National Pollutant Inventory

Summary Report of Fourth Year Data 2001-2002

www.npi.gov.au

About this report

Outline

This report provides a summary of the National Pollutant Inventory (NPI), a snapshot of activities during 2001-02 and interesting examples of the types of information that can be obtained from the NPI. The 2001-02 NPI data referred to in this report was published 31 January 2003.

The report explains why substances are included in the NPI and the sources or origins of pollutant emissions. The report focuses on pollutant emissions to each of the environmental destinations: air, land, and water.

One of the aims of the NPI is facilitating cleaner production. The report outlines what cleaner production is, along with a case study of the impact of cleaner production on reducing pollutant emissions from a sewage treatment facility.

Finally, a set of useful links to find out more about pollution and contact details of government agencies that are involved in the NPI is provided.

NPI – Keep an eye on pollution; it's your right to know.

ISBN: 0642549346

Key points:

- 2001-02 is the fourth year of reporting NPI facility data.
- The number of facilities reporting in 2001-02 was 2,972 - 25 per cent more than the previous year.
- The NPI website continues to be updated, making it easier to use.
- All 90 NPI pollutants had to be considered by facilities for the first time.
- In 2001-02 motor vehicles remain the chief cause of pollution in Australia.

What is the NPI?

The National Pollutant Inventory (NPI) is an online database that provides comprehensive information about pollution. It is the only nation-wide, publicly accessible inventory of estimated pollutant emissions in Australia.

The NPI provides a broad base of information on pollutant emissions for the community, policy makers and industry. It aims to promote cleaner production measures to help reduce emissions and create a cleaner, healthier environment for all Australians. While States and Territory Governments are responsible for measuring the quality of the air we breathe, the NPI is an important first step in providing the information we need to understand the sources and amounts of emissions.

It is important to realise that these are *estimated* emissions and the accuracy of the data varies according to the estimation technique used.

Some information in this report looks at the proportion of pollutant emissions from various emission sources. In effect this approach is comparing the average contribution of sources to pollutant emissions. A similar approach is used on the location reports on the NPI website. More details about this approach are on the website.

To find out more about the NPI visit the NPI website (**www.npi.gov.au**), or contact the agencies listed on pages 26 and 27 of this report.

What substances are included in the NPI?

The NPI reports estimated emissions of 90 NPI substances to air, land and water. Substances are included in the NPI because of their health and environmental effects, and include substances from acetone and arsenic to carbon monoxide, mercury and xylenes.

The NPI provides background information for each NPI substance, including information about the health and environmental effects of the substance, as well as other useful links and references.

What pollutant sources are included in the NPI?

Industry sources

Facilities such as factories, mines, and intensive animal raising industries report annually when they exceed NPI reporting thresholds for any of the 90 NPI substances. NPI reporting thresholds relate to the use of selected NPI substances, how much energy the facility uses, or emissions of total nitrogen or total phosphorus to water. Facilities only report the NPI substances for which they exceed reporting thresholds.

Hence only those facilities that exceed reporting thresholds appear on the NPI.

Diffuse sources

Emissions from sources like aeroplanes and motor vehicles, as well as activities such as cigarette smoking and lawn mowing, are estimated by state and territory agencies. These are called Aggregated Emissions Data on the NPI website.

Emissions from industry facilities that do not report to the NPI themselves are included as part of diffuse source emissions and are not estimated annually.

Diffuse estimates are typically updated every four years.

The NPI and you

The NPI is a starting point to learn about pollutant emissions in your local community, your state or across the nation.

For the general community, the NPI provides:

- The location, emissions and contact details for facilities that report to the NPI
- Some ranking information about emissions from facilities
- Pollutant sources and emissions for your postcode, local area, city, state or nation
- Interactive maps showing pollutant emission sources and levels
- Diffuse emissions in either airsheds or water catchments
- Data download of emissions for you to analyse off-line

For industry, the NPI provides:

- Valuable benchmarking for your company's performance
- Transparent and accountable mechanisms for monitoring emissions
- Information to develop programs and technology to help you improve your efficiency

Further information on how NPI substances contribute to pollution can be obtained from state and territory environment agencies (see contact details on pages 26 and 27).

New features of the website

As an online database, the NPI can be accessed at **www.npi.gov.au**

The website is continually undergoing refinement and improvement. There was a major upgrade of the NPI website during 2001-02 making it easier to access the data and providing additional maps and graphs to help interpret the information.

NPI national emissions by source a

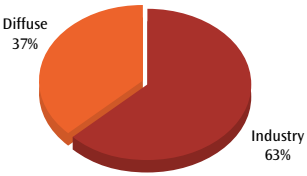
The NPI provides estimated pollutant emissions from industry sources such as factories and diffuse sources such as motor vehicles. See pages 7 and 8 for more information about diffuse and industry sources respectively.

