Non-thermal treatment of waste	21	1.58×10^{-2}	99.75
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	20	1.55×10^{-2}	99.77

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Bitumen mixing	20	1.54×10^{-2}	99.78
Industrial	Brewing and distilling	19	1.43×10^{-2}	99.79
Commercial	Plastic Bag and Film Manufacturing	18	1.35×10^{-2}	99.81
Commercial	Waste Disposal Services	17	1.32×10^{-2}	99.82
Commercial	Solid Paperboard Container Manufacturing	15	1.17×10^{-2}	99.83
Off-Road Mobile	Commercial Vehicles and Equipment	15	1.16×10^{-2}	99.84
Commercial	Port Operators	14	1.05×10^{-2}	99.86
Commercial	Automotive Component Manufacturing n.e.c.	13	9.69×10^{-3}	99.86
Commercial	Cake and Pastry Manufacturing	12	9.31×10^{-3}	99.87
Commercial	Basic Iron and Steel Manufacturing	12	9.11×10^{-3}	99.88
Commercial	Ink Manufacturing	11	8.11×10^{-3}	99.89
Industrial	Pesticides and related products production	10	7.99×10^{-3}	99.90
Industrial	General chemicals storage	8.59	6.54×10^{-3}	99.91
Industrial	Crushing, grinding or separating	8.33	6.34×10^{-3}	99.91
Industrial	Paper or pulp production	6.14	4.68×10^{-3}	99.92
Commercial	Industrial Gas Manufacturing	5.82	4.43×10^{-3}	99.92
Commercial	Food Manufacturing n.e.c.	5.72	4.35×10^{-3}	99.93
Industrial	Slaughtering or processing of animals	5.38	4.10×10^{-3}	99.93
Industrial	Glass production (float)	5.37	4.09×10^{-3}	99.93
Industrial	Concrete works	4.94	3.76×10^{-3}	99.94
Industrial	Boat construction/maintenance (dry/float)	4.54	3.46×10^{-3}	99.94
Commercial	Organic Industrial Chemical Manufacturing n.e.c.	4.54	3.45×10^{-3}	99.94
Commercial	Electrical and Equipment Manufacturing n.e.c.	4.18	3.18×10^{-3}	99.95
Industrial	Mining for coal	3.95	3.01×10^{-3}	99.95
Industrial	Rubber products/tyre production	3.65	2.78×10^{-3}	99.95
Commercial	Plaster Product Manufacturing	3.41	2.60×10^{-3}	99.96
Industrial	Sewage treatment - small plants	3.27	2.49×10^{-3}	99.96
Commercial	Wine Manufacturing	3.18	2.42×10^{-3}	99.96
Industrial	Dairy processing	3.01	2.29×10^{-3}	99.96
Industrial	General animal products production	2.96	2.25×10^{-3}	99.97
Industrial	General agricultural processing	2.94	2.24×10^{-3}	99.97
Commercial	Glass and Glass Product Manufacturing	2.86	2.18×10^{-3}	99.97
Commercial	Furniture Manufacturing n.e.c.	2.84	2.16×10^{-3}	99.97
Industrial	Other land-based extraction	2.67	2.04×10^{-3}	99.97
Commercial	Hospitals	2.62	1.99×10^{-3}	99.98

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Boat mooring and storage	2.60	1.98×10^{-3}	99.98
Commercial	Structural Metal Product Manufacturing n.e.c.	2.49	1.89×10^{-3}	99.98
Commercial	Soft Drink, Cordial and Syrup Manufacturing	2.24	1.71×10^{-3}	99.98
Industrial	Non-ferrous metal production (scrap)	2.16	1.65×10^{-3}	99.98
Biogenic-Geogenic	Agricultural Burning	2.10	1.60×10^{-3}	99.99
Commercial	Wooden Furniture and Upholstered Seat Manufacturing	1.77	1.35×10^{-3}	99.99
Industrial	Rendering or fat extraction	1.68	1.28×10^{-3}	99.99
Commercial	Confectionery Manufacturing	1.35	1.03×10^{-3}	99.99
Commercial	Medicinal and Pharmaceutical Product Manufacturing	1.35	1.03×10^{-3}	99.99
Industrial	Cement or lime production	1.28	9.74×10^{-4}	99.99
Industrial	Contaminated soil treatment	1.20	9.16×10^{-4}	99.99
Industrial	Recovery of waste oil	0.98	7.49×10^{-4}	99.99
Commercial	Basic Non-Ferrous Metal Manufacturing n.e.c.	0.96	7.34×10^{-4}	99.99
Domestic-Commercial	Liquid Fuel Burning (Domestic)	0.86	6.51×10^{-4}	99.99
Industrial	Waste storage	0.78	5.97×10^{-4}	99.99
Commercial	Lifting and Material Handling Equipment Manufacturing	0.75	5.67×10^{-4}	99.99
Industrial	Recovery of waste	0.67	5.11×10^{-4}	100.00
Commercial	Paper Product Manufacturing n.e.c.	0.47	3.58×10^{-4}	100.00
Commercial	Biscuit Manufacturing	0.45	3.46×10^{-4}	100.00
Industrial	Land-based extractive activity	0.45	3.45×10^{-4}	100.00
Commercial	Plastic Injection Moulded Product Manufacturing	0.44	3.36×10^{-4}	100.00
Industrial	Paper production using recycle materials	0.44	3.35×10^{-4}	100.00
Commercial	Ice Cream Manufacturing	0.44	3.33×10^{-4}	100.00
Commercial	Oil and Fat Manufacturing	0.35	2.66×10^{-4}	100.00
Commercial	Corrugated Paperboard Container Manufacturing	0.32	2.40×10^{-4}	100.00
Industrial	Railway systems activities	0.30	2.27×10^{-4}	100.00
Industrial	Water-based extractive activity	0.29	2.19×10^{-4}	100.00
Industrial	Recovery of waste tyres	0.26	1.99×10^{-4}	100.00
Industrial	Coke production	0.23	1.73×10^{-4}	100.00
Commercial	Gas Supply	0.20	1.54×10^{-4}	100.00
Industrial	Bird accommodation	0.20	1.49×10^{-4}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	0.18	1.37×10^{-4}	100.00
Commercial	Fruit and Vegetable Processing	0.16	1.24×10^{-4}	100.00
Commercial	Aircraft Manufacturing	0.15	1.17×10^{-4}	100.00
Commercial	Ceramic Product Manufacturing	0.15	1.17×10^{-4}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Poultry Farming (Meat)	7.57×10^{-2}	5.76×10^{-5}	100.00
Industrial	Sterilisation activities	6.92×10^{-2}	5.27×10^{-5}	100.00
Industrial	Road construction	6.89×10^{-2}	5.25×10^{-5}	100.00
Commercial	Milk and Cream Processing	6.73×10^{-2}	5.12×10^{-5}	100.00
Commercial	Scientific Research	6.07×10^{-2}	4.62×10^{-5}	100.00
Commercial	Railway Equipment Manufacturing	5.80×10^{-2}	4.42×10^{-5}	100.00
Commercial	Gravel and Sand Quarrying	4.77×10^{-2}	3.63×10^{-5}	100.00
Commercial	Soap and Other Detergent Manufacturing	2.89×10^{-2}	2.20×10^{-5}	100.00
Industrial	Pig accommodation	2.66×10^{-2}	2.03×10^{-5}	100.00
Industrial	Dairy animal accommodation	2.46×10^{-2}	1.87×10^{-5}	100.00
Industrial	Chemical storage	2.34×10^{-2}	1.78×10^{-5}	100.00
Commercial	Rubber Product Manufacturing n.e.c.	6.0×10^{-3}	4.57×10^{-6}	100.00
Industrial	Shipping in bulk	4.88×10^{-3}	3.72×10^{-6}	100.00
Industrial	Scrap metal processing	4.75×10^{-3}	3.62×10^{-6}	100.00
Industrial	Miscellaneous licensed discharges to waters (at any time)	3.94×10^{-3}	3.0×10^{-6}	100.00
Commercial	Non-Building Construction n.e.c.	2.88×10^{-3}	2.19×10^{-6}	100.00
Industrial	Helicopter-related activity	2.33×10^{-3}	1.77×10^{-6}	100.00
Commercial	Steel Pipe and Tube Manufacturing	1.23×10^{-3}	9.35×10^{-7}	100.00
Commercial	Spring and Wire Product Manufacturing	5.06×10^{-4}	3.85×10^{-7}	100.00
Commercial	Agricultural Machinery Manufacturing	2.30×10^{-4}	1.75×10^{-7}	100.00
Commercial	Prepared Animal and Bird Feed Manufacturing	9.60×10^{-5}	7.31×10^{-8}	100.00
Commercial	Concrete Slurry Manufacturing	5.85×10^{-5}	4.46×10^{-8}	100.00
Commercial	Wood Product Manufacturing n.e.c.	3.27×10^{-5}	2.49×10^{-8}	100.00
TOTAL VOLATILE ORGANIC COMPOUNDS in the Newcastle region				
Biogenic-Geogenic	Vegetation	3,383	29.70	29.70
Domestic-Commercial	Domestic/Commercial Solvents/Aerosols	1,276	11.20	40.90
On-Road Mobile	All - Evaporative	855	7.51	48.41
Off-Road Mobile	Commercial Boats Exhaust	686	6.02	54.43
Domestic-Commercial	Surface Coatings	622	5.46	59.89
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	537	4.71	64.60
Domestic-Commercial	Solid Fuel Burning (Domestic)	497	4.37	68.97
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	451	3.96	72.93
Commercial	Automotive Fuel Retailing	389	3.41	76.35
Off-Road Mobile	Recreational Boats Exhaust	351	3.08	79.43
Domestic-Commercial	Lawn Mowing Evaporative (Domestic)	305	2.68	82.11

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Petroleum products storage	233	2.04	84.15
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	223	1.96	86.11
Domestic-Commercial	Graphic Arts	175	1.54	87.65
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	174	1.52	89.17
Domestic-Commercial	Natural/Town Gas Leakage	160	1.40	90.57
Off-Road Mobile	Industrial Vehicles and Equipment	133	1.17	91.74
Industrial	Ammonium nitrate production	132	1.16	92.90
Industrial	Printing, packaging and visual media production	86	0.76	93.66
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	73	0.64	94.30
Industrial	Chemical production	68	0.60	94.90
Off-Road Mobile	Recreational Boats Evaporative	66	0.58	95.47
Industrial	Metal processing	59	0.52	95.99
Industrial	Waste disposal (application to land)	53	0.46	96.46
Off-Road Mobile	Ships	35	0.31	96.77
Industrial	Iron or steel production (scrap metal)	35	0.31	97.07
Industrial	Generation of electrical power from gas	32	0.28	97.35
On-Road Mobile	Others - Exhaust	30	0.26	97.61
Domestic-Commercial	Lawn Mowing Evaporative (Public Open Spaces)	24	0.21	97.82
Commercial	Laundries and Dry-Cleaners	22	0.20	98.02
Commercial	Smash Repairing	21	0.18	98.20
Biogenic-Geogenic	Bushfire and Prescribed Burning	21	0.18	98.38
Off-Road Mobile	Locomotives	18	0.16	98.54
Industrial	Mining for coal	17	0.15	98.69
Commercial	Waste Disposal Services	16	0.14	98.83
Industrial	Boat construction/maintenance (dry/float)	12	0.11	98.94
Industrial	Aluminium production (alumina)	11	9.99×10^{-2}	99.04
Industrial	Sewage treatment - large plants	11	9.33×10^{-2}	99.13
On-Road Mobile	Light Duty Diesel - Exhaust	10	9.21×10^{-2}	99.22
Commercial	Bread Manufacturing	10	9.01×10^{-2}	99.31
Domestic-Commercial	Cutback Bitumen	9.42	8.27×10^{-2}	99.40
Domestic-Commercial	Barbeques	8.71	7.65×10^{-2}	99.47
Industrial	Boat construction/maintenance (general)	8.31	7.30×10^{-2}	99.55
Commercial	Chemical Product Manufacturing n.e.c.	6.34	5.56×10^{-2}	99.60
Domestic-Commercial	Gaseous Fuel Burning	6.19	5.44×10^{-2}	99.66
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	5.31	4.66×10^{-2}	99.70

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Bitumen mixing	4.85	4.26×10^{-2}	99.75
Off-Road Mobile	Aircraft (Flight Operations)	4.55	3.99×10^{-2}	99.79
Commercial	Furniture Manufacturing n.e.c.	4.29	3.77×10^{-2}	99.82
Off-Road Mobile	Commercial Boats Evaporative	4.10	3.60×10^{-2}	99.86
Off-Road Mobile	Aircraft (Ground Operations)	3.05	2.68×10^{-2}	99.89
Industrial	General agricultural processing	2.84	2.50×10^{-2}	99.91
Off-Road Mobile	Commercial Vehicles and Equipment	1.97	1.73×10^{-2}	99.93
Industrial	Metal plating or coating	1.82	1.60×10^{-2}	99.94
Industrial	Slaughtering or processing of animals	1.59	1.39×10^{-2}	99.96
Industrial	Dairy processing	0.81	7.14×10^{-3}	99.97
Industrial	Crushing, grinding or separating	0.66	5.83×10^{-3}	99.97
Commercial	Metal Coating and Finishing	0.59	5.18×10^{-3}	99.98
Industrial	Concrete works	0.53	4.68×10^{-3}	99.98
Commercial	Mining and Construction Machinery Manufacturing	0.47	4.17×10^{-3}	99.99
Biogenic-Geogenic	Agricultural Burning	0.46	4.01×10^{-3}	99.99
Commercial	Hospitals	0.39	3.43×10^{-3}	99.99
Industrial	Non-thermal treatment of waste	0.18	1.61×10^{-3}	99.99
Industrial	Cement or lime handling	0.14	1.21×10^{-3}	100.00
Industrial	Coal works	0.11	9.72×10^{-4}	100.00
Commercial	Petroleum Product Wholesaling	8.95×10^{-2}	7.86×10^{-4}	100.00
Domestic-Commercial	Liquid Fuel Burning (Domestic)	5.90×10^{-2}	5.18×10^{-4}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	3.51×10^{-2}	3.08×10^{-4}	100.00
Commercial	Wine Manufacturing	3.40×10^{-2}	2.99×10^{-4}	100.00
Industrial	Other land-based extraction	3.28×10^{-2}	2.88×10^{-4}	100.00
Industrial	Agricultural fertiliser (phosphate) production	2.88×10^{-2}	2.53×10^{-4}	100.00
Commercial	Fabricated Metal Product Manufacturing n.e.c.	2.47×10^{-2}	2.17×10^{-4}	100.00
Industrial	Boat mooring and storage	2.13×10^{-2}	1.87×10^{-4}	100.00
Industrial	Contaminated soil treatment	1.09×10^{-2}	9.60×10^{-5}	100.00
Industrial	Sewage treatment - small plants	1.06×10^{-2}	9.27×10^{-5}	100.00
Commercial	Gravel and Sand Quarrying	9.0×10^{-3}	7.90×10^{-5}	100.00
Commercial	Road and Bridge Construction	7.02×10^{-3}	6.16×10^{-5}	100.00
Commercial	Construction Material Mining n.e.c.	4.23×10^{-3}	3.72×10^{-5}	100.00
Industrial	Scrap metal processing	2.92×10^{-3}	2.56×10^{-5}	100.00
Industrial	Land-based extractive activity	2.37×10^{-3}	2.08×10^{-5}	100.00
Industrial	Waste storage	1.57×10^{-3}	1.38×10^{-5}	100.00
Industrial	Shipping in bulk	1.17×10^{-3}	1.02×10^{-5}	100.00
Industrial	Water-based extractive activity	9.57×10^{-4}	8.40×10^{-6}	100.00
Commercial	Ceramic Product Manufacturing n.e.c.	8.40×10^{-4}	7.38×10^{-6}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	Helicopter-related activity	7.85×10^{-4}	6.89×10^{-6}	100.00
Industrial	General chemicals storage	9.53×10^{-5}	8.36×10^{-7}	100.00
TOTAL VOLATILE ORGANIC COMPOUNDS in the Wollongong region				
Biogenic-Geogenic	Vegetation	3,439	39.60	39.60
Domestic-Commercial	Domestic/Commercial Solvents/Aerosols	940	10.82	50.41
Industrial	Iron or steel production (iron ore)	452	5.21	55.62
Domestic-Commercial	Surface Coatings	449	5.17	60.79
On-Road Mobile	All - Evaporative	436	5.02	65.81
Off-Road Mobile	Recreational Boats Exhaust	373	4.30	70.11
Domestic-Commercial	Solid Fuel Burning (Domestic)	328	3.78	73.89
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	298	3.43	77.32
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	293	3.38	80.70
Commercial	Automotive Fuel Retailing	292	3.36	84.06
Domestic-Commercial	Lawn Mowing Evaporative (Domestic)	201	2.32	86.38
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	165	1.90	88.28
Industrial	Metal plating or coating	132	1.52	89.80
Domestic-Commercial	Graphic Arts	129	1.49	91.29
Domestic-Commercial	Natural/Town Gas Leakage	116	1.33	92.62
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	94	1.09	93.71
Off-Road Mobile	Industrial Vehicles and Equipment	83	0.96	94.66
Industrial	Waste disposal (application to land)	80	0.92	95.59
Off-Road Mobile	Recreational Boats Evaporative	70	0.80	96.39
Biogenic-Geogenic	Bushfire and Prescribed Burning	42	0.49	96.88
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	35	0.40	97.28
Off-Road Mobile	Commercial Boats Exhaust	34	0.39	97.67
Industrial	Shipping in bulk	23	0.26	97.93
Commercial	Laundries and Dry-Cleaners	18	0.20	98.13
Domestic-Commercial	Lawn Mowing Evaporative (Public Open Spaces)	18	0.20	98.33
Off-Road Mobile	Ships	16	0.18	98.51
Commercial	Smash Repairing	15	0.17	98.69
Off-Road Mobile	Locomotives	15	0.17	98.86
On-Road Mobile	Others - Exhaust	14	0.16	99.02
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	13	0.15	99.17
Industrial	Generation of electrical power from gas	12	0.13	99.31
Commercial	Petroleum Product Wholesaling	11	0.12	99.43
Industrial	Metal processing	6.94	7.99×10^{-2}	99.51

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Domestic-Commercial	Barbeques	6.29	7.24×10^{-2}	99.58
Commercial	Printing	6.19	7.12×10^{-2}	99.65
On-Road Mobile	Light Duty Diesel - Exhaust	5.50	6.34×10^{-2}	99.72
Domestic-Commercial	Cutback Bitumen	5.35	6.16×10^{-2}	99.78
Domestic-Commercial	Gaseous Fuel Burning	4.48	5.15×10^{-2}	99.83
Industrial	Container reconditioning	3.59	4.13×10^{-2}	99.87
Industrial	Bitumen mixing	2.34	2.70×10^{-2}	99.90
Industrial	Chemical production	1.54	1.77×10^{-2}	99.92
Industrial	Petroleum products storage	1.39	1.61×10^{-2}	99.93
Commercial	Fabricated Metal Product Manufacturing n.e.c.	1.39	1.60×10^{-2}	99.95
Industrial	Sewage treatment - large plants	1.02	1.17×10^{-2}	99.96
Commercial	Automotive Component Manufacturing n.e.c.	0.81	9.29×10^{-3}	99.97
Commercial	Ceramic Product Manufacturing	0.48	5.49×10^{-3}	99.97
Industrial	Coke production	0.35	4.04×10^{-3}	99.98
Commercial	Basic Iron and Steel Manufacturing	0.33	3.85×10^{-3}	99.98
Off-Road Mobile	Commercial Boats Evaporative	0.28	3.25×10^{-3}	99.99
Off-Road Mobile	Aircraft (Flight Operations)	0.26	3.05×10^{-3}	99.99
Off-Road Mobile	Commercial Vehicles and Equipment	0.24	2.79×10^{-3}	99.99
Industrial	General chemicals storage	0.23	2.69×10^{-3}	99.99
Industrial	Concrete works	0.23	2.64×10^{-3}	100.00
Commercial	Hospitals	0.14	1.58×10^{-3}	100.00
Industrial	Cement or lime handling	5.61×10^{-2}	6.46×10^{-4}	100.00
Domestic-Commercial	Liquid Fuel Burning (Domestic)	4.27×10^{-2}	4.91×10^{-4}	100.00
Industrial	Coal works	3.12×10^{-2}	3.59×10^{-4}	100.00
Industrial	Non-thermal treatment of waste	3.08×10^{-2}	3.55×10^{-4}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	1.09×10^{-2}	1.25×10^{-4}	100.00
Industrial	Contaminated soil treatment	1.08×10^{-2}	1.24×10^{-4}	100.00
Industrial	Mining for coal	6.17×10^{-3}	7.10×10^{-5}	100.00
Commercial	Gravel and Sand Quarrying	3.60×10^{-3}	4.14×10^{-5}	100.00
Commercial	Rubber Product Manufacturing n.e.c.	8.66×10^{-4}	9.96×10^{-6}	100.00
Industrial	Boat construction/maintenance (general)	7.21×10^{-4}	8.30×10^{-6}	100.00
Industrial	Scrap metal processing	6.12×10^{-4}	7.05×10^{-6}	100.00
Industrial	Water-based extractive activity	1.50×10^{-4}	1.72×10^{-6}	100.00
Commercial	Spring and Wire Product Manufacturing	1.05×10^{-4}	1.21×10^{-6}	100.00
Commercial	Synthetic Resin Manufacturing	9.68×10^{-5}	1.11×10^{-6}	100.00
TOTAL VOLATILE ORGANIC COMPOUNDS in the Non Urban region				
Biogenic-Geogenic	Vegetation	128,285	82.68	82.68

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Domestic-Commercial	Domestic/Commercial Solvents/Aerosols	3,154	2.03	84.71
Off-Road Mobile	Recreational Boats Exhaust	3,032	1.95	86.66
Off-Road Mobile	Industrial Vehicles and Equipment	2,607	1.68	88.34
Off-Road Mobile	Commercial Boats Exhaust	2,264	1.46	89.80
Biogenic-Geogenic	Bushfire and Prescribed Burning	1,978	1.27	91.08
On-Road Mobile	All - Evaporative	1,828	1.18	92.26
Domestic-Commercial	Surface Coatings	1,478	0.95	93.21
Commercial	Automotive Fuel Retailing	1,290	0.83	94.04
Domestic-Commercial	Solid Fuel Burning (Domestic)	1,248	0.80	94.84
Domestic-Commercial	Lawn Mowing Exhaust (Domestic)	1,133	0.73	95.57
On-Road Mobile	Passenger Vehicle Petrol - Exhaust	1,029	0.66	96.24
Industrial	Generation of electrical power from coal	904	0.58	96.82
Domestic-Commercial	Lawn Mowing Evaporative (Domestic)	765	0.49	97.31
Off-Road Mobile	Recreational Boats Evaporative	568	0.37	97.68
Domestic-Commercial	Lawn Mowing Exhaust (Public Open Spaces)	510	0.33	98.01
Domestic-Commercial	Graphic Arts	434	0.28	98.29
Domestic-Commercial	Natural/Town Gas Leakage	380	0.24	98.53
On-Road Mobile	Light Duty Commercial Petrol - Exhaust	295	0.19	98.72
Industrial	Metal plating or coating	222	0.14	98.86
Industrial	Composting	220	0.14	99.01
On-Road Mobile	Heavy Duty Commercial Diesel - Exhaust	200	0.13	99.13
Industrial	Mining for coal	177	0.11	99.25
Off-Road Mobile	Locomotives	153	9.86×10^{-2}	99.35
Industrial	Waste disposal (application to land)	120	7.74×10^{-2}	99.42
Commercial	Log Sawmilling	90	5.80×10^{-2}	99.48
Commercial	Electric Cable and Wire Manufacturing	84	5.41×10^{-2}	99.54
On-Road Mobile	Others - Exhaust	64	4.15×10^{-2}	99.58
Commercial	Laundries and Dry-Cleaners	62	4.02×10^{-2}	99.62
Commercial	Petroleum Product Wholesaling	61	3.95×10^{-2}	99.66
Domestic-Commercial	Lawn Mowing Evaporative (Public Open Spaces)	54	3.49×10^{-2}	99.69
Commercial	Smash Repairing	49	3.15×10^{-2}	99.72
Industrial	Solid waste landfilling	45	2.89×10^{-2}	99.75
Off-Road Mobile	Ships	36	2.33×10^{-2}	99.78
Industrial	Sewage treatment - small plants	30	1.92×10^{-2}	99.80
Domestic-Commercial	Cutback Bitumen	22	1.43×10^{-2}	99.81
Biogenic-Geogenic	Agricultural Burning	22	1.40×10^{-2}	99.82
Industrial	Sewage treatment - large plants	21	1.37×10^{-2}	99.84

