Project: "Promotion of BAT/BEP to reduce uPOPs releases from waste open burning in the participating African countries of SADC sub-region"

Module 7

Promoting occupational health and safety and hygienic measures at landfill sites

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I. Definitions

Definition of health and safety

The International Labour Organization (ILO) and the World Health Organization (WHO) define H&S as:

- The promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations;
- the prevention amongst workers of departures from health caused by their working conditions;
- the protection of workers in their employment from risks resulting from factors adverse to health;
- the placing and maintenance of the worker in an occupational environment adapted to his/her physiological and psychological capabilities.

I. Definitions

Definition of health and safety

In practice, guaranteeing health and safety involves ASSESSING THE Risks and then MODIFYING THE WORKING CONDITIONS to mitigate or eliminate them.

In determining the level of the risk a number of factors must be considered:

- nature of the work being undertaken
- environmental conditions under which that work is conducted
- preexisting health of the individual worker
- availability of resources to improve a given working situation: for SWM this strongly depends on the national income and on the level of development of the SWM system in each city.

The risk for workers is strictly dependent on the level of safety applied in each facility, which is in turn strictly dependent on the development of the existing SWM system

II. Occupational health in waste handling

What type of hazards are there for employees handling waste?

Waste disposal is a very challenging job: it poses a direct threat to the workers.

But there are deep differences between working as:

- informal workers: collecting waste or recycling from the bulk of waste in a dump or non-sanitary landfill
- professional workers in public or private companies that ensure good standards of health and safety.

The level of safety is strictly dependent on the financial resources available to develop a safe and effective SWM system.

This include the conditions for

- waste collection and transport
- recycling

II. Occupational health in waste handling

The occupational risk depends on the level of development of the SWM system which deeply modifies working conditions

Examples of different conditions for COLLECTION

→ with this kind of garbage trucks the worker never sees or touches the waste

→ the physical strain is reduced

II. Occupational health in waste handling

→ in this plant, heavy operations are mechanized

The occupational risk depends on the level of development of the SWM system which deeply modifies working conditions

Examples of very different ways of bulking for RECYCLING

II. Occupational health in waste handling

Waste pickers searching for material at a landfill in Pune, India.
Inclusive Cities Study - Synthesis Report by Zoe Elena Horn

The occupational risk depends on the level of development of the SWM system which deeply modifies working conditions

→ in this plant, sorting is semi-mechanised

Exampled of sorting for RECYCLING

II. Occupational health in waste handling

The occupational risk depends on the level of development of the SWM system which deeply modifies working conditions

Examples of different conditions for MANAGING LANDFILLS

Summary of the types of risk workers can encounter

II. Occupational health in waste handling

Types of occupational risks from working with waste handling

Biological impacts
(micro-organisms)

Vermin

Accidents

Chemicals

Other physical or psychological impacts

II. Occupational health in waste handling

Biological impacts (micro-organisms)
Bacteria (endotoxin and infections)
Fungi (mold and yeast: allergies and infections)
Pathogens, if present (infectious bacteria and parasites); particularly present in medical waste, wet municipal waste and sewage

Ways of exposure

Inhalation of dust and aerosols

+

Direct contact (cuts, mouth, eyes)

II. Occupational health in waste handling

Examples of Occupational risks from CHEMICALS:
Dioxin, furans, PAHs from open burning (highly toxic, cancer)
Mercury (highly toxic, brain damage and many others)
Organic solvents (brain damage, etc.)
Aggressive cleaning agents (etchings/burns, etc.)
Pesticides, biocides, etc. (many highly toxic effects)
Asbestos, mineral wool and other fibres (cancer, lung diseases)
Oil products (many effects)

