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What can you do

- ◆ Always try to apply the reduce, reuse or recycle principle.
- ◆ Report air pollution to the Chief Air Pollution Control Officer (CAPCO), Department of Health.
- ◆ Report freshwater and land pollution to the Department of Water Affairs and Forestry.
- ◆ Report marine pollution to the Department of Environmental Affairs and Tourism, Marine Pollution Division.

Further reading

Environmental Management in South Africa.
1999. R. F. Fuggle and M.A. Rabie. Juta: Cape Town.

Useful addresses

Department of Environmental Affairs and Tourism.
Marine Pollution Division, Private Bag X2, Roggebaai, 8012.
Tel (021) 402 3344; Fax (021) 402 3364; Call centre 086 111 2468;
E-mail refer to website; Website www.deat.gov.za

Department of Water Affairs and Forestry. Private Bag X313, Pretoria 0001. Tel (012) 336 7500; Fax and e-mails refer to website; Website www.dwaf.gov.za

Department of Health. Private Bag X828, Pretoria, 0001. Tel (012) 312 0000; Fax and e-mails refer to website; Website www.doh.gov.za

groundWork. PO Box 2375, Pietermaritzburg, 3200. Tel (033) 342 5662; Fax (033) 342 5665; E-mail team@groundwork.org.za; Website www.groundwork.org.za



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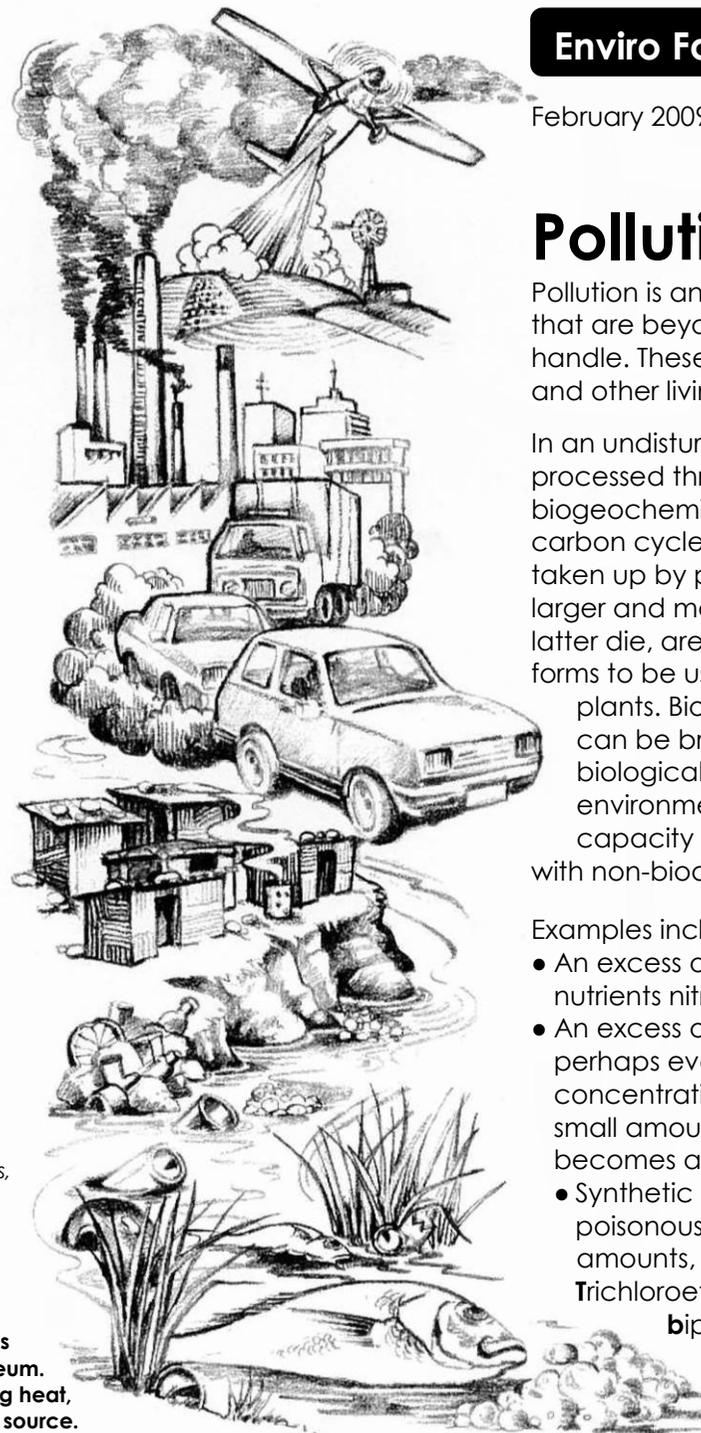
Pollution

Pollution is an unwelcome concentration of substances that are beyond the environment's capacity to handle. These substances are detrimental to people and other living things.

In an undisturbed ecosystem, all substances are processed through an intricate network of biogeochemical cycles, such as the nitrogen and carbon cycles. During these cycles, substances are taken up by plants, move through the food chain to larger and more complex organisms, and when the latter die, are decomposed (broken down) into simpler forms to be used again when they are taken up by plants. Biodegradable substances are those that can be broken down by the environment's biological systems. Pollution occurs when the environment becomes overloaded beyond the capacity of these normal processing systems or with non-biodegradable, human-made substances.