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Commercial	Wine Manufacturing	21	1.35×10^{-2}	99.85
Domestic-Commercial	Barbeques	21	1.33×10^{-2}	99.86
On-Road Mobile	Light Duty Diesel - Exhaust	19	1.24×10^{-2}	99.88
Industrial	Inert waste landfilling	18	1.18×10^{-2}	99.89
Off-Road Mobile	Aircraft (Flight Operations)	16	1.0×10^{-2}	99.90
Off-Road Mobile	Commercial Boats Evaporative	15	9.73×10^{-3}	99.91
Industrial	Generation of electrical power from gas	15	9.69×10^{-3}	99.92
Off-Road Mobile	Commercial Vehicles and Equipment	15	9.52×10^{-3}	99.93
Domestic-Commercial	Gaseous Fuel Burning	15	9.49×10^{-3}	99.94
Commercial	Printing	13	8.40×10^{-3}	99.95
Industrial	Chemical production	12	8.03×10^{-3}	99.95
Off-Road Mobile	Aircraft (Ground Operations)	11	7.12×10^{-3}	99.96
Industrial	Land-based extractive activity	6.10	3.93×10^{-3}	99.97
Industrial	Cement or lime production	5.56	3.59×10^{-3}	99.97
Commercial	Wood Product Manufacturing n.e.c.	5.42	3.49×10^{-3}	99.97
Industrial	Recovery of waste	5.11	3.29×10^{-3}	99.98
Industrial	Aluminium production (alumina)	4.40	2.84×10^{-3}	99.98
Industrial	Non-thermal treatment of waste	4.40	2.83×10^{-3}	99.98
Commercial	Plastic Product, Rigid Fibre Reinforced, Manufacturing	4.35	2.80×10^{-3}	99.98
Commercial	Chemical Product Manufacturing n.e.c.	4.06	2.62×10^{-3}	99.99
Industrial	Ceramics production	3.02	1.95×10^{-3}	99.99
Industrial	Concrete works	2.93	1.89×10^{-3}	99.99
Industrial	Petroleum products and fuel production	2.53	1.63×10^{-3}	99.99
Industrial	Bitumen mixing	1.94	1.25×10^{-3}	99.99
Industrial	Boat construction/maintenance (general)	1.56	1.0×10^{-3}	99.99
Commercial	Synthetic Resin Manufacturing	1.29	8.34×10^{-4}	100.00
Industrial	Aluminium production (scrap metal)	0.95	6.13×10^{-4}	100.00
Commercial	Mining and Construction Machinery Manufacturing	0.81	5.20×10^{-4}	100.00
Commercial	Medicinal and Pharmaceutical Product Manufacturing	0.69	4.47×10^{-4}	100.00
Commercial	Hospitals	0.64	4.15×10^{-4}	100.00
Commercial	Food Manufacturing n.e.c.	0.49	3.15×10^{-4}	100.00
Industrial	Boat mooring and storage	0.44	2.86×10^{-4}	100.00
Commercial	Automotive Component Manufacturing n.e.c.	0.43	2.76×10^{-4}	100.00
Commercial	Spring and Wire Product Manufacturing	0.38	2.45×10^{-4}	100.00
Industrial	Rendering or fat extraction	0.36	2.35×10^{-4}	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Industrial	General agricultural processing	0.36	2.30×10^{-4}	100.00
Industrial	Recovery of waste oil	0.34	2.17×10^{-4}	100.00
Industrial	Coal works	0.26	1.68×10^{-4}	100.00
Industrial	General animal products production	0.25	1.61×10^{-4}	100.00
Industrial	Wood or timber milling or processing	0.17	1.06×10^{-4}	100.00
Industrial	Explosives production	0.16	1.04×10^{-4}	100.00
Domestic-Commercial	Liquid Fuel Burning (Domestic)	0.14	9.05×10^{-5}	100.00
Industrial	Water-based extractive activity	0.11	7.03×10^{-5}	100.00
Commercial	Furniture Manufacturing n.e.c.	0.10	6.77×10^{-5}	100.00
Commercial	Prepared Animal and Bird Feed Manufacturing	8.52×10^{-2}	5.49×10^{-5}	100.00
Industrial	Bird accommodation	6.96×10^{-2}	4.49×10^{-5}	100.00
Industrial	Mining for minerals	5.91×10^{-2}	3.81×10^{-5}	100.00
Commercial	Fabricated Metal Product Manufacturing n.e.c.	5.86×10^{-2}	3.77×10^{-5}	100.00
Commercial	Funeral Directors, Crematoria and Cemeteries	5.78×10^{-2}	3.72×10^{-5}	100.00
Commercial	Gravel and Sand Quarrying	4.45×10^{-2}	2.87×10^{-5}	100.00
Industrial	Generation of electricity not coal or gas	4.26×10^{-2}	2.75×10^{-5}	100.00
Industrial	Animal accommodation	2.87×10^{-2}	1.85×10^{-5}	100.00
Commercial	Paper Product Manufacturing n.e.c.	2.76×10^{-2}	1.78×10^{-5}	100.00
Industrial	Crushing, grinding or separating	2.75×10^{-2}	1.77×10^{-5}	100.00
Commercial	Explosive Manufacturing	2.13×10^{-2}	1.37×10^{-5}	100.00
Industrial	Miscellaneous licensed discharges to waters (at any time)	1.90×10^{-2}	1.23×10^{-5}	100.00
Industrial	Pig accommodation	1.79×10^{-2}	1.15×10^{-5}	100.00
Commercial	Road and Bridge Construction	7.84×10^{-3}	5.05×10^{-6}	100.00
Industrial	Slaughtering or processing of animals	3.94×10^{-3}	2.54×10^{-6}	100.00
Commercial	Construction Material Mining n.e.c.	1.80×10^{-3}	1.16×10^{-6}	100.00
Commercial	Rail Transport	1.26×10^{-3}	8.12×10^{-7}	100.00
Commercial	Non-Building Construction n.e.c.	1.24×10^{-3}	7.99×10^{-7}	100.00
Industrial	General chemicals storage	1.14×10^{-3}	7.37×10^{-7}	100.00
Commercial	Glass and Glass Product Manufacturing	9.56×10^{-4}	6.16×10^{-7}	100.00
Industrial	Waste storage	9.34×10^{-4}	6.02×10^{-7}	100.00
Industrial	Other land-based extraction	8.26×10^{-4}	5.32×10^{-7}	100.00
Commercial	Non-Ferrous Metal Casting	6.40×10^{-4}	4.12×10^{-7}	100.00
Industrial	Pesticides and related products production	1.96×10^{-4}	1.26×10^{-7}	100.00
Industrial	Helicopter-related activity	1.27×10^{-4}	8.19×10^{-8}	100.00

Figure 3-56, Figure 3-57, Figure 3-58, Figure 3-59 and Figure 3-60 show the proportions of total estimated annual emissions for the top 15 natural and human-made sources of VOC in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

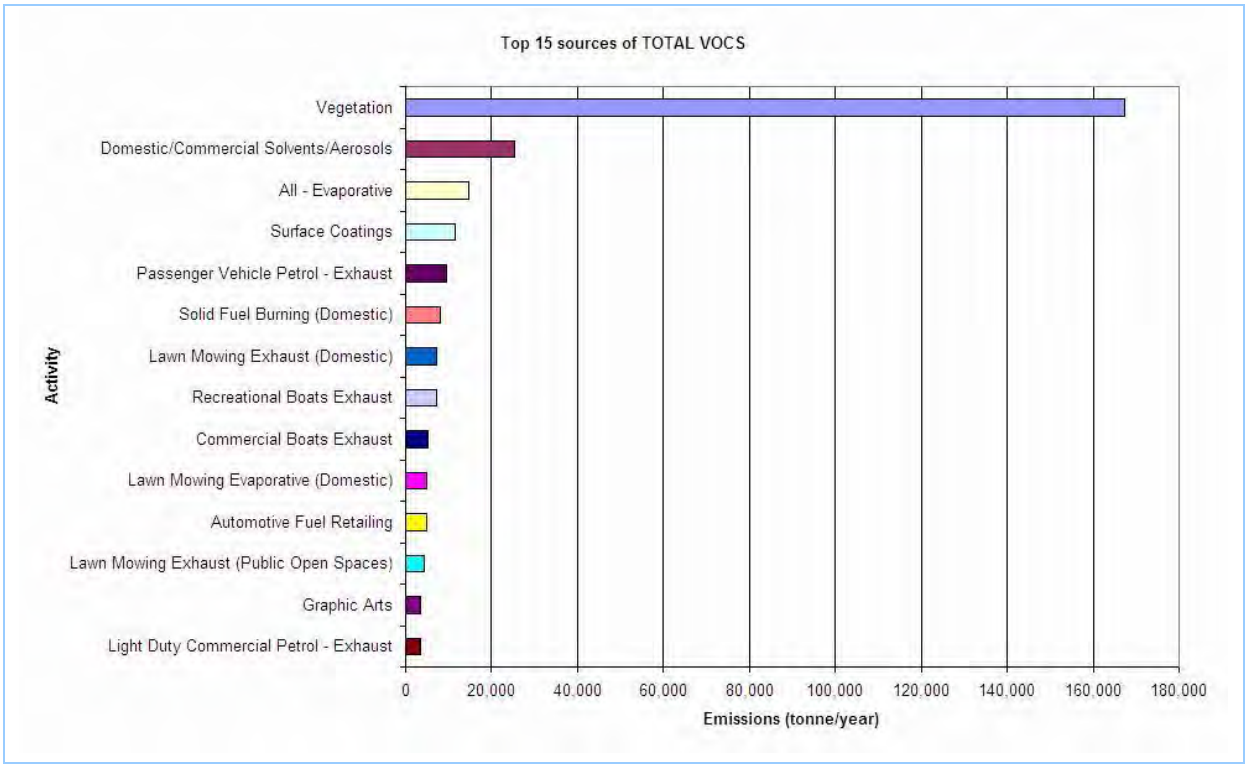

Figure 3-56: Top 15 natural and human-made sources of VOC in the GMR

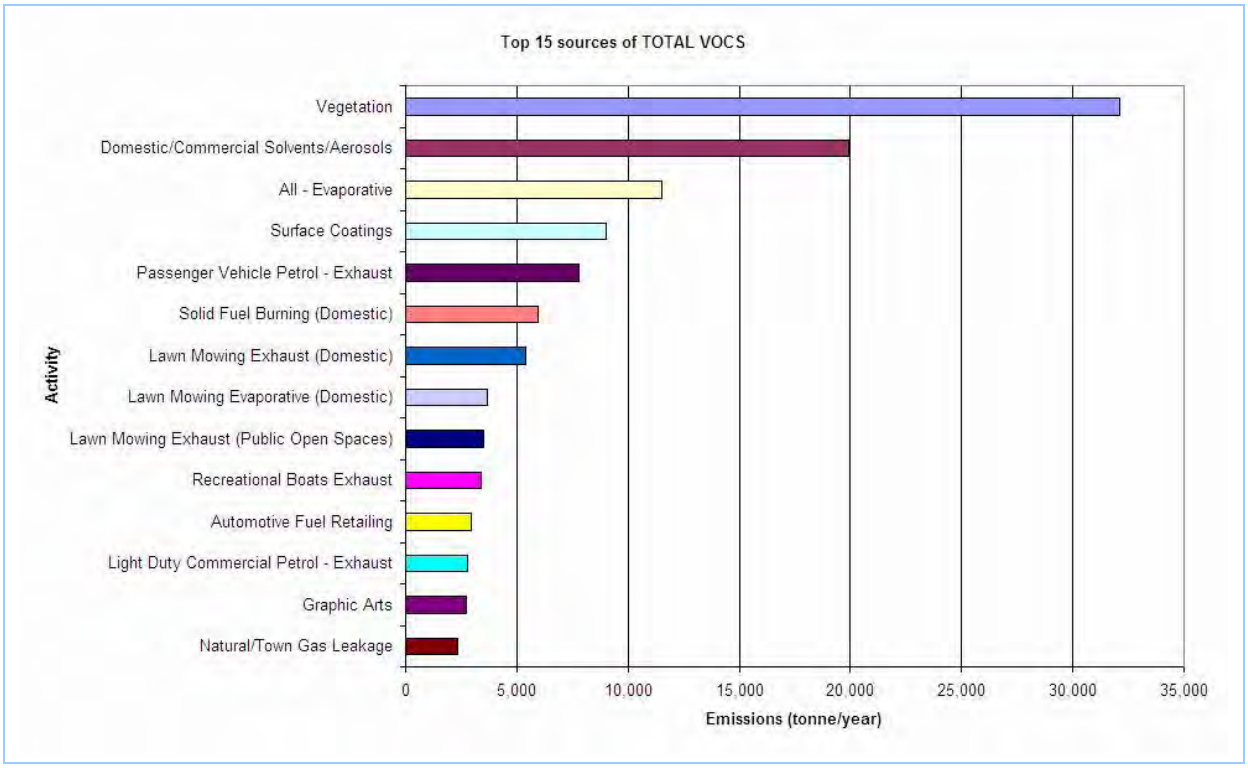

Figure 3-57: Top 15 natural and human-made sources of VOC in the Sydney region

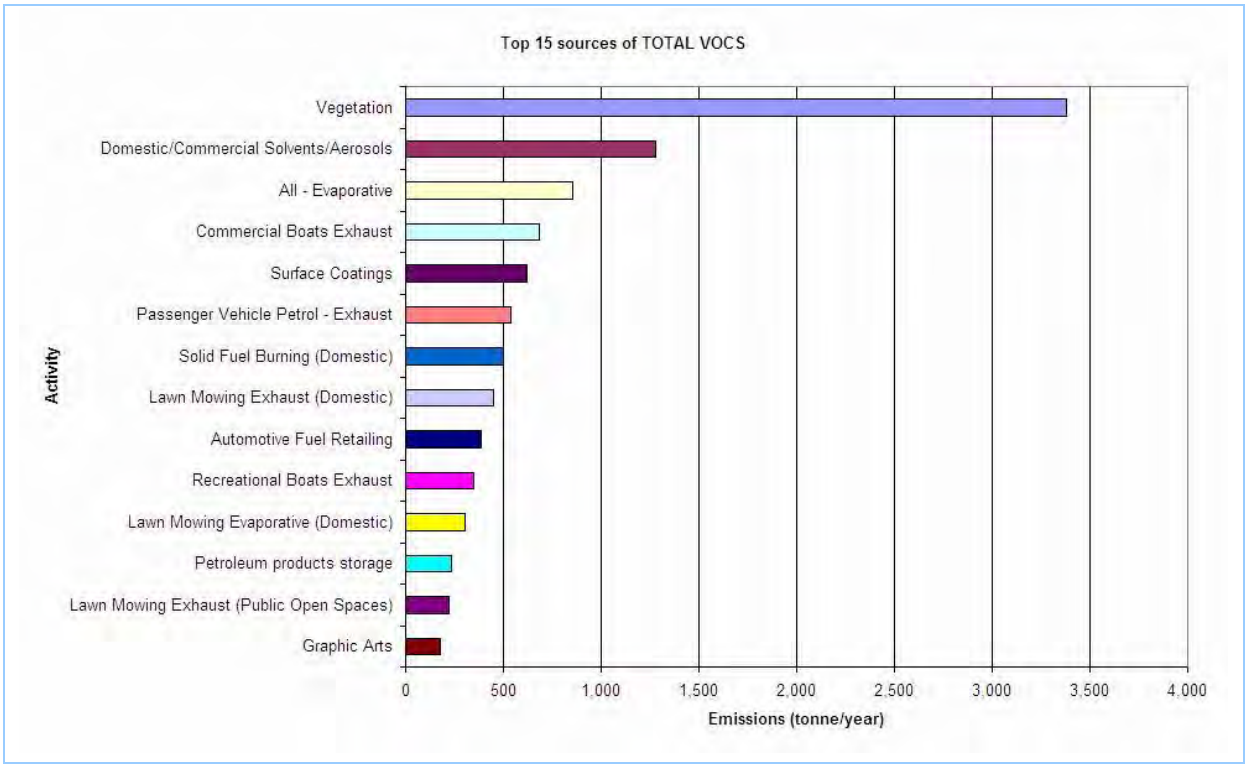

Figure 3-58: Top 15 natural and human-made sources of VOC in the Newcastle region

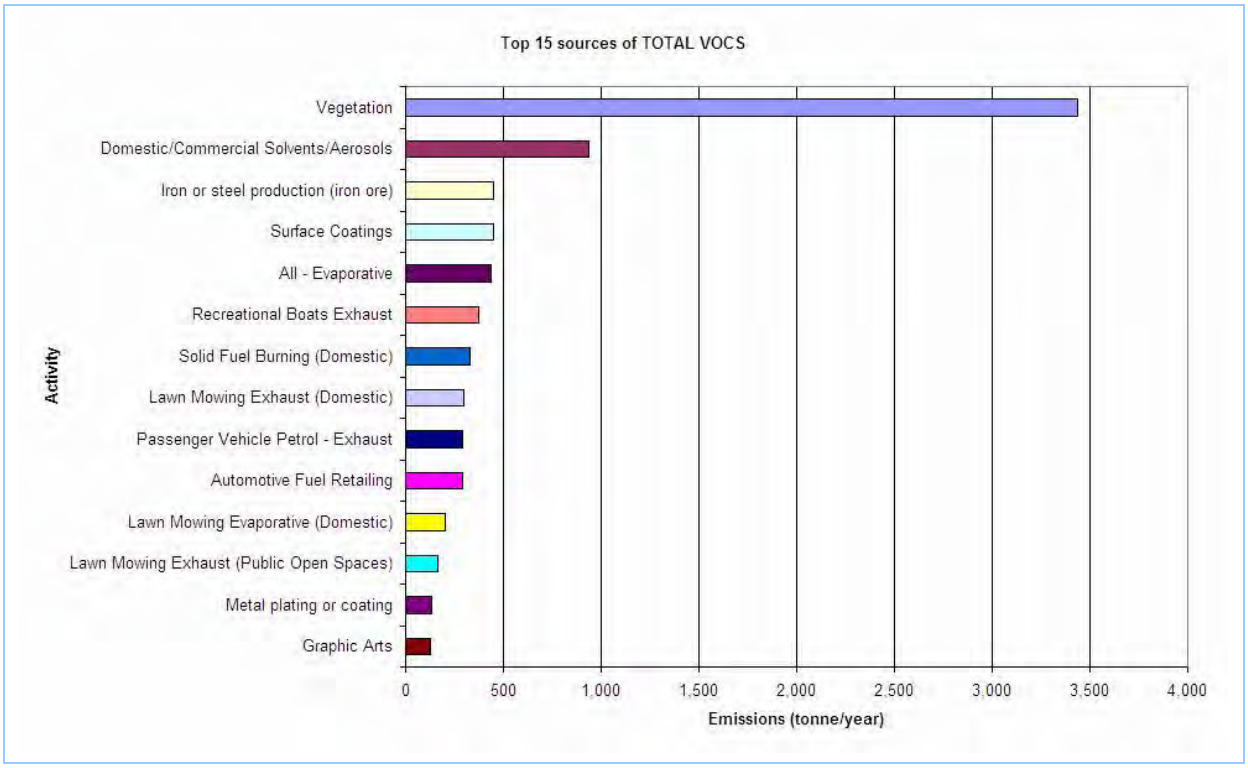

Figure 3-59: Top 15 natural and human-made sources of VOC in the Wollongong region

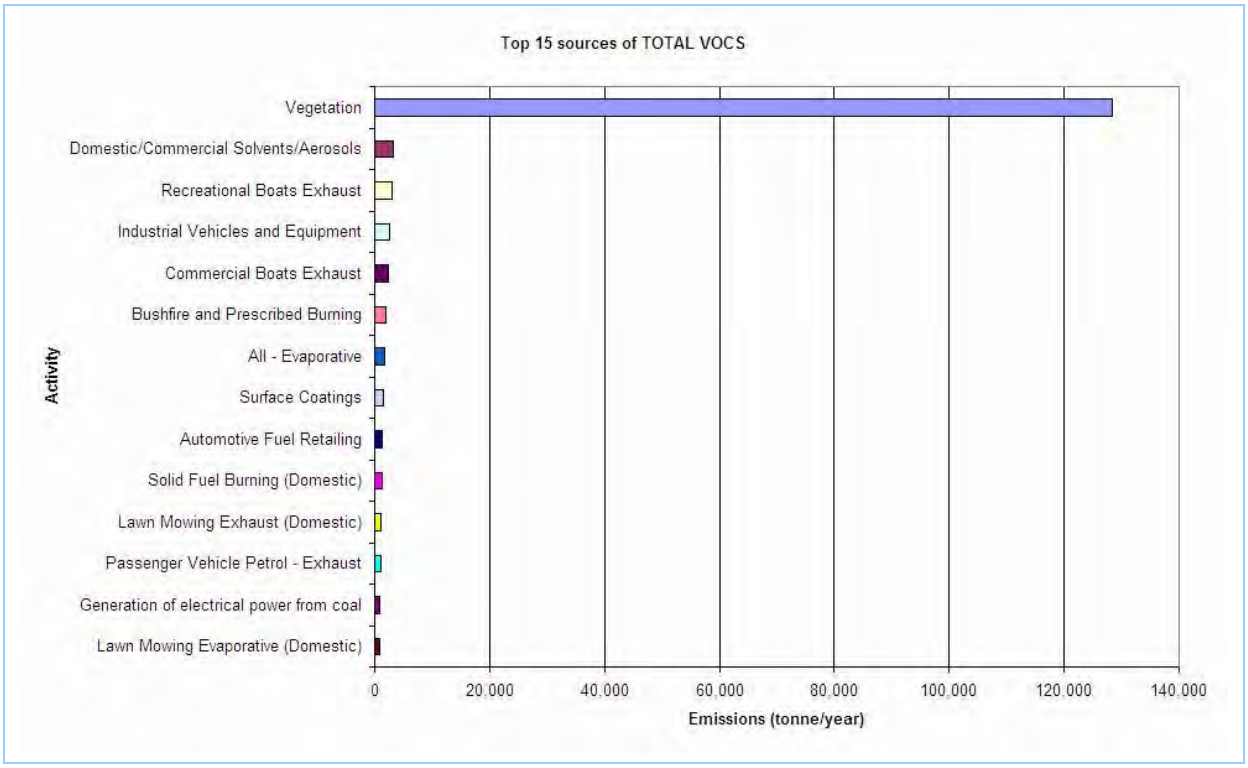

Figure 3-60: Top 15 natural and human-made sources of VOC in the Non Urban region

4 EMISSIONS SUMMARY

The air emissions inventory has been developed for the 2008 calendar year, which incorporates an area covering the greater Sydney, Newcastle and Wollongong regions, known collectively as the Greater Metropolitan Region (GMR).

The air emissions inventory includes emissions from biogenic (i.e. natural living organisms), geogenic (i.e. natural non-living) and anthropogenic (i.e. human-made) sources as follows:

- Natural (e.g. bushfires, marine aerosol and vegetation);
- Commercial businesses (e.g. non-EPA licensed[12] printers, quarries and service stations);
- Domestic activities (e.g. residential lawn mowing, portable fuel containers and wood heaters);
- Industrial premises (e.g. EPA licensed[13] coal mines, oil refineries and power stations);
- Off-road vehicles and equipment (e.g. dump trucks, bulldozers, and marine vessels); and
- On-road transport (e.g. registered buses, cars and trucks).

The pollutants inventoried include criteria pollutants specified in the Ambient Air Quality NEPM (NEPC, 2003), air toxics associated with the National Pollutant Inventory NEPM (NEPC, 2008) and the Air Toxics NEPM (NEPC, 2004), and any other pollutants associated with state-specific programs, i.e. Load Based Licensing (Protection of the Environment Operations (General) Regulation 2009 (PCO, 2010b)) and the Protection of the Environment Operations (Clean Air) Regulation 2010 (PCO, 2011).

This report presents emissions of criteria pollutants referred to in the Ambient Air Quality NEPM (NEPC, 2003), including:

- Carbon monoxide (CO);
- Oxides of nitrogen (NO_x);
- Particulate matter ≤ 10 µm (PM_{10});
- Particulate matter ≤ 2.5 µm ($PM_{2.5}$);
- Sulfur dioxide (SO_2); and
- Total volatile organic compounds (VOC).

[12] Not a scheduled activity or scheduled development work as defined in the *Protection of the Environment (Operations) Act 1997* (PCO, 2010a).
[13] An activity listed in Schedule 1 of the *Protection of the Environment (Operations) Act 1997* (PCO, 2010a).

More detailed information about source types and emissions of other air pollutants from natural, commercial businesses, domestic activities, industrial premises, off-road vehicles and equipment and on-road transport sources can be found in the individual air emissions inventory reports (EPA, 2012a; EPA, 2012b; EPA, 2012c; EPA, 2012d; EPA, 2012e; and EPA, 2012f), respectively.

Table 4-1 presents total estimated annual emissions of criteria pollutants from natural and human-made sources in the whole GMR and the Sydney, Newcastle and Wollongong regions. Total estimated annual emissions are also presented for the region defined as Non Urban. This region is the area of the GMR minus the combined areas of the Sydney, Newcastle and Wollongong regions.

Table 4-1: Total estimated annual emissions from natural and human-made sources in each region

Substance	Region	Emissions (tonne/year)		
		Human-Made	Natural	Grand Total
CARBON MONOXIDE	Sydney	241,208	5,484	246,692
	Newcastle	60,225	301	60,526
	Wollongong	540,390	603	540,993
	Non Urban	88,937	28,545	117,482
	GMR	930,759	34,934	965,693
OXIDES OF NITROGEN	Sydney	73,427	1,296	74,722
	Newcastle	9,506	126	9,632
	Wollongong	11,708	71	11,779
	Non Urban	214,704	8,319	223,023
	GMR	309,344	9,811	319,156
PARTICULATE MATTER ≤ 10 µm	Sydney	16,543	3,901	20,443
	Newcastle	4,838	689	5,526
	Wollongong	2,690	327	3,017
	Non Urban	65,752	28,719	94,471
	GMR	89,823	33,635	123,458
PARTICULATE MATTER ≤ 2.5 µm	Sydney	10,777	951	11,728
	Newcastle	2,023	121	2,144
	Wollongong	1,869	90	1,959
	Non Urban	17,076	6,176	23,253
	GMR	31,744	7,338	39,083
SULFUR DIOXIDE	Sydney	10,749	50	10,798
	Newcastle	11,593	2.72	11,596
	Wollongong	9,063	5.49	9,068
	Non Urban	257,516	259	257,774
	GMR	288,920	317	289,237
TOTAL VOLATILE ORGANIC COMPOUNDS	Sydney	98,889	32,468	131,356
	Newcastle	7,985	3,404	11,389
	Wollongong	5,205	3,482	8,687
	Non Urban	24,879	130,284	155,163
	GMR	136,957	169,637	306,595

Table 4-2 presents the proportions of total estimated annual emissions of criteria pollutants from natural and human-made sources in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 4-2: Proportions of total estimated annual emissions from natural and human-made sources in each region

Substance	Region	Proportions (%)	
		Human-Made	Natural
CARBON MONOXIDE	Sydney	97.78	2.22
	Newcastle	99.50	0.50
	Wollongong	99.89	0.11
	Non Urban	75.70	24.30
	GMR	96.38	3.62
OXIDES OF NITROGEN	Sydney	98.27	1.73
	Newcastle	98.69	1.31
	Wollongong	99.40	0.60
	Non Urban	96.27	3.73
	GMR	96.93	3.07
PARTICULATE MATTER ≤ 10 µm	Sydney	80.92	19.08
	Newcastle	87.54	12.46
	Wollongong	89.17	10.83
	Non Urban	69.60	30.40
	GMR	72.76	27.24
PARTICULATE MATTER ≤ 2.5 µm	Sydney	91.89	8.11
	Newcastle	94.37	5.63
	Wollongong	95.40	4.60
	Non Urban	73.44	26.56
	GMR	81.22	18.78
SULFUR DIOXIDE	Sydney	99.54	0.46
	Newcastle	99.98	2.35×10^{-2}
	Wollongong	99.94	6.05×10^{-2}
	Non Urban	99.90	0.10
	GMR	99.89	0.11
TOTAL VOLATILE ORGANIC COMPOUNDS	Sydney	75.28	24.72
	Newcastle	70.11	29.89
	Wollongong	59.92	40.08
	Non Urban	16.03	83.97
	GMR	44.67	55.33

Figure 4-1, Figure 4-2, Figure 4-3, Figure 4-4 and Figure 4-5 show the proportions of total estimated annual emissions of criteria pollutants from natural and human-made sources in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