Ways of exposure

Inhalation of dust, fumes and aerosols

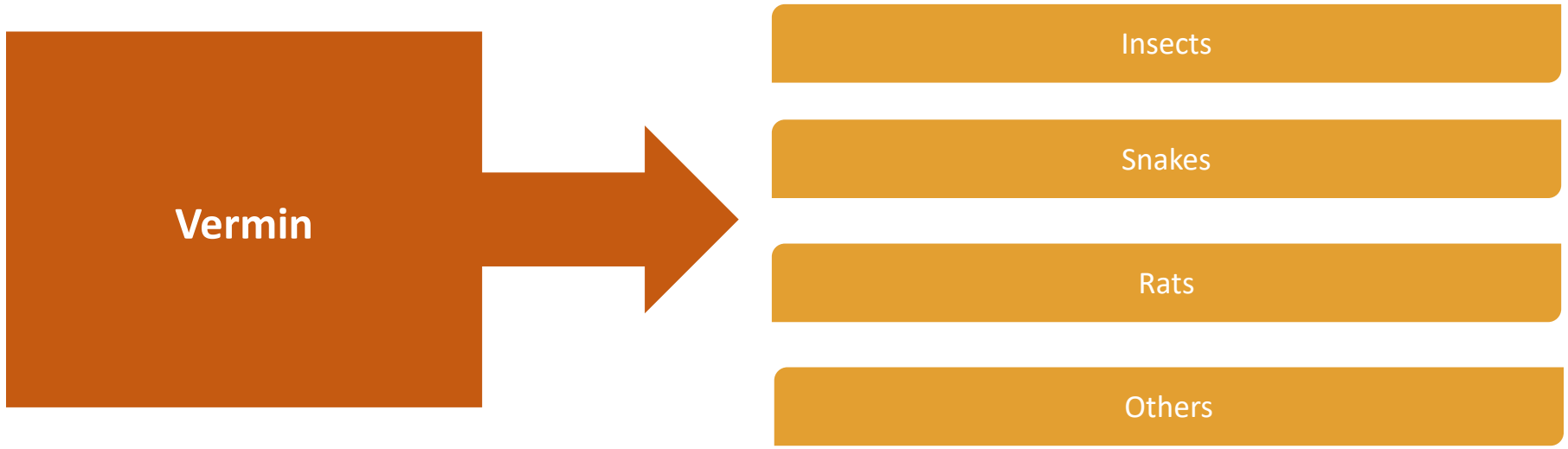
+

Direct contact
(skin, mouth, eyes)

II. Occupational health in waste handling

Examples of effects of occupational exposure to chemicals :
respiratory diseases
Allergy
Eye infections
Eczema
Etchings/burns
Impaired nervous system
Immune system malfunctions
Stomach problems

II. Occupational health in waste handling



II. Occupational health in waste handling

Other physical and psychological effects

- Heavy lifts
- Cuts
- Monotonous repetitive straining work
- Musculoskeletal damages, mechanical trauma
- Vibrations (white fingers, ect.)
- Noise (hearing damages, stress)
- Heat, cold and moisture
- Social stigma for informal workers

II. Occupational health in waste handling

Working condition when sorting waste from a non sanitary landfill

II. Occupational health in waste handling

IN PARTICULAR INFORMAL WORKERS are at risk of:

- being killed or severely injured by moving equipment, such as bulldozers or trucks carrying waste, particularly when the vehicles are reversing.
- developing respiratory disorders due to prolonged and frequent exposure to smoke from the fires common at the dump sites.
- Injuring themselves by sharp objects in the waste they handle.
- Undergoing permanent damages by exposure to fecal matter or to chemically hazardous, toxic, or otherwise contaminated waste.
- infecting with HIV or hepatitis C, particularly from hazardous healthcare waste.

II. Occupational health in waste handling

Waste pickers can suffer seemingly temporary injuries that may become permanent.

For example, individuals may lose their livelihoods as a result of an accident or injury that in industrialized countries would be considered relatively minor and readily treatable.

Minor cuts, for example, can quickly become infected in these unhygienic and contaminated working conditions. Such an infection might prevent a waste picker from working for a period of time.

The risks to the health and safety of waste pickers are compounded by poverty and a lack of resources to purchase proper food, personal protective equipment.

Further, they do not have access to clean running water or soap or disinfectant for cleaning themselves after finishing work at the end of each day.

These factors result in a high prevalence of infectious disease and chronic injuries among the waste pickers.

II. Occupational health in waste handling

Table 1. Risks to Health and Safety of Waste Pickers

Prevalence	Seriousness
1. Joint pain 2. Injuries / cuts 3. Respiratory issues 4. Gastrointestinal disorders 5. Fatigue 6. Skin infection 7. Infectious diseases	1. Infectious diseases 2. Respiratory issues 3. Skin infection 4. Gastrointestinal disorders 5. Injuries / cuts 6. Joint pain 7. Fatigue

II. Occupational health in waste handling

AVOID RISKS AT THE SOURCE

- Avoid and prevent burning of waste
- Sort hazardous waste out as early as possible and treat separately and safely
- Reduce dust formation and spreading (regulate traffic, plan handling, sprinkle)
- Eliminate or reduce noise
- Plan well to avoid accidents
- Plan to minimize other physical and psychological impacts
- Work upwind from smoke and dust

Eliminate the risk, if possible.

