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TRAINING MANUAL FOR COURSE TRA-38

HEALTHCARE WASTE MANAGEMENT

Presented by the

Basel Convention Regional Centre
Pretoria
for English-speaking African Countries

Basel Convention
the world environmental agreement on wastes

In partnership

with

JST

UNIDO

22-25 November 2005

BCRC Training Room, CSIR, PRETORIA

SOUTH AFRICA

COURSE PROGRAMME

Basel Convention Regional Centre
Pretoria
for English-speaking African countries

Basel Convention
the world environmental agreement on wastes

PO Box 109, Silverton, Pretoria, 0127 Room 131, 1st Floor Building No4, CSIR, Meiring Naude Rd, Brummeria, South Africa
Tel: 27 12 349 1130 Fax: 27 12 349 1043 www.baselpretoria.org.za

Draft Programme 4:

Course Programme
Health Care Waste Management Training, BCRC Pretoria
22 - 25 November 2005
Venue: BCRC Pretoria, CSIR Pretoria

TIME	*ACTIVITY*	*PRESENTER*
Day 1 : Tuesday 22 Nov 2005		
08.30 - 09.00	Registration	
09.00 - 09.30	Introduction to BCRC and its Roles and Responsibilities	Dr John Mbogoma
09.30 - 10.00	Introduction to MMIS and its Roles and Responsibilities	Dr Rose Mulumba
10.00 - 10.15	The Link Between JSI - MMIS and BCRC	Dr John Mbogoma & Dr Francis Hyera
10.15 - 10.30	TEA	
10.30 - 11.00	General Overview of Hazardous Waste Management	Ms Nomphelo Daniel
11.00 - 11.15	Introduction to Infection Prevention and Control	Ms Bronwyn Pearce
11.15 - 11.30	Discussions	
11.30 - 12.00	Overview of Healthcare Waste Management	Dr Francis Hyera
12.00 - 12.15	Discussions	
12.15 - 12.45	Health Waste Management Treatment and Disposal Methods	Dr Francis Hyera
12.45 - 13.00	Discussions	
13.00 - 14.00	LUNCH	
14.00 - 14.30	Waste Collection and Transport	Dr Francis Hyera
14.30 - 14.40	Discussions	
14.40 - 15.10	Importance of Healthcare Waste Segregation/Separation and Colour Coding	Dr Francis Hyera
15.10 - 15.15	Discussions	
15.15 - 15.30	TEA	
15.30 - 16.00	Overview of Hazardous Waste Management and Link with HCWM.	Dr Francis Hyera
16.00 - 16.10	Discussions	
16.10 - 16.40	Waste Collection and Transport	Dr Francis Hyera
16.40 -17.10	Discussions, Questions, Clarification on the visits.	
17.10 - 17.30	Group Assignment for the Visits.	Dr Francis Hyera
17.30	**END DAY ONE**	

Day 2: Wednesday 23 November 2005 ***Pretoria Academic Hospital site visit & HCW Disposal site visit***		
17.00	**END DAY TWO**	
Day 3: Thursday 24 November 2005		
08.00 - 8.30	Review of day two visits - group presentations and discussions	Ms Bronwyn Pearce & Ms Nomphelo Daniel
08.30 - 09.00	Communication tools for Better Public Health Management.	Ms Bronwyn Pearce
09.00 - 09.10	Discussion	
09.10 - 09.40	Results of Waste Management Assessment in Africa 2003	Dr Francis Hyera?
09.40 - 09.50	Discussions	
09.50 - 10.20	Waste water management	Dr Francis Hyera
10.20 - 10.30	Discussion	
10.30 - 11.00	***TEA***	
11.00 - 11.30	All participants mention HCW problems from their environments/ countries. All problems will be prioritized & grouped under different scenarios under the facilitator.	Mr Zama
11.30 - 13.00	Groups discussion per scenario & come up with solutions including a business plan.	Mr Zama
13.00 - 14.00	***LUNCH***	
14.00 - 15.00	Groups discussion per scenario & come up with solutions including a business plan.	Mr Zama
15.00 - 15.30	Group presentation & discussion on solutions and business plan.	
15.30 - 15.45	TEA	
15.45 - 16.15	Group presentation & discussion on solutions and business plan.	Mr Zama
16.15 - 16.45	Concerns towards Incineration study	
16.45 - 17.00	Discussions	
17.00	**END DAY THREE**	

Day 4: Friday 25 November 2005		
08.30 - 08.30	Legislation on Health Waste Disposal	Mr Zama
08.30 - 08.40	Discussion	
09.40 - 09.10	Worker's health and safety and emergencies	Dr Francis Hyera
09.10 - 09.20	Discussion	
09.20 - 09.50	Waste management related cost	Dr Francis Hyera
09.50 - 10.00	Discussion	
10.00 - 10.15	***TEA***	
10.15 - 11.00	Principles of Supply management	Dr Francis Hyera
11.00 - 11.15	Discussion	
11.15 - 11.45	Training of HCW on Healthcare Waste Management	Dr Francis Hyera
11.45 - 12.00	Discussion	
12.00 - 12.30	Course Evaluation	Ms Nomphelo Daniel
12.30 - 13.00	***COURSE CLOSURE***	Dr John Mbogoma

BRIEF ABOUT THE BCRC SERVING THE ENGLISH SPEAKING AFRICA

Basel Convention Regional Centre Pretoria for English-speaking African Countries

PRESENTATION
TO
A
HEALTHCARE WASTE MANAGEMENT
COURSE
PRETORIA
SOUTH AFRICA
22nd November 2005

1

BRIEF
ABOUT THE BASEL CONVENTION REGIONAL CENTRE SERVING THE ENGLISH SPEAKING AFRICA

by
John Mbogoma PhD
Executive Director
Basel Convention
Regional Centre
Pretoria

2

Basel Convention Regional Centre Pretoria for English-speaking African Countries

WHAT YOU WILL KNOW

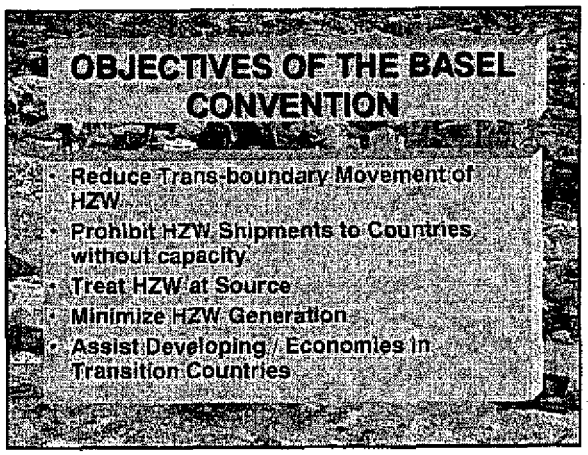
1) Brief history of the Centre
2) Its accomplishments
3) New mandates of BCRCs for MEAs and Nepa

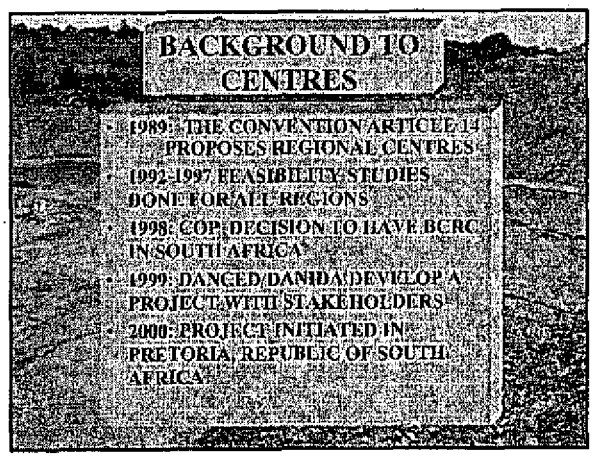
3

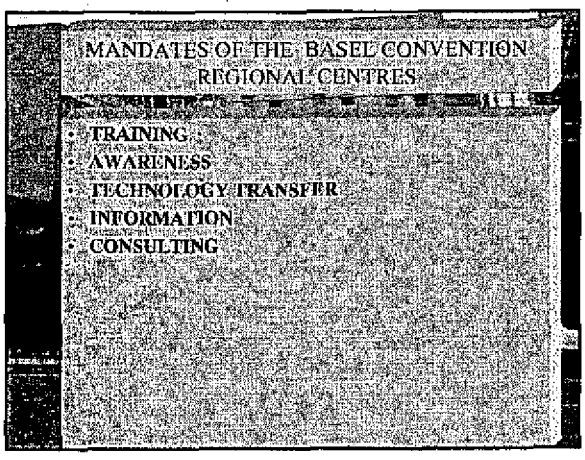
BACKGROUND TO THE BASEL CONVENTION

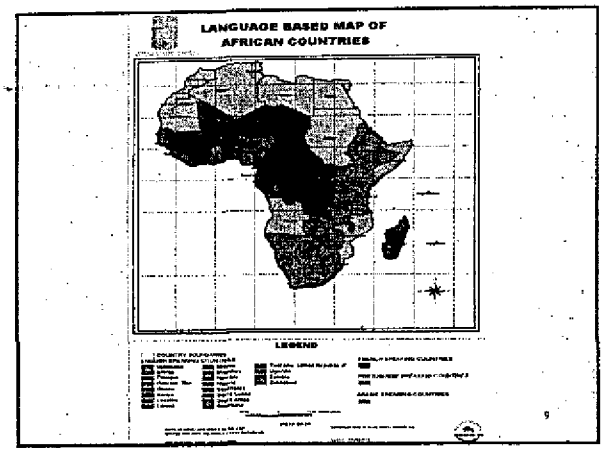
- Global Environmental Treaty
- 165 Parties
- Adopted (22 March 1989)
- Came into Force (5 May 1992)

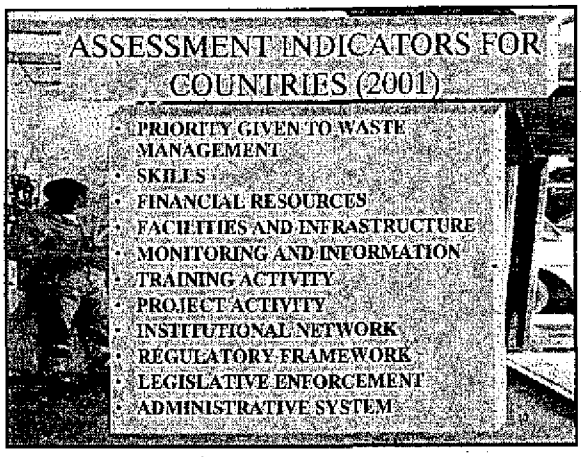

BASEL CONVENTION
EXTRA
PETROL
AIMS AT PROTECTING HUMAN HEALTH AND THE ENVIRONMENT FROM ADVERSE EFFECTS DUE TO GENERATION, TRANSBOUNDARY MOVEMENT AND MANAGEMENT OF HZW & OTHER WASTES

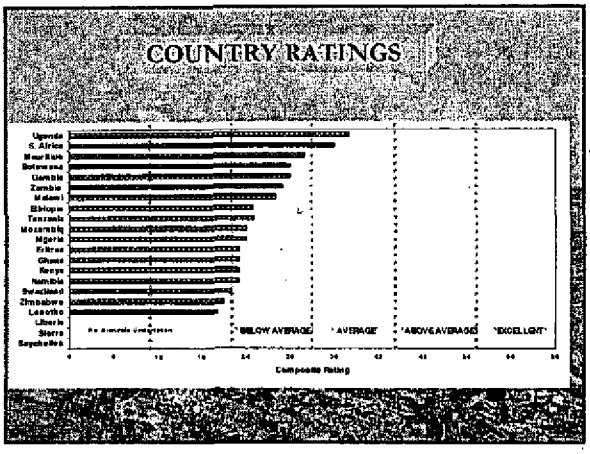

OBJECTIVES OF THE BASEL CONVENTION
Reduce Trans-boundary Movement of HZW
Prohibit HZW Shipments to Countries without capacity
Treat HZW at Source
Minimize HZW Generation
Assist Developing / Economies in Transition Countries

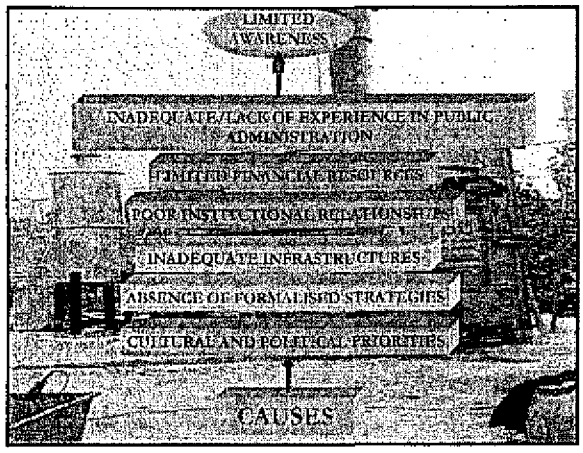

BACKGROUND TO CENTRES
1989: THE CONVENTION ARTICLE 14 PROPOSES REGIONAL CENTRES
1992-1997: FEASIBILITY STUDIES DONE FOR ALL REGIONS
1998: COP DECISION TO HAVE BCRC IN SOUTH AFRICA
1999: DANCED/DANIDA DEVELOP A PROJECT WITH STAKEHOLDERS
2000: PROJECT INITIATED IN PRETORIA, REPUBLIC OF SOUTH AFRICA

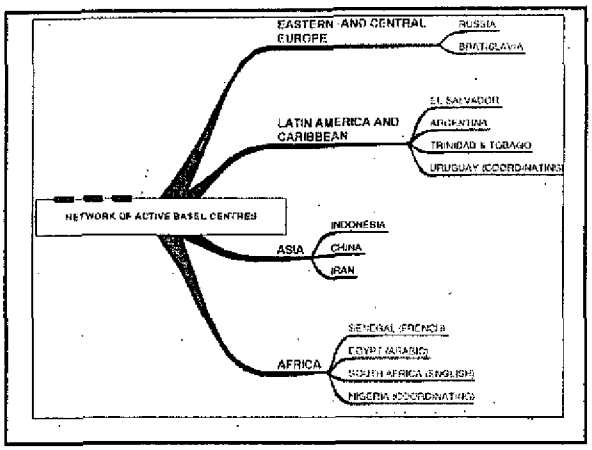

MANDATES OF THE BASEL CONVENTION REGIONAL CENTRES
TRAINING
AWARENESS
TECHNOLOGY TRANSFER
INFORMATION
CONSULTING

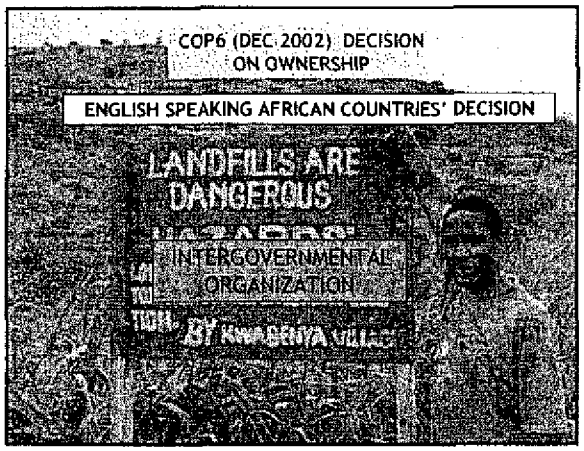

LANGUAGE BASED MAP OF AFRICAN COUNTRIES
LEGEND


ASSESSMENT INDICATORS FOR COUNTRIES (2001)
PRIORITY GIVEN TO WASTE MANAGEMENT
SKILLS
FINANCIAL RESOURCES
FACILITIES AND INFRASTRUCTURE
MONITORING AND INFORMATION
TRAINING ACTIVITY
PROJECT ACTIVITY
INSTITUTIONAL NETWORK
REGULATORY FRAMEWORK
LEGISLATIVE ENFORCEMENT
ADMINISTRATIVE SYSTEM


