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S. M. Shiva Nagendra
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Urban Air Quality Monitoring, Modelling and Human Exposure Assessment

 Springer

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Urban Air Quality Monitoring, Modelling and Human Exposure Assessment

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Preface

Urban air pollution poses a significant threat to human health, environment and the quality of life of people throughout the world. It also significantly contributes to climate change. The climate change has the potential to significantly modify the local and regional air quality through changes in chemical reaction rates, vertical mixing of pollutants (boundary layer height), and transport of pollutant. It is predicted that climate changes could increase ground level harmful air pollutants concentration in urban areas.

Poor air quality will largely affect human health, vegetation (crop yield) and material damage (economic loss). In cities, children and elderly people are more vulnerable to both climate and air quality changes. It is reported that climate factors such as temperature, humidity, and wind velocity and wind direction have considerable impact on chronic respiratory diseases. Asthma is also correlated with the changes in air temperature and humidity. The World Health Organization (WHO) has estimated that in developing countries, increasing urban air pollution (UAP) has resulted in more than 2 million deaths per annum along with various cases of respiratory illnesses (WHO, 2014). One of the major sources of UAP is the road transport sector. Besides, domestic, commercial and industrial activities also contribute to UAP.

Air pollution in urban areas involves multiple processes: the generation of pollutants at and their release from a source; their transport and transformation and removal from the atmosphere; and their effects on human beings, visibility, materials, and ecosystems. Therefore, modelling, monitoring and management of urban air quality are essential methods to achieve clean air and comfortable urban conditions in a sustainable manner.

This book dedicated to the topics focus on Air Quality Management in Cities and shares the practical experience of the contributing authors. This book is divided into two parts. Part I has seven chapters that discuss several topics related to urban air quality management. Chapter 1 provides introduction to urban air pollution including types of air pollutants and their emissions sources, air quality trends in developed and developing countries, current air pollution issues followed by air quality management options. Chapter 2 covers broadly on air quality monitoring

techniques. This chapter starts with basics of air pollution measurement, air quality monitoring networks, measurement of gaseous pollutants and measurement of particulate pollutants followed by data quality control and quality assurance. Chapter 3 explains topics related to air quality modelling. This chapter starts with basic concepts on mathematical model formulation, followed by air pollution meteorology, air quality modelling techniques, air pollutants dispersion models, source apportionment models, statistical distributions models, limitations of air quality models, application models in local and urban air quality management. Chapter 4 details the principles of air quality management, air quality management frame work, air quality standards and legislations, air quality management practices in developed countries, air quality management practices in developing countries and problems associated with air quality management. Chapter 5 covers topics related to indoor air quality, particularly covering basics of indoor air pollution, sources of indoor air pollutants, indoor air quality and human comfort, indoor air quality modelling and indoor air management. Chapter 6 provides an overview on personal exposure and health risk assessment. In this chapter topics such as air pollution and chemical toxicity, air pollutants and health risks, personal exposure to air pollutants, health risks assessment and case studies are emphasized in greater detail. The last chapter (Chap. 7) describes the smart sensors for air quality management with special focus on air quality measuring sensors, types of smart air quality sensors, data acquisition, smart-sensors for mobile and personal monitoring, air quality maps and limitations of smart air quality sensors. Part II presents twenty three case studies related to the concepts introduced in Part I.

This book is intended for students, academicians, scientists, engineers and researchers to know more about air quality management. We wish to thank the contributing authors and to acknowledge the help of the eminent members of the scientific advisory, committee of the IICAQM conferences and all reviewers in peer reviewing the submitted book chapter contributions.

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Contents

Part I Foundations of Air Pollution Monitoring, Modelling, Health Risk and Control Engineering

1	Introduction to Urban Air Pollution	3
	S. M. Shiva Nagendra, Mukesh Khare, Uwe Schlink, and Anju Elizbath Peter	
2	Air Quality Monitoring and Techniques	13
	R. Ravi Krishna, S. M. Shiva Nagendra, Saraswati, and M. Diya	
3	Air Quality Modelling	35
	S. M. Shiva Nagendra, Uwe Schlink, and Mukesh Khare	
4	Air Quality Management and Control	59
	S. M. Shiva Nagendra, Mukesh Khare, Uwe Schlink, and M. Diya	
5	Indoor Air Quality	69
	S. M. Shiva Nagendra and V. S. Chithra	
6	Personal Exposure and Health Risk Assessment	75
	S. M. Shiva Nagendra, Uwe Schlink, Andrea Müller, Jyothi S. Menon, and V. S. Chithra	
7	Air Quality Measuring Sensors	89
	S. M. Shiva Nagendra, Uwe Schlink, and Mukesh Khare	

