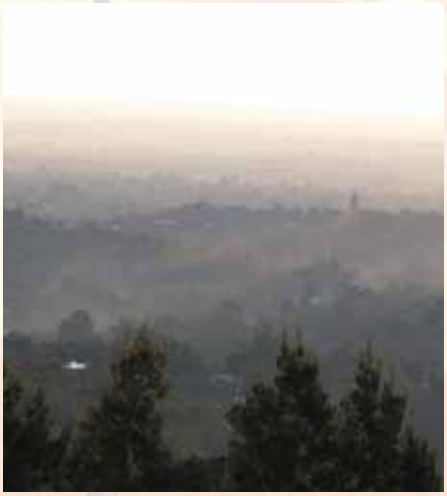
Unflued Gas Heaters and Indoor Air Quality

Facts on Unflued Gas Heaters

Australians spend approximately 90% of their time indoors, which makes the protection of indoor air quality important.[2]

There are approximately 30 million unflued gas heaters worldwide.[1]



Concerns about the air pollution emissions from unflued gas heaters in homes and schools were raised in the 1980s.[1]

Manufacturers of unflued gas heaters have been developing lower emission appliances for the market to improve indoor air quality.

Purpose

Unflued gas heaters are a popular heating option adopted in Australian households. By 2004, there were approximately 600,000 unflued gas heaters installed in homes and schools across Australia.[1]

Unflued gas heaters do not have a chimney or flue attached. The absence of a flue means combustion products from gas heating are not released outside, but are instead emitted into the air surrounding the heater. Consequently unflued gas heaters are a key air pollution source found within many homes. The indoor release of air pollution emissions from heaters can have impacts on human health, particularly children and the elderly.

The Department of Environment and Conservation (DEC) is responsible for managing and protecting the State's air quality, with assistance and co-operation from other levels of government, industry and the public. Air Quality Information Sheets (AQIS) offer the Department's current views on key air pollution issues and guidance on acceptable practices used to protect Western Australia's air quality.

This AQIS has been developed by DEC to provide information:

- to the community on the potential air quality impacts of unflued gas heaters; and
- on how the community can assist in improving indoor air quality.

Unflued Gas Heater

Scope

The information in this AQIS will be of particular use to individuals in WA who currently own or wish to purchase an unflued gas heater. The information will also be of interest to people seeking general information on key sources and potential impacts of air pollution in WA. A glossary is included at the back of the document to define key air pollution terms used in this AQIS.

An Australian study in 2004 concluded that unflued gas heaters contribute to increasing indoor concentrations of NO_2, CO_2 and CO.[3]

The levels of NO_2 produced by unflued gas heaters often exceed international health guidelines for indoor air quality.[3]

Patio outdoor heaters are classifiable as an unflued gas heater, with their emissions dispersed into the outdoor atmosphere. They are not to be used indoors.

In many homes, lack of adequate ventilation prevents the dispersion of air pollution emissions from unflued gas heaters.

A 2004 Perth survey found that 73% of homes in the Perth region have installed gas heating.[8]

