National Pollutant Inventory

Summary Report of Sixth Year Data 2003-2004

www.npi.gov.au

About this report

The National Pollutant Inventory (NPI) is the only nationwide, publicly accessible inventory of pollutant emissions in Australia.

The NPI provides a broad base of information on pollutant emissions for the community, government and industry. The NPI programme is run cooperatively by the Australian, state and territory governments to help create a cleaner and healthier environment.

This summary report gives an overview of the sixth NPI reporting year (2003-04). Facility data for 2003-04 was published on the internet (**www.npi.gov.au**) on 31 January 2005.

This report uses the data available as at 31 January 2005. As some minor changes to the data will be made after this time, information in this report may not be the same as data on the web site.

It is important to realise that the NPI data are often calculated rather than measured. Data accuracy varies according to the determination 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 web site. More details about this approach are on the web site.

NPI – It's your right to know

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Outline

Welcome to the sixth summary report of the National Pollutant Inventory (NPI).

This report presents an overview of activities during 2003-04, and examples of the types of information that can be obtained from the NPI web site **www.npi.gov.au**

One of the aims of the NPI is facilitating cleaner production. The report provides information about cleaner production, along with a case study of some innovative solutions the Toyota Motor Corporation has introduced to help reduce pollutant emissions.

The report explains why substances are included in the NPI, and discusses the sources of pollutant emissions. There is a focus on the environmental destination of emissions: air, land and water.

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

Key points

- 2003-04 was the sixth year for NPI facility reporting.
- In 2003-04, 3,618 facilities reported to the NPI - 6.5 per cent more than the previous year.
- Nearly half of the substances listed on the NPI had decreased emissions compared to last year's data.
- Motor vehicle emissions remain the main source of air pollutants for six out of eight Australian capitals.
- The NPI web site continues to be updated, making it easier to use.

The NPI and you

The NPI is a starting point to learn about pollutant emissions in your local community, your state or the nation. It is important to remember that there are many factors that contribute to pollution of our air, land or water, and that not all emissions and types of pollution are reported to the NPI. More information about pollution can also be obtained from state and territory environment agencies (see page 28 and 29).

Information the NPI provides:

- Full details of individual facilities that report to the NPI.
- A ranking of key substance emissions from a facility compared to the largest emission from a facility for that year.
- Pollutant sources and emissions for your postcode, local area, city, state or the nation.
- Interactive maps showing pollutant sources and destinations.
- Diffuse emissions estimated in airsheds or water catchments.
- A spreadsheet download of emissions that can be analysed off-line.
- Health and environmental information about the 90 NPI substances.
- Tips on what government, industry and you can do to help reduce pollution.

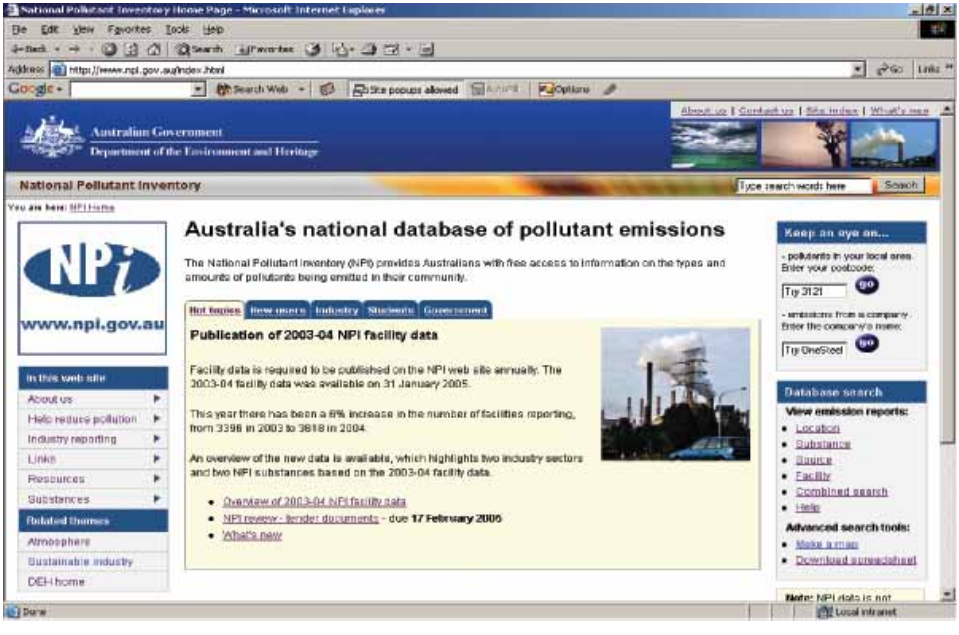
The NPI web site

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

The NPI web site has been updated this year with quick and easy access to information about pollution. Some of the new features include:

- Hot topics - the messages in this window will change regularly, and provide an instant update on what's new in the NPI.
- Targeted resources for industry, government, schools, and new users.
- User-friendly navigation.

