Firewood Restrictions and Air Quality in Western Australia

Why does the government regulate the sale and use of firewood?

In 1989, approximately 6 million tonnes of firewood was being collected each year for sale.[1]

Dry and seasoned firewood will produces less smoke and air pollution during burning than "green firewood".

When a wood log has a high moisture content, the heat energy and output from the fire is lowered.[2]

The moisture content in green firewood can vary between 40-200% depending on the tree type and age.[3]

With burning of green firewood, the heat energy from the fire is reduced by the heat energy being used to vaporize moisture, rather than producing heat output.[2]

If left to dry, the moisture in green firewood slowly evaporates over time.

Purpose

Firewood burning is a key source of air pollution in Western Australia (WA) through domestic activities including heating and cooking. Wood smoke emissions from these activities contain air pollutants that can be harmful to human health and the surrounding environment. The use of wood heaters in the Perth region in winter months contributes to the formation of the brown "haze" which is a serious air pollution problem in the city.

The *Environmental Protection (Domestic Solid Fuel Burning Appliances and Firewood Supply) Regulations 1998* specify that in Perth Metropolitan Region there are restrictions on the sale of green firewood. Green firewood is classified in the Regulations as firewood with more than 20 per cent internal moisture content. In addition the Regulations contain state- wide provisions restricting the sale of painted or treated firewood.

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 WA's air quality.

This AQIS has been developed by DEC to provide information:

- individuals that are purchasing or selling firewood in the Perth metropolitan region; and
- the community on the air pollution impacts associated with firewood burning.

Scope

The information in this AQIS will be of particular use to individuals in WA who wish to purchase or sell firewood, particularly in the Perth region. 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.

Firewood is a potential sustainable "green energy" source as trees are a renewable resource, comparable with wind and solar energy.

Firewood produces less carbon dioxide than other forms of energy combustion when sustainably grown for firewood use.

Burning firewood in small, hot fires will produce less air pollution than a large smouldering fire containing large firewood logs.

Do not burn garbage, rubber, oil, solvents, plastics, metals, paints or treated wood in a fire instead of dry firewood. Burning these substances can produce toxic air pollution emissions that are hazardous to your health.[2]

Avoid burning firewood when the air quality forecast is poor. For example haze alerts for Perth issued by the Department of Environment and Conservation.

Firewood is collected from both private and public land in Australia. The firewood is collected by commercial suppliers and private individuals.[1]

What air pollution is produced by firewood combustion?

The incomplete combustion of firewood leads to the production of air pollution in the form of smoke. Wood smoke can contain the following air pollutants:

- Particulate Matter (PM_{10} and $PM_{2.5}$ - particulate matter with an equivalent aerodynamic; diameter of 10 micrometres (microns) or 2.5 microns respectively);
- Volatile Organic Compounds (VOCs);
- Carbon monoxide (CO);
- Nitrogen oxides (NOx);
- Other air toxics (e.g. acetaldehyde, acetone, benzene, formaldehyde, polycyclic aromatic hydrocarbons).

Green firewood is wood containing more than 20 per cent internal moisture content. The combustion of green firewood creates an inefficient fire compared with dry firewood, due to the evaporation of water vapour which removes heat energy from the fire. Newly cut firewood requires time for the wood to internally dry, and also needs to be kept covered and protected from weather.[4]

What are the impacts of air pollution from burning firewood?

Health: Smoke from firewood creates air pollution that can contribute to numerous health conditions including asthma, lung and heart disease. Also wood smoke can aggravate chronic conditions in people with respiratory and cardiovascular illness. Air toxics in wood smoke can be carcinogenic leading to the development of cancer. The burning of treated firewood is a source of air toxics within smoke.

Vegetation and Crops: Air pollution can restrict processes enabling vegetation and crops to grow (e.g. photosynthesis) and contribute to the premature death of vegetation. Air pollution emissions from domestic wood heaters are not currently managed by government for vegetation impacts

Visibility: Particles in wood smoke can create a smoke haze and limit visibility.

