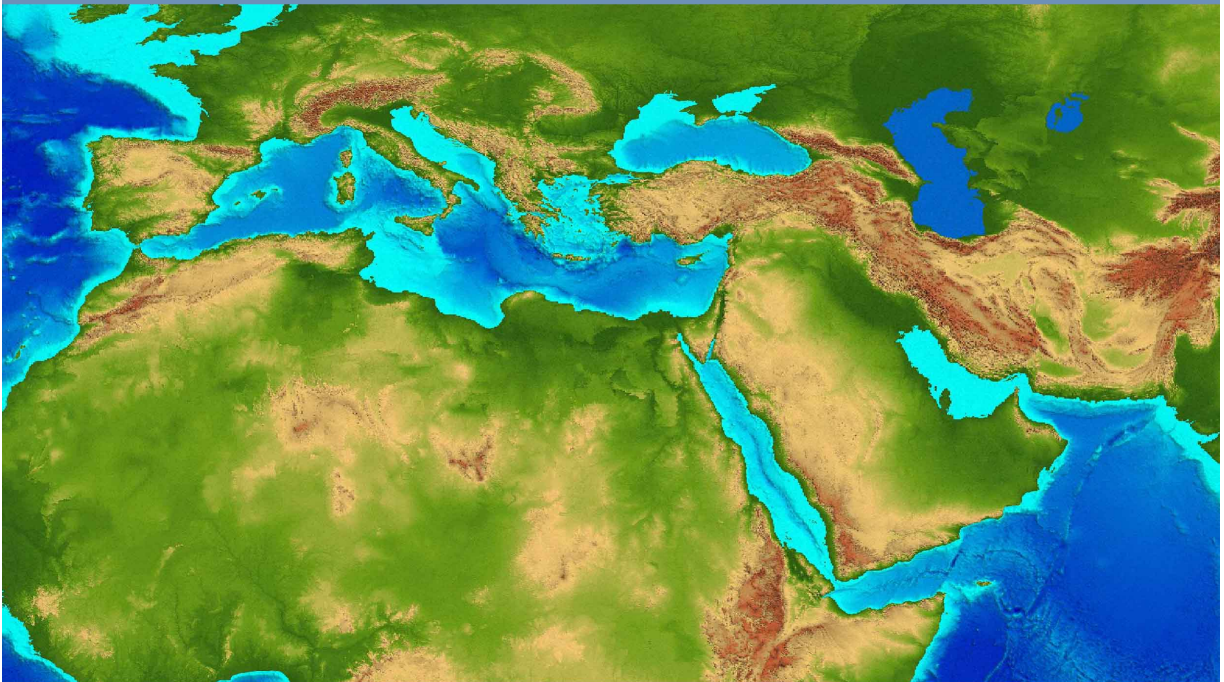


BOOK FLYER

# Ambient Air Pollution



Editor  
Paolo Zannetti

Co-Editors  
Dhari Al-Ajmi and Saud Al-Rashied

Published by



Arab School For Science & Technology and

**EnviroComp**  
The EnviroComp Institute

This is a new book titled *AMBIENT AIR POLLUTION*. This text takes an in-depth look at various aspects of ambient air pollution surrounding the Middle East from air pollution monitoring to regulatory processes, and computer modeling to statistical analysis. With individual chapters written by experts in their fields, this book gives environmental professionals a solid foundation for understanding various aspects of ambient air pollution using both semi-empirical formulations and well-established atmospheric science. The book is available both on CD-ROM (see below) and as a bound textbook (contact ASST). The book is published by the [Arab School for Science and Technology \(ASST\)](#) and [The EnviroComp Institute](#).

*For updates, corrections, and discussion, please visit:*  
<http://www.envirocomp.org/asst>

The electronic book *Ambient Air Pollution* is distributed on CD-ROM by the [The EnviroComp Institute](#).