The left-hand graph (A) shows the percentage of emissions (to air, land and water) from industry and diffuse sources. Diffuse emissions make up 37 per cent of NPI emissions.

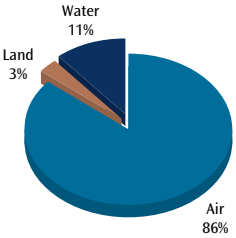
The middle graph (B) shows to where pollutants are emitted. Emissions to air were 86 per cent of all pollutant emissions for 2001-02.

The right-hand graph (C) shows how emissions to air are split between industry and diffuse sources. Industry facility emissions to air contribute more than half of the emissions of NPI pollutants to air.

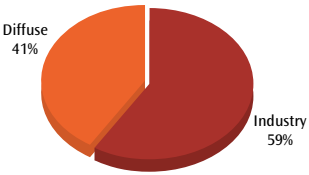
A – Emissions to air, land and water



B – Emissions from diffuse and industry sources



C – Emissions to air



Note: These graphs are not the sum of the total emissions of substances; see page 2 for an explanation of how the graphs were obtained.

nd destination

The table below shows the number of NPI pollutants emitted by industry and diffuse sources and where the pollutants are emitted to (air, land or water) in 2001-02.

The number of substances emitted to air, land and water

	Air	Land	Water	All Destinations
Industry	80	47	66	84
Diffuse	70	—	9[1]	73
Total number of NPI substances	80	47	66	84

Note:
1. Only one water catchment estimates emissions of more than two substances to water.

Diffuse sources

Diffuse emission data highlights how non-industrial sources, such as aeroplanes and cigarette smoking, contribute to Australia's pollutant emissions. Estimates of emissions have been made for selected airshed regions and water catchments.

Most of the 90 NPI substances are considered when estimating diffuse emissions to air in the various airshed studies and the boundaries of airsheds are selected by government agencies. Studies have been completed for all capital city and many regional areas in Australia. There were 32 airshed studies completed by the end of 2001-02. In 2001-02 two new airsheds, Ballarat and Mildura, were incorporated into the NPI. Airshed region and water catchment locations are shown on the map on page 11.

Industry facility sources

Facilities report their estimated emissions annually to the environment agency in the state or territory where they are located.

The table on page 9 shows that the number of reporting facilities has increased in most states and territories. The total number of reporting facilities in 2001-02 was 2,972 compared to 2,374 the previous year – an increase of 25 per cent. Each year the number of facilities that report increases as industry becomes aware of their obligations.

The number of facilities reporting in each state or territory is shown in the table on the next page.

Major industry sectors reporting to the NPI

The major industry sectors that report to the NPI are those five industry groups with the largest number of reporting facilities. The table on page 9 shows how the number of reporting facilities changed from 2000-01 to 2001-02. Overall there was a significant increase in the number of facilities reporting to the NPI in most industry sectors. The largest increase was for the public order and safety services sector, which consists of facilities such as waste disposal services (e.g. landfills). The number of facilities reporting in NSW for this sector showed the highest percentage increase.

In 2001-02, 700 facilities reported for the first time while 61 facilities that reported the previous year did not do so in 2001-02. Facilities may fall below NPI reporting thresholds or cease reporting because of:

- Cleaner production methods
- A change in production levels
- Facilities closing

Major Industry Sectors	Year	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Total
Mineral, metal and chemical wholesaling	**2001-02**	**5**	**159**	**21**	**143**	**64**	**14**	**84**	**98**	**588**
	2000-01	7	139	20	137	63	14	75	73	528
Water Supply, Sewerage and Drainage Services	**2001-02**	**3**	**83**	**6**	**50**	**43**	**37**	**58**	**15**	**295**
	2000-01	3	57	6	50	21	31	52	13	233
Electricity Supply	**2001-02**	**2**	**17**	**27**	**54**	**17**	**3**	**24**	**35**	**179**
	2000-01	2	12	29	49	17	3	21	35	168
Metal Ore Mining	**2001-02**	**0**	**9**	**14**	**19**	**1**	**6**	**4**	**110**	**163**
	2000-01	0	9	11	16	2	6	2	92	138
Public Order and Safety Services[1]	**2001-02**	**4**	**20**	**3**	**73**	**1**	**10**	**41**	**8**	**160**
	2000-01	2	3	3	73	1	5	10	9	106
All other industry sector facilities	**2001-02**	**9**	**339**	**22**	**410**	**136**	**58**	**416**	**197**	**1587**
	2000-01	9	241	18	307	121	43	302	160	1201
All reporting facilities 2001-02	**2001-02**	**23**	**627**	**93**	**749**	**262**	**128**	**627**	**463**	**2972**
	2000-01	23	461	87	632	225	102	462	382	2374

