

EXECUTIVE SUMMARY

The Department of Environment and Climate Change NSW (DECC), in collaboration with Pacific Air & Environment (Bawden et. al., 2006) has completed a three year air emissions inventory project for industrial sources. The base year of the industrial inventory represents activities that took place during the 2003 calendar year and is accompanied by emission projections in yearly increments up to the 2031 calendar year. The area included in the study covers greater Sydney, Newcastle and Wollongong regions, known collectively as the Greater Metropolitan Region (GMR).

The study region defined as the GMR measures 210 km (east-west) by 273 km (north-south). The study region is defined in Table ES1.1 and shown in Figure ES1.1.

Table ES1.1: Definition of Greater Metropolitan, Sydney, Newcastle and Wollongong Regions

Region	South-west corner MGA ¹ co-ordinates		North-east corner MGA ¹ co-ordinates	
	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

¹ MGA = Map Grid of Australia based on the Geocentric Datum of Australia 1994 (GDA94) (ICSM, 2002).

Industrial facilities include all NSW Activity Types that hold a licence to operate under the Protection of the Environment Operations Act 1997. The inventory includes emissions from 1,037 facilities. A total of 6,869 emission sources have been included in the industrial emissions inventory, consisting of 1,364 point sources¹ and 5,504 fugitive sources². Table ES1.2 presents the number and type of emission sources included in the industrial emissions inventory for each area considered.

Table ES1.2: Emission Source Summary

Area	Point Sources	Fugitive Sources	Total Sources
Sydney	915	3,012	3,927
Newcastle	193	533	726
Wollongong	130	250	380
Non Urban ^a	124	1,712	1,836
GMR	1,364	5,505	6,869

^a Non-urban area is defined as the area within the GMR that does not include the areas bounded by Sydney, Newcastle or Wollongong

The pollutants inventoried include criteria pollutants specified in the Air NEPM, air toxics associated with the National Pollutant Inventory and the Air Toxics NEPMs and any other pollutants associated with state specific programs, i.e. Load Based Licensing (Protection of the Environment Operations (General) Regulation 1998 (DEC, 2002 & PCO, 1998)) and Protection of the Environment Operations (Clean Air) Regulation 2002 (PCO, 2005).

¹ Point source means air pollutant emissions, which are released via a stack or vent and are generally controlled (i.e. captured, treated and reduced in mass using control equipment and/or captured and discharged through a vent, chimney, stack, or other equivalent emission point).

² Fugitive source means air pollutant emissions that are not released via a stack or vent and are generally not controlled emissions

Figure ES1.1 shows the location of all industrial emission sources that are included in the emissions inventory.

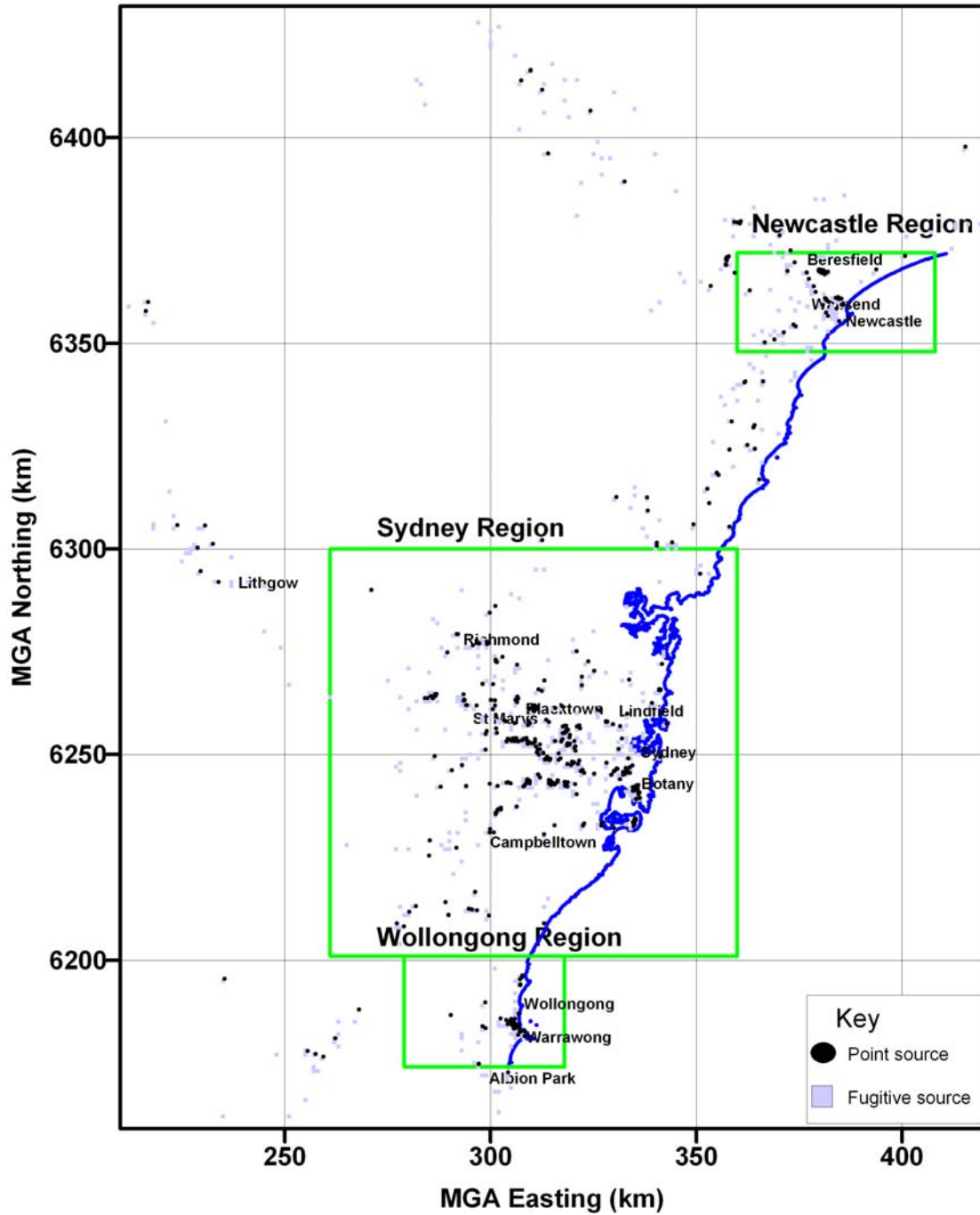


Figure ES1.1: Location of all Industrial Emission Sources

Table ES1.3 shows total estimated emissions for selected substances from industrial facilities in the study region (the GMR), Sydney, Newcastle and Wollongong. These substances have been selected since they are:

- ❑ The most common air pollutants found in airsheds according to the National Pollutant Inventory NEPM (NEPC, 2000);
- ❑ Referred to in National Environment Protection Measures (NEPMs) for criteria pollutants (NEPC, 2003) and air toxics (NEPC, 2004); and
- ❑ They have been classified as priority air pollutants (NEPC, 2005)

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.

Table ES1.3: Total Estimated Emissions from Industrial Facilities

Substance	Estimated Emissions (tonnes/year)				
	Sydney	Newcastle	Wollongong	Non-Urban	GMR ^a
1,3 BUTADIENE	0.11	0.09	0.002	6.54	6.73
ACETALDEHYDE	5.9	5.35	0.08	0.75	12.1
BENZENE	92.1	58.3	232	12.4	395
CARBON MONOXIDE	8,000	47,800	522,000	25,600	603,000
FORMALDEHYDE	411	39.6	53.8	13.4	517
ISOMERS OF XYLENE	380	27.5	17.1	370	795
LEAD & COMPOUNDS	4.7	0.25	4.13	2.89	12
OXIDES OF NITROGEN	14,000	1,730	7,930	152,000	175,500
PARTICULATE MATTER 10µm	7,890	1,710	2,070	34,900	46,500
PARTICULATE MATTER 2.5µm	3,370	826	1,560	7,380	13,100
PERCHLOROETHYLENE	32.6	6.0	1.43	2.48	42.5
POLYCYCLIC AROMATIC HYDROCARBONS	2.2	5.82	39	8.39	55.5
SULFUR DIOXIDE	11,000	9,300	10,300	265,000	296,000
TOLUENE	1,220	101	71.4	156	1,550
TOTAL SUSPENDED PARTICULATES (TSP)	20,400	4,040	2,810	83,500	111,000
TOTAL VOCs	14,000	1,270	788	1,710	17,700
TRICHLOROETHYLENE (TCE)	101	0.67	0.50	0.13	102

^a Totals may not appear additive due to rounding

Table ES1.4 shows the proportion of estimated emissions released in each region considered in the study.