Personal protection equipment should always be considered the **second choice**.

III. Personal protective equipment

HAND PROTECTION
against cuts, chemicals, irritating substances

FEET AND LOWER LEG PROTECTION

EYE PROTECTION
Safety glasses / goggles

HEAD PROTECTION

III. Personal protective equipment

Respiratory Protection

Protection against specific threat: dust/ fibre /aerosols (size), organic chemicals, mercury, etc.

3M filter, Specialbutikken.dk

JSP Safety - half mask & filters

3M active filter, Sikkerhedsgiganten

MSA – Fresh air supply

III. Personal protective equipment

Protective Clothing

Protect yourself by wearing personal protective equipment (PPE) when handling waste.

Wearing PPE reduces risk from sharps, germs, exposure to blood and other bodily fluids, and splashes from chemicals.

- Face mask
- Heavy duty, gloves
- Plastic apron
- Clothes that cover the body
- Heavy duty, boots

Essential communication

don't go to the landfill site alone without a way to contact: mobile phone

III. Personal protective equipment

Employer's / Local Authorities responsibilities

- Plan the work to eliminate or reduce risks and impacts
- Provide all required protection equipment
- Personal protection equipment may in some cases make the work heavier (heat, moisture, hindrance to movement)
- Plan the work accordingly with adequate breaks
- Train employees in safe procedures
- Train employees in the proper use of personal protection equipment
- Check that personal protection equipment is used as prescribed

Independently of the development of the SWM system, local authorities and employers must adopt the means to protect workers in every working conditions

III. Personal protective equipment

HEALTH AND SAFETY GUIDELINES FOR WASTE PICKERS

Local authorities should provide:

- **Security fence** to minimize unauthorized people and animals to the dumpsite
- **Protection against injuries:** the use of PPE by workers should be mandatory. Waste pickers should be provided with protection for their feet and lower legs with shoes or boots of appropriate size, shape, material, and condition.
- **Protection of body and clothes:** the contamination of clothes is significant because most waste pickers wear the same clothes at work and at home.
- **Respiratory tract protection:** bacteria in and around dump sites are very mobile, particularly when attached to fine particulate matter blown by the wind.
- **Use of waste-sorting tools** so that workers don't have to use their hands
- **Immunization** against life-threatening diseases, such as tetanus, meningitis, and hepatitis.

BOX 2. A CODE OF CONDUCT FOR WASTE PICKERS

1. Report and register at the site office upon entering and leaving the waste disposal site.
2. Where issued, wear ID badges at all times.
3. Unless absolutely unavoidable, do not bring small children onto the site. Where provided, use portable educational facilities provided for your child's education.
4. Wear all personal protective equipment provided. This should, ideally, include overalls, a high visibility/reflective vest, safety boots, gloves (preferably thick leather, not thin plastic), and disposable face masks.
5. Where provided—or if not, where affordable—ensure that regular health checks are completed at least every six months, and keep inoculations up to date.
6. Do not work close to moving equipment, such as bulldozers and vehicles, particularly when they are in reverse. Rather, work within designated areas away from moving plant vehicles and equipment.
7. Maintain high levels of hygiene:
    a. Wash hands thoroughly before eating. If soap and water are not available on site, carry water and disinfectant in a bottle.
    b. Shower at the end of the working day, utilizing site facilities where provided.
    c. Regularly wash work clothes to minimize the risk of transferring contaminants and bacteria from the work site to home.
8. Do not smoke on the site due to the risk of fires and explosions.
9. Do not drink alcohol on the site.
10. Do not burn waste products such as plastic coating of electrical cables within the site.
11. Comply with the instructions of site staff and operational plans within the site.

IV. Guidelines and protocols

SWM OPERATORS – EITHER PUBLIC OR PRIVATE – MUST APPROVE AND IMPLEMENT SITE-SPECIFIC PROTOCOLS

Having a COMPREHENSIVE PLAN in place for every activity performed and for every operating plants is the cornerstone for taking responsibility for improving working safety, but many sites simply haven't taken the time to prioritize putting these protocols on paper.

