Australian Government

Department of the Environment, Water, Heritage and the Arts

NATIONAL POLLUTANT INVENTORY

2006 - 07 SUMMARY REPORT

www.npi.gov.au

ABOUT THIS REPORT

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

By visiting www.npi.gov.au, the community, government and industry can explore a key source of information about pollution in Australia. The NPI program was established in 1998 to collect and collate the nation's emission data. It is a cooperative effort by the Australian, state and territory governments to help create a cleaner and healthier environment.

This summary report provides an overview of emissions reported during 2006-07. Data reported by facilities for that year were published on the internet (www.npi.gov.au) on 31 March 2008, with minor corrections being made on 1 August 2008.

This report uses the data available as at 1 August 2008.

It is important to note that industry uses various methods to calculate emissions, including direct monitoring, emission factors, mass balance and engineering calculations. Consequently, data accuracy can vary according to the calculation technique used.

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ISBN: 978 642 55445 1

National Pollutant Inventory
Tracking pollution across Australia

OUTLINE

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

This report presents an overview of activities during the 2006-07 reporting year, together with examples of the types of information you can find on the NPI web site and tips on how to use NPI data.

The report also explains why substances are included in the NPI and discusses the sources and paths of substance emissions to air, land and water.

Finally, this summary contains a set of useful links as well as contact details of government agencies involved in the NPI.

WHY DO WE HAVE A NATIONAL POLLUTANT INVENTORY?

Australia's NPI is one of many pollutant release and transfer registers (PRTRs) around the world. Others include Canada's National Pollutant Release Inventory (NPRI) and the United States' Toxics Release Inventory (TRI).

Governments provide this register as a means of informing the community about chemicals being emitted into the environment. The community's 'right to know' was identified as a priority in the 1996 Organisation for Economic Cooperation and Development (OECD) recommendation that all OECD member countries provide public access to information concerning pollutant releases and transfers from various sources.

The legislative framework underpinning the NPI is called the NPI National Environment Protection Measure (NPI NEPM). This was the nation's first NEPM and was agreed to by the Australian, state and territory governments in 1998. NEPMs set out agreed national objectives for protecting or managing particular aspects of the environment.

The main purpose of the NPI is to collect and publish information about emissions of substances on a geographical basis to help environmental decision making, to meet community right-to-know obligations, and to promote the need for cleaner production and waste minimisation programs in industry, government and the community.

Collect a broad base of information on emissions and transfers of substances on the reporting list, and disseminate the information collected to all sectors of the community in a useful, accessible and understandable format to:

- maintain and improve ambient air quality and ambient marine, estuarine and fresh water quality
- minimise environmental impacts associated with hazardous wastes, and
- improve the sustainable use of resources.

Goals of the NPI National Environment Protection Measure (NEPM)

HOW THE NPI CAN BENEFIT YOU

The NPI is an internet-based database that provides free information to the community, government and industry on the emissions of substances to our environment. The NPI is unique as it shows, on a geographical basis, where the substances are being emitted and in what amounts.

The NPI can provide users with:

- full details of individual facilities reporting to the NPI
- a particular facility's substance emission compared to the largest emission of that substance from any facility for that year
- substance sources and emissions at either postcode, local area, state or national level
- interactive maps showing substance sources and destinations
- diffuse emissions, such as from motor vehicles and bushfires, which are estimated in airsheds or water catchments
- a downloadable spreadsheet of emissions that can be analysed offline
- health and environmental fact sheets about the 93 NPI substances
- tips on what the community, government and industry can do to help reduce pollution, and
- reporting materials designed to help industry calculate and report their emissions.

How to use the NPI data

- The NPI contains two types of data – emissions from individual facilities and diffuse emissions. If facilities trip one of the NPI reporting thresholds, facilities must calculate their emissions and provide this data annually for the NPI. Diffuse data shows the contribution of non-industrial sources and selected sub-threshold industry to Australia's emissions. The diffuse data is not collected annually and is not necessarily for the particular reporting year being examined. For example, diffuse data may be from a study completed in 1998-99; however it is the most up-to-date information available at that time.
- It is important to note that NPI substances range in toxicity. For example, a small amount of a highly toxic substance may be more significant than a larger emission of a less toxic substance.
- The various NPI substances have distinct properties and levels of toxicity and it is therefore meaningless to add together emissions of different substances. This does not provide a measure of total pollution.
- The NPI is a database of emissions which have been calculated using a variety of techniques. The accuracy of these calculations may vary according to the technique used.

Key facts for 2006-07:

- **One** national inventory tracking pollution across Australia
- **Nine** jurisdictions collected data for submission to the Australian Government
- **Nine** years of facility emissions data
- **77** industry sectors reported emissions to the NPI
- **3 955** facilities reported to the NPI
- **Three** times the number of facilities reported this year compared to the first year of reporting in 1998
- **87** of the 90[1] NPI substances were reported
- **1 250** facilities reported emission reduction activities
- **562 391** new user sessions on the NPI web site
- **New** ANZSIC codes for NPI reporting sectors

1 From 1 July 2007, the NPI reports on a total of 93 substances. However for the 2006-07 reporting year, 90 substances were reported.

National Pollutant Inventory
Tracking pollution across Australia

SOURCES OF NPI EMISSIONS

Facility sources

A threshold is used to determine if a facility needs to report to the NPI. If a facility trips one of the reporting thresholds, they must report to the NPI.

There are six categories of thresholds. Three thresholds relate to the use of substances, one to nutrient emissions to water, and two to fuel combustion or energy use.

What are thresholds?

Every year Australian industrial facilities that exceed the specified thresholds of the 93 NPI substances must calculate and report their emissions to air, land and water directly to their state or territory environment agency. These agencies review all NPI reports for accuracy and forward the data to the Australian Government. The reports are published and displayed on the NPI public web site at www.npi.gov.au.

The NPI now contains nine years of facility data. The total number of reporting facilities increased from 3 890 in the 2005-06 reporting year to 3 955 in 2006-07.

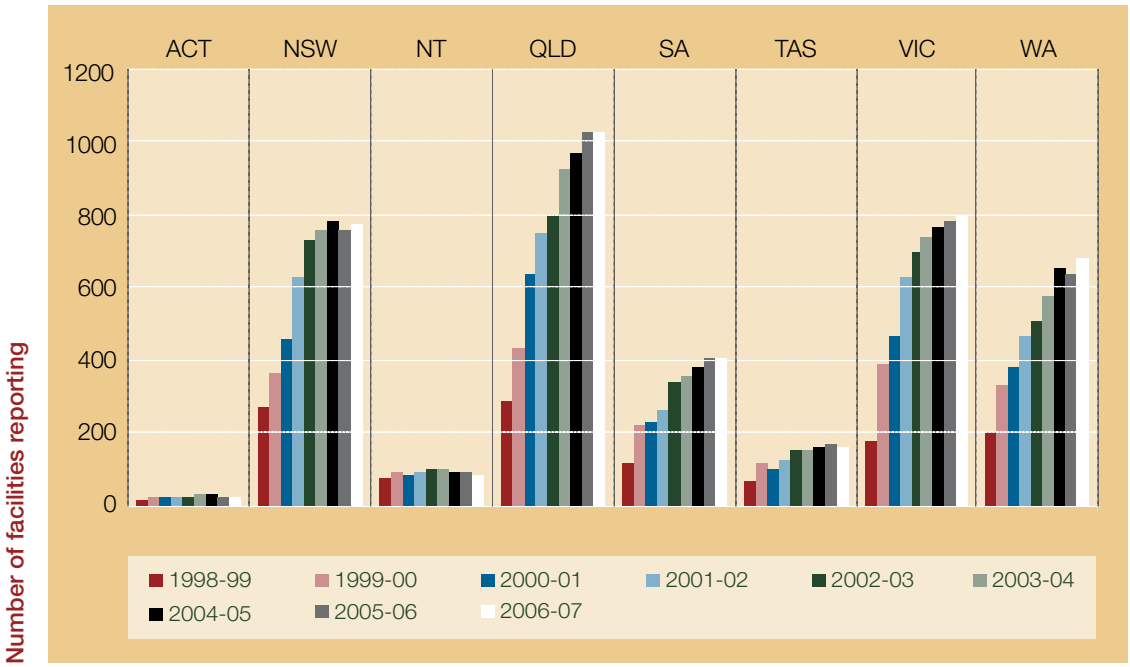


Figure 1: Number of reporting facilities across each jurisdiction – 1998-99 to 2006-07

In 2006-07, 215 facilities reported for the first time, including a seawater desalination plant in Western Australia, while 222 facilities that reported the previous year did not do so in 2006-07.