Note:

1. Mainly waste disposal services such as landfills

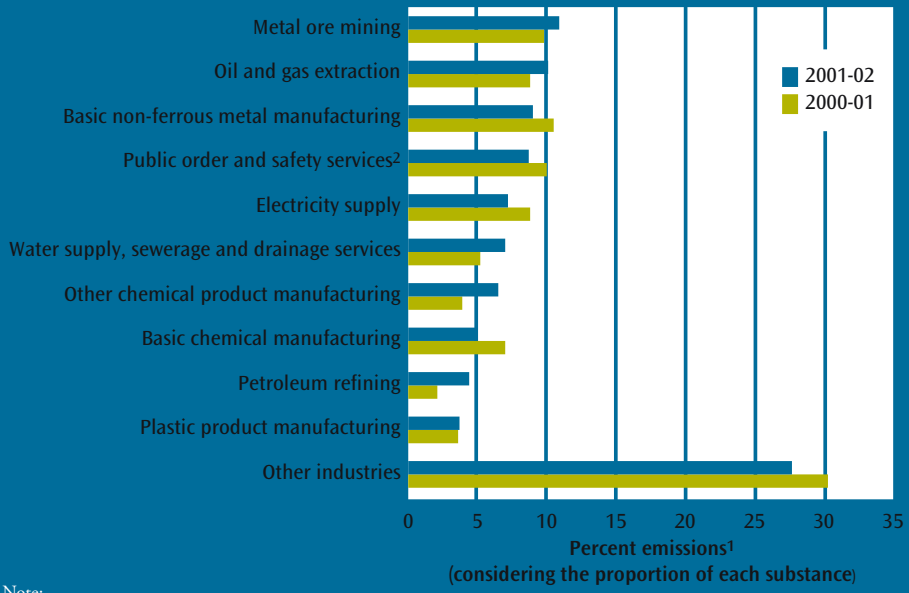
Significant industry sector emitters

The graph below shows the industry sectors that have the highest pollutant emissions. This is determined by the proportional contribution (as described on page 2) in 2001-02 compared to the previous reporting year.

These industry sectors are large industries that by their nature are significant pollutant emitters. These sectors are also central to maintaining our standard of living and are essential as they provide us with electricity, clean water, petrol and effective sewage treatment.

Some sectors have many facilities reporting to the NPI but contribute relatively little to pollutant emissions. For example, the beverage and malt manufacturing industry sector does not have high contributions to emissions, but does have a significant number of facilities reporting to the NPI.

Emissions from NPI industry sectors

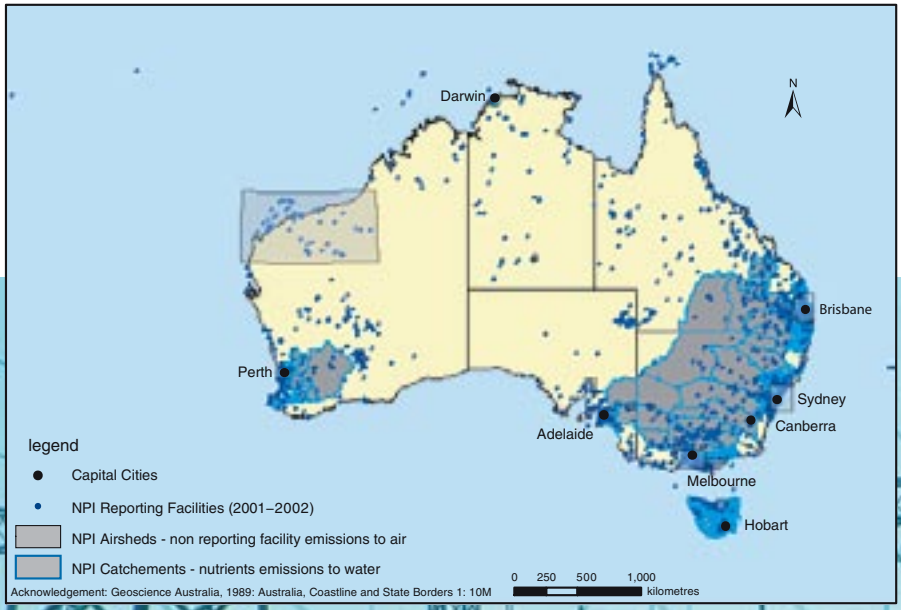


Note:

1. This graph is not the sum of the total emissions of substances; see page 2 for an explanation of how the graph was obtained.
2. Mainly waste disposal services such as landfills

Location of NPI pollutant sources

The map below shows the location of NPI reporting facilities for 2001-02 as blue dots. The location of diffuse emission water catchments and airsheds are also shown. Regions included in diffuse studies cover over 75 per cent of Australia's population.