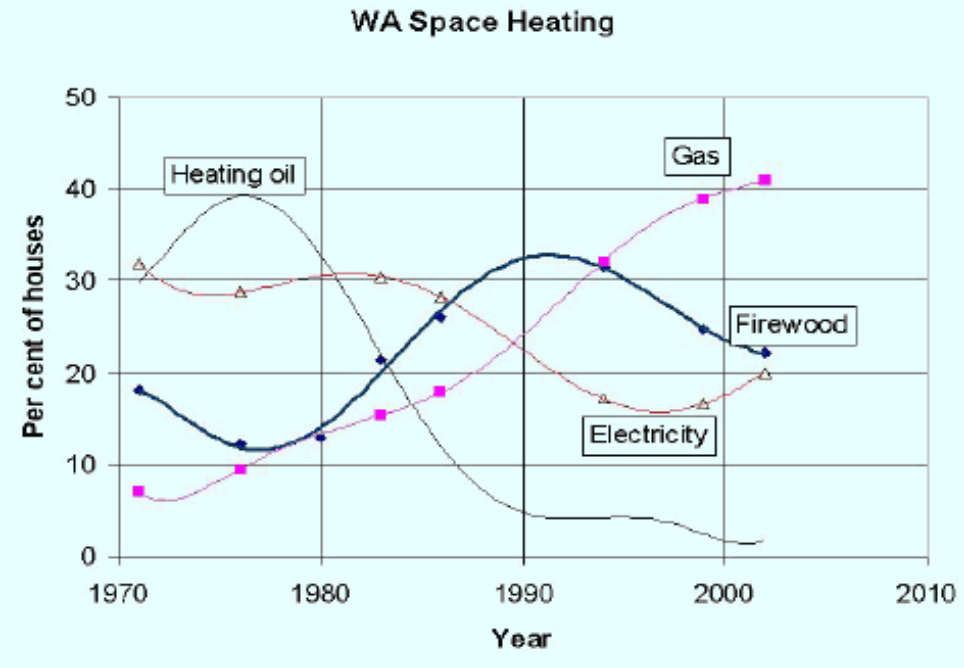
In 2004 Joondalup was found to have the highest percentage of unflued gas heaters in use with 49.4% of homes using an unflued gas heater as their primary source of heating.[8]

What air pollution is produced by unflued gas heaters?

Unflued gas heaters emit a range of air pollutants that can reduce indoor air quality. These include:

- Carbon monoxide (CO)
- Nitrogen oxides (NO_x)
- Volatile Organic Compounds (VOCs)
- Air toxics (e.g. formaldehyde)
- Unflued gas heaters also produce water vapour in the combustion process. This increases the moisture in the indoor atmosphere.

The amount of air pollution produced from unflued gas heaters will depend on several factors including the type of heater, correct installation and use of heater, heater maintenance, size of room being heated and room ventilation.[4]



An increasing proportion (%) of WA homes are using gas as their main heating source.[5]

What are the impacts of air pollution from "unflued gas heaters"?

Health: Air pollution from unflued gas heaters can contribute to numerous health problems (e.g. asthma, lung disease, cancer) particularly in vulnerable people with respiratory and cardiovascular illness, pregnant women, children and the elderly. NO_x can contribute to increased occurrence of asthma attacks, and place children at risk of developing respiratory infections. Elevated levels of CO can lead to increased dizziness, difficulty breathing, chest pain, tiredness and headaches. High CO concentrations can lead to death due to the high CO levels depriving the body of oxygen. Also unflued gas heaters are a source of formaldehyde emissions, which is a carcinogenic air toxic.[4,6]

Water vapour produced from gas heaters can contribute to mould formation and increasing numbers of dust mites. Both mould and dust mites can aggravate allergic conditions in susceptible humans.[4]

NO_2 and CO are both odourless and invisible gases, and difficult to detect.

NO_2 is a key air pollutant contributing to photochemical smog formation, an air quality problem in Perth.

When children in the house have asthma conditions, it will be safer to avoid the use of an unflued gas heater where possible.[4]

The Sustainable Energy Development Office (SEDO) has further information on energy use in WA and home heating options at www.sedo.wa.gov.au

Recommendations: Reducing air pollution from unflued gas heaters

If you are planning to purchase a gas heater, a flued gas heater is recommended to minimise indoor air pollution. However, if you do decide to purchase an unflued gas heater, please consider these recommendations:[4,6,7]

1. Purchase an unflued gas heater that is a suitable size for the room space in your home to increase its efficiency. Ask a retailer for advice on a suitable sized heater for your home.
2. Purchase an unflued gas heater with an electric ignition system.
3. Check the unflued gas heater has a safety system that initiates appliance shut down when fresh air flow is restricted.
4. Ensure installation of gas supply to the heater is by a qualified tradesperson. This will mean building codes are complied with, and installation is safe. An incorrectly installed gas heater can produce more air pollution emissions.