Facilities may fall below the NPI reporting thresholds, where previously their emission levels required them to report to the NPI, because they have:

- introduced cleaner production methods
- changed production levels
- changed how emissions are determined, or
- closed the facility.

Industry sector sources

Facilities are grouped into industry sectors in accordance with their ANZSIC codes. This enables each facility to compare its results against other facilities in the same industry sector, and for the community and decision makers to track emissions from different industries.

Of the 77 industry sectors reporting this year, 30 sectors did not report emissions on substances that had been reported in the previous year. For example, the other wood product manufacturing sector reported 4 700 kg for methanol for the 2006-07 reporting year. Whereas in the 2005-06 reporting year, this sector reported emissions of 30 000 kg, a decrease of 85 per cent. This is attributed to one of the facilities improving the effectiveness of their pollution control equipment, increasing destruction efficiency and therefore decreasing their emissions of methanol.

Toyota Manufacturing Plant Altona, VIC

In 2006 a new standard classification of industrial activity was developed to provide a more contemporary industrial classification system. The Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 has replaced the existing classification, ANZSIC 1993. The NPI updated all industry sector codes to ANZSIC 2006 in the 2006-07 reporting year.

Comparatively, the grain mill and cereal product manufacturing sector reported emissions of sulfur dioxide of 170 000 kg in the 2006-07 reporting year compared to reporting 130 kg in 2005-06. This is attributed to the two new facilities reporting in the 2006-07 reporting year compared to the previous year.

Some sectors demonstrated an improvement in certain areas during the 2006-07 reporting year. For example, the basic metal manufacturing sector recorded significant reductions in reported emissions of copper, mercury and compounds and ethyl acetate. However, this sector also reported increases in total volatile organic compounds (TVOC), chromium (VI) and formaldehyde[1].

Figure 2 below provides an overview of the nine industry sectors with the highest substance emissions in 2006-07 as well as a comparison of their emissions in previous reporting years. Emissions from these nine sectors accounts for about 67 per cent of total substance emissions from industry.

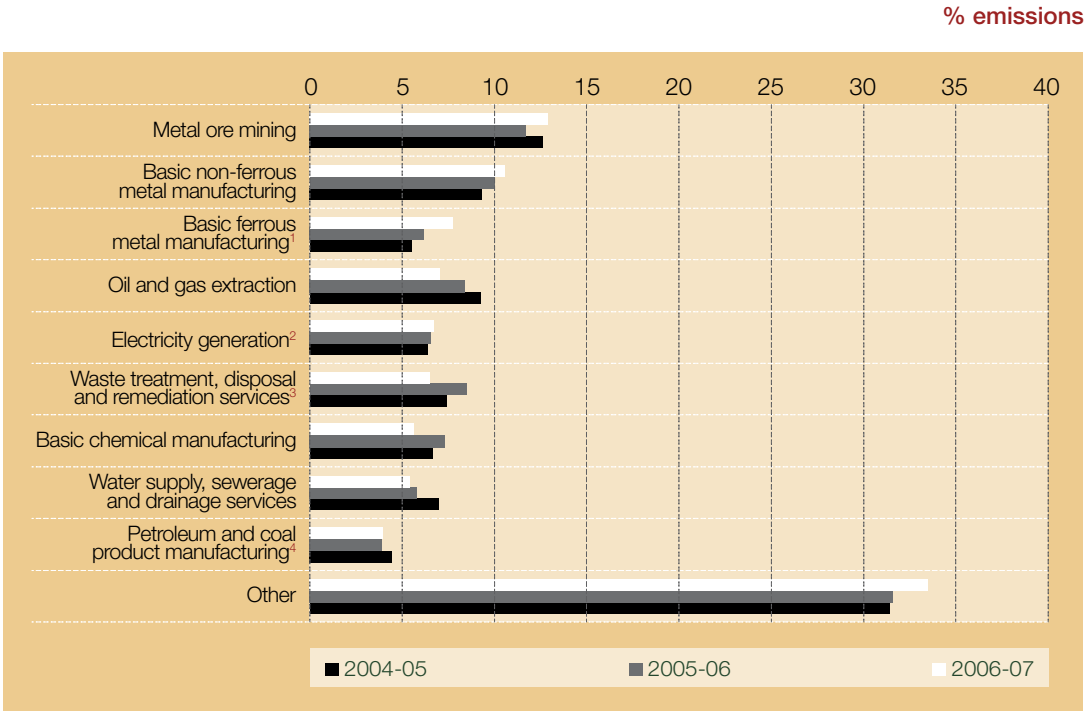


Figure 2: Top ten industry sectors reporting to the NPI – 2004-05 to 2006-07

Note: Substances are not added together in this graph. For each substance a sector emits, the percentage of the sector's emission to the national total for that substance is calculated and an average is taken. This calculation does not account for any variation in toxicity or ground level concentration of these substances. A similar approach is used for the location reports on the NPI web site.

1 previous ANZSIC code "Other chemical product manufacturing"
2 previous ANZSIC code "Electricity supply"
3 previous ANZSIC code "Public order and safety services"
4 previous ANZSIC code "Petroleum refining"

1 Please note that emissions are reportable for metals only and not their compounds.

Industry sources case study: metal ore mining

The NPI database can be used to generate a report for a specific industry sector such as the metal ore mining sector. This sector's facilities are engaged in mining iron ore or iron sands, which are used in the production of steel.

A total of 181 metal ore mining facilities reported on 56 substances in the 2006-07 reporting year – an increase of 21 facilities and 13 substances compared to the previous reporting year. The metal ore mining sector is a major emitter to air of particulate matter ≤10.0µm (PM10), carbon monoxide, oxides of nitrogen and sulfur dioxide. Overall reported emissions from this sector increased in the past year, particularly emissions of PM10, carbon monoxide, oxides of nitrogen and TVOC. However, there was a substantial decrease in emissions of sulfur dioxide.

Reported emissions to land, meanwhile, showed a decrease in emissions of manganese and chromium (III).

Year-to-year fluctuations in reported emissions, such as seen in the case study above, can be due to a variety of factors, including improved environmental performance, increases and decreases in production, changes to the process, installation of pollution control equipment such as fabric filters, the reporting of a substance for the first time and updated emission calculation techniques.

Table 1: Emissions of key NPI substances from the metal ore mining sector

Substance emitted to air, land and water	2005-06 (kg/year)	2006-07 (kg/year)	% change
Emission to air			
PM10	190 000 000	260 000 000	37%
Carbon monoxide	51 000 000	75 000 000	47%
Oxides of nitrogen	65 000 000	71 000 000	9%
Sulfur dioxide	62 000 000	39 000 000	37%
Emissions to land			
Manganese and compounds	260 000	72 000	72%
Chromium (III) compounds	46 000	30 000	35%
Emissions to water			
Manganese and compounds	1 300 000	1 400 000	8%
Zinc and compounds	410 000	430 000	5%
Total nitrogen	240 000	250 000	4%

Processing plant Cowal Gold Mine, NSW

Diffuse sources include:

- non-industrial activities such as transportation and bushfires
- domestic activities such as lawn mowing and barbeques
- commercial activities such as small bakeries
- industrial activities which are not reported because the relevant thresholds are not exceeded such as small commercial printers or spray painters, and
- industries which are exempt from reporting.

What are diffuse sources?

Diffuse sources

Emissions from diffuse sources are estimated by state and territory agencies. Most of the 93 NPI substances are emitted to air and therefore considered in airshed studies. However, a few substances, most notably total nitrogen and total phosphorus, are determined in water catchments.

The boundaries of NPI airsheds are selected by government agencies. A total of 33 studies were completed by the end of 2006-07, covering all capital cities and many urban regions in Australia. An airshed study of the greater Sydney, Newcastle and Wollongong regions within NSW was undertaken between 2004 and 2007 using the 2003 NPI calendar year base data. This airshed study replaces the old 'Sydney Newcastle Wollongong' airshed undertaken in 1996 and provides a more recent picture of pollutants discharged into the atmosphere in NSW.