Odour: The odour created from wood smoke signifies the presence of air pollutants which can adversely affect your health.

Half of the firewood privately collected in Australia is from local forests and woodlands on private properties, and from roadside areas.[1]

Firewood burning in wood heaters contributes approximately 40% of particles that are present in haze episodes.

Burning treated firewood releases dioxins and other poisonous emissions, which are hazardous to your health.

How is the Government regulating firewood sales in Western Australia?

Current laws in WA related to firewood use include the *Environmental Protection (Domestic Solid Fuel Burning Appliances and Firewood Supply) Regulations 1998*. These regulations outline the conditions that must be met to legally sell firewood in WA.

The Perth Air Quality Management Plan (AQMP) was released in 2000, and outlines 12 initiatives to protect air quality in the Perth region. Initiative 9 is Haze Reduction, which includes several programs for the Perth region to decrease haze occurrence. Programs include education campaigns of wood heater impacts, haze alerts and auditing firewood retailers for green firewood. Under Perth AQMP, firewood retailers in the Perth region are randomly audited to ensure they are complying with the Regulations on firewood sales.

To protect air quality in WA, the ***Environmental Protection (Domestic Solid Fuel Burning Appliances and Firewood Supply) Regulations 1998*** outlines what firewood can be sold for use in WA to minimise air pollution.

In the Perth region:

- A person must not sell domestic firewood with internal moisture content greater than 20 per cent (green firewood) unless they have an authorised permit or they are selling the firewood to a firewood wholesaler or retailer.
- The Director General of the Department of Environment and Conservation may issue a permit to privately sell green firewood with any conditions they see fit.
- A retailer who has green firewood in their possession for future sale must keep that green firewood separate from dry firewood for sale.
- This green firewood must be clearly marked as not for sale by a firewood retailer, since it exceeds 20 per cent internal moisture content.

Across Western Australia:

- A person must not sell as domestic firewood any wood that is painted, treated, coated with plastic or has been treated with copper-chrome-arsenate, or any substance containing that metal.

Contravening the above restrictions is an offence under the Regulations, with a penalty of $5000.

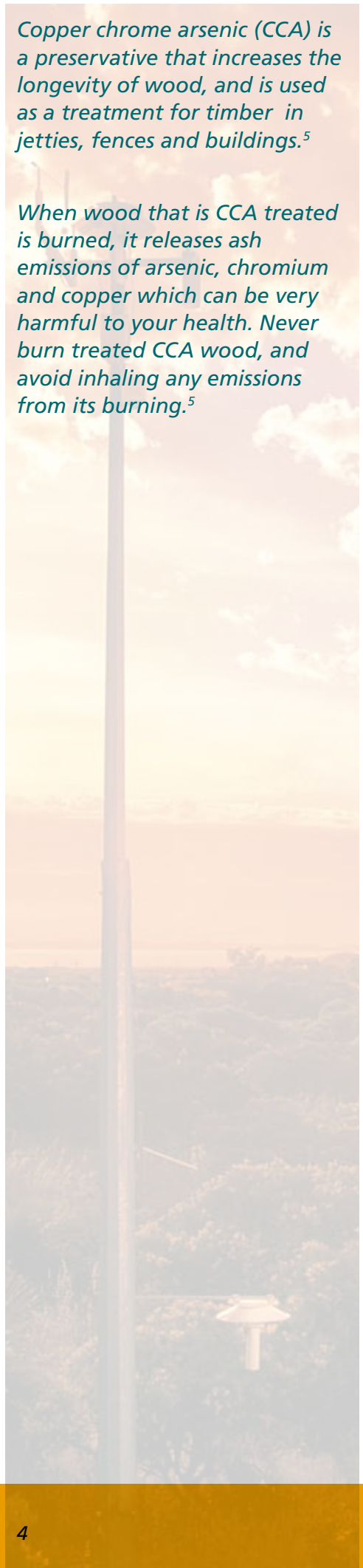
Recommendations: How can I dry my privately collected firewood?