Emissions to air

Pollutants are emitted to air from both industry facilities and diffuse sources. Emissions to air are the major component of all NPI emissions. This is shown in graph B on page 6 where 86 per cent all emissions were to air in 2001-02. Out of the 90 NPI substances, 80 are released to air.

The 20 major diffuse sources of pollutant emissions to air are listed in the table below. The most significant diffuse source nationally is motor vehicles.

Aeroplanes	Lawnmowing
Architectural surface coating (i.e. painting)	Liquid fuel burning (domestic)
Barbeques	Motor vehicle refinishing
Burning and bushfires[1]	Motor vehicles
Commercial shipping/boating	Natural/town gas leakage
Cutback bitumen	Print shops/graphic arts
Domestic/commercial solvents/aerosols	Railways
Dry Cleaning	Recreational boating
Fuel combustion from small industries[2]	Service stations
Gaseous fuel burning (domestic)	Solid fuel burning (domestic)

Notes:
1. Called 'Burning (fuel red. regen.)/wildfires' on the NPI
2. Called 'Fuel combustion (sub-threshold industries)' on the NPI

Top five NPI substances emitted to air

The five NPI substances with the largest estimated emissions to air for 2001-02 from both facility and diffuse sources are listed below. Most of these substances are also listed in the Ambient Air Quality National Environment Protection Measure (NEPM) and are called criteria pollutants.

The other criteria pollutant, ozone found at ground level, is not an NPI substance. Criteria pollutants cause or contribute to air pollution that may be anticipated to endanger public health or welfare (from the 'State of Knowledge Report: Air Toxics and Indoor Air Quality in Australia' by Environment Australia in 2001 - **www.deh.gov.au/atmosphere/airtoxics/sok/**). They are also the pollutants to which most Australians are exposed.

Pollutant	Overall ranking	Industry source ranking	Diffuse source ranking
Carbon monoxide	1	2	1
Total volatile organic compounds	2	5	2
Sulfur dioxide	3	1	5
Oxides of nitrogen	4	3	3
Particulate matter 10 micrometres or less in diameter	5	4	4

Notes:
1. 1 Is the largest emission to air and 5 is the smallest emission to air

Top five substances in different capital city airshed regions

Graphs showing the relative contributions of the top five NPI substances from **all** sources in three selected capital city airsheds are shown on the following page.

Darwin, Sydney-Newcastle-Wollongong and South East Queensland airsheds were chosen because they illustrate that the proportion of industry and diffuse sources of pollutant emissions varies amongst capital cities. Diffuse sources are non-industry sources such as motor vehicles. See pages 7 and 8 for some more information about diffuse and industry sources. The map on page 11 shows the extent of these airshed regions.

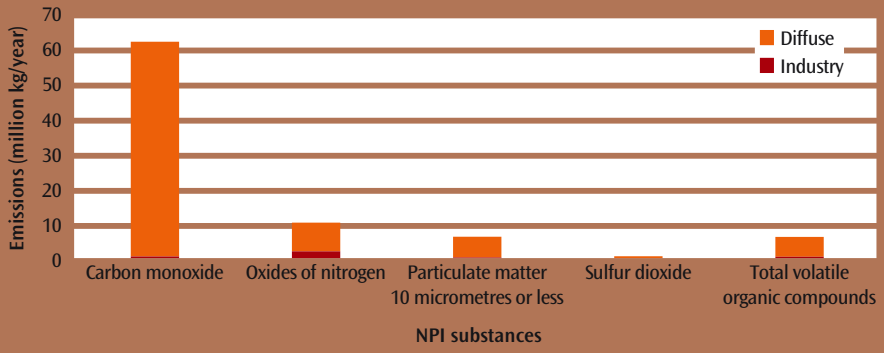
Motor vehicles are a significant source of emissions in these capital city airsheds. They are:

- The main source of carbon monoxide in the Sydney-Newcastle-Wollongong and South East Queensland airsheds
- The top source of oxides of nitrogen in all three airsheds
- The top source of total volatile organic compounds and particulate matter 10 micrometres or less in the Sydney-Newcastle-Wollongong airshed

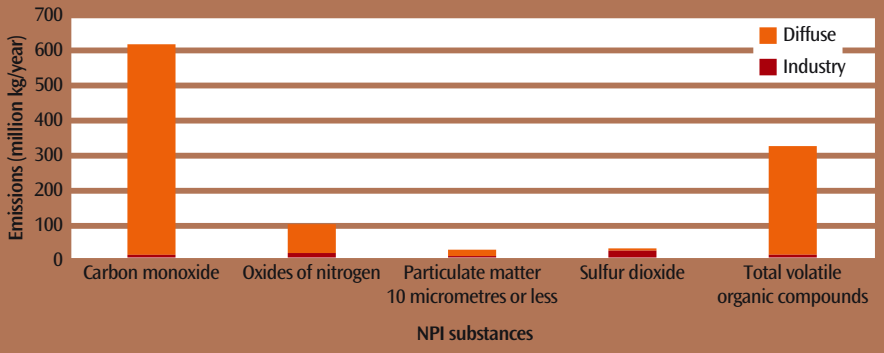
Darwin's major source of carbon monoxide and particulate matter 10 micrometres or less is from burning and wildfires. Burning and wildfires also contributes significantly to South East Queensland's emissions of these two substances.