COUNTRY RATINGS
BELOW AVERAGE
AVERAGE
ABOVE AVERAGE
EXCELLENT
Composite Rating


LIMITED AWARENESS
INADEQUATE/LACK OF EXPERIENCE IN PUBLIC ADMINISTRATION
LIMITED FINANCIAL RESOURCES
POOR INSTITUTIONAL RELATIONSHIPS
INADEQUATE INFRASTRUCTURES
ABSENCE OF FORMALISED STRATEGIES
CULTURAL AND POLITICAL PRIORITIES
CAUSES





APPROACH TO ACTIVITIES

- EACH ACTIVITY IS DONE IN COLLABORATION WITH THE HOST COUNTRY
- A SCOPING VISIT IS A PREREQUISITE TO GAINING SUPPORT AND CREATING AWARENESS
- TRAINING IS BASED ON AFRICAN SITUATIONS AND CASE STUDIES
- INVOLVEMENT OF LINKAGE NETWORKS IS ENCOURAGED
- HOST COUNTRIES ARE ENCOURAGED TO PROVIDE OR OBTAIN PARTIAL FUNDING
- EACH COURSE IS EVALUATED
- A RECORD IS KEPT OF ALL OPERATIONAL TRANSACTIONS

SOME PRODUCTS

- WEBSITE AT www.baselpretoria.org.za
- SPECIAL COUNTRY AND TOPIC SPECIFIC CDs
- INFORMATION BROCHURES
- REPORTS OF VARIOUS TRAINING SESSIONS UNDERTAKEN FROM 2001 TO 2003

TRAINING COURSES/WORKSHOPS ALREADY HELD BY 2002

- HAZARDOUS WASTE SEMINARS FOR SENIOR DECISION MAKERS IN KENYA AND TANZANIA
- HZWM FOR LINKAGE INSTITUTIONS AND FOCAL POINTS (PRETORIA X2)
- REGIONAL GENERAL HAZARDOUS WASTE MANAGEMENT COURSES (UGANDA/GHANA)
- COUNTRY SPECIFIC MEDICAL WASTE COURSES (ZAMBIA/GAMBIA/MAURITIUS)

TRAINING COURSES/WORKSHOPS

- WASTE REGULATION WORKSHOP IN MAURITIUS
- WASTE OIL MANAGEMENT- CAPE TOWN
- REGIONAL COURSE ON GENERAL HAZARDOUS WASTE IN MOZAMBIQUE
- COURSES ON INITIATION OF PROJECTS AND PROJECT PROPOSALS (PRETORIA)

COURSES/WORKSHOP

- COUNTRY SPECIFIC COURSES ON TRANSPORT OF HAZARDOUS WASTE AFRICA (BOTSWANA/SOUTH AFRICA/NIGERIA)
- COURSES ON INITIATION OF PROJECTS AND PROJECT PROPOSALS (SOUTH AFRICA, NIGERIA)
- COMMERCIAL COURSE IN HAZARDOUS WASTE MANAGEMENT FOR THE INDUSTRY (South Africa)
- TRAINING OF TRAINERS IN HZW (Pretoria)

SIGNIFICANT ACHIEVEMENTS

- **INCREASED AWARENESS OF THE CENTRE AND ITS SERVICES**
- **INCREASED AWARENESS ABOUT HAZARDOUS WASTE MANAGEMENT**
- **INCREASED COMMITMENT OF RESOURCES BY CERTAIN COUNTRIES**
- **IMPROVED WORKING RELATIONSHIPS BETWEEN FOCAL POINTS AND LINKAGE INSTITUTIONS**
- **SELF-INITIATION OF PROJECTS BY SOME COUNTRIES**
- **1400 TRAINEES BENEFITED BETWEEN 2001-2005 THROUGH 43 TRAINING SESSIONS**

AFRICAN BASEL CONVENTION REGIONAL CENTRES REGENT MANDATE

AMCEN ENDORSED IN NOVEMBER 2002 AND REQUESTED COPS OF THE BASEL CONVENTION IN DECEMBER 2002 TO ENDORSE THE FOLLOWING

AFRICAN BASLE CONVENTION REGIONAL CENTRES RECENT MANDATE

AFRICAN RCRCS TO UNDERTAKE CAPACITY BUILDING ACTIVITIES

- WITHIN THE NEPAD ENVIRONMENTAL INITIATIVES
- WITH RELATED MEAs

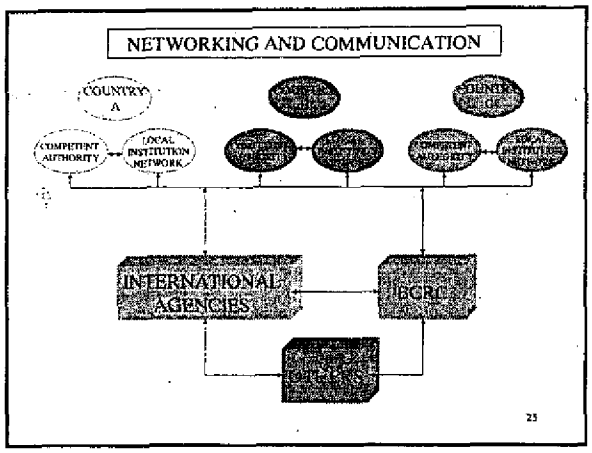
WITHIN THE SCOPE OF ENVIRONMENTALLY SOUND MANAGEMENT OF HAZARDOUS WASTE AND OTHER WASTES

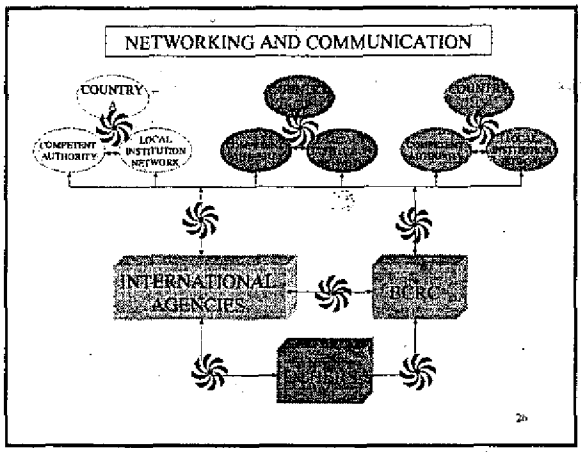
AFRICAN BASEL CONVENTION REGIONAL CENTRES PRESENT AND FUTURE ROLES

- TRAINING/HUMAN RESOURCE DEVELOPMENT
- TECHNOLOGY TRANSFER
- INFORMATION
- CONSULTING
- AWARENESS

CONCLUSIONS

THE CHALLENGES BEFORE US IS TO CONTINUE TO PUT IN PRACTICE MEASURES TOWARDS SOUND MANAGEMENT OF HAZARDOUS WASTE SO AS TO MAKE OUR HEALTH AND THE ENVIRONMENT SAFE


NETWORKING AND COMMUNICATION
COUNTRY A
COMPETENT AUTHORITY
LOCAL INSTITUTION NETWORK
INTERNATIONAL AGENCIES
IBCRC
25


NETWORKING AND COMMUNICATION
COUNTRY
COMPETENT AUTHORITY
LOCAL INSTITUTION NETWORK
INTERNATIONAL AGENCIES
IBCRC


THANK YOU

GENERAL OVERVIEW

OF

HAZARDOUS WASTE MANAGEMENT

General Overview of Hazardous Waste Management

Nomphelo Daniel, Training Coordinator, BCRC

Contents

1. Definition of Hazardous Waste
2. Classification of Waste: International & National
3. Identification & Properties of HZW
4. Chemicals & Environment
5. Handling, Labeling & Transportation of HZW
6. Treatment & Disposal of Scheduled Wastes
7. Public, Industry & Government awareness
8. Landfill Disposal
9. International Treaties
10. Regulatory Framework

Definition of Hazardous Waste

- An inorganic or organic element or compound that, because of its toxicological, physical, chemical or persistency properties, may exercise detrimental acute or chronic impacts on human health and the environment. It can be generated from a wide range of commercial, industrial, agricultural and domestic activities and may take form of liquid, sludge or solid.
- These characteristics contribute not only to degree of hazard, but are also of great importance in the ultimate choice of a safe and environmentally acceptable disposal method.
- Hazardous Waste needs stringent control and management, to prevent harm or damage and hence liabilities.
- Where there is doubt about potential danger of waste stream to man or environment, the Precautionary Principle is applied, waste is regarded as Hazardous.

Classification of Waste: Basel Convention

- Wastes are classified according to the categories listed in Annex I and bear the characteristics listed in Annex III of the Convention. (Annexes I, II & III of the Basel Convention are attached)

Classification of Waste: National (1)

- Each Party shall, within six months of becoming a Party to the BC, inform the SBC of the wastes, other than those listed in Annexes I and II, considered or defined as hazardous under its national legislation and of any requirements concerning transboundary movement procedures applicable to such wastes.
- 4 steps in classification of a Hazardous Waste *viz*:
  - ✓ **Identification** of a waste as probably hazardous
  - ✓ **Testing and analysis** to determine hazardous properties, characteristics and waste components
  - ✓ **Classification & treatment** according to SABS Code 0228
  - ✓ **Analysis and Hazard Rating** of waste or its residue in order to determine appropriate disposal method.

Classification of Waste: National (2)

- **The SABS Code 0228 gives the hazardous substance an identification number and are divided into 9 classes *viz*:**
  - ✓ **Class 1:** Explosives
  - ✓ **Class 2:** Gases
  - ✓ **Class 3:** Flammable liquids
  - ✓ **Class 4:** Flammable solids
  - ✓ **Class 5:** Oxidising substances & organic peroxides
  - ✓ **Class 6:** Toxic & infectious substances
  - ✓ **Class 7:** Radioactive substances
  - ✓ **Class 8:** Corrosives
  - ✓ **Class 9:** Other miscellaneous substances

Healthcare Waste Classification

- **DWAF Minimum Requirements for the Handling, Classification & Disposal of HZW**, classify HCW as Toxic and Infectious wastes (Class 6)
- **In the BC Text, HCW is listed in Annex I among the categories of waste to be controlled as**
  - ✓ **Y1** - Clinical wastes from medical care in hospitals, medical centres and clinics
  - ✓ **Y2** - Wastes from the production and preparation of pharmaceutical products
  - ✓ **Y3** - Waste pharmaceuticals, drugs and medicines

Identification & Properties of HZW

- Industrial sources of HZW
- Determining properties of HZW
- Sampling procedures for HZW
- Potential risks associated with HZW
- Safety precautions to be followed when handling HZW

Chemicals & Environment

- Benefits associated with use of chemicals
- Responsibility for proper management of chemicals and their wastes
- Chemicals implicated in:
  - ✓ impaired immune functions, birth defects
  - ✓ Chemicals deplete ozone layer, affect climate change
  - ✓ Accumulate in poorly managed stockpiles and waste sites, thus affect biodiversity

Handling, Labeling & Transport of HZW

- Proper methodologies on storage and handling of HZW and implementation of emergency response plans
- Ensure that wastes properly handled; i.e. (segregated, stored, packaged, labeled and accompanied by correct information during transport).
- Understand requirements for record keeping
- Importance of emergency response plan i.r.t. spillages and accidents

Treatment & Disposal of Scheduled Wastes

- Wastes should be treated & disposed of in a manner that ensures reduction of risks to human health and environment, and the following should be considered:
  - ✓ Principles of waste management hierarchy
  - ✓ Resource recovery techniques
  - ✓ Treatment processes
  - ✓ Disposal methods for different waste categories.

Public, Industry & Government awareness

- Limited awareness in the stakeholder countries.
- Important for purposes of sound institutional arrangements.

Landfill Disposal

- Different disposal options for HZW.
- Disposal of HZW on land.
- Construction, use and maintenance of engineered landfill sites.

International Conventions & Organizations

- International treaties & organizations involved in HZWM e.g. UNEP, AU, OECD, EU etc.
- Chronology of developments to and from Basel Convention.
- Basel Convention and its amendments
- Bamako Convention
- Stockholm Convention
- Rotterdam Convention

Regulatory Framework

- The SA Government has since 1996 recognised the principle of sustainable development as framework for economic, social and environmental policy and has since amongst others put the following regulatory framework in place:
- Section 24 of the Constitution of South Africa
- White Paper on Environmental Management Policy
- National Environmental Management Act (NEMA)
- Integrated Pollution & Waste Management (IP & WM)
- National Waste Management Strategy (NWMS)

References

- Minimum Requirements for Handling, Classification and Disposal of Hazardous Waste; 2nd Edition; 1998; Department of Water Affairs & Forestry
- www.basel.int
- www.pops.int
- www.pic.int

Rotterdam Convention

- The Rotterdam Convention is a multilateral environmental agreement designed to promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals, in order to protect human health and the environment from potential harm and to contribute to their environmentally sound use by facilitating information exchange about their characteristics, providing for a national decision-making process on their import and export and disseminating these decisions to Parties.

Stockholm Convention

- The Stockholm Convention is a global treaty to protect human health and the environment from persistent organic pollutants (POPs). POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of living organisms and are toxic to humans and wildlife. POPs circulate globally and can cause damage wherever they travel. In implementing the Convention, Governments will take measures to eliminate or reduce the release of POPs into the environment.