Part II Case Studies

8	Short-Term Variation of Particulate Matter and Black Carbon During Deepawali Festival in an Urban Area	107
	Abhilash T. Nair, S. Devaanandan, and S. M. Shiva Nagendra	
9	Surface O₃ and Its Precursors (NO_x, CO, BTEX) at a Semi-arid Site in Indo-Gangetic Plain: Characterization and Variability	119
	Nidhi Verma, Anita Lakhani, and K. Maharaj Kumari	

10	Predicting Particulate Air Pollution Using Line Source Models . . .	137
	Selvakumar Madhavan and S. Geetha	
11	Prediction of Air Pollution by the Contribution of Road Traffic—Signal Processing and Higher-Order Statistics (HOS) Spectra Approach	155
	S. Sangeetha, P. Venkatakrishnan, and G. Srikanth	
12	Performance Evaluation of UK ADMS-Urban Model and AERMOD Model to Predict the PM₁₀ Concentration for Different Scenarios at Urban Roads in Chennai, India and Newcastle City, UK	169
	Prince Vijay, S. M. Shiva Nagendra, Sunil Gulia, Mukesh Khare, Margaret Bell, and Anil Namdeo	
13	Modeling of Atmospheric Mercury Deposition in India	183
	Krish Vijayaraghavan, Shari Libicki, Ross Beardsley, and Sunil Ojha	
14	Risk-Based Optimal Ranking of Air Quality Monitoring Stations in a Fuzzy Environment: A Case Study	197
	Jyoti Yadav and Ashok Deshpande	
15	Impact of Increasing Ozone on Agricultural Crop Yields	211
	Sonal Kumari, Nidhi Verma, Anita Lakhani, and K. Maharaj Kumari	
16	Air Pollution Episode Analysis and Qualitative Evaluation of Proposed Control Measures in Delhi City	225
	Sunil Gulia, S. K. Goyal, and Rakesh Kumar	
17	Stabilizing Different Subgrade Soils with Pond Ash to Lower Greenhouse Gas Emissions for Bituminous Pavements in India . . .	239
	Gaurav Gupta, Hemant Sood, and Pardeep Kumar Gupta	
18	Strategic Approach for Emission Reduction from Coal-Fired Thermal Power Plants in India	255
	Shipra and Asim Kumar Pal	
19	Plasma-Based Hybrid Technique for Abatement of Pollutants (NO_x and CO) from Stationary Engine Exhaust-Effect of Loading Condition and Flow Rate	267
	A. D. Srinivasan, N. Jagadisha, and R. Rajagopala	
20	Evaluation of Carbon Foot Print Reduction in Aviation Infrastructure	279
	D. M. M. S. Dissanayaka and W. W. A. S. Fernando	
21	Structural Analysis of Interactions Between Airborne Pollutants and Chemically Modified RNAs	291
	Kannan Krishnamurthi, Pravin K. Naoghare, Saravana S. Devi, Amit Bafana, and Patrizio Arrigo	

22	Characterization of PM₁₀ and Its Impact on Human Health During Annual Festival of Lights (Diwali) in Northeast India	305
	Rajyalakshmi Garaga and Sri Harsha Kota	
23	Toxicological Study of Nanoparticles: An Attempt to Relate Physicochemical Characters with Toxicity	325
	A. Seenivasan, M. Muthuraj, and T. Panda	
24	Comparative Study of Gas and Particulate Phase Concentrations of Polycyclic Aromatic Hydrocarbons (PAHs) at Two Sites in Agra	343
	Puneet Kumar Verma, Dinesh Sah, K. Maharaj Kumari, and Anita Lakhani	
25	Estimation of Passenger Exposure to PM_{2.5} on a Highway	355
	Soma Sekhara Rao Kolluru and Aditya Kumar Patra	
26	Assessment of Organic Markers in Fine Aerosol of Mumbai City	367
	Abba Elizabeth Joseph, Seema Unnikrishnan, Rakesh Kumar, and S. Vivek Balachander	
27	Distributions of n-Alkanes, Alkanoic Acids and Anhydrosugars in Wintertime Size-Segregated Aerosols Over Middle Indo-Gangetic Plain	383
	Nandita Singh and Tirthankar Banerjee	
28	Exposure of PM_{2.5} and Carbonaceous Matter Amongst Rural Inhabitants in and Around Durg District of Chhattisgarh, India	399
	Shailendra Kumar Kushawaha, Yasmeen F. Pervez, Sumita Nair, and Shamsh Pervez	
29	Assessment of Biomass Burning Emissions from India—A Comprehensive Study	411
	N. Manojkumar and B. Srimuruganandam	
30	Correlation Assessment of Indoor Air Pollutants Emitted by Household Fuels and Its Health Impacts	425
	B. S. Shilpa and K. S. Lokesh	