The electronic book is made of chapters organized in Adobe Acrobat's PDF files that can be examined using Adobe Acrobat Reader (which can be [freely downloaded](#)). The reader can use any computer platform (PC/Mac/Unix). Navigation is straightforward. The book is complete with hypertext links, references, website and email pointers, graphics, and information about chapter authors including curriculum vitae, biographies, and pictures. The Table of Contents of *Ambient Air Pollution* and the order form are presented below.

Copyright © 2007 Arab School for Science and Technology (ASST) and The EnviroComp Institute. All rights reserved.



Arab School for Science and Technology (ASST)



# *Table of Contents*

	<b>Preface</b>	<b>ix</b>
	<b>About the Editors</b>	<b>xi</b>
	<b>About the Publishers</b>	<b>xiii</b>
	<b>About the Chapter Authors</b>	<b>xv</b>
<b>1</b>	<b>An Introduction to Air Pollution – Definitions, Classifications, and History</b>	<b>1</b>
	1 The Natural Environment and Some Definitions of Air Pollution	1
	2 Primary and Secondary Pollutants	3
	3 Air Pollution Regulation	5
	4 Classifications of Air Pollutants and Their Trends	7
	5 Emission Trends of Pollutants	11
	6 Further Reading	14
<b>2</b>	<b>Air Pollution Modeling – An Overview</b>	<b>15</b>
	1 Introduction	15
	2 Modeling of Point Sources	16
	3 Air Pollution Modeling at Urban and Larger Scales	18
	4 Examples of Dispersion Modeling	19
	5 Photochemical Modeling	20
	6 Other Models	21
	7 Further Reading	24
<b>3</b>	<b>Climate Change and U.S. Voluntary Partnerships</b>	<b>29</b>
	1 Introduction	30
	2 Background on Climate Change	31
	3 U.S. Efforts to Mitigate Climate Change	40
	4 Voluntary Programs	43
	5 Conclusion	61
<b>4</b>	<b>Overview of the U.S. Clean Air Act</b>	<b>67</b>
	1 Introduction	67
	2 The Regulatory Mechanisms of the CAA	71
	3 Accomplishments of the CAA, 1970-2005	81
	4 Conclusion	84
	Appendix A – List of Acronyms	89
<b>5</b>	<b>Global Warming and Climate Change: State of the Science</b>	<b>93</b>
	1 Introduction	93
	2 Background	94
	3 Do Measured Increases in Temperature Represent Global Warming?	97
	4 Can Global Warming Be Attributed to Increased GHG Concentrations?	102
	5 Conclusion	108

<b>6</b>	<b>Ambient Air Quality Monitoring and Assessment in Kuwait: Past, Present, and Future</b>	<b>109</b>
1	Introduction	110
2	Non-Petroleum-Based Emission Sources in Kuwait	113
3	Air Quality Monitoring, Assessment and Management	116
4	Data and Results	121
5	Air Quality Index (AQI)	133
6	Case Study I	137
7	Case Study II	141
	Appendix I	146
	Appendix II	153
	Appendix III	157
<b>7</b>	<b>Emergency Preparedness and Response System for Atmospheric Dispersion of Hazardous Gases</b>	<b>159</b>
1	Introduction	160
2	Decision Support System	161
3	Meteorological Information	162
4	Dispersion Modeling	163
5	Discussions	164
6	Conclusion	169
<b>8</b>	<b>The Relationship Between Emergency Hospital Admission for Respiratory Diseases and Air Pollution in Al-Ahmadi – Kuwait</b>	<b>171</b>
1	Introduction	171
2	Methods	175
3	Results	177
4	Discussion	182
<b>9</b>	<b>Exposure to Petrol-fuelled Automobiles and Urinary t,t-Muconic Acid</b>	<b>187</b>
1	Introduction	188
2	Method	189
3	Results	192
4	General Discussion	198
5	Conclusion	205
<b>10</b>	<b>The Effect of Fuel Sulphur Content on the SO<sub>2</sub> Ground Level Concentration in Kuwait: Numerical Study</b>	<b>209</b>
1	Introduction	210
2	Locations of Current Power Stations in Kuwait	210
3	ISCST3 Model	211
4	Basic Input Data Requirements	212
5	Assumptions	213
6	Scenarios Considered	213
7	Results and Discussion	213
8	Concluding Remarks	217
9	Future Work	218