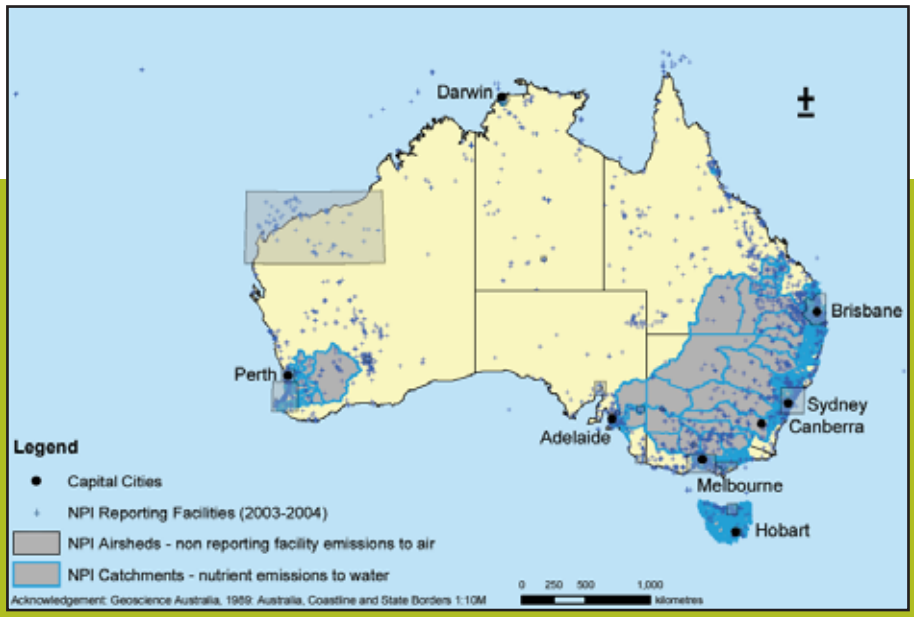
The database search option provides several ways of viewing emission reports and accessing data.



Emission sources

Location of NPI pollutant sources

The map below shows the location of NPI reporting facilities for 2003-04 as blue crosses, as well as the locations of completed diffuse emission studies for water catchments and airsheds. Regions included in diffuse studies cover more than 75 per cent of Australia's population.



Diffuse sources

Emissions from sources like aeroplanes and motor vehicles, as well as from activities such as cigarette smoking and lawn mowing, are estimated by state and territory agencies. Emissions from facilities that do not reach the reporting threshold levels are also included in the diffuse emissions.

Diffuse emissions data shows the contribution of non-industrial sources to Australia's pollutant emissions. Diffuse emissions are not estimated annually.

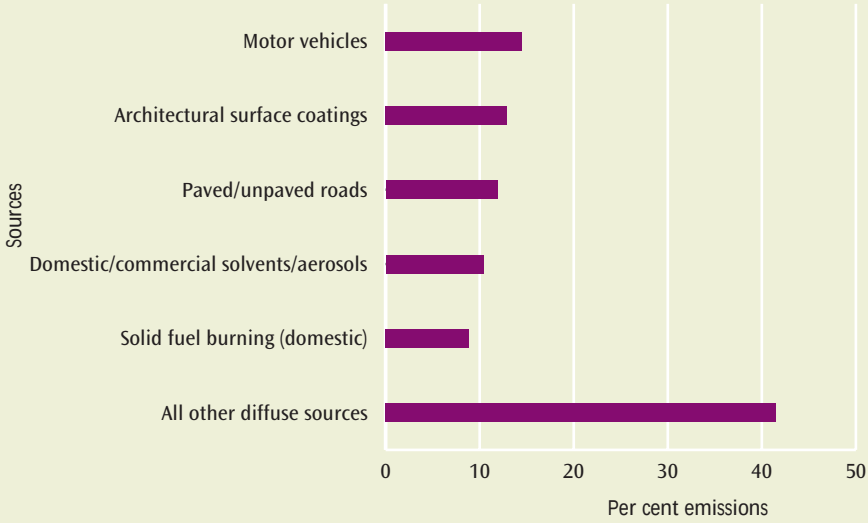
Most of the 90 NPI substances are considered in diffuse emissions to air in airshed studies. However, only total nitrogen and total phosphorus are determined in most water catchments.

The boundaries of NPI airsheds are selected by government agencies. 33 studies were completed by the end of 2003-04, covering all capital cities and many urban regions in Australia. In 2003-04 the Ballarat, Bendigo, Latrobe Valley, Mildura and Port Phillip regional studies were updated.

The boundaries of water catchments are determined by the drainage of interconnected river systems, and sometimes cross state or territory borders. To date, 32 catchment studies have been completed for the main urban and rural areas in Australia.

The major diffuse sources of pollutant emissions to air are listed in the table below. The most significant diffuse source across the nation is motor vehicles. See 'Motor vehicle emissions to air in the Port Phillip airshed' for a closer look at substance emissions from cars and other vehicles.

