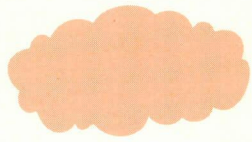
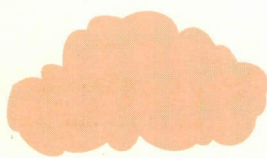
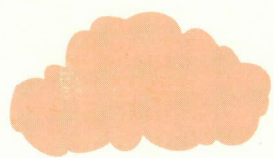
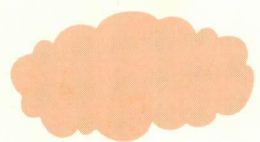
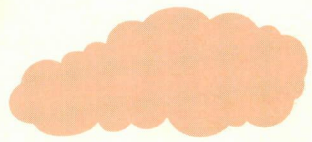


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Greenhouse Gases In New South Wales



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The majority of world scientific opinion is that increases in concentrations of greenhouse gases in the atmosphere will lead to warming of the atmosphere and consequent changes in world climate. The United Nations Framework Convention on Climate Change (FCCC) was developed to gain international agreement on strategies and actions by member countries to respond to climate change. Australia signed the Convention in December 1992. At the same time the National Greenhouse Response Strategy (NGRS) was endorsed by all Australian Governments and is Australia's primary strategic tool for addressing climate change issues.

One requirement of the FCCC is that member countries prepare regular inventories of their greenhouse gas emissions. Australia's first National Greenhouse Gas Inventory (NGGI) was released in October 1994 and provided estimates for the 1987–88 and 1989–90 financial years, but did not break down emissions by State. To ensure that detailed State information is available, the NSW Environment Protection Authority (EPA) commissioned a Greenhouse Gas Inventory for NSW.

The NSW inventory estimates emissions of various greenhouse gases from a range of human activities and land uses. It establishes a database that will prove valuable in:

- assessing the progress of NSW in meeting the planning target in the NGRS
- determining whether greenhouse gas control strategies are working
- environmental impact assessments of new development proposals.

The inventory is designed so that alternative data for future years may be easily substituted to enable the EPA to determine projections using various scenarios of future economic and land use patterns.

Methods used for the NSW greenhouse gas inventory

Methods used for estimating NSW greenhouse gas emissions are consistent with international and national methods. Although the estimates have varying degrees of uncertainties they are based on the best scientific methods currently available. The inventory was carried out for 1989–90 to allow direct comparison with other national and international inventories, and projections are also made for 2000. Greenhouse gas emissions have been estimated for each of the six sectors defined by the Intergovernmental Panel on Climate Change (IPCC), namely all energy, industrial processes, solvents, agriculture, land use change and forestry, and waste.

These sectors have been broken down to allow more detailed analysis of emission sources.

The **all energy sector** sources comprise:

- energy generation, including fuel used to produce electricity and energy transformations such as from coke ovens in iron and steel production
- fuel used in transport, such as cars, boats, aeroplanes and trains
- heating in manufacturing and industry
- fuel production, transmission, storage and distribution, including loss of coal seam methane
- other combustion from commercial, institutional and residential heating, agriculture, forestry and burning of vegetation for energy production.

Sources in the **industrial processes sector** comprise chemical changes in the production of iron and steel (not including the coke oven), other metals, chemicals and cement, and limestone and soda-ash use.

The **solvents sector** sources include various domestic, dry cleaning, surface coating and industrial sources, and bitumen.

The **agriculture sector** sources comprise livestock such as cattle and sheep, animal waste, rice cultivation, agricultural waste burning and burning of grasslands.

Sources in the **land use change and forestry sector** include forest clearing and on-site burning. These emissions are offset to a minor degree, however, by the storage of carbon in managed regrowth forests and by soil when pasture is improved.

The **waste sector** sources include landfill sites, waste water in treatment plants and incineration of solid wastes.

The greenhouse gases considered in the inventory were the three primary greenhouse gases—carbon dioxide (CO₂), methane and nitrous oxide—and three secondary greenhouse gases—oxides of nitrogen, carbon monoxide and non-methane volatile organic compounds. Emissions of two perfluorocarbons (PFCs) from aluminium refining have also been included. In line with national and international recommendations, however, the secondary gases are not included in overall totals.

