



AIR QUALITY MANAGEMENT IN THE UNITED STATES

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES

Contents

Executive Summary	3
Summary	8
1 INTRODUCTION	23
Air Pollution Science, 24	
Air Pollution Impacts, 28	
<i>Air Quality Management in the United States</i> , 29	
The Role of Science, 35	
Estimating the Costs and Benefits of the Federally Mandated Air Quality Management System, 37	
The Future, 39	
Charge to the Committee on Air Quality Management in the United States, 41	
Report Structure, 43	
2 SETTING GOALS AND STANDARDS	45
Introduction, 45	
Overview of Air Quality Standards, 46	
The Standard-Setting Process, 47	
Goals for Mitigating Visibility Degradation, 59	
Standards for Mitigating Effects of Acid Rain, 59	
The Scientific Basis for Setting Standards, 67	
Summary, 86	

- 3 **DESIGNING AND IMPLEMENTING CONTROL STRATEGIES THROUGH THE SIP PROCESS** 88
 Overview of SIP Process, 88
 The Main Components of an Attainment-Demonstration SIP, 96
 The Effectiveness of the SIP Process, 126
 Summary, 131
- 4 **IMPLEMENTING EMISSION CONTROLS ON MOBILE SOURCES** 133
 Introduction, 133
 Controlling Emissions through Certification Standards on New Vehicles and Motors, 136
 Controlling In-Use Motor-Vehicle Emissions, 148
 Behavioral and Societal Strategies to Reduce Mobile-Source Emissions, 162
 Critical Discussion of Mobile-Source Emission-Control Programs, 167
 Summary, 172
- 5 **IMPLEMENTING EMISSION CONTROLS ON STATIONARY SOURCES** 174
 Introduction, 174
 Permits and Standards for New or Modified Major Stationary Sources, 177
 Other Technology-Based Standards Imposed on Major Facilities, 186
 Evaluation of Traditional Control Programs for Major Stationary Sources, 188
 Compliance Assurance for Traditional Control Programs, 190
 Cap-and-Trade Provisions for Major Stationary Sources, 196
 Other Trading and Voluntary Stationary-Source Programs, 210
 Area-Source Regulations, 212
 Summary of Key Experiences and Challenges for Stationary-Source Control, 214
- 6 **MEASURING THE PROGRESS AND ASSESSING THE BENEFITS OF AQM** 216
 Introduction, 216
 Monitoring Pollutant Emissions, 216
 Monitoring Air Quality, 220
 Assessing Health Benefits from Improved Air Quality, 241
 Assessing Ecosystem Benefits from Improved Air Quality, 252
 Assessing the Economic Benefits of Air Quality Improvements, 261
 Summary, 265
- 7 **TRANSFORMING THE NATION'S AQM SYSTEM TO MEET THE CHALLENGES OF THE COMING DECADES** 268
 Introduction, 268
 The Challenges Ahead, 270

CONTENTS

xix

Principles for Enhancing the AQM System, 278	
Recommendations for an Enhanced AQM System, 283	
Conclusion, 313	
References	317
Abbreviations	349
Appendix A COMMITTEE BIOSKETCHES	355
Appendix B STATEMENT OF TASK	363
Appendix C 188 HAZARDOUS AIR POLLUTANTS	365
Appendix D RECOMMENDATIONS FOR CONTINUOUS DEVELOPMENT AND IMPLEMENTATION OF MEASUREMENTS TO DETERMINE STATUS AND TRENDS IN ECOSYSTEM EXPOSURE AND CONDITION	369