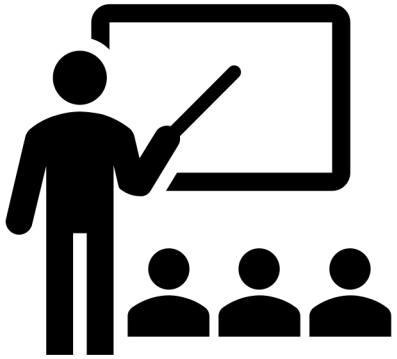
The Comprehensive Plan is composed of:

1. a standard operating procedures for how things are done
2. the identification of all potential risk associated to the activities performed and the equipment used
3. an injury and illness prevention program: a proactive process to help employers find and fix workplace hazards before workers are hurt. Management leadership and active worker participation are essential to ensuring that all hazards are identified and addressed.
4. a health and safety plan: what to do when injuries or accidents take place
5. a training program to train the employees on all these things
6. a program to collect data, measure all safety-related issues and assess the procedures being undertaken at a site
7. continuously improve this process by starting again from step 1.

IV. Guidelines and protocols

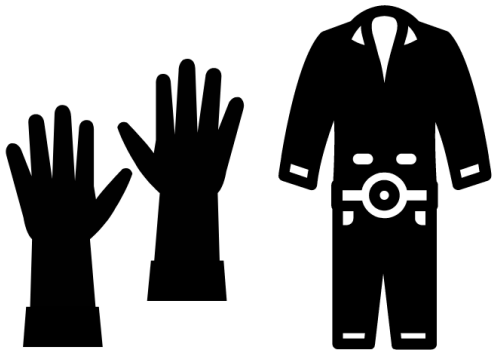
Training

- Educate all healthcare workers and healthcare waste workers.
- Increase awareness about hazards at the workplace.
- Outline all emergency, spill and injury response procedures.
- Educate on safe work practices.
- Provide training on PPE use.
- Provide anual refresher training.



Personal Hygiene

- Convenient washing facilities (with warm water and soap) should be available to all, including cleaning staff and waste workers.
- Personnel should be trained on personal hygiene issues that reduce the risks from handling hazardous waste.
- Wear appropriate PPE to reduce exposures.
- Cover cuts/abrasions with waterproof dressing to help reduce exposure of the affected area.



Response to injuries

- Provide immediate first aid measures
- Immediate reporting
- Identify source of injury
- Obtain additional medical information
- Maintain medical surveillance
- Conduct blood tests if needed
- Investigate the causes
- Implement prevention measures for similar incidents

Incident Reporting

- All incidents including near misses (no injuries) should be reported to the OHS committe or a specific representative.
- A report should be filed and kept on record.
    - Review reports to make work place or practice changes

Good occupational health is ensured by the effective management and control of operational conditions at each SWM site and for every equipment

The working conditions at landfills are particularly important

V. Types of landfills

The ability to manage landfills varies with national income and technological capabilities

Waste disposal across 20 reference cities (data collected in 2009)			
Income level	Engineered landfills %	Controlled dumps %	Open dumps %
High	100	0	0
Upper-middle	75	20	5
Lower-middle	45	50	5
Low	28	23	49

V. Types of landfills

Landfill classification

According to the waste management hierarchy, landfilling is the least preferable option and should be limited to the necessary minimum.

The legislation on landfilling addressing health and environmental protection must define the conditions to "prevent or reduce as far as possible negative effects on the environment, in particular the pollution of surface water, groundwater, soil and air, and on the global environment, including the greenhouse effect, as well as any resulting risk to human health, during the whole life-cycle of the landfill".

Adopting a risk management approach, the construction's requirements for a landfill change with different categories of waste

Landfills can be divided into three classes for:

- ✓ hazardous waste
- ✓ non-hazardous waste
- ✓ inert waste.

V. Types of landfills

Different waste and environment characteristics generate different impacts: sanitary landfill should be able to eliminate all H&E impacts (below acceptable risk level)