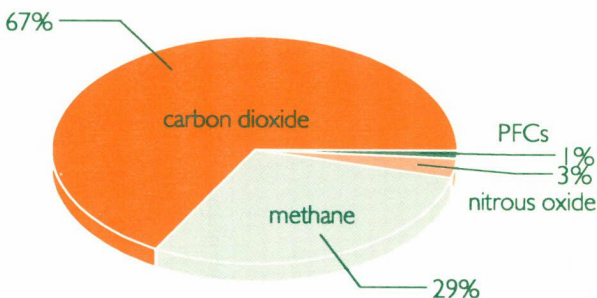


Figure 1. Contributions of primary greenhouse gases to total greenhouse gas emissions in NSW in 1990. Percentages are for equivalent carbon dioxide units.

Results of the NSW greenhouse gas inventory

- Emissions in NSW of the primary greenhouse gases carbon dioxide, methane and nitrous oxide, calculated using the latest international methodology (IPCC 1994), totalled the equivalent of **175 million tonnes of CO₂ in 1990** (Figure 1).
- The major contributor to total greenhouse gas emissions is the energy sector (65%), followed by the land use change and forestry sector and the agriculture sector (both about 14%). The industrial processes, solvents and waste sectors contribute less than 5% each to the total (Figure 2, over).
- Emissions from the land use change and forestry sector are from exposed soil, land clearing and the associated decay and burning of vegetation. The uncertainty associated with the estimated emissions from this sector is $\pm 75\%$. The estimated figure given of 24.1 million tonnes is the mid-range number. This means that emissions from this source could range from a high to a relatively low significance.
- Agriculture emissions are largely a result of methane released by livestock such as cattle and sheep. Livestock populations and diets are well documented but estimates of the methane generated are based on very little local experimental data. Agriculture emissions are therefore likely to have an uncertainty of $\pm 50\%$.
- The energy sector is clearly the biggest contributor in both the NSW and national inventories. Figure 3, overleaf, shows a breakdown of the energy sector.
- The biggest contributor to the energy sector is energy generation such as coal-fired power stations (nearly 58 million tonnes). Electricity generated in this sector is used by all of us in the home, office, shop and factory.

Figure 2. Contributions of activities to total greenhouse gas emissions in NSW in 1990. Percentages are for equivalent CO₂ units.

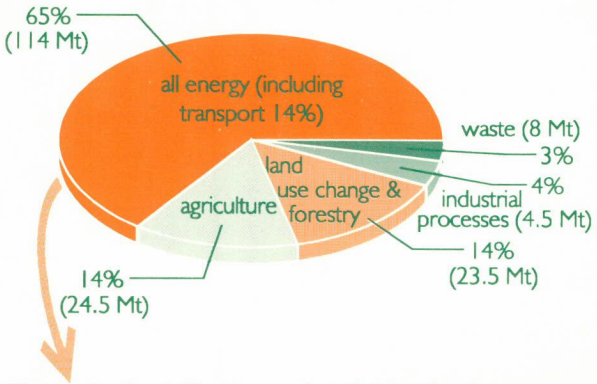


Figure 3. Contributions of activities in the energy sector to total greenhouse gas emissions in NSW in 1990. Percentages are for equivalent CO₂ units.

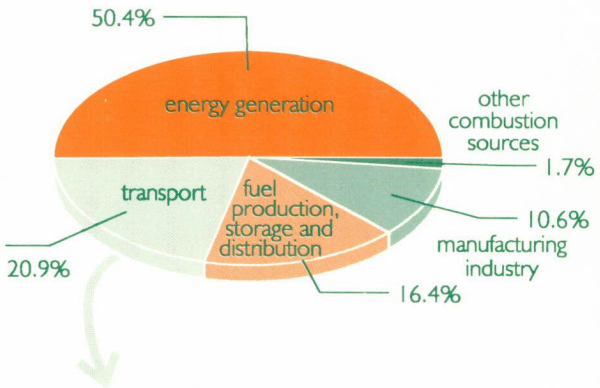
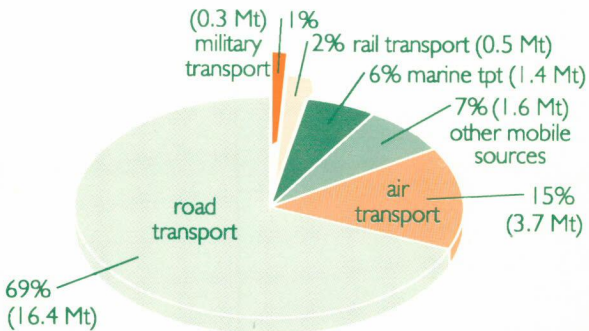