The major sources of sulfur dioxide in the airsheds are electricity supply in Sydney and South East Queensland and commercial shipping and boating in the Darwin airshed.

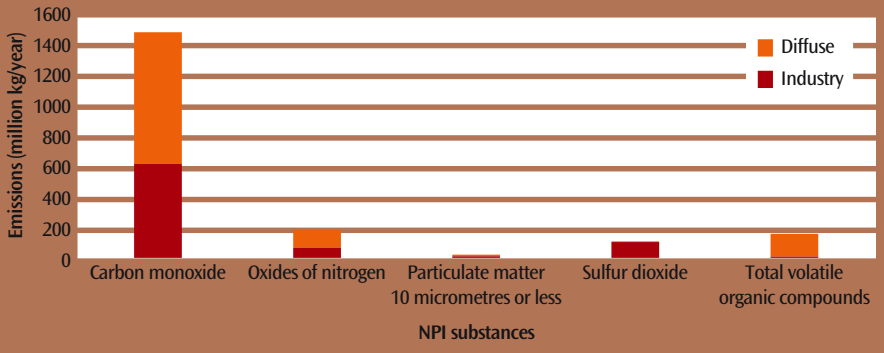
Distribution of top-five pollutants – Darwin



Distribution of top-five pollutants – South East Queensland



Distribution of top-five pollutants – Sydney-Newcastle-Wollongong



Mercury and compounds emissions to air

Emissions of mercury and compounds to air have been presented in the last two NPI summary reports so the 2001-02 data provides an update of the changes in emissions.

The human nervous system is very sensitive to all forms of mercury. Methyl mercury and mercury metal vapours are especially harmful, because more mercury reaches the brain. Exposure to high levels of any types of mercury can permanently damage the brain, kidneys, and developing foetus.

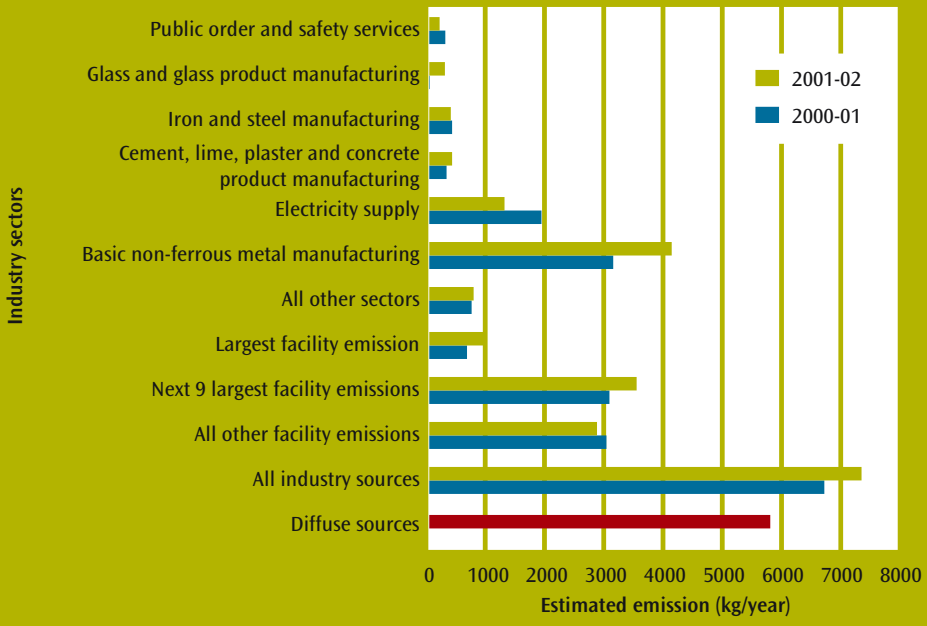
Major sources of mercury and compounds include the manufacturing industry where mercury can be used as a catalyst in some chemical reactions. It is also used to conduct electricity and can be a component of batteries, floodlights and streetlights.

