National Pollutant Inventory

Summary Report of Fifth Year Data 2002-2003

www.npi.gov.au

About this report

The National Pollutant Inventory (NPI) is the only nationwide, 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. The NPI also aims to promote cleaner production measures, which can result in reduced emissions and a cleaner environment.

This summary report gives an overview of the fifth NPI reporting year (2002-03). Facility data for 2002-03 were published on the Internet (www.npi.gov.au) on 30 January 2004.

This report uses the data available as at 30 January 2004. As some minor changes to the data were made in May 2004, visit the website for the latest information.

It is important to realise that the NPI data are estimated emissions and data accuracy 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.

NPI – It's your right to know

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More contact details are inside the back cover

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Outline

This report gives an overview of the NPI database and the 2002-03 facility data.

The section 'The NPI and you' provides information about the NPI, how to use the database and the type of information available.

The NPI contains data from two types of emission sources: facility sources and diffuse sources. Data from facility sources, and an example of an industry sector, is in the section 'Facility sources', while the 'Diffuse sources' section gives an explanation of diffuse data, and how it is displayed in the NPI.

Some of the substances reported to the NPI are in the 'Substance emissions' section. As well as an overview of the NPI substance data, this section gives information on one substance, why it is included on the NPI list and the sources of emissions.

The last three sections: 'Emissions to air', 'Emissions to water' and 'Emissions to land' describe the destination of the substance emissions.

Key points

- Total emissions for 50 substances had decreased, compared with the previous year. This is more than half of the NPI substances.
- 3,364 facilities reported to the NPI.
- 13 per cent more facilities reported than in the previous year.
- Motor vehicle emissions remain the main source of air pollutants for six out of eight Australian capitals.
- 2002-03 was the fifth year for NPI facility reporting.

The NPI and you

The NPI is a starting point to learn about pollutant emissions in your local community, your state or the nation. Emissions do not necessarily contribute to pollution of our air, land or water, and many other factors, such as weather conditions, come into play before that occurs. More information about air and water pollution can be obtained from state and territory environment agencies (see contact details inside the back cover).

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 facility substance emissions reported for that year.
- Pollutant sources and emissions for your postcode, local area, city, state or nation.
- Interactive maps showing pollutant sources and levels.
- Diffuse emissions estimated in airsheds or water catchments.
- A data download of emissions that can be analysed off-line if you wish.
- Health and environmental information about the 90 NPI substances

The NPI website

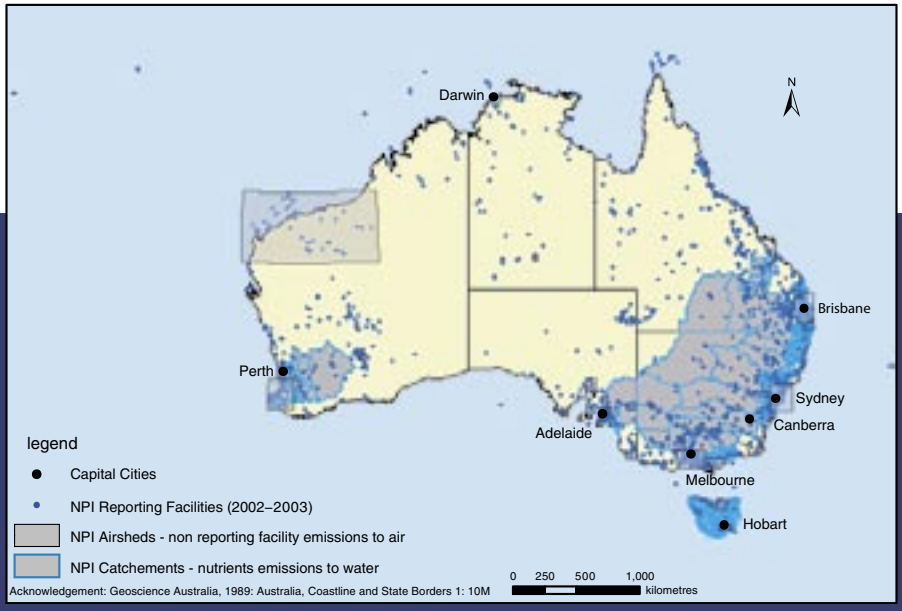
As an online database, the NPI can be accessed at www.npi.gov.au.

