

EXECUTIVE SUMMARY

The Department of Environment and Climate Change NSW (DECC), in collaboration with Environment Protection Authority of Victoria (Ng, 2006), has completed a three year air emissions inventory project for biogenic sources. The base year of the biogenic inventory represents activities that took place during the 2003 calendar year. The area included in the study covers greater Sydney, Newcastle and Wollongong regions, known collectively as the Greater Metropolitan Region (GMR), and is shown in Figure E1. The coordinates of the south-west and north-east corners of each region are listed in Table E1.



Figure E1. Definition of Greater Metropolitan, Sydney, Newcastle and Wollongong Regions

Table E1. Definition of Greater Metropolitan, Sydney, Newcastle and Wollongong Regions

Region	South-west corner MGA coordinates ^a		North-east corner MGA coordinates ^a	
	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

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

The sources included in the biogenic module are as follows:

- burning (emissions from agricultural burning, bushfires and prescribed burning);
- fugitive/windborne (windblown dust from agricultural lands and unpaved roads due to wind erosion);
- soil (emissions of oxides of nitrogen from soil due to microbial and chemical processes of nitrification and denitrification); and
- vegetation (emissions of volatile organic compounds from trees and grass).

The pollutants inventoried include criteria pollutants specified in the Ambient Air Quality National Environment Protection Measure (NEPM) (NEPC, 2003), air toxics associated with the National Pollutant Inventory (NPI) NEPM (NEPC, 2000) 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 1998 (PCO, 1998)) and Protection of the Environment Operations (Clean Air) Regulation 2002 (PCO, 2005).

Tables E2 and E3 show total estimated emissions and source contributions to total estimated emissions (for selected substances) respectively from biogenic sources in the GMR, Sydney, Newcastle and Wollongong regions. These substances were selected since they are: the most common air pollutants found in airsheds according to the NPI NEPM (NEPC 2000); referred to in NEPMS for Ambient Air Quality (NEPC 2003) and Air Toxics (NEPC 2004); and they have been classified as priority air pollutants (NEPC 2005). Total estimated emissions and source contributions to 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 Sydney, Newcastle and Wollongong regions.

Figures E2 to E7 show the percentage contributions to total estimated emissions (for selected substances) in the five regions. Most biogenic emissions occur in Non-Urban region. Bushfires and prescribed burning are the most dominant sources of most pollutants in the GMR, except for total volatile organic compounds and acetaldehyde, which originate mostly from vegetation, and oxides of nitrogen, which originate mostly from soil. Agricultural burning and fugitive/windborne are minor sources of emissions, as agricultural lands and unpaved road areas are relatively small in the GMR.

Table E2. Emissions (t/yr) from all biogenic sources in 2003

Substance	Agricultural burning	Bushfires and prescribed burning	Fugitive/windborne	Soil	Vegetation	Total
Greater Metropolitan						
oxides of nitrogen	10.6	5,190		8,144		13,344
sulfur dioxide	0.962	519				520
lead & compounds	7.90×10^{-04}	2.35	2.68			5.03
particulate matter < 10 µm	57.9	15,680	1,699			17,436
particulate matter < 2.5 µm	33.6	14,373	662			15,069
polycyclic aromatic hydrocarbons		1.88				1.88
total VOCs	38.5	27,398			165,157	192,594
total suspended particulates (TSP)	65.8	23,519	3,411			26,996
carbon monoxide	299	188,105				188,405
Acetaldehyde					1,009	1,009
1,3-butadiene		158				158
Sydney						
oxides of nitrogen	0.923	693		891		1,585
sulfur dioxide	0.0835	69.3				69.4
lead & compounds	6.86×10^{-05}	0.364	0.449			0.813
particulate matter < 10 µm	5.03	2,425	268			2,699
particulate matter < 2.5 µm	2.92	2,223	104			2,331
polycyclic aromatic hydrocarbons		0.291				0.291
total VOCs	3.34	3,428			30,557	33,989
total suspended particulates (TSP)	5.71	3,638	539			4,182
carbon monoxide	26.0	27,320				27,346
Acetaldehyde					136	136
1,3-butadiene		19.8				19.8
Newcastle						
oxides of nitrogen	0.200	4.56		98.4		103

