

TIPS TO REDUCE AIR POLLUTION

- Use renewable energy, e.g. wind and solar power.
- Switch off electrical appliances and lights when leaving a room to conserve energy.
- Connect outdoor lights to a day/night switch or use solar-powered lights.
- Replace incandescent light bulbs with energy-efficient light bulbs.
- Use rechargeable batteries for frequently used electronic items, such as remote controls.
- Buy energy efficient electrical products; e.g. energy efficient lighting, computers carrying the ENERGY STAR label.
- Choose products that have less packaging and are reusable.
- Buy local products that use less packaging and less energy for transportation.
- Some products that you use at your home or office are made with smog-forming chemicals that can evaporate into the air when you use them. Follow manufacturers' directions for use and seal cleaners, paint, and other chemicals to prevent evaporation into the air.
- Use paints and thinners with low VOC content or water-based paints and environmentally safe cleaning products, whenever possible.
- Recycle paper, plastic, glass, cardboard, and aluminium cans to reduce production emissions.
- Wash clothes in warm or cold water, instead of hot water.
- Plant deciduous trees in locations around your home to provide shade in the summer, while allowing light during winter.
- Reduce fireplace and wood stove use.
- Use leaves and organic waste for compost in your garden. Burning it is illegal.
- Buy vehicles that are:
 - Fuel-efficient/low-polluting models of vehicles;
 - Have manual transmissions as these are usually five percent more efficient than automatic vehicles.
- Fill your car with petrol/diesel in the evening to decrease evaporation.
- Plan your trips to avoid congestion or peak traffic hour and avoid waiting and idling a car in long drive-through lines at fast-food outlets.
- Maintain the engine of your car, boat or any other transport vehicle and try to combine errands to reduce "cold starts". Servicing your vehicle regularly can also save up to five percent on fuel costs.
- Increase the lifespan of your tyres by keeping them properly inflated and aligned.
- Use the air conditioner only when necessary, thereby reducing your fuel consumption by more than 10 percent.
- Walk, ride a bike, use public transport or car-pool.
- Ensure boilers, chimneys and wood burners are serviced regularly.
- Fit a cyclone or filter to reduce PM10 emissions.
- Decrease the intake of nutrients in farm animals to dietary amounts that reduce emissions in the excreta without compromising the health and productivity of animals.
- Use alternatives to agricultural burning.
- Stop field activities when the wind velocity is more than 40km/h.
- Combine tractor operations to reduce field passes.
- Explore options to modify farm equipment that reduce the generation of particulate matter.
- Avoid smoking in your home, especially if you have children.

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Sustainable
Measures to
Abate and
Reduce
Threats

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2. Introduction to types and sources of air pollutants (Department of Environmental Affairs and Tourism)
3. United States of America Environmental Protection Agency (www.epa.gov)
4. Michigan Green (www.michigangreen.org)
5. Reducing Wood Smoke: A Burning health issue (Bay Area Air Quality Management District)
6. Alberta Government (www3.gov.ab.ca)

For information on the Western Cape Air Quality, please refer to this website: <https://www.westerncape.gov.za/eadp/about-us/meet-chief-directorates/environmental-quality/air-quality-management>

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Western Cape
Government
Environmental Affairs and
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Understanding air pollutants

WHAT CAUSES AIR POLLUTION?

Air pollution results when substances from man-made activities, e.g. dust, smoke, gases and fumes, and natural activities, e.g. forest fires and volcanoes, contaminate the atmosphere.

TYPES OF AIR POLLUTANTS:

Primary Pollutants: Air pollutants that are emitted directly from a source into the atmosphere, e.g. carbon monoxide (CO) from motor vehicles.

SO₂ Sulphur dioxide
CO Carbon monoxide
NO Nitric oxide
CO₂ Carbon dioxide
NO₂ Nitrogen dioxide
SO₃ Sulphur trioxide

Secondary Pollutants: Air pollutants that form within the atmosphere when various primary pollutants react with each other or natural particles.

H₂SO₄ Sulphuric acid
HNO₃ Nitric acid
O₃ Ozone
H₂O₂ Hydrogen peroxide
NO₃ Nitrate
SO₄⁻² Sulphate

WHAT ARE CRITERIA POLLUTANTS?

Criteria pollutants are common air pollutants for which national ambient air quality standards or guidelines have been set. In South Africa, the following seven criteria pollutants have been identified:

Nitrogen oxides (NO_x)

Nitrogen oxides is a collective term referring to two types of oxides of nitrogen; namely nitric oxide (NO) and nitrogen dioxide (NO₂). Nitric oxide is a colourless, flammable, slightly toxic gas with a slight odour. Nitrogen dioxide is a reddish-brown, non-flammable gas with a noticeable odour. Nitrogen oxides are produced when fuel is burned in combustion processes, e.g. power stations and motor vehicles.

Ozone (O₃)

Ozone occurs naturally in the stratosphere layer of the earth's atmosphere. This layer, also known as the ozone layer, protects us from the sun's harmful ultra-violet (UV) rays. However, when volatile organic compounds (VOCs) react with NO_x in the presence of sunlight, ground-level ozone forms. This ozone is harmful to human health and plays a role in the formation of photochemical smog (brown haze).

Carbon Monoxide (CO)

Carbon monoxide is a colourless, odourless, tasteless and toxic gas that is released to the atmosphere when fossil fuel, e.g. wood and diesel, undergo incomplete combustion. When organic materials in soil decompose, CO can also be released.