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

The top 10 substances and the major diffuse sources of these emissions to the environment are listed in the following table. As shown in this table, the most significant diffuse source of emissions to air across the nation is vehicular traffic.

Table 2: Top 10 substances and the major diffuse sources

Substance	Total from all airsheds (tonnes)	Major diffuse source	% of total diffuse emissions for substance from major source
Carbon monoxide	4 500 000	Motor vehicles	44%
TVOC	3 000 000	Biogenics (i.e. natural sources including vegetation and soil)	78%
Oxides of nitrogen	650 000	Motor vehicles	52%
PM10	630 000	Burning (i.e. fuel reduction, regeneration, agriculture) and wildfires	38%
Sulfur dioxide	73 000	Fuel combustion - sub reporting threshold facilities	56%
Ammonia	35 000	Agriculture (livestock)	86%
Toluene	32 000	Motor vehicles	50%
Ethanol	22 000	Domestic and commercial solvents/ aerosols	61%
Xylenes	21 000	Motor vehicles	54%
Benzene	14 000	Motor vehicles	69%

Note: diffuse data is not collected annually and may be from varying years.

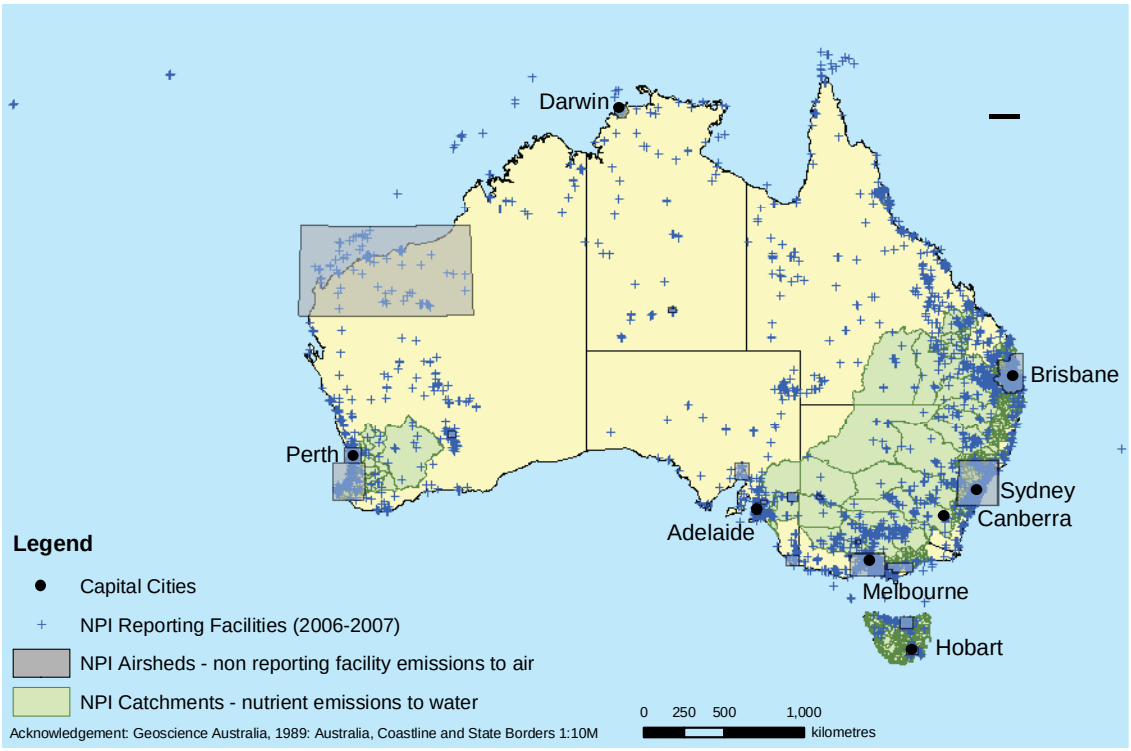
What is an airshed?

An airshed is a body of air, bounded by meteorology and topography, in which substance emissions are contained. For example, the Bunbury Regional Airshed study area in Western Australia covers an area of 165 km (east to west) and 234 km (north to south), comprising a population of 270 000 people.

What is a water catchment?

A water catchment is the land area drained by a creek or river system. For example, the Vasse-Wonnerup water catchment in Western Australia covers an area of 96 093 hectares and encompasses the catchments of the Ludlow, Abba, Sabina, Vasse and Buayanup Rivers and Locke Swamp. The main population centre in the catchment, the town of Busselton, currently has a population of about 19 000 and is one of the fastest-growing regional centres in the state.

Figure 3: NPI reporting facilities, airsheds and catchments



The blue crosses on the map show NPI reporting facilities for 2006-07, as well as the locations of completed diffuse emission studies for water catchments and airsheds. Regions included in the diffuse studies cover more than 75 per cent of Australia's population.

Anthropogenic sources are caused or produced by human activity. Sources can include industrial facilities, motor vehicles, fireplaces and controlled burns.

Biogenic activities occur naturally in the environment and sources include animals, wildfires and lightning.

Biogenic vs anthropogenic sources

Diffuse sources case study – Greater Sydney, Newcastle and Wollongong regions of NSW airshed

The air emissions inventory for the Greater Metropolitan Region (GMR) is a detailed listing of substances discharged into the atmosphere by each source type at a specific location. The study area covers 57 330 km^2 and includes the greater Sydney, Newcastle and Wollongong regions (Figure 4). The study commenced in 2004, utilising data from activities that took place in the 2003 calendar year, and was completed over a period of three years. The GMR has replaced the old 'Sydney Newcastle Wollongong' airshed.

The inventory includes emissions from biogenic (i.e. natural) and anthropogenic (i.e. human) derived sources. In the NPI, emissions arising from sources other than facilities are categorised as diffuse. The NPI relies on state and territory governments to estimate diffuse emissions, and whilst they are not updated as regularly as facility data, they still provide a comprehensive picture of emissions across Australia.

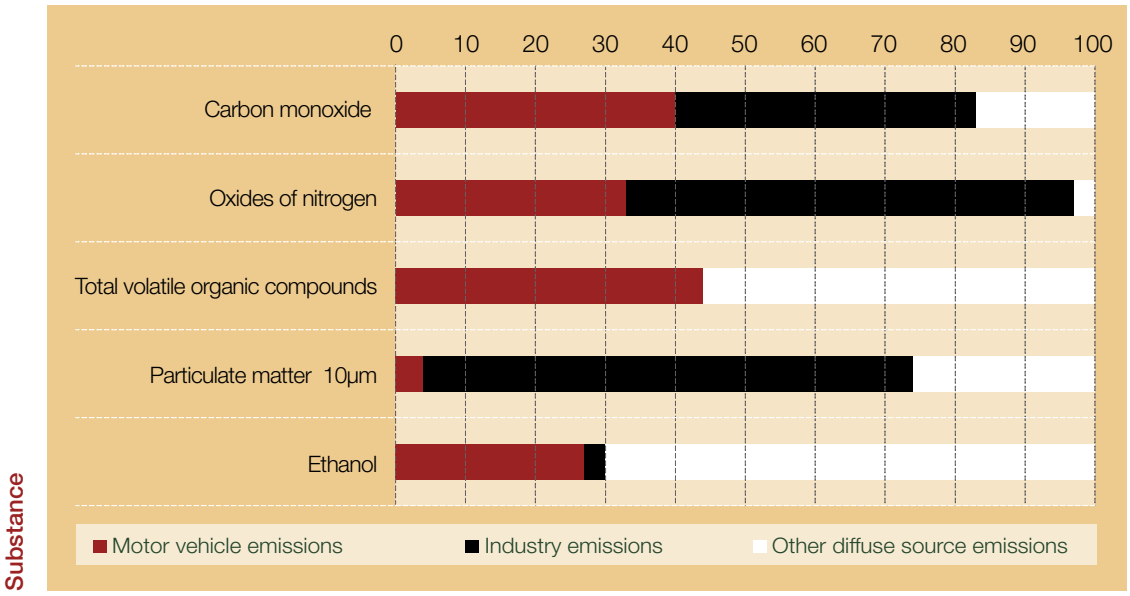
NPI data from the GMR air emission inventory includes diffuse emissions of 73 different pollutants from 23 sources. The top five diffuse sources of air emissions, in descending order, are motor vehicles, burning (fuel reduction, regeneration and agriculture) and wildfires, solid fuel burning (domestic), lawn mowing and domestic and commercial solvents and aerosols. The top five substances to air from diffuse sources, in descending order, are carbon monoxide, TVOC, oxides of nitrogen, PM10 and ethanol.

