

Part VI

Protecting Human Health: Policy, Regulation and Scientific Uncertainty

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As discussed in many chapters of this book, there is a large body of evidence which demonstrates the potential for airborne particulate matter (PM) to negatively impact human and environmental health. Given this, there is a critical need for air quality policy and emissions regulations that minimize PM exposures and health risks as much as possible, while considering the interests of industry and society in general (e.g. energy requirements, travel). Despite the advances which have been made in our knowledge of airborne PM and its potential to impact human health, existing knowledge gaps and the attendant scientific uncertainty complicates decisions regarding air quality and emissions regulations. Airborne PM is perhaps one of the most difficult environmental contaminants to regulate in the interest of protecting public health. This is due, in part, to the fact that airborne PM can originate from a large number of natural and man-made sources and its prevalence and composition can be highly variable through both time and space as a consequence of many factors. Our ability to develop good public health policy is made even more difficult by the lack of established threshold levels between PM dose and response and existence of mathematical models which adequately describe the relationship between PM exposure and health effects. The ability for airborne PM to be transported further distances from the emission source, especially the finer fractions of PM, adds even more complexity to the issue of air quality regulation, highlighting the need for cross-jurisdictional cooperation.

This concluding part includes two chapters, which grapple with different aspects of the above issues and questions. In the first chapter, Grahame critically examines a variety of methodological issues as they relate to population-based studies undertaken to investigate the relationship between airborne PM exposures and effects. He further discusses how these issues may be addressed, emphasizing a need to systematically examine the constituents of PM and their sources. Grahame argues for an interdisciplinary approach to better describe exposure-response relationships and to provide a basis for policy that more adequately protects human health. In the second chapter, Morawska et al. provide a comprehensive overview of existing regulations and policy measures to regulate air quality and reduce airborne PM levels in various political jurisdictions. As part of this, they

detail a number of problems which are inherent to the regulation of emissions and air quality, including the quantification of source contributions and confounding factors such as the nature of particle formation. Similar to Grahame, Morawska et al. discuss problems with current approaches to air quality policy and emissions regulations, which are based on the mass of certain particle size fractions, notably $PM_{2.5}$ and PM_{10} .