In 2001-02 there were 810 facilities that reported estimated emissions of mercury and compounds to air greater than zero. This represents over a quarter of all NPI reporting facilities for 2001-02. This is an increase of 128 facilities, or 19 per cent, compared to 2000-01. For some facilities the estimated emissions were zero. This means the facility exceeded the NPI reporting thresholds for mercury and compounds, but the operator estimated the facility has no emissions to air.

Total emission estimates for mercury and compounds to air for 2000-01 and 2001-02 were 12,484 and 13,116 kilograms/year respectively. This five per cent increase is accounted for mainly by increases in emissions from the basic non-ferrous metal manufacturing industry sector.

The graph on page 17 shows the major sources of emissions of mercury and compounds to air.

Mercury and compounds emissions to air



Emissions to water

Pollutant emissions to water comprise both facility emissions and diffuse emissions. Diffuse emissions are estimated within defined catchments. For diffuse data, only total nitrogen and total phosphorus emission estimates are reported for every catchment.

The Mitchell-Tambo catchment in Victoria was added in 2001-02 bringing the total number of water catchment studies in the NPI to 24.

In 2001-02, industry facilities reported emissions of 66 NPI pollutants to water, while nine NPI pollutants were estimated for diffuse sources. One catchment, Darwin Harbour and surrounding catchments, has estimated emissions for substances other than total nitrogen and total phosphorus.

The major substances reported to water in 2001-02 and the change compared to 2000-01 is shown below.

Pollutant emissions to water for four NPI substances

Pollutant	2001-02 emission (kg/year)	Change from 2000-01 (per cent)
Total nitrogen	240,000,000	↓ 4
Total phosphorus	30,000,000	↓ 21
Sulfuric acid	20,000,000	↑ 18
Ammonia (total)	19,000,000	↑ 19

Total phosphorus emissions to water

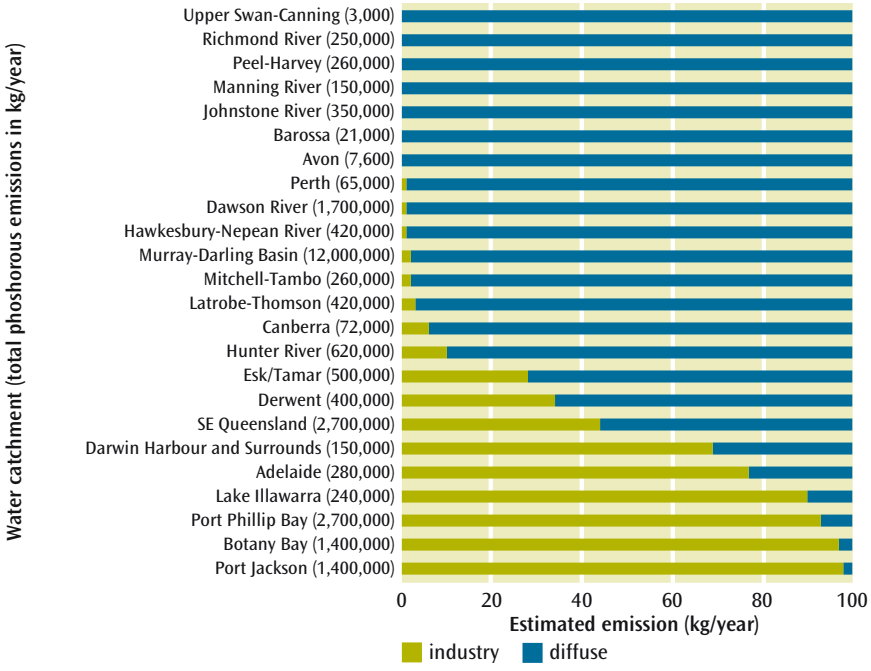
Total phosphorus emissions to water come from both diffuse and industry sources. In 2001-02, 214 facilities reported estimated emissions of total phosphorus to water, a decrease of 36 from the previous year. The estimated emissions from industry decreased from 18 million kg/year in 2000-01 to 10 million kg/year due largely to the decrease in the estimated emissions of a single facility.

The total phosphorus estimated emissions to water from diffuse and industry sources for 2001-02 was 31 million kg/year, with 10 million kg/year from industry. This indicates that, like many NPI substances emitted to air, the largest source of total phosphorus to the environment is diffuse sources.

Facility emissions contribute two-thirds of the total phosphorus emitted to water in 2001-02 from water catchments included on the NPI. The graph below shows the contribution of diffuse and industry sources for NPI catchments.

The water supply, sewerage and drainage services industry sector was the major source of total phosphorus emissions for all but one of the catchments that had an industry component.

Urban and regional catchments generally have different sources of total phosphorus. For many urban catchments the major sources are run-off from urban residential areas. For most regional areas the major diffuse sources are run-off from bushland, cropping, grazing or native vegetation.