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List of Figures

Fig. 1.1	Mobile, stationary, area and natural sources all emit pollution into the air	4
Fig. 1.2	Air quality management	10
Fig. 2.1	Schematic of a gas chromatography system. <i>Image source</i> Wikipedia	17
Fig. 2.2	Sample chromatogram with the retention time on the x -axis	17
Fig. 2.3	Mass spectra of benzene	19
Fig. 2.4	UV absorbance spectrum.	20
Fig. 2.5	Various instrumentations and methods adopted for the measurements of atmospheric aerosol particles. The methods and instruments depending upon the application of the techniques can be used for both the number size and mass estimation. Adopted from Simões Amaral et al. (2015).	21
Fig. 2.6	Operating principle of optical particle counter (OPC) component is that the pulse from the emitted laser is used for counting the particles, whereas scattering of the light due to particle up to 90° is used to infer the size in given 31 channels	22
Fig. 2.7	Working principle of high volume sampler for the measurement of PM_{10}	25
Fig. 2.8	A pictorial representation of UVAPS as obtained from TSI UVAPS manual. The unit on the left hand side shows the instrument panel, whereas the unit on the right had side depicts the dedicated power unit used to supply the high-voltage power to the UV laser in the instrument.	29
Fig. 2.9	Double-crested signal from particle passing through overlapping beams. Figure as obtained from TSI manual	30
Fig. 2.10	Schematic representation of operating principle and aerosol flow through UVAPS	31
Fig. 3.1	Mixing height	40

Fig. 4.1	A framework of LAQMP	64
Fig. 4.2	Components of air quality management	66
Fig. 7.1	Sensors with electrical circuit a RTD (Pt 1000) operation upon Wheatstone bridge, b temperature versus voltage graph.	91
Fig. 7.2	Temperature measurements with thermocouple	91
Fig. 7.3	Specification sheet of SDS011 PM _{2.5} sensor a range specification, b resolution specification	93
Fig. 7.4	Linearized characteristics of RTD	94
Fig. 7.5	SPEC sensors and SO ₂ sensor data sheet for environmental specifications.	95
Fig. 7.6	SPEC sensors and SO ₂ sensor data sheet for electrical specifications.	95
Fig. 7.7	Pre-deployment calibration setup in air quality research laboratory, IITM	98
Fig. 7.8	Sensor node preparations.	100
Fig. 7.9	Flowchart and data acquisition system preparation	100
Fig. 7.10	Personal monitoring a personal monitoring sensor device, b attachment of device to a person, c pedestrian exposure monitoring.	101
Fig. 7.11	Air quality maps showing temporal and spatial variation of pollutants generated using interpolation techniques. <i>Source</i> Wang et al. 2014.	102
Fig. 8.1	Aerial view of monitoring locations 1 and 2 in Chennai during Deepawali festival. <i>Source</i> Google earth	110
Fig. 8.2	Daily average PM ₁₀ and PM _{2.5} concentrations at monitoring location 1 during Deepawali festival	111
Fig. 8.3	Box plot indicating the concentration of PM ₁₀ , PM _{2.5} and PM ₁ at monitoring location 2 during Deepawali festival (28th October, 2016).	112
Fig. 8.4	Diurnal variations of particulate matter concentration at monitoring location 2 during Deepawali festival (28th October, 2016).	113
Fig. 8.5	Particle size distribution of PM _{2.5} observed at monitoring location 2 during Deepawali festival (28th October, 2016).	114
Fig. 8.6	Hourly average BC concentration at monitoring location 1	114
Fig. 8.7	Hourly average BC concentration at monitoring location 2	115
Fig. 8.8	Correlation plot between BC and PM concentration at location 2	116
Fig. 9.1	Map of sampling site (shown by star) at Dayalbagh, Agra, India	121