2003-04 emissions from major diffuse sources

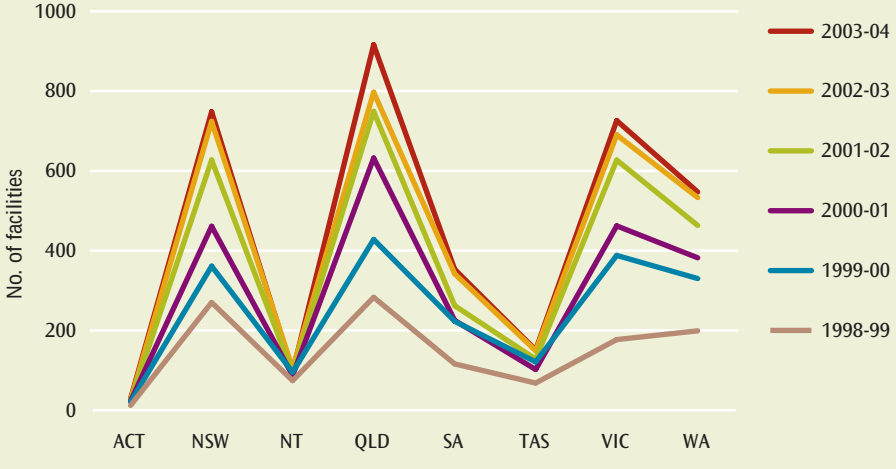


Facility sources

Facilities such as factories, mines, and intensive animal-raising enterprises report annually when they exceed NPI reporting thresholds for any of the 90 NPI substances.

The graph below shows that the number of reporting facilities has increased in most jurisdictions. The total number of reporting facilities in 2003-04 was 3,618 compared to 3,364 the previous year – an increase of 6.5 per cent.

Number of facilities reporting



In 2003-04, 382 facilities reported for the first time while 242 facilities that reported the previous year did not do so in 2003-04. Facilities may fall below the NPI reporting thresholds where previously they were above them because of:

- commencing cleaner production methods.
- changing production levels.
- changing how emissions are determined.
- closing of facilities.

Industry sector sources

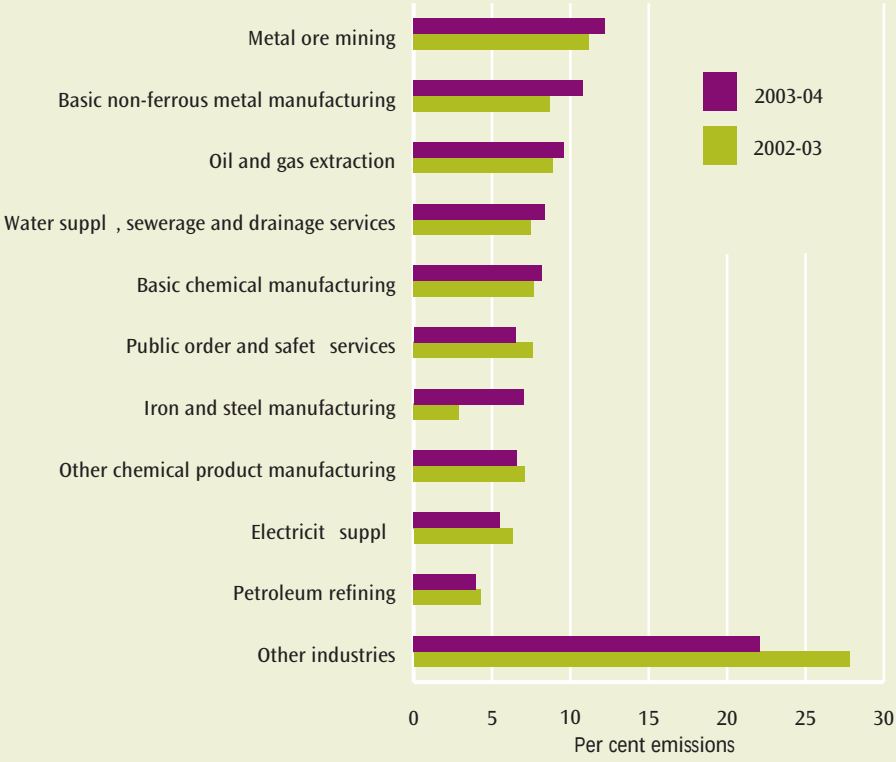
Facilities are grouped into industry sectors using the Australian and New Zealand Standard Industrial Classification (ANZSIC) codes. This enables facilities to compare their results against other facilities in the same ANZSIC code, and for the community and policy makers to track emissions from different industries.

Several sectors showed improvement in certain areas. For example, the electricity supply sector has seen significant reductions in oxides of nitrogen, lead and compounds and chlorine. The mining and metals sectors are two of the fastest-growing sectors in the Australian economy. Although overall emissions from these sectors are higher this year due to the raised output, there has been a reduction in the emissions of lead and compounds. Lead and compounds emissions from industry decreased significantly from 710 thousand kilograms in 2002-2003 to 490 thousand kilograms in 2003-2004.