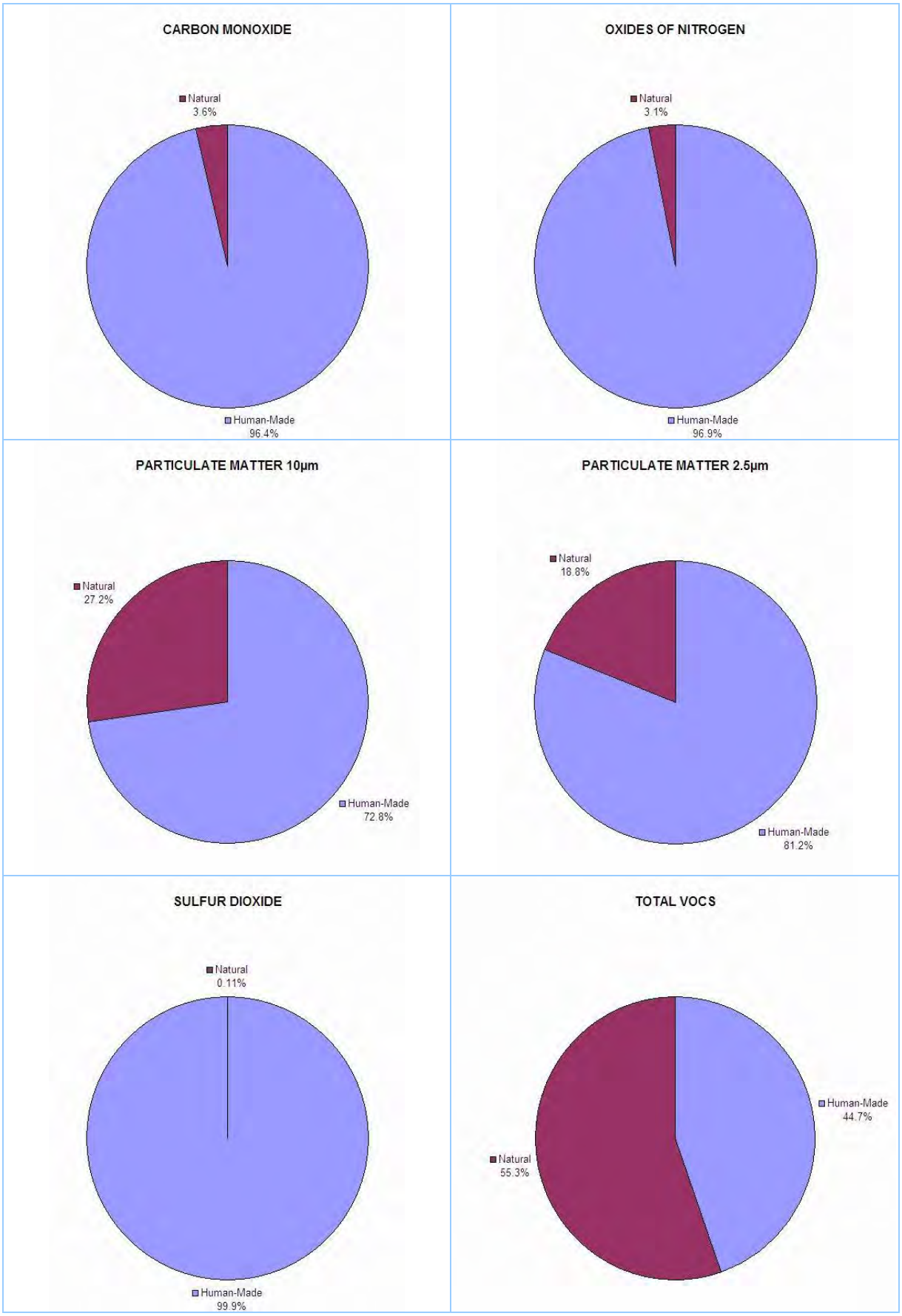

Figure 4-1: Proportions of total estimated annual emissions from natural and human-made sources in the GMR

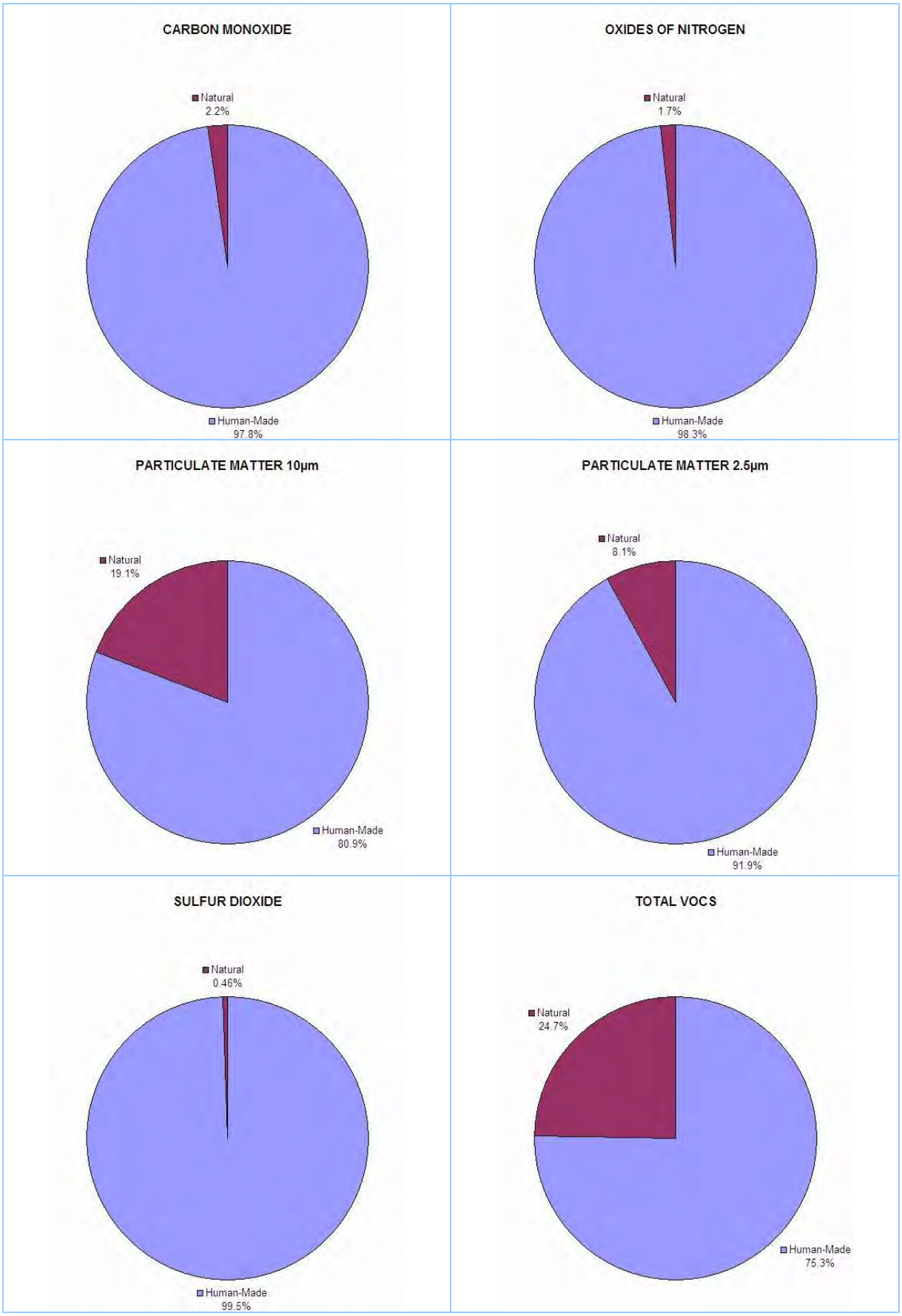

Figure 4-2: Proportions of total estimated annual emissions from natural and human-made sources in the Sydney region

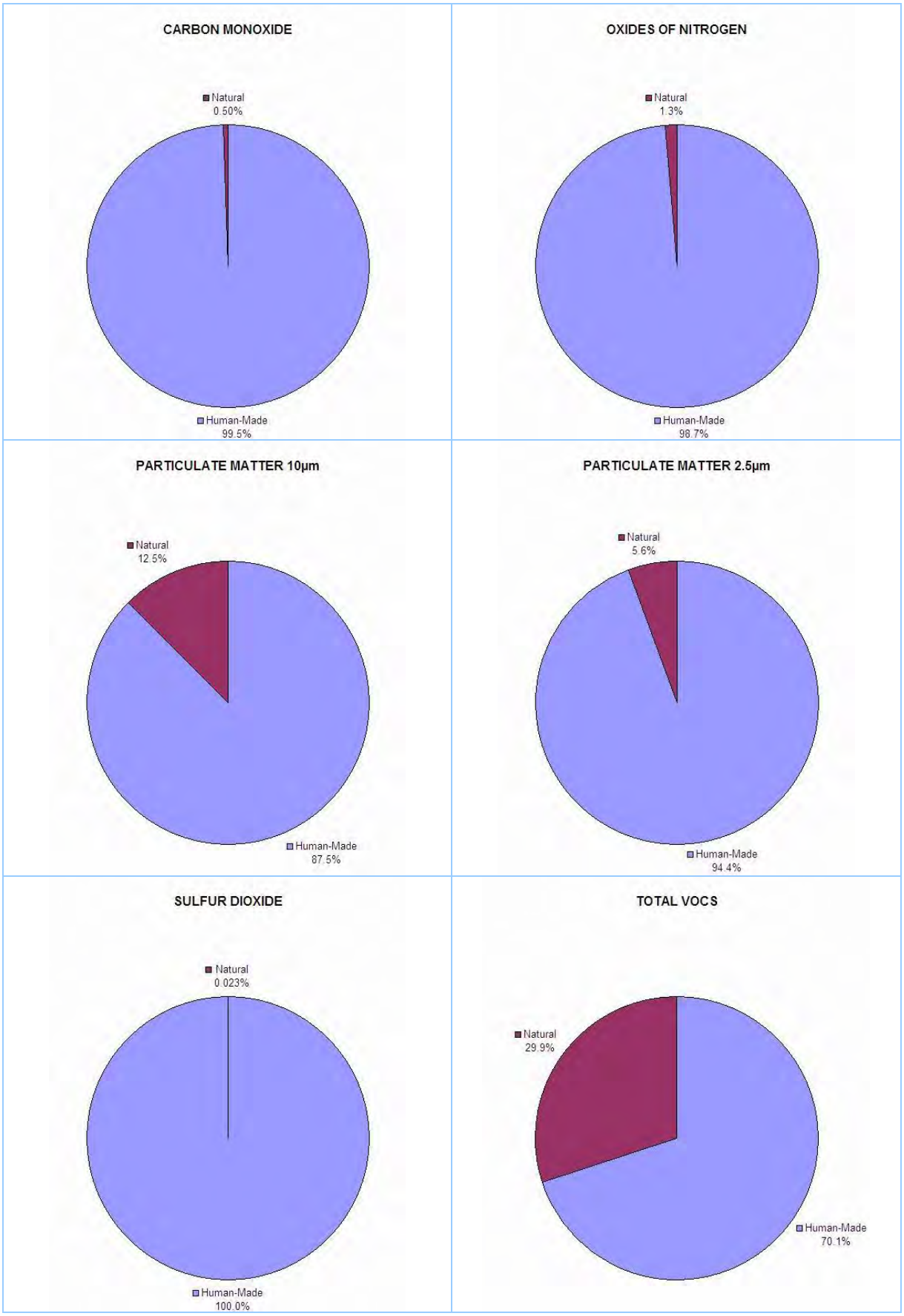

Figure 4-3: Proportions of total estimated annual emissions from natural and human-made sources in the Newcastle region

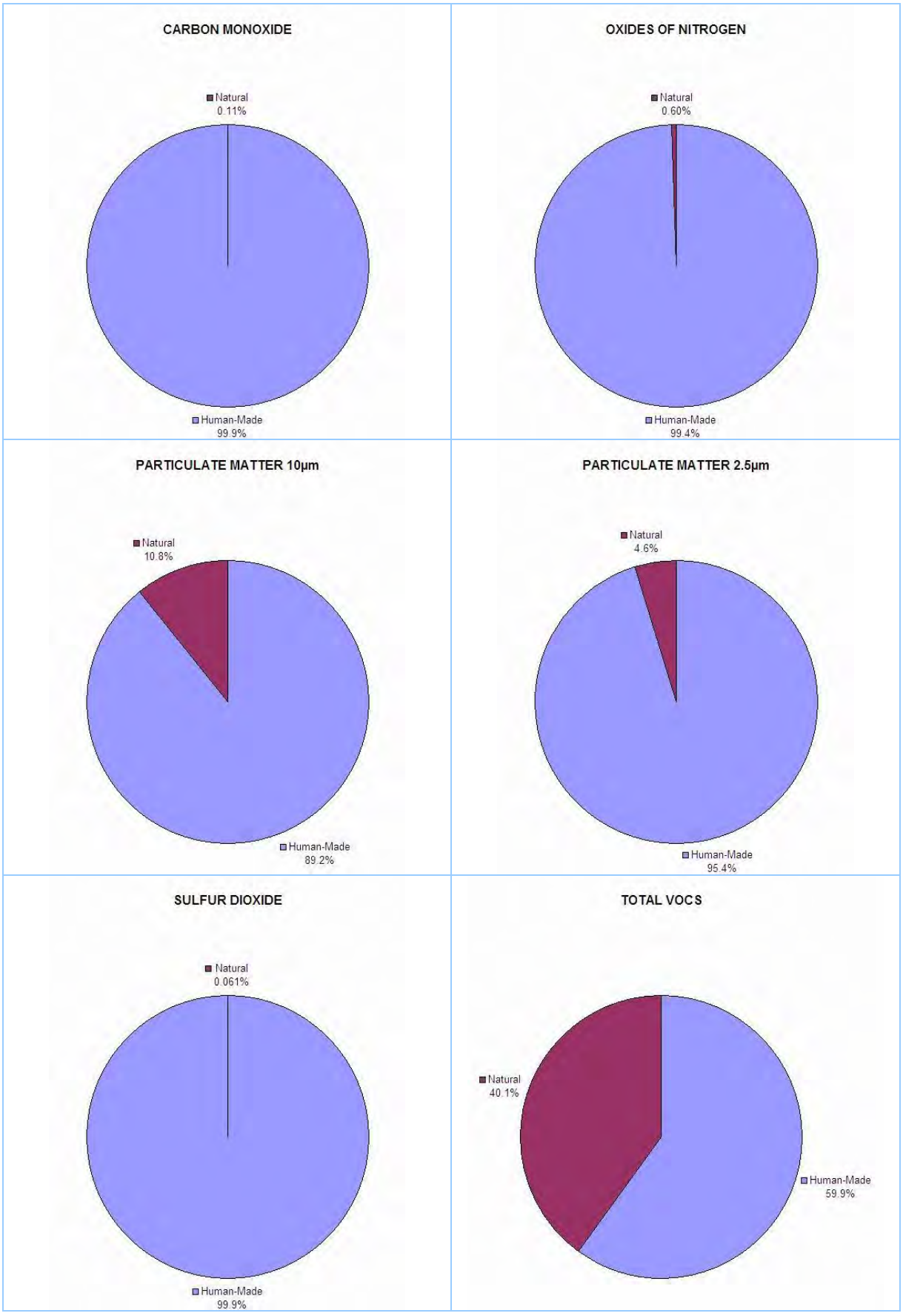

Figure 4-4: Proportions of total estimated annual emissions from natural and human-made sources in the Wollongong region

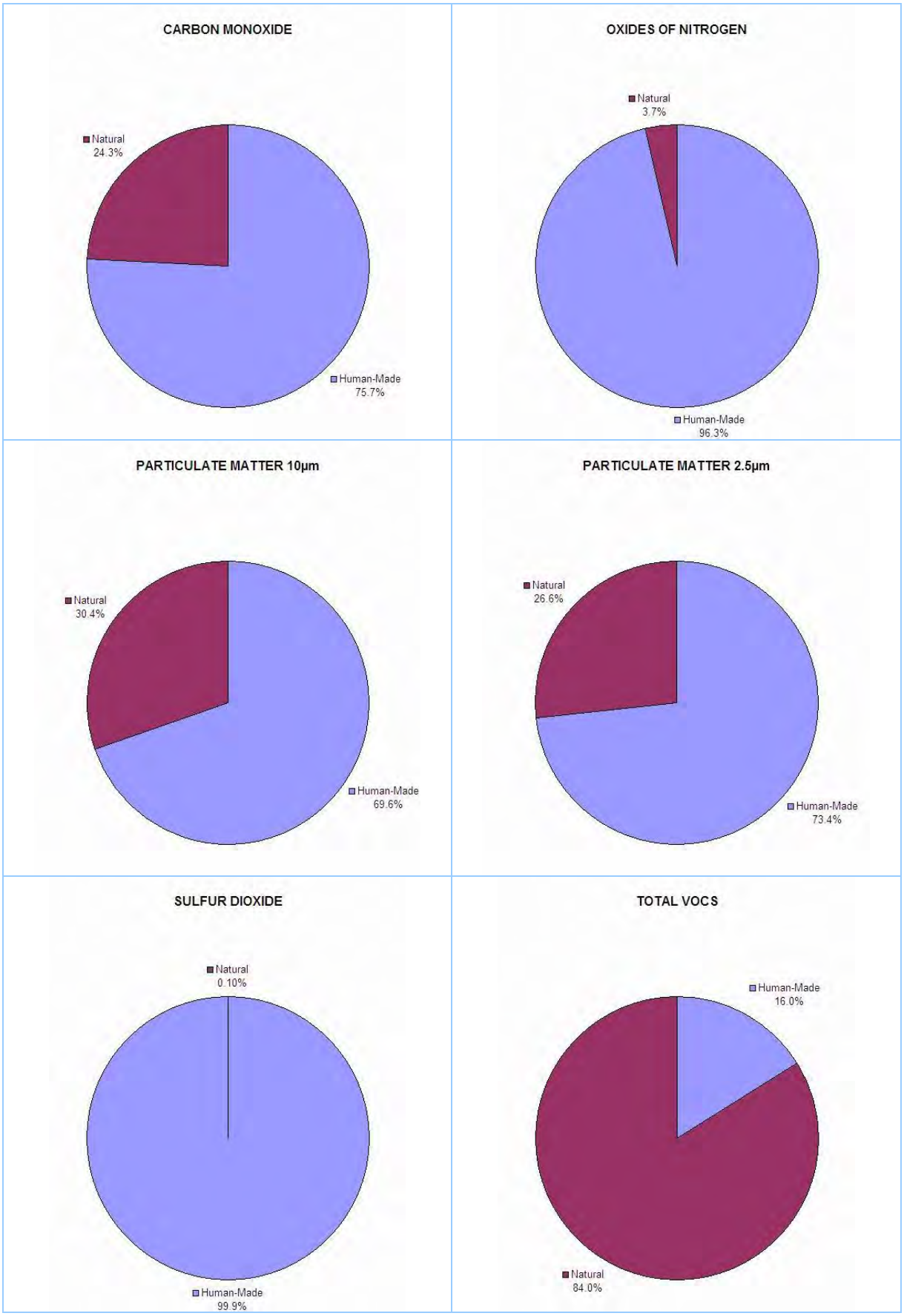

Figure 4-5: Proportions of total estimated annual emissions from natural and human-made sources in the Non Urban region

Table 4-3 presents total estimated annual emissions of criteria pollutants by human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 4-3: Total estimated annual emissions by human-made source type in each region

Substance	Region	Emissions (tonne/year)					
		Commercial	Domestic-Commercial	Industrial	Off-Road Mobile	On-Road Mobile	Grand Total
CARBON MONOXIDE	Sydney	335	82,186	14,173	20,801	123,712	241,208
	Newcastle	9.20	6,554	41,950	3,343	8,369	60,225
	Wollongong	20	4,412	529,474	1,698	4,786	540,390
	Non Urban	24	16,226	27,768	27,975	16,944	88,937
	GMR	389	109,377	613,365	53,817	153,812	930,759
OXIDES OF NITROGEN	Sydney	344	2,531	8,921	16,238	45,392	73,427
	Newcastle	39	184	1,833	3,548	3,902	9,506
	Wollongong	12	130	7,784	1,598	2,184	11,708
	Non Urban	106	445	172,873	31,826	9,453	214,704
	GMR	501	3,290	191,411	53,210	60,932	309,344
PARTICULATE MATTER ≤ 10 µm	Sydney	1,111	6,088	6,215	1,019	2,110	16,543
	Newcastle	129	504	3,744	284	176	4,838
	Wollongong	48	334	2,099	119	90	2,690
	Non Urban	732	1,262	61,155	2,185	417	65,752
	GMR	2,020	8,189	73,213	3,607	2,793	89,823
PARTICULATE MATTER ≤ 2.5 µm	Sydney	485	5,853	1,935	952	1,553	10,777
	Newcastle	30	485	1,110	266	131	2,023
	Wollongong	14	321	1,354	112	68	1,869
	Non Urban	167	1,214	13,273	2,104	319	17,076
	GMR	695	7,873	17,672	3,433	2,071	31,744
SULFUR DIOXIDE	Sydney	108	131	5,574	4,725	210	10,749
	Newcastle	1.62	11	10,266	1,300	15	11,593
	Wollongong	0.73	7.07	8,494	553	8.13	9,063
	Non Urban	70	26	256,139	1,246	35	257,516
	GMR	180	175	280,472	7,824	269	288,920
TOTAL VOLATILE ORGANIC COMPOUNDS	Sydney	6,652	53,178	8,205	7,341	23,512	98,889
	Newcastle	476	3,757	771	1,303	1,678	7,985
	Wollongong	358	2,660	716	591	879	5,205
	Non Urban	1,689	9,213	1,826	8,715	3,435	24,879
	GMR	9,176	68,809	11,519	17,950	29,504	136,957

Table 4-4 presents the proportions of total estimated annual emissions of criteria pollutants by human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 4-4: Proportions of total estimated annual emissions by human-made source type in each region

Substance	Region	Proportions (%)				
		Commercial	Domestic-Commercial	Industrial	Off-Road Mobile	On-Road Mobile
CARBON MONOXIDE	Sydney	0.14	34.07	5.88	8.62	51.29
	Newcastle	1.53×10^{-2}	10.88	69.66	5.55	13.90
	Wollongong	3.64×10^{-3}	0.82	97.98	0.31	0.89
	Non Urban	2.73×10^{-2}	18.24	31.22	31.45	19.05
	GMR	4.17×10^{-2}	11.75	65.90	5.78	16.53
OXIDES OF NITROGEN	Sydney	0.47	3.45	12.15	22.11	61.82
	Newcastle	0.41	1.94	19.28	37.32	41.05
	Wollongong	0.10	1.11	66.48	13.65	18.65
	Non Urban	4.93×10^{-2}	0.21	80.52	14.82	4.40
	GMR	0.16	1.06	61.88	17.20	19.70
PARTICULATE MATTER ≤ 10 µm	Sydney	6.72	36.80	37.57	6.16	12.76
	Newcastle	2.67	10.42	77.40	5.87	3.64
	Wollongong	1.77	12.42	78.03	4.42	3.35
	Non Urban	1.11	1.92	93.01	3.32	0.63
	GMR	2.25	9.12	81.51	4.02	3.11
PARTICULATE MATTER ≤ 2.5 µm	Sydney	4.50	54.31	17.95	8.83	14.41
	Newcastle	1.48	23.97	54.89	13.17	6.49
	Wollongong	0.74	17.20	72.44	5.97	3.65
	Non Urban	0.98	7.11	77.73	12.32	1.87
	GMR	2.19	24.80	55.67	10.82	6.52
SULFUR DIOXIDE	Sydney	1.01	1.22	51.86	43.96	1.96
	Newcastle	1.40×10^{-2}	9.06×10^{-2}	88.55	11.21	0.13
	Wollongong	8.01×10^{-3}	7.80×10^{-2}	93.72	6.10	8.97×10^{-2}
	Non Urban	2.71×10^{-2}	1.01×10^{-2}	99.47	0.48	1.36×10^{-2}
	GMR	6.25×10^{-2}	6.05×10^{-2}	97.08	2.71	9.30×10^{-2}
TOTAL VOLATILE ORGANIC COMPOUNDS	Sydney	6.73	53.78	8.30	7.42	23.78
	Newcastle	5.96	47.05	9.66	16.31	21.02
	Wollongong	6.89	51.11	13.76	11.36	16.88
	Non Urban	6.79	37.03	7.34	35.03	13.81
	GMR	6.70	50.24	8.41	13.11	21.54

Figure 4-6, Figure 4-7, Figure 4-8, Figure 4-9 and Figure 4-10 show the proportions of total estimated annual emissions of criteria pollutants by human-made source type in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

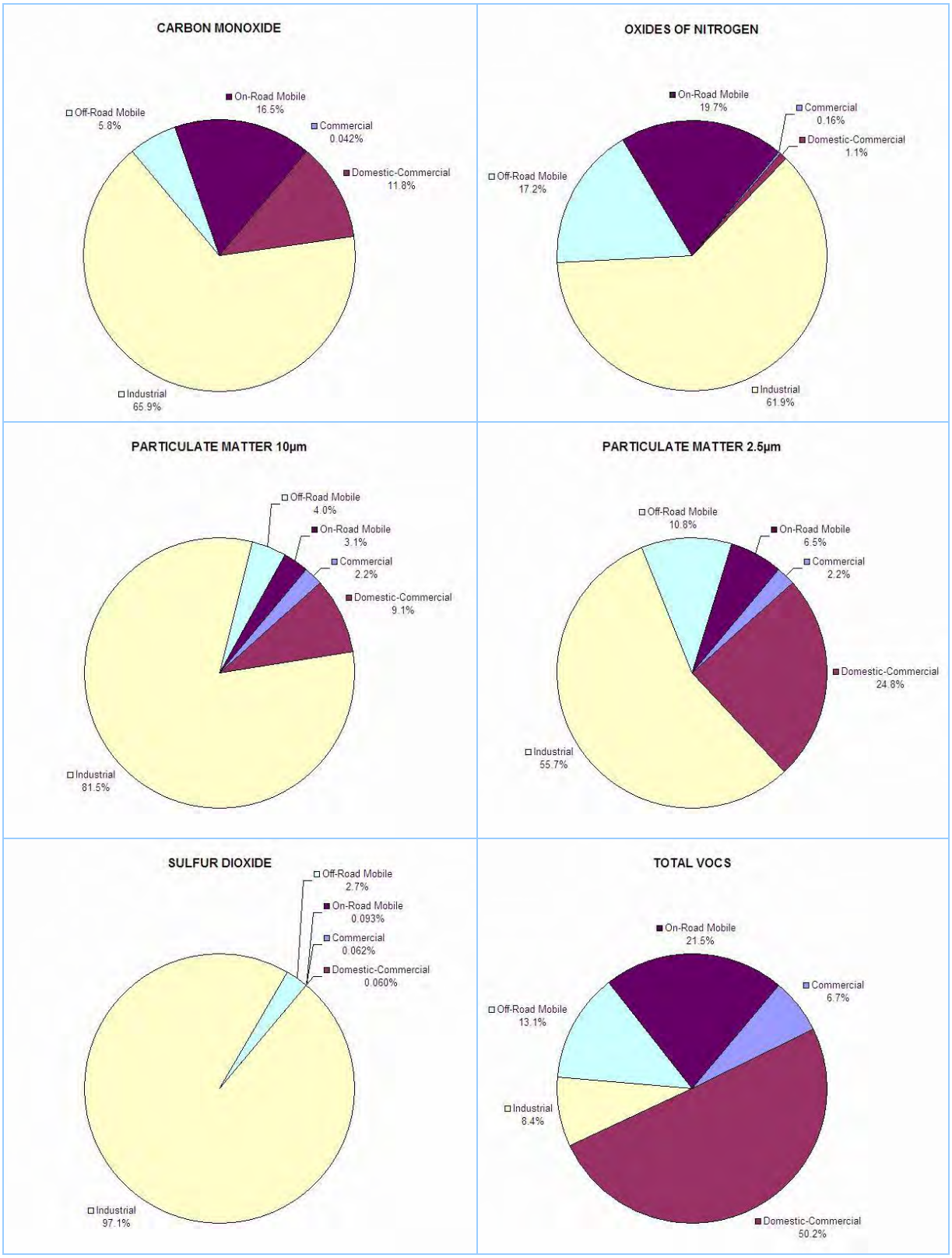

Figure 4-6: Proportions of total estimated annual emissions by human-made source type in the GMR

