MSW Webinar Series

Part I: Closure and Rehabilitation of Open Dumps

THE WEBINAR WILL START SHORTLY
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This Webinar has been developed on behalf of the CCAC MSW Initiative by ISWA
MSW Webinar Series

Part I: Closure and Rehabilitation of Open Dumps

Mitigating SLCPs from the Municipal Waste Sector
http://waste.ccac-knowledge.net/
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He is a Chartered Environmentalist, Chartered Waste Manager and a Fellow of the Chartered Institution of Wastes Management (CIWM). He is a Past President of CIWM.

Luis Marinheiro is the Chair of the ISWA WG-Landfill who began his professional career in 1996 as an Environmental Engineer.

Working as a consultant, advisor, coordinator and technical director, he has managed and coordinated a number of projects and contracts to provide services in various environmental areas including waste management.

In 2010 he was elected President of the Environmental Engineering College of the Portuguese Association of Engineers.
INTRODUCTION
What is an open dump? (1)

- Uncovered waste, widely spread
- Open fires, waste periodically on fire
- No liner system or clay-type soils in place
- No or limited compaction
- Leachate and landfill gas not managed
- Slope stability issues
- Lack of security measures, access by waste pickers
- Vectors (dogs, birds, other animals) often present
What is an open dump? (2)

- Site soils usually permeable
- No compaction of waste
- No daily cover
- Spread of light materials around the surrounding area
- Animals seeking food
- Potential transfer of disease by vectors
- Opposition from neighbours
Impacts of open dumps
Impacts of open dumps

Environmental
  o Ground & surface water contamination
  o Air pollution, black carbon from burning
  o Climate impacts from black smoke and Methane
  o Soil contamination
Impacts of open dumps

**Public Health**
- Contamination of drinking water
- Pests and spread of disease
- Health & Safety issues of waste pickers accessing site
Impacts of open dumps

Economic
- Public health costs
- Costs relating to environmental impacts, loss of potable water, contaminated land, etc.
- Loss in value of land and surrounding real estate
- Clean up costs
- Loss of resources
Drivers for moving away from open dumps

- Public health
- Environmental protection
- Bans on Open Dumps (potential implications / need for enforcement and alternative solutions)
- Incentives for alternative practices
- Improved quality of life
- Public perceptions
Problems Encountered when moving away from Open Dumps

- Overcoming old habits, using new technologies
- Little or no funding set aside for dump closures
- Impact on local economy (need alternatives for disposal)
- Lost income for waste pickers/recyclers
Pre-closure considerations

- The overall risks from the open dump should be assessed
- Amount of potential landfill gas reserve should be determined
- A plan for rehabilitation should be prepared
- Funds for rehabilitation should be made available
Options for Managing Open Dumps
Overview of Options for Managing Open Dumps

- Business as usual – not recommended
- Improvements in operation & management to reduce impacts
- Close by
  - covering waste in place or piggybacking
  - close by removing wastes from the site (mining/recycling and excavation)
  - close and establish a controlled landfill or a sanitary landfill
Overview of Options for Managing Open Dumps

- Controlled
  - Simple non engineered measures

- Engineered
  - Simple engineering eg impermeable cap

- Sanitary
  - Sophisticated engineering of base, sides and surface
1. Closure of Waste in Place

**Cover Layer**
- Reduce exposure of waste to wind and animal/vectors
- Reduce/prevent scavenging
- Control odours
- Control infiltration of rain water/surface water
- Improves ability to capture landfill gas
- Growth medium for vegetation
- 1.5 metre of soils
  - 1250 mm of sub soil
  - 250 mm of plant growing media
- Support suitable post-closure activities
- Final slopes of 1:7/1:10 (V:H)
- First 250 mm to be compacted to give a permeability of $<1 \times 10^{-7}$ m/s
2. Closure of Waste in Place
Piggybacking

Placing a new waste mass on the slopes or on the top of an existing waste mass...in a controlled manner.
Basic Piggybacking Scenarios
Advantages of Landfill Piggyback Approaches

- More efficient use of land area
  - Gain airspace and lifespan
  - Conserve areas for future uses
  - Significant cost-benefits ($$/m3)
- Use existing infrastructure and facilities
- Use existing monitoring systems
- Materials and construction savings
3. Closure as a Controlled Landfill

- Application of daily cover
  - Operating slopes of 1:3 (V:H)
  - Compact in layers of 300mm
- Site secure with single entry and exit point
- Waste checking and recording (weighing?)
- Combustion of landfill gas using open flare
- Hardcore access roads to tipping face
- Keep tipping face to a minimum – no wider than the width of 3 tipping trucks
- Litter control
4. Close by removing wastes from the site (mining/recycling and excavation)

Why?