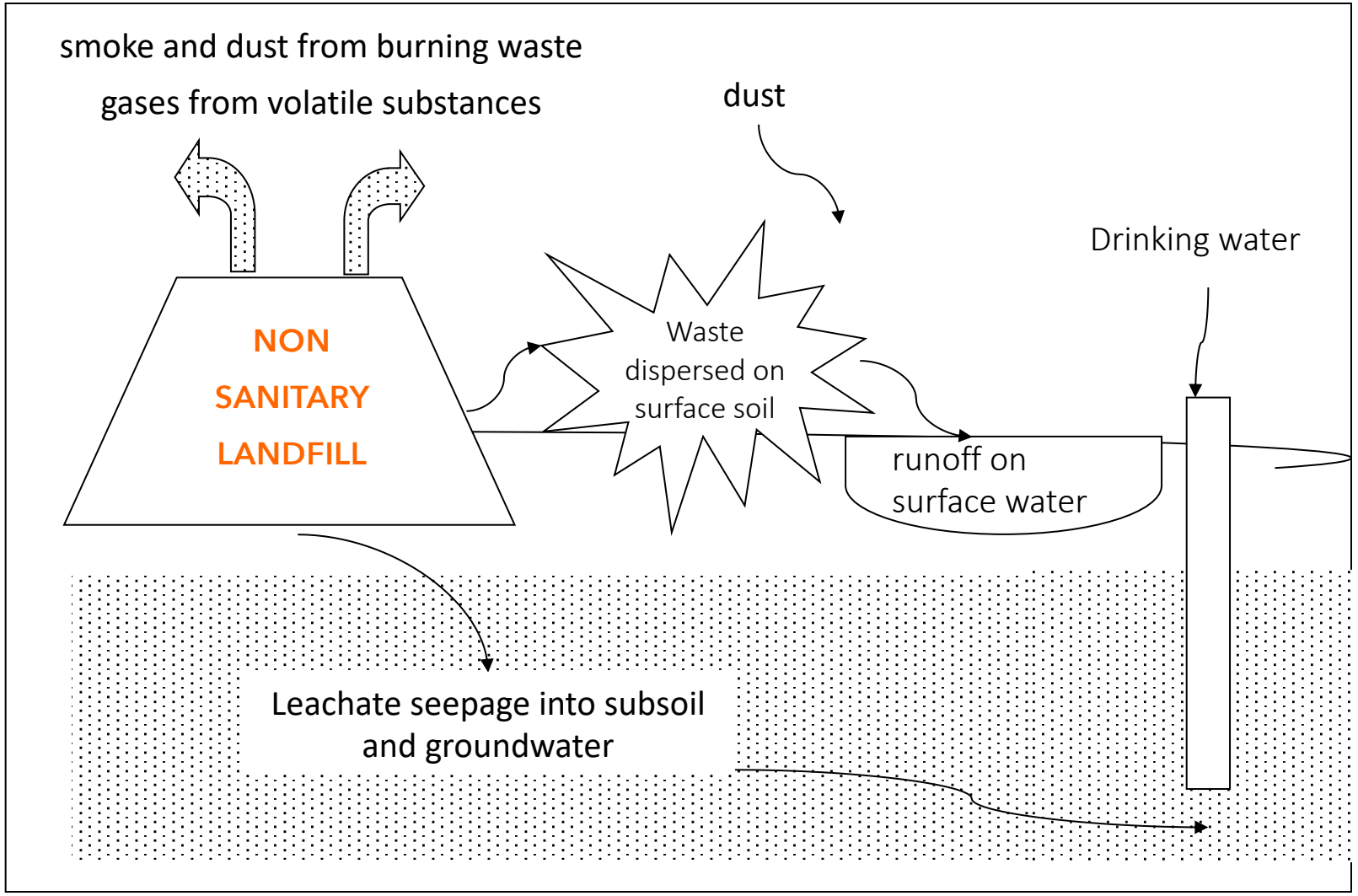
DIFFERENCES IN TECHNICAL CHARACTERISTICS AND IMPACT BETWEEN DUMPS AND LANDFILLS		
Open dumps	• poorly sited • unknown capacity • no cell planning • little or no site preparation • no leachate management • no gas management	• only occasional cover • no compaction of waste • no fence • no record keeping • waste picking and trading
Controlled dumps	• sited with hydro-geological criteria • planned capacity • no cell planning • grading, drainage in site preparation • partial leachate management • no or partial gas management	• regular cover (usually not daily) • in some cases compaction • fence • basic record keeping • controlled waste picking and trading • no post-closure plan
Engineered/sanitary landfills	• sited with a complete set of risk criteria • planned capacity • designed cell development • extensive site preparation • full leachate management • full gas management	• daily and final cover • compaction • fence and gate • record type, weight, source • no waste picking • post-closure plan is required