The graph on the following page shows the industry sectors that have the highest pollutant emissions in 2003-04. This is determined by the proportional contribution from various emission sources compared to the previous reporting year.

Some sectors, such as mining industries, are big industries and by their nature are large emitters. Other sectors have many facilities reporting to the NPI but contribute relatively little to pollutant emissions. For example, the intensive poultry-farming sector has a high proportion of NPI facilities but does not make a large contribution to total emissions.

Emissions from NPI industry sectors



Note: Substances are not added together to get this graph. The table looks at the proportion of pollutant emissions from various emission sources. A similar approach is used for the location reports on the NPI web site.

Overview of a major industry sector reporting to the NPI – cement and lime manufacturing

The NPI database can be used to generate a report for a specific industry sector. The cement and lime manufacturing sector is one example of a major industry sector reporting to the NPI. The sector makes a significant contribution to the Australian economy. Facilities in this sector are engaged in producing products for building and construction.

A total of 27 facilities reported on 40 substances in the 2003-04 reporting year, one more facility than the previous year. This sector is a major emitter of carbon monoxide, mercury and mercury compounds, and polychlorinated dioxins and furans.

In the past year the cement and lime manufacturing sector reported decreased emissions for most substances. For some other substances, such as carbon monoxide, reported emissions increased.

Changes in reported emissions can be due to improved environmental performance, changes to the process, installation of pollution control equipment such as fabric filters and updated determination techniques.

Emissions of some NPI substances from the cement and lime manufacturing sector for the past two years are in the following table.

Substance to air, land and water	2002-03 (kg/year)	2003-04 (kg/year)	Change
Arsenic and compounds	100	77	> 25% decrease
Mercury and compounds	520	520	No change
Substance to air			
Carbon monoxide	6.7 million	11 million	< 75% increase
Formaldehyde	7,700	7,400	> 4% decrease
Particulate matter 10 micrometers or less in diameter	2.2 million	2.0 million	> 6% decrease
Polychlorinated dioxins and furans	0.015	0.012	> 24% decrease
Sulfur dioxide	1.6 million	1.5 million	> 1% decrease
Substance to water			
Total nitrogen	15,000	4,700	> 70% decrease

Cleaner production

One of the main goals of the NPI is to encourage facilities to use cleaner production techniques to reduce pollutant emissions. Reporting facilities can report on cleaner production activities and pollution control developments undertaken during the reporting year. Any analysis must recognise that provision of this information is voluntary.

In 2003-04, 970 facilities reported emission reduction activities.

Examples of cleaner production techniques and case studies can be found at the Eco-Efficiency and Cleaner Production home page at: www.deh.gov.au/industry/corporate/eecp/index.html

Examples can also be found through some state environmental protection agencies web sites; see contact details on page 28 and 29.

Robots at work in the paint shop, Toyota Altona facility

Success story:

Toyota vehicle manufacturing facility in Altona Victoria

As a regular reporter to the NPI, Toyota Motor Corporation has introduced several innovative technological and management solutions in recent years to help reduce pollutant emissions.

A significant improvement in total volatile organic compounds (TVOC) emissions has been achieved with the introduction of cartridge-based robots in the Altona paint shop topcoat line. The articulated robots represent world best practice in car painting technology. By maintaining a correct distance to the vehicle body at all times and by using dedicated refillable cartridges for each different colour, it has been possible to reduce cleaning solvent use in the process by up to 75 per cent. It has also improved the quality of the finish. Toyota has just introduced the same technology in the primer painting stage.

In an effort to reduce gas consumption at the engine foundry, Toyota has installed a new holding furnace for their high-pressure engine block casting machine. This furnace allows for the delivery of molten aluminium by road transport straight from the smelter, negating the need to re-melt solid ingots. This has resulted in significant energy savings, which has led to reduced NPI emissions associated with gas combustion. Scraps from the process can also be melted which reduces waste generated.

Toyota has introduced a chemical substance management system to control the amount and variety of chemicals used. Every chemical used on the site is subject to approval, being checked against an internal list of over 700 controlled substances. Any chemical containing substances on the NPI list are recorded, so that usage and emission of the chemical can be tracked and included as part of the annual reporting process.

Toyota is committed to reducing the environmental impact of operations through the use of leading technology. This includes commissioning a new bumper bar painting facility in 2006 that will dramatically reduce TVOC emissions by using water based paint technology.

In addition the company continues to set stringent and challenging targets to reduce energy consumption and to minimise waste in line with the Toyota philosophy of 'Kaizen' or continuous improvement.

For further information visit the Toyota website **www.environment.toyota.com.au**

Air stack emission sampling – Toyota Altona facility

Substance emissions

The substances on the NPI list have been chosen because of their health and environmental effects. The NPI gives an annual, nationwide snapshot of these substance emissions, which helps policy makers and the community find information on specific substances, and see whether these emissions decrease over time.

In the 2003-04 reporting year, total reported emissions for about half of the 90 NPI substances had decreased compared with the previous year.