The search types give different ways of accessing data.

Reuse water tank at a factory

Location of NPI pollutant sources

The map below shows the location of NPI reporting facilities for 2002-03 as colour dots, as well as the locations of completed diffuse emission studies in water catchments and airsheds. Regions included in diffuse studies cover more than 75 per cent of Australia's population.



Emission sources

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. Emissions from facilities that do not reach the reporting threshold levels are also included in the diffuse emissions.

Diffuse emission 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 estimated in most water catchments.

The boundaries of NPI airsheds are selected by government agencies. Thirty-three studies were completed by the end of 2002-03, covering all capital cities and many urban regions in Australia. In 2002-03 the south east (SE) Queensland region was updated and the Bunbury WA region airshed added to the NPI.

The boundaries of water catchments are determined by the drainage of interconnected river systems, and sometimes cross state or territory borders. Thirty-two catchment studies have been completed for the main urban and rural areas in Australia, with the addition of the Macleay River NSW and Shoalhaven River NSW catchments in 2002-03 and Vasse-Wonnerup WA catchment in May 2004.

The 20 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 SE Queensland airshed' for an in-depth look at the emissions from cars and other vehicles.

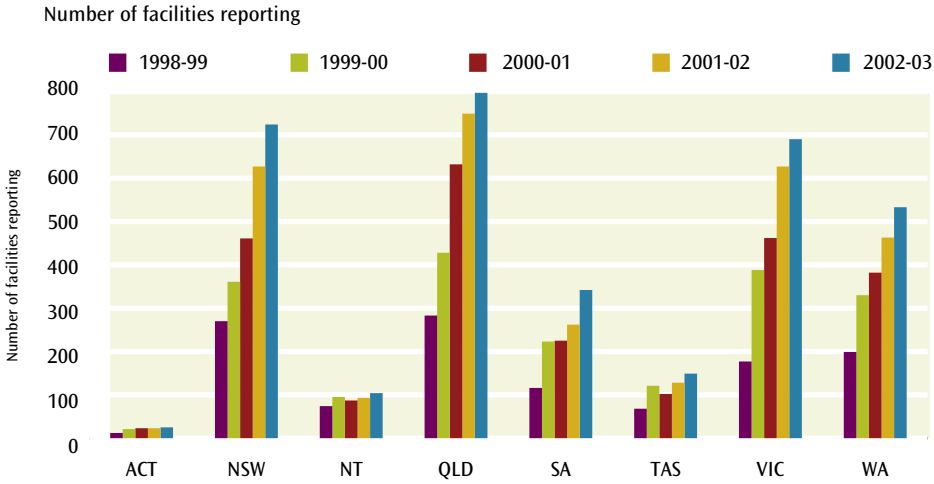
Aeroplanes	Lawnmowing
Architectural surface coating (i.e. painting)	Liquid fuel burning (domestic)
Barbeques	Motor vehicle refinishing
Wildfires and fuel reduction burning[1]	Motor vehicles
Commercial shipping/boating	Natural/town gas leakage
Cutback bitumen	Print Shops/graphic arts
Domestic/commercial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

Notes:
[1] This is shown as 'Burning (fuel red. regen.)/wildfires' on the NPI database
[2] This is shown as 'Fuel combustion (sub-threshold industries)' on the NPI database

Facility 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.

The graph below shows that the number of reporting facilities has increased in most jurisdictions. The total number of reporting facilities in 2002-03 was 3,364 compared to 2,972 the previous year – an increase of 13 percent.



