

# WASTES MANGEMENT IN INDIA MODULE GUIDE

## MSc International Environmental Management

ENVM030





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## 1.0 Introduction and Module Overview

Solid Waste Management is a matter of great concern in the urban areas of developing countries. To preserve the environment from extensive pollution and to protect human health, wastes need careful storage, transfer and transport, treatment and disposal. This module provides you with the opportunity to assess the environmental impact and economics of current waste disposal practices in urban areas, the system deficiencies that exist, and the steps that need to be taken to correct solid wastes management practices in compliance with Municipal Solid Waste (Management and Handling) Rules 2000 ratified by the Government of India. Examples of best practices adopted in various parts of India and abroad, are discussed as well as the institutional, financial, social, and legal aspects of solid waste management, essential for sustainability of the system.

### 1.1 Aims and Learning Outcomes

#### **Overall Aim(s) for the Module**

To:

- provide students with a multi-disciplinary approach to the study of wastes;
- develop an appreciation of the legal, ethical, social and environmental aspects of wastes management in the Indian sub-continent;
- develop the particular knowledge required to enhance wastes management practises in the Indian sub-continent;
- develop an understanding of the skills required to handle, treat and dispose of waste;

#### **Learning Outcomes**

**On successful completion of the module, students will be able to:**

##### **Knowledge and Understanding**

- a. demonstrate an understanding of the sources of wastes, their nature, classification, environmental and health impacts
- b. demonstrate a detailed knowledge of the chemical and physical principles underlying methodologies for reducing emissions from wastes storage, collection, treatment and disposal facilities

##### **Subject Specific Skills**

- c. critically evaluate the hierarchy of wastes management and its applicability to the developing world
- d. determine the biological and chemical processes associated with various wastes management treatments, and apply them
- e. assess the key technological, economic and social factors involved in the collection/ sorting / separation processes for the segregation of wastes
- f. critically assess the treatment options for a variety of waste types

##### **Key Skills**

- g. interpret Indian wastes management legislation and assess its impact / influence on wastes management practices
- h. explain the nature, management and use of organic and recyclable wastes
- i. undertake an investigation of the viability of "alternative" waste collection, transfer, treatment and disposal strategies for a given urban location.

## 1.2 Indicative Content

1. Wastes as an environmental issue: the urban challenge, solid waste management systems operating in India, principles of integrated and sustainable wastes management; waste arisings and types; and their environmental impact; chemical and physical properties of hazardous materials; catastrophic exposure, endemic exposure and concomitant exposure; UK and world-wide case studies.
2. Wastes Management Policy and Strategy: current situation in Indian cities; legal framework, status of compliance with the 2000 Rules; prevalent deficiencies and challenges in the solid wastes management system in India; steps toward an improved solid wastes management system
3. Financing for Municipal Solid Waste Services; existing financial situation of Municipal Authorities; strategies for improving the financial situation; costing and budgeting of wastes management services; carbon finance; private sector participation – opportunities, challenges Involvement
3. Waste Collection, Treatment and Disposal: Collection Systems; Landfill: - mandatory requirements for disposal of waste, disposal practices in India; sustainable landfill; worldwide landfill case studies. Organic Wastes Management- major sources of organic wastes; composting and anaerobic digestion; Incineration- objectives; principles of combustion; essential design features, combustion pathways; emission control systems; measurements of efficiency such as DRE's and PIC's; disposal of incinerator residues; legislation relating to gaseous discharges; case studies
6. Recycling: methods for minimising waste and reclamation; the types of materials currently recycled in India; compare the effectiveness of recycling strategies; research the re-use of materials; case studies.

## 2.0 Assessment

### 2.1 Teaching and Learning Strategy

The Module will be delivered via a number of modes, ie traditionally taught, block and distance. All modes will be supported by comprehensive e-learning Module Learning Materials, self assessment questions and tutorials. In addition you will be expected to organise visit(s) to a wastes management facility (ie landfill site or recycling centre) within their locality.