Motor vehicles account for almost 60 per cent of diffuse air emissions in the GMR. The top five substances emitted by motor vehicles in descending order are carbon monoxide, oxides of nitrogen, TVOC, toluene (methylbenzene) and ethanol. Motor vehicles emit a total of 33 NPI substances.

Burning (fuel reduction, regeneration and agricultural) and wildfires account for almost 20 per cent of diffuse air emissions in the GMR. The top five substances emitted by burning and wildfires, in descending order, are carbon monoxide, TVOC, PM10, oxides of nitrogen and sulfur dioxide. Burning and wildfires emit a total of 22 NPI substances.

The following chart shows the top five substances emitted by diffuse sources in the GMR compared to industrial sources in the 2006-07 NPI reporting year for the same region.

Figure 4: Top five substances from diffuse sources compared to industrial sources



Further information on the GMR air emissions inventory can be found on the NPI web site as well as at www.environment.nsw.gov.au/air/airinventory.htm.

EMISSION REDUCTION ACTIVITIES

Industry initiatives to reduce emissions

One of the main goals of the NPI is to encourage facilities to use cleaner production techniques to reduce emissions. Reporting facilities can report on cleaner production activities and pollution control equipment. Provision of this information is voluntary.

A total of 1 250 facilities have provided information on their emission reduction activities since the start of NPI reporting.

The most common reduction techniques were improving maintenance scheduling, record keeping or procedures, and implementing inspection or monitoring programs for potential spill or leak sources. The most common type of pollution control equipment reported was fabric filters or baghouses. These such changes can improve the overall environmental performance of a facility. Changes in reported emissions can also be attributed to decreases in production, changes to the process, the reporting of a substance for the first time and updated emission calculation techniques.

Industry emission reduction activity case study: galvanizing

The NPI web site cites a number of case studies to illustrate how facilities have used innovative solutions to reduce their emissions.

Galvanization is the process of coating steel with zinc. Case studies show that zinc-coating vastly extends the useful life of steel goods and structures and reduces the cost of their maintenance.

What is galvanization?

A group of small-scale galvanization companies worked together on a cleaner production program for two years, involving staff from all levels within the companies' operations.

These businesses took part in a joint training program that included plant maintenance and modifications, procedural improvements and skills development. A critical aspect of the program was improving zinc recovery from the galvanizing process, through disciplined, detailed analysis of chemical concentrations and milling mechanics.

Process improvements were investigated and trialled. For example, replacing insulation in kettles and process tanks was found to significantly reduce the natural gas consumption per tonne of steel galvanized.

A further successful innovation was the integration of environmental and safety procedures data into existing production.

The two main objectives were to improve resource efficiency and reduce waste so that galvanization businesses can run more efficiently and become more environmentally sustainable.

Hot dip galvanizing Campbellfield, VIC

What were the environmental gains?

Four plants achieved considerable reductions in resource usage during the program. Two other plants, which had previously taken part in a cleaner production program and had already made gains in resource usage and process efficiency also achieved a parallel drop in waste generation. Each of these advances in resource usage was derived from a distinct phase within the galvanizing process.

What were the environmental and financial benefits?

Annual savings, resource usage

Resource	Quantity saved	Annual saving
Zinc	89 tonnes	$187,167
Acid	97.6 kL	$45,872
Water	5 400 kL	$7,020
Natural gas	1 590 GJ	$8,935
Electricity	32 300 kWh	$197,030
Total savings		**$446,024**

Annual savings, waste generation

Waste	Quantity saved	Annual saving
Dross	33 300 kg	$47,619
Ash	11 000 kg	$7,040
Waste Acid	225 kL	$58,500
Total savings		**$113,159**

Total savings from improvements in both resource usage and waste generation amounted to $559,183.

Where to now?

Inevitably, different plants found different opportunities, but the results overall signal good prospects for further improvements across the industry as a whole. These gains are expected to be conservative at first, but long-term monitoring of the new procedures will show increasing levels of improvement. Further gains can be expected as levels of understanding and skill increase.

NPI reports

In the 2006-07 reporting year, a total of 34 facilities from the metal coating and finishing sector (of which galvanizing, together with polishing, heat treating and ceramic coating, are primary activities) reported on a total of 34 substances – a decrease of one facility but an increase of two substances compared to the previous reporting year.

In the past year, the metal coating and finishing sector reported decreased emissions of PM10 and hydrochloric acid. For some other substances, such as carbon monoxide and oxides of nitrogen, reported emissions increased.

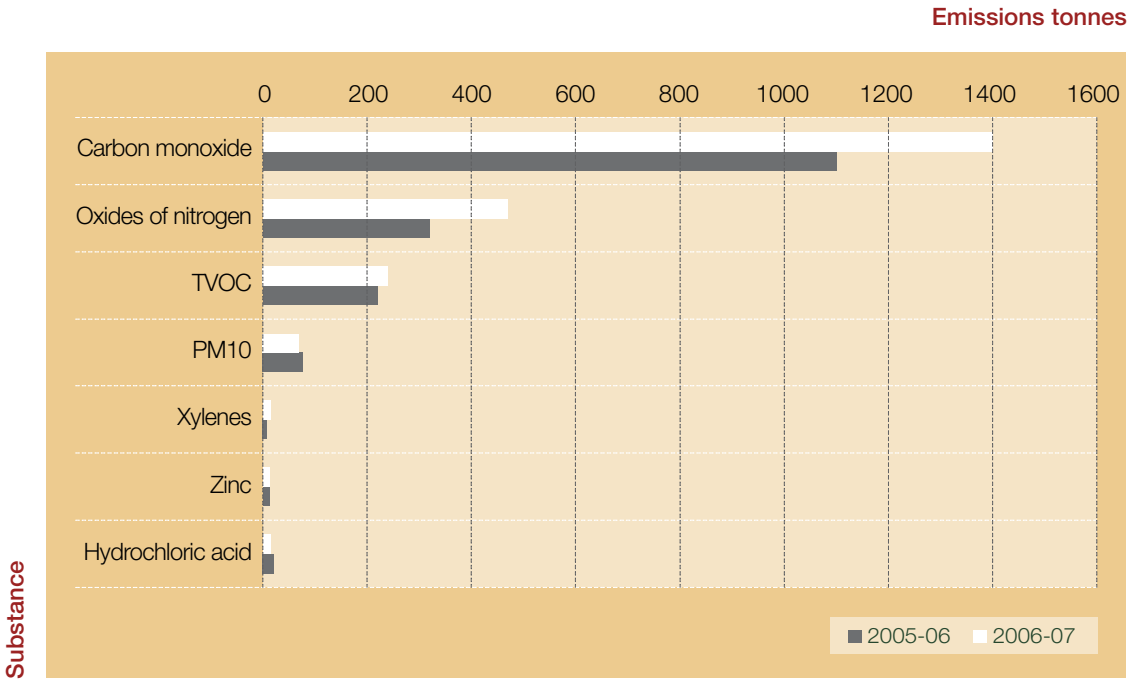


Figure 5: Emissions for the metal coating and finishing sector – 2005-06 and 2006-07

Government initiatives to reduce emissions

Australian, state, territory and local governments work cooperatively on a wide range of initiatives aimed at protecting our environment. Some of these include:

- Motor vehicles and better quality fuel
- Stockholm Convention on Persistent Organic Pollutants, and
- Clean and Healthy Air for Gladstone.

Motor vehicles and better quality fuel

Motor vehicles are one of the most significant contributors to urban air pollution in Australia and have a major influence on the incidence of smog and haze. Management strategies are focused on ensuring that vehicles meet effective emission standards when they first enter the market; checking that they continue to meet these emission standards while they are in use; and providing them with the cleanest economically viable fuels on which to operate.

The quality of fuel supplied in Australia has been a key determinant for the introduction of tighter new vehicle emissions standards under the *Motor Vehicle Standards Act 1989,* administered by the Department of Infrastructure, Transport, Regional Development and Local Government.