Fig. 9.2	a Diurnal variation of O ₃ , NO, NO ₂ and CO during the study period b daily variation of PBL height	123
Fig. 9.3	Seasonal variation of benzene, toluene, ethyl-benzene, <i>p,m</i> -Xylene and <i>o</i> -Xylene	126
Fig. 9.4	Ozone formation potential in different seasons	128
Fig. 9.5	Scree plot showing Eigenvalue associated with each principal component	130
Fig. 9.6	Component plot in rotated space	132
Fig. 10.1	Locations of monitoring stations	139
Fig. 10.2	Relationship between wind and line source coordinate system	141
Fig. 10.3	a Validation of GFLSM for respirable particulate matter. b Validation of GFLSM for total suspended particulate matter	142
Fig. 10.4	a Validation of DFLSM for respirable particulate matter. b Validation of DFLSM for total suspended particulate matter	144
Fig. 10.5	a Validation of IITLSM for respirable particulate matter. b Validation of IITLSM for total suspended particulate matter	146
Fig. 10.6	a Validation of CALINE4 for respirable particulate matter. b Validation of CALINE4 for total suspended particulate matter	147
Fig. 10.7	a GIS Map showing the distribution of Particulate matter. b GIS map showing the distribution of particulate matter	148
Fig. 10.8	a GIS map showing the air quality index of total suspended particulate matter. b GIS map showing the air quality index of respirable particulate matter	150
Fig. 11.1	Air pollution analysis methodology block diagram	160
Fig. 11.2	No. of vehicles from origin–destination <i>A</i> to <i>B</i> and <i>C</i> to <i>B</i> matrix	162
Fig. 11.3	Lipschitz exponent values for <i>A</i> to <i>B</i> and <i>C</i> to <i>B</i> matrix	163
Fig. 11.4	LE value distribution for a heavy traffic and b less traffic	163
Fig. 11.5	Geographical position of the area of average CO ₂ in particular surrounding a <i>A</i> to <i>B</i> matrix and b <i>C</i> to <i>B</i> matrix in origin–destination road network	164
Fig. 11.6	CO ₂ emission under various traffic intensity time intervals	165
Fig. 12.1	a Study area: Chennai. b Study area: Newcastle City Centre, UK	171
Fig. 12.2	a Daily average vehicle count for Sardar Patel Road. b Daily average vehicle count for Newcastle City	173
Fig. 12.3	a Windrose for Chennai for December 2008. b Windrose for Chennai for January–February 2009	175

Fig. 12.4	a Windrose for Newcastle for December 2008. b Windrose for Newcastle for January–February 2009	176
Fig. 12.5	Average of the predicted values and observed values for PM for both the cities	178
Fig. 13.1	2010 global anthropogenic mercury emissions inventory used in modeling (Mg year^{-1}). <i>Source</i> AMAP/UNEP (2013)	185
Fig. 13.2	Anthropogenic mercury emissions in the modeling grid in India and surrounding regions	188
Fig. 13.3	Annual natural mercury emissions plus re-emissions in the modeling grid in India and surrounding regions	189
Fig. 13.4	Annual total (anthropogenic + natural + re-emitted) mercury emissions in the modeling grid in India and surrounding regions.	189
Fig. 13.5	Annual total deposition flux of total mercury ($\mu\text{g m}^{-2} \text{year}^{-1}$).	190
Fig. 13.6	Annual total deposition flux of total mercury ($\mu\text{g m}^{-2} \text{year}^{-1}$) in India and surrounding regions.	191
Fig. 13.7	Annual wet deposition flux of total mercury ($\mu\text{g m}^{-2} \text{year}^{-1}$) in India and surrounding regions.	192
Fig. 13.8	Annual dry deposition flux of total mercury ($\mu\text{g m}^{-2} \text{year}^{-1}$) in India and surrounding regions.	193
Fig. 14.1	Convex normalized fuzzy number A.	200
Fig. 14.2	Degree of match for PM_{10} parametric data for fuzzy set <i>poor</i>	201
Fig. 14.3	Overall framework for the combined Zadeh-Deshpande and Bellman-Zadeh approach.	203
Fig. 14.4	Assigning membership grade to PM_{10} pollutant	206
Fig. 15.1	Ozone production, its effects, and development of control strategies	212
Fig. 15.2	Site description map	213
Fig. 15.3	Monthly mean values of O_3 during 2010–13.	215
Fig. 15.4	Yearly M7 and AOT40 values for Kharif and Rabi crops.	216
Fig. 15.5	Comparison of AOT40 (in ppb h) and M7 (in ppb) values for wheat and rice crop reported at different sites of India (Mohali (Sinha et al. 2015); Varanasi (Singh et al. (2015) for wheat), (Sarkar et al. (2015) for rice); Ahmednagar (Debaje et al. 2010); Pune (Beig et al. 2008) and Agra (present study))	217
Fig. 15.6	Assessment of the impact of O_3 on wheat and rice crops during 2010–13.	219
Fig. 15.7	Comparison of old and revised O_3 crop-exposure relationships	220
Fig. 16.1	Delhi map showing locations of selected AQM stations	228