Basel Convention

- Basel Convention controls transboundary movement of Hazardous Wastes and their disposal
- Adopted by the Conference of the Plenipotentiaries on 22 March 1989
- Entry into force in May 1992

Bamako Convention

- Puts a ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa (1991)
- Not yet in force

Annex I

CATEGORIES OF WASTES TO BE CONTROLLED

Waste Streams

Y1	Clinical wastes from medical care in hospitals, medical centers and clinics
Y2	Wastes from the production and preparation of pharmaceutical products
Y3	Waste pharmaceuticals, drugs and medicines
Y4	Wastes from the production, formulation and use of biocides and phytopharmaceuticals
Y5	Wastes from the manufacture, formulation and use of wood preserving chemicals
Y6	Wastes from the production, formulation and use of organic solvents
Y7	Wastes from heat treatment and tempering operations containing cyanides
Y8	Waste mineral oils unfit for their originally intended use
Y9	Waste oils/water, hydrocarbons/water mixtures, emulsions
Y10	Waste substances and articles containing or contaminated with polychlorinated biphenyls (PCBs) and/or polychlorinated terphenyls (PCTs) and/or polybrominated biphenyls (PBBs)
Y11	Waste tarry residues arising from refining, distillation and any pyrolytic treatment
Y12	Wastes from production, formulation and use of inks, dyes, pigments, paints, lacquers, varnish
Y13	Wastes from production, formulation and use of resins, latex, plasticizers, glues/adhesives
Y14	Waste chemical substances arising from research and development or teaching activities which are not identified and/or are new and whose effects on man and/or the environment are not known
Y15	Wastes of an explosive nature not subject to other legislation
Y16	Wastes from production, formulation and use of photographic chemicals and processing materials
Y17	Wastes resulting from surface treatment of metals and plastics
Y18	Residues arising from industrial waste disposal operations

Wastes having as constituents:

Y19	Metal carbonyls

Y20	Beryllium; beryllium compounds
Y21	Hexavalent chromium compounds
Y22	Copper compounds
Y23	Zinc compounds
Y24	Arsenic; arsenic compounds
Y25	Selenium; selenium compounds
Y26	Cadmium; cadmium compounds
Y27	Antimony; antimony compounds
Y28	Tellurium; tellurium compounds
Y29	Mercury; mercury compounds
Y30	Thallium; thallium compounds
Y31	Lead; lead compounds
Y32	Inorganic fluorine compounds excluding calcium fluoride
Y33	Inorganic cyanides
Y34	Acidic solutions or acids in solid form
Y35	Basic solutions or bases in solid form
Y36	Asbestos (dust and fibres)
Y37	Organic phosphorus compounds
Y38	Organic cyanides
Y39	Phenols; phenol compounds including chlorophenols
Y40	Ethers
Y41	Halogenated organic solvents
Y42	Organic solvents excluding halogenated solvents
Y43	Any congenor of polychlorinated dibenzo-furan
Y44	Any congenor of polychlorinated dibenzo-p-dioxin
Y45	Organohalogen compounds other than substances referred to in this Annex (e.g. Y39, Y41, Y42, Y43, Y44)

(a) To facilitate the application of this Convention, and subject to paragraphs (b), (c) and (d), wastes listed in Annex VIII are characterized as hazardous pursuant to Article 1,

paragraph 1 (a), of this Convention, and wastes listed in Annex IX are not covered by Article 1, paragraph 1 (a), of this Convention.

(b) Designation of a waste on Annex VIII does not preclude, in a particular case, the use of Annex III to demonstrate that a waste is not hazardous pursuant to Article 1, paragraph 1 (a), of this Convention.

(c) Designation of a waste on Annex IX does not preclude, in a particular case, characterization of such a waste as hazardous pursuant to Article 1, paragraph 1 (a), of this Convention if it contains Annex I material to an extent causing it to exhibit an Annex III characteristic.

(d) Annexes VIII and IX do not affect the application of Article 1, paragraph 1 (a), of this Convention for the purpose of characterization of wastes.[1]

[1] Decision IV/9 adopted by the Conference of Parties at its fourth meeting modified Annex I by adding paragraphs (a), (b), (c) and (d) at the end of Annex I. The amendments under Decision IV/9 entered into force on 6 November 1998.

Annex II

CATEGORIES OF WASTES REQUIRING SPECIAL CONSIDERATION

Y46	Wastes collected from households
Y47	Residues arising from the incineration of household wastes

Annex III

LIST OF HAZARDOUS CHARACTERISTICS

UN Class[2]	Code	Characteristics
1	H1	Explosive An explosive substance or waste is a solid or liquid substance or waste (or mixture of substances or wastes) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings.
3	H3	Flammable liquids The word "flammable" has the same meaning as "inflammable". Flammable liquids are liquids, or mixtures of liquids, or liquids containing solids in solution or suspension (for example, paints, varnishes, lacquers, etc., but not including substances or wastes otherwise classified on account of their dangerous characteristics) which give off a flammable vapour at temperatures of not more than 60.5°C, closed-cup test, or not more than 65.6°C, open-cup test. (Since the results of open-cup tests and of closed-cup tests are not strictly comparable and even individual results by the same test are often variable, regulations varying from the above figures to make allowance for such differences would be within the spirit of this definition.)
4.1	H4.1	Flammable solids Solids, or waste solids, other than those classed as explosives, which under conditions encountered in transport are readily combustible, or may cause or contribute to fire through friction.
4.2	H4.2	Substances or wastes liable to spontaneous combustion Substances or wastes which are liable to spontaneous heating under normal conditions encountered in transport, or to heating up on contact with air, and being then liable to catch fire.
4.3	H4.3	Substances or wastes which, in contact with water emit flammable gases Substances or wastes which, by interaction with water, are liable to become spontaneously flammable or to give off flammable gases in dangerous quantities.
5.1	H5.1	Oxidizing Substances or wastes which, while in themselves not necessarily combustible, may, generally by yielding oxygen cause, or contribute to, the combustion of other materials.
5.2	H5.2	Organic Peroxides

[2] Corresponds to the hazard classification system included in the United Nations Recommendations on the Transport of Dangerous Goods (ST/SG/AC.10/1Rev.5, United Nations, New York, 1988).

		Organic substances or wastes which contain the bivalent-o-o-structure are thermally unstable substances which may undergo exothermic self-accelerating decomposition.
6.1	H6.1	Poisonous (Acute) Substances or wastes liable either to cause death or serious injury or to harm health if swallowed or inhaled or by skin contact.
6.2	H6.2	Infectious substances Substances or wastes containing viable micro organisms or their toxins which are known or suspected to cause disease in animals or humans.
8	H8	Corrosives Substances or wastes which, by chemical action, will cause severe damage when in contact with living tissue, or, in the case of leakage, will materially damage, or even destroy, other goods or the means of transport; they may also cause other hazards.
9	H10	Liberation of toxic gases in contact with air or water Substances or wastes which, by interaction with air or water, are liable to give off toxic gases in dangerous quantities.
9	H11	Toxic (Delayed or chronic) Substances or wastes which, if they are inhaled or ingested or if they penetrate the skin, may involve delayed or chronic effects, including carcinogenicity.
9	H12	Ecotoxic Substances or wastes which if released present or may present immediate or delayed adverse impacts to the environment by means of bioaccumulation and/or toxic effects upon biotic systems.
9	H13	Capable, by any means, after disposal, of yielding another material, e.g., leachate, which possesses any of the characteristics listed above.

HEALTHCARE WASTE MANAGEMENT

TRAINING

Health Care Waste Management Training

BCRC Pretoria , 22 – 25 November 2005

Basel Convention Regional Centre
Pretoria
for English-speaking African countries

INTRODUCTION

The management of health care waste is an issue that is being looked upon from both a public and an environmental point of view. Such different perspectives may lead to gaps in visions and understanding, and even definitions. It is joint responsibility of World Health Organisation (WHO) and the Secretariat of the Basel Convention (SBC) to harmonise the different view points, and develop a common approach for the preparation of national health care waste management plans, that address both the health and waste management dimensions.

Health–care activities lead to the production of waste that may lead to adverse health effects. Most of the waste is not more dangerous than regular household waste. However, some types of health-care waste represent a higher risk to health. These include infectious waste (15% to 25% of total health-care waste) among which are sharps waste (1%), body part waste (1%), chemical and pharmaceutical waste (3%), and radioactive and cytotoxic waste or broken thermometers (less than 1%).

Sharps waste, although produced in small quantities, is highly infectious. Poorly managed, they expose health-care workers, waste handlers and the community to infections. Contaminated needles and syringes represent a particular threat and may scavenged from waste areas and dump sites and re-used. WHO has estimated that, in 2000, injections with contaminated syringes caused:

- 21 million hepatitis B virus (HBV) infections (32% of all new infections)
- 2 million hepatitis C virus (HCV) infections (40% of all new infections)
- 260 000 HIV infections (5% of all new infections).
- 501.000 deaths in 2000 due to unsafe injection practices in the past.

Epidemiological studies indicate that a person who experiences one needle-stick injury from a needle used on an infected source patient has risks of 30%, 1.8% and 0.3% respectively to become infected with HBV, HCV and HIV. In 1998, WHO estimated that the proportion of health-care facilities that do not use proper waste disposal methods ranges from 18% to 64% world-wide.

This document forms part of the training course on HealthCare Waste Management (HCWM). It is prepared by the Basel Convention in collaboration with the John Snow Incorporation – Making Medical Injection Safer, South Africa. It aims to provide as a framework and guideline of some the training programmes provided by the institute. The programme contents include: General and practical general education on HCWM from its source of production, segregation, transportation, storage, treatment and disposal. HCWM terminologies and their definitions are provided. Besides, occupational health principles (e.g. the use of personal protective equipments – PPEs) and behavioural change are provided.

It is the aim of this document therefore, to provide an overview of the training framework on the whole HCWM system from its source of production, segregation, storage, transportation, treatment to its final disposal and legislation principles. All steps in HCWM including definitions are elaborated for better understanding. It also includes "Occupational Health principles" especially in personal protective equipments (PPEs) and behavioural change and awareness creation towards HCWM.

Education and Training:

Old approach;

The system for educating and training workers, professionals and managers for the waste management institution was totally inadequate. It had the following characteristics

- Due to narrow focus of policy in the past it acquired few trained staff
- Previous labour policy favoured the use of unskilled and untrained labourers.
- The former apprenticeship programmes and other methods for passing skill onto young workers broke down in the late 1970s and 1980s
- Former education policy focused on memorisation of facts and mastering routine tasks and did not prepare staff for engaging in the type of critical thinking and problem solving activities required of all staff to implement modern management systems including HCWM.

New Approach:

In order to implement current HCWM policy requires.

- Larger workforce that is trained in a variety of multidisciplinary skills at all levels from entry level to senior management (in government and institutions) capable of critical thinking and problem solving activities required of all staff to implement modern management systems including HCWM
- Requires that government decision makers are aware of HCWM issues and their implications to the environment, economic growth and the health and safety of the health-care and other workers:
- Requires the broader participation of the population

The South African government, the Basel Convention, John Snow Inc, the Institute for Waste Management for Southern Africa (IWMSA) and others have conducted a number of skills needs assessment surveys. These have identified many critical areas of need: most of them are addressed in this first short course which includes policy makers, managers, administrators, trainers and technicians etc. It will be therefore very important for the participants of this course to attend the second programme early next year.

Basel Convention Regional Centre
Pretoria
for English-speaking African countries

Infection Prevention and Control and Injection Safety

Francis Hyera; MD

Modes of disease transmission

- Inhalation
- Direct contact
- Inoculations
- Ingestion
- Injection safety focus on inoculation method. Picture

Definition of Injection Safety

- A safe injection is one that is given using appropriate equipment, does not harm recipient, does not expose the provider to any avoidable risk and does not result in any waste that is dangerous for other people.

Objectives

- Define hospital acquired infections
- Define infection prevention and control
- Discuss modes of disease transmission
- Define injection safety
- Discuss the relationship between infection prevention and control and injection safety

Definitions

- **Hospital acquired infections:**
  - Infections acquired during the delivery of healthcare while receiving treatment from or visiting a health facility.
- **Infection prevention and control:**
  - Policies and procedures to minimize the risk of spreading infections, especially in hospitals and human or health care facilities

Relationship between Infection prevention & control &injection safety

- Injection safety is an integral component of infection prevention & control
- It is an element of Standard Precaution
- It is a key element of healthcare worker safety
- It is supported by infection prevention & control policies and procedures as:
  - Hand hygiene
  - House keeping
  - Waste management
- It is a critical item of the continuous quality improvement (CQI) programme. (managed by infection prevention & control healthcare team)

Risks associated with unsafe Injection Practices

- Risks include:
  - *Transmission of infections:* inoculation of infectious agents into the patient's body.
  - *Paralysis:* drugs into nerves
  - *Drug reactions:* anaphylaxis shock – sudden collapse of circulatory system
- Diseases/conditions transmitted:
  - Hepatitis B & C
  - HIV/AIDS
  - Abscesses
  - Hemorrhagic fevers
  - Malaria
  - Tetanus
- Risk groups
  - Patients/clients esp. immuno-comprised persons
  - Healthcare workers
  - Healthcare waste management personnel
  - Communities
  - Drug users

Conditions causing risks i

Providers	Patients/clients	Community
Inadequate supply of appropriate sharps container Unsafe practices that lead to needle stick injuries when: Recapping needles Manipulating used sharps (bending, breaking or cutting hypodermic needles) Passing on sharps from one healthcare worker to another Sharps are found in unexpected places like linen Patient/client suddenly moves during administering an injection.	Use of injections when there are other suitable alternatives Reuse of injection equipment Self-medication Sharps are found in unexpected places like linen Patient/client suddenly moves during administering an injection When contaminated drug is administered When aseptic technique is not observed by healthcare worker Administration of the drug at incorrect anatomical site	Unsafe waste disposal practices such as: Non-secure waste site (should be fenced) improperly placed disposal site (away from people, crops, water sheds) improperly disposed waste (pit too shallow, incinerator overflowing, open dumping) Reused syringes Sharing syringes.

Conditions causing risks ii

Providers	Patients/clients	Community
	Accidental switching of drugs Expired drugs Package is damaged or compromised.	

Regional burden of infections caused by unsafe injections

Infections due to unsafe injections	Africa (AFRO)	Region of the Americas	Eastern Mediterranean (EMRO)	European (EURO)	South East Asia (SEAR)	Western Pacific (WPRO)	The World
HBV	10.9%	2.3%--9.3%	58.3%	0.9%	22.4%--53.6%	33.6%	31.9%
HCV	16.4%	0.9%--9.2%	81.7%	0.9%--21.2%	30.8%--59.5%	37.6%	39.9%
HIV	2.5%	0.2%--1.5%	7.1%	0.6%	7.0%--24.3%	2.5%	5.4%

Proportion of infections & total disease burden caused by unsafe injection practices annually, 2000.

Infections	Estimated burden of infections due to unsafe injection practices	Estimated proportion of infections due to unsafe injection practices
Hepatitis B	21 million new cases	32%
Hepatitis C	2 million new cases	40%
HIV/AIDS	260,000 new cases	5%
Deaths in 2000 due to unsafe injection practices on the past, 501,000 deaths		

Global burden of Unsafe Injection Practices

Key Points

- Global burden of unsafe injection practices (21 million HBV, 2 million HCV, 260,000 HIV/AIDS cases).
- 16 billion injections are given each year in developing and transitional countries.
- 90 to 95% of injections are therapeutic; 5-10% is given for immunization.
- 70% of these injections are unnecessary; oral medications could have been prescribed.
- Consequences of unsafe injections lead to death and disability
- WHO (2000) estimates that 501,000 deaths have occurred because of unsafe injection practices.

Healthcare Waste Management

Francis Hyera; MD

Basel Convention Regional Centre
Pretoria
for English-speaking African countries

HCW Management

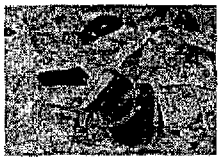
- Objectives:
- Understand issues related to healthcare waste
- Understand the effects of healthcare waste on people & environment
- Demonstrate knowledge of proper process of healthcare waste management + hbc infectious waste
- Develop a waste management plan
- Improve communication amongst staff on healthcare waste management related problems

Definition & Classification of Waste

- WHO defines healthcare waste as a total waste stream from healthcare or research facility that includes both potential risk waste and non-risk waste materials.
- Classification of healthcare waste:
- 80% - general waste – not harmful. Also referred as "Low risk".
- 20% - Dangerous – referred as "Risk waste"
- 1% - of risk waste is Sharps waste.

Health Care Waste (HCW)

WHO definition: Health care waste includes all the waste generated by health-care establishments, research facilities, and laboratories. In addition, it includes the waste originating from "minor" or "scattered" sources - such as that produced in the course of health care undertaken in the home (dialysis, insulin injections, etc.)