National fuel quality standards are regulated under the *Fuel Quality Standards Act 2000,* administered by the Department of the Environment, Water, Heritage and the Arts (DEWHA). Fuel quality standards have been introduced for petrol, diesel, biodiesel and autogas sold in Australia. The fuel standards facilitate advanced emissions control technology required to meet tighter emissions standards, reduce the level of harmful pollutants in fuel, and ensure the efficient operation of engines.In addition to cleaning up fuels supplied to the current vehicle fleet, work has continued on key projects to help manage emissions from vehicles in use.

DEWHA supports in-service emissions testing for diesel vehicles through funding agreements with the states and territories. Diesel vehicles are tested for compliance with exhaust emissions standards set by the Australian Transport Council. Testing facilities to measure diesel emissions from motor vehicles have been established in all states through Australian Government funding.

A comprehensive petrol vehicle testing program is underway in the form of the $2.5 million second phase of the National In-Service Emissions study. Air pollutant emissions from a range of passenger vehicles are being measured using a combination of standard certification tests and tests based on actual Australian on-road conditions and driving patterns. Results from this study will provide more accurate information on the contribution petrol vehicles make to urban air pollution, paving the way for more targeted and effective pollution management strategies.

Stockholm Convention on Persistent Organic Pollutants

Australia is a Party to the Stockholm Convention on Persistent Organic Pollutants (POPs) which came into force in 2004. The Convention aims to protect human health and the environment from the effects of POPs with a range of control measures to reduce and, where feasible, eliminate POPs, including unintentionally produced POPs.

Twelve POPs are listed in the Annexes to the Convention, the majority of which are pesticides and industrial chemicals such as polychlorinated biphenyls (PCBs), dioxins and furans. The Convention recognises that there are other chemicals that could pose similar hazardous threats to human health and the environment, therefore provisions have been made to allow for other chemicals to be added in the future.

The Stockholm Convention requires each Party to develop, and endeavour to put into practice, a plan setting out how it will implement its obligations under the Convention. In line with this directive, the then Department of the Environment and Heritage developed Australia's National Implementation Plan (NIP) in consultation with other Australian Government agencies and state and territory environment protection agencies. Non-government community and industry organisations were also consulted in the preparation of the NIP. The NIP outlines the actions that Australia will undertake to control POPs and was submitted to the Stockholm Convention Secretariat in August 2006.

Australia was well advanced in meeting the measures agreed under the Convention before it came into force. Existing stocks and residues of organochlorine chemicals were controlled under the *Organochlorine Pesticides (OCP) Waste Management Plan* and the *PCB Management Plan*. Production and import of PCBs was prohibited in the 1970s in Australia, with phase-out of existing PCBs being managed under the National Strategy for the Management of Scheduled Waste.

In 2001, DEWHA also undertook the National Dioxins Program – a four year study to improve our knowledge of dioxin levels in Australia, with the ultimate aim of reducing the occurrence of dioxins and dioxin-like substances in the environment. A range of studies was undertaken, the findings of which were used to determine the risks dioxins pose to our health and the environment. At a meeting of Environment Ministers in October 2005, the National Action Plan for Addressing Dioxins in Australia was endorsed and has subsequently been used as a guiding document under the Stockholm Convention.

The Convention also requires Parties to reduce emissions from the unintended production and release of POPs, in particular dioxins, furans, PCBs and Hexachlorobenzene. These are undertaken through best available techniques (BAT) and best environmental practices (BEP) guidelines. DEWHA is currently engaging with State and Territory environment agencies to identify whether the adoption of Australia's BAP/BEP guidelines could be done at either an administrative or legislative level.

Further information on the Stockholm Convention can be found at:
www.environment.gov.au/settlements/chemicals/pop.html.

Clean and Healthy Air for Gladstone – Queensland EPA

The Queensland Environmental Protection Agency (EPA) has been monitoring key air pollutants in Gladstone since 1979. Historically, monitoring has focused on the substances listed in the *National Environmental Protection (Ambient Air Quality) Measure*, which are sometimes called 'criteria pollutants'. This includes monitoring of pollutants such as oxides of nitrogen, sulfur dioxide and fine particles. The results of past monitoring show that, for these pollutants, the air in Gladstone meets air quality criteria for protecting public health.

In recent times, industrial activity in Gladstone has grown in scale and a number of different industries have become established. This industrial growth has led to concerns in the community about the potential for other air pollutants to have an effect on people's health.

To assess the impact of air emissions on the air quality in the Gladstone area and the potential risks to human health associated with those emissions, the "Clean and Healthy Air for Gladstone" (CHAG) project has been established in collaboration between the Queensland Environmental Protection Agency (EPA) and Queensland Health. EPA is leading the project and contributing expertise in air quality, while Queensland Health is contributing expertise in population health.

The initial component of the project includes the development of a detailed emissions inventory which identifies and quantifies past and present air pollutant discharges within the Gladstone area. This inventory includes emissions from a comprehensive range of sources such as rail, shipping and material storage facilities around the Port of Gladstone, current and past industrial activities, and a range of diffuse sources such as vehicular transport. The inventory relies heavily on data reported to the NPI by a number of industries within the study area, as well as data from diffuse sources, collected and estimated by the NPI.

For the past 10 years, the NPI has been collecting data from industries in the Gladstone region. This information is not only vital to the inventory and assessment phase of the CHAG project, it also provides a strong basis for the consultation process within the community and industry.

Further information can be found at:
www.epa.qld.gov.au/environmental_management/air/clean_and_healthy_air_for_gladstone/.

Gladstone, QLD

THE NPI WEB SITE

The NPI web site had 562 391 user sessions in 2006-07 compared to 404 676 user sessions in the previous year – an increase of 39 per cent.

Improvements to the NPI web site are ongoing. DEWHA has developed a new, purpose-built online reporting system for NPI data. The system, which supersedes the National Reporting Tool, includes navigational screens with populated fields and online calculation tools.

DEWHA has also been making improvements to many of the industry guidance materials available on the NPI web site. A full list of NPI emission estimation technique manuals can be found at: http://www.npi.gov.au/handbooks/approved_handbooks/sector-manuals.html.

SUBSTANCE EMISSIONS

The 93 substances currently included in the NPI list have been selected because of their potential impacts on health and the environment. Each year, the NPI provides an annual, nationwide snapshot of these substance emissions. This database is made available to policy makers and the community, enabling them to find information on specific substances and to monitor changes in their emission levels over time.

In any given year, the NPI data presents a mixed picture emissions to our environment compared with previous years. In the 2006-07 reporting year 87 substances were reported, with 38 substances showing an increase in total emissions and 49 showing a decrease.

What were the key trends for emissions in 2006-07 compared to the previous year?

- Emissions of air pollutants such as lead and sulfur dioxide decreased by 13 per cent and four per cent respectively, while reported emissions for PM10 increased by 15 per cent, oxides of nitrogen increased by three per cent and carbon monoxide increased by two per cent.
- Air toxic pollutants such as benzene, toluene and xylenes, showed a decrease in reported emissions in 2006-07. Emissions of polycyclic aromatic hydrocarbons increased by 13 per cent and emissions of formaldehyde rose by nine per cent.
- The substance for which a significant decrease in emissions was reported (in spite of the number of reporting facilities remaining constant) was benzene, with a 38 per cent decrease from most industrial sources, particularly oil and gas extraction.
- Significant drops in emission levels were also reported for boron (mainly from solar salt production) and cyclohexane, n-hexane and toluene, and methylbenzene (mainly from oil and gas extraction).
- Substances with a significant total increase in reported emissions and a similar number of reporters as last year also included chlorine (mainly from landfill) and 1,2-dichloroethane (from chemical product manufacturing).
- Emissions to water of total nitrogen and total phosphorus showed steady decreases of about nine per cent. The major industry source of emissions of these substances is water supply, sewerage and drainage services.

What are emissions and where do emissions go?

For NPI reporting purposes, emissions are defined as the release of an NPI substance to the environment whether in pure form or contained in other matter and/or in solid, liquid or gaseous form. It includes the release of substances to the environment from landfill, sewage treatment plants and tailings dams. All emissions are separated into emissions to air, land and water.

Emissions to air

The NPI categorises air emissions as either point source or fugitive emissions. Substances can be emitted to the atmosphere through a single point such as a vent or a stack. A facility often has many separate point sources.