Substance	Agricultural burning	Bushfires and prescribed burning	Fugitive/ windborne	Soil	Vegetation	Total
sulfur dioxide	0.0181	0.456				0.474
lead & compounds	1.49×10^{-05}	0.00218	0.111			0.113
particulate matter < 10 µm	1.09	14.6	77.6			93.3
particulate matter < 2.5 µm	0.633	13.3	30.3			44.2
polycyclic aromatic hydrocarbons		0.00175				0.00175
total VOCs	0.726	23.5			3,260	3,285
total suspended particulates (TSP)	1.24	21.8	156			179
carbon monoxide	5.64	170				176
Acetaldehyde					10.7	10.7
1,3-butadiene		0.136				0.136
Wollongong						
oxides of nitrogen		3.22		48.8		52.0
sulfur dioxide		0.322				0.322
lead & compounds		0.00210	0.00317			0.00527
particulate matter < 10 µm		14.0	1.75			15.8
particulate matter < 2.5 µm		12.8	0.681			13.5
polycyclic aromatic hydrocarbons		0.00168				0.00168
total VOCs		14.0			3,357	3,371
total suspended particulates (TSP)		21.0	3.51			24.5
carbon monoxide		145				145
Acetaldehyde					10.2	10.2
1,3-butadiene		0.0808				0.0808
Non-Urban						
oxides of nitrogen	9.51	4,489		7,106		11,604
sulfur dioxide	0.861	449				450
lead & compounds	7.06×10^{-04}	1.98	2.11			4.10
particulate matter < 10 µm	51.8	13,226	1,351			14,629
particulate matter < 2.5 µm	30.1	12,123	527			12,680
polycyclic aromatic hydrocarbons		1.59				1.59
total VOCs	34.5	23,933			127,982	151,949
total suspended particulates (TSP)	58.9	19,838	2,713			22,610
carbon monoxide	268	160,470				160,737
Acetaldehyde					852	852
1,3-butadiene		138				138

Table E3. Contributions (%) to emissions from all biogenic sources in 2003

Substance	agricultural burning	bushfire and prescribed burning	fugitive/ windborne	soil	vegetation
Greater Metropolitan					
oxides of nitrogen	0.080	39		61	
sulfur dioxide	0.19	100			
lead & compounds	0.016	47	53		
particulate matter < 10 µm	0.33	90	9.7		
particulate matter < 2.5 µm	0.22	95	4.4		
polycyclic aromatic hydrocarbons		100			
total VOCs	0.020	14			86
total suspended particulates (TSP)	0.24	87	13		
carbon monoxide	0.16	100			
Acetaldehyde					100
1,3-butadiene		100			
Sydney					
oxides of nitrogen	0.058	44		56	
sulfur dioxide	0.12	100			
lead & compounds	0.0084	45	55		
particulate matter < 10 µm	0.19	90	9.9		
particulate matter < 2.5 µm	0.13	95	4.5		
polycyclic aromatic hydrocarbons		100			
total VOCs	0.0098	10			90
total suspended particulates (TSP)	0.14	87	13		
carbon monoxide	0.095	100			
Acetaldehyde					100
1,3-butadiene		100			
Newcastle					
oxides of nitrogen	0.19	4.4		95	
sulfur dioxide	3.8	96			
lead & compounds	0.013	1.9	98		
particulate matter < 10 µm	1.2	16	83		
particulate matter < 2.5 µm	1.4	30	68		
polycyclic aromatic hydrocarbons		100			
total VOCs	0.022	0.72			99
total suspended particulates (TSP)	0.69	12	87		
carbon monoxide	3.2	97			

Substance	agricultural burning	bushfire and prescribed burning	fugitive/ windborne	soil	vegetation
Acetaldehyde					100
1,3-butadiene		100			
Wollongong					
oxides of nitrogen		6.2		94	
sulfur dioxide		100			
lead & compounds		40	60		
particulate matter < 10 µm		89	11		
particulate matter < 2.5 µm		95	5.0		
polycyclic aromatic hydrocarbons		100			
total VOCs		0.42			100
total suspended particulates (TSP)		86	14		
carbon monoxide		100			
Acetaldehyde					100
1,3-butadiene		100			
Non-Urban					
oxides of nitrogen	0.082	39		61	
sulfur dioxide	0.19	100			
lead & compounds	0.017	48	52		
particulate matter < 10 µm	0.35	90	9.2		
particulate matter < 2.5 µm	0.24	96	4.2		
polycyclic aromatic hydrocarbons		100			
total VOCs	0.023	16			84
total suspended particulates (TSP)	0.26	88	12		
carbon monoxide	0.17	100			
Acetaldehyde					100
1,3-butadiene		100			