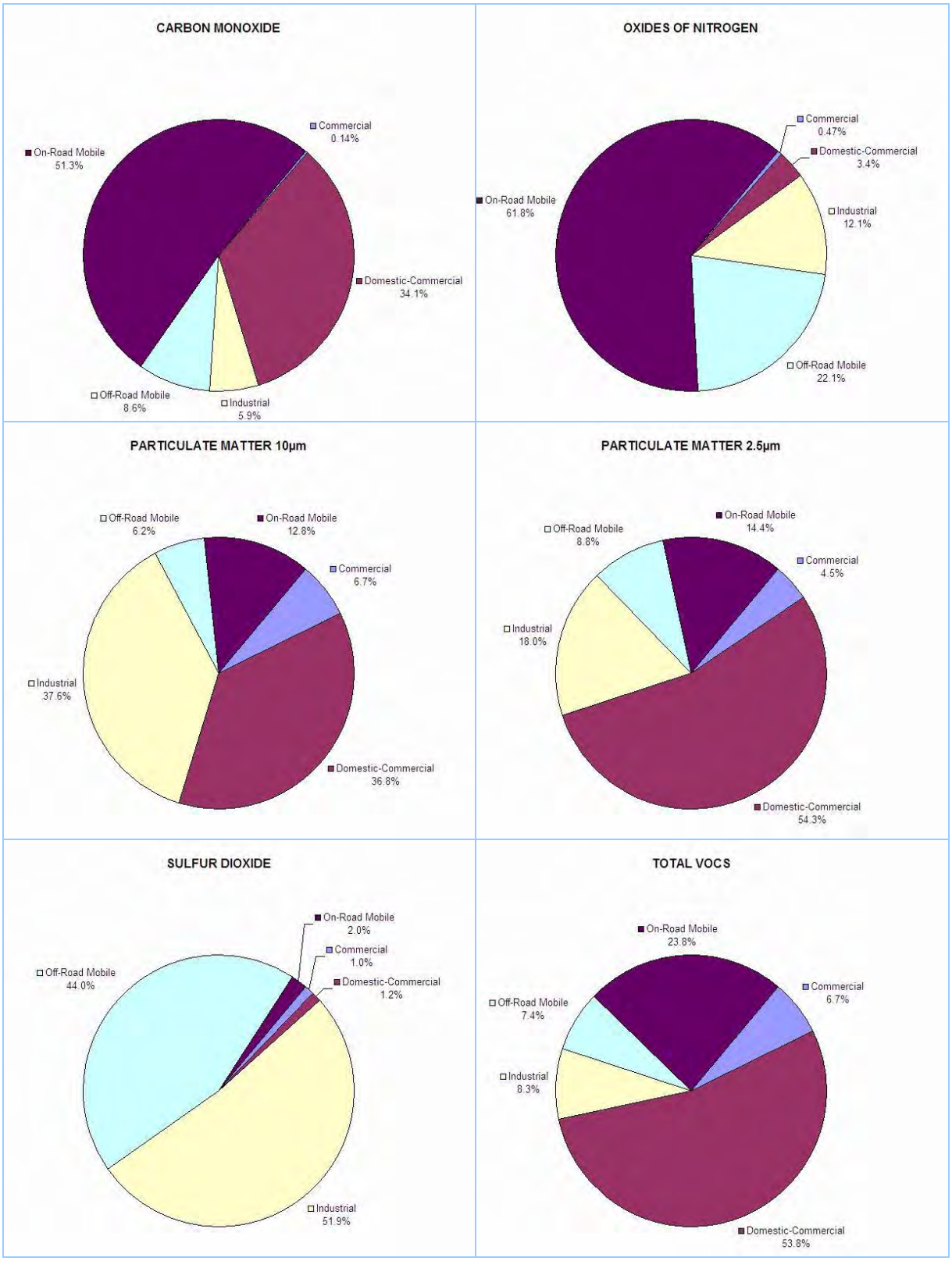

Figure 4-7: Proportions of total estimated annual emissions by human-made source type in the Sydney region

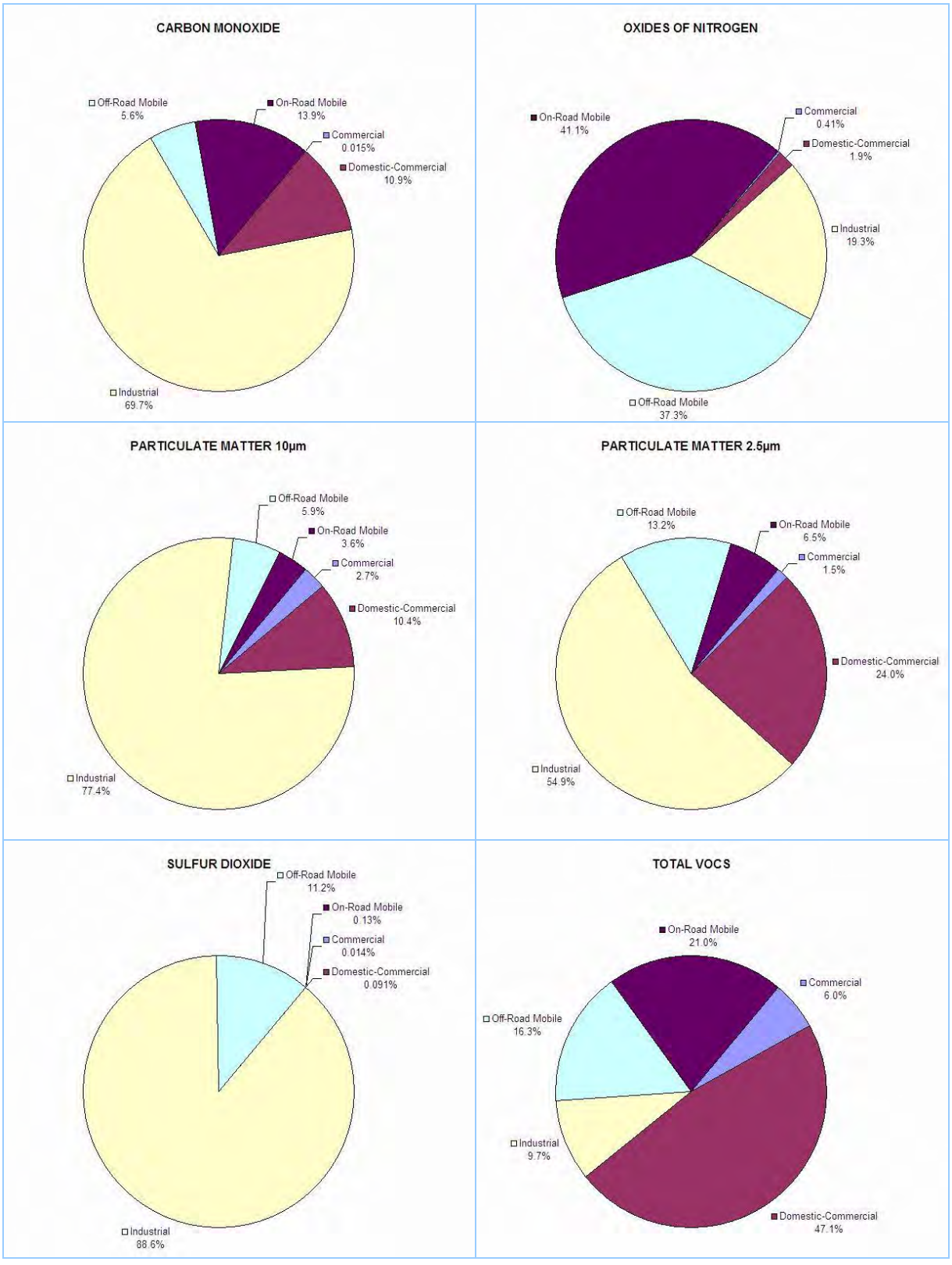

Figure 4-8: Proportions of total estimated annual emissions by human-made source type in the Newcastle region

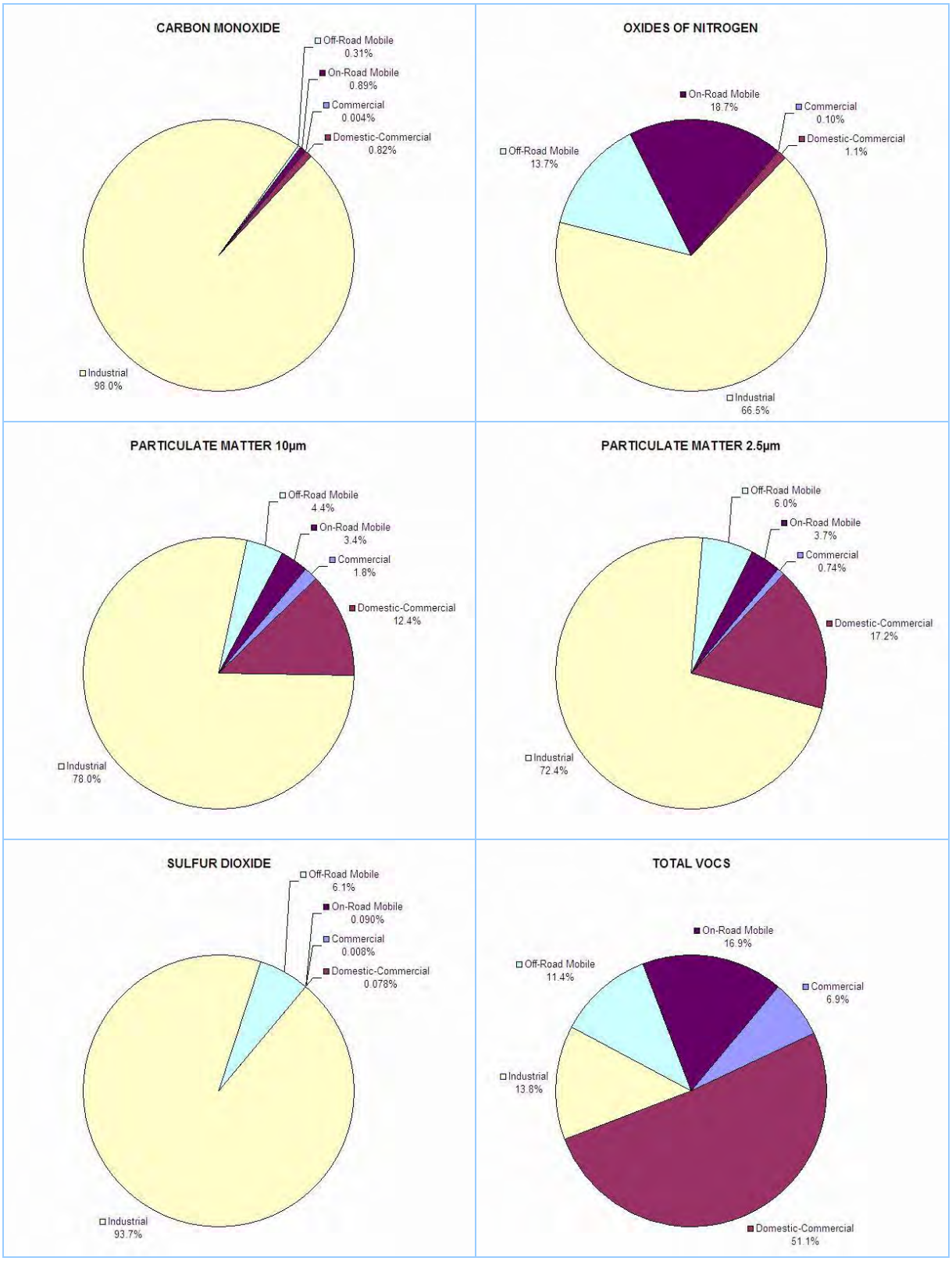

Figure 4-9: Proportions of total estimated annual emissions by human-made source type in the Wollongong region

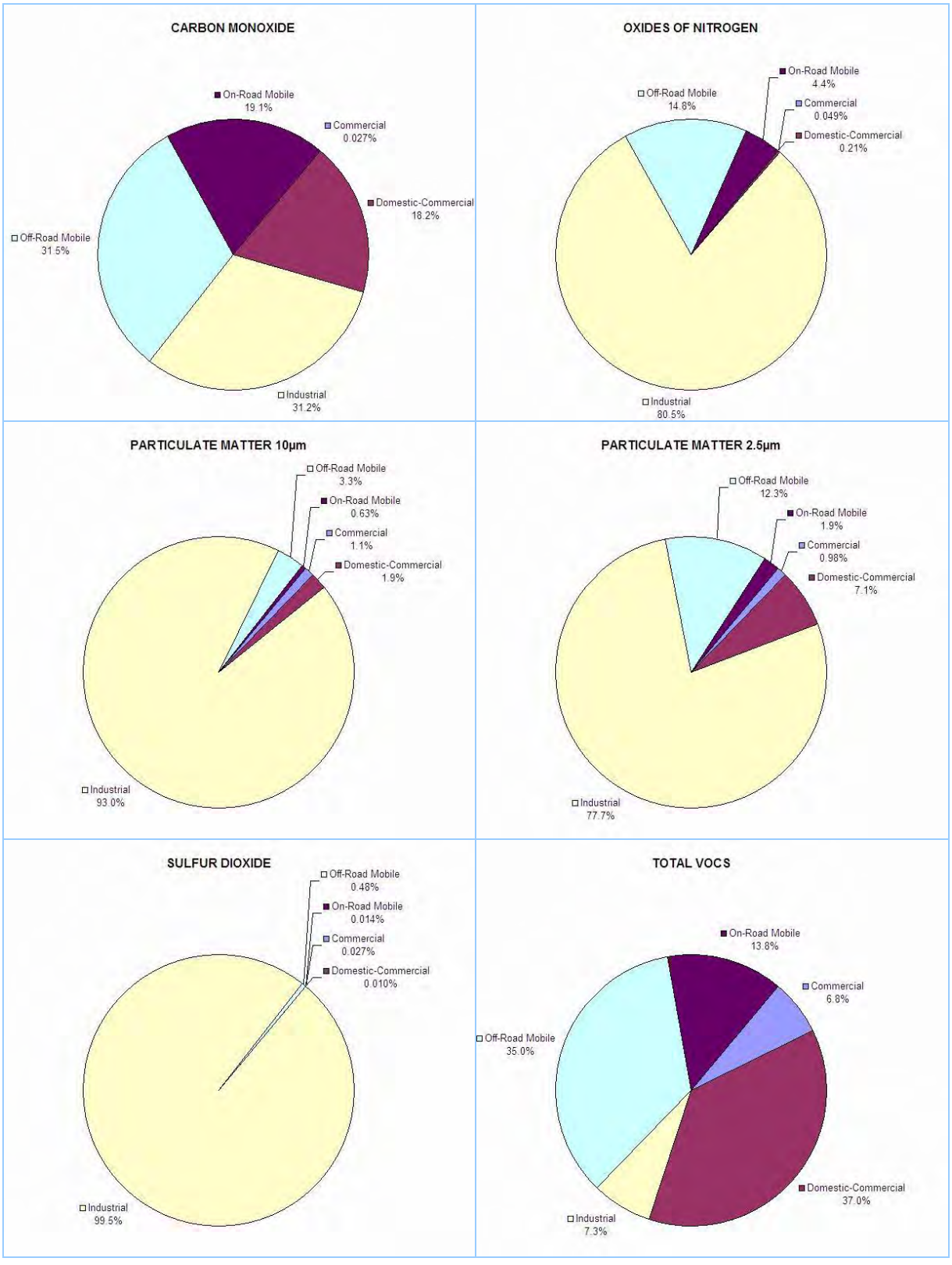

Figure 4-10: Proportions of total estimated annual emissions by human-made source type in the Non Urban region

Table 4-5 presents total estimated annual emissions, proportions and cumulative proportions for the top 10 human-made sources of carbon monoxide in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 4-5: Top 10 human-made sources of carbon monoxide in each region

Source type	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made CARBON MONOXIDE sources in the GMR				
Industrial	Iron or steel production (iron ore)	527,922	56.72	56.72
On-road mobile	Passenger vehicle petrol – exhaust	93,437	10.04	66.76
Domestic-commercial	Solid fuel burning (domestic)	53,985	5.80	72.56
Industrial	Aluminium production (alumina)	52,994	5.69	78.25
On-road mobile	Light duty commercial petrol – exhaust	48,731	5.24	83.49
Domestic-commercial	Lawn mowing exhaust (domestic)	34,994	3.76	87.25
Off-road mobile	Industrial vehicles and equipment	20,431	2.20	89.44
Domestic-commercial	Lawn mowing exhaust (public open spaces)	19,009	2.04	91.48
Off-road mobile	Recreational boats exhaust	14,585	1.57	93.05
Off-road mobile	Commercial boats exhaust	12,153	1.31	94.36
Human-made	Other	52,518	5.64	100.00
Top 10 human-made CARBON MONOXIDE sources in the Sydney region				
On-road mobile	Passenger vehicle petrol – exhaust	75,067	31.12	31.12
Domestic-commercial	Solid fuel burning (domestic)	40,034	16.60	47.72
On-road mobile	Light duty commercial petrol – exhaust	39,923	16.55	64.27
Domestic-commercial	Lawn mowing exhaust (domestic)	25,951	10.76	75.03
Domestic-commercial	Lawn mowing exhaust (public open spaces)	15,118	6.27	81.30
Off-road mobile	Recreational boats exhaust	6,912	2.87	84.16
Industrial	Iron or steel production (scrap metal)	6,882	2.85	87.01
Off-road mobile	Commercial boats exhaust	5,332	2.21	89.23
On-road mobile	Heavy duty commercial diesel – exhaust	4,081	1.69	90.92
On-road mobile	Others – exhaust	3,691	1.53	92.45
Human-made	Other	18,218	7.55	100.00
Top 10 human-made CARBON MONOXIDE sources in the Newcastle region				
Industrial	Aluminium production (alumina)	39,203	65.09	65.09
On-road mobile	Passenger vehicle petrol – exhaust	4,997	8.30	73.39
Domestic-commercial	Solid fuel burning (domestic)	3,345	5.55	78.95
On-road mobile	Light duty commercial petrol – exhaust	2,650	4.40	83.35
Industrial	Iron or steel production (scrap metal)	2,210	3.67	87.02
Domestic-commercial	Lawn mowing exhaust (domestic)	2,169	3.60	90.62
Off-road mobile	Commercial boats exhaust	1,566	2.60	93.22
Domestic-commercial	Lawn mowing exhaust (public open spaces)	965	1.60	94.82
Off-road mobile	Industrial vehicles and equipment	816	1.35	96.17
Off-road mobile	Recreational boats exhaust	717	1.19	97.37
Human-made	Other	1,586	2.63	100.00

Source type	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made CARBON MONOXIDE sources in the Wollongong region				
Industrial	Iron or steel production (iron ore)	527,922	97.69	97.69
On-road mobile	Passenger vehicle petrol – exhaust	2,861	0.53	98.22
Domestic-commercial	Solid fuel burning (domestic)	2,209	0.41	98.63
On-road mobile	Light duty commercial petrol – exhaust	1,564	0.29	98.92
Domestic-commercial	Lawn mowing exhaust (domestic)	1,432	0.27	99.19
Industrial	Metal plating or coating	1,049	0.19	99.38
Off-road mobile	Industrial vehicles and equipment	770	0.14	99.52
Off-road mobile	Recreational boats exhaust	762	0.14	99.66
Domestic-commercial	Lawn mowing exhaust (public open spaces)	716	0.13	99.80
Industrial	Generation of electrical power from gas	445	8.23×10^{-2}	99.88
Human-made	Other	660	0.12	100.00
Top 10 human-made CARBON MONOXIDE sources in the Non Urban region				
Off-road mobile	Industrial vehicles and equipment	15,361	17.27	17.27
Industrial	Aluminium production (alumina)	13,791	15.51	32.78
On-road mobile	Passenger vehicle petrol – exhaust	10,512	11.82	44.60
Domestic-commercial	Solid fuel burning (domestic)	8,396	9.44	54.04
Industrial	Generation of electrical power from coal	7,535	8.47	62.51
Off-road mobile	Recreational boats exhaust	6,194	6.96	69.48
Domestic-commercial	Lawn mowing exhaust (domestic)	5,443	6.12	75.60
Off-road mobile	Commercial boats exhaust	5,178	5.82	81.42
On-road mobile	Light duty commercial petrol – exhaust	4,595	5.17	86.58
Industrial	Mining for coal	4,497	5.06	91.64
Human-made	Other	7,435	8.36	100.00

Figure 4-11, Figure 4-12, Figure 4-13, Figure 4-14 and Figure 4-15 show the proportions of total estimated annual emissions for the top 10 human-made sources of carbon monoxide in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

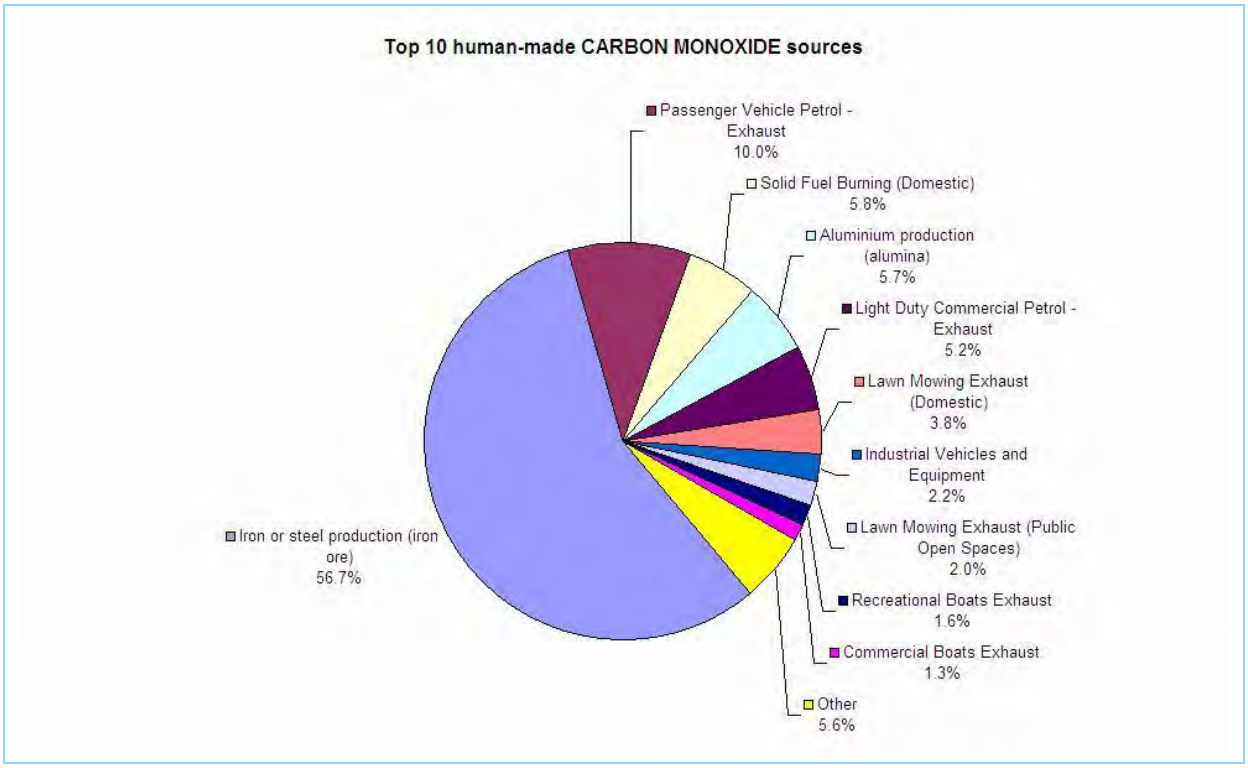

Figure 4-11: Top 10 human-made sources of carbon monoxide in the GMR

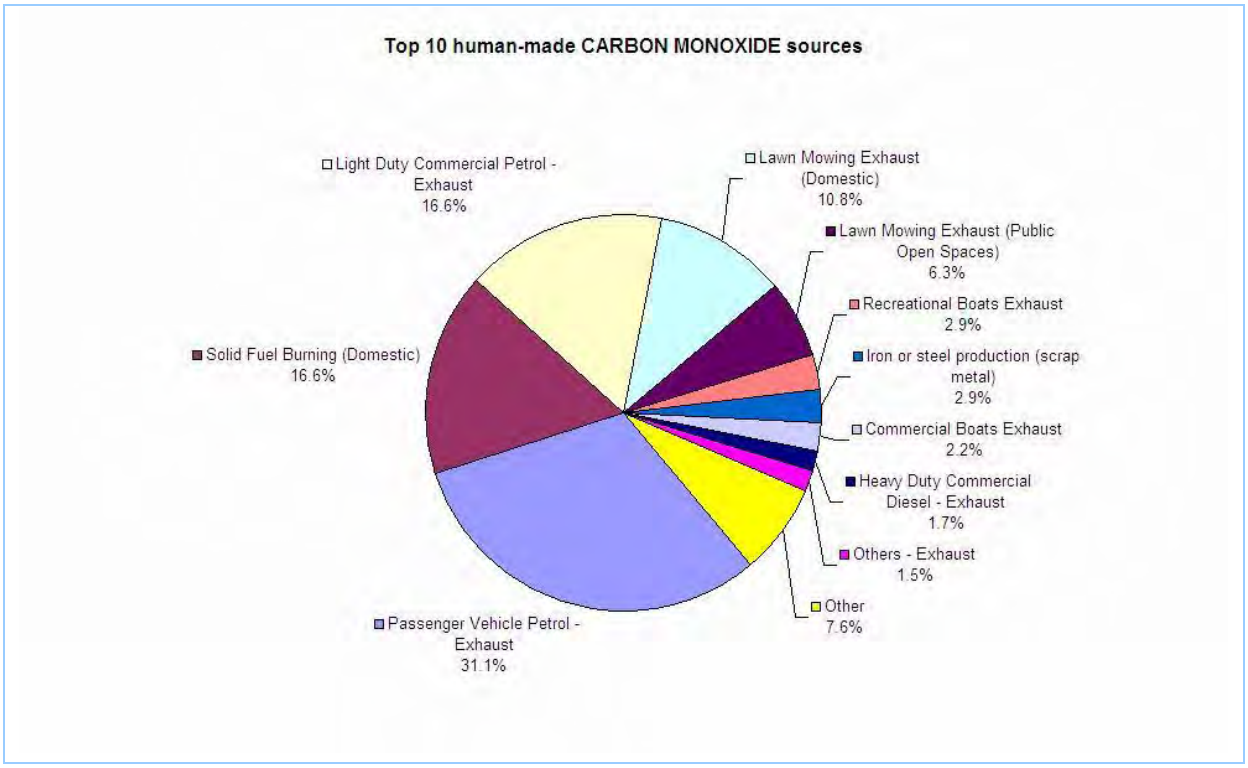

Figure 4-12: Top 10 human-made sources of carbon monoxide in the Sydney region

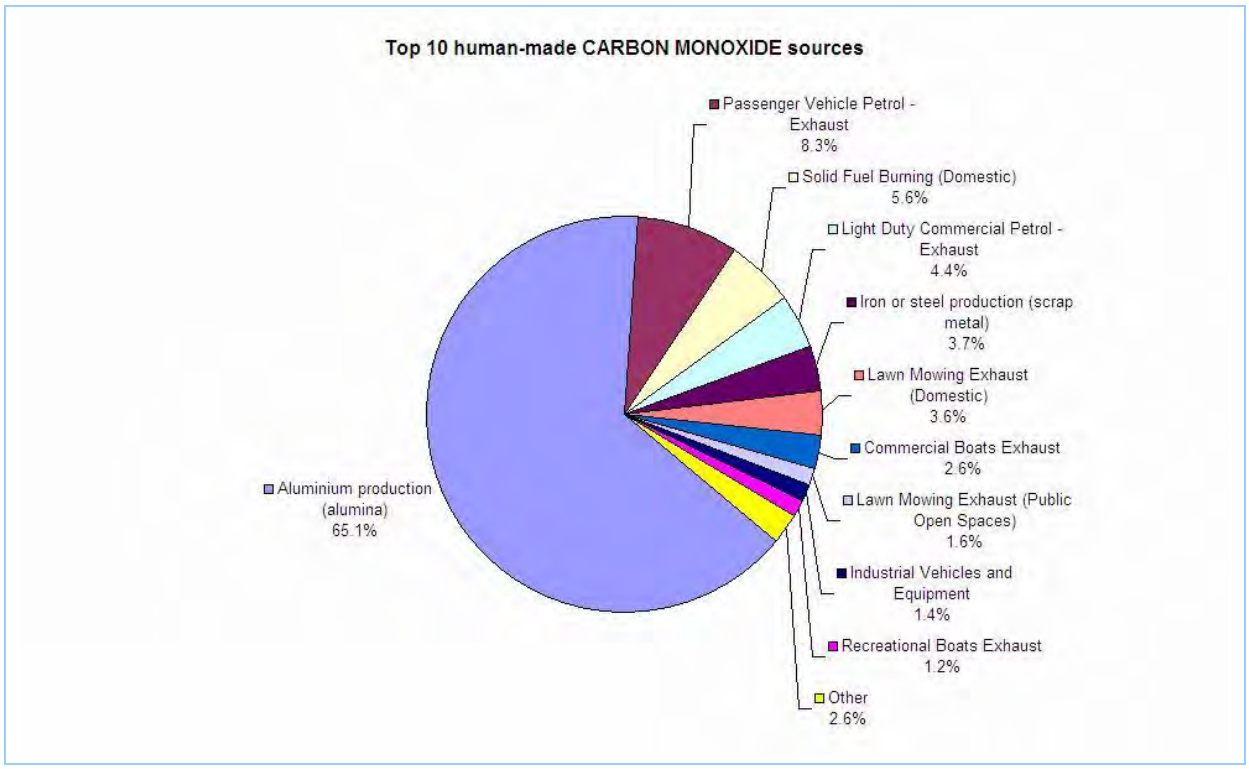

Figure 4-13: Top 10 human-made sources of carbon monoxide in the Newcastle region