Of the 46 substances that had increased emissions, 29 were only required to be reported for the last three years. This may indicate that facilities are still adjusting to the reporting of the new substances.

Substances that had a significant decrease in total emissions and a similar number of reporting facilities as last year include lead and compounds and toluene (methylbenzene).

Substances that had a significant increase in total emissions and a similar number of reporters as last year include acetaldehyde, acetone and methanol.

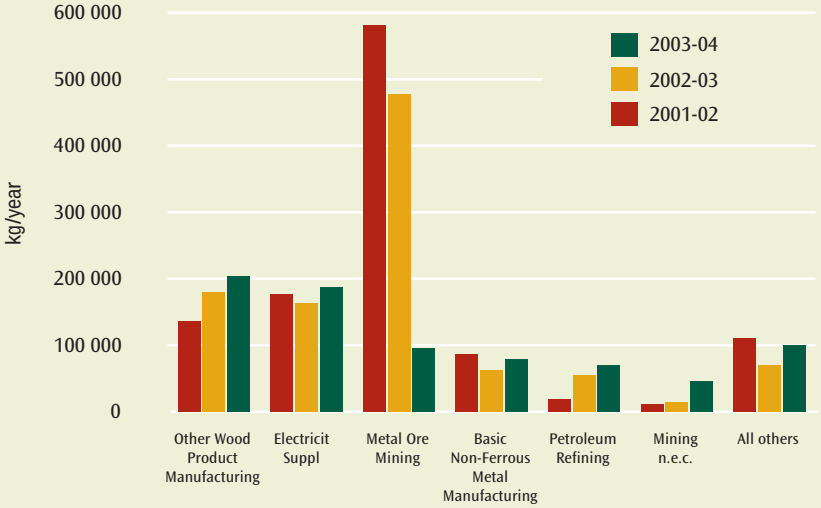
Changes in emissions can be due to a number of reasons including the installation of new pollution control equipment, better estimation of emissions and changes in facility operations.

Formaldehyde (methyl aldehyde)

Australian Environment Ministers have listed formaldehyde as an air toxic pollutant. Air toxic pollutants have been shown to be responsible for a range of health problems, including asthma, respiratory illnesses and cancer. Exposure to formaldehyde can be by inhalation of fumes, particularly indoors where concentrations can build up due to poor ventilation. Indoor environments consistently have higher concentrations than outdoor environments, because many building materials, consumer products, and fabrics emit formaldehyde.

Formaldehyde is emitted mainly to air. However, there are also some emissions to land and water by industry.

Major industry sources of formaldehyde



The primary source of formaldehyde emissions is domestic wood burning followed by motor vehicles. The Australian Government is focusing on improving community awareness of the impacts of air pollution and how to improve air quality. There are programmes to help minimize smoke from wood heaters and reduce pollution from motor vehicles.

There was a 24 per cent decrease in the emissions of formaldehyde from industry, and a three per cent increase in the number of facilities reporting formaldehyde in the 2003-04 reporting year.

Industry accounts for 11 per cent of all the estimated emissions of formaldehyde[1]. In 2003-04, the largest source of formaldehyde emissions was the other wood product manufacturing sector, followed by the electricity supply sector. The total emissions of formaldehyde have decreased over the past few years, although emissions from some sectors did increase. The major industry sources of formaldehyde are shown on the graph (remember that these do not include indoor sources which is where higher concentrations are normally found).

[1] Based on airshed studies completed to date.

Destination of emissions

Substances are emitted to air, land and/or water, and some substances can cause particular environmental problems when emitted to a particular destination, for example, total phosphorus to water.

The following sections give an overview on the destinations of emissions and some information from the 2003-04 facility data.

Emissions to air

Substance emissions to air comprise both facility emissions and diffuse source emissions.

In 2003-04, out of the 90 NPI substances, 83 were released to air.

Emissions of the most commonly known air pollutants, such as carbon monoxide and particulate matter 10 micrometres or less in diameter, were higher this year than last year. There was also an increase in the number of facilities reporting these substances.

The Port Phillip airshed

The Port Phillip airshed region covers an area of approximately 2.4 million square hectares.

Data about the Port Phillip airshed was updated in 2003-04. The number of facilities reporting in the Port Phillip airshed area was 432, compared to 412 the previous year. 77 substances from 99 sources were found. The major source of emissions was motor vehicles, and diffuse data in the region was collected from 45 sources.

Three of the five criteria pollutants (carbon monoxide, oxides of nitrogen and sulfur dioxide) are in the top five substances emitted to air in the Port Phillip region. The other major pollutants in this airshed are total volatile organic compounds and ammonia. There was no change in the top five substances in this airshed from the 2002-03 reporting year.