Table ES1.4: Proportion of Estimated Releases in Each Region Considered in the Study

Substance	Proportion of Estimated Emissions				
	Sydney	Newcastle	Wollongong	Non-Urban	GMR ^a
1,3 BUTADIENE	2%	1%	0%	97%	100%
ACETALDEHYDE	49%	44%	1%	6%	100%
BENZENE	23%	15%	59%	3%	100%
CARBON MONOXIDE	1%	8%	87%	4%	100%
FORMALDEHYDE	79%	8%	10%	3%	100%
ISOMERS OF XYLENE	48%	3%	2%	47%	100%
LEAD & COMPOUNDS	39%	2%	35%	24%	100%
OXIDES OF NITROGEN	8%	1%	5%	87%	100%
PARTICULATE MATTER 10µm	17%	4%	4%	75%	100%
PARTICULATE MATTER 2.5µm	26%	6%	12%	56%	100%
PERCHLOROETHYLENE	77%	14%	3%	6%	100%
POLYCYCLIC AROMATIC HYDROCARBONS	4%	11%	70%	15%	100%
SULFUR DIOXIDE	4%	3%	3%	90%	100%
TOLUENE	79%	7%	5%	10%	100%
TOTAL SUSPENDED PARTICULATES (TSP)	18%	4%	3%	75%	100%
TOTAL VOCS	79%	7%	4%	10%	100%
TRICHLOROETHYLENE (TCE)	99%	1%	0%	0%	100%

^a Totals may not appear additive due to rounding

Table ES1.5 shows the average emissions from industrial sources for a summer weekday (January weekday), summer weekend day (January weekend day), winter weekday (July week day) and winter weekend day (July weekend day).

Table ES1.5: Typical Seasonal Day Type Emissions from Industrial Facilities

Substance	Average Estimated Emissions (kg/day)			
	Summer week day	Summer weekend day	Winter week day	Winter weekend day
1,3 BUTADIENE	19.4	14.9	19.4	14.9
ACETALDEHYDE	34.4	28.5	33.4	28.0
BENZENE	1,080	980	1,090	970
CARBON MONOXIDE	1,620,000	1,613,300	1,625,300	1,613,900
FORMALDEHYDE	1,380	1,280	1,440	1,280
ISOMERS OF XYLENE	2,220	1,810	2,280	1,830
LEAD & COMPOUNDS	31.6	30.1	32.3	30.6
OXIDES OF NITROGEN	475,200	473,200	484,170	481,930
PARTICULATE MATTER 10µm	122,540	114,710	128,650	118,050
PARTICULATE MATTER 2.5µm	34,850	32,820	36,090	33,500
PERCHLOROETHYLENE	113	107	121	111
POLYCYCLIC AROMATIC HYDROCARBONS	150	148	150	147
SULFUR DIOXIDE	801,700	801,080	822,130	821,560
TOLUENE	4,190	3,140	4,620	3,200
TOTAL SUSPENDED PARTICULATES (TSP)	288,650	254,860	312,240	268,300
TOTAL VOCS	48,710	40,560	50,690	40,990
TRICHLOROETHYLENE (TCE)	324	141	332	145

Figure ES1.2 shows the proportion of total emissions in the GMR emitted in each defined region for each criteria pollutant (NO_x (oxides of nitrogen), Total VOCs (volatile organic compounds), PM₁₀ (particulate matter with an aerodynamic diameter of less than 10 µm), CO (carbon monoxide), SO₂ (sulfur dioxide)).

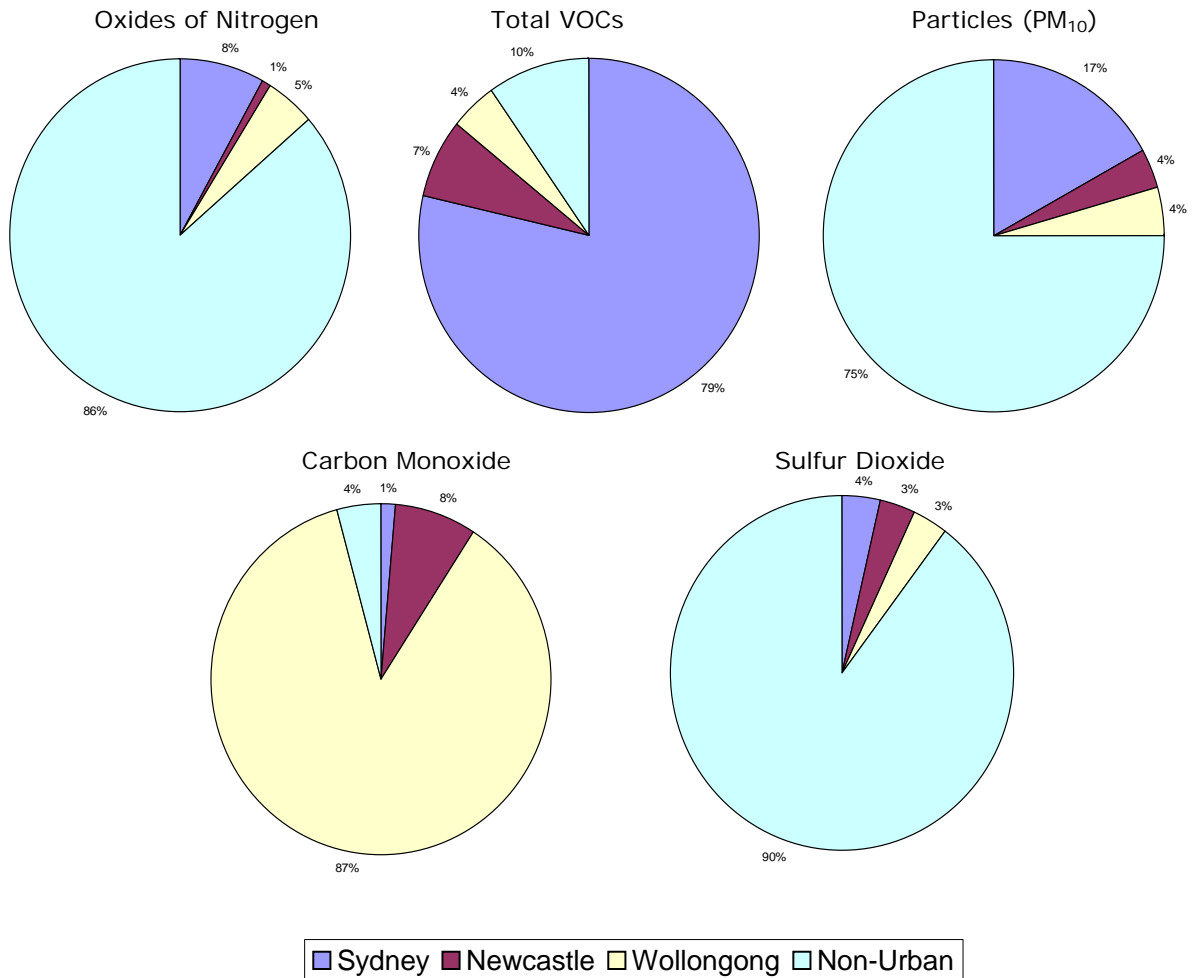
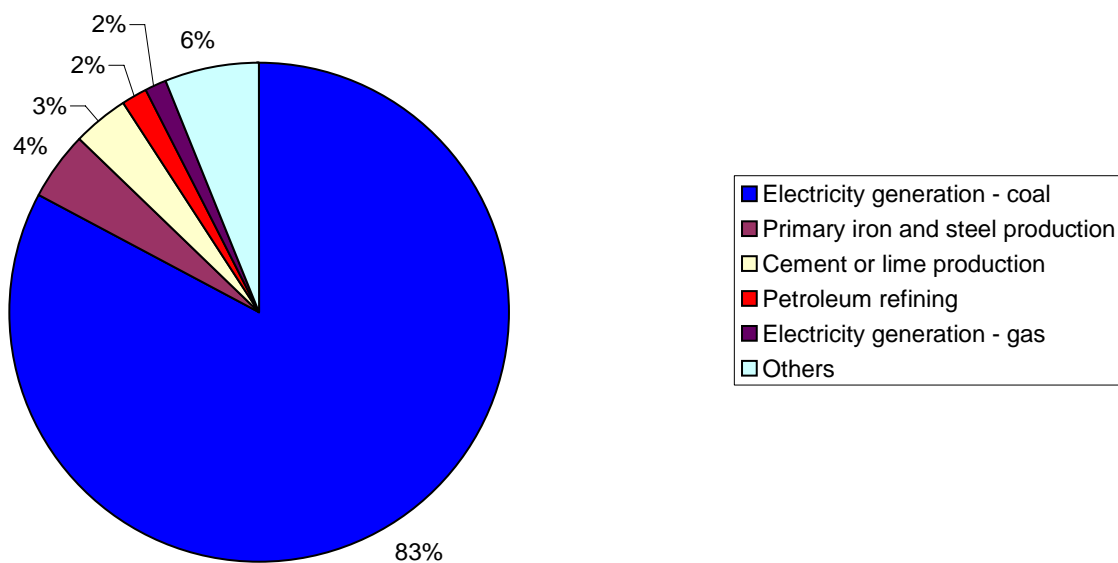