Fig. 16.2	Time series plot of 24 hourly PM _{2.5} (a), PM ₁₀ (b), NO _x (c), and SO ₂ concentration (d)	230
Fig. 16.3	Time series plot of meteorological parameters of (a) Temperature, (b) Relative Humidity, (c) Wind Speed during the study period at four AQM locations	232
Fig. 16.4	Pollution rose diagram of four pollutants at four locations	233
Fig. 17.1	Factors for the embodied CO ₂ for different pavement layers.	245
Fig. 17.2	Change in MDD with the contents of pond ash	246
Fig. 17.3	Change in OMC with the contents of pond ash.	246
Fig. 17.4	Change in soaked CBR with the contents of pond ash	247
Fig. 17.5	Thickness of the BC layer for natural and pond ash-stabilized subgrade	248
Fig. 17.6	Thickness of the DBM layer for natural and pond ash-stabilized subgrade	248
Fig. 17.7	Thickness of the WMM layer for natural and pond ash-stabilized subgrade	249
Fig. 17.8	Thickness of the GSB layer for natural and pond ash-stabilized subgrade	249
Fig. 17.9	Total pavement thickness for natural and pond ash-stabilized subgrade	249
Fig. 17.10	Embodied CO ₂ from construction materials during the construction phase	250
Fig. 17.11	Variation in embodied CO ₂ due to the transportation for the construction stage	250
Fig. 17.12	Embodied CO ₂ from construction materials during the maintenance phase.	251
Fig. 17.13	Embodied CO ₂ from transportation of materials during the maintenance phase.	251
Fig. 17.14	Percentage reduction in CO ₂ emissions for the construction, maintenance and total service life of bituminous pavements	252
Fig. 17.15	Carbon credits amassed along the life cycle of the bituminous pavement.	252
Fig. 19.1	Diesel engine exhaust treatment using single-step plasma hybrid catalysis/adsorbent technique	268
Fig. 19.2	Effect of flow rate on NO _x removal by adsorbent process.	270
Fig. 19.3	Flow rate effect on NO _x removal by plasma-assisted adsorbent process	271
Fig. 19.4	Flow rate effect on NO _x removal by catalyst process	271
Fig. 19.5	Effect of flow rate on NO _x removal by plasma-assisted catalytic process	272
Fig. 19.6	Flow rate effect on CO removal by catalyst process	272

Fig. 19.7	Flow rate effect on CO in removal by plasma-assisted catalytic process	273
Fig. 19.8	Comparison between adsorbents on NO _x removal.	273
Fig. 19.9	Effect of load on NO _x removal by plasma-assisted adsorbent process	274
Fig. 19.10	Effect of loading on NO _x removal by catalyst process	274
Fig. 19.11	Effect of load on NO _x removal by plasma-assisted catalytic process	275
Fig. 20.1	Research framework	283
Fig. 20.2	Carbon emission in kgCO _{2-eq} /month	287
Fig. 20.3	ARIMA forecast for carbon emission	289
Fig. 21.1	N6-methyladenosine (CID 102175). The methyl group is marked by yellow stick. This figure has been obtained using UCSF Chimera (https://www.cgl.ucsf.edu/chimera/)	294
Fig. 21.2	Synthetic N6-methylated RNA. The PDB entry 2MVS containing a methylated adenosine (yellow labeled). This figure has been obtained using UCSF Chimera (https://www.cgl.ucsf.edu/chimera/)	297
Fig. 21.3	Structure of methylaziridine (cid 6377). The yellow stick indicated the CH ₃ group and the red residue is an NH ₃ ⁺ . This figure has been obtained using UCSF Chimera (https://www.cgl.ucsf.edu/chimera/)	301
Fig. 21.4	Bis(chloro)methyl ether (cid10967). The green atoms mark the Cl and the red the O. This figure has been obtained using UCSF Chimera (https://www.cgl.ucsf.edu/chimera/)	301
Fig. 21.5	Complex of 2MVS chain A with Bis(chloro)methyl ether (cid10967). The yellow residue indicates the position of m6A	302
Fig. 21.6	Complex of 2MVS chain A with 2-methylaziridine (cid 6377). The yellow residue indicates the position of m6A. This figure has been obtained using UCSF Chimera (https://www.cgl.ucsf.edu/chimera/)	302
Fig. 22.1	a Guwahati city in India. b Study area—IIT Guwahati	307
Fig. 22.2	Observed mean and standard deviation of PM ₁₀ concentrations (µg/m ³) during pre-Diwali, Diwali, and post-Diwali days. Dashed line indicates Indian NAAQS of 100 µg/m ³	312
Fig. 22.3	Variation in bacteria concentration (CFU/m ³) during pre-Diwali, Diwali, and post-Diwali days. Ratio (CFU/µg) of change in concentrations of bacteria and PM ₁₀ during those days is shown as filled circle using right y-axis.	312