Fugitive emissions are emissions that are not released via a stack or vent. Example of fugitive emissions include dust from stockpiles, volatilisation of vapour from vats, open vessels, spills and materials handling.

In 2006-07, 84 of the 90 NPI substances were released to air, making them the major component of all NPI emissions.

Top five NPI substances emitted to air

The largest substance emission to air from industrial facilities in 2006-07 was sulfur dioxide followed by carbon monoxide. The five NPI substances from industrial sources with the largest estimated emissions to air were sulfur dioxide, carbon monoxide, oxides of nitrogen, PM10 and TVOC.

The highest emitter of sulfur dioxide is the electricity generation sector. Electricity is generated by the combustion of fossil fuels. These fuels include black coal, brown coal, natural gas and petroleum oils. Since coal and petroleum often contain sulfur compounds, their combustion generates sulfur dioxide. Emissions of sulfur dioxide from electricity generation has remained steady for a number of reporting years.

Reported industrial emissions of the most commonly known pollutants, such as sulfur dioxide (mainly from electricity generation) and zinc and compounds (mainly from metal ore mining) have remained steady this year. Reported emissions of PM10, carbon monoxide and oxides of nitrogen, meanwhile, have shown increases of 18 per cent, 10 per cent and two per cent respectively, while TVOC has decreased by approximately three per cent compared to the previous year.

In some cases, the emissions from diffuse sources exceeded those from industry. The graph below shows the industry emissions compared with diffuse sources as a percentage of total emissions for each of the top five substances emitted to air.

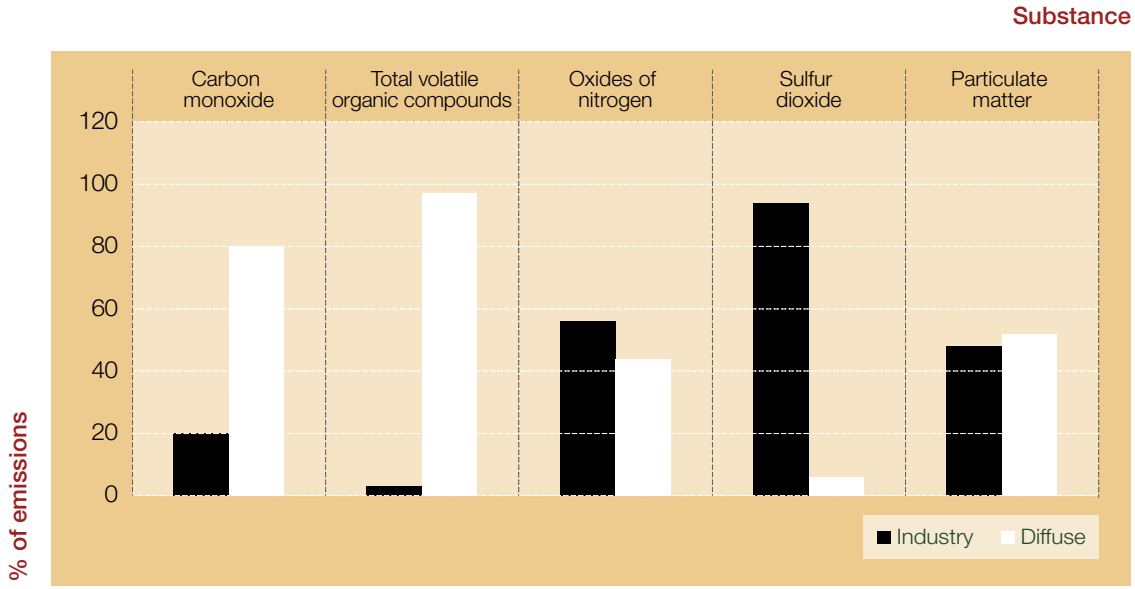


Figure 6: Top five NPI substances to air – industry and diffuse sources

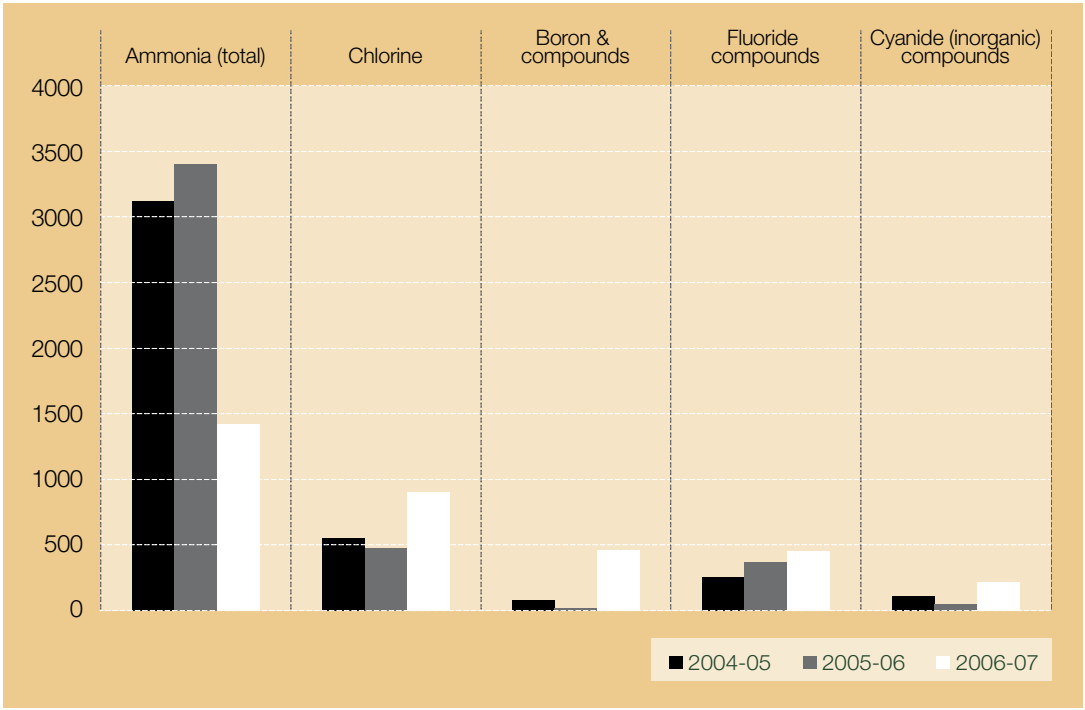
Note: Industry emissions are for the 2006-07 reporting year. The diffuse and motor vehicle data is not collected annually and thus does not reflect this particular facility reporting year.

Emissions to land

Emissions to land are substance emissions onto a facility's site, including solid wastes, slurries and sediments, as well as accidental spills and leaks from facilities. Emissions to land from diffuse sources are not included in the NPI.

The following chart shows the five major substances emitted to land in 2006-07 and compares them to the previous two years.

Figure 7: Top five substances emitted to land 2004-05 to 2006-07



A total of 56 NPI substances were reported as being emitted to land in 2006-07 – an increase of about four per cent from 2005-06.

- The highest emitted substance to land, ammonia, was attributed to meat and meat product manufacturing, followed by water supply, sewerage and drainage services and waste treatment, disposal and remediation.
- Ammonia emissions to land decreased by almost 60 per cent compared to the previous reporting year. This can be attributed to a drop of about 85 per cent in the level of ammonia emitted from water supply, sewerage and drainage services. However, this gain was offset by an increase in ammonia to meat and meat product manufacturing (30 per cent) and waste treatment, disposal and remediation services (80 per cent).
- An increase of about 91 per cent was reported for emissions of chlorine and compounds (the second-highest emitted substance to land). This is attributed to an increase in emissions to land from waste treatment, disposal and remediation services (87 per cent). Whilst the number of facilities reporting emissions of chlorine to land from this sector decreased by three per cent in the 2006-07 reporting year, chlorine emissions from one facility increased by approximately 400 tonnes compared to the previous year.