Other substances emitted to water by industry

For most NPI substances, as indicated in graph C on page 6, the major environmental destination is to air. NPI substances for which more than 60 per cent of emissions are to water are set out in the table below.

Emissions to water of NPI substances are often dominated by an individual industry sector, as indicated in the table below. This is also the case for emissions of many NPI substances to air.

NPI substance	Per cent of emissions to water from a single industry sector
Aniline (benzenamine)	100
Benzene hexachloro- (HCB)	100
Chloroform (trichloromethane)	100
Chlorophenols (di, tri, tetra)	100
Manganese and compounds	93
Phenol	97
Sulfuric acid	84
Total nitrogen[1]	92
Total phosphorus[1]	97

Note:
1. This is for the emissions of this substance from industry and does not include diffuse sources.

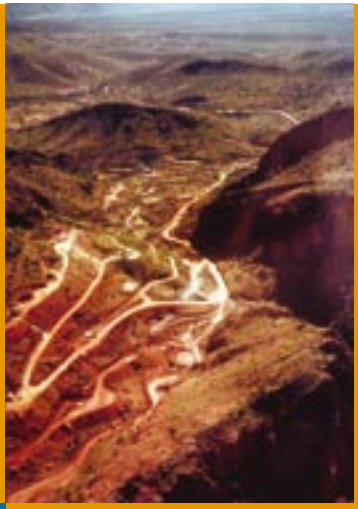
Emissions to land

Only industry emissions to land are reported. Emissions to land include seepage into soil and groundwater, accidental spills and leaks from facilities.

Often the community is interested in the emissions from landfills. Landfills are included on the NPI as waste disposal facilities and are not a major source of emissions to land. The largest emissions to land from landfill facilities were chlorine and ammonia. Material disposed into landfills is not classed as an emission, but rather a transfer.

Transfers are the movements of substances to be permanently stored, reused, reprocessed or otherwise treated rather than being released to air, land and water as pollutant emissions. Unlike many similar programs overseas, the NPI does not include transfers.

There were 47 NPI pollutants reported as being emitted to land in 2001-02. There were no NPI pollutants reported as being emitted solely to land. The largest five NPI pollutant emissions to land were: ammonia, chlorine, cyanide (inorganic) compounds, fluoride (usually from water fluoridation), and lead and compounds.

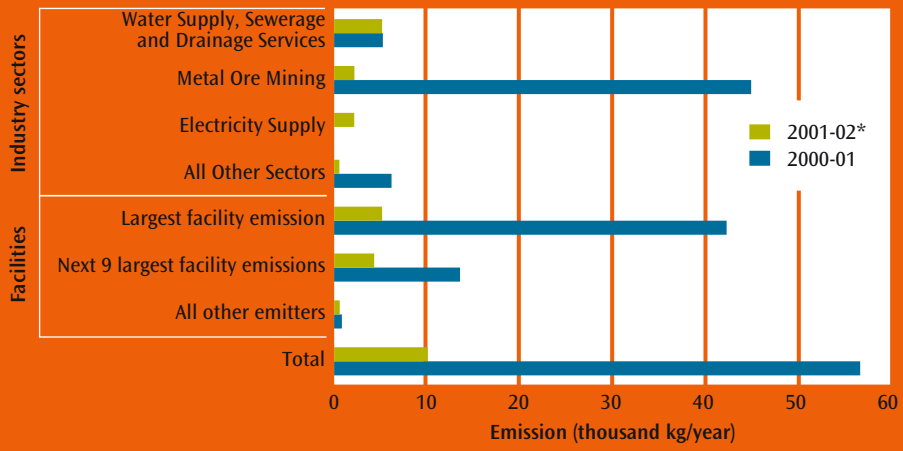


Lead and compounds emissions to land

There has been a large increase in the number of facilities reporting lead and compounds emissions to land over the last three years, which largely accounts for the increase in emissions since the 1999-00 reporting year.

In 2001-02, 212 facilities reported emitting lead and compounds to land. This is nearly double the number of facilities from the previous reporting year and represents 7 per cent of all NPI reporting facilities. Of all the facilities that reported lead and compounds to land in 2001-02, only 37 per cent had also reported lead and compounds in 2000-01.

Emissions of Lead and compounds to land



Note:

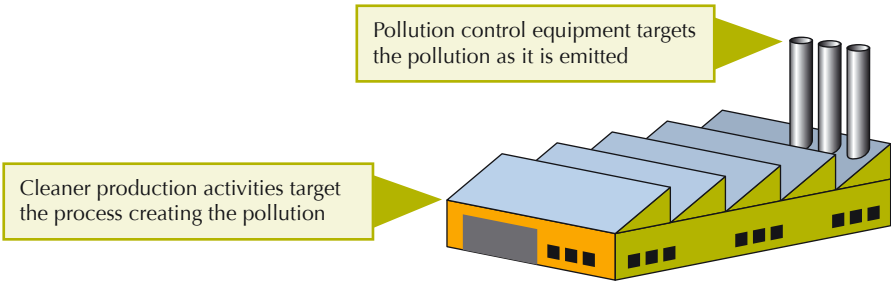
* One large facility emission recorded for 2001–02 has been excluded from this graph as it was found to be incorrect. It is still recorded in the NPI database for 2001–02 emissions as it was reported at that time.

