

Contents

1	Introduction and Summary	1
1.1	Aims of this book.....	1
1.2	Summary.....	2
1.2.1	Anthropogenic emissions of volatile organic compounds.....	2
1.2.1.1	Road transport.....	2
1.2.1.2	Solvent use.....	3
1.2.1.3	Other sources	3
1.2.2	VOC Split	4
1.2.3	Biogenic emissions of volatile organic compounds	4
1.3	Anthropogenic emissions of ammonia.....	6
1.4	Emissions of particulate matter to the atmosphere.....	7
1.5	Assessment of the quality of emission data.....	7
1.6	Improvement and application of emission models and tools	10
1.6.1	Urban modelling	10
1.6.2	Regional modelling.....	10
1.7	Outlook.....	11
1.8	References.....	12
2	Improvement of Emission Factors	15
2.1	Introduction	15
2.2	Emissions of Volatile Organic Compounds (VOC)	15
2.2.1	Introduction	15
2.2.2	VOC emissions from biogenic sources	16
2.2.3	VOC-Split of gasoline and diesel passenger cars.....	25
2.2.4	Cold start emissions	33
2.2.5	VOC emissions from high-emitting gasoline passenger cars	40
2.2.6	Emissions of fuel stations and tankers determined by the inverse method	47
2.2.7	Determination of emission factors of volatile organic compounds from the residential burning of brown-coal briquettes	52
2.2.8	NM VOC emissions from solvent use in Germany.....	63
2.3	Emissions of Particulate Matter	79
2.3.1	Summary	79
2.3.2	PM emission factors for road vehicles from tunnel measurements	83
2.3.3	PM size distribution measurements in engine exhaust in context to road tunnel and ambient air measurements	86
2.3.4	Atmospheric emissions from wood combustion	92
2.3.5	A national emission inventory of Particulate Matter.....	97
2.3.6	Anthropogenic Particulate Matter emissions in Germany.....	103
2.4	Emissions of Ammonia.....	111
2.4.1	Introduction	111
2.4.2	Overview of Ammonia emissions	114
2.4.3	Emissions from animal husbandry	114
2.4.4	Emissions from fertilisers	118
2.4.5	Crops.....	119
2.4.6	Spatial resolution required	119

2.4.7	Temporal resolution required	120
2.4.8	Possibilities for reducing emissions.....	122
2.4.9	A framework for the calculation of NH ₃ emissions in Europe.....	123
2.4.10	ALFAM: an EU database on the NH ₃ emissions from manure applied to fields	125
2.4.11	Detailed emission map of Vejle county, Denmark.....	125
2.4.12	Modelling of NH ₃ emissions after spreading of manure.....	129
2.4.13	Need to check reported national NH ₃ emissions.....	130
2.4.14	Conclusions	131
2.5	References	133
3	Uncertainties, Validation and Verification	145
3.1	Introduction	145
3.2	Uncertainty Analysis	146
3.2.1	Harmonised method for the compilation of urban emission inventories for urban air quality modelling.....	146
3.2.2	Statistical uncertainty analyses	166
3.3	Comparisons of emissions	179
3.3.1	Comparison of emission inventories.....	179
3.3.2	Comparison with measurements: road transport.....	187
3.3.3	Comparison with measurements: The EVA city experiment	204
3.4	Sensitivity analysis	256
3.4.1	Introduction	256
3.4.2	Scope	257
3.4.3	Sensitivity calculations using the EURAD CTM.....	259
3.5	References	268
3.6	Annex	276
4	Emission Models and Tools	279
4.1	Introduction	279
4.1.1	Overview	279
4.1.2	Methodology.....	279
4.2	Land cover and topography mapping	282
4.2.1	Introduction	282
4.2.2	Data models and data processing.....	282
4.2.3	Land Cover Data for Europe (LCE).....	284
4.2.4	Digital Elevation Models (DEM)	287
4.2.5	Data accuracy.....	288
4.2.6	Conclusions	290
4.3	EMIMO: An emission model	292
4.3.1	Introduction	292
4.3.2	Methodology.....	294
4.3.3	Results	297
4.3.4	Summary.....	298
4.4	MIMOSA: a road emission model using average speeds from a multi-modal traffic flow model.....	299
4.4.1	Context and objectives.....	299
4.4.2	Methodology and considered pollutants.....	299
4.4.3	Static versus dynamic versions	303
4.4.4	Advantages of the MIMOSA software and further improvements.....	303

4.4.5	Comparison exercise and sources of discrepancies	303
4.4.6	Summary	304
4.5	Improvement and application of methodology and models to calculate multiscale high resolution emission data for Germany and Europe	305
4.5.1	Introduction	305
4.5.2	Development of CAREAIR/ECM.....	305
4.5.3	Model structure.....	307
4.5.4	Examples of applications	312
4.5.5	Conclusions	315
4.6	Developing emission inventories for Turkey	316
4.6.1	Overview.....	316
4.6.2	Introduction	316
4.6.3	First steps towards an improved emission inventory	317
4.6.4	First results	320
4.6.5	Emission inventory of the Aegean region in Turkey.....	321
4.6.6	Results	322
4.6.7	Air quality management in Izmir	324
4.6.8	Results	328
4.6.9	Conclusions and outlook.....	332
4.7	References.....	333