Lead emissions to land

- Lead occurs naturally in the environment in the Earth's crust as well as in rocks and soil. Lead can also be released through natural sources such as windblown dust and forest fires.
- Lead may be released as particles into the atmosphere or as dissolved compounds in water. Lead usually adheres to the soil and attaches to particles of organic matter, clay, soil or sand.
- The metal ore mining sector is the largest sources of lead emissions to land in Australia. Water supply, sewerage and draining surfaces, basic non-ferrous metal manufacturing and oil and gas extraction also emit levels of lead to land.
- Lead emissions may also be present from the vehicle exhaust of cars, aeroplanes, railway operations and from recreational and commercial shipping or boating.
- 248 facilities emitted a total of 11 700 kilograms of lead and compounds to land during the 2006-07 reporting year. Emissions decreased by 22 per cent compared to the previous year, with the biggest decrease occurring in the metal ore mining sector, the water supply, sewerage and drainage service sector, the basic non-ferrous metal manufacturing sector and the basic chemical manufacturing sector.

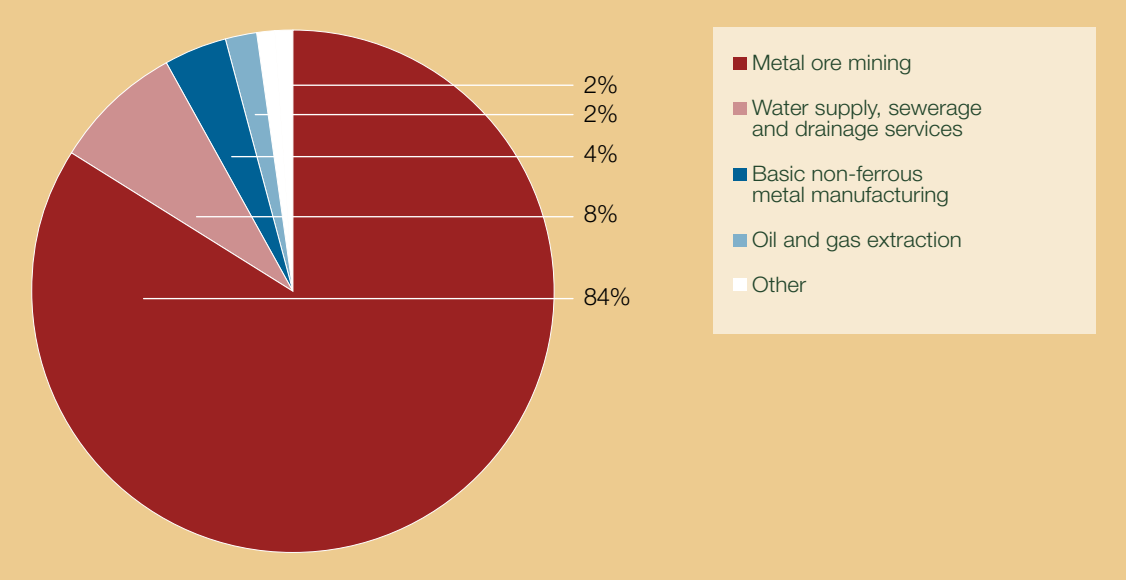


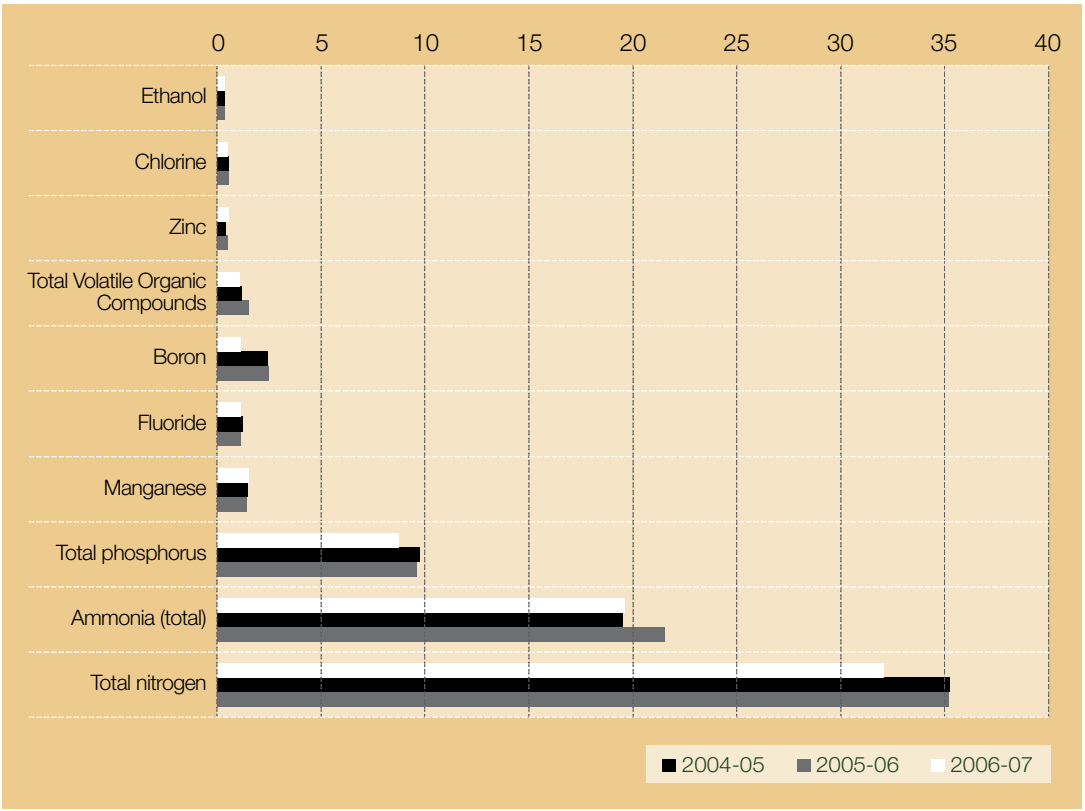
Figure 8: Top emitters of lead to land by sector

Emission to water

The NPI defines emissions to water as discharges to surface waters such as lakes, rivers, dams and estuaries, coastal or marine waters and stormwater runoff. Diffuse emissions are estimated within defined water catchments and usually (but not always) only include estimates of total nitrogen and total phosphorus.

In 2006-07, almost 750 industry facilities reported emissions of 57 NPI substances to water. This is an increase of approximately 200 facilities and two substances from the previous reporting year.

Figure 9: Top ten emissions to water 2004-05 to 2006-07



The largest emission to water was that of total nitrogen, with an emission of more than 32 000 tonnes in the reporting year. This is a decrease of more than 3 000 tonnes, or nine per cent, compared to the 2005-06 reporting year.

The industry sector with the highest contribution to emissions of total nitrogen is water supply, sewerage and drainage services. The top five industrial sectors with total nitrogen emissions to water in the 2006-07 reporting year are illustrated in the following Table.

Table 3: Top five industrial sectors emitting total nitrogen to water, 2005-06 to 2006-07

	Sector	2005-06 emission (kg)	2006-07 emission (kg)	
1	Water supply, sewerage and drainage services	32 000 000	29 000 000	↓ 9%
2	Basic chemical manufacturing	730 000	720 000	↓ 1%
3	Fertiliser and pesticide manufacturing	660 000	520 000	↓ 21%
4	Meat and meat product manufacturing	290 000	310 000	↑ 7%
5	Basic ferrous metal manufacturing	360 000	270 000	↓ 25%

The top five diffuse source emissions of total nitrogen to water are illustrated in the following Table.

	Catchment	Emission (kg)
1	Unimproved pasture – Murray-Darling Basin	70 000 000
2	Cropping – Murray-Darling Basin	48 000 000
3	Improved pasture – Murray-Darling Basin	29 000 000
4	Woodland/forest/forestry – Murray-Darling Basin	12 000 000
5	Native Vegetation – SE Queensland	2 900 000

Table 4: Top five diffuse source emissions of total nitrogen to water, 2006-07

Ammonia emissions to water

Ammonia occurs naturally in the environment and is present in air, soil, water, plants and animals.

Ammonia is used widely and is present in commonly used household and industrial cleaners, bleaching agents and disinfectants as well as being released during intensive livestock production, from humans and pets, and the manufacture of basic chemicals, metals, leather products, cement, textile and paper and paper products. Ammonia is also produced by mining, electricity supply and petroleum refining activities.

Large concentrations of ammonia can be transported by a number of pathways. These include air, water, soil, plants and animals.

Ammonia is soluble in water and can be transported to a surface water body by overland flow, direct discharge in effluents from industry, or sewage treatment plants. Ammonia can also occur in water from the deposition of airborne particulates.