Figure 4. Contributions of transport activities to total greenhouse gas emissions in NSW in 1990. Percentages are for equivalent CO₂ units.



- The second biggest contributor to the energy sector is transport (24 million tonnes). Figure 4 shows a breakdown of NSW emissions from the transport sector.
- Of the 24 million tonnes of CO₂-equivalent emissions emitted by transport in 1990, 30% came from air, rail, marine and other off-road engines and 70% came from road transport. Of the road transport emissions, 65% were from passenger cars and the remaining 35% were from buses, trucks and motorcycles.

Comparisons between the NSW and national inventories

- To enable a direct comparison between the NSW and national inventories the estimates for NSW need to be adjusted to account for the slightly different methods used in the national inventory (IPCC 1990), which give lower figures than the recently agreed ones. All the NSW figures used in this comparison have been adjusted accordingly.
- In most emission categories the NSW figures are close to the percentages of the national ones (Figure 5). However, significant departures occur owing to fundamental structural differences between the States; for example, industry, energy and land use patterns.
- The adjusted NSW emissions totalled the equivalent of 167 million tonnes of CO₂ in 1990, approximately 30% of the national total of 572 million tonnes estimated in the NGGI. (The population of NSW comprises 34% of Australia's total population.)
- The largest departure from the population percentage for NSW is in the land clearing component of the land use change and forestry sector, where the NSW estimates are less than the national average. NSW emissions from land

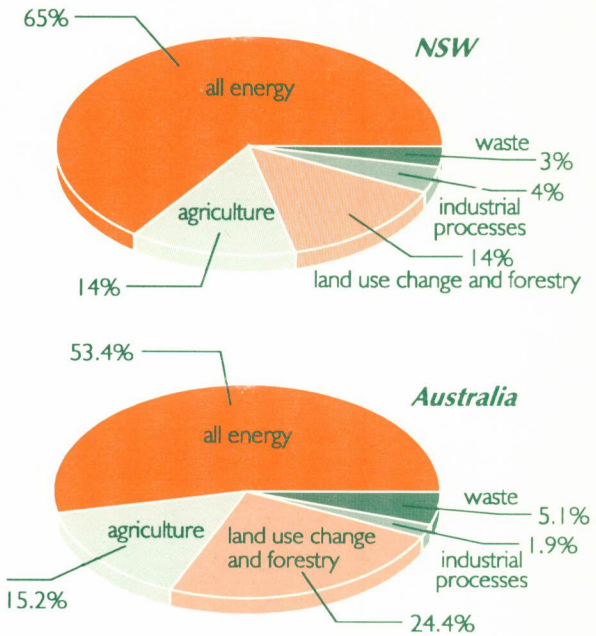


Figure 5. NSW and national greenhouse gas emissions by sector in 1990. Percentages are for equivalent CO₂ units.

clearing account for 16% of the national total. However, there are major uncertainties in both the national and NSW estimates for land clearing.

- The relative contribution of individual greenhouse gases between the two inventories is very similar.

Projections of NSW greenhouse gas emissions for 2000

- Projections of future greenhouse gas emissions in NSW have to be based on a range of assumptions, often specific to the different sectors. Assumptions include population growth

and the growth of activity and changes in practices in each sector. In very broad terms, these correspond to a 'business as usual' scenario, where only changes already planned or foreshadowed in the National Greenhouse Response Strategy are taken into account. Assumptions are identified in detail in the NSW Greenhouse Gas Inventory 1990 Report.