In 2002-03, 526 facilities reported for the first time while 73 facilities that reported the previous year did not do so in 2002-03. Facilities may fall below the NPI reporting thresholds where previously they were above them because of:

- commencing cleaner production methods
- changing production levels
- facilities closing

Industry sector sources

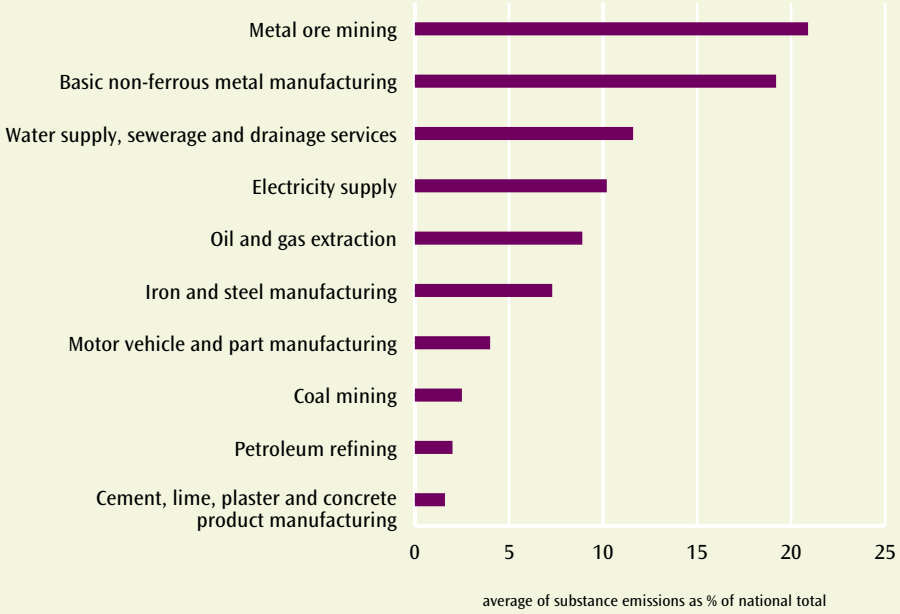
Facilities are grouped into industry sectors using the Australian and New Zealand Standard Industry Classification (ANZSIC) codes. This enables facilities to compare their results against other facilities in the same ANZSIC code, and for the community and policy makers to track the emissions in different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

Several sectors showed marked improvement in certain areas. For example, the water supply, sewerage and drainage sector has seen significant reductions in cadmium and compounds, mercury and compounds, and lead and compounds but an increase in sulfur dioxide emissions.

Open Cut mine

The graph below gives an overview of the largest industry sector emitters in 2002-03.

Largest Industry Sources



Note: For more information on how this graph was calculated, see the footnote[1]

Some sectors such as mining 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 beverage and malt manufacturing and other food manufacturing industry sectors do not make a large contribution to total emissions, but make up a high proportion of NPI facilities.

[1] Substances are not added together to present this graph. For each substance a sector emits, the percentage of the sector's emission is compared to the national total for that substance. Once the percentage for each substance is calculated, an average is taken of the percentages. The more substances a sector emits, and the higher the percentage of the national total for each substance, the greater the average.

Example of a major industry sector reporting to the NPI – Metal ore mining

The NPI database can be used to generate a report for a specific industry sector. The metal ore mining sector is one example of a major industry sector reporting to the NPI.

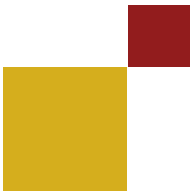
The metal ore mining sector makes a significant contribution to the economy, and is one of the largest industry sectors in Australia. Facilities in this sector are engaged in mining ores of, for example, iron, copper, gold, silver-lead-zinc and nickel.

A total of 171 facilities reported on 49 substances in the 2002-03 reporting year, a 5 per cent increase in the number of facilities from the last reporting year.