Particulate Matter (PM_{2.5} and PM₁₀)

Particulate matter is a mixture of microscopic solids and liquid droplets suspended in air. Found in various sizes, it is usually reported in micrometre units (i.e. one-thousandth of a millimetre). Particulate matter that has a diameter of <2.5 micrometres (PM_{2.5}) are called "fine particulates" and are produced from burning coal, oil or wood. Particulate matter with a diameter ranging between 2.5 and 10 micrometres (PM₁₀) are called

"coarse dust particles" and are produced from crushing and grinding processes normally associated with construction activities, as well as dust emanating from gravel or unpaved road surfaces.

Sulphur Dioxide (SO₂)

Sulphur dioxide is a colourless gas with a pungent smell, like a burning match. Sources of SO₂ include the combustion of fossil fuels such as diesel, and coal from coal-fired power stations or domestic coal burning, and from oil refineries.

Lead (Pb)

Lead is a naturally occurring metal in the environment and vaporises easily during combustion processes. Sources of lead emissions include mining and smelting of lead, as well as demolition processes.

Benzene

Benzene is a colourless, highly flammable liquid with a sweet odour. It is a natural constituent of crude oil and is responsible for the aroma around petrol stations. It is also emitted from natural sources, such as volcanoes and forest fires. Benzene is also used to make plastics, lubricants, dyes, and pesticides. Benzene is a carcinogen.

OTHER IMPORTANT AIR POLLUTANTS:

Volatile Organic Compounds (VOCs)

VOCs are organic compounds that are easily evaporated into the atmosphere. VOCs play a role in the formation of ground-level ozone. Benzene, toluene, ethane, xylene, methylene, formaldehyde, benzopyrene, and ethylene glycol are examples of VOCs. Common household sources of VOCs include paints, thinners, petroleum fuel, moth balls and cleaning detergents. Industrial sources include oil refineries, spray-painting and wood-furniture coating.

Mercury (Hg)

Mercury is a toxic metal that occurs naturally in the environment. Natural sources are volcanoes and the weathering of rock, while manmade sources include waste incineration (particularly of mercury-containing medical waste) and the burning of coal (in coal-fired power stations). Compact fluorescent lamps, computers, and batteries all contain Hg and should be disposed of in an appropriate manner. Other sources include smelting processes of zinc, copper and lead.

Carbon Dioxide (CO₂)

Carbon dioxide is a colourless gas that occurs naturally in the atmosphere. It is considered to be the most important greenhouse gas (GHG). GHGs are gases that contribute to global warming. It is a product of the combustion of fossil fuels, such as petrol, coal and diesel. Other sources include industries such as cement manufacturing, iron and steel production and oil refineries.

Methane (CH₄)

Methane is a colourless, flammable gas. In its pure form it is odourless. Although it is the simplest hydrocarbon (compounds that contain only hydrogen and carbon atoms), it is the second most important GHG. Sources of methane include the decomposition of organic waste at landfill facilities and the combustion of fossil fuels.

Hydrogen Sulphide (H₂S)

Hydrogen sulphide is a colourless, flammable, toxic gas that has an offensive odour (like a rotten egg). It can result from the natural decomposition of organic matter, in for example, swamps or lakes. Manmade sources of H₂S include sewage plants, oil refineries and paper and pulp mills.

POLLUTION RESULTING FROM THE BURNING OF HOUSEHOLD AND MUNICIPAL WASTE

The burning of waste by households and at municipal landfill facilities is common in many areas of the Western Cape. These low temperature fires receive very little oxygen and produce large amounts of smoke. Under these conditions a great many toxic substances are produced. Carbon monoxide, carbon dioxide, and nitrogen oxides represent the largest portion of pollutants emitted from burning of household waste. Smaller amounts of more poisonous chemicals are also released into the air when household waste is burned. Chemicals commonly detected in the smoke include benzene, styrene, formaldehyde, polychlorinated dibenzodioxins (PCDDs; also known as dioxins), polychlorinated biphenyls (PCBs), polychlorinated dibenzofurans (PCDFs; also known as furans), and heavy metals such as lead, mercury and arsenic. Virtually all of the pollutants are released into the air close to ground level where they can be easily inhaled.

Pollution Resulting from Farming Activities

Agricultural practices also have a negative impact on air quality. Agricultural burning practises, e.g. burning to control crop diseases, weeds or pests, and to clear vegetation can produce a large amount of smoke in a short amount of time. Dust is also emitted into the air from agricultural processes such as ploughing and the movement of vehicles and farm-machinery on unpaved roads. Modern trends in agriculture have led to increases in the number of animals raised on farms, such as piggeries and chicken houses, which in turn result in an increase of air emissions (e.g. ammonia and hydrogen sulphide from concentrated animal feeding operations). Air-borne pesticides used on farms also pollute the atmosphere.

Pollution Resulting from Tyre-Burning

People burn tyres to recover scrap metal, to chase rodents away or to reduce fog. The exact emissions from tyre-burning vary. This variation is influenced by factors such as the amount of fuel used, temperature of the fire, meteorological conditions, and the topography of the area. Usually the air pollutants released during tyre-burning include VOCs, polycyclic aromatic hydrocarbons (PAHs), CO, particulate matter, metals such as zinc and iron, SO₂, and carcinogenic dioxins.