If you have collected firewood that you believe is green with a high moisture content, follow these recommendations to dry and season wood: [2]

1. Split your big logs into small pieces to accelerate the drying process.
2. Stored logs for drying should be approximately 10-15cm thick.
3. Store firewood in a place that is well ventilated and protected from the weather for approximately 6 months to a year.
4. Dry firewood will make a hollow cracking noise when two pieces are banged together, rather than a dull thud when firewood is still green.

Copper chrome arsenic (CCA) is a preservative that increases the longevity of wood, and is used as a treatment for timber in jetties, fences and buildings.[5]

When wood that is CCA treated is burned, it releases ash emissions of arsenic, chromium and copper which can be very harmful to your health. Never burn treated CCA wood, and avoid inhaling any emissions from its burning.[5]



More Information?

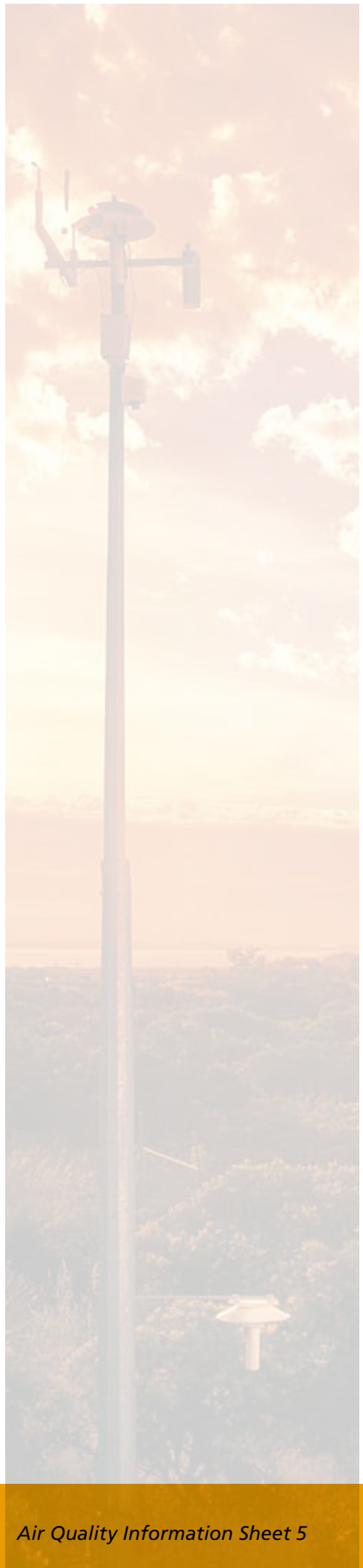
For further information related to this topic please read the following publications on the DEC website at http://www.dec.wa.gov.au:

- **AQIS 1: Wood Heaters and Air Pollution: Reducing Smoke Emissions**
- **AQIS 3: Purchasing and Selling Wood Heaters in Western Australia**
- **Brochure on Wood Smoke – Halt the Haze**
- **A guide to buying and selling wood heaters in Western Australia**

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. For specific information on wood heaters and firewood restrictions, please contact DEC at haze@dec.wa.gov.au

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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2. California Air Resources Board (CARB). 2005. Wood Burning Handbook: Protecting the Environment and Saving Money. California: Cal/EPA Air Resources Board
3. Firewood Association of Australia Inc (FAA). 2009. Moisture Content and Seasoning of Wood. http://www.firewood.asn.au/generalInformation.php (accessed 13 January 2009)
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GLOSSARY

Acetaldehyde

A clear, strong smelling organic liquid or vapour, that can cause numerous health impacts with exposure including irritation of the skin, eyes and respiratory system, headaches and dizziness. In severe cases exposure can lead to liver or kidney damage and death. Common sources of acetaldehyde include manufacturing of industry organic chemicals, rubber, plastics, fuels, chemicals and pesticides. Motor vehicle emissions and petrol stations are additional sources of this air pollutant.[6]