Fig. 22.4	Concentrations ($\mu\text{g}/\text{m}^3$) of metals, Zn, Fe, Cd, Co, Ni, and Sr, during pre-Diwali, Diwali, and post-Diwali days. Diwali/non-Diwali day ratios of those metals are also shown as filled dots using right y-axis	313
Fig. 22.5	Percentage variation of ions in PM_{10} during pre-Diwali, Diwali and post-Diwali days	315
Fig. 22.6	Cation and anion concentrations ($\mu\text{eq}/\text{m}^3$) and their anion/cation ratios (secondary y-axis) during pre-Diwali, Diwali, and post-Diwali days.	316
Fig. 22.7	Predicted source profiles and percentage of species contributed from dust emissions, biomass burning, secondary sources 1 (SS1), vehicular sources, fireworks, and secondary sources 2 (SS2). Median values estimated using the bootstrap analysis are only shown	317
Fig. 22.8	a Number of patients suffering from headache, fatigue, irritation, coughing, sneezing and sinusitis during Diwali and Non-Diwali days, and b incremental risk (%) due to Diwali from met	319
Fig. 23.1	Size (a) and shape (c) dependent uptake of gold nanoparticles on HeLa cells. b Transmission electron microscopic capture of trapped 50 nm gold nanoparticles in vesicles of cells. Similarly, d represents TEM image of localized spherical and rod shaped gold nanoparticles. Reproduced with permission from Chithrani et al. (2006)	328
Fig. 23.2	Parametric evaluation of dimension (size) and surface charge on the cellular internalization of AuNPs. Various sizes (2, 4, 6 nm) and charges (positive (+), negative (-), and zwitterionic (- and +) ligands has been tested on cellular internalization. The cellular uptake of zwitterionic and anionic ligands was decreased with increase in particle size, whereas, the positive particles has internalized more as its size increased. Reproduced with permission from (Jiang et al. 2015)	331
Fig. 23.3	The modulation of membrane potential and intracellular activities in different cancerous and normal cell types by the surface modified AuNPs. A rapid and considerable membrane depolarization was induced by the cationic AuNPs at 1.2 μM and it was also influenced by its concentration. The particles uptake by the cell followed by depolarization of membrane that induced influx of calcium ion from surrounding as well as from endoplasm reticulum via IP_3R channels, which leads to augmented apoptosis and reduced cellular proliferation. Reproduced with permission from Arvizo et al. (2010)	332

Fig. 24.1	Sampling sites in Agra (https://earth.google.com)	345
Fig. 24.2	Percentage abundance of PAHs in gas and particle phase at both sites	349
Fig. 24.3	Percentage variations of PAHs	350
Fig. 25.1	Study route from Bhadrachalam to Vijayawada. <i>Source</i> Google maps	357
Fig. 25.2	EPAM 5000	358
Fig. 25.3	Personal exposure levels in bus between a BCM and KTDM, b KTDM and TVR, and c TVR and VJA	360
Fig. 25.4	Personal exposure levels in car between a BCM and KTDM, b KTDM and TVR, and c TVR and VJA	361
Fig. 25.5	Personal exposure levels in car (AC) between a BCM and KTDM, b KTDM and TVR, and c TVR and VJA	362
Fig. 25.6	Background exposure levels	363
Fig. 26.1	Study area (Mumbai city)	369
Fig. 26.2	Sitewise variation of PAHs (ambient and indoor environment)	373
Fig. 26.3	Sitewise variation of N-alkanes (ambient and indoor environment)	375
Fig. 26.4	Sitewise variation of hopanes (ambient and indoor environment)	376
Fig. 26.5	Sitewise variation of steranes (ambient and indoor environment)	378
Fig. 26.6	Sitewise breakup of total levoglucosan concentration (ambient and indoor environment)	379
Fig. 27.1	Distribution of a simulated organic mass over tropopause layer. Modified from Yu et al. (2015), b pre-mature mortality related to PM _{2.5} in 2010 (Lelieveld et al. 2015)	386
Fig. 27.2	Spatial variation of aerosol optical depth (AOD) across South Asia with relative contribution of major chemical species to surface-level total particulate mass (only for Hisar and Allahabad), and for PM _{2.5} , PM ₁₀ mass concentration (Singh et al. 2017). <i>Note</i> Data within the parenthesis indicate aerosol mass for PM _{2.5} and PM ₁₀ or TSP (Singh et al. 2017, and references therein)	387
Fig. 27.3	Variation in organic carbon emitting sources during winter season at Lahore (Stone et al. 2010), Delhi (Chowdhury et al. 2007), Kolkata (Chowdhury et al. 2007), Agra (Villalobos et al. 2015) and Kanpur (Villalobos et al. 2015)	388
Fig. 27.4	Geographical location of particulate monitoring station. <i>Source</i> https://gibs.earthdata.nasa.gov	389
Fig. 27.5	Distribution of a size-segregated particulate mass concentration, b normalized mass frequency	391