This sector is a major emitter of arsenic and compounds, formaldehyde and PM10 (particulate matter of 10 micrometres diameter or less).

In the past year the metal ore mining sector reported decreased emissions for lead and compounds, formaldehyde and sulfur dioxide. For some other substances, such as mercury and compounds and polycyclic aromatic hydrocarbons (PAHs), reported emissions increased. Possible reasons for changes in emissions include changes in facility operations and better estimation techniques.

Emissions of NPI substances mentioned above from the metal ore mining sector for the past two years are in the following table.



Substance to air, land and water	2001-02 (kg/year)	2002-03 (kg/year)	Change
Arsenic and compounds	50,000	56,000	12% increase
Lead and compounds	320,000	250,000	22% decrease
Mercury and compounds	190	1,200	543% increase
Substance to air			
Formaldehyde	580,000	470,000	19% decrease
PM10	220 million	210 million	5% decrease
PAHs	16,000	57,000	255% increase
Sulfur dioxide	260 million	220 million	15% decrease

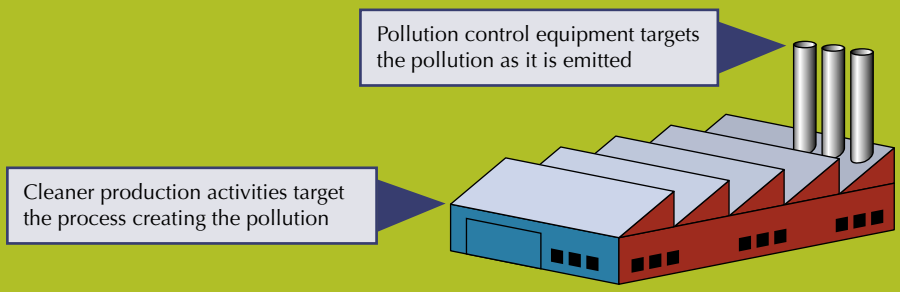
Argyle diamond mine

Cleaner production

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

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

Examples can also be found through some state environmental protection agency websites (see contact details on the last page).



Facility case study

Nestlé's milk processing plant in Dennington Victoria

Nestlé upgraded their briquette-fired burners to natural gas in their milk processing plant in Dennington Victoria, and reduced combustion emissions. PM10 emissions were reduced by 78 percent, while emissions of sulfur dioxide, and heavy metals such as lead and compounds, nickel and compounds and cadmium and compounds, were almost eliminated.

Natural gas burners emit far less combustion pollutants than briquette-fired burners. The briquettes that were used in the Dennington facility were compressed brown coal.

This facility can be found on the NPI website by using the facility search. Enter the facility name Nestle and the postcode 3280.

For more information, contact the Victorian EPA using the contact details on the last page.

Substance emissions

The substances on the NPI list have been chosen because of their health and environmental effects. The NPI can give 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 2002-03 reporting year, total reported emissions for 50 out of the 90 NPI substances had decreased compared with the previous year.

Of the 40 substances that had increased emissions, more than half (23 substances) were only required to be reported for the last two 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, benzene, and acetone.

Substances that had a significant increase in total emissions and a similar number of reporters as last year include cadmium and compounds, cobalt and compounds and zinc and compounds.

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.