Acetone

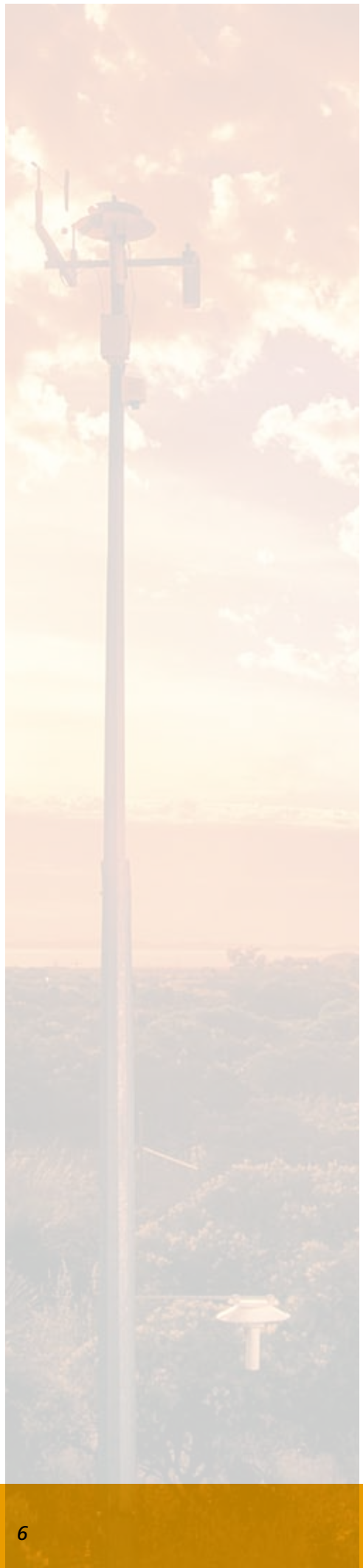
Acetone is a colourless strong smelling liquid or gas that is highly flammable. Health impacts associated with high level acetone exposure include irritation of the eyes, respiratory system, headaches, nausea and vomiting. Severe health impacts of acetone exposure include kidney, liver or nerve damage. Sources of acetone include paints, varnishes, manufacturing of chemicals, plastics, lime, paper and motor vehicles. Motor vehicles and aeroplanes are also a source of acetone.[6]

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.



Benzene

Benzene is a clear to light yellow coloured liquid, with an aromatic odour. It evaporates in the air easily, and is a hazardous air pollutant. Benzene can be produced during industry manufacture (e.g. plastics, pesticides) and is also used as a solvent. Benzene is also found in motor vehicle fuels. Health impacts associated with benzene exposure include skin and eye irritations, headaches and vomiting. Benzene is also carcinogenic and long term exposure can lead to the development of cancers such as leukemia.[6]

Carbon dioxide (CO2)

A colourless, odourless gas that occurs naturally in the atmosphere, and primarily produced by fuel combustion. Carbon dioxide is a 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.[6]

Haze

The term used to describe the presence of very small airborne particles in concentrations large enough to affect visibility. Sources of haze include smoke, vehicle emissions, secondary production, dust, sea-salt particles and organic acids. Smoke can originate from domestic sources including wood heaters, fireplaces and backyard burning. Health studies have shown that increased levels of particles and smoke in the air are associated with increased reports of illness, hospitalisation and death.

National Environment Protection Measures (NEPM)

National Environment Protection Measures are statutory instruments defined in the National Environment Protection Council (NEPC) legislation. They outline agreed national objectives for protecting or managing aspects of the environment. The NEPMs in place that are relevant to air quality are:

- Ambient Air Quality
- Diesel Vehicle Emissions
- National Pollutant Inventory
- Air Toxics

Implementation reports and more information on the NEPMs are available at the Environment Protection and Heritage Council website at www.ephc.gov.au.

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 NO_x 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 micrometres 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 produced by motor vehicles, wood heaters, industrial emissions, agricultural burning and 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, 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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