Figure ES1.2: Proportion of Total Industrial Emissions in Each Defined Region

Total industrial emissions for each NSW Activity type (NSW Activity type is defined in Schedule 1 of the Protection of the Environment Operations Act 1997) for each criteria pollutant in each region (i.e. the GMR, Sydney, Newcastle and Wollongong) are presented graphically as follows:

- ❑ Figure ES1.3 to Figure ES1.7 present industrial emissions by NSW Activity Type for the entire GMR.
- ❑ Figure ES1.8 to Figure ES1.12 present industrial emissions by NSW Activity Type for the Sydney region.
- ❑ Figure ES1.13 to Figure ES1.17 present industrial emissions by NSW Activity Type for the Newcastle region
- ❑ Figure ES1.18 to Figure ES1.22 present industrial emissions by NSW Activity Type for the Wollongong region.



**Figure ES1.3: Industrial Emissions of Oxides of Nitrogen (NO_x) by NSW Activity Type in the GMR
(Total Emissions = 175,500 tonnes/year)**

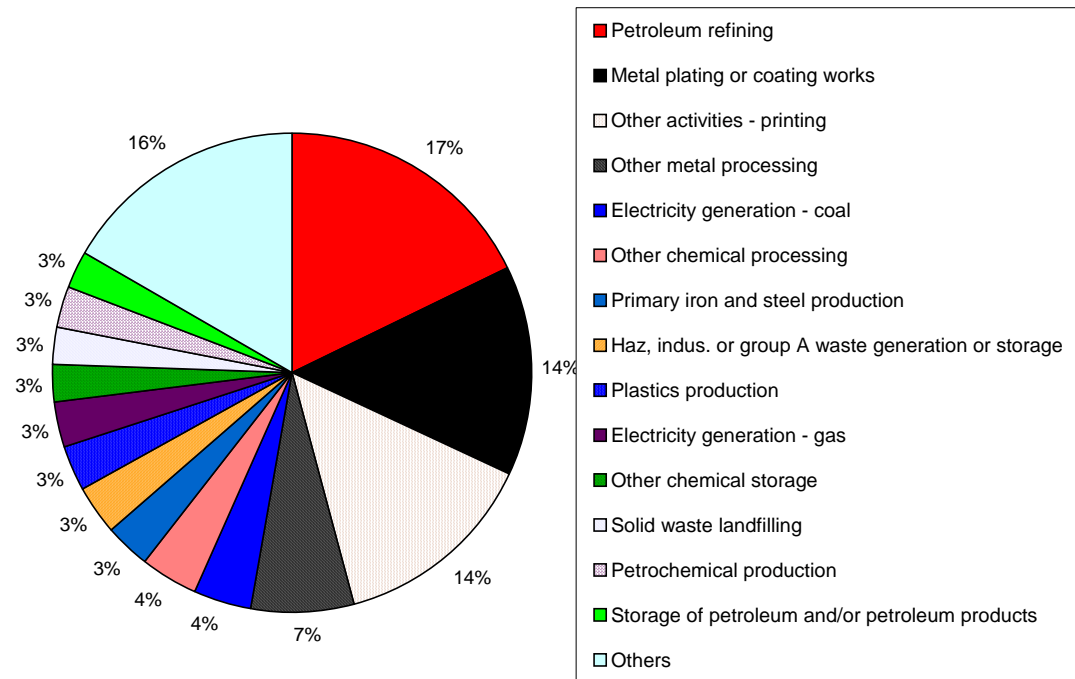


Figure ES1.4: Industrial Emissions of Total VOCs by NSW Activity Type in the GMR
 (Total Emissions = 17,700 tonnes/year)

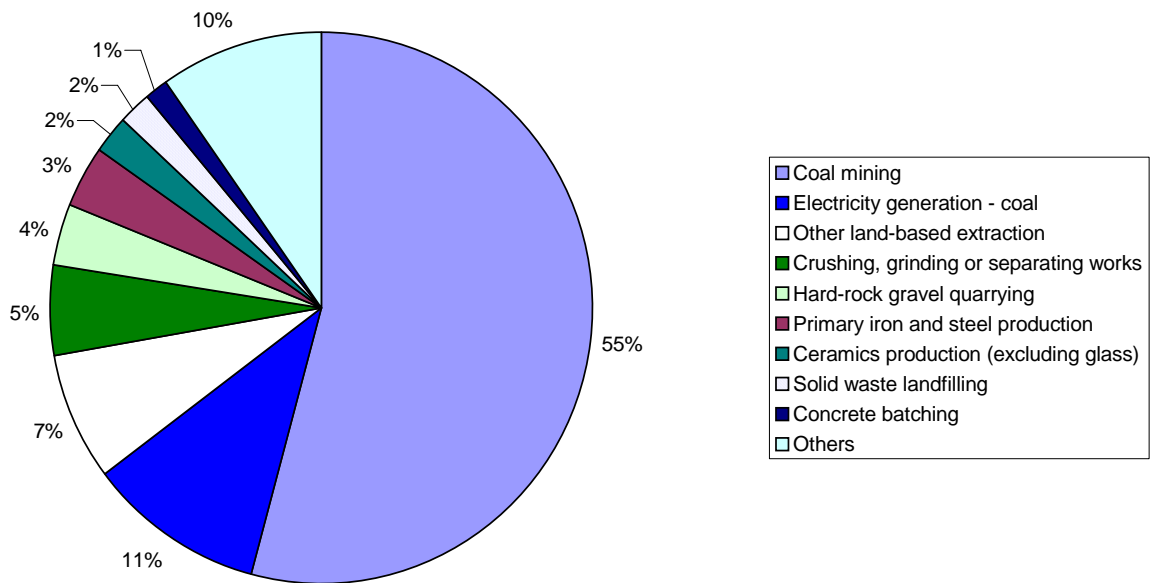


Figure ES1.5: Industrial Emissions of Particles (PM₁₀) by NSW Activity Type in the GMR
 (Total Emissions = 46,500 tonnes/year)