Health Care Activities

- Healthcare human activities generating waste:
- Diagnosis
- Treatment
- Prevention of diseases
- Alleviation of disablement
- Associated research

Categories of Healthcare Waste

5.1 Risk Waste

Waste Category	*Description & examples*
Infectious	Waste suspected to contain pathogen e.g.: lab culture, isolation ward waste, tissues, (swabs), materials, equipment in contact with infected pts, excreta.
Pathological / Anatomical	Human tissues / fluids e.g. body parts, blood & other body fluids, fetuses.
Sharps	Sharps waste e.g.: Needles, infusion sets, scalpels, knives, blades, broken glass
Pharmaceutical waste	Waste with expired / no longer needed pharmaceuticals, items contaminated by or containing pharmaceuticals (boxes, bottles)
Genotoxic	Waste with genotoxic properties e.g. cytotoxic drugs (used in cancer therapy), genotoxic chemicals

Categories of Healthcare Waste

5.1 Risk Waste

Waste Category	*Description & examples*
Chemical	Waste with chemical substances; lab reagents, film developers, expired disinfectants / no longer in needed, solvents
Heavy metals	Batteries, broken thermometers, blood pressure gauges etc
Pressurized containers	Gas cylinders, gas cartridges, aerosol cans
Radioactive	Radioactive waste substances; unused liquids from radiotherapy or lab research, contaminated glassware, packages, urine & excreta of pts treated or tested with unsealed radionuclide.

Categories of Healthcare Waste

5.2 Low Waste

Waste Category	*Description & examples*
Communal Waste	All solid waste that does not contain high risk waste types (e.g. infectious, chemical, radioactive). Its waste from medical treatment or research centers and includes uncontaminated wastes such as office papers, bottles, boxes and packaging materials.

Major sources of health-care waste

- Hospitals – university hospitals, general hospital, district hospital
- Other health establishments – emergency medical care, health care centres, obstetric & maternity clinics, OPD clinics, dialysis centres, First Aid posts, transfusion centres, military medical services
- Related lab & research centers – medical & biomedical labs, biotechnology labs & institutions, MRC
- Mortuary & autopsy centers
- Animal research & testing centers
- Blood banks & collection services
- Nursing homes for the elderly.

Minor sources of health-care waste

- Small healthcare establishments – physicians' offices, dental clinics, acupuncturists, chiropractors
- Specialized health-care establishments & institutions with low waste generation – nursing homes, psychiatric hospitals, disabled persons' institutions.
- Non-health activities involving i/v or s/c interventions – cosmetic ear-piercing & tattoo parlors, illicit drug users
- Funeral services
- Ambulance services
- Home treatments

HCW Generation by Region

Region	Kg/bed/day
•North America	7 – 10
•Latin America	3
•Western Europe	3 – 6
•Eastern Europe	1.4 – 2
•Middle East	1.3 - 3
•East Asia High Income	2.5 – 4
•East Asia Middle Income	1.8 – 2.2

What is RISK

- The probability that the hazard of a substance will cause harm and severity of that harm.
- Hazardous properties include:
  - Containing infectious agents
  - Genotoxic
  - Containing hazardous chemicals / pharmaceuticals
  - Containing sharps

Risks & Hazards of Healthcare Waste

- Sharps & needle-stick injuries
- Transmission of infectious diseases: cholera, dysentery, hepatitis A, B, C, HIV/AIDS
- Reuse of some types of wastes, e.g. syringes & needles (accidental or intentional)
- Environmental pollution or degradation e.g. air, water, soil
- Exposure to radiation
- Fires
- Public nuisance (offensive smells, unsightly debris)
- Genotoxic affects
- Intoxication &
- Corrosion to skin with chemicals
- Shock sensitive

Who is at Risk?

- Doctors and nurses
- Patients
- Hospital support staff
- Waste collection and disposal staff
- General public.

Public Sensitivity

- Public sensitivity:
  - About incidents involving HCW
  - About visual impact of HCW
- Cultural practices should be taken into account in HCW management.

The Importance of Waste Disposal

- Minimize the spread of infection & reduces the risk of accidental injury to staff, patients, visitors & community
- Reduces likelihood of soil or ground water contamination with chemicals or micro-organisms
- Attracts fewer insects & rodents and does not attract animals
- Reduces odors
- Helps provide an aesthetically pleasing atmosphere

Treatment and Disposal of healthcare waste

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Aim of treatment and disposal:

- Limit health and environmental impacts by:
  - Transforming the waste into non-hazardous residues by treatment
  - Containing the waste / residues to avoid human exposure
  - Containing the waste / residues to avoid dispersion into the environment

Criteria for the options

- Prevailing international/ country regulations
- Available options in the region
- Quantities of generated waste categories
- Availability of qualified personnel
- Technologies available on the market
- Available options for disposal
- Environmental aspects
- Available space on hospital premises
- Related cost

Treatment and disposal options for waste

- **Treatment**
  - Incineration
  - Chemical disinfection
  - Autoclaving
  - Encapsulation
  - Microwave irradiation
- **Final disposal**
  - Municipal landfill
  - Burying inside premises
  - Discharge into sewer

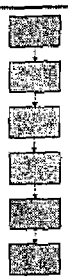
Incineration

- Reduces organic and combustible waste to inorganic incombustible waste (ashes)
- Reduces significantly waste volume and weight
- Residues are transformed to final disposal site
- Treatment efficiency depends on incineration temperature and type of incinerator
- Not all wastes can be incinerated
- Investment and operation costs vary greatly according to type of incinerator
- Produces combustion gases

Wastes not to be incinerated

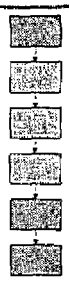
- Pressurized gas containers
- Large amounts of reactive chemical waste
- Radioactive waste
- Silver salts or radiographic waste
- Halogenated plastics eg PVC
- Mercury
- Ampoules of heavy metals

Steps in the disposal process



- Injection procedure/generation of waste
- Segregation/collection (needles/syringes, non sharps waste)
- Transportation in wards/to treatment site
- Storage on site/off site
- Treatment (thermal/mechanical/non thermal)
- Disposal or reuse of materials

Steps in the disposal process



- Injection procedure/generation of waste
- Segregation/collection
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Safe disposal – a technology approach

- Environmentally Sound Technologies (ref)
  - Reduce pollution compared to alternatives (acceptable)
  - Compatible with national policies and regulations (ie acceptable costs and risks)
  - Based on organizational " know how"
  - Are using working procedures in the hospital
  - Supported with local suppliers of parts and training
  - Can be maintained by local technologists
  - The organization has trained managers and workers
  - This is supported by a management system, ie, funds for maintenance, and capital budgeting for replacement.

Ref- Agenda 21 Chapter 34

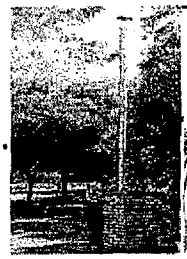
Incineration as a medical technology

- Infection control
  - Technology for waste disposal understood by MO and medical staff
  - Sterilization of waste by destroying pathogens
  - Temperatures of 650-1200 C for 0.3 to 2 seconds
  - Destruction of waste devices which will cause infection if used again, eg, needles and syringes
  - Destruction is rapid, waste build up can be avoided
  - Eliminates need for refrigeration
- Engineering solutions
  - Reduction of waste quantities for disposal in safety pits
  - 85-95% of volume and mass is reduced, combustible waste materials
  - Lower transport and handling costs, increased safety

Definition of an incinerator

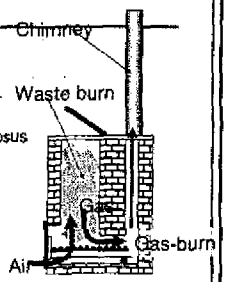
- Enclosed container (to maintain high temperature)
- Air and waste feed control (to control efficiency of combustion and avoid pathogens and toxins in the gaseous emissions)
- Chimney for release of burnt gases (above inhalation zone, and for dispersal – up to 1000 times), and to induce a draught which increases air speed and temperature
- Ash removal door

SSI option 1: built on-site



« Design optimized by DeMontfort »

Mark 8c » Cost: 700-3000$US



SSI option 1: built on-site

« DeMontfort »

Problematic...

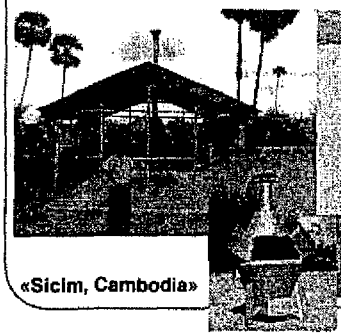
- Over-loading – molten plastic
- Lack of fuel/budget
- Fire-bricks not available
- No control over waste-stream
- Community complaints
- Illegal in some countries
- No systematic evaluation
- Bad siting and installation

SSI option 1: built on-site

Solutions

- Assigned, trained staff, supervision
  - Assure correct load
  - Control waste stream
- Provision of fuel/staff/maint budget
- Invest in imported fire-bricks
- Stakeholders in planning
  - Plan with env.authorities
  - Seek "Best Practicable Environment Option"
- High standard installation
  - Site away from community
- Organise systematic evaluations

SSI option 2: Manufactured product

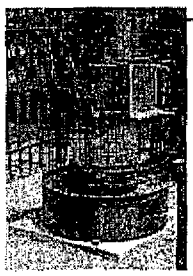


Compared to option 1...

- Control over standard of materials/ manufacture better
- Installation speed faster
- Working life probably longer
- But, cost usually higher

«Sicim, Cambodia»

SSI option 2: Manufactured product



Compared to Sicim...

- LP Gas driven
- Ease and speed of start-up faster
- Capacity smaller (2 boxes/15min. Cycle)
- Could be operated at health center but..
- Cost per workload high (11 cents per injection RSA) and...
- No current manufacturer!

« Medicin400 »

Milling-shredding

- Indonesian manufacturer
  - High cost, about 5000$US
  - 16 months blade maintenance cycle
- Requires 3-phase electricity
- 2 models: 375 or 750 syringes per hour (low capacity)
- With or without needles
- Produces high value powder for recuperation plant
- Loading needs optimization
- Evaluation by PATH in progress

Solar melting

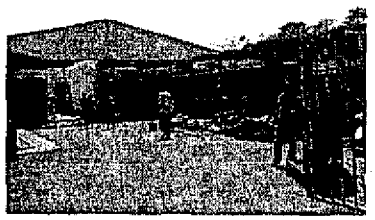
- Approx 300 syringes per hour in Senegal
- No fuel, no op.costs
- Low purchase cost (150-250 $US)
- No need for collection system
- Produces 0.5l 'cake'
- Requires design optimized for syringes
  - IT Power India

EG-Solar, Germany

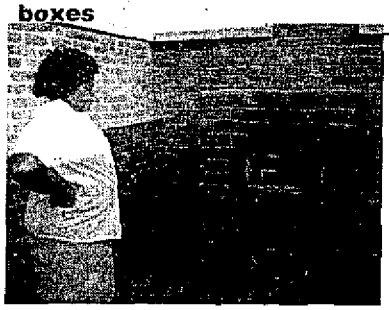
Electrical melting

- Processes infectious waste: organic/sharps
- 90 minutes at +165C to +195C
- 800wH of energy per cycle
- $US 2700 + replaceable carbon filters (1-3 yearly) + 4$US/cycle disposable containers
- Designed for the US market - FDA approved

Adjacent to working area and wards; smoking incinerator not used

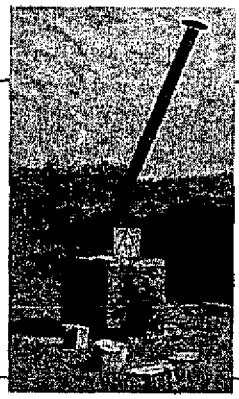


Door too small to accept safety boxes



Weekly burn at Rural PHC

Kenya MoH contract



Alternatives to incineration

- Wet thermal disinfection 60 minutes, 121 C, 1 bar steam, 0.020 to 80m3 volume, disposal to landfill
- Microwave Combustion volumes (0.02 to 0.1 m3) 20 *minutes with water, disposal to landfill*
- Shred and chemical disinfection, disposal of liquids to sewer and solids to landfill
  - Maybe some volume reduction, but no mass reduction
- Part of integrated waste management systems!

Ref WHO- safe management of wastes from HC Activities

Types of incinerators

- Rotary Kilns 1200 – 1600 C
- Double chamber pyrolitic incinerators – burning temperature 800 – 900 C
- Single chamber furnaces with static grate 300 – 400 C
- Simple field incinerators <300 C

Incinerator applications

- Municipal incinerators
- Incinerators for industrial waste
- On-site incinerators (on hospital premises)
- Regional incinerators
- Furnaces for industrial application (eg cement industry)

Hcw incineration in municipal incinerators

- Check packaging on delivery to plant
- Special incinerator loading required
- Should NOT be placed in bunker
- Automatic loading devices recommended
- No longer than 24 hour storage
- Only introduce HCW when regular combustion conditions established (not during start-up phase).

Simple field incinerators

- Simple one chamber incinerator with manual operation; can be constructed of:
  - Steel drums
  - Sheet metal
  - Clay
  - Brick or concrete
- Should be used as last resort
- Requires adequate fuel and good air supply

Incineration of HCW

(some advantages & disadvantages)

- ***Advantages:***
  - Good disinfection efficiency
  - Drastic reduction of weight and volume
- ***Disadvantages:***
  - Efficiency of chemical + pharmaceutical waste treatment good for rotary kiln, - 95% for pyrolytic incinerator, very limited for lower temperatures.
  - Toxic emission to air if no control devices
  - Difficult in maintaining temperature levels & efficiency
  - High cost for high temperature incinerators.