Teaching Learning + Assessment Activities	Study Hours		
	Standard	Block	DL
Lectures, Seminars, Practicals, Site Visits	35	15	
Guided and Self Directed Study	100	15	
Learning Materials		70	100
Seminar, Tutorials, Web-Based activity, E-Mail	5	20	20
Self Assessment Questions / Activities (formative)		20	20
Assessments	60	60	60
<b>Total</b>		<b>200</b>	

### 2.2 Assessment Strategy

The Module will be assessed by two distinct elements:

- 1) Time Constrained Assignment (TCA-1)
- 2) Written Assignment 1 (WA-1)

ASSESSMENT ITEMS	WEIGHTING	LEARNING OUTCOMES
TCA: Urban Wastes Management Issue (2,000 words)	40%	a, c, e, f, g, i
WA1: Waste analytical review paper (3,000 words)	60%	a, b, c, d, e, g, h, i

### 2.3 Deadline Dates

Written assignments must be completed by the dates given below.

Assessment Type	Deadline Dates
TCA- 1	Last submission date – 10 <sup>th</sup> December 2010
Written Assignment – 1	Last submission date – 15 <sup>th</sup> January 2011

If nothing is received by the last date for submission you will be automatically granted a referral for the assignment (the complete Course Regulations can be found in the *Programme Guide*). Such action would mean that you can only achieve 50% for the work, which of course will make a significant impact on your overall grade for the module. It is therefore essential that you maintain regular contact with both your Module and Course Tutor to ensure such a situation never arises. Remember the tutors are here to help and advise you – so use them!

Full details of the module course tutors and the programme support team can be found on

the NILE web-site ([www.northampton.ac.uk/nile](http://www.northampton.ac.uk/nile)).

In addition to the summative assessments you are required to participate in a range of Activities. Some require you to participate in group tasks / on-line discussions, whilst others require you to short written responses to the Module Leader as outlined in the Table below:

Week	Date	Suggested Teaching & Learning Timetable – Sept 2010
-1	13-9-10	Modules Guides, MLM, Assignments for Modules A and B etc sent out/given to students Teaching Block at the University of Madras
0	20-9-10	Activity 1
1	27-9-10	Lesson 1 + SAQs
2	4-10-10	Lesson 2 + SAQs
3	11-10-10	Teaching Block at the University of Madras + Activity 2
4	18-10-10	Lessons 3 and 4 + SAQs
5	25-10-10	Lesson 5 + SAQs
6	1-11-10	Lesson 6 + SAQs + Activity 3
7	8-11-10	Lessons 7 & 8+ SAQs
8	15-11-10	Lessons 9 + SAQs + Activity 4
9	22-11-10	Activity 5
10	29-11-10	Lesson 10 + SAQs
11	6-12-10	Assignment TCA Deadline
12	13-12-10	Lessons 11 and 12 + SAQs
13	10-1-11	
14	17-1-11	Assignment WAI Submission

**Failure to engage in the Activities will severely hinder your learning experience**

## 2.4 Assessment Criteria

Generic grading criteria are given in the Programme Guide, whilst grading criteria for specific assignments are given in appropriate Assignment Briefing Notes

## 2.5 Module Leader/Tutors

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## 3.0 Indicative Reading

### Indicative Reading and Other Learning Resources:

Aalok A, Tripathi A K, Soni P (2008), *Vermicomposting: A Better Option for Organic Solid Waste Management*, J. Hum. Ecol., 24(1): 59-64



Asnani P U, (2007) India Infrastructure Report (2006) Chapter 8 *Solid Wastes Management*; Infrastructure Development Finance Company (IDFC),

Babu B V, Ramakrishna V *Hazardous Wastes Management in India*.

Batstone, R., Smith, J. and Wilson, D. *The Safe Disposal of Hazardous Wastes: The Special Needs and Problems of Developing Countries*. 3 Volumes, World Bank Technical Paper Number 93, World Bank, Washington, DC, 1989.

Beede, D. N. and D. E. Bloom (1995), *The Economics of Municipal Waste*, The World Bank Research Observer 10(2):113-150.

Bernstein, J D (1993) *Alternative Approaches to Pollution Control and Waste Management*. Urban Management Programme Discussion Paper No. 3, World Bank, Washington, DC, March 1993.