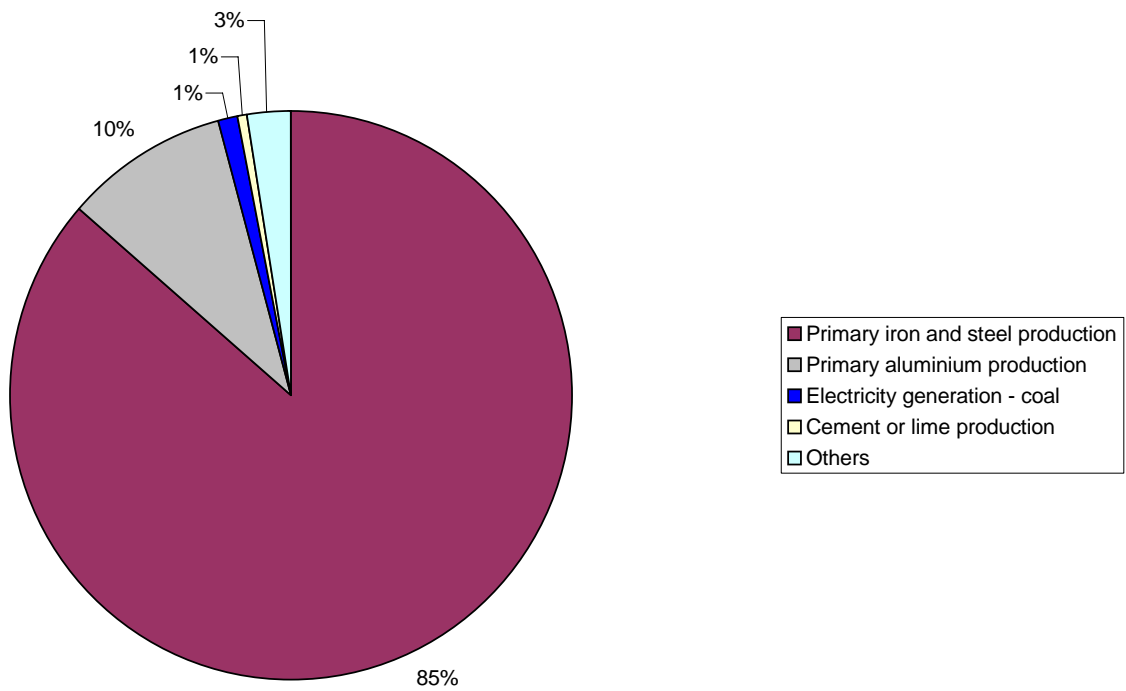


Figure ES1.6: Industrial Emissions of Carbon Monoxide (CO) by NSW Activity Type in the GMR
(Total Emissions = 603,000 tonnes/year)

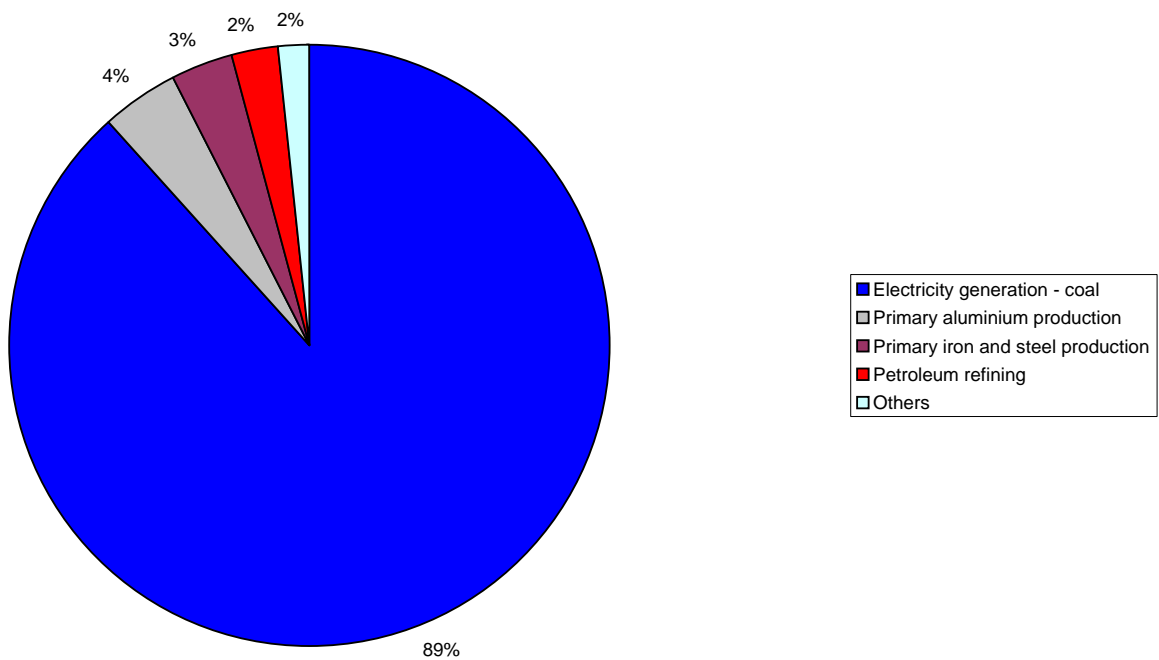


Figure ES1.7: Industrial Emissions of Sulfur Dioxide (SO₂) by NSW Activity Type in the GMR
(Total Emissions = 296,000 tonnes/year)

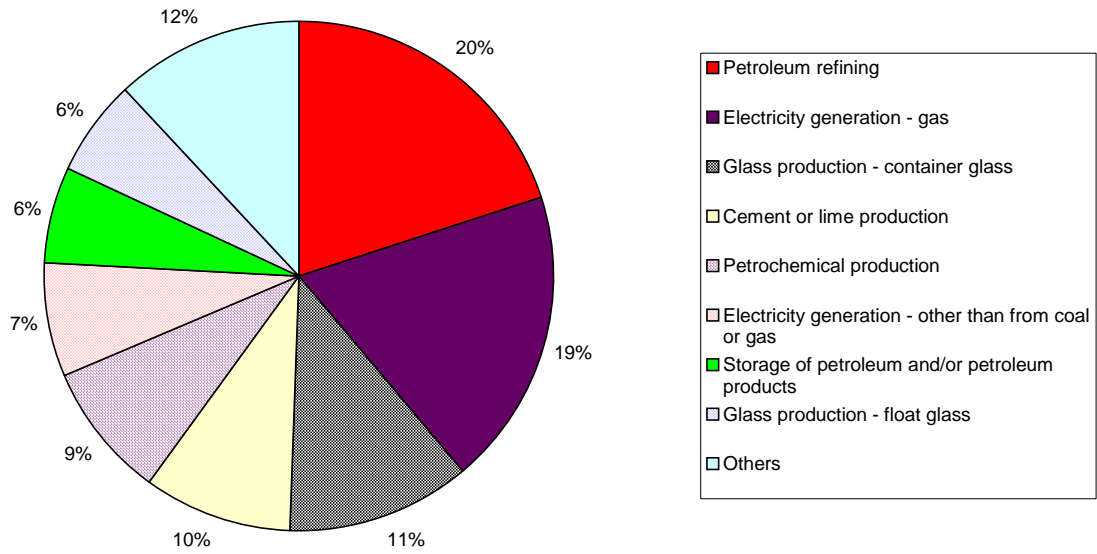


Figure ES1.8: Industrial Emissions of Oxides of Nitrogen (NO_x) by NSW Activity Type in Sydney
 (Total Emissions = 14,000 tonnes/year)

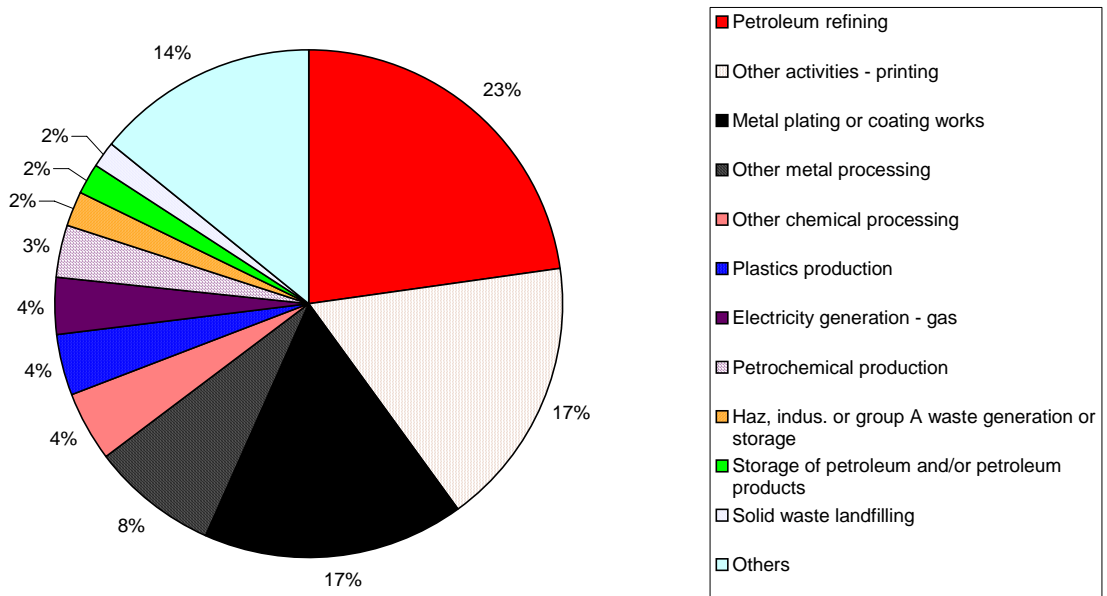


Figure ES1.9: Industrial Emissions of Total VOCs by NSW Activity Type in Sydney
 (Total Emissions = 14,000 tonnes/year)