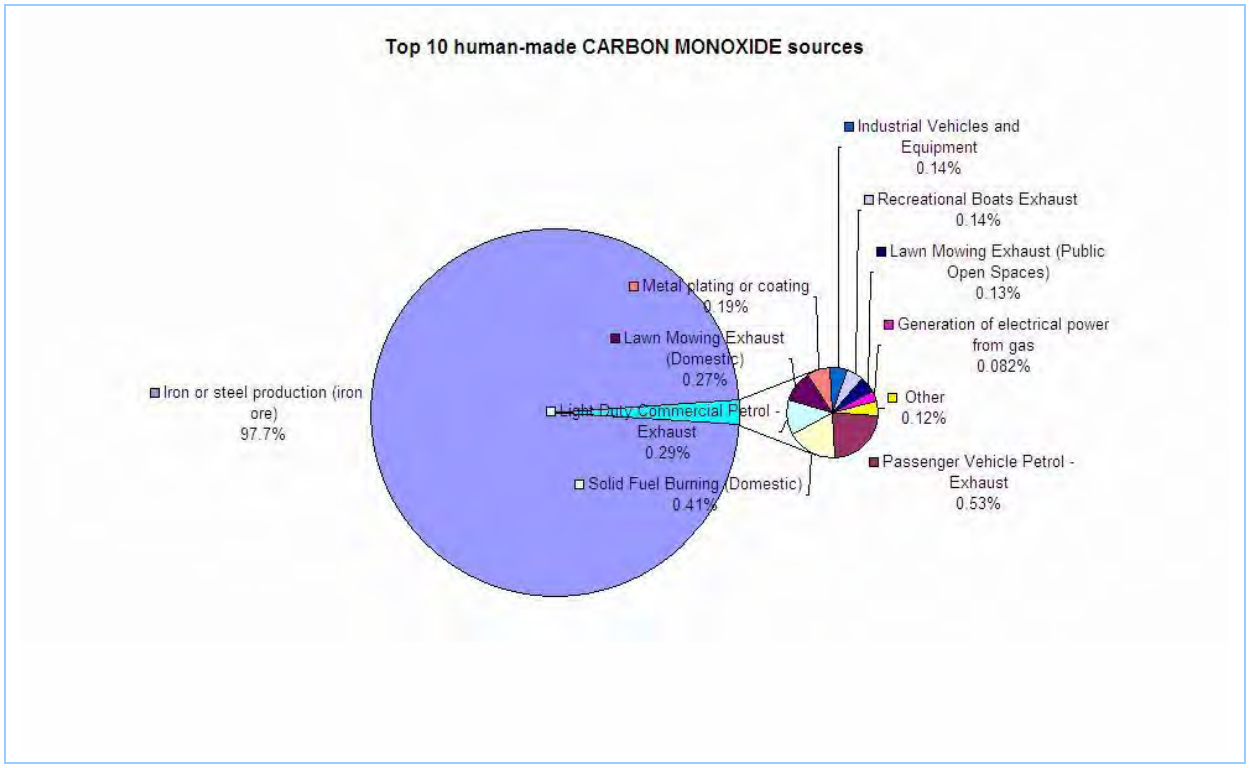

Figure 4-14: Top 10 human-made sources of carbon monoxide in the Wollongong region

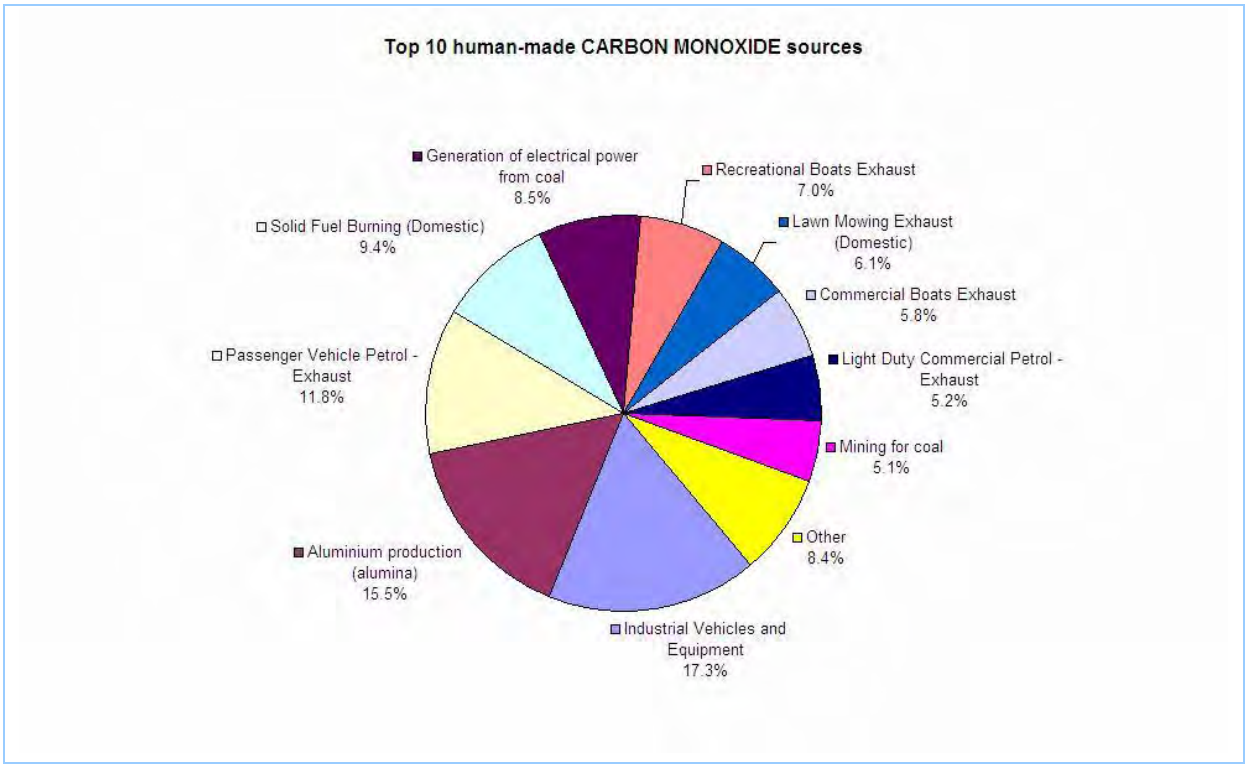

Figure 4-15: Top 10 human-made sources of carbon monoxide in the Non Urban region

Table 4-6 presents total estimated annual emissions, proportions and cumulative proportions for the top 10 human-made sources of oxides of nitrogen in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 4-6: Top 10 human-made sources of oxides of nitrogen in each region

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made OXIDES OF NITROGEN sources in the GMR				
Industrial	Generation of electrical power from coal	165,956	53.65	53.65
Off-road mobile	Industrial vehicles and equipment	30,716	9.93	63.58
On-road mobile	Passenger vehicle petrol – exhaust	27,515	8.89	72.47
On-road mobile	Heavy duty commercial diesel – exhaust	21,419	6.92	79.40
Off-road mobile	Ships	9,425	3.05	82.44
On-road mobile	Light duty commercial petrol – exhaust	8,679	2.81	85.25
Industrial	Iron or steel production (iron ore)	7,513	2.43	87.68
Off-road mobile	Locomotives	6,087	1.97	89.64
Industrial	Cement or lime production	5,020	1.62	91.27
Off-road mobile	Commercial boats exhaust	4,404	1.42	92.69
Human-made	Other	22,609	7.31	100.00
Top 10 human-made OXIDES OF NITROGEN sources in the Sydney region				
On-road mobile	Passenger vehicle petrol – exhaust	21,575	29.38	29.38
On-road mobile	Heavy duty commercial diesel – exhaust	14,423	19.64	49.03
On-road mobile	Light duty commercial petrol – exhaust	6,799	9.26	58.29
Off-road mobile	Ships	5,138	7.00	65.28
Off-road mobile	Commercial boats exhaust	3,319	4.52	69.80
Off-road mobile	Locomotives	2,927	3.99	73.79
Off-road mobile	Industrial vehicles and equipment	2,600	3.54	77.33
On-road mobile	Light duty diesel – exhaust	2,417	3.29	80.62
Industrial	Generation of electrical power from gas	2,077	2.83	83.45
Industrial	Petroleum products and fuel production	1,891	2.58	86.03
Human-made	Other	10,260	13.97	100.00
Top 10 human-made OXIDES OF NITROGEN sources in the Newcastle region				
On-road mobile	Passenger vehicle petrol – exhaust	1,666	17.52	17.52
Off-road mobile	Ships	1,643	17.28	34.81
On-road mobile	Heavy duty commercial diesel – exhaust	1,511	15.90	50.70
Off-road mobile	Industrial vehicles and equipment	1,305	13.73	64.43
Industrial	Ammonium nitrate production	844	8.88	73.31
On-road mobile	Light duty commercial petrol – exhaust	530	5.57	78.89
Industrial	Aluminium production (alumina)	347	3.65	82.54
Off-road mobile	Locomotives	306	3.22	85.75
Off-road mobile	Commercial boats exhaust	227	2.38	88.14
On-road mobile	Light duty diesel – exhaust	177	1.87	90.00
Human-made	Other	950	10.00	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made OXIDES OF NITROGEN sources in the Wollongong region				
Industrial	Iron or steel production (iron ore)	7,513	64.17	64.17
On-road mobile	Passenger vehicle petrol – exhaust	938	8.02	72.19
On-road mobile	Heavy duty commercial diesel – exhaust	783	6.68	78.87
Off-road mobile	Ships	706	6.03	84.90
Off-road mobile	Industrial vehicles and equipment	607	5.18	90.08
On-road mobile	Light duty commercial petrol – exhaust	346	2.96	93.04
Off-road mobile	Locomotives	252	2.15	95.19
Industrial	Generation of electrical power from gas	178	1.52	96.71
On-road mobile	Light duty diesel – exhaust	107	0.91	97.62
Domestic-commercial	Gaseous fuel burning	78	0.66	98.28
Human-made	Other	201	1.72	100.00
Top 10 human-made OXIDES OF NITROGEN sources in the Non Urban region				
Industrial	Generation of electrical power from coal	165,956	77.30	77.30
Off-road mobile	Industrial vehicles and equipment	26,204	12.20	89.50
On-road mobile	Heavy duty commercial diesel – exhaust	4,702	2.19	91.69
Industrial	Cement or lime production	4,213	1.96	93.65
On-road mobile	Passenger vehicle petrol – exhaust	3,336	1.55	95.21
Off-road mobile	Locomotives	2,602	1.21	96.42
Industrial	Mining for coal	2,313	1.08	97.50
Off-road mobile	Ships	1,938	0.90	98.40
On-road mobile	Light duty commercial petrol – exhaust	1,004	0.47	98.87
Off-road mobile	Commercial boats exhaust	843	0.39	99.26
Human-made	Other	1,593	0.74	100.00

Figure 4-16, Figure 4-17, Figure 4-18, Figure 4-19 and Figure 4-20 show the proportions of total estimated annual emissions for the top 10 human-made sources of oxides of nitrogen in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

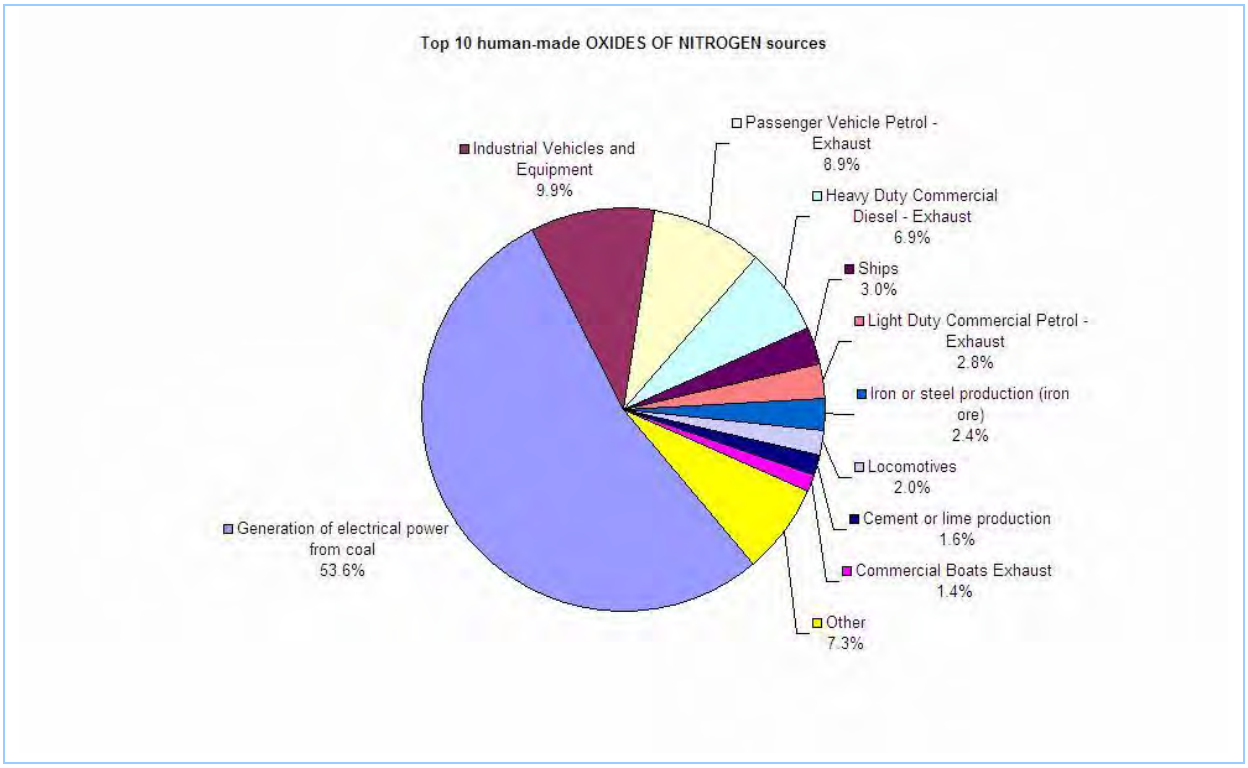

Figure 4-16: Top 10 human-made sources of oxides of nitrogen in the GMR

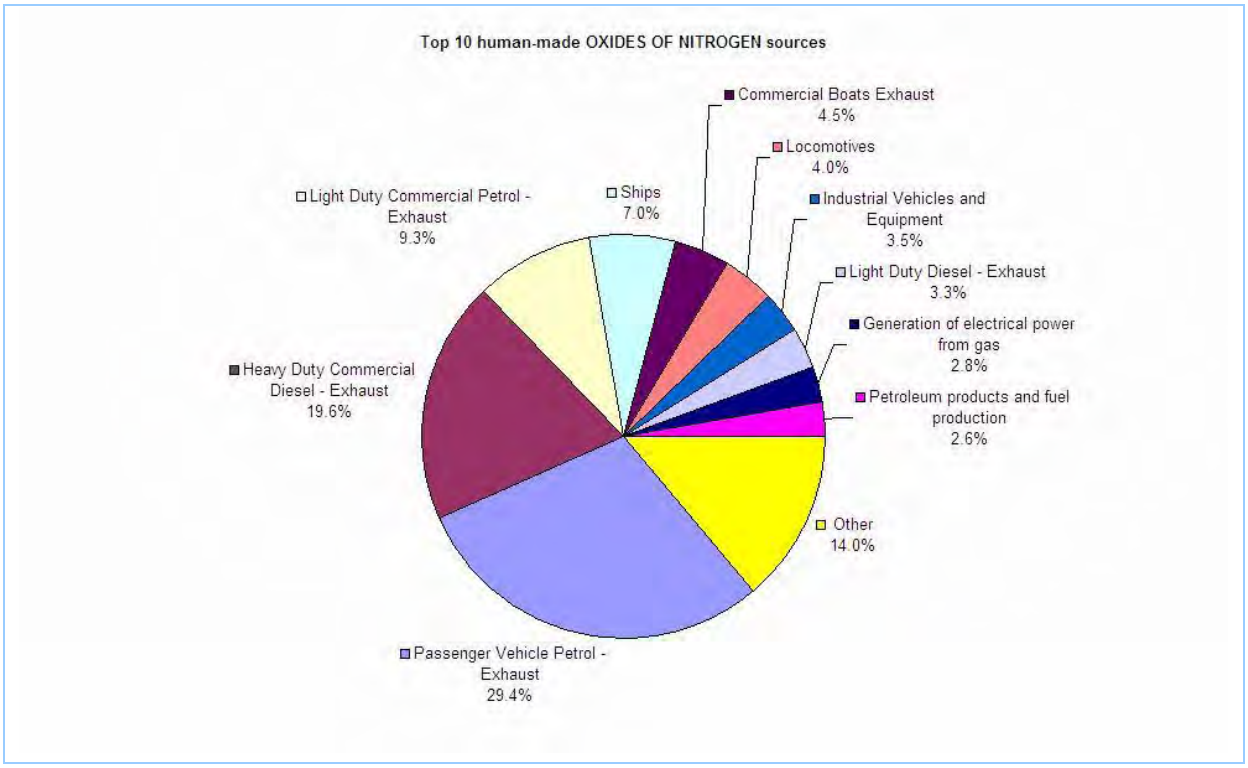

Figure 4-17: Top 10 human-made sources of oxides of nitrogen in the Sydney region

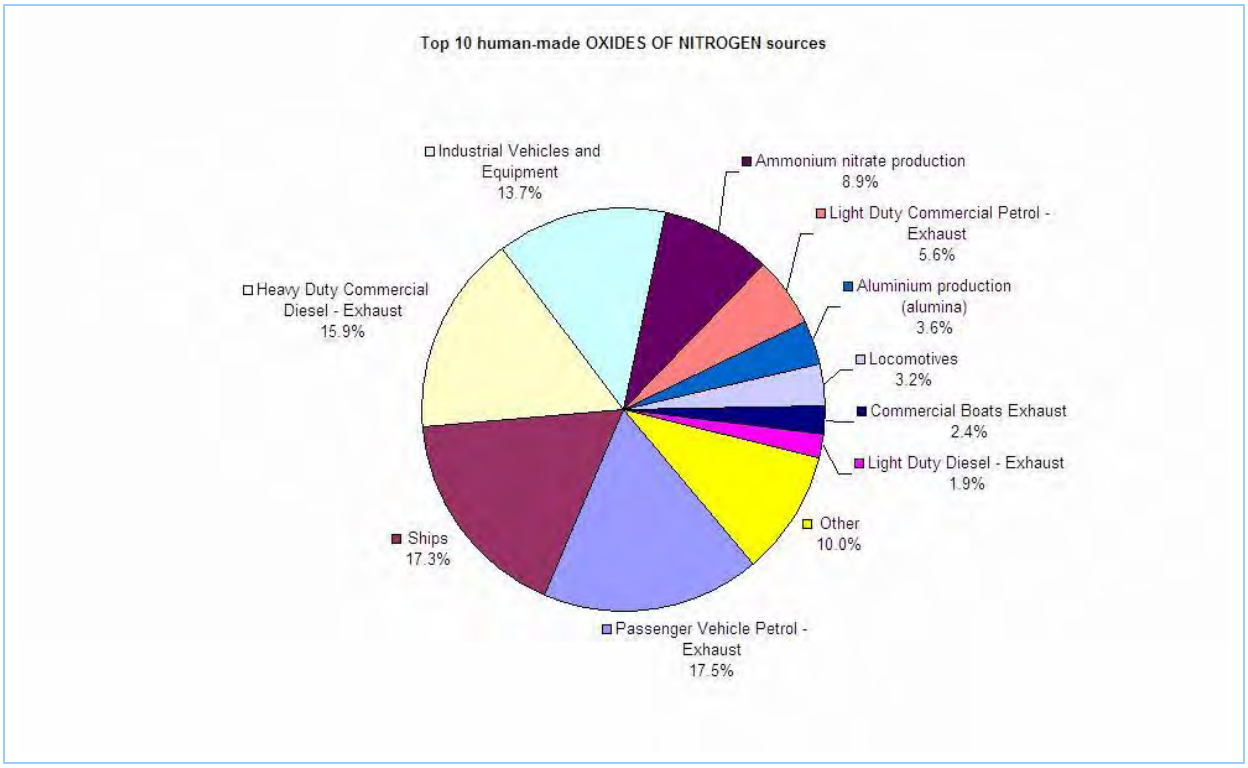

Figure 4-18: Top 10 human-made sources of oxides of nitrogen in the Newcastle region

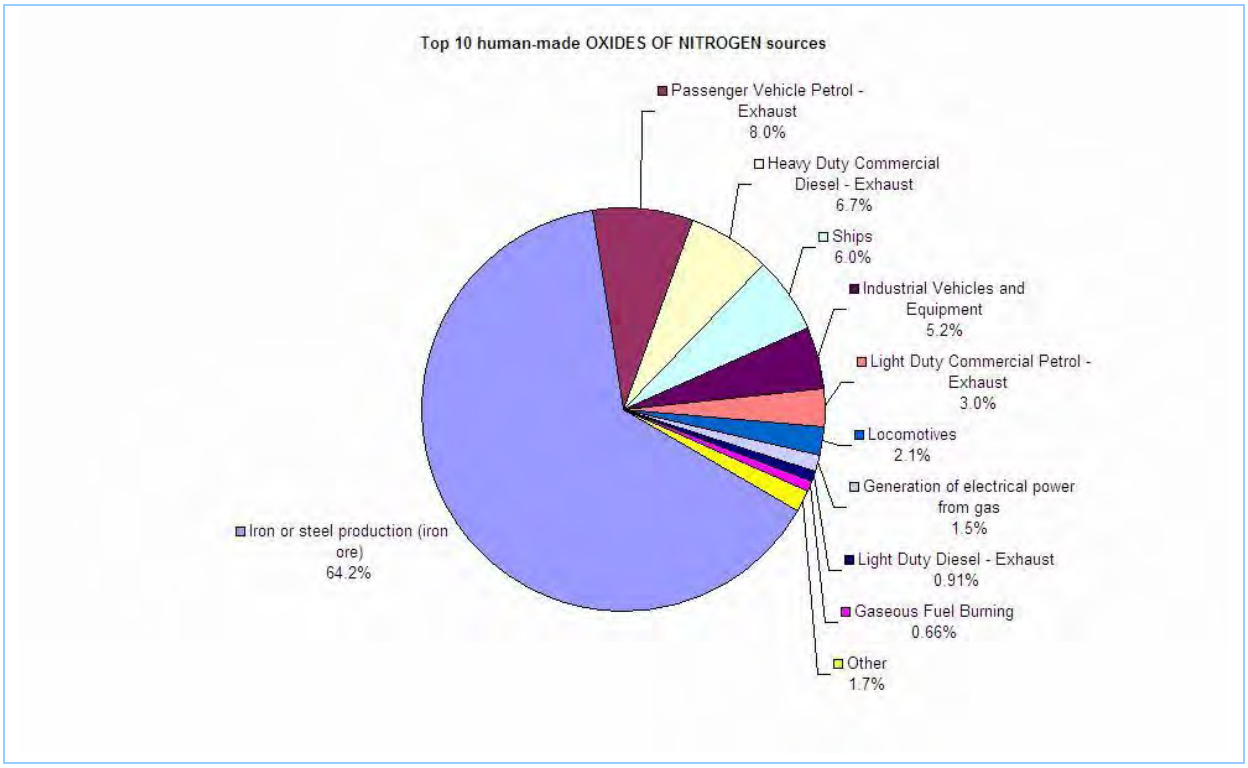

Figure 4-19: Top 10 human-made sources of oxides of nitrogen in the Wollongong region

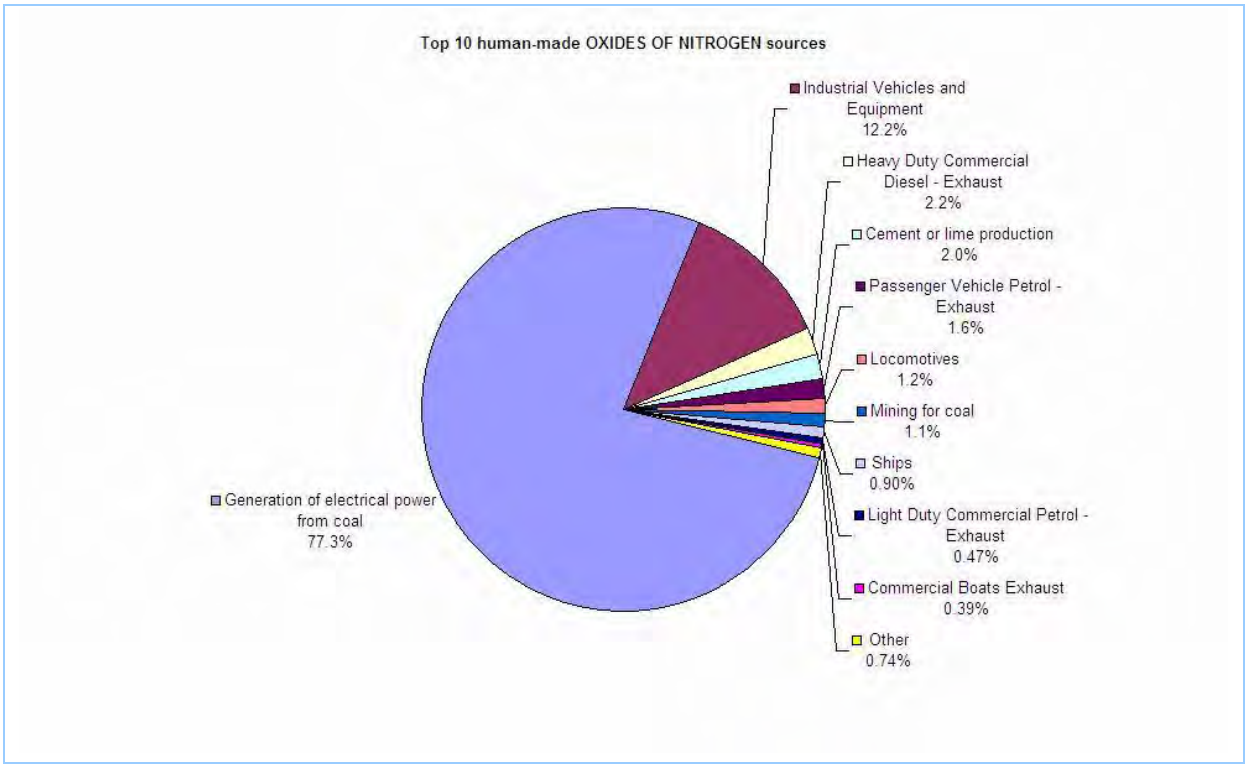

Figure 4-20: Top 10 human-made sources of oxides of nitrogen in the Non Urban region

