Effects of photochemical smog

Photochemical smog is a complex mixture of chemicals, some harmless, others highly reactive and potentially dangerous for plants, animals and humans.

The main constituents of photochemical smog are ozone (O_3) and nitrogen dioxide (NO_2). Although ozone is widely considered the chief indicator of photochemical smog, nitrogen dioxide is an important pollutant in its own right, affecting human and plant health and playing a role in the formation of acid rain.

Ozone, a powerful oxidising gas, readily attacks living tissue. In humans it can cause sore throats, inflammation and discharges in the nasal passages, and congestion at levels as low as 10 parts per hundred million (p.p.h.m.). The current Australian health standard, set down by the National Health and Medical Research Council in 1979, is 12 p.p.h.m. for a 1-hour average.

The gas has been shown to affect the function of the lungs, irritating the membranes and lining of the smaller airways and air sacs (alveoli) in the lower respiratory tract. During exercise, changes in lung function, such as the maximum amount of air the lungs can move in and out, have been observed at ozone levels of 12 p.p.h.m.. These effects are potentially serious for people suffering from chronic bronchitis or allergies.

Children and asthmatics are especially prone, showing adverse effects at ozone levels of between 8 and 17 p.p.h.m.. Changes in immune cells in lung tissue, similar to those caused by tobacco smoke, have recently been observed at ozone concentrations as low as 6 p.p.h.m.. The lung tissue of mice exposed for a short time to a level of 8 p.p.h.m. has shown an impaired capacity to ward off bacterial infection.

Ozone also attacks plants during the growing season at low concentrations (below 8 p.p.h.m.), especially citrus fruits, potatoes, legumes and soybeans, affecting their ability to photosynthesise. Combined with other compounds in photochemical smog, the gas damages buildings and degrades rubber, clothing and paint dyes, resulting in substantial economic costs.

A recent review of air-quality goals in Victoria, conducted by leading respiratory specialist Dr Jonathan Streeton, recommended a lowering of the Victorian acceptable 1-hour ozone limit from 12 p.p.h.m. to 8 p.p.h.m., in line with the Japanese standard. New South Wales does not have a set of air-quality goals, but has adopted the national standards.

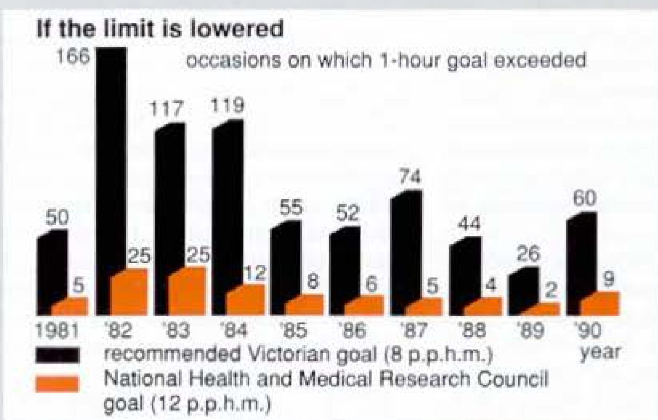
Dr Streeton concluded that the current 1-hour Victorian standard was too high, and that its value in protecting health is 'highly suspect'. He recommended a lowering of the limit to 8 p.p.h.m.. If accepted, it is expected to lead to a tightening of the national standard and, subsequently, a lower limit in New South Wales.

If adopted in Victoria, the change will herald a new wave of smog-alert days in Melbourne. Between July 1986 and June 1989, Melbourne recorded 17 occasions in which the 1-hour goal of 12 p.p.h.m. was exceeded. At a new level of 8 p.p.h.m., the city would have recorded 72 ozone breaches during the same period.

The situation in Sydney is worse. Between 1987 and 1990, the city recorded 20 occasions on which the 1-hour goal of 12 p.p.h.m. for ozone was exceeded. Under the recommended Victorian standard, Sydney would have recorded 204 ozone breaches, or more than 50 breaches a year on average.

'Air Pollution Health Effects and Air Quality Objectives.' J. A. Streeton, MB. (EPA: Melbourne, September 1990.)

'Air Quality Guidelines for Europe.' (World Health Organisation: Copenhagen, 1987.)



The 1-hour goal for maximum ozone levels has been exceeded at Sydney measuring stations on fewer than ten occasions a year since 1984. However, if the goal was set at the level recommended for Victoria, the number of breaches would multiply.