- On this basis, if no further changes were made, NSW greenhouse gas emissions in 2000 could reach **189 million tonnes** of CO₂ equivalents, 8% up on the estimate for 1990. Most of the projected increase is due to an expected rise in emissions of carbon dioxide itself from 117 to 132 million tonnes, mainly from the energy sector.
- Emissions from the energy sector as a whole were projected to increase by 13% to almost 136 million tonnes of carbon dioxide equivalents in 2000. The major contributions to this increase were from the transport and energy generation subsectors, which were both projected to increase by about 15%.

Relationship to the national interim planning target

- The NGRS includes an **interim planning target** to stabilise greenhouse gas emissions at 1988 levels by 2000, and to reduce these emissions by 20% by 2005 'subject to Australia not implementing response measures that would have net adverse economic impacts nationally or on Australia's trade competitiveness, in the absence of similar action by major greenhouse producing countries.' We know from the NGGI, however, that total emissions have increased in the two years between 1988 and 1990.

To meet these national targets in full NSW would have to:

- stabilise annual emissions at less than the 1990 estimated emissions of **175 million tonnes** by 2000. The NSW Inventory has projected that emissions will increase to **189 million tonnes by 2000** on the 'business as usual' assumptions. This is a 14 million tonne increase on 1990 emissions. At an 8% increase this is a slightly higher percentage than the 7% increase projected for the whole of Australia (made before the announcement of the 'Greenhouse 21C Package' by the Commonwealth Government in late 1994).
- reduce annual emissions by 20% to **140 million tonnes by 2005**. This would require a further 35 million tonne reduction on 1990 levels. This represents a 49 million tonne reduction on the 2000 emissions projected under the 'business as usual' assumptions.

All these figures are estimates and the projections involve significant assumptions. Nevertheless, the reductions in emissions in NSW required to meet national and international commitments are large. Because the potential effects of climate change arising from an enhanced greenhouse effect are great, there are good precautionary reasons for striving to meet these commitments.

The NSW Government is committed to achieving the necessary reductions firstly through 'no regrets' measures. These are measures where there are reasons for adopting them in addition to greenhouse concerns. The reasons may be economic, in that the measures will reduce costs, or save resources, without loss of competitiveness. Many energy efficiency measures are of this kind. Or there may be environmental reasons, for example where measures designed to reduce air pollution will also reduce greenhouse emissions.

The NSW Government will be working to accelerate the adoption of such 'no regrets' measures in all sectors in NSW.

Further information

More detailed information and breakdowns of 1990 and 2000 NSW greenhouse gas emissions are presented in *The NSW Greenhouse Gas Inventory 1990* report, which is available from the Environment Protection Authority, PO Box 1135 Chatswood, NSW 2057, or by phoning Pollution Line on (02) 325 5555.

References

International Panel on Climate Change (1990) *Climate Change: The IPCC Scientific Assessment*. Cambridge University Press, Cambridge, UK.

IPCC and OECD (1994) *IPCC Draft Guidelines for National Greenhouse Gas Inventories* vols 1, 2 and 3.

IPCC (1994) *The 1994 Report to the Scientific Assessment Working Group of the IPCC—Summary for Policy Makers*.

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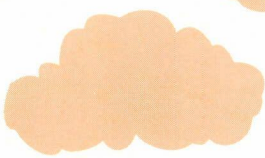
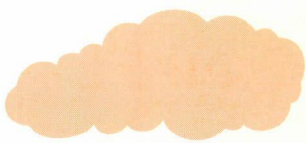
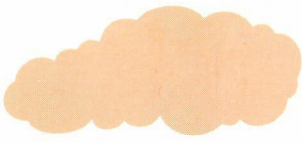
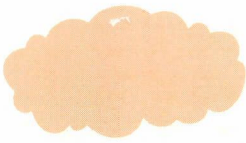
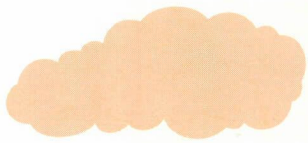
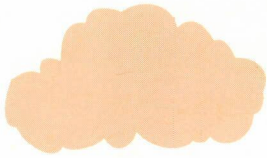
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