In 2006-07, 217 facilities reported 20 000 tonnes of ammonia emissions to water. Reported emissions of ammonia to water from industry have not changed despite a decrease in the number of facilities reporting the substance since 2005-06.

The largest sector emitting ammonia to water is that of water supply, sewage and drainage services, followed by basic chemical manufacturing and fertiliser and pesticide manufacturing.

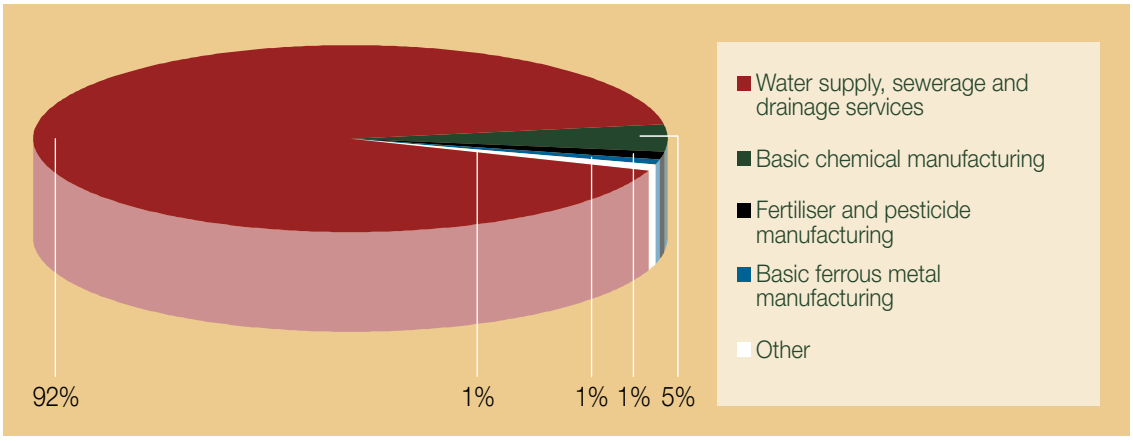


Figure 10: Top five industrial sectors emitting ammonia to water

Note: Ammonia is one of the forms that nitrogen exists in the environment. Further information can be found in the ammonia fact sheet www.npi.gov.au/database/substance-info/profiles/pubs/ammonia.pdf

Report card on a substance – mercury

Typical information available from the NPI fact sheets on substances and their effects are provided in the following example.

Mercury and its compounds is one of the 93 NPI substances. In its pure form, mercury is used in thermometers and barometers, batteries, light globes and in dental amalgam. Whilst there are moves away from using mercury in some of these industries, many mercury containing items are still in production.

Mercury is emitted to the environment from fossil fuel power plants, precious metal mining operations, metal smelters, cement manufacture, municipal landfills, sewage, metal refining, and chemical manufacturing.

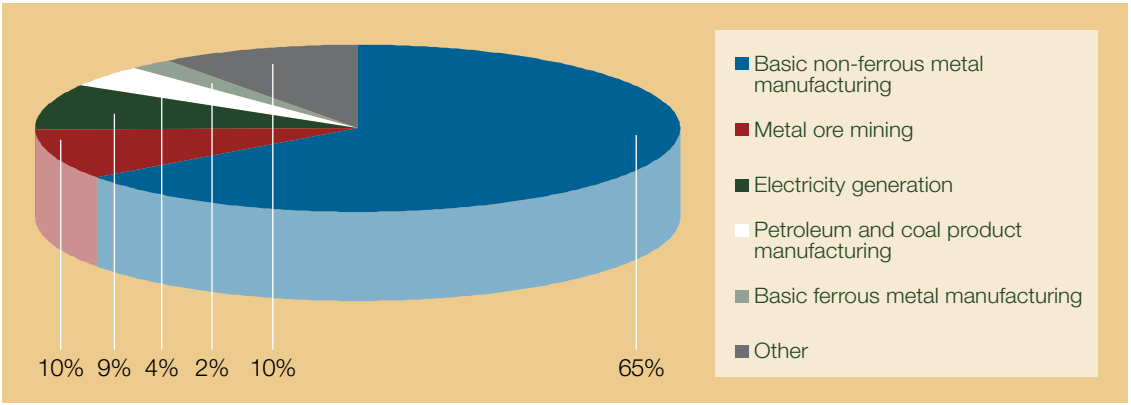
Burning of fossil fuels (home heating oil, petrol), disposal of batteries, thermometers and other mercury containing products and photographic processing facilities may also emit mercury to the environment.

Mercury is also a naturally occurring element that is found in rocks and ores and can be released into the environment by evaporation from soils and from volcanic activity. Mercury is emitted mainly to air with smaller emissions to land and water.

Industry sectors account for 53% of mercury emissions to the environment and are illustrated in Figure 11.

Mercury emissions to air declined slightly by around 8 percent in the last reporting year with the number of reporting facilities increasing by 5 percent.

Figure 11: Major sources of mercury emissions from industrial sources



WHAT NEXT FOR THE NPI?

NPI web site

In a review of the NPI program in 2005, a number of improvements to the NPI web site were recommended to enhance the program in terms of its efficiency and effectiveness. DEWHA, in partnership with state and territory governments, is working to improve the NPI web site by:

- developing and releasing the NPI Online Reporting System to simplify the process by which industry reports their emissions to the NPI, as well as provide improved validation; this will feed into an enhanced jurisdictional database system allowing for more effective auditing of emissions data

- progressively updating emission estimation technique manuals to reflect changes in emission factors, as well as industrial processes, and
- redesigning the NPI web site to improve the database search function, update fact sheets, and provide additional contextual data.

FOR MORE INFORMATION

- For information on the **National Pollutant Inventory**, including access to the 2006-07 or previous years emissions data, visit www.npi.gov.au
- 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, at www.npi.gov.au/contacts/index.html
- For information on the **industry, business and government sustainability activities** of DEWHA, visit www.environment.gov.au/settlements/index.html
- The Australian Government's **greenhouse gas** activities can be viewed at www.climatechange.gov.au/
- For more information about **NEPMs,** see the Environment Protection and Heritage Ministerial Council's web site at www.ephc.gov.au
- For information on international pollutant registries visit the global portal to **Pollutant Release and Transfer Register (PRTR)** information and activities from countries and organisations around the world, visit www.prtr.net
- For more information on the change to **ANZSIC 2006,** visit www.abs.gov.au

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ABBREVIATIONS AND DEFINITIONS

ANZSIC	Australian and New Zealand Standard Industrial Classification
Emission	release or discharge of a substance to the environment whether in pure form or contained in other matter and whether in solid, liquid or gaseous form.
Emission data	an estimate of the amount of the substance emitted in a reporting period that identifies: (a) the medium to which the substance was discharged (for example, air, land, or water), and (b) the estimation technique used.
DEWHA	Department of the Environment, Water, Heritage and the Arts (Australian Government)
Facility	any building or land together with any machinery, plant, appliance, equipment, implement, tool or other item used in connection with any activity carried out at the facility, and includes an offshore facility. The facility may be located on a single site or on adjacent or contiguous sites owned or operated by the same person.
GJ	gigajoule, one billion joules
J	Joule is the primary measure of energy in the metric system
kL	A unit of volume equivalent to 1000 litres.
kWH	kilowatt per hour, a measure of energy equal to the use of one kilowatt in one hour.
NEPM	National Environment Protection Measure
NPI	National Pollutant Inventory
PM_{10}	Particulate matter 10 micrometres or less in diameter
TAP	Technical Advisory Panel
TVOC	Total volatile organic compounds
Transfer	the transport or movement, on-site or off-site, of substances to a mandatory reporting transfer destination or a voluntary reporting destination; but does not include the transport or movement of substances contained in overburden, waste rock, uncontaminated soil, uncontaminated sediment, rock moved in construction or road building, or soil used for the capping of landfills.

For more definitions in the NPI glossary, visit www.npi.gov.au/epg/npi/contextual_info/glossary.html

IMAGE CREDITS

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Footer	Crepuscular rays at Pyengana, TAS	Margaret Brown
6	Toyota Manufacturing Plant Altona, VIC	John Baker
8	Processing plant Cowal Gold Mine, NSW	Cowal Gold Mine
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