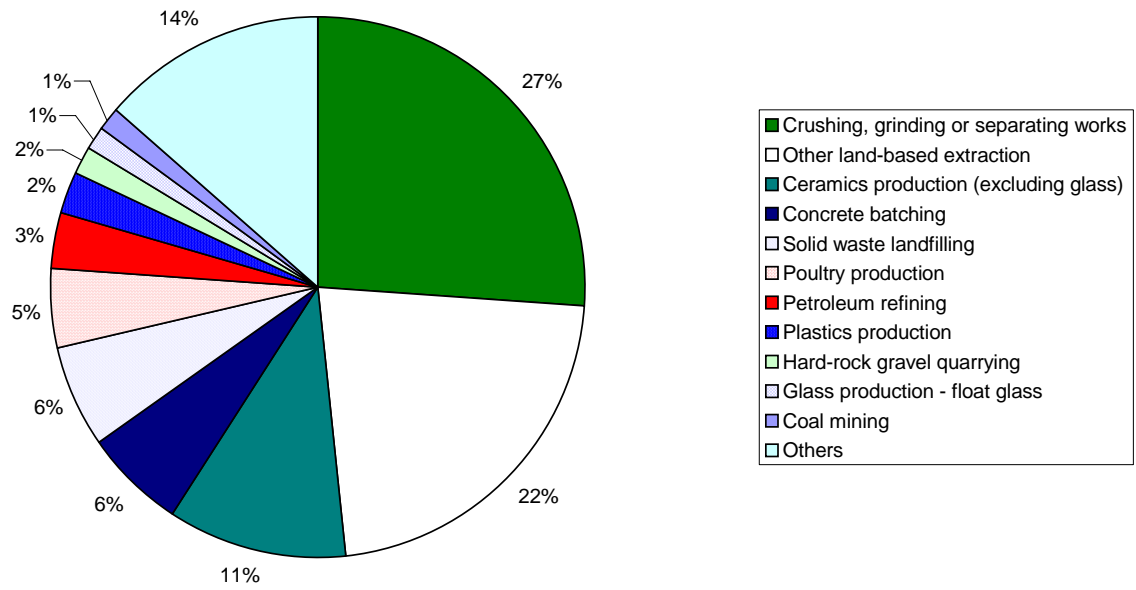


Figure ES1.10: Industrial Emissions of Particles (PM₁₀) by NSW Activity Type in Sydney
 (Total Emissions = 7,980 tonnes/year)

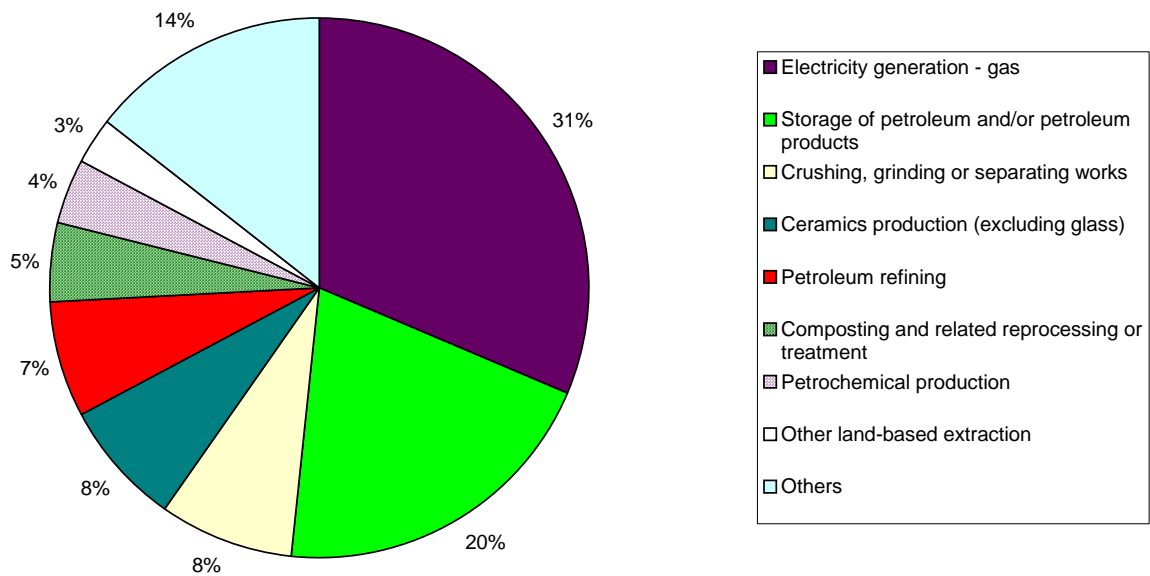


Figure ES1.11: Industrial Emissions of Carbon Monoxide (CO) by NSW Activity Type in Sydney
 (Total Emissions = 8,000 tonnes/year)

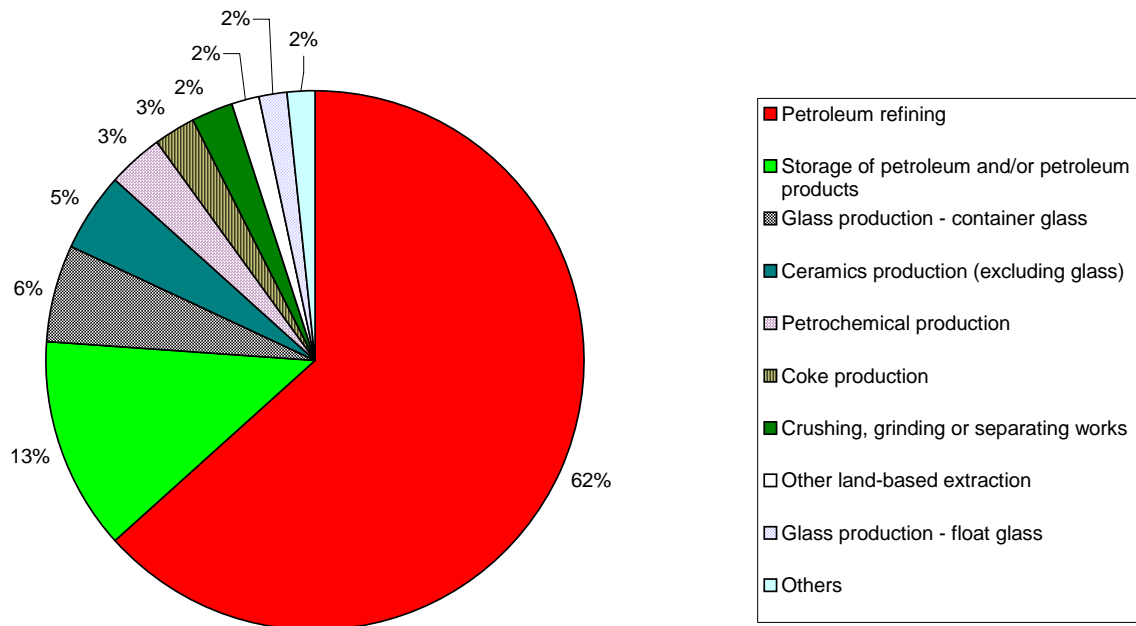


Figure ES1.12: Industrial Emissions of Sulfur Dioxide (SO₂) by NSW Activity Type in Sydney
 (Total Emissions = 11,000 tonnes/year)