V. Types of landfills

AN ENGINEERED LANDFILL

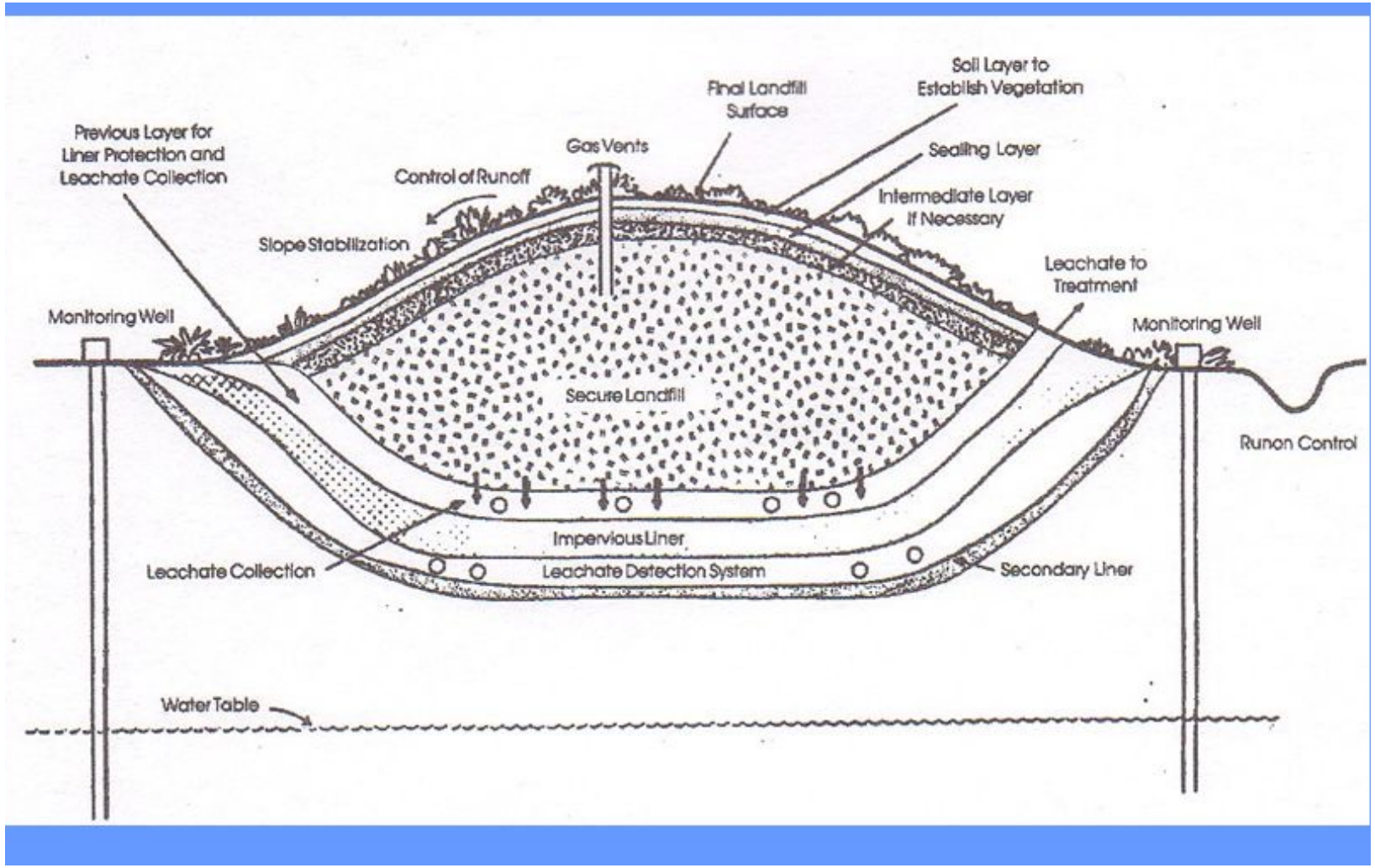
An engineered landfill commonly consists of multiple cells and is managed on a cell-by-cell basis in order to operate the entire landfill effectively.