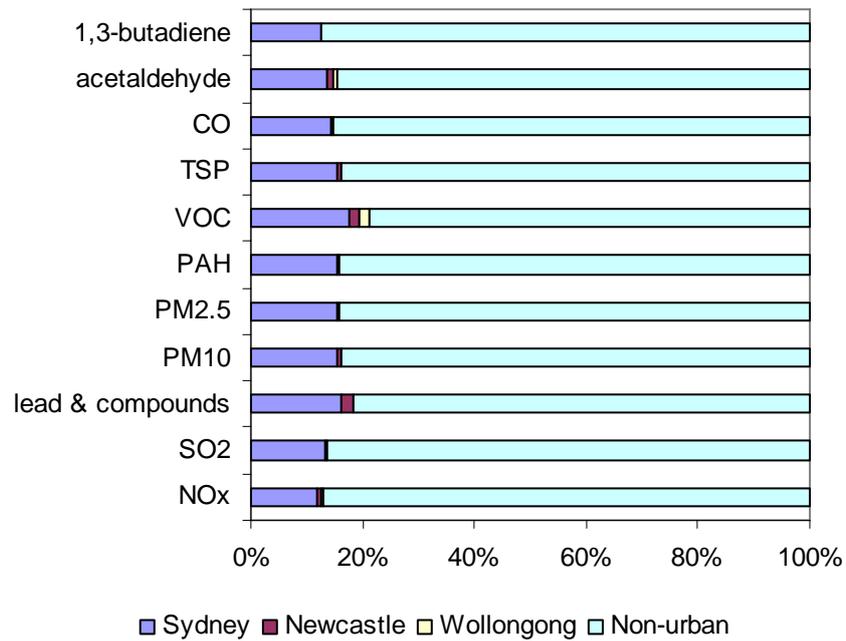


Figure E2. Contributions to emissions from all biogenic sources by region in 2003