Cleaner production

One of the goals of the NPI is to help minimise waste and make production cleaner. The NPI shows how pollutant emissions vary from year to year for a facility and within similar industries. This highlights the impact that improved environmental performance of facilities has on pollutant emissions. Emission levels may vary because of: more facilities reporting their emissions, changes in factory production levels, improved environmental performance, changes to the process, installation of pollution control equipment such as fabric filters, and updated estimation techniques. Even weather conditions can affect the level of emissions.

Cleaner production occurs when the environmental performance of a process is improved. Examples are installing new equipment or changing the process so that different raw materials are used. See the website address below for more information about cleaner production.

Since the inception of the NPI program in 1998, reporting facilities have had the opportunity to report on cleaner production activities and pollution control developments that they have undertaken to reduce pollutant emissions. This information is voluntary and thus caution must be used with any analysis undertaken.



Examples of cleaner production techniques can be found at the Eco-Efficiency and Cleaner Production homepage of the Department of the Environment and Heritage: **www.deh.gov.au/industry/corporate/eecp/**

Examples can also be found through some State Government Environment Department websites, see contact details on page 26 & 27.

Success story:
Melbourne Water Corporation reduces emissions

Melbourne Water Corporation's treatment facility at Werribee is one of Victoria's major sewage treatment facilities. It processes 54 per cent of Melbourne's sewage waste and is located on the shores of Port Phillip Bay.

A $124 million upgrade of the facility is underway. The upgrade has already significantly reduced emissions of total nitrogen and ammonia into Port Phillip Bay.

In 2001-02 the ammonia emissions from the facility were 950,000 kilograms, which was 47 per cent lower than the previous year. In 2001-02 the total nitrogen emissions were 2.5 million kilograms per year, which was 27 per cent lower than the previous year.

For both ammonia and total nitrogen, the emissions from the Werribee facility represent a decrease of approximately 10 per cent for the entire Port Phillip Bay water catchment. The upgrade also resulted in significant decreases in emissions of other NPI substances.

Melbourne Water recently gained approval from the Victorian EPA for a similar upgrade to their facility at Bangholme.

For more information about Melbourne Water visit: **www.melbournewater.com.au**.

To see the NPI facility report for the Werribee facility search for 'Melbourne water corp' at postcode 3030 on the facility search link on the NPI website at **www.npi.gov.au**. Using postcode 3175 instead of 3030 will provide a report for the Bangholme facility.

More information about pollution and the environment

For information on the National Pollutant Inventory, including access to the emissions data: **www.npi.gov.au**

For further information on air, land and water quality, refer to state agencies listed on the next page and at: **www.npi.gov.au/contacts/**

Information on the Australian Government's activities to encourage sustainable industry can be found at: **www.deh.gov.au/industry**

The State of the Environment 2001 Report that provides information on a wide range of environmental issues is available at: **www.deh.gov.au/soe/**

Information about the Australian Government's activities in relation to greenhouse gases is at: **www.greenhouse.gov.au/**

Information on ozone-depleting substances that are regulated by the Australian Government: **www.deh.gov.au/atmosphere/ozone/**

NPI contacts

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Abbreviations and definitions from this report

Criteria pollutants:

Substances that cause or contribute to air pollution that may be anticipated to endanger public health or welfare.

DEH:

Department of Environment and Heritage

Diffuse pollutant emissions:

Pollutant emissions estimated by governments from sources such as motor vehicles.

NEPC:

National Environment Protection Council consisting of Australian, State and Territory Environment Ministers.

NEPM:

National Environment Protection Measure: an agreement between Australian, State and Territory Governments in relation to an aspect of environmental protection. The NPI is a NEPM.

NPI:

National Pollutant Inventory

Transfers:

The movements of pollutants to be permanently stored, reused, reprocessed or otherwise treated rather than being released to air, water and land as emissions.

What can the NPI do for me?

The NPI is your opportunity to find out about the nature and location of pollutant emissions to our environment.

It allows you to identify sources of pollution and recognise facilities actively reducing their environmental impacts.

For information about the NPI visit **www.npi.gov.au** or contact an NPI officer from the details listed on page 26.

The NPI is a cooperative program between Australian, State and Territory Governments.

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Designed and Typeset by Levitate Graphic Design, Canberra.