If you already have an unflued gas heater, the following steps are provided as guidance to reduce indoor air pollution:[4,6,7]

5. Read carefully all manufacturer instructions related to the correct use of the unflued gas heater.
6. Ensure the room is well ventilated. Make sure that internal room doors and a window is open to ensure adequate dispersion of emissions. Check that the room air vents are not blocked.
7. Reduce the length of time an unflued gas heater is in operation.
8. Have the unflued gas heater professionally serviced once a year to improve its efficiency.
9. Never leave an unflued gas heater operating in the room where you sleep. Unflued gas heaters should also not be used in caravans, bathrooms and tents and other confined spaces.
10. Be aware of other gas appliances and cumulative emissions within the indoor environment and their potential impacts. For example, gas cook tops in a kitchen can also produce air pollution emissions.

If you are concerned that your heater is leading to high concentrations of indoor air pollution and you have symptoms of NO_2 or CO poisoning, immediately open the doors and windows, turn off the heater and go outside. ***Please see a doctor*** if you are further concerned about your symptoms.

More Information?

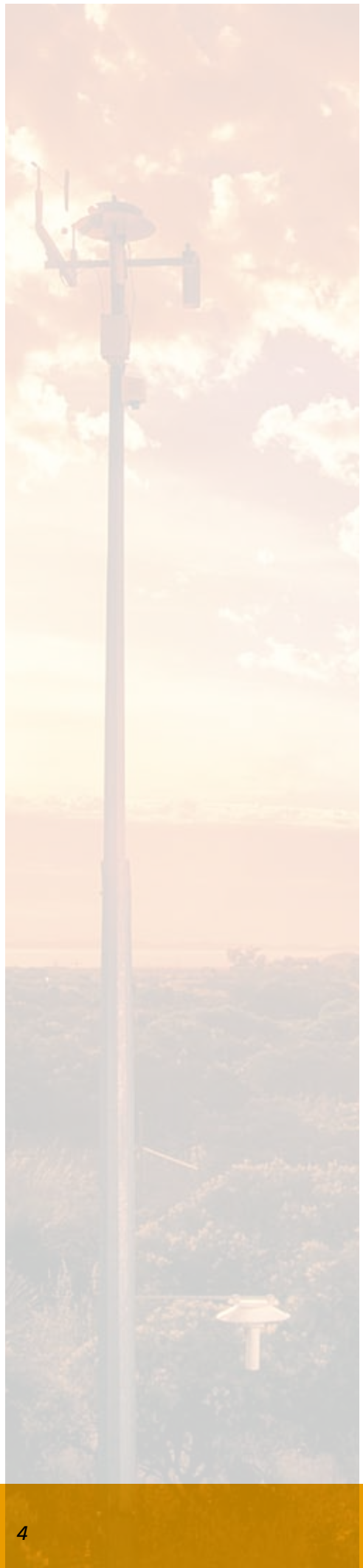
For further information related to this topic please read the following publications, which are available on the Department of Environment and Conservation (DEC) website at http://www.dec.wa.gov.au:

- Perth Home Heating Survey 2004 Technical Report.

With the further development of Air Quality Information Sheets, additional information on air pollution issues affecting Perth and WA will be published on the DEC website.

To comment on this AQIS or for more information, please contact DEC's Air Quality Management Branch at our Perth offices on (08) 9333 7436 or email airquality@dec.wa.gov.au citing the AQIS topic and version.

The AQIS recommendations do not override any statutory obligation or Government policy statement on air pollution control. Alternative practical environmental solutions to suit local conditions may be considered. Also this AQIS shall not be used as this Department's policy position on a specific matter, unless confirmed in writing.