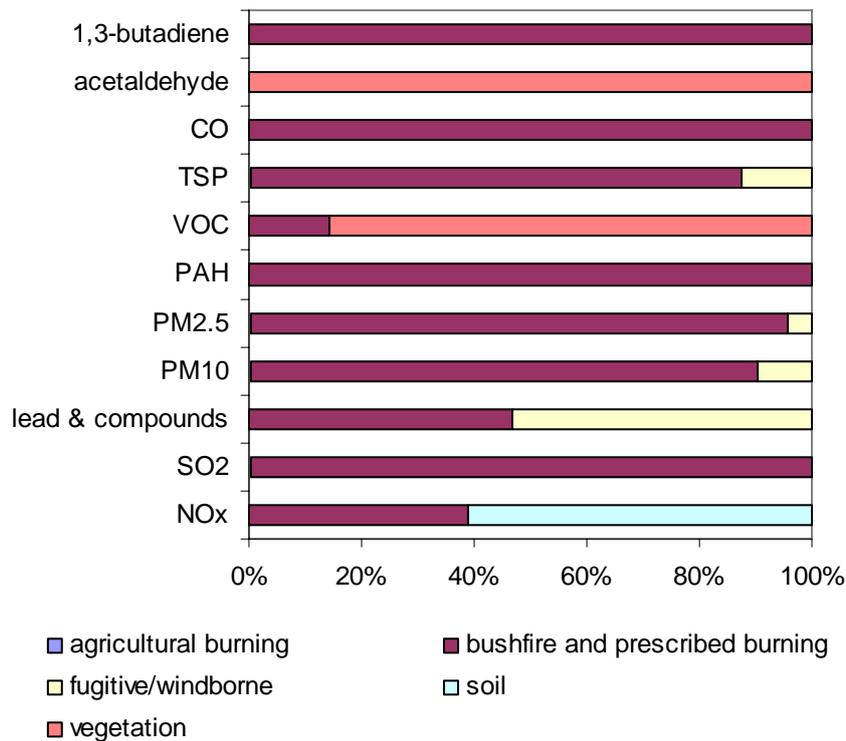


Figure E3. Contributions to emissions from all biogenic sources, GMR 2003

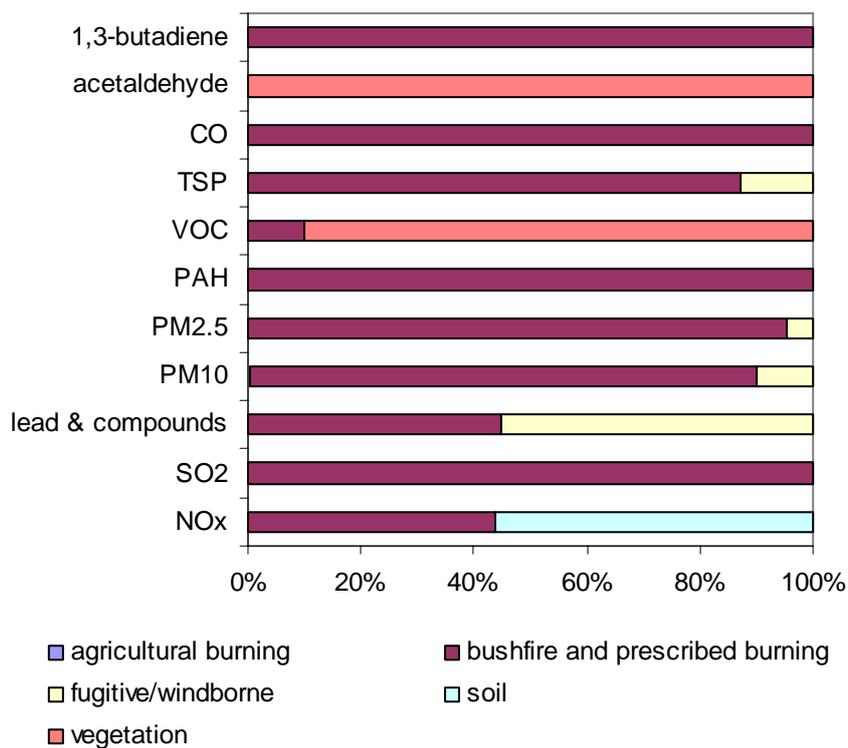


Figure E4. Contributions to emissions from all biogenic sources, Sydney region 2003

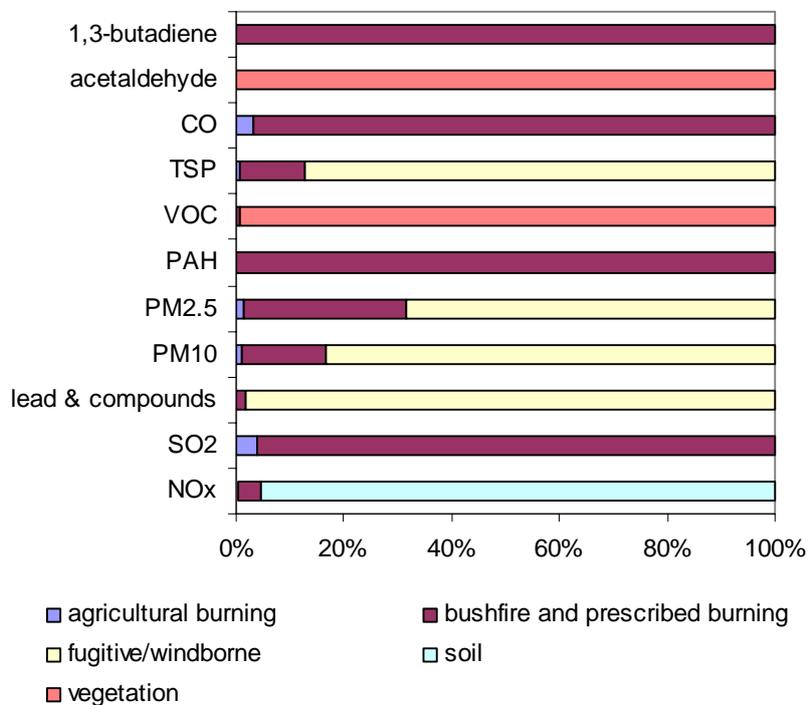


Figure E5. Contributions to emissions from all biogenic sources, Newcastle region 2003

