

Air Quality: Synopsis

Lecture 1

Economic development in the form of industrialisation results in increasing concentrations of people in towns and cities (urban areas), and the increasing industrial, commercial and domestic activities associated with the historical process of industrial development. Industrial development may have undesirable environmental consequences, particularly an increase in air pollution in these growing urban areas. An increase in air pollution, and more generally environmental degradation, is frequently considered to be an undesirable but unavoidable result of 'development'. Therefore the strict control and minimisation of environmental impacts is frequently seen as being in conflict with 'development' and 'progress'. But an understanding of the activities and factors that generate air pollution, the human health and environmental consequences of exposure to air pollutants and the available alternative approaches for the reduction or elimination of air pollution enables a different development scenario. The alternative is the management of and avoidance of air pollution impacts within the development process, choosing a different way to do 'development'.

Sources of air pollution in a developed or developing urban area are characterized by factors such as the emission rates of specific pollutants, whether the source is stationary or mobile (cars and trucks), the elevation of the source in relation to environmental receptors (people, crops, buildings etc.), and the exit velocity and temperature of the gas if the source is emitted from a stack. Stationary sources may be further characterized as point sources such as chimneys or stacks, and area sources such as landfill sites, or agricultural areas.

Several factors not directly related to pollution source characteristics influence the ambient (ground level) concentrations of air pollutants. These factors are mainly the meteorological conditions, distance from the source and the nature of the intervening terrain – whether urban, rural or a water body. Ambient pollution levels are usually measured and reported averaged over time periods between 15 minutes up to a year, at a give location.

In the case of persistent air pollutants, such as heavy metals (compounds of lead, chromium, arsenic, etc.) and dioxins/ furans, the main exposure path for people is not the direct inhalation of the polluted air, but through ingestion of contaminated food or dust. These persistent air pollutants (they do not break down into less toxic substances naturally, or break down very slowly) settle on crops or grass that are in turn eaten by livestock and subsequently by people. Water and sediments contaminated by persistent toxic substances result in the contamination of aquatic species and the food web, with attendant environmental and health risk consequences. Children may ingest contaminated dust – this is the main exposure pathway for leaded petrol emissions.

Exposure-response relationships (frequently called dose-response relationships) may be used to estimate potential health impacts on people and/or on the environment. The health impacts may include increased mortality, increased heart and lung disease and increased use of health facilities and medication; environmental impacts

include acid rain and crop damage. The World Health Organisation (WHO) has reviewed, summarised and published information on the exposure-response relationships for the most commonly encountered urban air pollutants as well as Air Quality Guidelines Values.

Section 24 of the SA Constitution says that we have the right to an environment that is not detrimental to our health and well-being. But the protection or enforcement of environmental rights in relation to air quality requires an insight into the relationship between the pollution source and the exposure of people or the environment to air pollutants, and the legal and regulatory framework that enables the enforcement of those environmental rights. The regulation and control of air pollution, and more generally the regulatory system for the management of air quality, is under-developed by comparison with the industrialised countries of Europe and North America. Until recently (and to some extent currently) the air pollution was mainly regulated under the outdated and largely ineffective Air Pollution Prevention Act, Act 45 of 1965 (APPA). A new act that regulates activities that have an impact of air quality, the Air Quality Act (Act 39 of 2004) came into effect (partially) in September 2005. The latter legislation provides a framework for further regulation of air polluting activities. The full and effective regulation of air quality will require a number of years, and considerable government resources.