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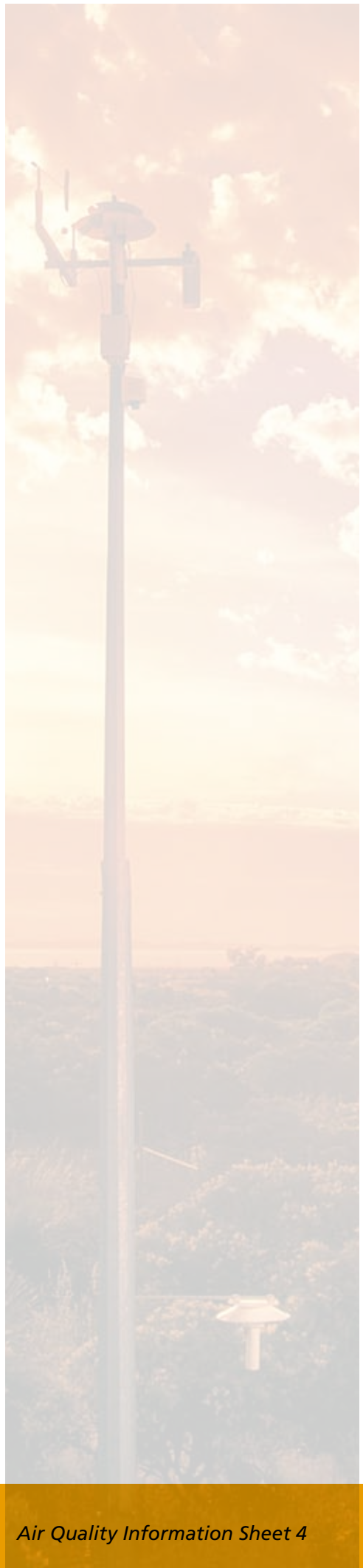


GLOSSARY

Air Pollution

Degradation of the air quality by the presence of natural and foreign substances present in the atmosphere, which can have adverse impacts on human health, vegetation, livestock, agriculture, materials and aesthetics (e.g. visibility).

Air toxics

Air toxics represent a large number of air pollutants that are present in the ambient air and have characteristics that are hazardous to human health and the environment. Air toxics include benzene, 1,3 butadiene, polycyclic aromatic hydrocarbons, heavy metals, volatile and semi-volatile organic compounds and persistent organic pollutants. Air toxics are produced by motor vehicles, industry emissions, paints and adhesives, cigarette smoke and burning of fuel including the incomplete combustion of wood. Exposure to air toxics can produce increased eye, nose and throat irritation. Air toxic exposure is also linked to increased occurrences of cancer, and respiratory and nervous system damage.

Carbon dioxide (CO_2)

A colourless, odourless gas that occurs naturally in the atmosphere, and primarily produced by fuel combustion. Carbon dioxide is the most important principal greenhouse gas, with emissions a factor contributing to climate change.

Carbon monoxide (CO)

Carbon monoxide is a colourless, odourless, highly toxic gas, which is readily taken up by the blood and interferes with oxygen absorption. It is one of the most common and widely distributed air pollutants. It is commonly produced by motor vehicles, industrial emissions, cigarettes and area sources (homes, gardens, office blocks and services stations). Relatively small quantities of carbon monoxide can impair bodily functions with prolonged and acute exposure being fatal.

Formaldehyde

Formaldehyde in its pure form is a gas with a pungent odour. Exposure to formaldehyde can lead to allergic conditions impacting on the skin and lungs, and other health impacts including shortened life expectancy and reproductive problems. Within indoor environments, sources of formaldehyde include building materials, fabrics, cigarettes and gas combustion.[9]