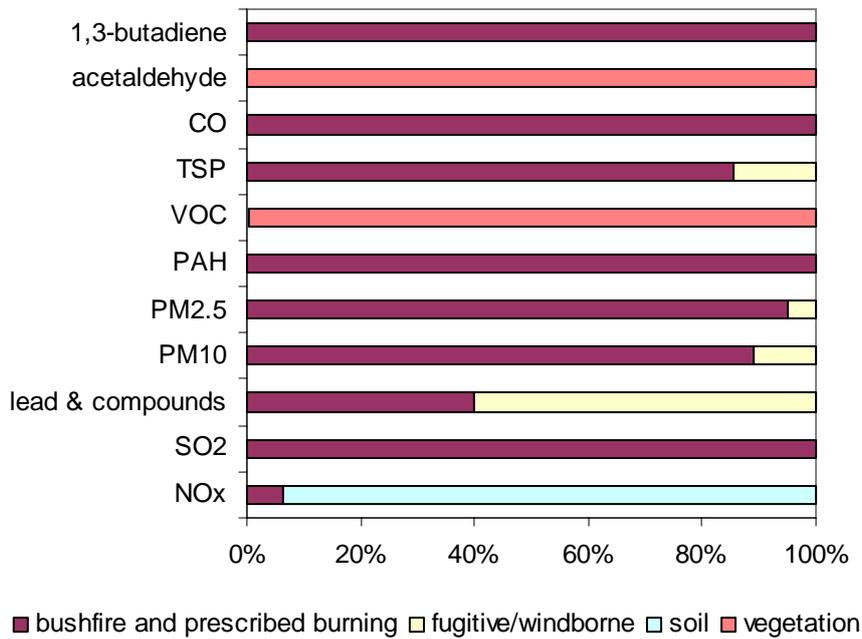


Figure E6. Contributions to emissions from all biogenic sources, Wollongong region 2003

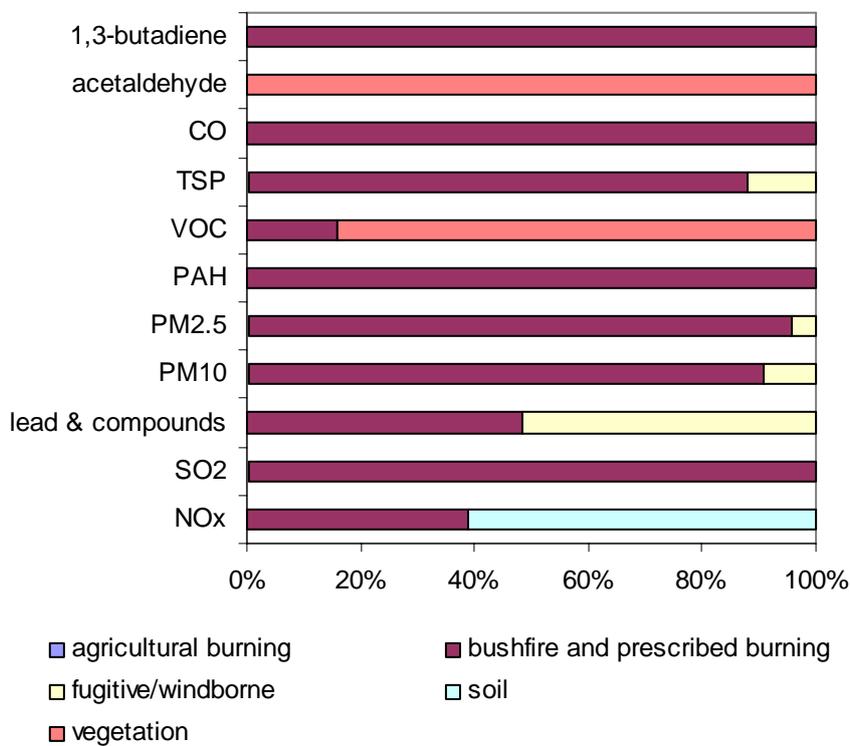


Figure E7. Contributions to emissions from all biogenic sources, Non-Urban region 2003