Bogner, J., M. Abdelrafie Ahmed, C. Diaz, A. Faaij, Q. Gao, S. Hashimoto, K. Mareckova, R. Pipatti, T. Zhang, Waste Management, In Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Coad (1997), *Lessons from India in Solid Waste Management*, Department for International Development, Government of UK.

Cointreau, S.(2004) *Sanitary Landfill Design and Siting Criteria*. World Bank/Urban Infrastructure Note. May 1996 and updated November 2004.

Cointreau, S.(2006) *Occupational and Environmental Health Issues of Solid Waste Management. Special Emphasis on Middle- and Lower-Income Countries*. World Bank

Cointreau, S (1994). *Private sector participation in municipal solid waste services in developing countries (Vol.1)* Urban Management Programme Discussion Paper No. 13, World Bank, Washington DC, 1994. (Also available in Spanish: "Desechos sólidos sector privado/rellenos sanitarios." Programa de Gestion Urbana (PGU), Serie Gestión Urbana Vol. 13, Quito, Ecuador.).

Cointreau, S., Gopalan, P. and Coad, A (2000). *Private Sector Participation in Municipal Solid Waste Management: Guidance Pack (5 Volumes)*. SKAT, St. Gallen, Switzerland, 2000.

*E-Waste Management In India*, Environment, April 2009, pp30-34

Environmental Resources Management (2000). *Strategic Planning Guide for Municipal Solid Waste Management*.. Prepared for the World Bank, SDC and DFID by Waste-Aware, London

Giusti, L (2009). *A review of waste management practices and their impact on human health*; Waste management, 29(8), pp2227-2239

Hanarhan D, Srivastava S, Ramakrishna A S, (2006) *Improving Management of Municipal Solid Waste in India: Overview and Challenges*, World Bank

Hoornweg, D., Thomas L, Otten L (2000). *Composting and Its Applicability in Developing Countries*. Urban and Local Government Working Paper Series #8,

World Bank, Washington, DC

Jain A P, ( 1994), *Solid Waste Management in India*, Proceedings of the 20<sup>th</sup> WEDC Conference, Sr Lanka

Johannessen L M (1999). *Guidance Note on Leachate Management for Municipal Solid Waste Landfill*, The World Bank

Johannessen L M (1999) *Observations of Solid Waste Landfills in Developing Countries: Africa, Asia and Latin America*. The World Bank

Johannessen L M (1999) *What a Waste: Solid Waste Management in Asia*. The World Bank

Joseph, K, .Nagendran R, Palanivelu K (2003), *Open Dumps To Sustainable Landfills* Proceedings Of The Workshop On Sustainable Landfill Management, December 3-5, Chennai, India

Joseph, K; (2002) *Perspectives of Solid Waste Management In India.*; International Symposium on the Technology and management of the treatment & reuse of the MSW, Shanghai, China

Lacoste, E., Chalmin, P. *From Waste to Resource. 2006 World Waste Survey*. Economica, 2007.

McMichael A J (2000) *The urban environment and health in a world of increasing globalization: issues for developing Countries*; Bulletin of the World Health Organization, 78(9), pp117-1126

Narayana, T (2009) *Municipal solid waste management in India: From waste disposal to recovery of resources*; Wastes management 29(3), pp1163-66

Onursal B, (2003) *Health Care Waste Management in India Lessons From Experience*, World Bank

*Planning Guide for Municipal Solid Waste Management – Facilitators Guide*, World Bank

This Facilitator's Guide is structured into 8 modules and five sub-modules introducing strategic planning for MSWM. It presents a short summary of key concepts and issues contained in each of the steps in the Planning Guide.

- Module 0: Strategic Planning
- Module 1: Mobilising the Planning Process
- Module 2: Defining the Baseline
- Module 3: Establishing the Planning Framework
- Module 4: Identifying and Evaluating Options
- Module 4A – Institutional Framework
- Module 4B - Waste Collection and Recycling
- Module 4C - Waste Treatment and Disposal
- Module 4D - Financial Sustainability
- Module 4E - Public Awareness and Participation
- Module 5: Developing the Strategy
- Module 6: Preparing the Action Plan
- Module 7: Implementing the Strategic Plan

Rothenberger, S.; Zurbrugg, C.; Enayetullah, I. and Maqsood Sinha, A. H. *Decentralised Composting for Cities of Low - and Middle - Income Countries - A User's Manual*. Waste Concern, 2006.