Characteristics of different types of incinerators

	Single chamber	Pyrolytic double chamber	Rotary kiln
Capacity	100-200kg per day	200-10000kg per day	500-3000kg per day
Temperature	300-400°C	800-900°C	1200-1600°C
Exhaust gas cleaning	Difficult to instal	Usually installed for larger plants	Required
Personnel	Training of operatives needed	Well trained personnel required	Highly trained personnel
Costs	Reasonably low for investment and operation	Relatively high for investment and maintenance	High

Simple chemical disinfection

- Treatment by contact to commonly used products for surface disinfection
  - Requires shredding of waste
  - May introduce strong chemicals into the environment
  - Efficiency depends on operational conditions
  - Only the surface is disinfected
  - Human tissue should usually not be disinfected
  - Special disposal required to avoid pollution of the environment

Commercial chemical disinfection systems

- Several self contained, fully automatic systems available on the market, containing several operations, such as:
  - Shredding
  - Chemical treatment
  - Encapsulation

Possible advantage
* Land-filling of residues
* Environmentally friendly
* Easy to operate

Possible disadvantages
* Requires specialized operators for maintenance.
* May be expensive

Wet thermal treatment

- **Method that exposes waste to steam under pressure:**

- ***Examples:***
  - Autoclaving, larger off-site treatment facilities
- ***Characteristics:***
  - Low investment and operating costs for simple apparatus
  - Environmentally friendly
  - Not appropriate for tissue or carcasses
  - Trained operatives required

Screw feed technology

- **Continuous dry thermal process:**
  - Waste is shredded to particle size of 25mm first
  - Waste rotates through hot auger:
    - Oil circulates in central shaft at 110 – 140 degree
    - 20 minutes retention in system
  - Waste reduction
    - 80% volume
    - 30% weight
  - Air & water emissions must be treated

Microwave irradiation

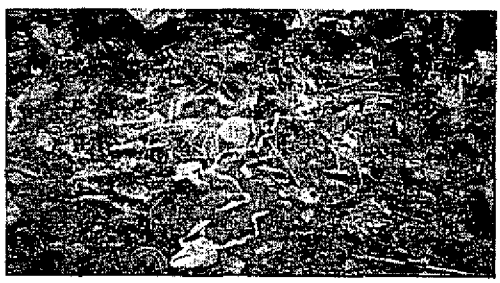
- Waste is shredded
- Waste is humidified for homogeneous heating
- Microwave rapidly heat waste
- Microbiological inactivation by heat conduction and radiation
- Routine microbiological testing required
- Waste is compacted to landfill

Disposal land

- **Not recommended for untreated hazardous waste**
- **Minimum requirements for land disposal:**
  - No deposit on open dumps
  - A degree of management control is exercised
  - Engineered avoid leaching to water bodies and retain waste on site
  - Rapid burial of HCW on site to isolate from animal or human contact

Black Bags Used for All Types of Waste Transported to Dumpsite

Medical waste on dumpsite



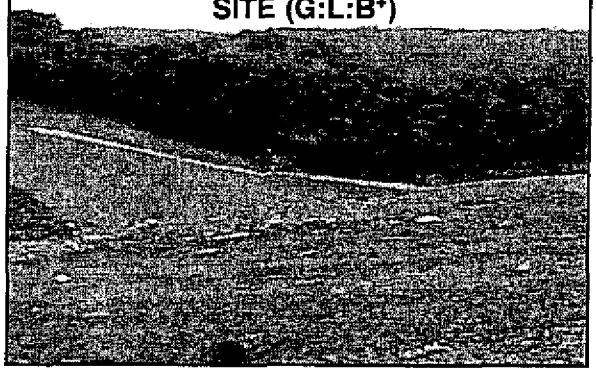
Burning medical waste

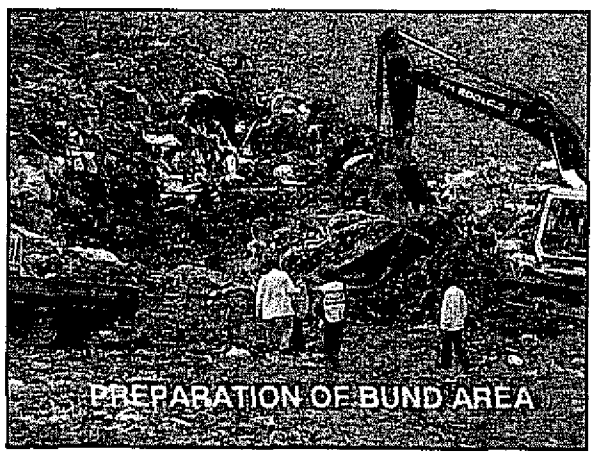
Children on dumpsite

Land-filling in municipal landfills

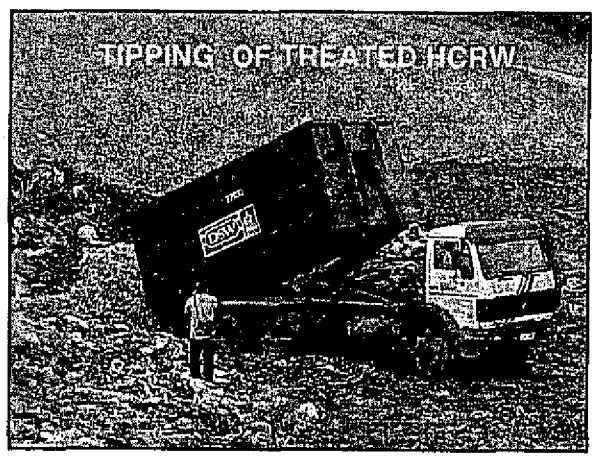
- In case hazardous health-care waste cannot be treated or disposed elsewhere:
  - Within the site, establish a designated place for hazardous HCW
  - Limit access to this place
  - Burry the waste rapidly to avoid human or animal contact
  - Investigate more suitable treatment methods

MARIANNHILL LANDFILL SITE (G:L:B+)



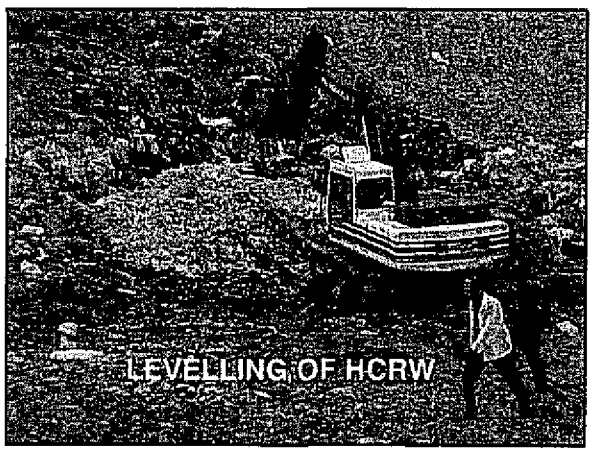


PREPARATION OF BUND AREA



TIPPING OF TREATED HCRW


OFFLOADING COMPLETED


LEVELLING OF HCRW


TOP SOIL - COVERING

Burying inside hospital premises

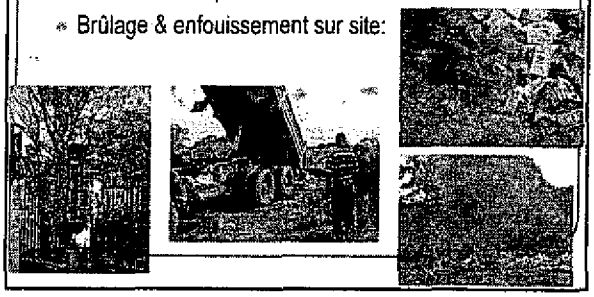
- **For remote locations and temporary encampments.**
- **Apply the following rules:**
  - Access to the site restricted and controlled
  - Site lined with low permeable material
  - Only hazardous HCW to be buried
  - Each deposit covered with soil
  - Ground-water pollution must be avoided.

Disposal to land by encapsulation

- Fill metal or plastic containers to ¾ with waste and fill up with:
  - Plastic foam
  - Bituminous sand
  - Cement mortar
  - Clay material
- When dry, seal containers and landfill to restrict access to and reduce mobilization of hazardous substances;
- May be used for sharps, chemicals, drugs etc

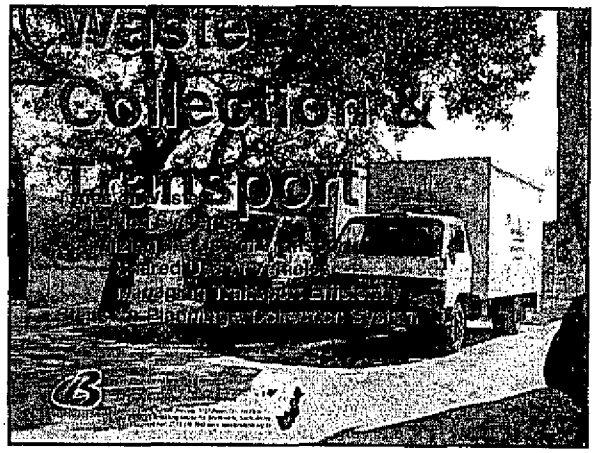
Stratégies de destruction des déchets

- ~~Incinération: utilication d'incinérateur permettant~~ d'atteindre température d'au moins 800°C
- Brûlage & enfouissement sur site:



Inertization

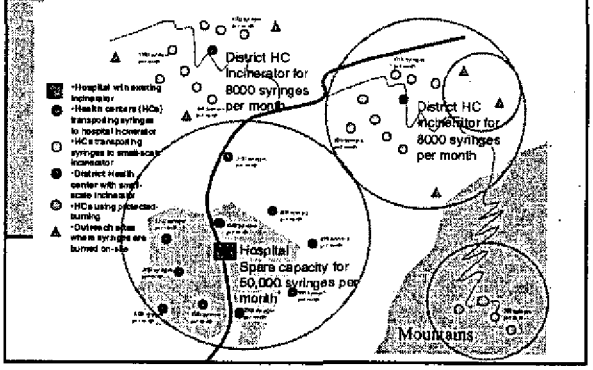
- **Method:**
- Remove packaging
- Grind material (road roller)
- Add Water Lime and Cement
- Then, either
  - When dry, store and land-fill; or
  - When wet, decant into municipal waste in landfill
- **For chemical and pharmaceutical waste and incinerator waste**



Types of Waste for Collection

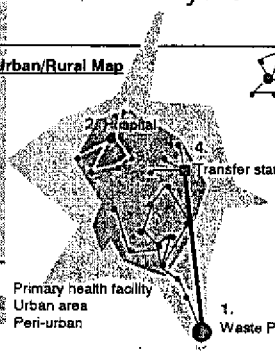
- ***Non-infectious*** waste? ***NO***
  - High volume, low risk, high cost to transport
- ***Infectious***, pathological waste? ***NO***
  - Difficult to contain, loads incineration
- ***Infectious***, non-sharp waste? ***YES***
  - Dry waste, bulky but requires destruction
  - Plastics for recycling
- ***Infectious***, sharps waste? ***YES***
  - Small volume, high risk – if not buried

The Waste Collection Concept



Collection Systems

Urban/Rural Map



- 1. Centralized urban waste collection /processing system
- 2. Hospital-based collection system
- 3. Small-scale incinerator (SSI)-based collection system
- 4. Transfer stations for 2-stage collection

Collection Systems—1

- Centralized urban waste collection/processing system

- Dedicated vehicles
  - Trucks and vans
- Delivery of containers & collection of waste
- High quality, low emission incineration & processing

Collection Systems—2

1. Centralized urban waste collection /processing system
2. Hospital-based collection system

- Use of bicycles/motorcycles to bring in waste
- Integration with hospital waste container system
- Potential for patient 'tax' to contribute to disposal budget

Collection Systems—3

1. Centralized urban waste collection /processing system
2. Hospital-based collection system
3. Small-scale incinerator (SSI)-based collection system

- Dedicated use of pickup trucks
- Shared use of double-cabs for supply/collection of sharps waste & supervision

Collection Systems—4

1. Centralized urban waste collection /processing system
2. Hospital-based collection system
3. Small-scale incinerator (SSI) - based collection system
4. Transfer stations for 2-stage collection

- Monthly collection from health centers to collection point by pickup
- Storage in secure enclosure
- Periodic collection by truck to centralized disposal facility

Optimizing Use of Transport

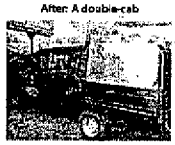
Shared use of vehicles

Shared Use of Vehicles

- Double-cab permits:
  - <4 people to travel
  - Plastic liner to truck section
    - Hypochlorite disinfection each trip
  - Plastic container for bagged waste
  - Efficient utilization
  - Monthly collection frequency

Before: A light truck

After: A double-cab



Managing Transport Efficiently

Operations Management

- Planning and scheduling the use of transport
- Prioritization of transport needs according to health priorities
- Authorization and monitoring of vehicle movements
- Management responsibility for transport
- Scheduling of maintenance
- Effective controls on fuel, use keys etc

Fleet Management

- Vehicle choice/replacement lowers system cost
  - Motorcycles highly efficient
- Driver contract & training reduces accidents, downtime
- Regular preventive maintenance:
  - Reduces whole life cost
  - Increases vehicle availability
- Outsourced fleet management can be cost effective
- Pooling of vehicles

Implementing a collection system

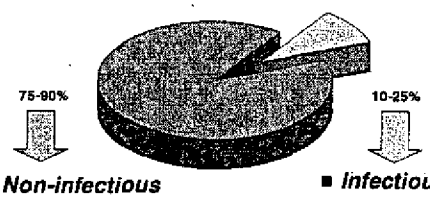
- ***Select*** facilities to be served
  - Assess their waste volumes
- ***Assess*** disposal capacity
  - New and existing disposal facilities
- ***Map*** collection trips
  - Schedule trips and list resources
- ***Assign*** transport
  - To a regular schedule of trips
- ***Introduce*** monitoring & supervision

Waste Segregation

Dr Francis Hyera

Basel Convention Regional Centre Pretoria for English-speaking African countries

The Health Care Waste Stream



- ***Non-infectious***
  - Identical to household waste
  - Includes paper and empty drug packaging
  - Can be disposed of as household waste
- ***Infectious***
  - May create a variety of health risks
  - Requires special care from the point of generation until final disposal

Infectious Waste

- **Infectious waste is:**
  - Waste that is known or suspected to contain pathogens (bacteria, viruses, parasites) in sufficient amounts to cause disease.
  - All items that are visually contaminated with blood or body fluids.
    - **Pathological waste:**
      - Includes tissues, organs, blood, and body fluids.
      - Anatomical waste is made of recognizable body parts. For ethical/cultural reasons it is sometimes classified apart with placentas.
    - **Sharps waste:**
      - All items that pose a risk of injury and infection due to their puncture and cutting properties (syringe needles).

Sharps Waste Priority

- Sharps waste is the focus of this project because:
  - It is not-only infectious, it is also **HAZARDOUS**:
    - Potential for reuse causing transmission of pathogens from patient to patient.
    - Potential for accidental needlesticks among health workers and waste handlers.
    - Potential for needlesticks in the community from improper disposal.
- Sharps have highest risk of transmitting pathogens.

Waste Segregation

- Segregation of waste is a critical activity because:
  - It takes place at the point of use, immediately after the intervention.
  - Separation and containment of sharps waste protects people.
  - Separation of infectious waste from domestic waste:
    - Assures that there is no manual contact, minimizes risk.
    - Assures that domestic waste can be treated routinely, minimizes cost.
- The system of segregation must be:
  - **Simple** to implement for medical and ancillary staff.
  - **Safe**: no infectious waste in the domestic waste flow.
  - **Standard**: applied in all the HCFs of the country.
  - **Supervised**: to ensure the procedures are respected.

Segregation Systems

- WHO: **3 bins & 2-colour coding system** used to ensure immediate and clear identification of the type of waste:
  - non-infectious waste: *black*
  - Infectious HCW: yellow
  - Infectious sharps: *yellow safety box*

Kenya 3-bin/liner segregation

Separate bins for different disposal destinations:

- Except sharps, ALWAYS separate

Mozambique 5-bin segregation

Sharps Waste Reduction

- ***Direct Disposal***
  - Puncture-proof box
    - Syringes/needles
    - Blades and broken

- ***Needle Removal***

- ***Syringes &***
- ***IV Plastics***
- Yellow bag

- ***Needles***
- Container
- Protected pit or barrel

Implementing Segregation

Components Cycle

Category:	Examples	Colour of Bin Liner	
Non-infectious	Paper, packaging materials, plastic bottles, food, cartons	BLACK	
Infectious	Gloves, dressings, blood, body fluids, used specimen containers	YELLOW	
Highly Infectious	Anatomical waste, pathological waste	RED	
Chemical	Formaldehyde, photographic chemicals, solvents, organic chemicals, inorganic chemicals	BROWN	
Radioactive	Any solid, liquid, or pathological waste contaminated with radioactive isotopes of any kind.	YELLOW with radioactive label (see Figure 4).	