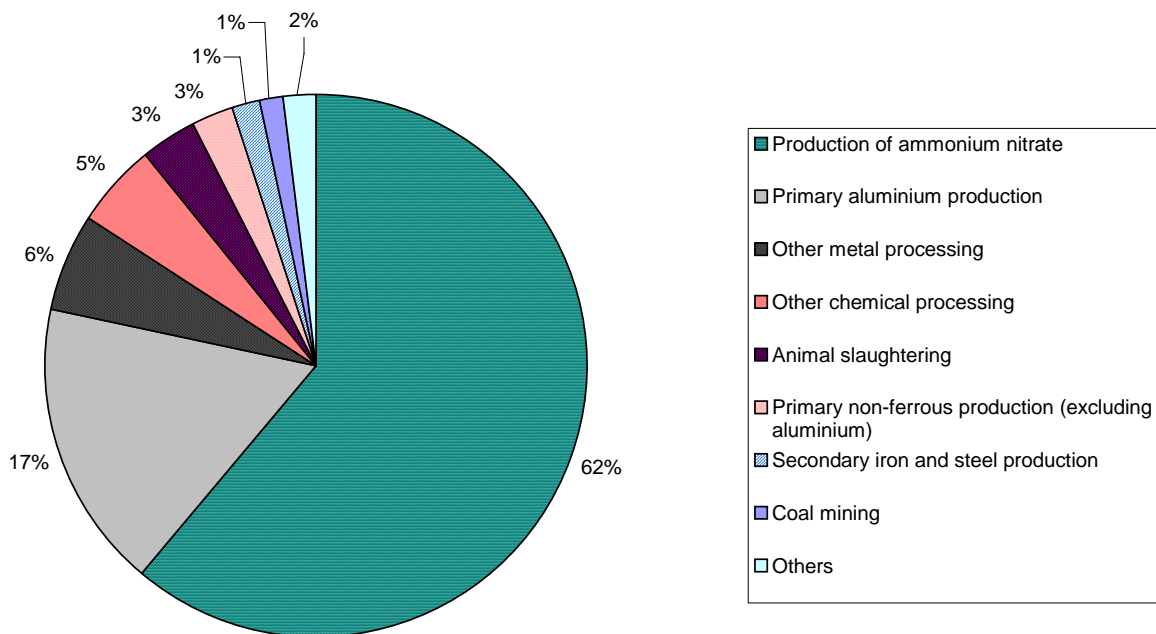


Figure ES1.13: Industrial Emissions of Oxides of Nitrogen (NO_x) by NSW Activity Type in Newcastle
 (Total Emissions = 1,730 tonnes/year)

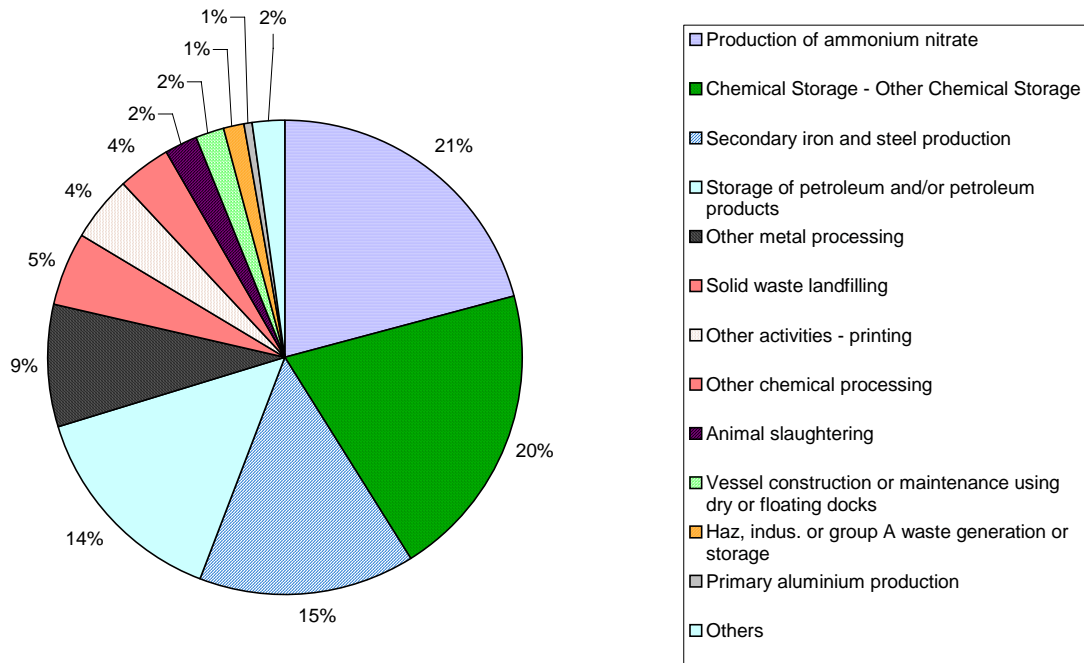


Figure ES1.14: Industrial Emissions of Total VOCs by NSW Activity Type in Newcastle
 (Total Emissions = 1,270 tonnes/year)

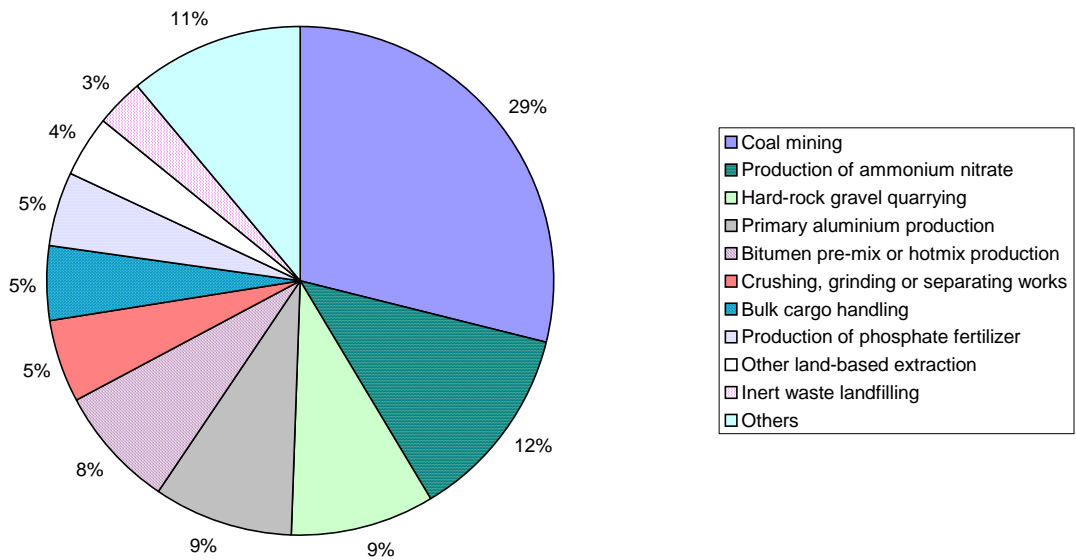


Figure ES1.15: Industrial Emissions of Particles (PM₁₀) by NSW Activity Type in Newcastle
 (Total Emissions = 1,710 tonnes/year)

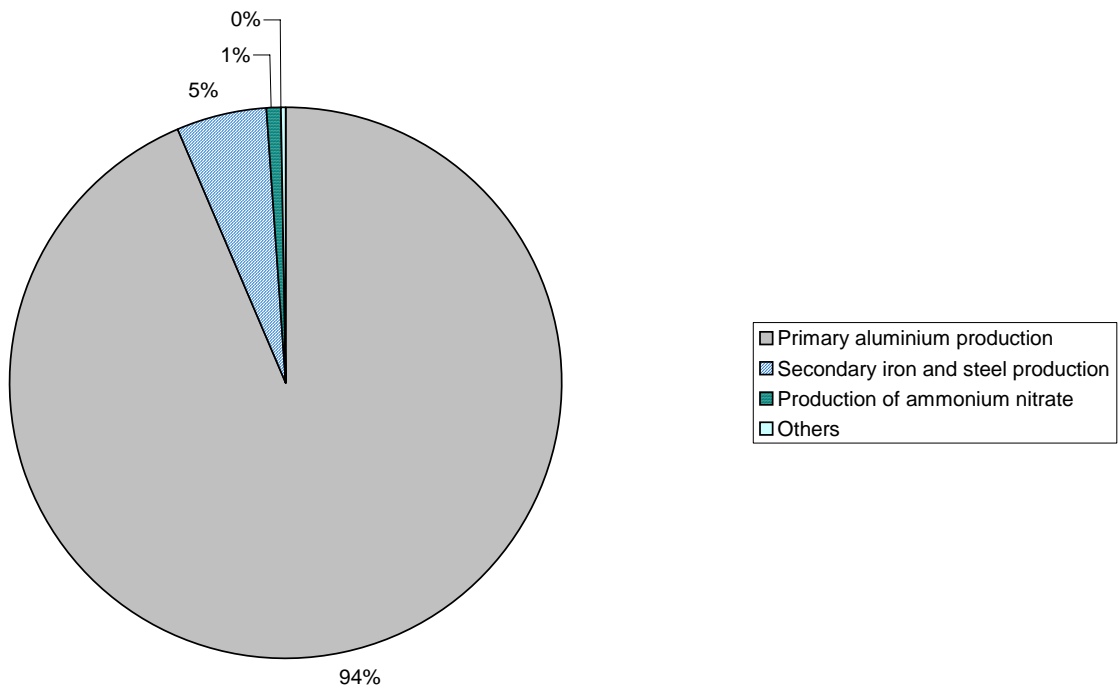


Figure ES1.16: Industrial Emissions of Carbon Monoxide (CO) by NSW Activity Type in Newcastle
(Total Emissions = 47,800 tonnes/year)