Indoor Air Pollution

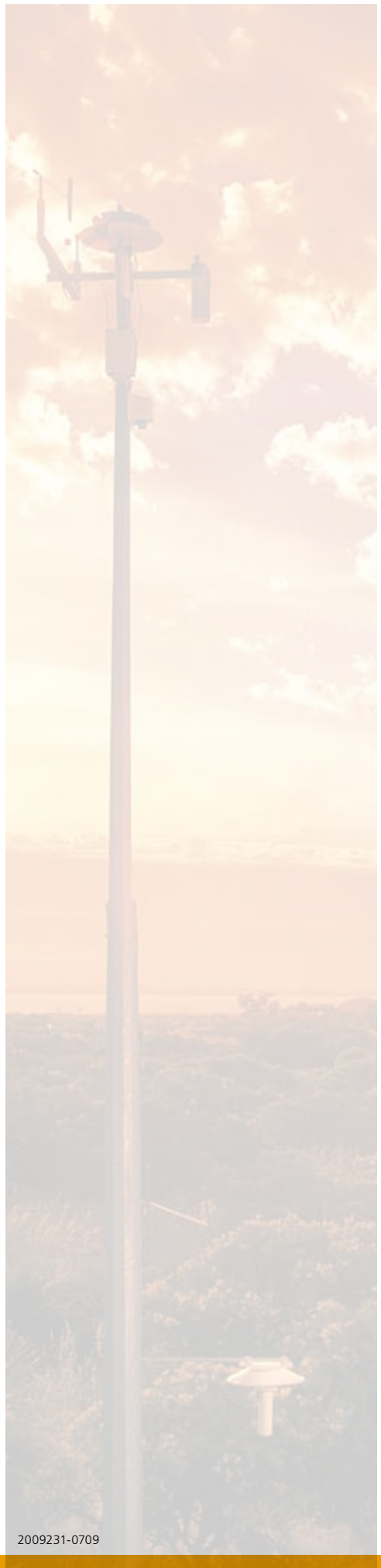
The air within the indoor environment such as your home can contain air pollutants that are man-made or natural, and which can be harmful to human health. Common sources of indoor air pollution include building and construction materials, household product, appliances within the home (e.g. unflued gas heaters) and outdoor air pollution. Health impacts associated with indoor air pollution include headaches, allergies, and respiratory conditions.

Mould

Mould is fungi that grow in the presence of organic materials (including leaves, wood, paper) and water moisture. The most common moulds found in indoor environments are Alternaria, Cladosporium, Penicillium and Aspergillus. These moulds release spores which travel in the air, which can impact on human health. High levels of mould spores indoors can aggravate respiratory conditions (e.g. asthma), lung disease and allergies in people.[10]

Nitrogen oxides (NO_x)

Oxides of nitrogen are gases that can undergo chemical reactions to produce photochemical smog. Most common are nitric oxide (colourless, odourless gas) and nitrogen dioxide (orange-brown gas with a stinging smell). They are produced by the combustion of fossil fuels, motor vehicles, gas appliances and industry. Low levels of NOx can irritate and damage the eyes, nose, throat and lungs.



Particulate matter (PM)

Particulate matter is a mix of solid and liquid particles suspended in the air. Particles are produced by wood heaters, fires and diesel vehicles. Particles less than 10 microns (one seventh the width of a human hair) can lodge in respiratory tracts and lungs and have been linked to asthma, respiratory disease, cardiovascular disease and premature death. Particles with a diameter of 2.5 microns or less are small enough to penetrate deep into our lungs, causing irritation and structural damage.

Polycyclic aromatic hydrocarbons (PAHs)

PAHs are a group of more than 100 organic compounds. They are colourless, whitish to greenish solids that often attach to particulate matter. They are usually produced by combustion processes including motor vehicles, wood heaters, industrial emissions, agricultural burning and also natural sources (volcanoes and fire). They can cause health effects ranging from eye, nose and throat irritation to organ damage and may even cause death.

Volatile organic compounds (VOCs)

VOCs cover a wide range of gaseous organic compounds and include hydrocarbons, oxygenates and halocarbons. Carbonyls are a reactive subset of VOCs. They include the aldehydes such as formaldehyde and acetaldehyde and the ketones such as acetone and methylethylketone. VOCs are found in carpets, particle-board, cigarette smoke, wood smoke, paper products, pesticides, cleaning agents, glues, paints, solvents and some industry emissions. Their main environmental significance is their role in photochemical smog formation. They can also cause health effects ranging from eye, nose and throat irritation to liver and kidney damage.

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