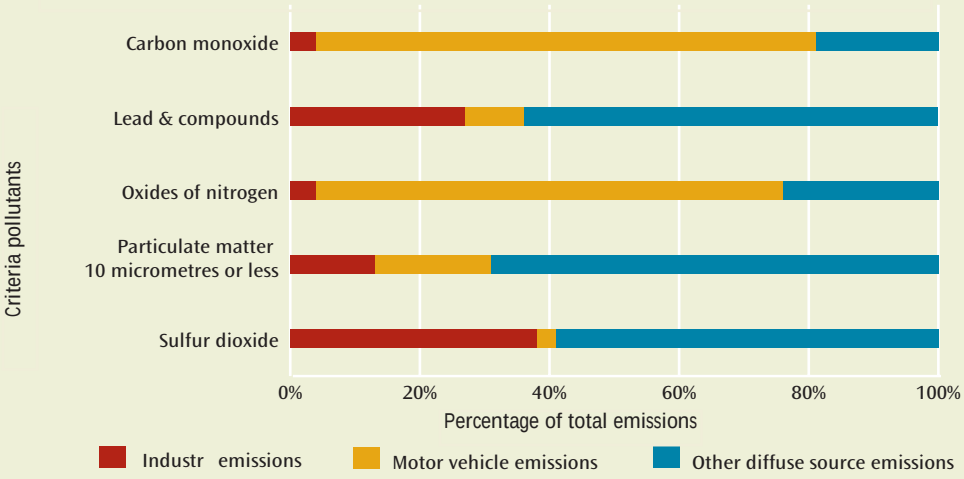
Motor vehicle emissions to air in the Port Phillip airshed

Motor vehicle emissions to air of five criteria pollutants (carbon monoxide, lead and compounds, oxides of nitrogen, particulate matter 10 micrometres in diameter or less and sulfur dioxide) compared with industry and other diffuse source emissions to air are shown in the following graph. The criteria pollutants are the focus of the Ambient Air Quality National Environment Protection Measure.

The major sources of sulfur dioxide from industry in the airshed were electricity supply, petroleum refining and non-ferrous metal manufacturing. Non-ferrous metal manufacturing was also a major source of lead and compounds, along with water supply, sewerage and drainage services and glass and glass product manufacturing.

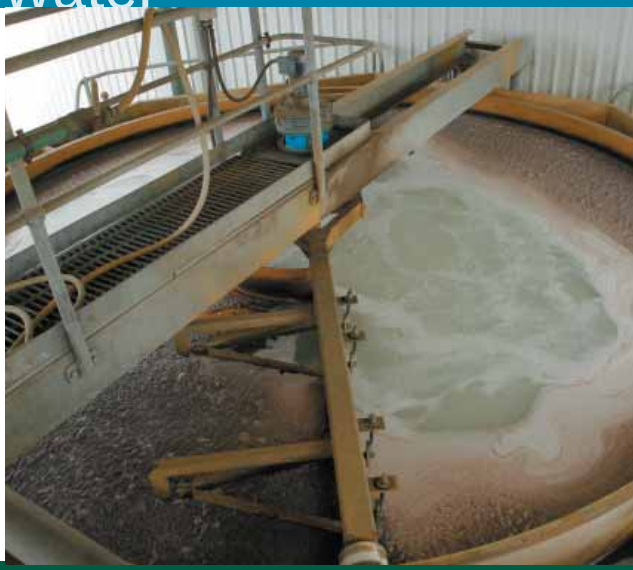
Ecogen Newport power station, Melbourne

Port Phillip Airshed



Emissions to water

Pollutant emissions to water comprise both facility emissions and diffuse emissions. Diffuse emissions are estimated within defined water catchments and usually (but not always) only include estimates of total nitrogen and total phosphorus.



Substances emitted to water

In 2003-04, industry facilities reported emissions of 69 NPI pollutants to water, and nine NPI pollutants were estimated for diffuse sources in the catchments.

The major substances reported to water in 2003-04 and the change compared to 2002-03 is shown below.

Substance	Total emissions 2002-03 (kg/year)	Total emissions 2003-04 (kg/year)	Change
Ammonia (total)	21 million	21 million	Steady
Sulfuric acid	19 million	4 million	> 79% decrease
Boron and compounds	1.9 million	1.4 million	> 26% decrease
Manganese and compounds	1.4 million	1.3 million	> 8% decrease
Fluoride compounds	1.3 million	1.2 million	> 8% decrease

Sectors that are major emitters of substances to water include: water, sewerage and drainage; oil and gas extraction; and mineral, metal and chemical wholesaling.