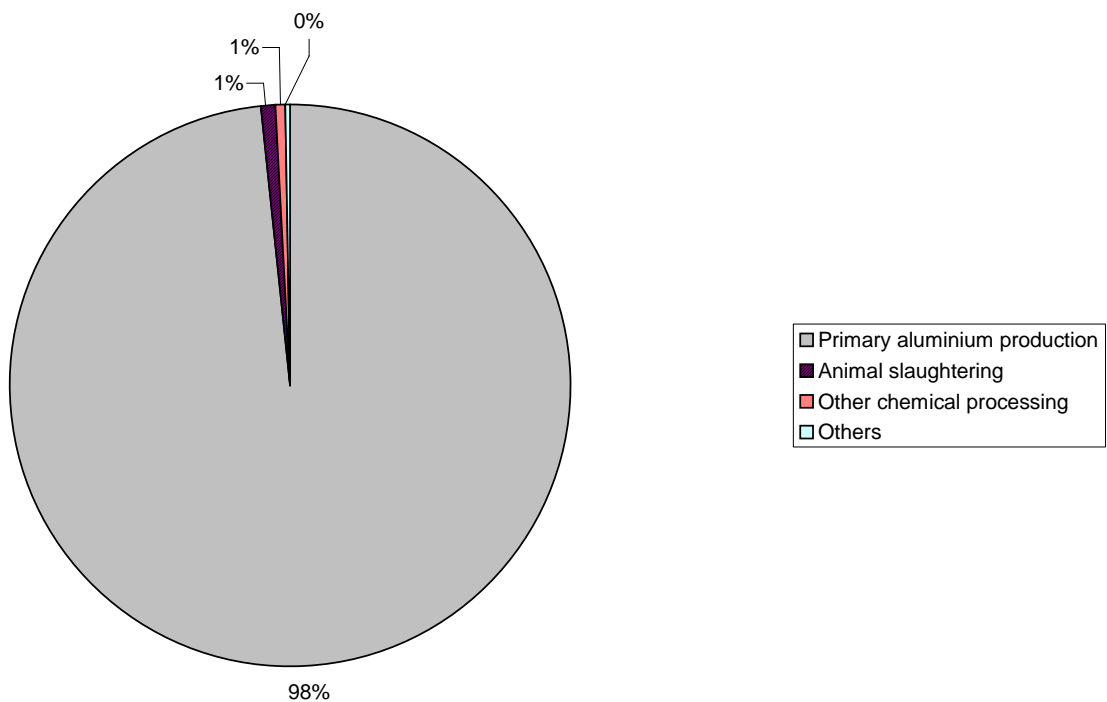


Figure ES1.17: Industrial Emissions of Sulfur Dioxide (SO₂) by NSW Activity Type in Newcastle
(Total Emissions = 9,300 tonnes/year)

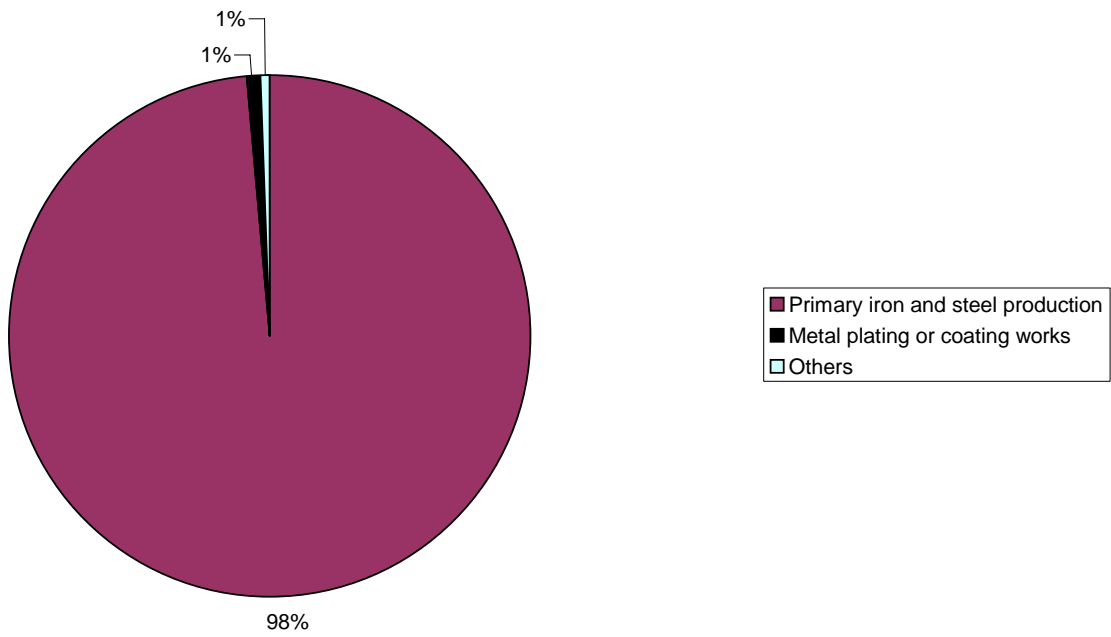


Figure ES1.18: Industrial Emissions of Oxides of Nitrogen (NO_x) by NSW Activity Type in Wollongong
(Total Emissions = 7,930 tonnes/year)

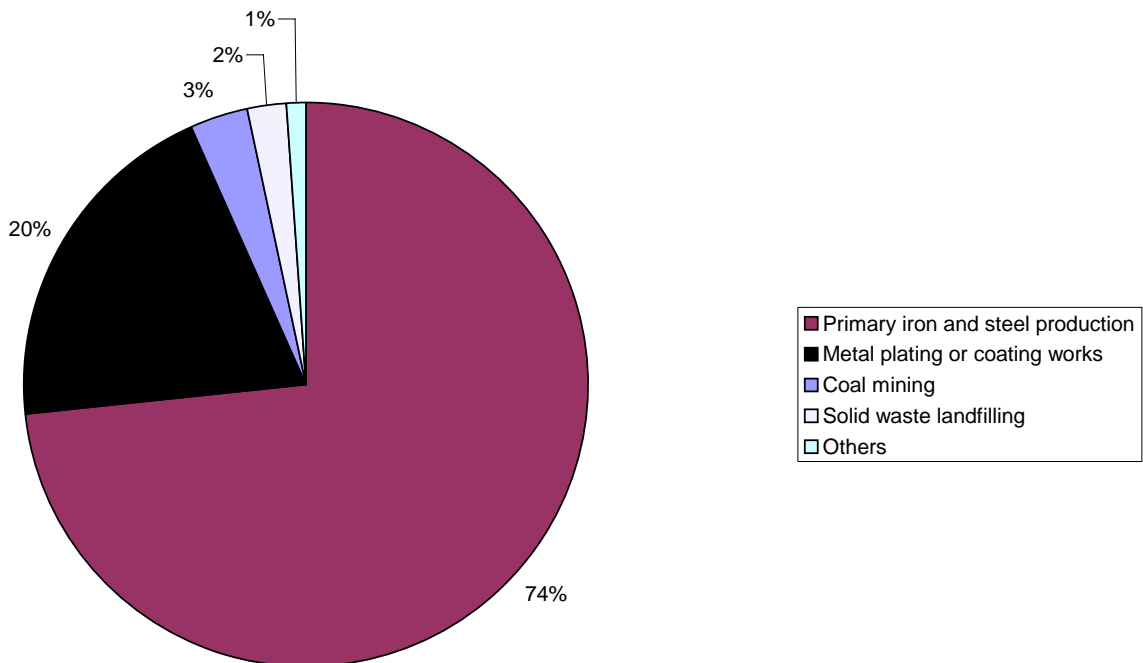


Figure ES1.19: Industrial Emissions of Total VOCs by NSW Activity Type in Wollongong
(Total Emissions = 788 tonnes/year)

