

Contents

<i>Foreword</i>	(vii)
<i>Preface</i>	(ix)
<i>Acknowledgement</i>	(xiii)
1. BASICS	1
1.1 Introduction	1
1.2 Types of Solid Waste.....	4
1.3 Waste Management Concepts.....	10
1.4 Health and Environmental Impacts.....	11
1.5 Global Warming	13
1.6 Source Reduction.....	19
2. WASTE GENERATION AND CHARACTERIZATION	24
2.1 Waste Generation and Composition	25
2.2 Waste Characterization	34
3. WASTE REDUCTION AND RECYLING	38
3.1 Recycling	39
3.2 Status in Developing Countries	40
3.3 Status in Developed Countries.....	44
3.4 Case of Plastics	46
3.4.1 Nature of Plastics.....	46
3.4.2 Recycling of Plastic Waste	48
3.5 Recovery and Recycling of E-waste	53
3.6 Waste Trading.....	55
3.7 Waste Picking as a Livelihood	55

4.	WASTE COLLECTION AND TRANSFER	58
4.1	Waste Collection in Developing Countries	58
4.2	Waste Collection in Developed Countries	63
4.3	Waste Processing and Disposal	66
5.	COMPOSTING	67
5.1	Process	67
5.2	Benefits	69
5.3	Composting Technologies	70
5.3.1	Backyard or a Home Composting	73
5.3.2	Vermi Composting	75
5.3.3	Aerated (Turned) Windrow Composting.....	81
5.3.4	Aerated Static Pile Composting	83
5.3.5	In-Vessel Composting	85
5.4	Biowaste Composting in Europe	88
5.5	Composting Challenges	89
5.6	Composting in Developing Countries.....	89
5.7	Composting in Developed Countries.....	95
6.	ENERGY FROM WASTE	98
6.1	Introduction	98
6.1.1	Assessment of Energy Recovery Potential.....	100
6.1.2	Environmental Impacts of the Technologies	102
6.2	Thermal Processing	103
6.2.1	Combustion/Incineration	103
6.2.2	Pyrolysis	129
6.2.3	Gasification	131
6.2.4	Plasma Arc Gasification.....	137
6.3	Biochemical Processing.....	141
6.3.1	Anaerobic Digestion (Biomethanation).....	141
6.3.2	Mechanical Biological Treatment	158
6.3.3	Fermentation.....	161

6.4	Chemical Processing: Esterification	161
6.5	Recent Developments in WTE Technologies	167
6.6	Planning and Execution of WTE Technologies.....	169
6.7	Applications of Important Industrial Wastes	173
7.	LANDFILLING	175
7.1	Introduction	175
7.2	Environmental Impact Study	177
7.3	Landfill Construction.....	178
7.4	Decomposition in the Landfill	182
7.5	Benefits.....	184
7.6	Recovery and uses of Landfill Gas	184
7.7	Associated Activities	186
7.8	Health and Environmental Impacts.....	186
7.9	An Example	187
7.10	Landfills in Developing Countries.....	191
7.11	Landfills in Developed Countries	197
8.	MSW MANAGEMENT IN INDIA.....	199
8.1	Introduction	199
8.2	Analysis of MSW	205
8.3	Storage and Collection of MSW	210
8.4	Transfer Stations and Trasporation.....	216
8.5	MSW Treatment/Disposal	219
8.5.1	Landfilling	220
8.5.2	Composting	221
8.5.3	Anerobic Digestion (Biomethanation)	223
8.5.4	Incineration.....	227
8.5.5	Gasification	228
8.5.6	RDF Plants	228
8.6	Recovery of Recyclables Materials	230
8.7	Healthcare Waste Treatment.....	232

8.8	Hazardous Waste Management	233
8.9	E-waste Management.....	234
8.10	Rules, Legislation and Legal Provisions.....	236
8.11	Financial Resources	245
8.12	Future Scenario	251
9.	PRIVATE SECTOR PARTICIPATION IN INDIA	256
9.1	Introduction	256
9.2	Options in PSP Arrangement.....	258
9.3	Examples of PSP in MSW Services	261
9.4	Important Contractual Issues	264
9.5	Survey on Privatisation of MSW Services	268
9.6	Role of NGOs and CBOs.....	270
9.7	Initiatives by Some State Governments.....	271
9.8	Case Studies.....	277
10.	MSW MANAGEMENT AND PLANNING –	
	GLOBAL EXAMPLES.....	304
10.1	Asia.....	304
10.2	Africa	312
10.3	Latin America	328
10.4	Europe.....	337
10.5	North America	350
	ANNEXURES.....	357
A1	Waste Generation and Management Data by Country	357
A2	Waste-to-Energy Facilities in USA	363
A3	Waste-to-Energy Plants Operating in India	370

A4	Composting Plants in India.....	377
A5	Waste-to-Energy Status in China.....	379
A6	International Agreement and Commnitments to Environmentally Sound Management of Waste	386
A7	Types of Biogas Plants	389
A8	Zero-waste Approach.....	395
A9	Integrated Solid Waste Management.....	397
A10	Door to Door Refuse/Garbage Collection System in Surat Municipal Corporation City – A Project in Best Practice	402
A11	Centralised Co-digestion of Multiple Substrates: (CAD) Example of Denmark	407
	<i>Glossary</i>	413
	<i>References</i>	423