Sulfur dioxide

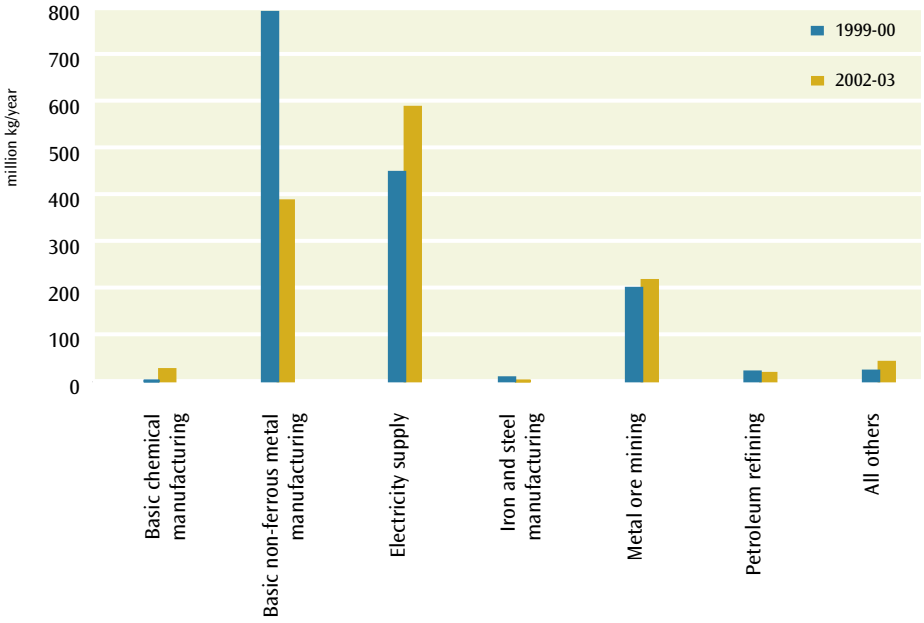
Sulfur dioxide is primarily an air pollutant. It can cause irritation of the eyes, nose and throat as well as choking and coughing. Even low concentrations of sulfur dioxide can harm plants and trees and reduce crop productivity. Higher levels, and especially if the sulfur dioxide forms acid rain (although this has not been documented in Australia), can harm both land and water ecosystems.

The primary source of sulfur dioxide is burning sulfur contained in fuel. Fuel is burnt for a wide range of human activities, including electricity supply and transport, and many fuels contain only low levels of sulfur. The Australian Government has introduced standards for petrol and diesel to reduce the sulfur levels in these fuels and hence the sulfur dioxide emitted from their combustion. Sulfur dioxide is also part of the focus of pollution reduction programs such as the Ambient Air Quality National Environment Protection Measure.

There was a slight decrease in the emissions of sulfur dioxide from industry despite an 11 per cent increase in the number of facilities reporting sulfur dioxide in the 2002-03 reporting year.

Industry accounts for 97 per cent of all the estimated emissions of sulfur dioxide[2]. In 2002-03, the largest source of sulfur dioxide emissions was the electricity supply sector, followed by the basic non-ferrous metal manufacturing sector. The total emissions of sulfur dioxide have decreased over the past three years by 14% while the total number of facilities have increased by over 50%, although there are variations among the sectors. For example, the sulfur dioxide emissions from the electricity supply and metal ore mining sectors have increased since 1999-2000. The major industry sources of sulfur dioxide are shown on the graph below.

Major Industry Sources of Sulfur Dioxide



[2] Based on airshed studies completed to date.

Destination of emissions

Substances are emitted to air, land and/or water, and some substances can cause 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 2002-03 facility data.

Emissions to air

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

In 2002-03, out of the 90 NPI substances, 83 were released to air.

Emissions of the most commonly known air pollutants, such as carbon monoxide and oxides of nitrogen, were similar this year to last year, despite an increase in the number of facilities reporting these substances.

The south east Queensland airshed

Data about the south east (SE) Queensland airshed was updated in a major study in 2002-03, which shows the contributions of diffuse emissions and industry emissions. The number of facilities reporting in the SE Queensland airshed area was 167, compared to 119 the previous year. Facility emissions make up about 37 per cent on average of all estimated emissions.