Table 4-7 presents total estimated annual emissions, proportions and cumulative proportions for the top 10 human-made sources of particulate matter ≤ 10 µm in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 4-7: Top 10 human-made sources of particulate matter ≤ 10 µm in each region

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made PARTICULATE MATTER ≤ 10 µm sources in the GMR				
Industrial	Mining for coal	52,462	58.41	58.41
Domestic-commercial	Solid fuel burning (domestic)	7,645	8.51	66.92
Industrial	Generation of electrical power from coal	6,515	7.25	74.17
Industrial	Land-based extractive activity	2,802	3.12	77.29
Off-road mobile	Industrial vehicles and equipment	2,094	2.33	79.62
Industrial	Iron or steel production (iron ore)	1,749	1.95	81.57
Industrial	Waste disposal (application to land)	1,592	1.77	83.34
On-road mobile	All non-exhaust particulate matter	1,450	1.61	84.95
Commercial	Gravel and sand quarrying	1,388	1.54	86.50
Industrial	Other land-based extraction	1,363	1.52	88.02
Human-made	Other	10,763	11.98	100.00
Top 10 human-made PARTICULATE MATTER ≤ 10 µm sources in the Sydney region				
Domestic-commercial	Solid fuel burning (domestic)	5,669	34.27	34.27
Industrial	Other land-based extraction	1,300	7.86	42.13
Industrial	Waste disposal (application to land)	1,224	7.40	49.53
On-road mobile	All non-exhaust particulate matter	1,123	6.79	56.32
Industrial	Ceramics production	681	4.12	60.43
Commercial	Gravel and sand quarrying	646	3.91	64.34
On-road mobile	Heavy duty commercial diesel – exhaust	592	3.58	67.91
Off-road mobile	Ships	539	3.26	71.17
Industrial	Mining for coal	410	2.48	73.65
Industrial	Crushing, grinding or separating	372	2.25	75.90
Human-made	Other	3,987	24.10	100.00
Top 10 human-made PARTICULATE MATTER ≤ 10 µm sources in the Newcastle region				
Industrial	Mining for coal	1,747	36.11	36.11
Industrial	Coal works	753	15.57	51.68
Domestic-commercial	Solid fuel burning (domestic)	474	9.79	61.47
Industrial	Ammonium nitrate production	323	6.68	68.15
Industrial	Land-based extractive activity	207	4.27	72.43
Industrial	Aluminium production (alumina)	186	3.84	76.27
Off-road mobile	Ships	159	3.28	79.55
Industrial	Waste disposal (application to land)	158	3.27	82.81
Off-road mobile	Industrial vehicles and equipment	90	1.86	84.67
On-road mobile	All non-exhaust particulate matter	90	1.86	86.53
Human-made	Other	652	13.47	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made PARTICULATE MATTER ≤ 10 µm sources in the Wollongong region				
Industrial	Iron or steel production (iron ore)	1,749	65.02	65.02
Domestic-commercial	Solid fuel burning (domestic)	313	11.63	76.64
Industrial	Mining for coal	86	3.19	79.83
Industrial	Coal works	74	2.74	82.57
Off-road mobile	Ships	68	2.51	85.08
On-road mobile	All non-exhaust particulate matter	44	1.63	86.71
Industrial	Generation of electrical power from gas	36	1.32	88.04
Off-road mobile	Industrial vehicles and equipment	35	1.32	89.36
Commercial	Gravel and sand quarrying	35	1.31	90.66
Industrial	Waste disposal (application to land)	32	1.20	91.86
Human-made	Other	219	8.14	100.00
Top 10 human-made PARTICULATE MATTER ≤ 10 µm sources in the Non Urban region				
Industrial	Mining for coal	50,219	76.38	76.38
Industrial	Generation of electrical power from coal	6,515	9.91	86.29
Industrial	Land-based extractive activity	2,301	3.50	89.79
Off-road mobile	Industrial vehicles and equipment	1,818	2.77	92.55
Domestic-commercial	Solid fuel burning (domestic)	1,189	1.81	94.36
Industrial	Cement or lime production	637	0.97	95.33
Commercial	Gravel and sand quarrying	621	0.94	96.27
Industrial	Mining for minerals	441	0.67	96.94
Industrial	Aluminium production (alumina)	205	0.31	97.25
On-road mobile	All non-exhaust particulate matter	193	0.29	97.55
Human-made	Other	1,612	2.45	100.00

Figure 4-21, Figure 4-22, Figure 4-23, Figure 4-24 and Figure 4-25 show the proportions of total estimated annual emissions for the top 10 human-made sources of particulate matter ≤ 10 µm in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

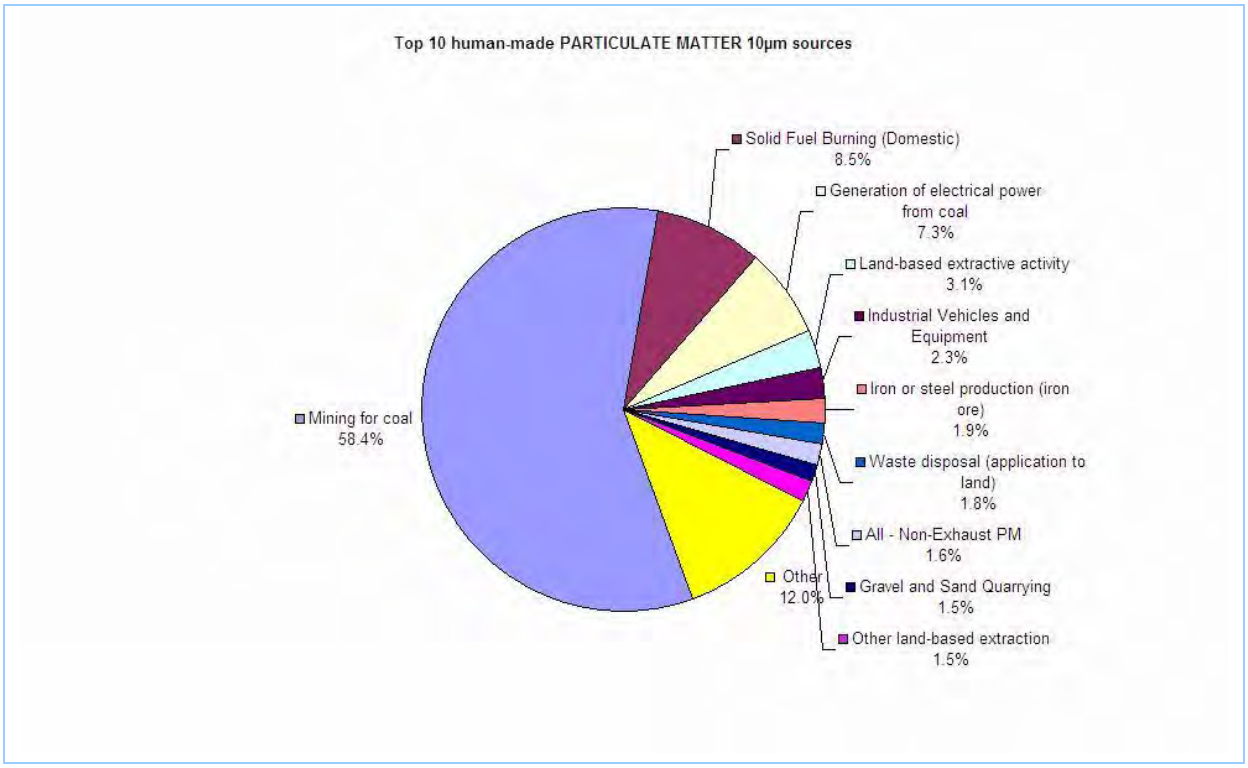

Figure 4-21: Top 10 human-made sources of particulate matter ≤ 10 µm in the GMR

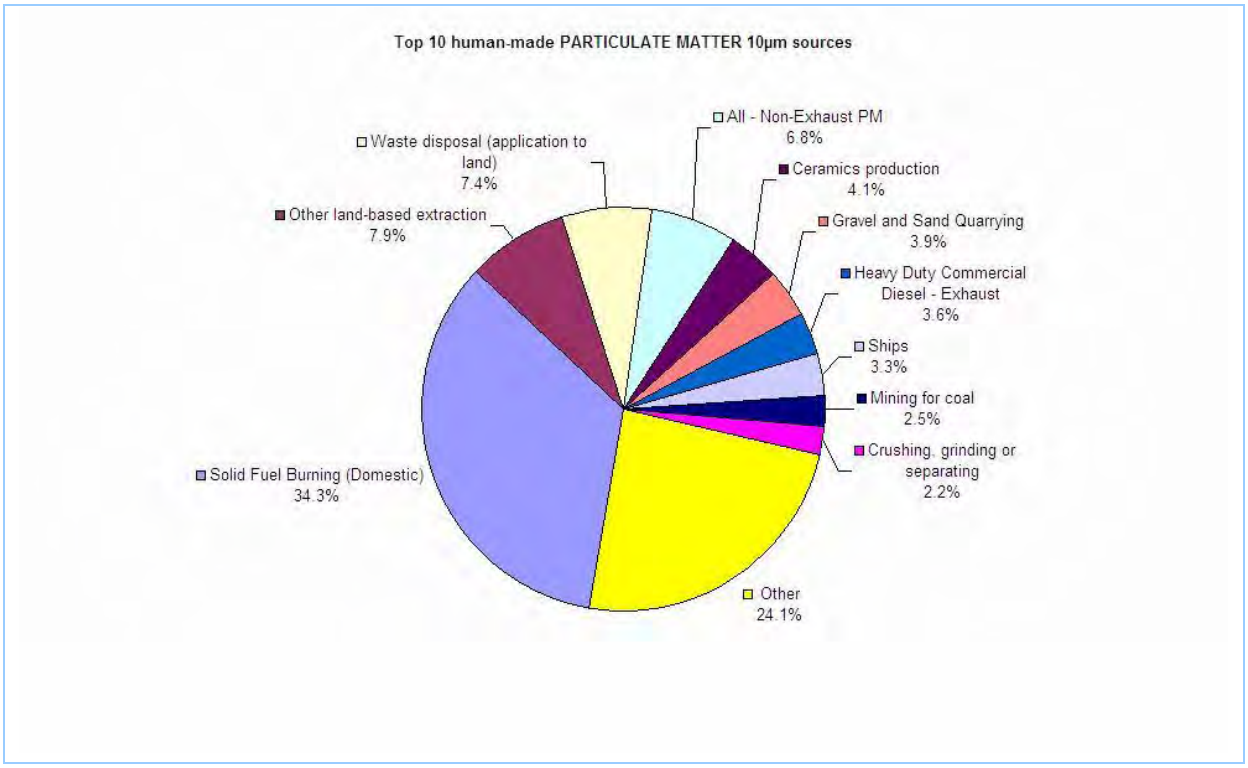

Figure 4-22: Top 10 human-made sources of particulate matter ≤ 10 µm in the Sydney region

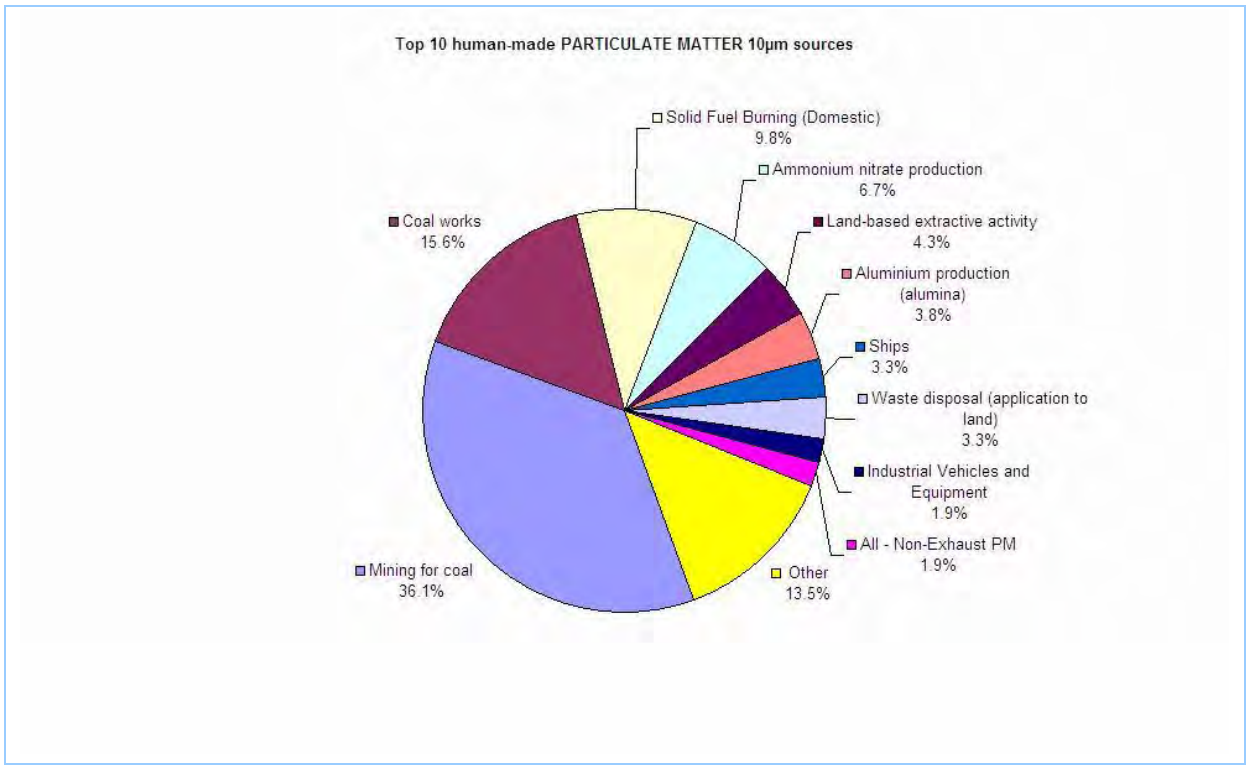

Figure 4-23: Top 10 human-made sources of particulate matter ≤ 10 µm in the Newcastle region

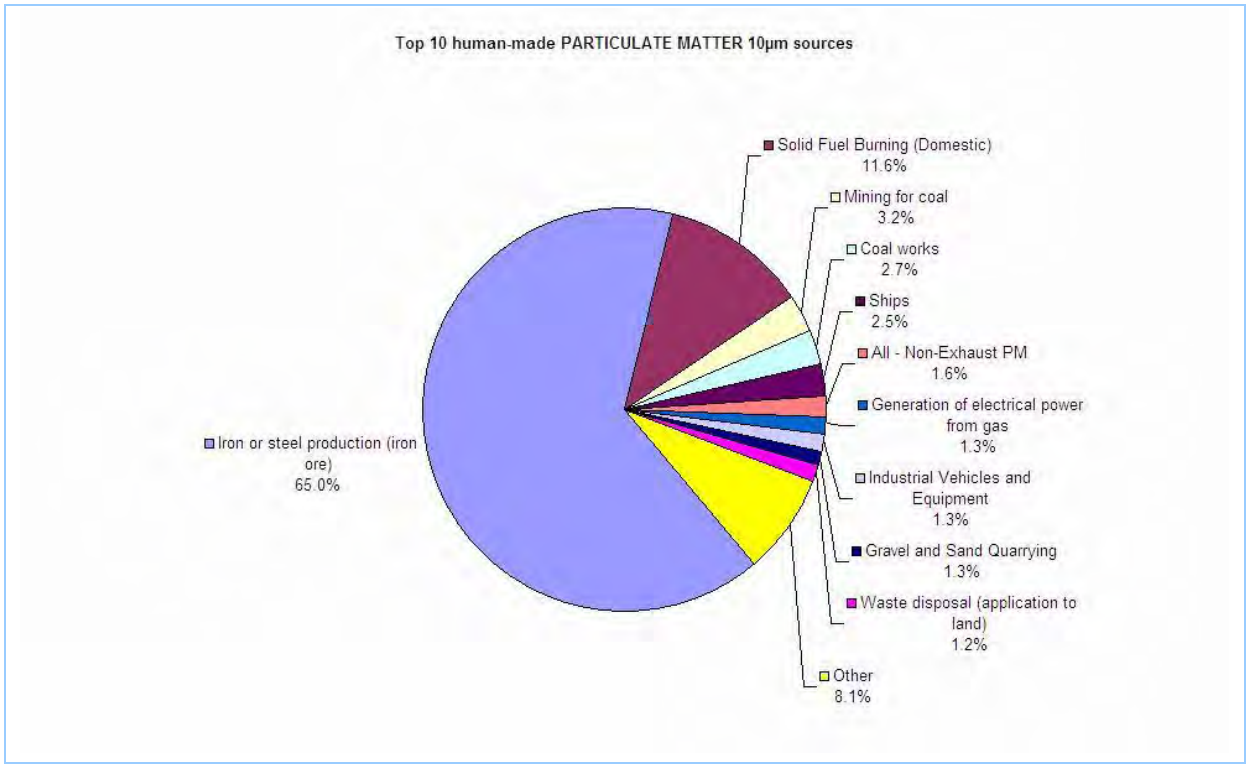

Figure 4-24: Top 10 human-made sources of particulate matter ≤ 10 µm in the Wollongong region

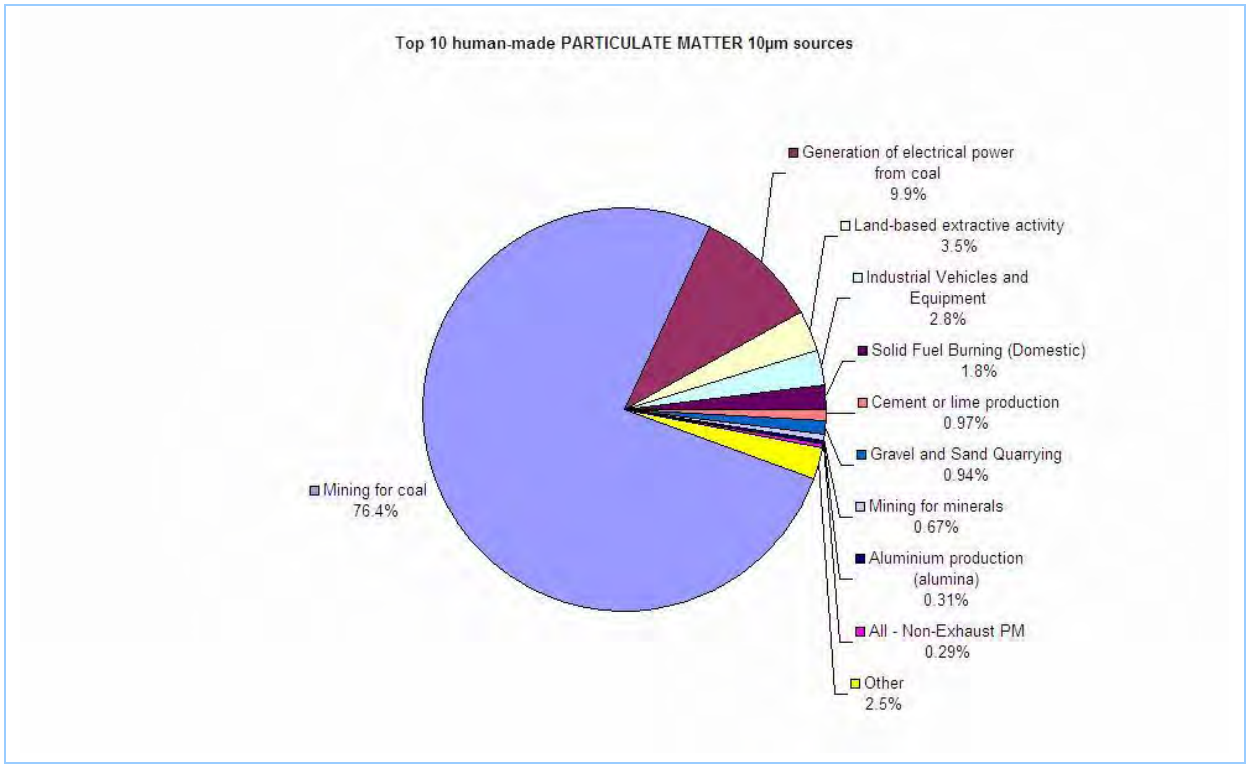

Figure 4-25: Top 10 human-made sources of particulate matter ≤ 10 µm in the Non Urban region

Table 4-8 presents total estimated annual emissions, proportions and cumulative proportions for the top 10 human-made sources of particulate matter ≤ 2.5 µm in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 4-8: Top 10 human-made sources of particulate matter ≤ 2.5 µm in each region

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made PARTICULATE MATTER ≤ 2.5 µm sources in the GMR				
Industrial	Mining for coal	8,832	27.82	27.82
Domestic-commercial	Solid fuel burning (domestic)	7,359	23.18	51.01
Industrial	Generation of electrical power from coal	3,335	10.51	61.51
Off-road mobile	Industrial vehicles and equipment	2,031	6.40	67.91
Industrial	Iron or steel production (iron ore)	1,223	3.85	71.76
Off-road mobile	Ships	849	2.67	74.44
On-road mobile	Heavy duty commercial diesel – exhaust	816	2.57	77.01
On-road mobile	All non-exhaust particulate matter	771	2.43	79.44
Industrial	Ceramics production	593	1.87	81.30
Industrial	Cement or lime production	582	1.83	83.14
Human-made	Other	5,352	16.86	100.00
Top 10 human-made PARTICULATE MATTER ≤ 2.5 µm sources in the Sydney region				
Domestic-commercial	Solid fuel burning (domestic)	5,457	50.64	50.64
On-road mobile	All non-exhaust particulate matter	597	5.54	56.19
On-road mobile	Heavy duty commercial diesel – exhaust	574	5.33	61.51
Off-road mobile	Ships	496	4.60	66.11
Industrial	Ceramics production	478	4.43	70.55
On-road mobile	Light duty diesel – exhaust	239	2.22	72.77
Industrial	Waste disposal (application to land)	226	2.10	74.87
Commercial	Synthetic resin manufacturing	189	1.75	76.62
Off-road mobile	Industrial vehicles and equipment	146	1.35	77.98
Industrial	Other land-based extraction	145	1.35	79.32
Human-made	Other	2,228	20.68	100.00
Top 10 human-made PARTICULATE MATTER ≤ 2.5 µm sources in the Newcastle region				
Domestic-commercial	Solid fuel burning (domestic)	456	22.54	22.54
Industrial	Ammonium nitrate production	316	15.63	38.17
Industrial	Mining for coal	302	14.91	53.08
Off-road mobile	Ships	146	7.21	60.29
Industrial	Aluminium production (alumina)	119	5.90	66.19
Industrial	Coal works	93	4.61	70.81
Off-road mobile	Industrial vehicles and equipment	87	4.31	75.12
On-road mobile	Heavy duty commercial diesel – exhaust	56	2.74	77.86
Industrial	Iron or steel production (scrap metal)	53	2.60	80.46
Industrial	Boat construction/maintenance (dry/float)	49	2.41	82.88
Human-made	Other	346	17.12	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made PARTICULATE MATTER ≤ 2.5 µm sources in the Wollongong region				
Industrial	Iron or steel production (iron ore)	1,223	65.46	65.46
Domestic-commercial	Solid fuel burning (domestic)	301	16.12	81.57
Off-road mobile	Ships	62	3.33	84.90
Industrial	Generation of electrical power from gas	36	1.90	86.81
Off-road mobile	Industrial vehicles and equipment	34	1.84	88.65
On-road mobile	Heavy duty commercial diesel – exhaust	28	1.50	90.15
Industrial	Coke production	28	1.48	91.63
On-road mobile	All non-exhaust particulate matter	23	1.25	92.88
Industrial	Mining for coal	12	0.63	93.50
Industrial	Coal works	11	0.61	94.11
Human-made	Other	110	5.89	100.00
Top 10 human-made PARTICULATE MATTER ≤ 2.5 µm sources in the Non Urban region				
Industrial	Mining for coal	8,467	49.58	49.58
Industrial	Generation of electrical power from coal	3,335	19.53	69.11
Off-road mobile	Industrial vehicles and equipment	1,764	10.33	79.44
Domestic-commercial	Solid fuel burning (domestic)	1,145	6.70	86.15
Industrial	Cement or lime production	544	3.19	89.33
Industrial	Land-based extractive activity	463	2.71	92.05
On-road mobile	Heavy duty commercial diesel – exhaust	159	0.93	92.98
Off-road mobile	Ships	145	0.85	93.82
Commercial	Gravel and sand quarrying	136	0.80	94.62
Industrial	Aluminium production (alumina)	135	0.79	95.41
Human-made	Other	784	4.59	100.00

Figure 4-26, Figure 4-27, Figure 4-28, Figure 4-29 and Figure 4-30 show the proportions of total estimated annual emissions for the top 10 human-made sources of particulate matter ≤ 2.5 µm in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

