Need for a Guide
Proposing a Guide for Solidwaste Landfill Management

At a time where solid waste management is given high priority at national level the country needs;

• New methods and approaches to improve; from Waste Collection to Treatment and final Disposal
• The GoSL with assistance from foreign funding agencies like JICA has upgraded the Waste Collection, Handling, Transportation capacity- NSWMSC
• However no firm initiative for final waste disposal improvements
• This project is aimed at filling this void
Main objectives of the Project

• Prepare a guide for planning, management and maintenance of waste landfill sites in Sri Lanka.

• Strengthen the knowledge base by introducing adoptable and affordable appropriate solutions for landfilling that are suited to our local conditions
Framework of the Project

Overall goal
: Develop site-specific pollution control and remediation techniques for waste dumping sites and propose a guideline for sustainable design and construction of waste dumping sites in Sri Lanka

Project purpose
: The solid waste management services of Sri Lanka are improved

Activity 1: **Identify policy framework of solid waste management in Sri Lanka** and recognize and **assess components of social capacity**
Activity 2: **Define methodology** of appropriate **site selection** for new landfills
Activity 3: **Monitor existing landfills** and its surroundings
Activity 4: **Develop pollution control and environmental restoration techniques** for waste landfill sites
Activity 5: Finalize the guide for sustainable and applicable planning, maintenances and operations for waste landfills
Understanding of the Problem

- Socio-economic capacity
- Available Legislation/Guidance
- Characteristics of open dumping
- Available Technology

Education

- Postgraduate opportunities
- Research Publications
- Consultative workshops
- Dissemination of information

Scheme of SATREPS Project

Development

- Advanced Laboratory
- Site Selection
- Pollution monitoring
- Appropriate technology
- Field Scale Studies

Outreach to the Community

- SWM Action Plans
- Better Conditions Guide
Concept for Guide Content Selection

Basic Considerations;

- **Target landfills**: Municipal solid waste landfills owned and managed by Local Authorities

- **The Guide shall be a support/complementary document** of “Technical guidelines of solid waste management in Sri Lanka (CEA, 2005)”

- **Beneficiaries of the Guide** shall be;
  - All persons concerned with solid waste management in Central government and Local authorities,
  - private sector, NGOs, and donors

- **The Guide written in shorter and easier to read format**
Objectives of the Guide

Overall: To propose an integrated solid waste management system to minimize solid waste related pollution and more specifically to;

• To develop appropriate pollution control and environmental restoration technologies for landfilling

• Take geographical characteristics in Sri Lanka into account.

• To propose a methodology for site selection for new waste landfills and to

• To propose a plan and implement a monitoring system for waste landfill sites and surroundings
Preparations of the Contents of the Guide

Guide Organization;

• Guide will fully reflect the **actual situations, constraints, and technical capacities** of Local Authorities

• Options for **establishing, managing and controlling landfill sites**

• **Examples** for **pollution monitoring and control techniques** at solid waste landfills

**For this purpose, the Guide is organized to have 7 Chapters + Appendices**
# Introduction to the Guide

The Guide contains the following chapters:

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Objectives of Chapter 1

• To highlight the necessity of a guide for Waste Landfills
• Purpose of the guide and its usage
• Objectives of the guide
• Target waste landfills
Chapter I

Contents

Introduction
1.1 Need for Guide
1.2 Objectives
1.3 Definitions of the Technical Terms
1.4 Scope and Limitations of the Guide
1.5 How to use this Guide
Objectives of Chapter 2

This chapter is intended to;

• Examine the present SWM practices and institutional arrangement
• Identify the Municipal solid waste characteristics and waste streams in LAs
• Provide information on current situation of SW
• Examine the role of related institutions in SWM activities
Chapter 2
Contents

2.1 Introduction
   Overview, Objectives, Scope and Limitations,
2.2 Basic information of SWM
2.3 Characterization of Municipal Solid Waste and Waste Streams
   2.3.1 Waste Amount
   2.3.2 Waste Composition
   2.3.3 Waste Stream
   2.3.4 Final Disposal
2.4 SWM practices in local authorities
   2.4.1 Current strategies in SWM
   2.4.2 Participation of Stakeholders
2.5 Role of related Institutions of SWM
2.6 Legal Framework of SWM
2.7 Institutional Arrangement and Information Systems
2.8 Future of SWM in SL
References
Objectives of Chapter 3

To explain a procedure for data collection and methodology for risk assessment;

- To estimate the present environmental and health risk of final disposal site
- To make a quick decision for prioritizing actions related to dumpsite to close or rehabilitation
- To provide knowledge on simple risk assessment methodology
- To provide proper risk management actions to LAs
Chapter 3..