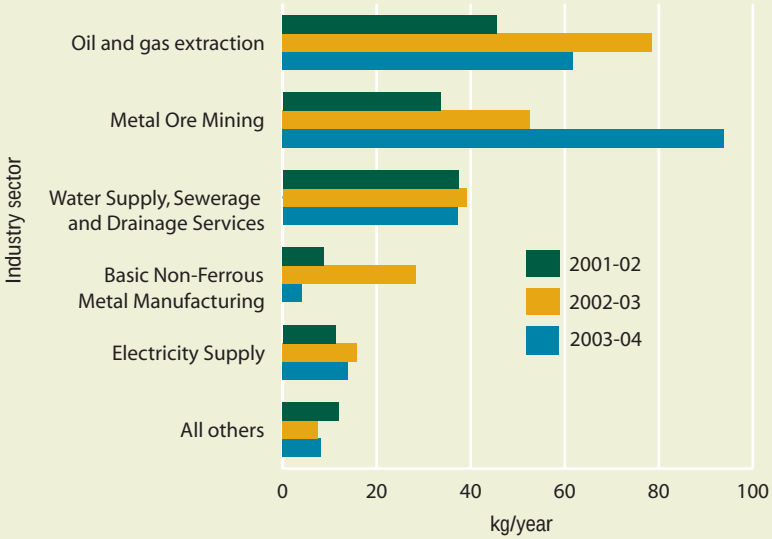
Mercury and compounds emissions to water

The human nervous system is very sensitive to all forms of mercury. In high concentrations, mercury can permanently damage the brain, kidneys and developing foetus. Methyl mercury builds up in the tissues of fish and shellfish. In areas of mercury contamination, larger and older fish tend to have higher levels of mercury. Once emitted, mercury and its compounds remain in the environment.

In 2003-04, 168 facilities reported mercury and compounds emissions to water. This is 23 per cent more than the previous reporting year and represents around 5 per cent of all NPI reporting facilities. Emissions of mercury and compounds to water from industry have not increased despite the growth in the number of facilities reporting the substance in 2003-04. There are variations among the sectors from year to year for emissions of this substance, but overall it is estimated that 218 kilograms of mercury and compounds were emitted to water in 2003-04 compared with 221 kilograms in 2002-03.

The top industry sector emissions of mercury and compounds to water are shown on the graph below.

Mercury and compounds emissions to water

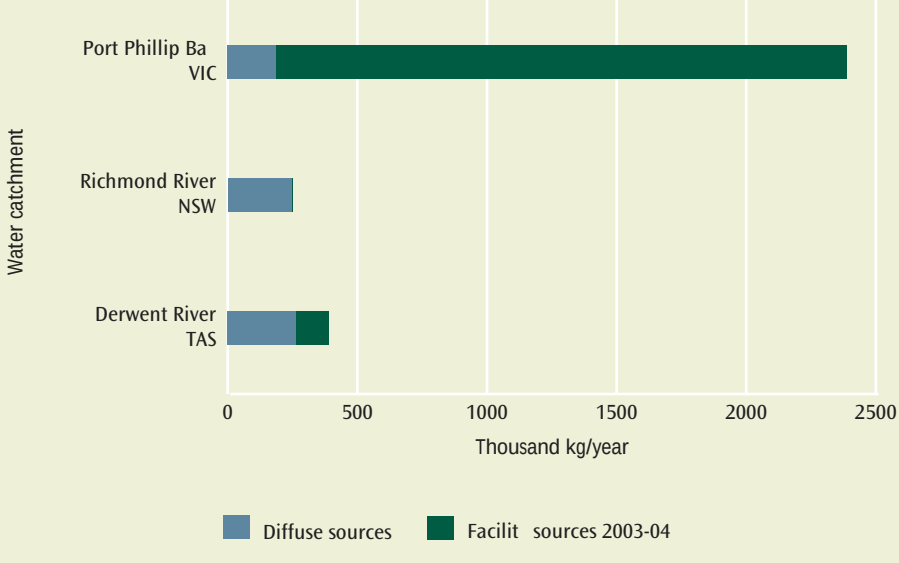


Total phosphorus emissions in catchments

Urban and regional catchments generally have different sources of substances such as total nitrogen and total phosphorus. In populated areas, the major sources are more likely to be facilities, such as sewage treatment plants and urban run off. In regional areas diffuse sources such as run off from bushland and land used for cropping and grazing are more likely to be important.

The following chart shows an example of three catchments that have different land uses and emissions of total phosphorus. Port Phillip Bay in Victoria is predominantly urban. The Richmond River catchment in NSW is mainly rural, while the Derwent River catchment in Tasmania has a mixture of urban and rural land uses such as aquaculture, paper and paper product manufacturing and agriculture.

Total phosphorus in different catchments



Emissions to land

Emissions to land include seepage into soil and groundwater, as well as accidental spills, and leaks from facilities. The only emissions to land that are reported to the NPI are from facilities such as factories, not from diffuse sources such as motor vehicles. The deposition of materials *into* landfills is not reported, but emissions *from* landfills are reported.

The largest emissions to land from landfill facilities were chlorine and ammonia. Landfill emissions can be found on the NPI database by looking at the waste disposal sector or the public order and safety services sector.

There were 73 NPI pollutants reported as being emitted to land in 2003-04. The top five NPI pollutant emissions to land were: ammonia, chlorine, chromium (III) compounds, copper and compounds and nickel and compounds.