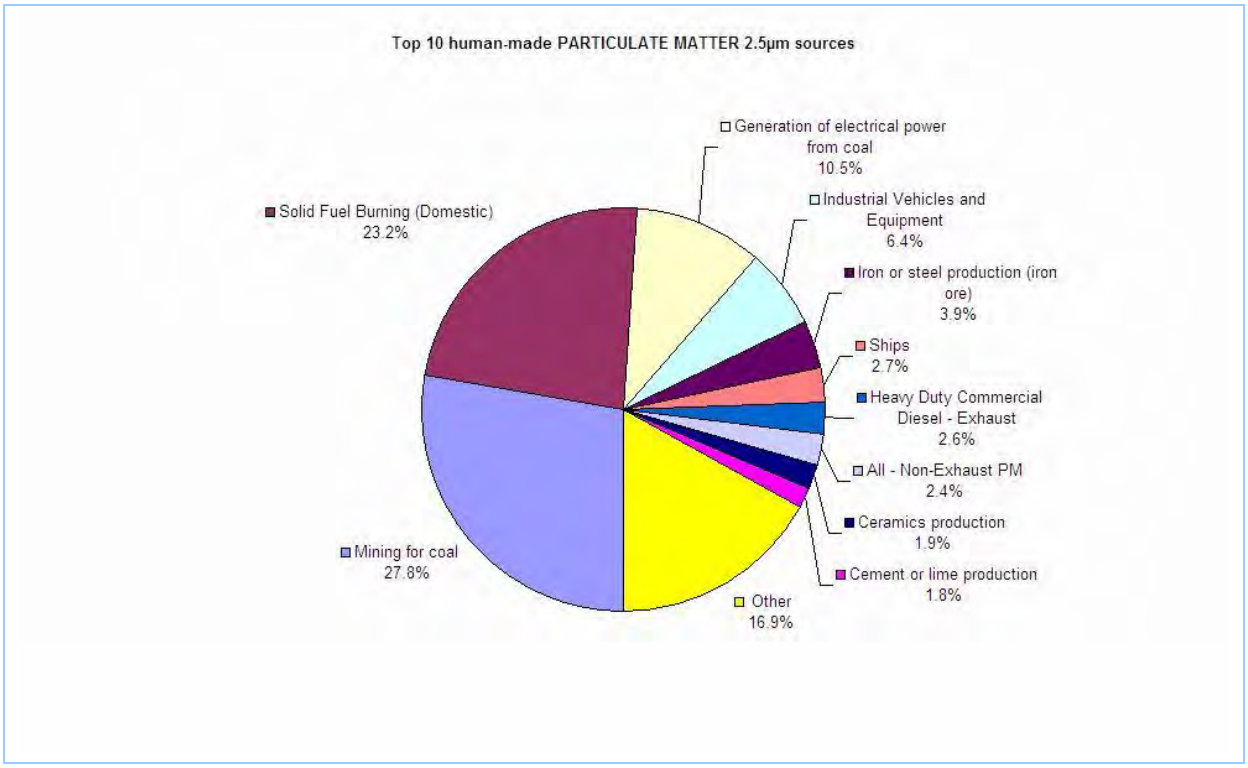

Figure 4-26: Top 10 human-made sources of particulate matter ≤ 2.5 µm in the GMR

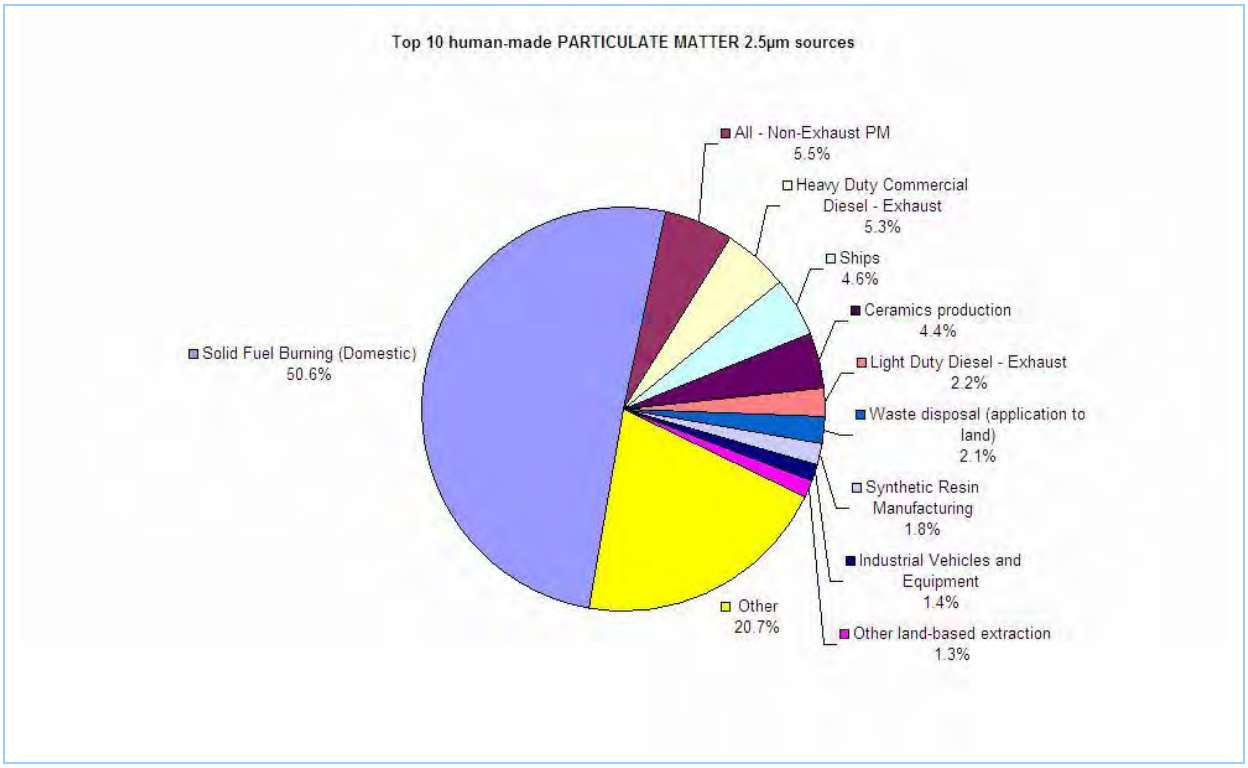

Figure 4-27: Top 10 human-made sources of particulate matter ≤ 2.5 µm in the Sydney region

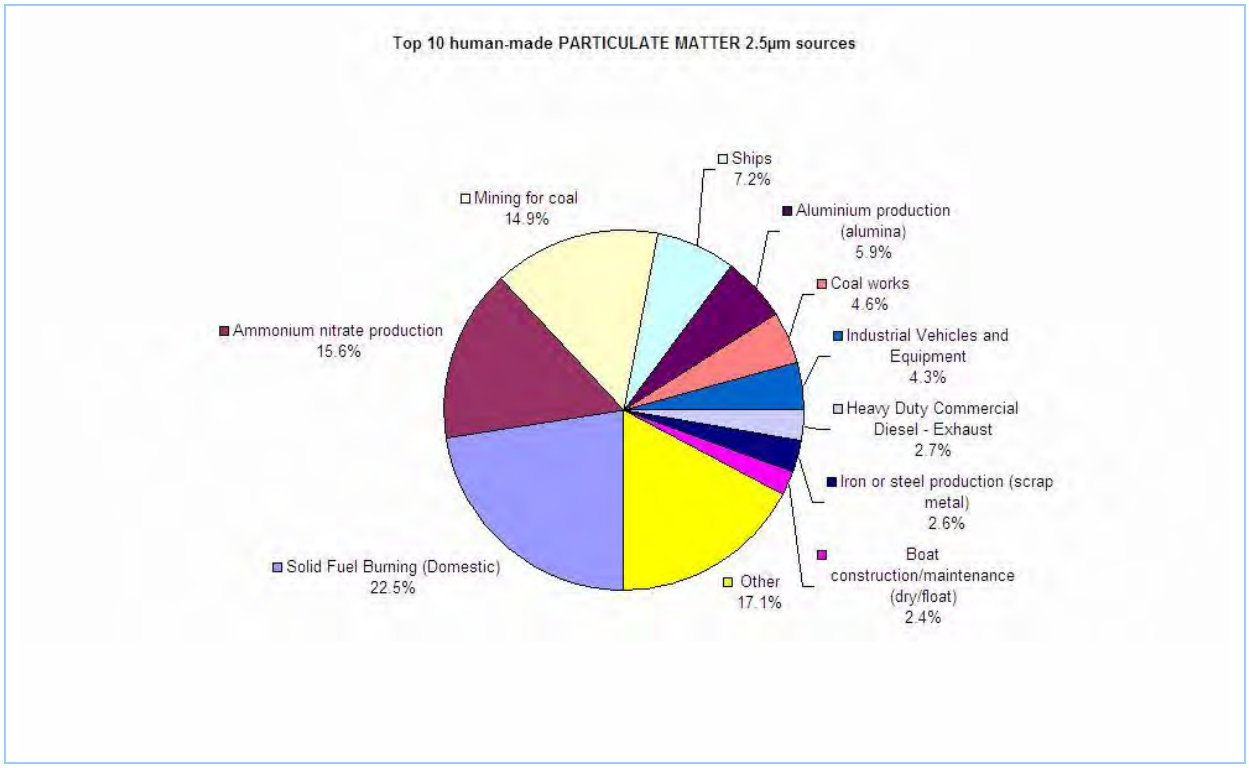

Figure 4-28: Top 10 human-made sources of particulate matter ≤ 2.5 µm in the Newcastle region

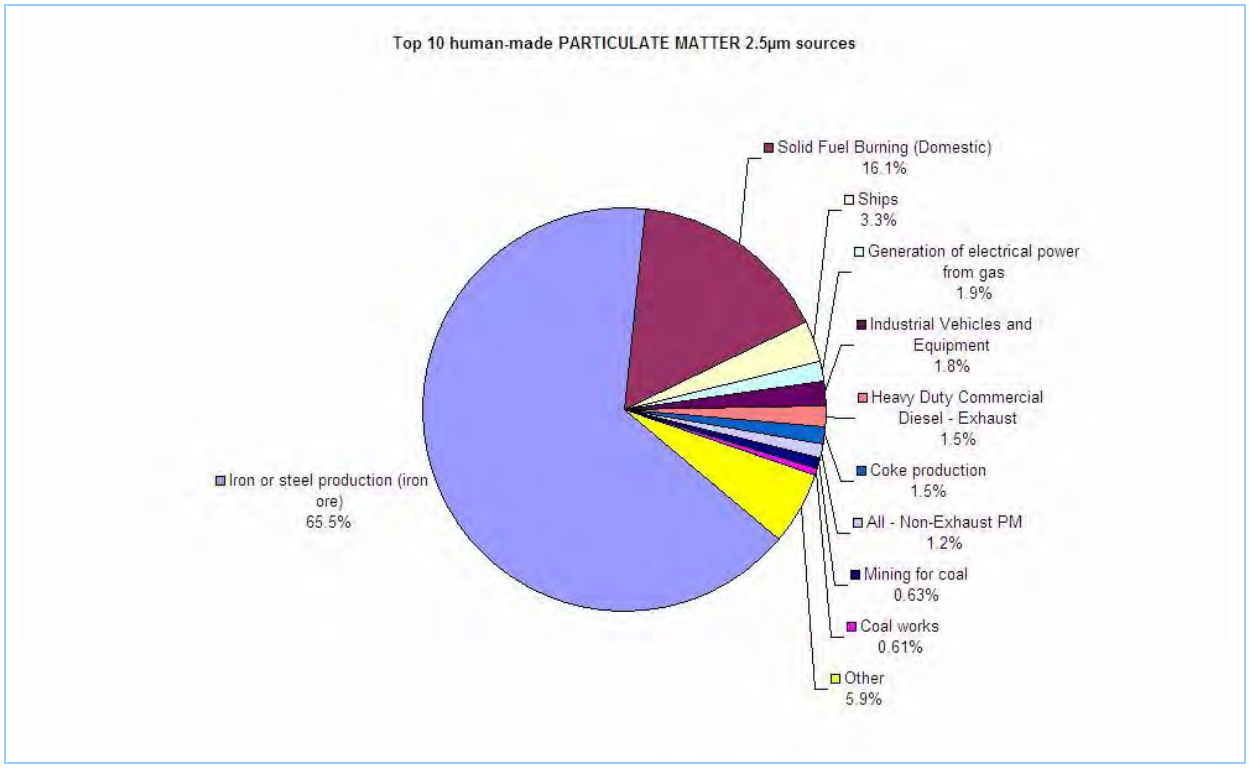

Figure 4-29: Top 10 human-made sources of particulate matter ≤ 2.5 µm in the Wollongong region

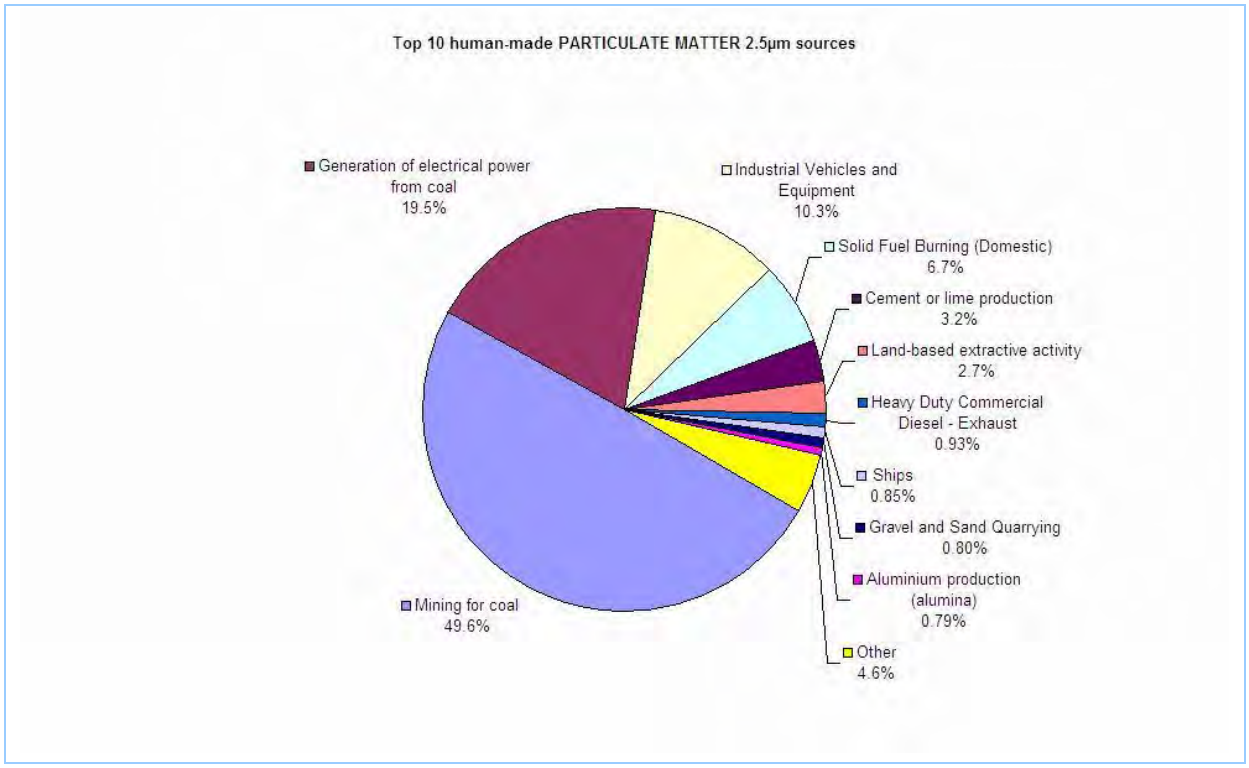

Figure 4-30: Top 10 human-made sources of particulate matter ≤ 2.5 µm in the Non Urban region

Table 4-9 presents total estimated annual emissions, proportions and cumulative proportions for the top 10 human-made sources of sulfur dioxide in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 4-9: Top 10 human-made sources of sulfur dioxide in each region

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made SULFUR DIOXIDE sources in the GMR				
Industrial	Generation of electrical power from coal	251,437	87.03	87.03
Industrial	Aluminium production (alumina)	13,857	4.80	91.82
Industrial	Iron or steel production (iron ore)	8,216	2.84	94.67
Off-road mobile	Ships	7,557	2.62	97.28
Industrial	Petroleum products and fuel production	3,119	1.08	98.36
Industrial	Petroleum products storage	737	0.26	98.62
Industrial	Ceramics production	581	0.20	98.82
Industrial	Mining for coal	496	0.17	98.99
Industrial	Coke production	455	0.16	99.15
Industrial	Cement or lime production	379	0.13	99.28
Human-made	Other	2,085	0.72	100.00
Top 10 human-made SULFUR DIOXIDE sources in the Sydney region				
Off-road mobile	Ships	4,538	42.22	42.22
Industrial	Petroleum products and fuel production	3,111	28.94	71.17
Industrial	Petroleum products storage	737	6.86	78.03
Industrial	Ceramics production	505	4.69	82.72
Industrial	Glass production (container)	327	3.05	85.77
Industrial	Coke production	237	2.20	87.97
Industrial	Petrochemical production	229	2.13	90.10
Industrial	Glass production (float)	223	2.08	92.18
Off-road mobile	Aircraft (flight operations)	160	1.48	93.66
On-road mobile	Passenger vehicle petrol – exhaust	144	1.34	95.00
Human-made	Other	537	5.00	100.00
Top 10 human-made SULFUR DIOXIDE sources in the Newcastle region				
Industrial	Aluminium production (alumina)	10,119	87.29	87.29
Off-road mobile	Ships	1,292	11.15	98.43
Industrial	Slaughtering or processing of animals	65	0.56	99.00
Industrial	Chemical production	65	0.56	99.55
On-road mobile	Passenger vehicle petrol – exhaust	9.73	8.40×10^{-2}	99.64
Industrial	Iron or steel production (scrap metal)	8.91	7.69×10^{-2}	99.71
Domestic-commercial	Solid fuel burning (domestic)	8.01	6.91×10^{-2}	99.78
Industrial	Bitumen mixing	4.42	3.82×10^{-2}	99.82
Off-road mobile	Aircraft (flight operations)	2.88	2.49×10^{-2}	99.85
Off-road mobile	Industrial vehicles and equipment	2.68	2.31×10^{-2}	99.87
Human-made	Other	15	0.13	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made SULFUR DIOXIDE sources in the Wollongong region				
Industrial	Iron or steel production (iron ore)	8,216	90.65	90.65
Off-road mobile	Ships	551	6.08	96.73
Industrial	Coke production	219	2.41	99.14
Industrial	General chemicals storage	31	0.34	99.49
Industrial	Metal plating or coating	24	0.27	99.76
Domestic-commercial	Solid fuel burning (domestic)	5.29	5.84×10^{-2}	99.81
On-road mobile	Passenger vehicle petrol – exhaust	5.15	5.68×10^{-2}	99.87
Industrial	Generation of electrical power from gas	2.76	3.05×10^{-2}	99.90
Off-road mobile	Industrial vehicles and equipment	1.41	1.55×10^{-2}	99.92
On-road mobile	Light duty commercial petrol – exhaust	1.36	1.50×10^{-2}	99.93
Human-made	Other	6.20	6.85×10^{-2}	100.00
Top 10 human-made SULFUR DIOXIDE sources in the Non Urban region				
Industrial	Generation of electrical power from coal	251,437	97.64	97.64
Industrial	Aluminium production (alumina)	3,738	1.45	99.09
Off-road mobile	Ships	1,176	0.46	99.55
Industrial	Mining for coal	495	0.19	99.74
Industrial	Cement or lime production	371	0.14	99.88
Industrial	Ceramics production	76	2.97×10^{-2}	99.91
Off-road mobile	Industrial vehicles and equipment	53	2.07×10^{-2}	99.93
Commercial	Log sawmilling	49	1.92×10^{-2}	99.95
On-road mobile	Passenger vehicle petrol – exhaust	22	8.46×10^{-3}	99.96
Domestic-commercial	Solid fuel burning (domestic)	20	7.81×10^{-3}	99.97
Human-made	Other	78	3.02×10^{-2}	100.00

Figure 4-31, Figure 4-32, Figure 4-33, Figure 4-34 and Figure 4-35 show the proportions of total estimated annual emissions for the top 10 human-made sources of sulfur dioxide in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

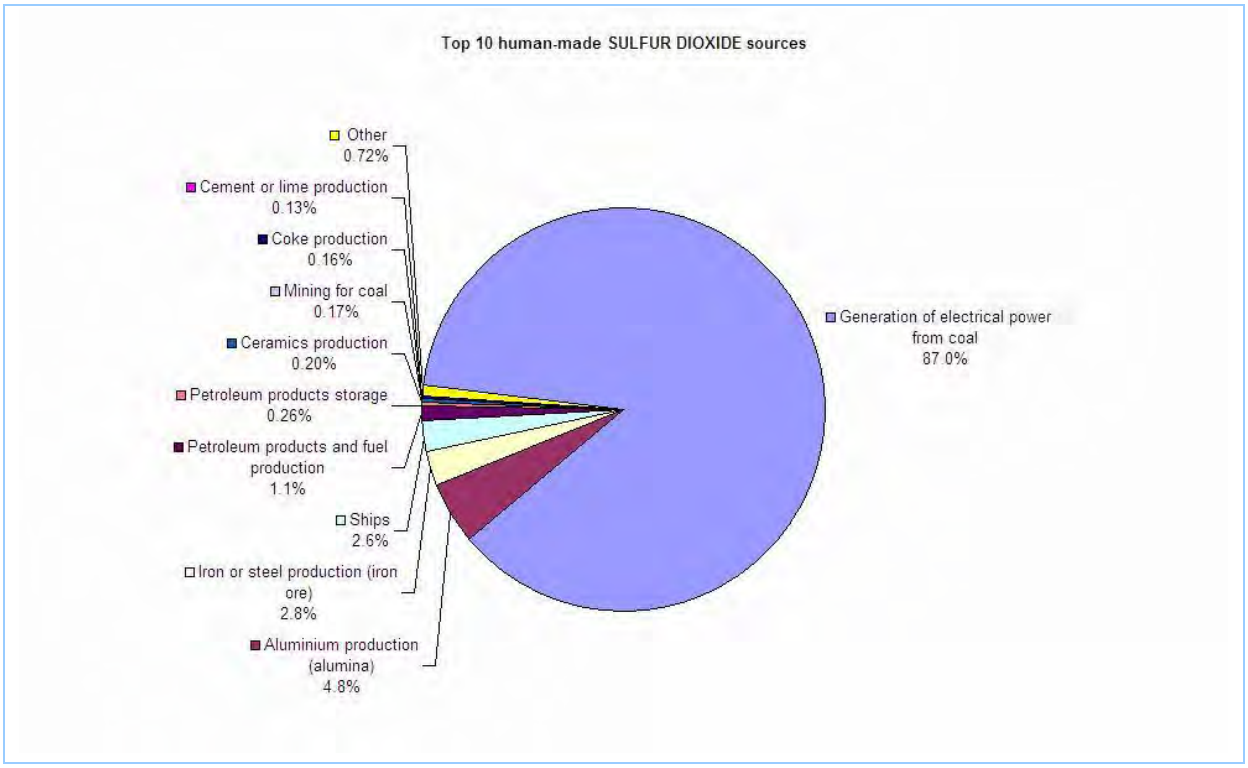

Figure 4-31: Top 10 human-made sources of sulfur dioxide in the GMR

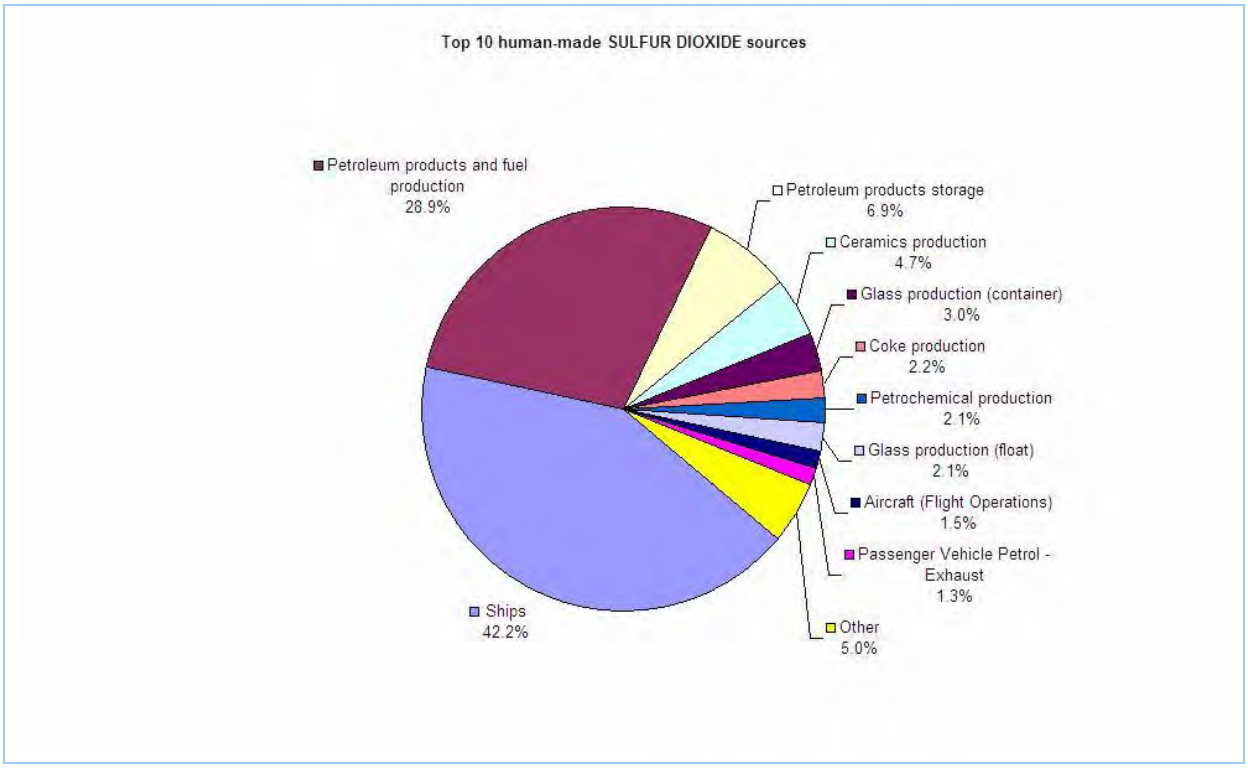

Figure 4-32: Top 10 human-made sources of sulfur dioxide in the Sydney region

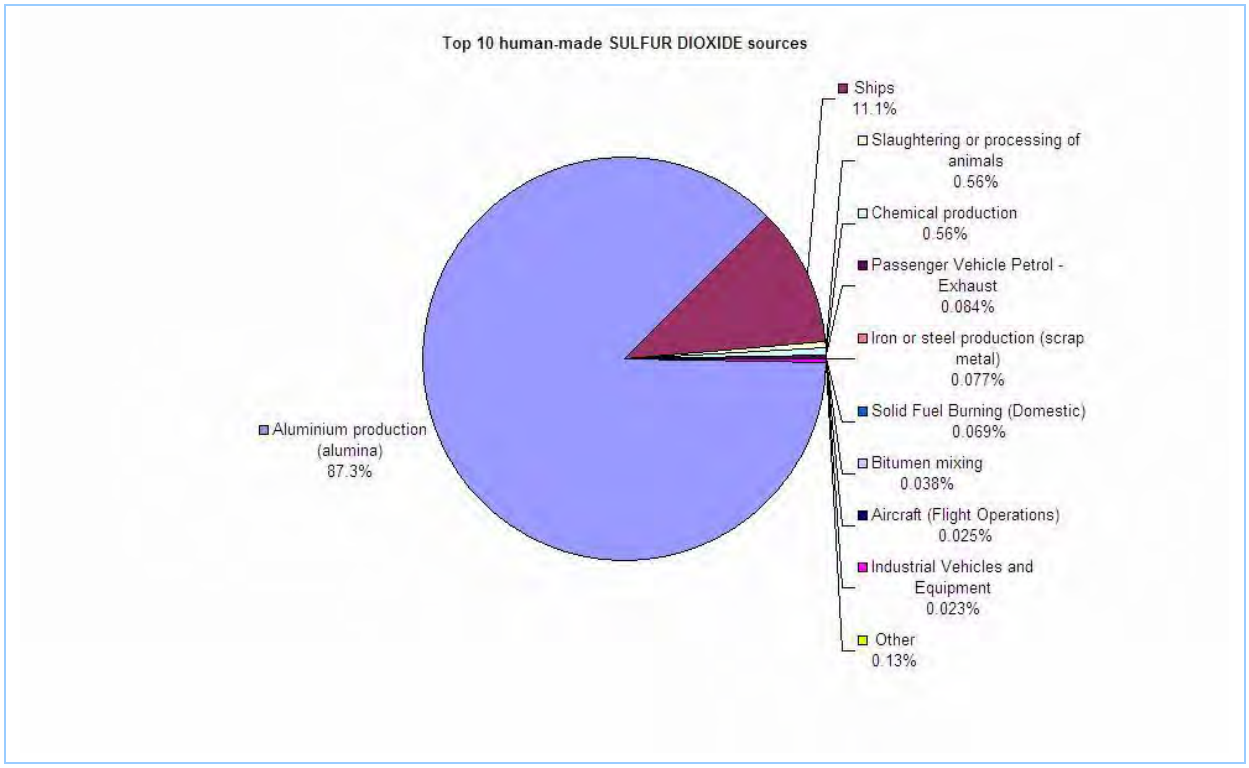

Figure 4-33: Top 10 human-made sources of sulfur dioxide in the Newcastle region

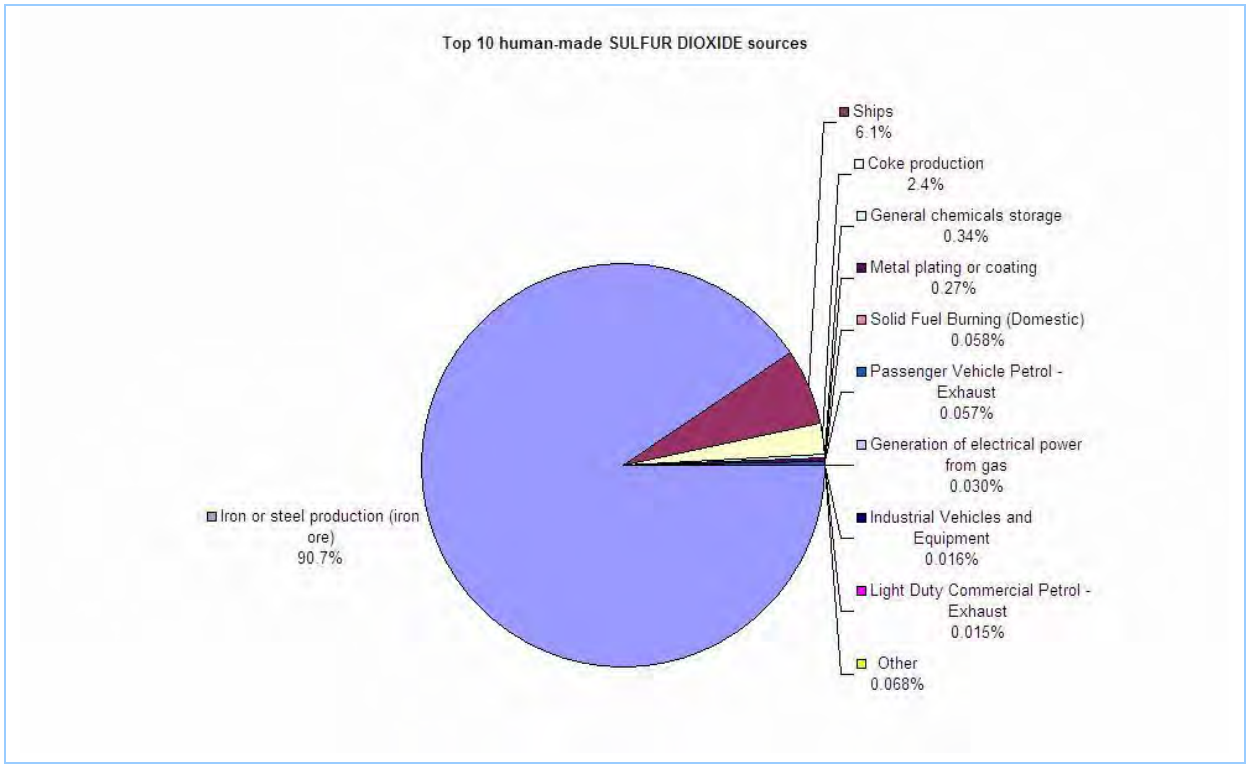

Figure 4-34: Top 10 human-made sources of sulfur dioxide in the Wollongong region