Fig. 27.6	Wintertime variation of a particulates mass concentration and b particle ratio	392
Fig. 27.7	Size distribution of organic species	393
Fig. 27.8	Size distribution of individual a n-alkanes and b n-fatty acids during winter	395
Fig. 28.1	Map of Durg district shows sampling sites <i>Source</i> mapdata©2014	401
Fig. 28.2	Concentration of PM _{2.5} in sampling site in winter and summer	403
Fig. 28.3	Concentration of OC in sampling site in winter and summer	404
Fig. 28.4	Concentration of EC in sampling site in winter and summer	405
Fig. 28.5	Correlation scattered plot of OC with EC in selected sampling sites in winter and summer.	407
Fig. 29.1	Map showing the forest covers in India. <i>Source</i> Forest Survey of India (2012)	413
Fig. 29.2	Percentage of fire-prone areas in India. <i>Source</i> Forest Survey of India (2012)	415
Fig. 29.3	Forest burned area map of India during the year 2013	417
Fig. 29.4	Forest burned area map of India during the year 2014	418
Fig. 30.1	Location of sampling stations	427
Fig. 30.2	a SPM, b RSPM concentration in indoors at various time interval for different fuels	428
Fig. 30.3	Concentration a NO ₂ , b SO ₂ , c CO in indoors at various time interval for different fuels	429
Fig. 30.4	Ambient concentration of pollutants at different fuel households.	430
Fig. 30.5	Comparison of control filter paper (A) and filter paper having RSPM emitted during cooking from different household fuels. a Control, b biomass, c coal, d cowdung cakes, e kerosene.	431
Fig. 30.6	SEM images at various magnification showing spherules emitted by biomass during cooking.	431
Fig. 30.7	SEM images reveal about concentration of RSPM and morphology of particles emitted by biomass	432
Fig. 30.8	SEM images of spherules emitted by cowdung cakes	432
Fig. 30.9	SEM images of spherules emitted by coal.	432
Fig. 30.10	SEM images at various magnification showing spherules emitted from kerosene during cooking	433
Fig. 30.11	Indoor/outdoor ratio of a SPM and b RSPM for different fuels	433
Fig. 30.12	Indoor/outdoor ratio of a NO ₂ , b SO ₂ and c CO for different fuels	434

List of Tables

Table 1.1	World Health Organization recommended long-term air quality goals	10
Table 2.1	Common analytes in vapour phase and the methods for their analysis	32
Table 3.1	List of source profiles obtained from U.S.EPA Speciate database	47
Table 3.2	Summary of the statistical distribution models to air pollutants concentration	50
Table 4.1	The UAQM definition/concept	67
Table 6.1	Carcinogenic and non-carcinogenic risk associated with elements (Chithra and Nagendra 2018).	82
Table 7.1	Some of the low-cost air quality measuring sensors in the market.	90
Table 7.2	EU performance requirements for the fixed and indicative measurements	97
Table 7.3	EU suggested performance goals for different application areas	98
Table 7.4	Wireless communication techniques used in wireless sensor networks	99
Table 8.1	Meteorological data of Chennai city during the study period	109
Table 9.1	Monthly variation of O ₃ , NO _x and CO	124
Table 9.2	Mean, median and range of BTEX (µg m ⁻³) at Dayalbagh, Agra	125
Table 9.3	Comparison of interspecies ratios with other sites around the world	127
Table 9.4	Ozone formation potential and propylene-equivalent for benzene, toluene, ethyl-benzene, <i>p,m</i> -Xylene and <i>o</i> -Xylene	129
Table 9.5	Total variance explained.	131
Table 9.6	Rotated component loadings.	132

Table 10.1	Geographical location details of monitoring stations	140
Table 10.2	Breakpoints for the air quality index (EPA 1999).	151
Table 11.1	Origin–destination matrix used in the simulation (number of vehicles per hour) in Madurai city as on 01.05.2016 (8.45 am–9.45 am)	160
Table 11.2	List of air quality parameters and emission measurement of the proposed study	161
Table 11.3	<i>p</i> -value for the statistical Mann–Whitney U test.	165
Table 12.1	Emission factors for different category of vehicles for both the cities	177
Table 12.2	Predominant wind speed, wind direction and the calm conditions (wind speed <1 m/s)	177
Table 12.3	Statistical analysis for the model performance of PM ₁₀	180
Table 13.1	Estimated 2010 anthropogenic Hg emissions from India used in modeling (kg year ⁻¹)	187
Table 13.2	Speciated annual mercury deposition fluxes in India (μg m ⁻² year ⁻¹)	193
Table 14.1	Classification of air quality using CAQI and ZD methods	204
Table 14.2	Assigning membership grades to SO ₂ , NO _x , PM ₁₀ constraints.	206
Table 14.3	Assigning membership grades to power plants, population, temperature and humidity constraints	207
Table 14.4	Ranking of air quality monitoring stations	209
Table 15.1	O ₃ exposure-relative yield equations for wheat and rice	214
Table 15.2	A comparison of old and revised O ₃ exposure-related equations.	220
Table 16.1	Details of selected ambient air quality monitoring stations in Delhi city	228
Table 16.2	Category wise status of AQI values during 25th Oct.–15th Nov. 2016 (21 days).	229
Table 16.3	Values of correlation coefficient between four locations	230
Table 16.4	Graded response action plan impacts matrix for different locations in Delhi city.	235
Table 17.1	Geotechnical properties of pond ash.	242
Table 17.2	Geotechnical properties of subgrade soils	243
Table 17.3	Embodied CO ₂ factors for different construction materials	243
Table 17.4	Proportioning of different construction materials for the layers of bituminous pavement	244
Table 17.5	Emission factors of freight vehicles	245
Table 18.1	Regionwise total Capacity of coal-based thermal power plant in (MW) in India as on 31.03.2016	256