- Mitigation of environmental impacts (pollution of watercourses, air quality and soil)
- Reduce methane emissions to atmosphere (greenhouse gas with high GWP)
- Removal of hazardous materials and implementation of protective, remediation or neutralization measures
- Collect combustible fraction for the generation of power (although this capability depends on composition of the buried waste)
- Create valuable development land/opportunities
5. Close and establish a Sanitary Landfill

- Permitted and planned
- Engineered to a specification
- Leachate collection and treatment
- Landfill gas collection and treatment
- Sound operational practices (See ISWA Landfill Operations Guidelines)
- Monitoring
- Long-term aftercare and management
Operational Practices

- Site Roads
- The Use of Daily Cover
- Bird Control
- Wheel Cleaning
- Litter Control
- Vector Control
- Managing the Working Face
- Waste Compaction
- Landfill Fires
- Storm water and Sediment Control
- Waste Control at Landfills
- Leachate Control
- Odour Control
- Landfill Gas Management
- Site Safety and Security

access here
Post Closure Management

- Repair fencing and gates
- Clean and maintain ditches
- Inspect and maintain any gas flaring equipment
- Remediate any areas of settlement to retain final slopes
- Clear up and remove any areas of illegally deposited waste
- Monitor all adjacent surface water bodies
Capturing Methane from Closed Dumpsites

- Open dumps are typically more aerobic than anaerobic
- Open dumps once closed may provide a source of methane
- Amount of methane depends on:
  - age of dumpsite
  - amount and type of waste disposed at site
  - the porosity of the base material (clay, rock, sand or aggregates)
- Treatment option will depend upon the amount of methane available for exploitation
In Summary

- In situations where it is not possible to close an existing dumpsite, improvements to the way it is managed can minimize its impact on the surrounding environment and human health.

- Closure of open dumps provides significant protection from environmental releases and reduces public nuisance.

- Successful in-place closures requires engineering planning and control systems/site security.

- Piggyback systems can yield improved local solid waste management conditions and practices.
QUESTIONS
CASE STUDY
Bo – Sierra Leone

- Sierra Leone 5.8m people
- 180th out of 187 countries in UN Human Development Index
- Bo is second city of Sierra Leone
- Poor infrastructure
- Very little equipment
- Limited waste collection
- Dumping a universal habit
- International Project to improve Waste Management
Strategic Objectives

- Overall improvements to Public Health
- Improve the appearance of the cities
- Inward investment by the private sector into the urban/town environment
- Business growth with, ultimately, generation of new local jobs, thus creating a more sustainable environment and economy
Pilot programme

- To introduce efficient scheme for the collection of waste in the centre of Bo
- To make the out-of-town landfill (final disposal) site fit to receive and process biodegradable waste and landfill the non-biodegradable waste
- To train staff and the public to implement a new programme of waste management in the City
Methodology – the plan…

- Closure of open dump
- Improved waste collection
- Develop a controlled landfill
- Waste separation at source
- Windrow Composting
How will the new scheme work? Waste collection and separation

- Purchase of a skip lorry
- Provision of 8-30 skips
- Strategically located in the centre of the city at unofficial dump sites, already used by residents.
- Two skips per location - one for green and one for grey waste.
- Environmental Police
- Compost sale business opportunity for local women?
Bo Waste Composition

Average Waste Stream Composition of all three areas

- Kitchen organics: 46%
- Garden: 29%
- Paper: 3%
- Glass: 3%
- Metals: 2%
- Textiles: 5%
- Wood: 10%
- Misc.: 2%
Situation as at January 2014

- Mini pilot operating in three Bo wards
- Landfill operation stumbled by JCB gear problem and repair slow
- Spares and engineering support difficult to procure
- Some initial funding lost due to the worldwide economic crisis
- UNDP reinstated funds for skips with OWL procuring from UK
- 26 new skips to fit Chinese skip lorries bought and shipped to Sierra Leone
- Dock/customs clearance delayed
- Green/bio waste segregation not happening due to delay in receipt of additional skips so composting not operational
- Expectation management difficult for BCC – political issue re location of the few skips they have at present
Some Lessons Learned

- Don’t assume major donors/agencies are efficient or immune from financial cutbacks.
- Ensure support supply chain for vehicles/equipment is adequate.
- Expectation management is important locally.
- Embed the idea/operation in local Council - don’t become over reliant on key individuals.
- Communicate often and explicitly – check for common understanding & don’t assume anything.
But All Was Not Lost…

- Further project approved by UK Department for International Development
- Further contributions from PPP partners and Bo City Council;
- Close unofficial dump;
- Rehabilitation of unofficial dumpsite;
- Establish door to door waste collections through NGOs;
- Build on present recycling and re-use capability;
- Establish engineered landfill and composting facility;
- Re-construction of highway;
- Proposed budget of £4.4m of which £3.2m from dfid;
- 4 year project; and
- Commenced early 2014
So where are we now?

- A number of recycling initiatives established
- 10 acre landfill site procured
- Improvements of highway to be funded by the National government
- 6 collection points constructed
- 2 additional skip lorries acquired
- Preliminary site design under preparation
- Unofficial landfill closed
- Some commercial size composting established
- Youth groups established to collect household waste
Some recycling initiatives
Then and now …
Then and now …
QUESTIONS
Further Reading

- Guidelines for Design and Operation of Municipal Solid Waste Landfills in Tropical Climates
- International Guidelines for Landfill Evaluation
- Management of Landfill Gas - ISWA Key Issue Paper
- Field Procedures Handbook for the Operation of Landfill Biogas Systems
- Landfill Methane: Reducing Emissions, Advancing Recovery and Use Opportunities
- The World’s 50 biggest dumpsites (available at http://www.atlas.d-waste.com/ under reports and presentations)
Helpful Web Resources

- Global Methane Initiative [https://www.globalmethane.org/landfills/](https://www.globalmethane.org/landfills/)
Thank you

Please feel free to contact the presenters for any further information

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Please kindly provide your feedback on the webinar by filling in the very brief questionnaire

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