Saxena V K, Verghese T, (1996) *Observations on Urban ecology of Surat and Bubonic Plague Transmission to the City*, Science Now, 71(10), p83

Schübeler P (1996), *Conceptual Framework for Municipal Solid Waste Management in Low-Income Countries*, SKAT, Switzerland

Shuchi Gupta S, Mohan K, Prasad R, Gupta S, Kansal A (1998); *Solid waste management in India: options and opportunities*; Resources, Conservation and Recycling, 24(2), pp137-154

Singh A K, 2Vidyarthi P, (2008), *Optimal Allocation Of Landfill Disposal Site: A Fuzzy Multi-Criteria Approach*, Iran. J. Environ. Health. Sci. Eng., 5(1), pp. 25-34

Singhal S, Pandey S; (2001) *Solid Waste Management in India: Status & Future Directions*, TERI Information Monitor on Environmental Science, 6(1), p 1-4

*Surat Plague Outbreak 1994 Case Study Analysis*

UNFCCC (2003). *Clean Development Mechanism Project Design Document: Municipal Solid Waste Treatment cum Energy Generation Project, Lucknow, India*. Infrastructure Development Finance Company, Ltd., September 2003.

United Nations Environment Programme, (2005), *Closing an Open Dumping and Shifting from Open Dumping to Controlled Dumping and to Sanitary Landfill: Training Module*, DNER

Upadhyay V P , Prasad M R, Srivastav A, Singh K (2005), *Eco Tools for Urban Waste Management in India*, J. Hum. Ecol., 18(4): 253-269

Union Audit Report (2008) *Performance Audit on the Management of Waste in India*, Performance Audit - Report No. 14 of 2008, Comptroller and Auditor General of India

*Waste Management in India Fact Pack* (2008) ; Swedish Energy & Environment Technology in India program, Swedish Trade Council, Delhi, India

WSP (2008) *Secured Landfills The Bucket at the End of the Solid Waste Management Chain*, WSP

Voegeli Y, Zurbrügg C(2008). *Decentralised Anaerobic Digestion Of Kitchen And Market Waste In Developing Countries – “State-Of-The-Art” In South India. Proceedings Venice 2008, Second International Symposium on Energy from Biomass and Waste Venice, Italy; 17-20 November 2008*

Zerbock O, Candidate M S, (2003), *Urban Solid Waste Management: Waste Reduction in Developing Nations*. Michigan Technological University

Zhu D, Asnani P U, Zurbrigg C, Anapolsky S (2008) *Improving Municipal Solid Waste Management in India: A Sourcebook for Policy Makers and Practitioners*; World Bank, Washington, DC

Zurbrügg C (2002), *Urban Solid Waste Management in Low-Income Countries of Asia How to Cope with the Garbage Crisis*. Presented at the Scientific Committee on Problems of the Environment (SCOPE) Urban Solid Waste Management Review Session, Durban, South Africa, November 2002

Zurbrugg, C (2003). *Solid Waste Management in Developing Countries*, EAWAG

\_\_\_\_\_ (2009) *Developing Integrated Solid Waste Management Plan Volume 1: Waste Characterization And Quantification With Projections For Future Training Manual*. United Nations Environment Programme,

\_\_\_\_\_ (2009) *Developing Integrated Solid Waste Management Plan Training Manual. Volume 2: Assessment of Current Waste Management System and Gaps therein*. United Nations Environment Programme

\_\_\_\_\_ (2009) *Developing Integrated Solid Waste Management Plan Training Manual Volume 3: Targets and Issues of Concern for ISWM*. United Nations Environment Programme,

\_\_\_\_\_ (2009) *Developing Integrated Solid Waste Management Plan Training Manual Volume 4 ISWM Plan*. United Nations Environment Programme

*A Proposal for Solid Waste management – Environmental Protection that benefits the Poor; Hand in Hand*

Up to date information and technical papers are available from journals including:

- Journal of Waste Management
- Waste Management Bulletin
- Warmer Bulletin
- ENDS Newsletter

all available in the library.

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all available from the SITA Wastes Management library, Northampton, UK