Implementing Segregation—1

1. Choice of bins, colors, and labels:
   - Infectious sharps
   - Infectious non-sharps
   - Infectious pathological
   - Glass
   - Non-infectious domestic

- Non-sharps:
  - Reusable polypropylene bins with disposable polyethylene liner-bags (100 liter).
- Sharps:
  - Disposable puncture-proof cartons (WHO).
  - Reusable plastic containers with centralized disinfection.

Implementing Segregation—2

1. Choice of bins, colors, and labels:
2. Where needed, how many?

On the floor, not the working surface!!

- Point of use—sharps for every invasive intervention
  - NO batching allowed
  - Quantity = workload x time:
    - 5L sharps box holds 235 syringe barrels or 150 syringes/needles
    - 10-15L containers common for infectious waste at point of use (PHC)

Implementing Segregation—3

1. Choice of bins, colors, and labels
2. Where needed, how many?
3. Scheduling collection/disposal

Point of incineration	Divisions served	No of facilities served	No of boxes per month	Incineration frequency
[illegible]	3	18	131	2X20 Weekly
[illegible]	2	15	124	2x20 Weekly

- 1. Internal collection:
  - Sharps containers collected when full.
  - Other infectious waste collected daily (<48hrs).
  - Storage in locked, ventilated room.
- 2. External collection:
  - Vehicle each month/week.
  - Site incinerator operator each day/week.
  - Sterilizer/shredder by vehicle each month/quarter.

Implementing Segregation—4

1. Choice of bins, colors and labels
2. Where needed, how many?
3. Scheduling collection/disposal
4. Resupply & reusables

Re-usable paint-pots Disposable lids

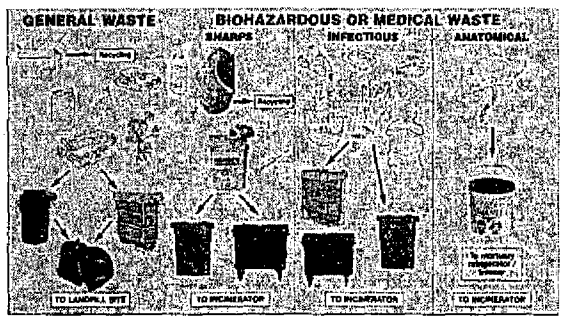
- **Disposable bags and puncture–proof containers**
  - Need budget and routine distribution process
  - With vaccines & drugs?
- **Re-usable sharps containers**
  - Locally disinfected?
  - Centrally disinfected
  - Locking disposable lids

Implementing Segregation—5

1. Choice of bins, colors and labels
2. Where needed, how many?
3. Scheduling collection/disposal
4. Resupply & reusables
5. Training and supervision

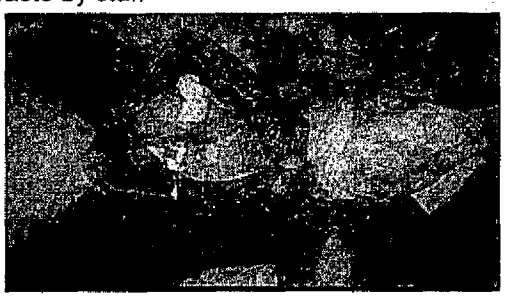
- National HCWM committee/regulations
  - Establish standard segregation procedures
- Training needs identified
  - Health workers
  - Waste handlers/transporters
  - Equipment operators
- Periodic supervision of sample health facilities
  - By "Injection Safety Technical Group"
- Encourage facilities to appoint person responsible for HCWM:
  - Facility manager or other technical staff member

Waste Segregation



Lack of resources at hospital i.e. no colour coded bags or sharps containers

No internal policies for waste segregation leads to confusion and incorrect disposal of waste by staff



Results of Waste Management Assessment in Africa 2003

Dr Francis Hyera

Basel Convention Regional Centre Pretoria for English-speaking African countries

Purpose 1

- 1. Review the waste management situation (policies and strategies) in immunization services within the context of health care waste management in the country.
- 2. Make proposals for future steps in waste management improvement

Scope:(defined indicators)

- •Availability of a policy and plan of action on HCWM
- •Awareness of risk of handling HCW
- •Segregation of HCW
- •Adequacy of containers of HCW at generation points
- •Adequacy of interim storage of HCW
- •Adequacy of treatment of HCW
- •Adequacy of waste disposal after treatment of HCW

Countries assessed: Benin, Nigeria

General common findings

1. No formal medical waste infrastructure, consequence:
   - Lack of clear directives,
   - Undefined responsibilities
   - Absence of waste mgmt budget
   - Sporadic controls
   - Inadequate maintenance provision
   - Training dispersed amid various departments
2. Ownership of incinerators unclear.
   - Who's property??
   - Who is responsible??
3. Motivation of Personnel (casual personnel, not assigned personnel)
   - Very low

WASTE MANAGEMENT IN AFRICA
Key activities to be undertaken at country level:

- Set up at MoH level safety committee of stakeholders **(MoH, AIDS programs, Municipalities, MoE, etc.)** to review policy and disposal system options and set a **commitment for safe waste management.**
- Assess injection safety and waste management practices, waste disposal needs and existing waste disposal capacity **(eg. Hospital incinerators)**
- Prepare and implement plans district by district for injection safety and safe waste management
- Implement effective supervision of injection safety and waste mangement activities
- Budget and finance waste management activities (eg. **Sensitization and training of staff, provision and use of appropriate WM equipment...)**
- Include waste management monitoring and evaluation in routine monitoring activities : reviews, monitoring forms, WHO/UNICEF JRF, etc. (need for appropriate indicators)

Wastewater management

Dr Francis Hyera; MD

Basel Convention Regional Centre Pretoria for English-speaking African countries

Wastewater from health-care establishments

May contain:

- Microbiological pathogens
  - Bacteria
  - Viruses
  - Helminthes
- Hazardous chemicals
- Pharmaceuticals
- Radioactive isotopes

Wastewater discharge to municipal sewer

Hospitals may use a sewer providing:

- The sewer is connected to a plant removing 95% of bacteria
- Sludge is anaerobically digested to a standard of <one helminth egg per litre
- High standards of HCW management and low discharge of hazardous chemicals
- Waste from patients treated with cytotoxic drugs is collected separately

On-site treatment of wastewater

- **Primary treatment**
- **Secondary biological purification**
  - 90% to 95% of bacteria removed
  - Most helminths removed
- **Tertiary treatment**
  - Lagooning or sand filter
  - <10 mg/l suspended organic matter
- **Chlorine disinfection**
  - Especially important if effluent discharge in a coastal area

On-site sludge treatment

- Options
  - Anaerobic digestion
  - Natural drying in beds, and incineration
- Guidelines for sale land spreading without disinfection
  - <one helminth egg per kilogram
  - <1000 faecal coliform per 100 grammes

On-sites minimal safety requirements

Lagooning

- Two lagoons (minimum) followed by soil filtration

If no sewage enteric patients and disinfect excreta:

- No discharge of chemicals and pharmaceuticals to the sewer
- Deshydrate sludges from hospital cesspools and disinfect chemically
- NEVER use hospital sewage for agriculture
- Don't discharge to natural waters
- Small rural establishments: infiltrate through porous soil

Sanitation in health-care establishments

Hospital sanitation is of primary importance to avoid the continuous recirculation of diseases in the community.

Lack of Municipal Services health waste mixed with waste

Health waste mixed with wastewater

Incineration Concerns

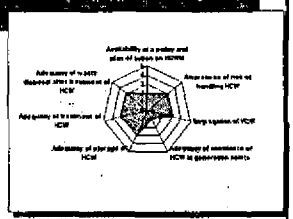
Dr Francis Hyera

Basel Convention Regional Centre Pretoria

Global Concerns drawn from findings at 5 Workshops under GAVI Partnership Work plan for 2002/2003

Principle Problems Raised:

- Lack of appropriate Regulatory Framework for HCWM
- Absence of global guidelines on management and final disposal of PHF waste



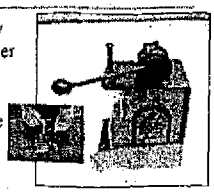
- Scarcity of appropriate options for final disposal
- Technical and Environmental problems of Small Scale Incineration

Presentation Focus: Concerns towards Incineration

path

Operational Concerns towards Incineration(1)

- *Needle Cutters* provide option to bury needles, bag and reprocess plastic. Other infectious waste still needs to be destroyed. **Current SSI designs focused upon syringe or mixed waste destruction only.**



- *Waste Collection* from rural PHF to PHF location for incineration is rarely practiced. **SSI's frequently not used sufficiently to justify investment unless installed within campaigns.**

path

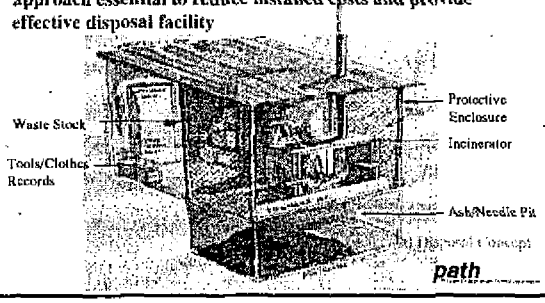
Operational Concerns (2)

- *Trained and Committed Operators* are frequently not available for Peripheral CC Equipment operation, service and maintenance after 25+ years. **Can this be achieved for waste disposal, especially when persons responsible for SSI operations are casual workers**
- *Budgetary Provision* is frequently inadequate or zero for HCWM. **Any SSI technology requires maintenance with financial implications**
- *Need to Stockpile Waste* for more than 48hrs so justify operating SSI. **Most SSI's destroy 6-10Safety Boxes/Hr**

path

Technical Concerns towards Incineration(1)

- Not considered as *integrated disposal arrangement*. **This approach essential to reduce installed costs and provide effective disposal facility**



path

Technical Concerns (2)

- *Working Life uncertain:* Insufficient operational experience to assess real working life and maintenance implications for most SSI's
- *Working life of De Monifort systems* less that 3 yrs between major maintenance/replacement for many systems installed in Africa. **Installation/Component quality issue rather than design issue.**

path

Technical Concerns (3)

- *Size/Throughput of most SSI's* does not lend itself to needs of decentralised destruction.

path

Environmental Concerns towards Incineration

- *Only high tech,* automated SSI's meet current environmental norms. Issues: High Capital Cost, Maintenance Complexity, Operator skills.
- *Inconsistent and Inappropriate Environmental Norms* make it difficult for SSI Equipment Developers to invest and commit to finding technology solutions
- *Environmental Norms (Except SA) not rationalised* to consider utilisation levels of SSI's

path

Management Concerns towards Incineration

- *Poor Segregation* of waste reduces incinerator environmental performance
- *Inadequate staffing* of HCWM encourages poor operating practices
- *Insufficient budget* encourages poor quality maintenance
- *Need for Good training* in HCWM practices are essential for good incineration operation

path

The Road Forward to Address Concerns towards Incineration

Driving Mechanisms Required:

- SSI and Alternate Technology Technical/Market Development
- Appropriate Regulatory and Environmental Legislation
- Commitment to HCWM

Financial Instruments Required to Trigger Drivers:

- Venture Capital for Tech Devt
- Mechanisms to encourage financial sector investment in HCWM, (Env Banks, GEF, etc)

small-scale incinerator has an important part to play until research has produced more environmentally acceptable and affordable alternatives.

A guideline on the construction methods and materials, the correct use and the maintenance of these incinerators January 2004

path

LEGISLATION

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1. Introduction to Legislation

- There are International agreements and principles governing either public health or hazardous waste.
- The following principles should be taken into consideration when formulating national legislation or regulations governing healthcare waste management:
  - Basel Convention
  - Polluter Pays Principle
  - Precautionary Principle
  - Duty of Care Principle
  - Proximity Principle

Basel Convention, 1989

- Coordinated by the UN Environmental Programme (UNEP)
- Signed by >100 Nations (Parties)
- Controls trans-boundary movements of hazardous waste &
- Health care waste.
  - Legitimate transboundary shipments of hazardous waste are exports from countries that lack facilities or expertise to dispose safely of certain wastes to other countries that have both facilities & expertise.
  - Exported waste should be labelled according to UN standards.

Polluter Pays Principle

- All waste producers are legally and financially responsible for:
  - ✓ Safe handling of waste;
  - ✓ Environmentally sound disposal;
  - ✓ Creating an incentive to produce less and
  - ✓ Assigns liability to the party.

Precautionary Principle

Governs health and safety protection.
When magnitude of a risk is uncertain or unknown:

- Assume that this risk is significant
- Plan protective measures for health and safety accordingly.

"Duty of Care" Principle

- The "duty of care" principle stipulates that any person handling or managing hazardous substances or related equipment is ethically responsible for using the utmost care in that risk.

Proximity Principle

- Recommends treatment and disposal of waste take place as nearer as possible to the point of production (source) to minimize risk involved in transportation.
- Any community recycle or dispose of waste it produces, inside its own territorial limits (with this principle).

2. National Legislation

- National legislation is the best basis for improving HCW practices in a country.
- Establishes legal controls and permits national agencies responsible for disposal of hcw (DoH) +- DEA&T applying pressure on its implementation
- Legal package:
  - a law,
  - a policy document and
  - technical guidelines

Importance of Legal Package

- Specify treatment for different waste categories;
- Segregation / separation
- Collection
- Storage
- Handling
- Disposal
- Transport of waste
- Responsibilities
- Training requirements

(consider resources, available facilities & cultural aspects on handling waste)

National Law

- May be alone "On Hazardous wastes or with Hospital hygiene and Infection control" a specific chapter devoted to Health-care Waste.
- The Law includes:
  - Clear definitions of hazardous hcw + categories
  - Duty of Care of waste producers and safe handling
  - Specifications for record tracking and keeping
  - Define penalties on non-compliance with the law.
  - Regulatory and enforcement systems

In Hospitals

Hcw disposed in accordance to other relevant national legislation:

- Waste in general
- Effects of public health and the environment
- Air quality
- Prevention and control of infectious diseases
- Management of radioactive materials.

3.1 Policy document

- Outlines the rationale for legislation, national goals and key steps essential to the achieve these goals. It contains:
  - ✓ Description of health and safety risks from mismanagement
  - ✓ Reasons for sound and safe hcw management practices in hc establishments
  - ✓ Listing of approved methods of waste treatment, minimization, handling and disposal

3.2 Policy Document

- ✓ Warnings against unsafe practices, eg. Disposal of hazardous waste in landfills.
- ✓ Management responsibilities within and outside hc establishments.
- ✓ Assessment cost of hcw management
- ✓ Record keeping and documentation
- ✓ Training
- ✓ Rules governing protection of "Workers" health and safety.
- ✓ Key steps of HCWM: minimization, separation, identification, handling, treatment, and final disposal.

4.1 Technical Guidelines

- Should be practical and directly applicable
- Should include following specifications:
  - Legal framework for safe management of hcw, hospital hygiene, & occupational health and safety (limits of emission of atmospheric pollutants & measures of protection of water resources)
  - Recommended treatment & disposal methods for each health-care waste & waste water.

4.2 Technical Guidelines

- Responsibilities of the public health authorities, national environmental body, heads of health-care establishments, scattered & smaller producers of hcw, heads of private or public waste-disposal agencies
- Safe practices for:
  - *Minimization*
  - *Segregation / separation*
  - *Storage*
  - *Handling*
  - *Transport*

Workers' health and safety principles

Francis Hyera, MD.