Examples include:

- An excess of normally helpful substances, such as the nutrients nitrogen and phosphorus.
- An excess of substances that are harmless, and perhaps even necessary in tiny amounts, but toxic in concentration. Copper, for example, is necessary in small amounts for healthy plant growth, but becomes a pollutant if it occurs in greater quantities.
- Synthetic (human-made) compounds that are poisonous in the environment, often even in trace amounts, such as DDT (**D**ichloro-**D**iphenyl-**T**richloroethane), dioxin, PCBs (**P**olychlorinated biphenyls) and organochlorines.
- Substances that, in any amount, are not biodegradable, such as highly persistent chemicals like DDT and other organochlorines.



- Radioactive materials.

Some pollutants kill living organisms outright, other sub-lethal pollutants do not kill, but may cause long-term biological damage, interfere with organisms' reproductive cycles, or make them more vulnerable to disease. Sometimes these sub-lethal pollutants in prey species accumulate into lethal amounts in the predators that eat them, such as owls dying from eating mice with sub-lethal doses of DDT.

Types of pollution

Pollutants can be grouped according to the main ecosystem which they affect. One pollutant often affects more than one ecosystem.

POLLUTANTS AND MAIN SOURCE	HEALTH AND ENVIRONMENTAL EFFECTS
AIR	
Sulphur dioxide - burning of coal	Acid rain and respiratory problems
Nitrogen oxides - vehicle emissions Volatile hydrocarbons - vehicle emissions	Combine to form photochemical smog; causes respiratory problems
Carbon monoxide - vehicle emissions	Restricts oxygen uptake, causes drowsiness, headaches, death
Carbon dioxide - burning of coal	Displaces oxygen causing drowsiness, headaches, death
CFCs - aerosol, refrigeration, airconditioning and foam-blowing industries	Destroys ozone layer, which protects us from the sun's cancer-causing UV radiation
Methane - feedlots, rubbish dumps	Potent greenhouse gas
Noise - industry, traffic	Affects hearing, stressful
Asbestos dust - construction, mining, industry	Asbestosis, mesothelioma
FRESH WATER	
Sewage - inadequate sanitation	Pathogens cause typhoid, cholera, gastroenteritis; nutrients cause eutrophication (which can cause fish deaths from oxygen depletion)
Fertilizers - agriculture	Eutrophication
Silt - agriculture, construction, mining	Smother aquatic organisms; affects light penetration reducing photosynthesis
Pesticides - agriculture and health services	Toxic, interferes with breeding of mammals and birds
Toxic metals - industry	Health and life threatening
Salinisation - industry, agriculture, landfills	Reduced crop yields, scale and corrosion in domestic and industrial water systems
MARINE	
Sewage - inadequate sanitation	Pathogens cause typhoid, cholera, gastroenteritis, nutrients cause eutrophication
Fertilizers - agriculture	Eutrophication
Oil spills	Smother marine plants and animals
Plastics	Death of animals through suffocation or entanglement
Pesticides - agriculture, health services	Toxic, interferes with breeding of mammals and birds
LAND	
Solid waste is classified as hazardous (radioactive, pesticides, medical, poisons), or non-hazardous (domestic, urban, mining, industrial, scrap metal)	Hazardous waste is health- and life-threatening, non-hazardous is unsightly and disposal takes up much space
Radioactive materials from nuclear powerstations, military, medical and engineering sources	Cancers, cell mutations, organ failure, interferes with breeding of animals, death

Dealing with pollution

In the past, most approaches to handling pollution could be summed up by the phrase 'dilution is the solution to pollution'. However, pollution levels have increased so much in amount and toxicity that this approach is no longer acceptable. An alternative approach is source reduction (a reduction in the amount of pollution where it is produced).

- ♦ **Point source pollution:** Pollutants are produced from a stationary location, e.g. industrial plants, mines, and municipal sewage works.
- ♦ **Non-point source pollution:** This pollution cannot be traced to a specific spot, and is far more difficult to monitor and control. Common examples are veld fires, motor vehicle emissions, fertilizer runoff, sediment from construction and erosion, plastic packaging, and gases from aerosol cans. Some non-point sources can be addressed by laws, such as banning CFCs (chlorofluorocarbons), or requiring that car manufacturers install emission controls.

Polluter-must-pay principle

This means that a polluter should bear the costs of avoiding pollution, or remedying its effects. This principle is difficult to apply when the source of pollution cannot be identified, as is often the case with atmospheric pollution. The principle can be usefully applied following a pollution disaster, such as an oil spill from a tanker or requiring beverage producers to set up a can recycling programme. However, the consumer often pays for such pollution costs.

Movement of pollution

Pollution does not stay in one place but moves around the world by air and water, as well as by living organisms. Even in Antarctica, birds and marine mammals show traces of pollutants such as DDT and PCBs. Some pollution is deliberately moved abroad. Companies restricted by pollution control regulations at home, sometimes move their industrial plants to other less restrictive countries, as was the case with the plant involved in the Bhopal chemical disaster. Or while remaining at home, they may sell products abroad, that are classed in their own countries as too dangerous for sale, such as banned pesticides. In some cases hazardous waste may also be shipped abroad, generally from industrialised countries to countries from the Developing World willing to accept such waste for a fee, despite the hazards (see *Enviro Facts Hazardous Waste*). When such pollutants turn up again in the originating country, as when food is imported that contains banned pesticides, the process is said to be completing the 'circle of poison'. Some pollution is dumped illegally on land, in rivers or out at sea, by the polluters trying to avoid costly waste treatment.