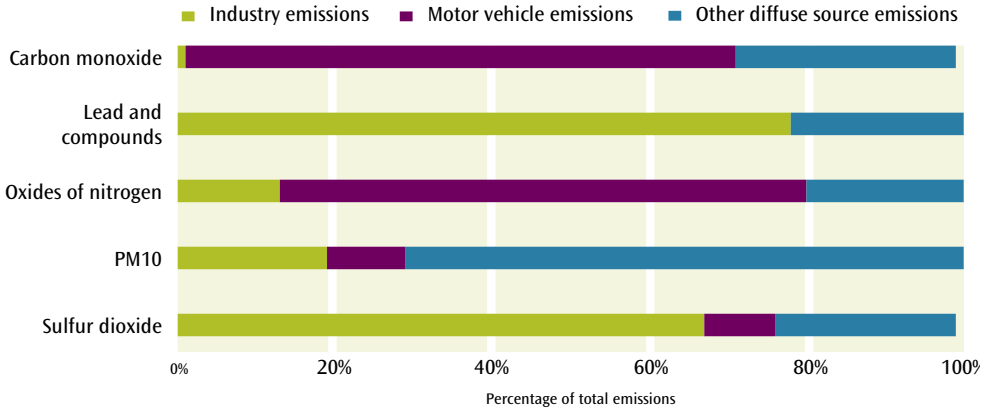
Diffuse emissions make up the remaining 63 per cent on average of all substance emissions to air in the SE Queensland airshed, with motor vehicles being the major source of emissions of two of the important air pollutants – carbon monoxide and oxides of nitrogen. However, recent changes to petrol and diesel fuel standards have meant that motor vehicles are no longer contributing to the emissions of lead and compounds.

Industry is the major source of sulfur dioxide emissions, while other diffuse emissions are the major source of PM10.

Motor vehicle emissions to air in the SE Queensland airshed

Motor vehicle emissions to air of five criteria pollutants (carbon monoxide, lead and compounds, oxides of nitrogen, PM10 and sulfur dioxide) compared with industry and total emissions to air are shown in the following graph. The criteria pollutants are the focus of the Ambient Air Quality National Environment Protection Measure.

SE Queensland airshed



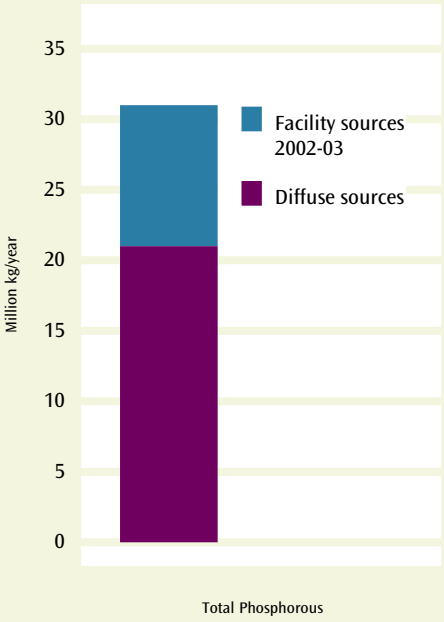
Emissions to water

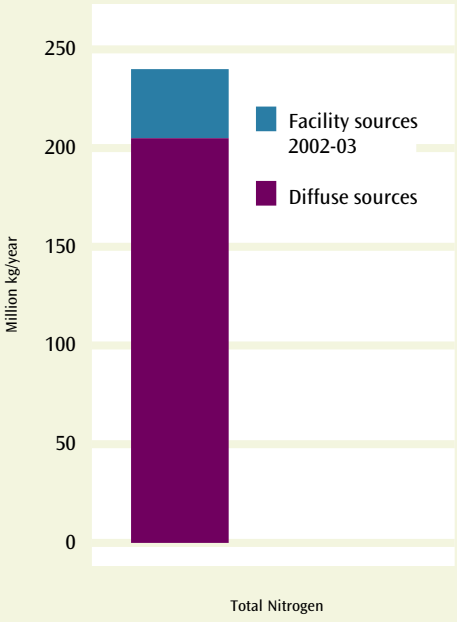
Pollutant emissions to water comprise both facility emissions and diffuse emissions. Diffuse emissions are estimated within defined water catchments and usually (but not always) only include estimates of total nitrogen and total phosphorus.