Ammonia emissions to land

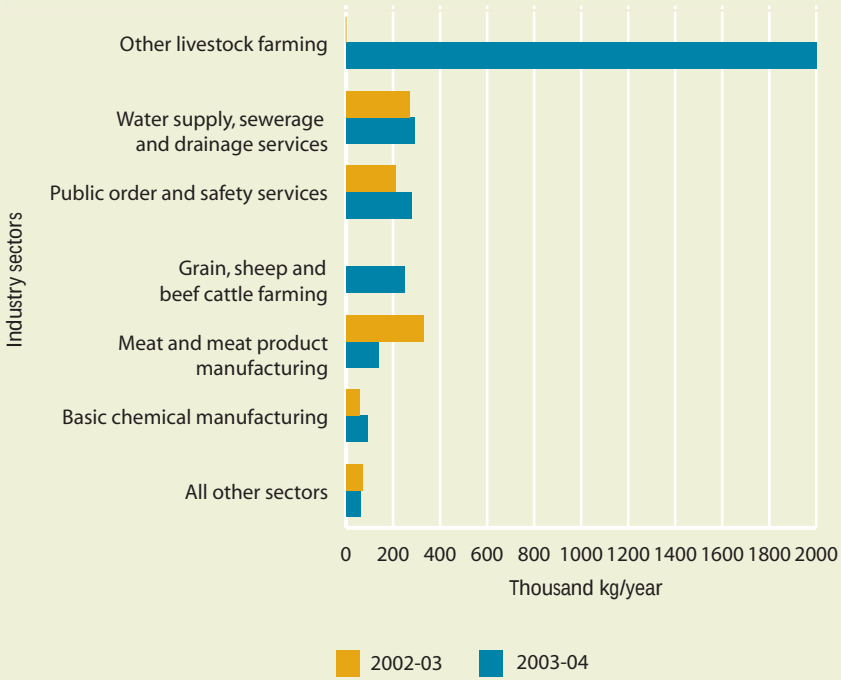
Ammonia is a chemical made by both man and nature. Since ammonia occurs naturally in the environment, we are regularly exposed to low levels of ammonia in air, soil, and water.

Ammonia is a powerful irritant. Exposure to ammonia can be by inhalation of fumes, or by swallowing water or food containing ammonia. The harmful effects of exposure to high levels of ammonia can be severe burns on your skin, eyes, throat, or lungs. Chronic long-term exposure to ammonia can lead to shortened lifespan of animals, lower fertility and changes in appearance and behaviour.

In 2003-04, 234 facilities from 14 industry sources reported ammonia emissions to land. This is eleven per cent more than the previous reporting year and represents around 6 per cent of all NPI reporting facilities. Of all the facilities that reported ammonia to land in 2003-04, 82 per cent had reported the same substance in the previous year.

The top industry sector emissions of ammonia to land are shown on the graph on the following page. Emissions to land have generally increased, mainly due to the increase in intensive livestock facilities reporting. The intensive animal-raising sector consists of the intensive raising of beef, pigs and poultry. Poultry is raised for both eggs and meat. Intensive animal-raising sectors emit over half of Australia's ammonia emissions.

Ammonia emissions to land



For more information

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

The links page on the NPI web site has links to international pollutant inventories, consumer and business tips for helping the environment and many other useful links www.npi.gov.au/contacts/npi-links.html

To find out how you can help reduce pollution see www.npi.gov.au/about/reduce.html

For further information on air, land and water quality, refer to state or territory agencies. Contact details are available on page 28 and 29 and at www.npi.gov.au/contacts/index.html

Information on the sustainable industry activities of the Australian Government Department of Environment and Heritage can be found at www.deh.gov.au/industry/index.html

The State of the Environment 2001 Report provides information on a wide range of environmental issues. Australian State of Environment reports are available at www.deh.gov.au/soe/index.html

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

Ozone depleting substances are regulated by the Australian Government, with information available at www.deh.gov.au/atmosphere/ozone/index.html

The NPI was the first National Environment Protection Measure (NEPM) and was agreed to by the Australian, state and territory governments in 1998. For more information about NEPMs, see the Environment Protection and Heritage Ministerial Council's web site at www.ephc.gov.au

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Abbreviations and definitions

ANZSIC – Australian and New Zealand Standard Industrial Classification

DEH – Department of Environment and Heritage

NEPC – National Environment Protection Council

NEPM – National Environment Protection Measure

NPI – National Pollutant Inventory

CO – Carbon monoxide

NOx – Oxides of nitrogen (also known as nitrogen oxides)

PAHs – Polycyclic aromatic hydrocarbons

PM10 – Particulate matter 10 micrometres or less in diameter

TVOC – Total volatile organic compounds

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 gives you comprehensive, free and easy access to consistent and reliable information about pollutant emissions to our environment.

You can find out about pollutant emissions in your local area, learn more about the environmental impact of local industry and everyday activities, and recognise facilities actively reducing their emissions.

For information about the NPI visit **www.npi.gov.au** or contact an NPI officer from the details listed on pages 28 and 29.

The NPI is a cooperative programme between Australian, and state and territory governments.

The NPI helps everyone keep an eye on pollution – it's your right to know

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Department of the Environment and Heritage

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