Basel Convention Regional Centre Pretoria for English-speaking African countries

Workers' health and safety principle

Good occupational and health safety measures include the following points:

- Proper training
- Personal protective clothing and equipment
- Effective occupational health program
- Immunization
- Post-exposure prophylaxis
- Medical surveillance
- Personal Hygiene

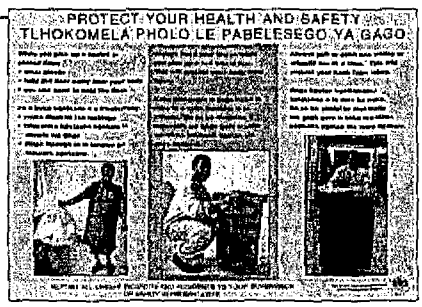
Personal Hygiene

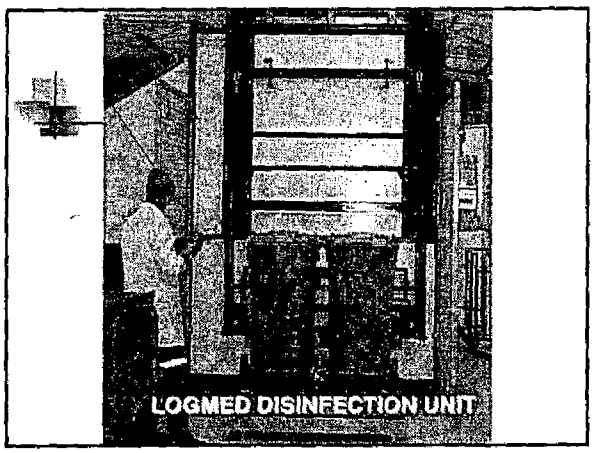
- Convenient washing facilities (with warm water and soap) should be available for personnel handling hazardous HCW.
- Personnel should be trained on personal hygiene issues that reduce the risk from handling hazardous HCW.

Protective clothing

- Helmets
- Respiratory face masks
- Eye protectors
- Overalls
- Industrial aprons
- Leg protectors
- Industrial boots
- Disposable gloves (medical staff) or
- Heavy duty gloves (waste workers)

Staff to be trained in ways of protecting their own health and safety as well as that of others





Safe management practices

- Waste segregation
- Appropriate packaging of waste
- Waste identification
- Proper storage of waste
- Adequate transportation

Programme for response to injuries

- Immediate first aid measures
- Immediate reporting
- Identify source of injury
- Obtain additional medical care
- Maintain medical surveillance
- Blood tests if required
- Record the incident in full
- Investigate the causes and report
- Implement prevention measures for similar incidents

Cytotoxic safety

Special measures should be taken when using cytotoxic drugs:

- A specially assigned safety officer should supervise the safe management of these products and wastes
- Set up written procedures for handling products and waste
- Training of the staff about hazards, and handling and decontamination procedures
- Develop emergency programme for spills and accidents

Emergency response - principles

- Follow the waste management plan
- Clean contaminated areas and disinfect if necessary
- Limit exposure of workers
- Patience
- Personnel
- Environment

Procedure for spillage cleaning

- Evacuate the area
- Decontaminate eyes and skin
- Inform designated person determine nature of spill
- Provide first aid
- Secure area
- Protective clothing
- Limit the spill
- Neutralize or disinfect
- Collect the spill
- Decontaminate the area
- Rinse the area
- Seek medical care where necessary

Reporting incidents

All incidents including near misses must be notified as follows:

- Description of incident
- Where and when it occurred
- Which staff were involved
- Other relevant circumstances

A report should be made and records should be kept.

Aims of education and training

- To make the waste management strategy effective
- To create a competent workforce
- Highlight employees' responsibilities
- To protect employees' health and safety

Target groups for training (health-care establishments)

- Hospital managers and waste managers
- Medical doctors
- Nursing staff
- Hospital cleaners, porters and auxiliary staff

Training programme content

Training should be competence based with hands-on training in simulated real life situations, on the following objects:

- Health-care waste policy with full justification
- Instructions on individual responsibilities
- Detailed technical instructions on procedures to be followed

Training for waste management operators

- Information on risks, and health and safety advice
- Competence based training on all handling procedures, including the management of incidents
- Wearing of protective clothing
- Use of safety equipment
- Documentation and record keeping

Training for waste transporters

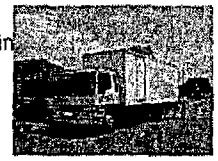
- Risks related to the transported waste
- Handling, loading and unloading procedures
- Procedures for dealing with spillages
- Wearing of protective clothing
- Equipment of the vehicle
- Documentation and record-keeping procedures (e.g. consignment note system)

Care Risk Waste collection vehicles with disposal of untreated HCRW.

Health Care Risk Waste not treated according to internationally recognised standards.

Transport

- No dedicated removal vehicle
- Inadequate washing/ decontamination of vehicles
- Vehicles not correctly marked (SANS)
- No tracking system
- Spill response trainin
- Inter-provincial
- Registration
- Rural areas



Training for operators of waste treatment facilities

- Outline of the operation of the facility
- Health and safety related to the operations
- Emergency procedures
- Technical procedures
- Maintenance and record keeping
- Emission control
- Surveillance of residue quality

Training for landfill operators

- Information on health and safety
- Control of scavenging
- Protective clothing and personal hygiene
- Safe procedures for landfilling HCW
- Emergency response measures

Waste Management Related Costs

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Principles of Costing

- Polluter Pays Principle
  - Healthcare establishment pays for the safe disposal of the waste it generates
- Minimization, segregation and recycling of waste
- Appropriate sizing of the waste management system
- Anticipate future trends

Internal and External costs

- **Internal costs:**
  Segregation, packaging, on-site handling and treatment: costs of supplies and labour.
- **External costs:**
  off-site transport and treatment, final disposal: paid to contractors who provide the service.

Total Costs of WM Systems

- Initial capital investments:
  purchase of equipments
- Amortization of plant and equipment:
  over life time of equipment
- Operating costs:
  costs of labour and consumables
- Contractual costs:
  for external services, e.g.. transportation, final disposal.

Methods of Financing

- **Public funding of investment:**
  compulsory use of public facilities
- **Private funding of investment:**
  choice of private facilities and services
- **Funding of investments by the health-care establishment:**
  use of on-site treatment facility
- **Funding of investments by several health-care establishments:**
  cooperation between establishment to use common facility

Use of Private Services

Advantages:

- Inability of health-care establishments to raise needed capital
- Expected greater efficiency than public facilities
- Transfer of risk for operation

Disadvantages:

- Potential loss of control by the public agency
- May result in minimum level of services provided
- Regular inspection and regulatory control required

Contractual Arrangements

Any agreement with private companies should include the following points:

- Prescribe minimal levels of service (reliability, safety, public health risks, expansion)
- Method of dealing with cost increases (inflation etc.)
- Environmental concerns
- Transfer ownership
- Quality and regulatory control

Cost Reduction Check List

- **On-site waste management practices**
  - waste segregation, minimization and recycling
- **Purchasing policy and stock management**
- **Comprehensive planning:**
  - develop and implement waste management strategy
  - consider regional cooperation
- **Cost accounting and control**
- **Choose adequate methods and technologies**
- **Training of personnel for efficient and safe implementation**

Principles of the Supply Chain

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Introduction to Logistics

Logistics:

- is the movement of commodities from one place to another according to schedule.

Importance of good logistics:

- ensure the continued availability of supplies and equipment, good logistics affects positively the outcome of a programme or service, therefore meeting customer's needs.

Purpose of Logistics

To provide excellent customer service by:
Fulfilling the six "**RIGHTS**":

- the **RIGHT** goods
- in the **RIGHT** quantities
- in the **RIGHT** condition

and delivered

- to the **RIGHT** place
- at the **RIGHT** time
- for the **RIGHT** cost.

Important Terminologies

Pipeline:
- Steps that a product passes through from when it is ordered to when it reaches the end user.

Lead time:
- Amount of time between *placing the order and receiving the* commodities in your store ready for use.

Push system:
- A system where a higher level facilities decide what they send to the lower-level facilities. Also called "Allocation system." higher level allocates products to client facilities.

Pull system:
- A system where the lower level facilities decide how much they require and when, and pull the products down. Also called "Requisition system"

Maximum stock level:
- The amount of commodity by name above which the store/warehouse should not exceed under normal circumstances.

Ending balance:
- The quantity of commodities on hand at a given period, which is determined by a physical count.

Bin card:
- An individual stock keeping card that keeps information about a single brand of a given product.

Stock levels:
- Current stock levels *in relation to the set stocking periods.*

Stock registers:
- Tools that monitor stock movements and status.

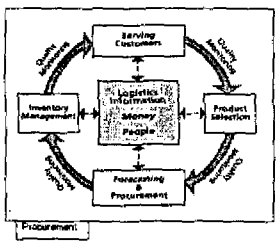
Working stock:
- Amount of commodities by name between maximum and minimum stock levels.

Issue voucher:
- This form is ideal in the pull system. It lists the items and quantity issued to a facility as well as in a separate column of those received.

Components of Logistics Cycle

- Serving customers
- Product selection
- Forecasting and procurement
- Inventory management
- Logistics information: money, people etc
- Quality monitoring

The Logistics Cycle



Inventory Management (i)

Physical inventory definition:

- Counting by hand the total number of each commodity type and by expiry date in the store.

Importance of conducting physical inventory:

- To identify discrepancies between actual supplies and what is recorded in the bin card
- To detect any supplies that has expired or are damaged
- To know how much of each commodity is in store.

Inventory Management (ii)

Types of physical inventory:

Complete physical inventory
- All products/commodities are inventoried at the same time. Normally yearly.

Partial or sample physical inventory:
- Some of the products are inventoried at different times for example partial inventory of a specific product is done at each reorder point to verify quantities.

Key measurements in inventory:
- Average Monthly Consumption Rate (AMCR)
- Months of Supply at Hand (MOS)
- Minimum/Maximum Stock Levels
- Amount of commodity to order

Logistics Management Information System (LMIS)

- Definition:
  - Is a set of a well coordinated procedures that ensure effective flow of information.
- It ensures the seven Rights:
  - Right product
  - Right quantities
  - Right place
  - Right time
  - Right condition
  - Right cost
  - Right customer

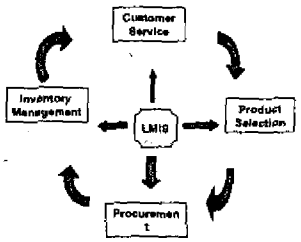
Role of LMIS on Ensuring the Seven "RIGHTS"

Helps answer the following questions to logistics managers for decision making:

- Which goods are required?
- What quantities?
- What kind of goods are required?
- Where are the goods required?
- When are the goods required?
- How are goods going to get there?
- Who requires the goods

LMIS in the Logistics Cycle

Logistics



Importance of LMIS

- It indicate when to order supplies
- Highlights the position of supplies in the pipeline and whether commodities need to be pushed from higher to lower levels
- It captures information on where consumption is highest and whether more resources are required
- Highlights loses in the system, which requires action
- Points out bottlenecks in the system, thus enabling adjustments.
- Picks out information on 'nearly expired' commodities, thus redistribution. Expired ones are also picked out, thus enabling destruction.

Important Activities in Logistics

Only three things happen Supplies in Logistics systems:

- Supplies can be STORED as inventory
- Supplies caan be DISTRIBUTED from one facility to another
- Supplies can be DISPENSED to customer at a facility.

Design & Characteristics of functional LMIS

- Data items needed for LMIS:
  - Stock at hand
  - Rate of consumption
  - Loses and adjustments.
- Functional LMIS should:
  - Keep data items that need to be collected to a minimum
  - Ensure that forms are not complicated
  - Ensure that forms does not take along time to complete.

Monitoring, Evaluation and Supervision.

Monitoring:

- The routine tracking and reporting of priority information about a programme and its intended output and outcomes.

Evaluation:

- A rigorous, scientifically based collection of injection safety activities, characteristics, and outcomes that determines the merit or worth of injection safety practices.

Rationale of Logistics Evaluation.

- To make informed logistics decisions regarding operations and service delivery.
- To ensure the most effective and efficient use of resources.
- To find out the extent to which a programme or project is having or has had on desired impact.
- To determine the extent to which the programme or project is on track and to make any needed correction accordingly.

Purpose of Logistics Supervision

- To ensure health care workers have the knowledge skills needed to effectively manage the logistics system
- To identify performance level and take appropriate actions
- To ensure that established logistics guidelines and procedures are being followed
- To provide on-the-job training
- To ensure that personnel at all levels carry out their responsibilities.

Programme Evaluation Indicators:

Types of data required:

Input Indicators:
- Quantity of devices supplied (Issue Voucher)
- Number of devices received (stock/bin cards)
- Number of devices used (stock card supplied)
- Availability of injury reporting forms and log books
- Availability and reuse prevention devices (stock cuts)

Process Indicators:
- Infection Prevention/Control Committee with a logistician
- Number of meetings on infection prevention/control discussing devices/equipments
- Availability of infection prevention/control information, education and communication materials (posters, leaflets etc) on display.

Outcome Indicators:
- Number of clients served (receiving devices from the programme)
- Number of health workers trained in infection prevention/control
- Reported incidences on injuries while using new devices supplied
- Observable practice on the use of infection prevention/control equipments

Logistics Core Indicators:

These are *quantitative* and cover most aspects of a logistics cycle and are used to monitor, evaluate and *supervise* many types of interventions:

- Logistics management information system (LMIS) quality
- Storage conditions
- *Order fill rate*
- Stoke out frequency
- Adequate stock status
- Forecast accuracy
- Stakeholder commitment to procurement plan
- Existence of *an adequate multi-year* procurement plan.

Training of Healthcare Workers on Waste Management

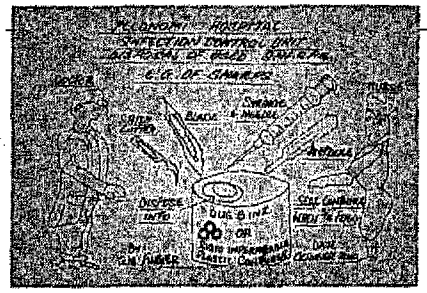
Dr Francis Hyera

Basel Convention Regional Centre Pretoria

Aims of Education and Training

- To make the waste management strategy effective
- *To create a competent workforce*
- *Highlight employees' responsibilities*
- To protect employees health and safety

EDUCATION AND AWARENESS



Training and capacity building

Target:

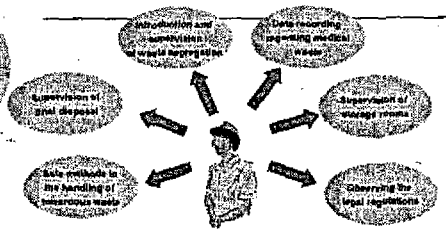
1. Increasing of the awareness on risks and problems from HCW among stakeholders
2. Know-ledge transfer for the controlling authorities to ensure the correct supervision of the HCW management
3. Creation of a responsibility structure for HCW on generator level
4. Capacity building among the responsible persons in the hospitals and clinics
5. Set-up of a framework and foundation for later on to be implemented integrated waste management systems

Target Groups for Training

(health-care establishments)

- Hospital managers and waste managers
- Medical doctors
- Nursing staff
- Hospital cleaners, porters and auxiliary staff

The "Hospital Waste Executive" (HWE)



The hospital waste executive is the head of the waste management. He/She is responsible for the supervision of the waste management, introduction of new methods and for the training of the employees.

