

Preface

Serious deterioration of urban air quality was initially a consequence of urbanisation itself and the large quantities of wood and coal which were burnt for heating purposes. The situation worsened subsequent to the industrial revolution which caused further large quantities of fuels to be burnt in order to provide the energy needed by manufacturing machinery. Air quality in London throughout the 19th and first half of the 20th century is known to have been extremely poor and particularly so in winter, when larger amounts of fuel were burned, and during weather conditions that inhibited the dispersion of the emissions. Subsequent to the London smog of December 1952, in which it is estimated that at least 4000 premature deaths occurred as a result of air pollution exposure, legislative measures were put into place to clean up the atmosphere. Other developed countries produced a similar policy response and there were dramatic improvements in air quality through the 1960s in particular, which in respect of some pollutants continue to the present day. However, concurrent with this reduction in pollutant emissions from home heating and industry, there was a massive growth in road traffic and consequently in vehicle-emitted pollutants. Only subsequently, in the US from the 1970s and in Europe from the 1980s, were substantial reductions required in the emissions from each new vehicle so as to limit the detrimental effect on urban air quality. A modern vehicle now emits a small fraction of the quantity of pollutants emitted by vehicles that preceded these technological developments, which were themselves enforced by legislation. However, despite the great improvements of recent years, there are substantial residual urban air quality problems and many thousands of people die prematurely each year as a consequence of air pollutant exposure.

This volume is designed to provide an overview of the most important aspects of this field of science. In the first chapter, Ole Hertel and Michael Goodsite set the scene by reviewing the major air pollutants and the typical urban air pollution climates encountered across the world. They also introduce those factors that are important in determining air quality, which are then elaborated upon in subsequent chapters. Jenny Salmond and Ian McKendry

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consider meteorological factors, which are the key to understanding episodic high concentrations of pollution which can be so damaging to public health. However, airborne concentrations are determined not only by emissions and meteorology but also by atmospheric chemical processes. It is now more than half a century since researchers in California developed an understanding of photochemical smog formed in the urban atmosphere, but research continues in this area and our understanding of even quite basic aspects can be found wanting. William Bloss, in the third chapter, reviews the more important chemical processes involved in determining the composition of urban atmospheres, highlighting some more recent findings.

Having considered the factors determining above-ground air pollutant concentrations, the next chapter by Imre Salma considers air quality in underground railway systems. Because underground trains are themselves a source of pollution, especially airborne particles, and since they operate in a relatively enclosed space, air quality in underground railway systems can be very poor in comparison to the open atmosphere and researching the sources and concentrations of pollutants in underground railways is currently a very topical subject. This leads naturally to a chapter by Sotiris Vardoulakis on indoor and outdoor human exposure to air pollutants. Typically, air quality monitoring uses fixed outdoor sites, but these do not well describe the behaviour of people who are, of course, much more mobile. Such factors are considered in the chapter which considers not only how exposure occurs but also some of the implications of reducing it.

In the sixth chapter, Robert Maynard reviews the health effects of urban air pollution. These include both acute effects which represent rather rapid responses to air pollutant exposures, as well as chronic effects which manifest themselves in reduced life expectancy in people living in more polluted cities. The current state of knowledge and overall implications for human health are considered. In the final chapter, Martin Williams considers the policy response to improving urban air quality. In doing so, he shows how measures taken in the UK have led to air quality improvements and also how new approaches based on exposure reduction will become important within Europe in coming years.

Overall, the volume provides a comprehensive overview of current issues in this long-standing but nonetheless still topical field, which we believe will be of immediate and lasting value, not only to the many practitioners in central and local government, consultancies and industry, but also to environmentalists and policy-makers, as well as to students in environmental science and engineering and management courses.

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