V. Types of landfills



Main dispersion processes from a non-sanitary landfill to environmental media

V. Types of landfills



Engineered landfills reduce risk for workers and environmental impacts

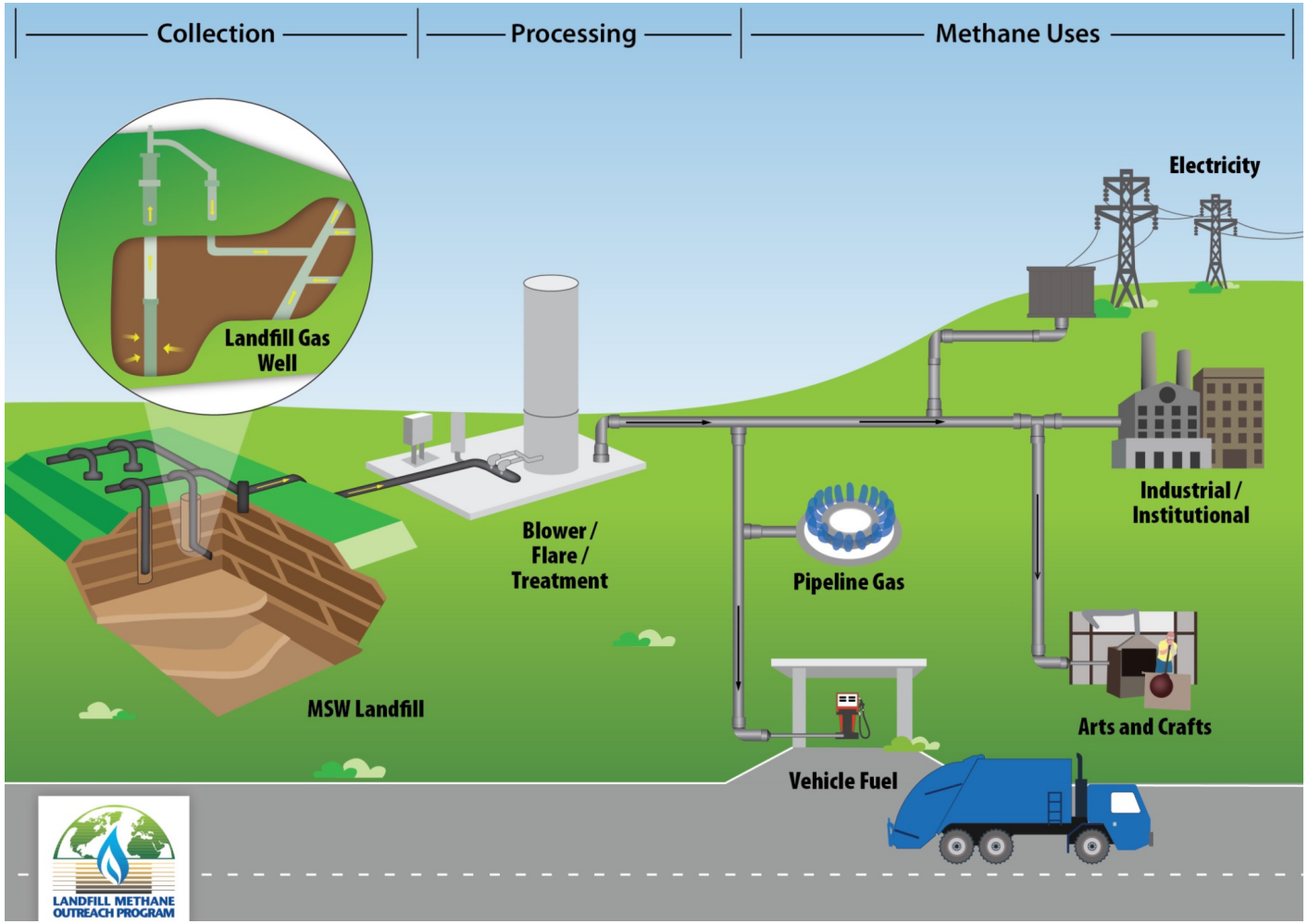
http://slideplayer.com/slide/3440603/

Build and operate a safe landfill

Applications to build and operate a landfill must contain the following information:

- a description of the types and total quantity of waste to be deposited;
- the overall capacity of the disposal site;
- a description of the site: the physical context
- the proposed methods for pollution prevention and abatement;
- the proposed operation, monitoring and control plan;
- the plan for closure and aftercare procedures;
- the applicant's financial security;
- an impact assessment study.

VI. Safe landfills



Biodegradable waste and biogas collection from landfills (cont.)

it is accounted as renewable energy

BIODEGRADABLE WASTE AND BIOGAS COLLECTION (CONT.)

Mare Chicose Landfill in Mauritius: biogas recovery and dedicated area for hazardous waste

Thank you for your attention!

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