Table 18.2	Summary of coal production and consumption (million tons) in India	257
Table 18.3	MOEF CC proposed standard for coal-fired thermal power plants	258
Table 18.4	Average efficiency of coal-based thermal power plant of different technology	260
Table 18.5	Heat rate and per kWh coal requirement of different technology	260
Table 18.6	Total projected electricity demand in India from 2010 to 2020	260
Table 18.7	Amount of coal used in thermal power plants	261
Table 18.8	Emission rate for different technology (kg of CO ₂ /kWh)	261
Table 18.9	Summary of predicted annual CO ₂ emission (million tons CO ₂ /year) in different technology at the power plants in India in 2010–20	262
Table 18.10	Summary of SO ₂ and NO emissions (million tons) during 2010 to 2020 from coal-fired plant	262
Table 18.11	Estimated Hg emissions (tons) during 2010 to 2020 from coal-fired plant	263
Table 18.12	Calculated power generation cost in different combustion Technology	265
Table 19.1	Initial concentration of pollutants/components present in diesel engine exhaust	270
Table 20.1	Specific emission factors (IPCC 2006)	285
Table 20.2	Airport carbon emission sources categorized according to the scope	286
Table 20.3	Carbon emission sources at BIA and its emission level in 2015	287
Table 20.4	Final estimates of parameters	288
Table 20.5	Modified Box-Pierce (Ljung–Box) chi-square statistic	288
Table 20.6	Final estimates of parameters	288
Table 20.7	Modified Box-Pierce (Ljung–Box) chi-square statistic	289
Table 21.1	EPA hazardous air pollutants selected for this analysis	295
Table 21.2	Set of HAP features used for classification	298
Table 21.3	Summary of cluster validation (Davies–Bouldin index)	298
Table 21.4	Hazardous air pollutants minimizing the distance from cluster centroid	299
Table 21.5	Feature obtained from docking and used for classification	299
Table 21.6	Physico-chemical feature extracted from PubChem and used for classification	300
Table 21.7	Set of more informative features (docking and PubChem) used for classification	300

Table 21.8	Set of more informative feature (docking and PubChem) without ACE.	300
Table 22.1	Sampling schedule and meteorological parameters recorded during the monitoring period	308
Table 22.2	Comparison of PM_{10} ($\mu\text{g}/\text{m}^3$) and metal concentration monitored during various firework episodes across the world along with present study.	311
Table 22.3	Comparison of concentrations of ionic components of PM_{10} ($\mu\text{g}/\text{m}^3$) monitored during various firework episodes across the world along with present study.	314
Table 22.4	Coefficient of determination (R^2), standard error (S_e), slope.	316
Table 24.1	Limit of detection (LOD)	347
Table 24.2	Concentration of PAHs at rural and traffic site	348
Table 24.3	Mean values of $K_p \times \text{TSP}$ and $K_p \text{TSP}/1 + K_p \text{TSP}$ (Φ).	350
Table 25.1	Summary $PM_{2.5}$ exposure levels in travel modes in three sections of the highway	363
Table 26.1	Concentration of organic markers in fine particles and data analysis of markers in Mumbai during 2007–2008.	371
Table 27.1	Mass distribution of airborne particulate concentrations ($\mu\text{g m}^{-3}$).	391
Table 28.1	Seasonal concentration (geometric mean \pm standard derivation) ($\mu\text{g m}^{-3}$) of $PM_{2.5}$ and carbonaceous species in sampling site.	403
Table 28.2	OC/EC ratio of the present study	405
Table 28.3	Correlation of OC and EC in selected sampling site [M = slope ($\mu\text{g m}^{-3}$) and C = intercept ($\mu\text{g m}^{-3}$)]	406
Table 29.1	Indian biogeographic zones and provinces (Rodgers et al. 2000)	414
Table 29.2	Indian forest classes	414
Table 29.3	Forest types and its percentage	414
Table 29.4	Calculated emissions of gaseous, particulates, and volatile organic compounds.	420
Table 30.1	Factor analysis for indoor air quality data—Fuel: biomass.	435
Table 30.2	Factor analysis for indoor air quality data—Fuel: coal	436
Table 30.3	Factor analysis for indoor air quality data—Fuel: cowdung cakes.	436
Table 30.4	Factor analysis for indoor air quality data—Fuel: kerosene	437
Table 30.5	Factor analysis for indoor air quality data—Fuel: LPG.	437

Part I
**Foundations of Air Pollution Monitoring,
Modelling, Health Risk and Control
Engineering**