Total nitrogen and total phosphorus emissions

Total nitrogen and total phosphorus emissions are exclusively reported to water. While having some nitrogen and phosphorus in water is necessary for the health of the river, these two substances can accumulate in water and lead to algal growth and a deterioration in water quality. This can restrict people and animals from drinking or using it.

A comparison of the diffuse and facility sources of emissions for total nitrogen and total phosphorus is shown in the two graphs below.

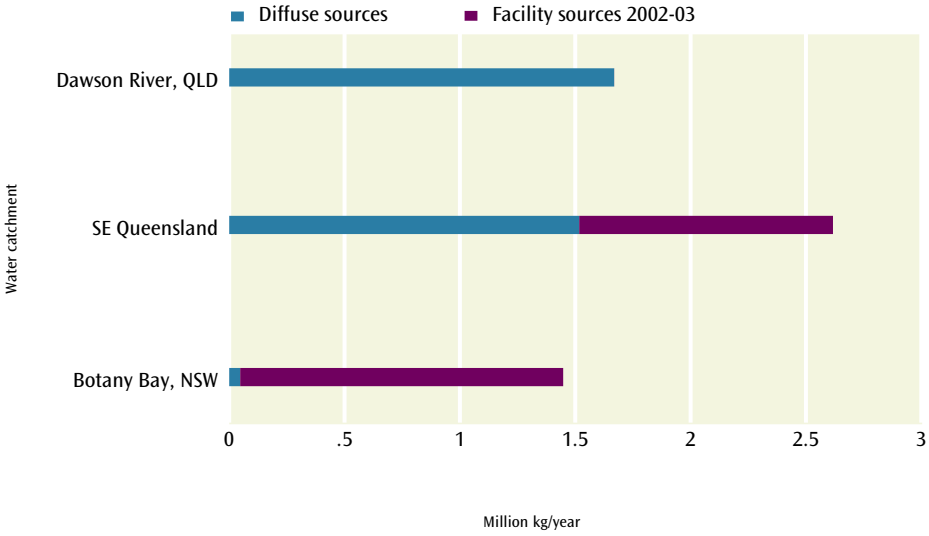




Urban and regional catchments generally have different sources of total nitrogen and total phosphorus. In urban areas, the major sources are more likely facilities such as sewage treatment plants and urban run off. In regional areas diffuse sources such as run off from bushland and land used for cropping 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. Dawson River catchment in Queensland is predominately rural, while south east (SE) Queensland catchment has a mixture of urban and rural land uses, although some diffuse sources are from sewered and unsewered urban areas. Botany Bay in NSW is predominately urban.

Total Phosphorous



Water supply, sewerage and drainage sector

The water supply, sewerage and drainage sector contains facilities that treat water and sewage. Most of the emissions from this sector are from sewage treatment plants, especially total nitrogen and total phosphorus. The table below shows the emissions of total nitrogen and total phosphorus, for the two most recent NPI reporting years.

Substance to water	2001-02 (kg/year)	2002-03 (kg/year)	Change
Total nitrogen	35 million	32 million	9% decrease
Total phosphorus	9.8 million	9.3 million	5% decrease

Comparing the table to the graphs of total nitrogen and total phosphorus from diffuse and industry sources demonstrates that the water, sewerage and drainage sector makes up most of the facility emissions.

Other substances emitted to water

In 2002-03, industry facilities reported emissions of 63 NPI pollutants to water, while up to nine NPI pollutants were estimated for diffuse sources in the catchments.

The major substances reported to water in 2002-03 and the change compared to 2001-02 is shown below.