Training Programme Content

Training should be competence based with hands-
on training in simulated real life situations, on the
following subjects:

- Health-care waste policy with full justification
- Instructions on individual responsibilities
- Detailed technical instructions on procedures to be followed

Periodical repetition courses will refreshen and update the knowledge.

The HWE

Main four tasks and duties:

- **Information and Motivation:** e.g. training, sensitisation and motivation of the hospital staff; information of stakeholders, etc.
- **Initiative and Innovation:** introduction of environmental friendly procedures, replacement of disposables; ecological purchasing, ...
- **Monitoring and Supervision:** The internal waste logistic including segregation, collection, storage and disposal; capacity building, etc.
- **Reporting and Documentation:** Accidents and incidents combined with hospital waste; documentation of waste activities, ...

Training for Waste Management Operators

- Information on risks, and health and safety advice
- Competence based training on all handling procedures, including the management of incidents
- Wearing of protective clothing
- Use of safety equipment
- Documentation and record keeping

Training for Waste Transporters

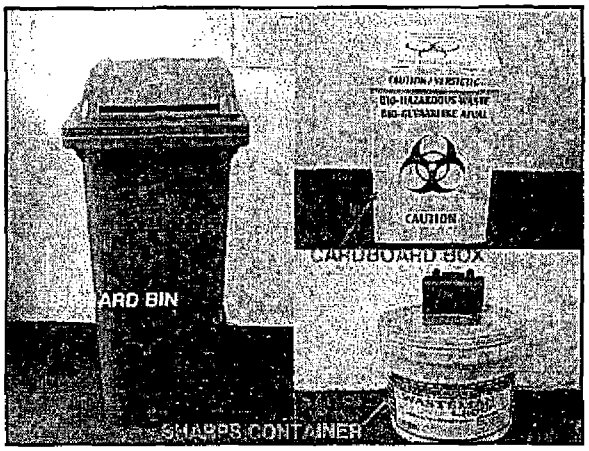
- Risks related to the transported waste
- Handling, loading and unloading procedures
- Procedures for dealing with spillages
- Wearing of protective clothing
- Equipment of the vehicle
- Documentation and record-keeping procedures (e.g. consignment note system)

Training for Operators of Waste Treatment Facilities

- Outline of the operation of the facility
- Health and safety related to the operations
- Emergency procedures
- Technical procedures
- Maintenance and record keeping
- Emission control
- Surveillance of residue quality

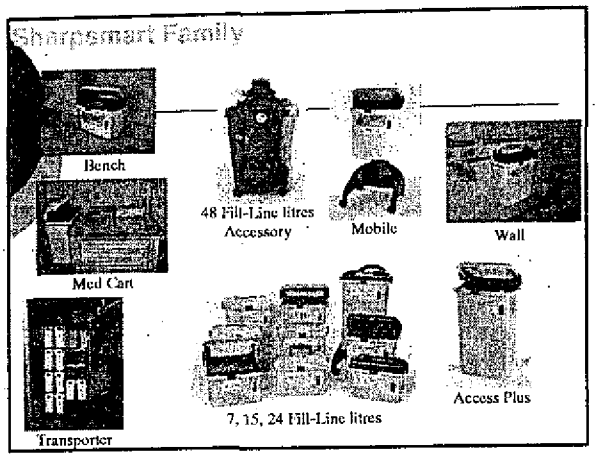
he use of appropriate containers for Health Care Risk Waste as well as lth Care General Waste gories

Internal storage and collection of Health Care Waste done in a safe and hygienic manner.



Training for Landfill Operators

- Information on health and safety
- Control of scavenging
- Protective clothing and personal hygiene
- Safe procedures for landfilling HCW
- Emergency response measures



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PROJECT

MAKING MEDICAL INJECTIONS SAFER

SOUTH AFRICA

Making Medical Injections Safer
- South Africa -

Health Care Waste Management
Training, BCRC Pretoria
22 – 25 November 2005

JSI

MMIS

Sources of Information

UNIVERSITY OF WASHINGTON

CDC

JSI

Injection Safety

- Because injections are so common, unsafe injection practices are a powerful engine to transmit blood-borne pathogens, such as
  - **Hepatitis B virus**
  - **Hepatitis C virus**
  - **Human Immunodeficiency Virus**
  - Other blood-borne pathogens e.g. Ebola and Marburg

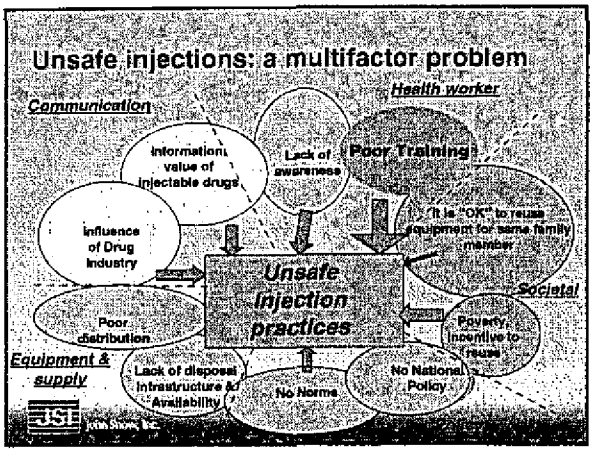
JSI

Injections: A dangerous engine of disease

- Hepatitis B
  - Highly infectious virus
  - Highest number of infections (21 million annually)
  - 32% of HBV infections
- Hepatitis C
  - More than 2 million infections each year
  - More than 40% of HCV infections
- HIV
  - More than 260 000 infections
  - Approximately 5% of HIV infections

JSI

Unsafe injections: a multifactor problem



Reported common conditions leading to injection prescription[1]

- Infections
  - Fever
  - Upper Respiratory Infection/ Ear Infection
  - Pneumonia
  - Tonsillitis
  - Pelvic Inflammatory Disease
  - Skin infections
  - Diarrhea
  - Urinary tract infection
- Asthma
- Other
  - Malaise
  - Fatigue
  - Old Age

Simoonsen et al. WHO 1999

Reported injectable medicines commonly used

- Antibiotics
- Anti-Inflammatory agents / Analgesics
- Vitamins

Simoonsen et al. WHO 1999

Reported factors leading to injection overuse

- Prescriber-associated factors
  - Perceptions regarding injections
  - Assumptions about patient's expectations
- Patient-associated factors
  - Perceptions regarding injections
  - Therapeutic expectation
- System issues
  - Lack of effective oral medications
  - Financial implications

Reeler et al. WHO 2000

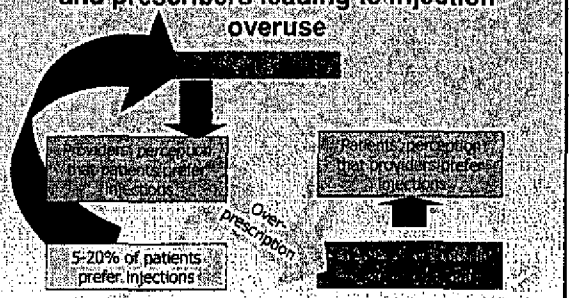
Reported prescribers' reasons for the use of injections

- Pharmacokinetics
  - "Strength" of injectables
  - Rapid onset of action
  - Poor intestinal absorption of oral medications
  - Absence of effective oral medications
- Other
  - Recommendations by Professors/Ministry of Health
  - Direct observed therapy
- Patient care issues
  - Inability of patient to take medications by mouth
  - Patient's desire for injection
  - Chronic condition of patient (illness, malnutrition or alcohol abuse)

Misconceptions about injections among prescribers

- Oral absorption is variable, whereas parenteral administration assures high drug levels
- Injectable drugs are "stronger" than oral drugs
- Injectable drugs have more rapid onset of action
- Chronic conditions (malnutrition) of patients leads to poor oral absorption of drugs

Misunderstanding between patients and prescribers leading to injection overuse



Recommendations: indication for therapeutic injections

- Serious and life-threatening illness
- Inability to swallow
- Profuse vomiting
- Absence of effective oral agent
- Significantly altered absorption pattern

Making Medical Injections Safer – South Africa

MMIS in South Africa

- Meeting held in May 2004, between JSI, NDoH and US Government – JSI obtained go-ahead for implementation of project
- Project start-up in July 2004
- First phase ended in December 2004, extended to 2009
- Implementation in 3 provinces:
  - Eastern Cape
  - Kwa-Zulu Natal
  - Free State province
- Key Liaison through Department of Environmental Health

Key Partners

- Government Departments
  - Departments of Health
    - All levels, relevant departments
  - DEAT
- Professional Organisations e.g. SANC, HPCSA, DENOSA, SAMA etc
- International organizations – BASEL Convention Centre, CDC, WHO
- Academic Institutions
- Waste management companies
- Injection equipment Supply companies

Making Medical Injections Safer

- Project activities include a wide range of initiatives to address injection safety.
- JSI is working in twelve countries including Cote d'Ivoire, Rwanda, Haiti, South Africa, Botswana, Kenya, Tanzania, Nigeria, Mozambique, Uganda, Guyana
- JSI works with sub-contractors – PATH, AED, MANOFF

The Way We Work

- Partnership at International and National levels (WHO, CDC, NDOH, etc.)
- National Task Force – key government stakeholders
- South-to-south collaboration
- Skills Transfer

In July 2005 the national Department of Health (NDoH) ... reports on a Klebsiella outbreak in a hospital in South Africa

Poor infection control killed babies in hospital: report

SABC NEWS

Intravenous equipment cause of Klebsiella outbreak

Key Strategies

- Infection Control
- Behavior change communication
- Proper waste management
- Availability of appropriate commodities

Key MMIS Strategies

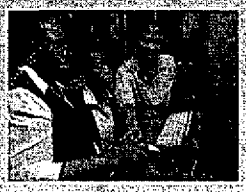
Training, support, and capacity building:
To ensure only safe and necessary injections become a social and professional norm within the health system and among ancillary services personnel

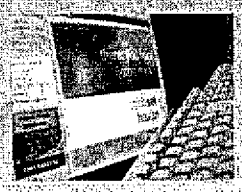
Equipment, supplies, and commodity procurement and management:

To improve the **availability of safe injection equipment** and protective equipment (syringes with re-use prevention and/or needle stick prevention features and safety boxes)

Advocacy and behavior change to reduce unnecessary injections and to promote health care worker safety:

- Support development of national plans, policies or guidelines to support the use of non-injectable formulations: IEC



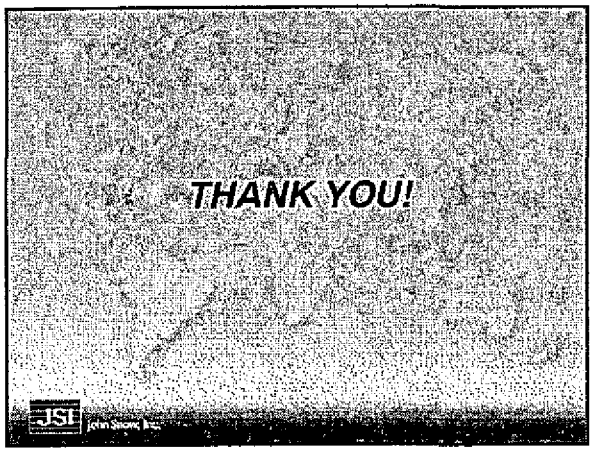


Managing waste safely and appropriately

Monitoring and Evaluation

Expected Results

- National Policy, Norms and standards on Injection Safety and health Care Waste Management
- Health workers trained to observe safe practices
- Protection of health care workers
- Reduction of unnecessary injections
- Sound Health care waste management systems


THANK YOU!
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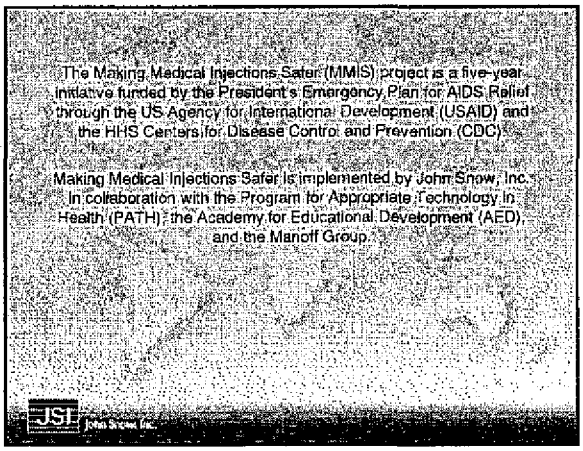
The Making Medical Injections Safer (MMIS) project is a five-year initiative funded by the President's Emergency Plan for AIDS Relief through the US Agency for International Development (USAID) and the HHS Centers for Disease Control and Prevention (CDC).
Making Medical Injections Safer is implemented by John Snow, Inc. in collaboration with the Program for Appropriate Technology in Health (PATH), the Academy for Educational Development (AED), and the Manoff Group.
JSI
John Snow, Inc.

BEHAVIOUR CHANGE / COMMUNICATION TOOLS FOR PUBLIC HEALTH MANAGEMENT

Making Medical Injections Safer - South Africa -

Behavior Change/Communication Tools for Public Health Management

JSI

MMIS

Health Communication is...

- The systematic attempt to influence positively the health practices of large populations
- "... the modification of human behavior and environmental factors related to that behavior which directly and indirectly promote health, prevent illness or protect individuals from harm". (Elder, Geller, Hovell &Meyer)
- Terms used –
  - health education,
  - health communication,
  - health promotion: information, education and communication (IEC)

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Key Success Factors...

- Application of a scientific and systematic health communication methodology
- Need to reflect the cultural context and needs of each country, region, district
- Alternate
  - Listening and doing
  - Research and action

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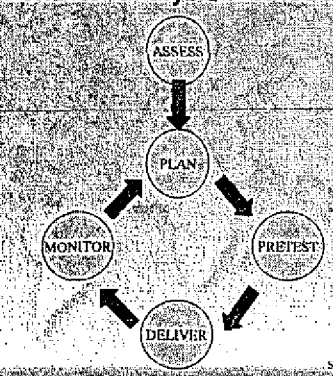
Behavior analysis methodology



Source: HealthCom, 1991

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Behavior Change requires a mix of program strategies…

1. Start with identifying desired behaviors: WHO needs to do WHAT to work toward a goal or objective

ABC: Antecedent-Behavior-Consequence

2. Identify obstacles and enabling factors

3. Identify what program strategies are needed to bring about change in behavior

These will include communication, but extend beyond it

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What is an ideal behavior…

- An ACTION
- Observable and measurable
- Specific
- Do-able
- Directly linked to improved health outcome

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Possible Program Strategies

- Policies, legislation, norms, guidelines
- Logistics, supplies, technologies
- Capacity building (training, supervision, etc.)
- Communication and advocacy
- Service Delivery
- Monitoring and Evaluation

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Designing the strategy…

Program Objective: _____

Target Group (who will take action): _____

Desired actions/ ideal behavior for target group: _____

Behavioral Analysis		Program Strategies					
Obstacles	Enabling Factors	Policy, legislation, norms, guidelines	Logistics, supplies, technologies	Capacity-building (e.g., training, supervision)	Communication and advocacy	Service delivery	Monitoring and evaluation

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