<b>11</b>	<b>SO<sub>2</sub> Emissions Control of a Thermal Power Plant</b>	<b>237</b>
	1 Introduction	238
	2 Power Plant Specifications	239
	3 Model Application	240
	4 Results and Discussion	242
	5 Conclusion	249
<b>12</b>	<b>Air Pollution Monitoring Technologies and Measurement Artifacts</b>	<b>251</b>
	1 Introduction	251
	2 Air Pollution Monitoring Technologies	252
	3 Measurement Artifacts	260
	4 Summary	264
<b>13</b>	<b>HVAC System Design and Control for Energy Savings and Reduction in Greenhouse Gas Emission</b>	<b>267</b>
	1 Introduction	267
	2 Energy Use in Kuwait	270
	3 Energy Conservation Measures in Kuwait	273
	4 Advanced Technology in HVAC System Designs and Control (Kuwait Case Studies)	274
	5 Recommendations	277
<b>14</b>	<b>Comparison of Some Sigma Schemes for Estimation of Air Pollutant Dispersion in Moderate and Low Winds</b>	<b>281</b>
	1 Introduction	281
	2 Theoretical Aspects	282
	3 Experimental Techniques	285
	4 Results and Discussion	286
	5 Conclusion	293
<b>15</b>	<b>Statistical Analysis for the Air Quality in the State of Kuwait</b>	<b>295</b>
	1 Introduction	295
	2 Pollutants	297
	3 Nature of the Data	299
	4 Monitoring Stations	299
	5 Comparison Study	330
	6 Conclusion	335
<b>16</b>	<b>Measurements of Polycyclic Aromatic Hydrocarbons (PAH), Heavy Metals, and Gaseous Pollutants in Polluted Airsheds over some Syrian Cities</b>	<b>337</b>
	1 Introduction	337
	2 Experimental Section	339
	3 Results and Discussion	345
	4 Conclusion	353

<b>17</b>	<b>Reforming Legislations vis-à-vis Air Pollution in Lebanon</b>	<b>355</b>
1	Structure of the Ministry of Environment (MOE)	356
2	Types of Legislations	357
3	Procedures for Legal Texts Preparation in Lebanon	358
4	Air Pollution	359
5	The Environmental Code (Law for Protection of the Environment)	360
<b>18</b>	<b>Bio-monitoring Studies on the Effect of Lead in Date Palm (<i>Phoenix dactylifera</i>) in the Arid Ecosystem of Kuwait</b>	<b>363</b>
1	Introduction	363
2	Materials and Methods	364
3	Results	366
4	Discussion	367
5	Conclusion	369
<b>19</b>	<b>Assessment of Suspended Particulate Matter and Settled Dust in Kuwait</b>	<b>371</b>
1	Introduction	372
2	Methodology	373
3	Results and Discussion	374
4	Dust Fall	385
5	Conclusion	391
6	Recommendations	391
<b>20</b>	<b>Kuwait Atmospheric Corrosivity Stations for Time of Wetness Measurement and Corrosion Rate Prediction</b>	<b>393</b>
1	Introduction	394
2	Kuwait Atmospheric Corrosivity Station	396
3	Results and Discussion	400
4	Environmental Effect of Sewage Atmospheric H <sub>2</sub> S Gas on the Failure of Air-Conditioning Units in Kuwaiti Buildings	402
5	Conclusion	406
	<b>Authors' Index</b>	<b>409</b>
	<b>Subject Index</b>	<b>411</b>