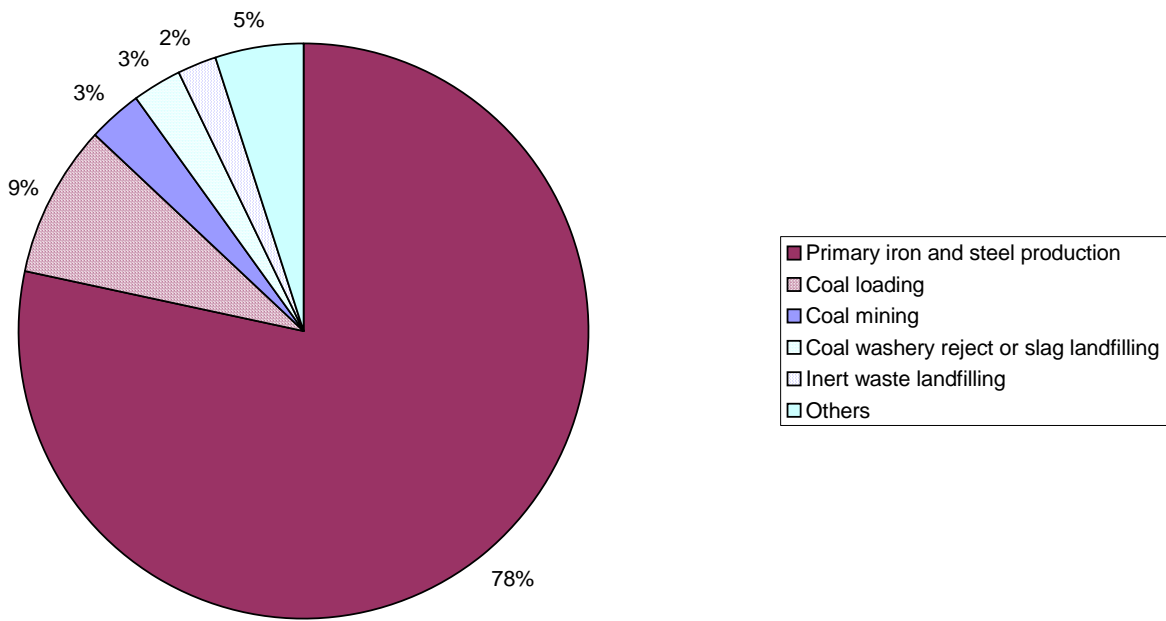


Figure ES1.20: Industrial Emissions of Particles (PM₁₀) by NSW Activity Type in Wollongong
(Total Emissions = 2,070 tonnes/year)

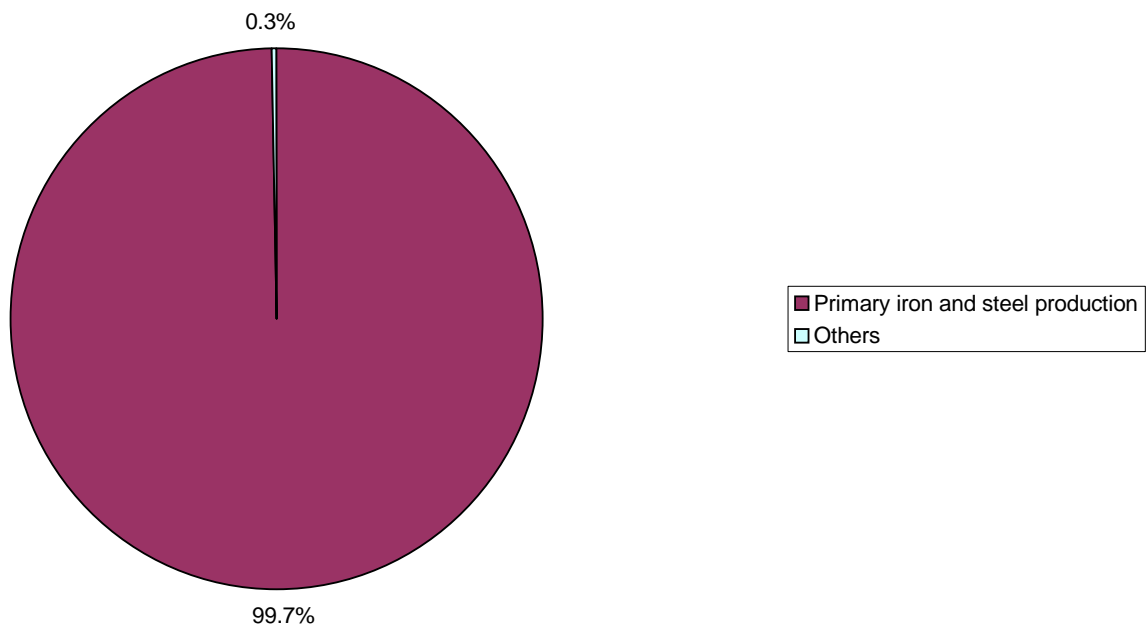


Figure ES1.21: Industrial Emissions of Carbon Monoxide (CO) by NSW Activity Type in Wollongong
(Total Emissions = 522,000 tonnes/year)

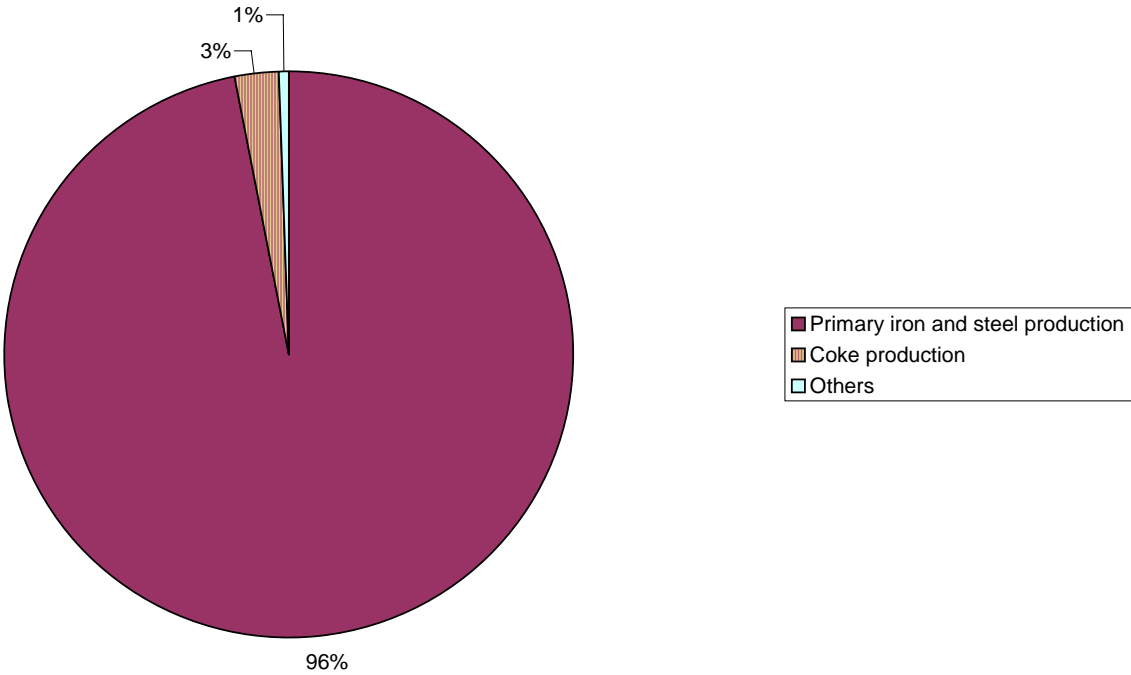


Figure ES1.22: Industrial Emissions of Sulfur Dioxide (SO₂) by NSW Activity Type in Wollongong
(Total Emissions = 10,300 tonnes/year)