3. Risk Assessment and Risk Management of Waste Landfills

3.1 Introduction
   Overview, Objectives, Scope and Limitations,

3.2 Methodology for risk assessment
   3.2.1 Selection of Attributes
   3.2.2 Allocation of scores and sensitivity
   3.2.3 Risk Evaluation

3.3 Risk management: Action plan mitigation of risks
   3.3.1 Identification of policy options for risk management
   3.3.2 Implementation of Policy Options

3.4 Action plan for Risk management: Kandy Municipal Council

3.5 Joint Solid Waste Management as a strategy for risk management
Objectives of Chapter 4

The reader of guide will be able to

1. understand the *basic science related to monitoring*
   - Functions, process and products of landfills
   - Important parameters to be monitored

2. plan and design the monitoring program
   - Selection of parameters, locations and frequent of monitoring

3. implement **standard monitoring procedure**
   - Sampling
   - Filed measurement
   - Laboratory measurements
   - Reporting and management

4. interpretation and forecasting
Contents of the Chapter 4

4.1 Introduction
   Overview, Objectives, Scope and Limitations

4.2 Purpose of environmental monitoring
   4.2.1 Impact and risk assessment
   4.2.2 Quality assurance for monitoring procedure
   4.2.3 Continuous reliable data record

4.3 Typical parameters for environmental monitoring

4.4 Formation of leachate and landfill gases from waste landfills
   4.4.1 Leachate
   4.4.2 Landfill gas

4.5 *On site* and off site monitoring

4.6 Field Monitoring
Contents of the Chapter 4

4.7 Data recording and reporting

4.8 Analysis and management of data
   – 4.3.1 Database management (Hard and Soft)
   – 4.3.2 Temporal variations in groundwater level, water quality, and landfill gas composition
   – 4.3.3 Waste composition in different climatic zones
   – 4.3.4 Rainfall and leachate generation
   – 4.3.5 Statistical analysis for monitoring landfill
   – 4.3.6 Risk assessment (criteria and procedure)

4.9 Other issues
Objectives of Chapter 5

• Clarify the technical and social conditions for selecting appropriate sites for waste landfills

• Develop the processes of site selection, screening, site-specific and detailed risk assessment

• Complete the procedures on the statement and methodology of site selection for waste dump sites in Sri Lanka
Chapter 5 contents

5. Landfill Site Selection

5.1 Introduction

5.1.1 Potential site screening
5.1.2 Ranking candidate sites
5.1.3 Factors to be considered for landfill site selection

5.2 Factors affecting landfill site selection

5.2.1 Introduction
5.2.2 Environmental criteria
5.2.3 Technical and engineering criteria
5.2.4 Social, political and economic criteria
5.2.5 Infrastructural criteria
5.2.5.6 Other criteria and/or restrictions

5.3 Assessment for landfill site selection

5.3.1 Preliminary assessment
5.3.2 Detailed assessment
Chapter 5 contents

5. Landfill Site Selection

5.4 Methodology for Landfill Site Selection
   5.4.1 Overall Methodology
   5.4.2 Geographic Information System (GIS)
   5.4.3 Data Collection
   5.4.4 Analytic Hierarchy Process (AHP)

5.5 Case Study – Kandy District, Hambantota District
Objectives of Chapter 6

This may be used

– To **mitigate environmental contamination from leachate**
– To discharge leachate according to the CEA discharge standards
– To **monitor the performance of leachate treatment systems**
– To **identify leachate treatment options** for new landfill sites
Contents of Chapter 6

6.1 Introduction

6.2 Leachate Treatment

6.2.1 Introduction to leachate
  • Leachate
  • Consequences of leachate contamination in environment
  • Legal implications

6.2.2 Leachate Quantification and Characterization

6.2.3 Leachate Treatment Options
  • Typical Treatment Sequence (Primary, Secondary, Tertiary and Advanced)
  • Leachate Treatment Flow Diagrams
  • Cost Comparison
Contents of Chapter 6

6.2.4 Operations and Maintenance

• Routine Monitoring
• Record Keeping
• Troubleshooting
• Emergency Procedure

• 6.3 Liner systems

  6.3.1 Liner regulations

  6.3.2 Liner types

    6.3.2.1 Locally available clayey soils
    Expansive soils from Moragahakanda
    Expansive soils from Buttala

    6.3.2.2 Bentonite
6.3.3 Durability and compatibility of clay liners

6.3.4 Estimation of leakage through liner systems

6.3.5 Cost items for liner systems
6.4 Final cover systems

6.4.1 Final cover regulations
• CEA requirements

6.4.2 Final cover systems
• Geosynthetic systems

6.4.3 Compacted soils for earthen cover systems
• Soil properties (hydraulic, shear strength)
• Soil mixed with compost (methane oxidation) and biochar (VOC removal)
• Capillary barrier system

6.4.4 Cost items for final cover systems
6.7 Geomechanics and slope stability of waste landfills

• Settlement of waste fill and subgrade
• Slope stability of liner and waste slopes during landfilling
• Slope stability of cover materials
Chapter 7
Conclusive Remarks
Endeavor for green