Pollutant	Total emissions 2001-02 (kg/year)	Total emissions 2002-03 (kg/year)	Change
Ammonia (total)	19 million	21 million	11% increase
Fluoride compounds	1.3 million	1.3 million	Steady
Manganese and compounds	2.1 million	1.4 million	33% decrease
Sulfuric acid	20 million	19 million	5% decrease
Total volatile organic compounds	760,000	800,000	5% increase

Other sectors are major emitters of substances to water besides the water, sewerage and drainage sector. For example, metal ore mining is responsible for more than 85 per cent of the emissions of manganese and compounds and sulfuric acid.

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 estimated on 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 54 NPI pollutants reported as being emitted to land in 2002-03. The top five NPI pollutant emissions to land were: manganese and compounds, ammonia (total), chlorine, fluoride compounds (usually from water fluoridation), and sulfuric acid.

Manganese and compounds were not in the top five substance emissions for 2001-02, because the largest manganese and compounds emission to land was from a company that had not reported this substance in 2001-02.

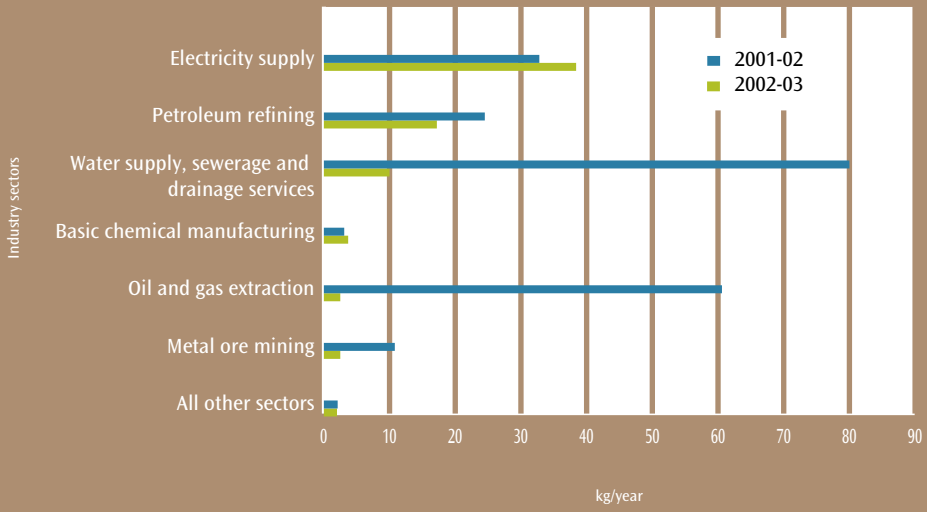
Mercury and compounds emissions to land

Mercury is a liquid metal that, in high concentration, can permanently damage the brain, kidneys and developing foetus. Mercury and compounds emitted to land can remain in the environment for years, and build up in fish and shellfish if they seep into rivers or the ocean.

In 2002-03, 251 facilities reported mercury and compounds emissions to land. This is 11 per cent more than the previous reporting year and represents around 7 per cent of all NPI reporting facilities. Of all the facilities that reported mercury and compounds to land in 2002-03, 76 per cent had reported the same substance in the previous year.

The top industry sector emissions of mercury and compounds to land are shown on the graph below. Emissions to land have generally decreased despite a rise in facilities reporting. The large decrease in water supply, sewerage and drainage sector emissions was mainly due to one facility reporting a reduction of more than 85 per cent from the previous year. This is similar to the oil and gas extraction sector, which had one facility responsible for the majority of mercury and compounds emissions to land in 2001-02, but zero emissions in 2002-03.

Mercury and compounds 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 website has links to international pollutant inventories, consumer and business tips for helping the environment and many other useful links at www.npi.gov.au/contacts/npi-links.html

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

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

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/

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

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

For more information about National Environment Protection Measures, see the Environment Protection and Heritage Council's website at www.ephc.gov.au

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Abbreviations and definitions from this report

DEH – Department of the 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

Total VOC – 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 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 28–29.

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

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Australian Government

Department of the Environment and Heritage

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