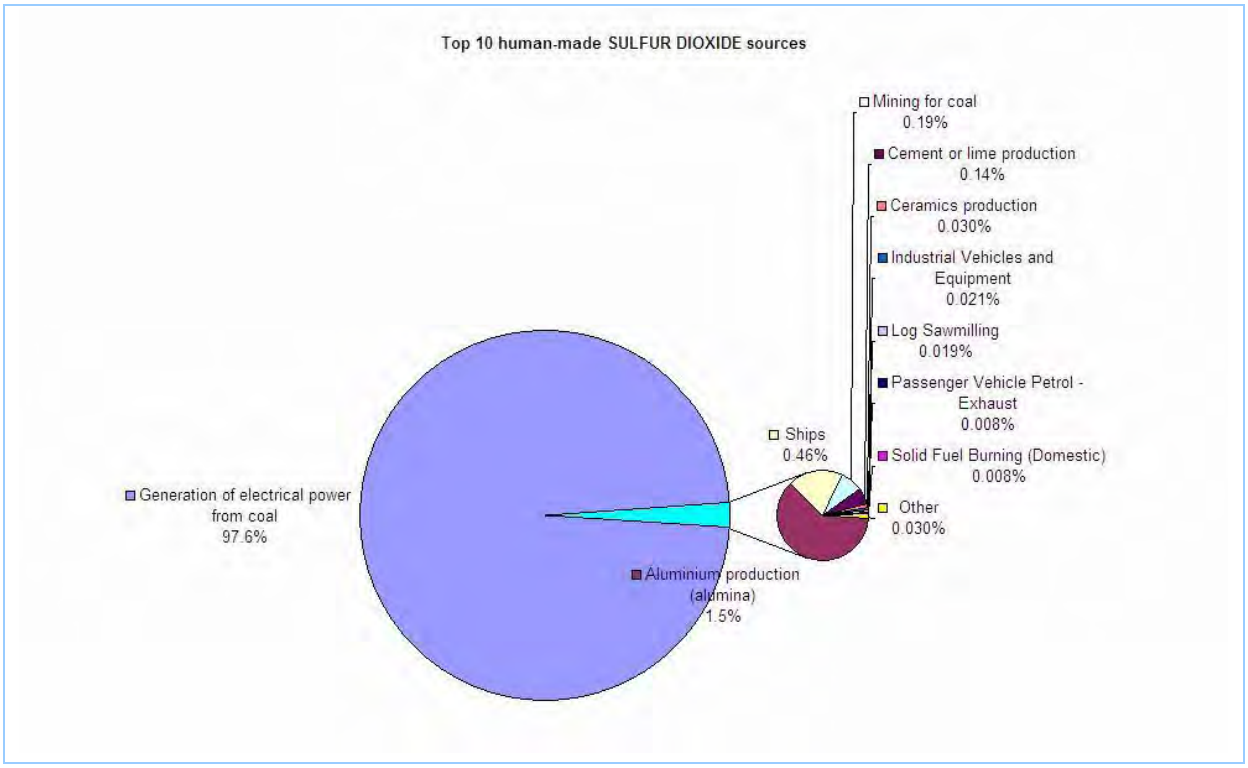

Figure 4-35: Top 10 human-made sources of sulfur dioxide in the Non Urban region

Table 4-10 presents total estimated annual emissions, proportions and cumulative proportions for the top 10 human-made sources of VOC in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions.

Table 4-10: Top 10 human-made sources of VOC in each region

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made TOTAL VOLATILE ORGANIC COMPOUNDS sources in the GMR				
Domestic-commercial	Domestic/commercial solvents/aerosols	25,274	18.45	18.45
On-road mobile	All - evaporative	14,632	10.68	29.14
Domestic-commercial	Surface coatings	11,561	8.44	37.58
On-road mobile	Passenger vehicle petrol – exhaust	9,647	7.04	44.62
Domestic-commercial	Solid fuel burning (domestic)	8,027	5.86	50.48
Domestic-commercial	Lawn mowing exhaust (domestic)	7,282	5.32	55.80
Off-road mobile	Recreational boats exhaust	7,139	5.21	61.01
Off-road mobile	Commercial boats exhaust	5,224	3.81	64.83
Domestic-commercial	Lawn mowing evaporative (domestic)	4,917	3.59	68.42
Commercial	Automotive fuel retailing	4,907	3.58	72.00
Human-made	Other	38,347	28.00	100.00
Top 10 human-made TOTAL VOLATILE ORGANIC COMPOUNDS sources in the Sydney region				
Domestic-commercial	Domestic/commercial solvents/aerosols	19,905	20.13	20.13
On-road mobile	All – evaporative	11,512	11.64	31.77
Domestic-commercial	Surface coatings	9,012	9.11	40.88
On-road mobile	Passenger vehicle petrol – exhaust	7,789	7.88	48.76
Domestic-commercial	Solid fuel burning (domestic)	5,952	6.02	54.78
Domestic-commercial	Lawn mowing exhaust (domestic)	5,400	5.46	60.24
Domestic-commercial	Lawn mowing evaporative (domestic)	3,647	3.69	63.93
Domestic-commercial	Lawn mowing exhaust (public open spaces)	3,489	3.53	67.45
Off-road mobile	Recreational boats exhaust	3,383	3.42	70.88
Commercial	Automotive fuel retailing	2,936	2.97	73.85
Human-made	Other	25,864	26.15	100.00
Top 10 human-made TOTAL VOLATILE ORGANIC COMPOUNDS sources in the Newcastle region				
Domestic-commercial	Domestic/commercial solvents/aerosols	1,276	15.98	15.98
On-road mobile	All – evaporative	855	10.71	26.69
Off-road mobile	Commercial boats exhaust	686	8.59	35.27
Domestic-commercial	Surface coatings	622	7.79	43.06
On-road mobile	Passenger vehicle petrol – exhaust	537	6.72	49.78
Domestic-commercial	Solid fuel burning (domestic)	497	6.23	56.01
Domestic-commercial	Lawn mowing exhaust (domestic)	451	5.65	61.66
Commercial	Automotive fuel retailing	389	4.87	66.53
Off-road mobile	Recreational boats exhaust	351	4.40	70.93
Domestic-commercial	Lawn mowing evaporative (domestic)	305	3.82	74.74
Human-made	Other	2,017	25.26	100.00

Module	Activity	Emissions (tonne/year)	Proportions (%)	Cumulative Proportions (%)
Top 10 human-made TOTAL VOLATILE ORGANIC COMPOUNDS sources in the Wollongong region				
Domestic-commercial	Domestic/commercial solvents/aerosols	940	18.05	18.05
Industrial	Iron or steel production (iron ore)	452	8.69	26.74
Domestic-commercial	Surface coatings	449	8.63	35.38
On-road mobile	All – evaporative	436	8.38	43.76
Off-road mobile	Recreational boats exhaust	373	7.17	50.93
Domestic-commercial	Solid fuel burning (domestic)	328	6.31	57.24
Domestic-commercial	Lawn mowing exhaust (domestic)	298	5.73	62.96
On-road mobile	Passenger vehicle petrol – exhaust	293	5.64	68.60
Commercial	Automotive fuel retailing	292	5.62	74.22
Domestic-commercial	Lawn mowing evaporative (domestic)	201	3.87	78.08
Human-made	Other	1,141	21.92	100.00
Top 10 human-made TOTAL VOLATILE ORGANIC COMPOUNDS sources in the Non Urban region				
Domestic-commercial	Domestic/commercial solvents/aerosols	3,154	12.68	12.68
Off-road mobile	Recreational boats exhaust	3,032	12.19	24.86
Off-road mobile	Industrial vehicles and equipment	2,607	10.48	35.34
Off-road mobile	Commercial boats exhaust	2,264	9.10	44.44
On-road mobile	All – evaporative	1,828	7.35	51.79
Domestic-commercial	Surface coatings	1,478	5.94	57.73
Commercial	Automotive fuel retailing	1,290	5.18	62.91
Domestic-commercial	Solid fuel burning (domestic)	1,248	5.02	67.93
Domestic-commercial	Lawn mowing exhaust (domestic)	1,133	4.55	72.48
On-road mobile	Passenger vehicle petrol – exhaust	1,029	4.13	76.62
Human-made	Other	5,817	23.38	100.00

Figure 4-36, Figure 4-37, Figure 4-38, Figure 4-39 and Figure 4-40 show the proportions of total estimated annual emissions for the top 10 human-made sources of VOC in the whole GMR and the Sydney, Newcastle, Wollongong and Non Urban regions, respectively.

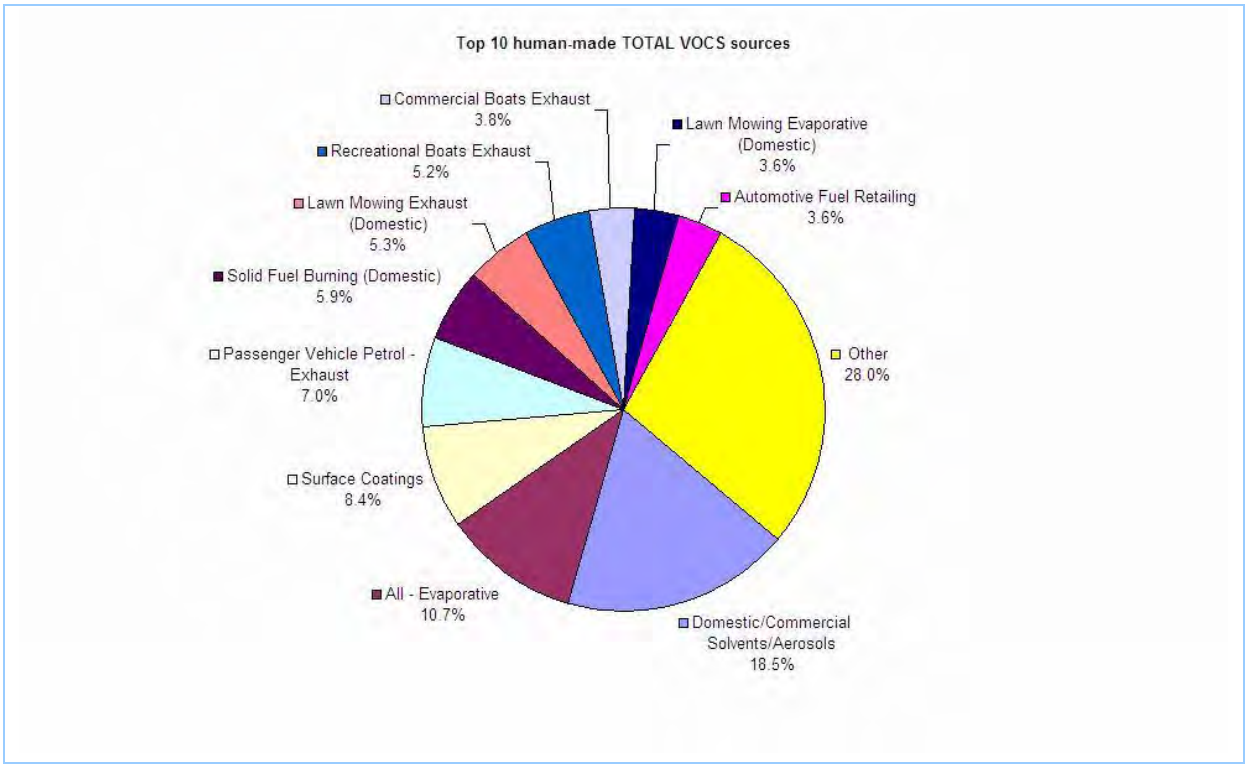

Figure 4-36: Top 10 human-made sources of VOC in the GMR

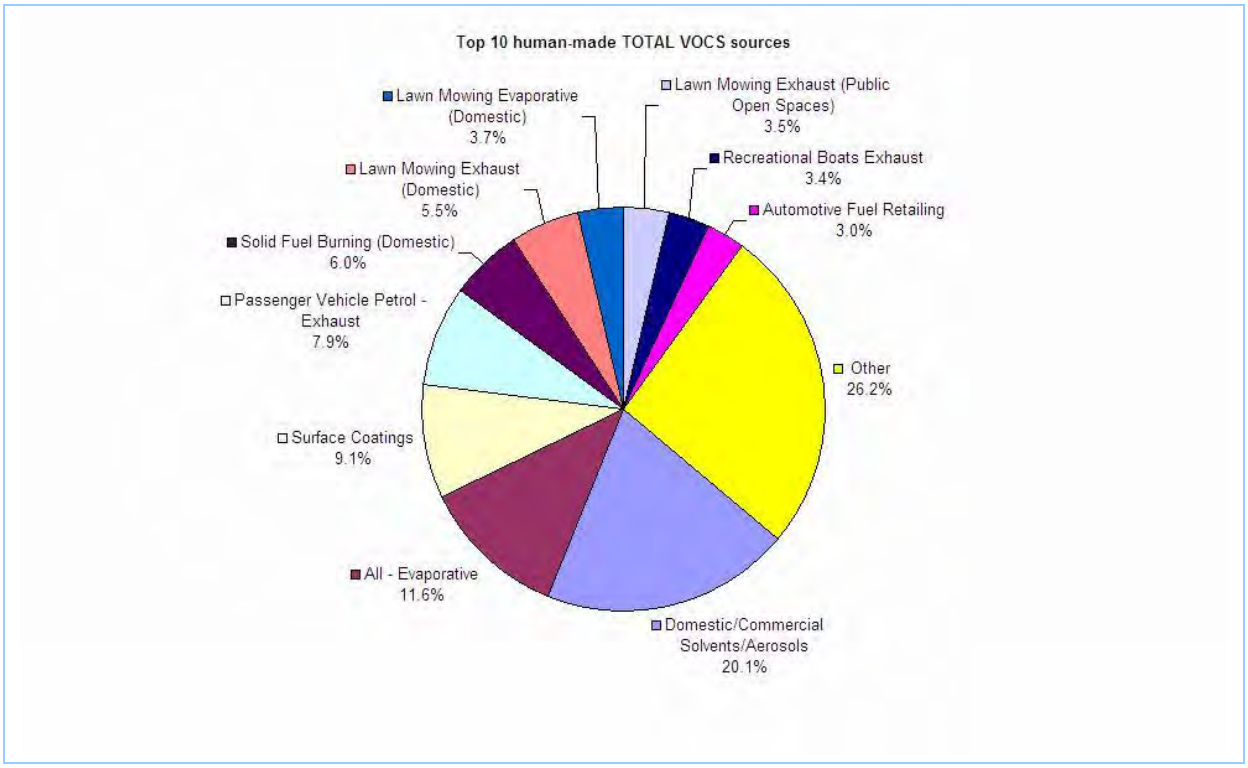

Figure 4-37: Top 10 human-made sources of VOC in the Sydney region

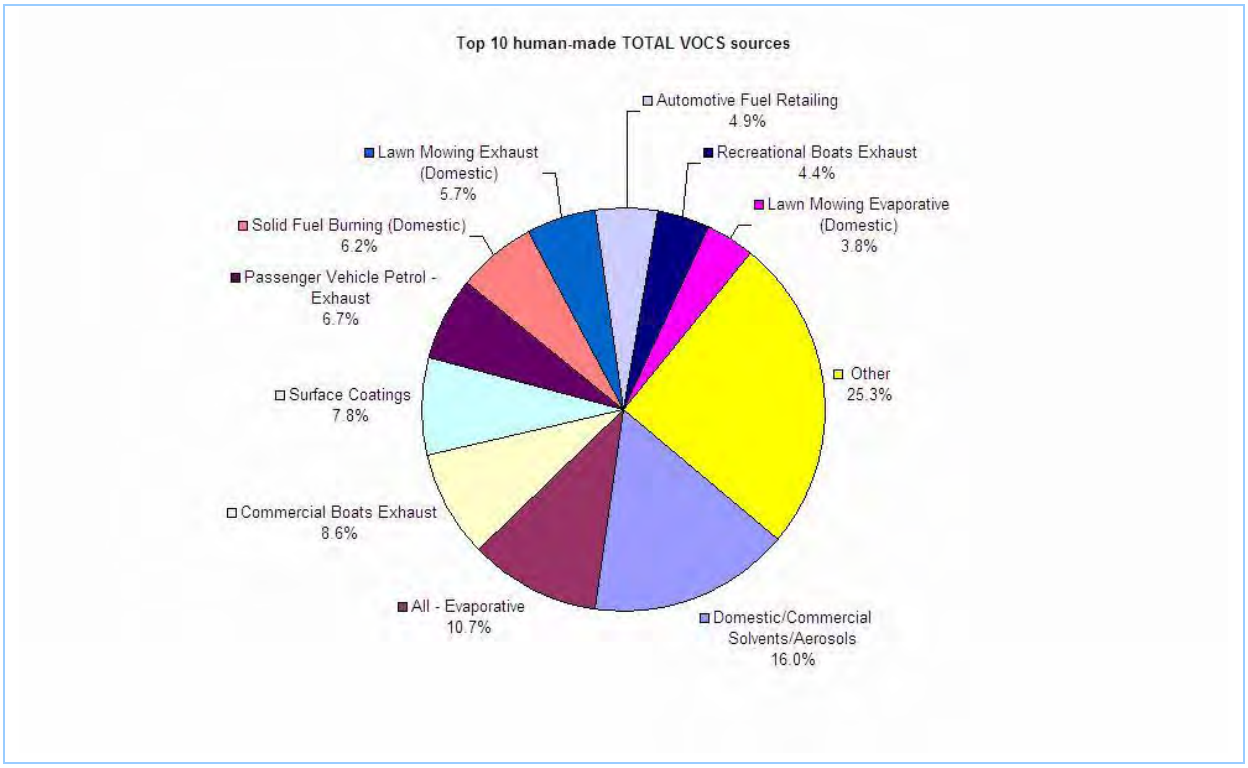

Figure 4-38: Top 10 human-made sources of VOC in the Newcastle region

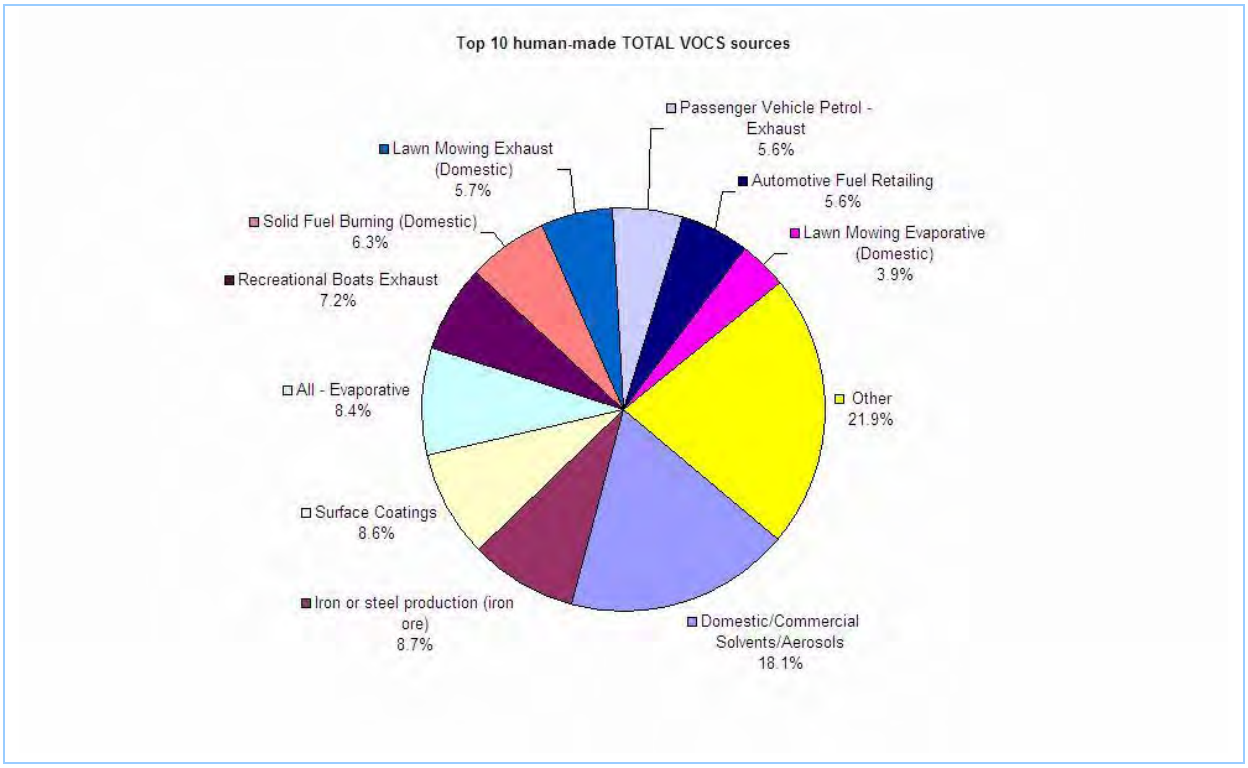

Figure 4-39: Top 10 human-made sources of VOC in the Wollongong region

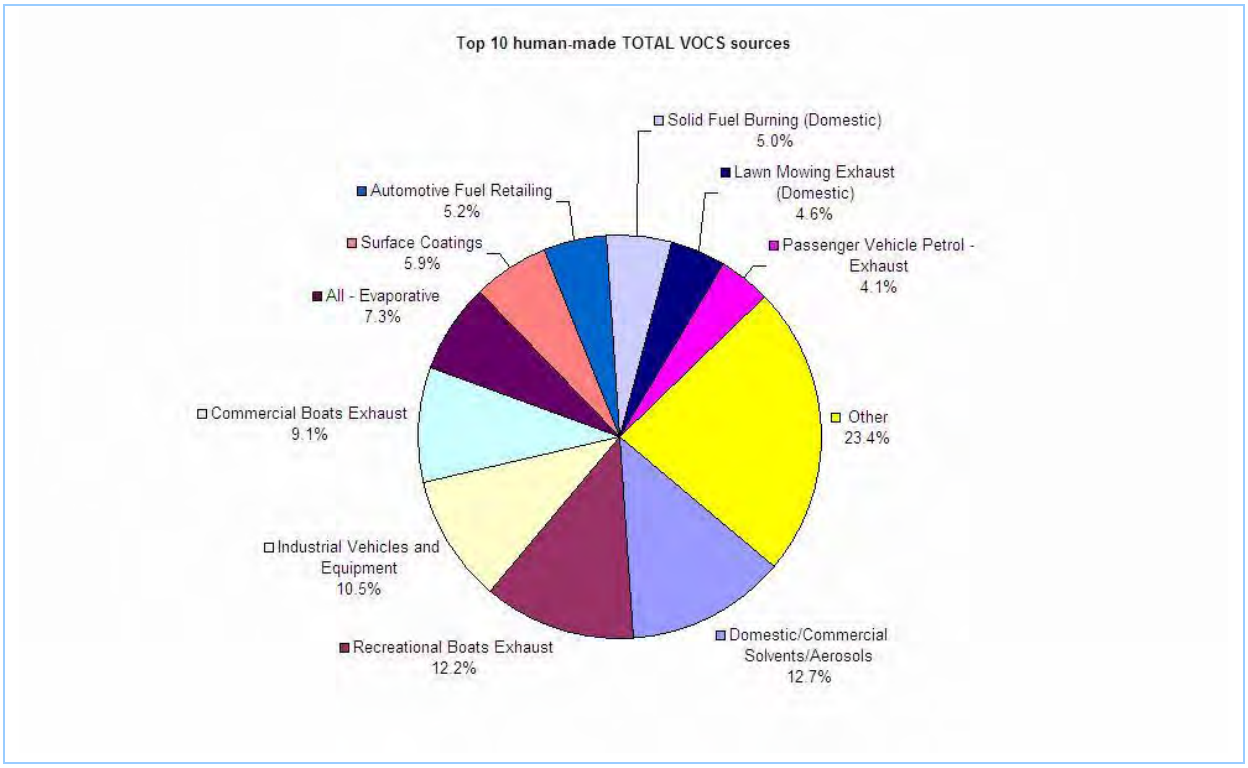

Figure 4-40: Top 10 human-made sources of VOC in the Non Urban region

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