



# SUSTAINABLE HEALTH CARE WASTE MANAGEMENT IN GAUTENG (South Africa)

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# 0 Overview of presentation

1. Introduction to the Gauteng HCWM Project
2. Setting of Minimum Requirements for HCW Management
3. Feasibility Study into Management Scenarios
4. Pilot Projects for improved HCW Management
5. Improving the Role of Service Providers and New Tender Requirements
6. Conclusions & Findings
7. Source of further information and documentation

## 1.1 Produced & Planned outputs

- HCWM Policy
- Feasibility Study
- HCWM Guidelines
- HCWM Regulations
- WIS Regulations
- Draft Capacity Building Report (Pilots & Province)
- Non-burn Verification Protocol
- Study Tour Report
- HCWIS Design
- DACEL HCW Treatment Manual
- Survey Report for Pilots
- Cost of compliance monitoring (Incin.)
- HCW Composition Study
- Final Capacity Build. Plan
- Awareness Guidance Booklet
- Illustrated Code of Practice
- Techn. Spec & Tender Doc's
- HCWM Strategy & Action Plans
- 5-day training course (SETA approved)
- Int'l HCW Conference 25-26th of August at Sandton CC
- Local Gov Guidelines
- Tender Roll-out Support

## 1.2 Status Quo Report (Y 2000)

- First time in South Africa that HCRW was weighed at selected institutions
- All treatment plants were located, mapped and the technology evaluated
- 600 major and 9700 minor HCRW generators (90/10%)
- 50% of waste from private HC facilities
- Approx. 1200 tonne/month of HCRW
- 70 incinerators at 58 sites (25 DEAT registered)
- Poor performance, non-compliance
- Not cost-efficient, cardboard boxes costly
- Very manual system, unsafe, needle stick injuries
- Poor segregation

# 1.3

## Generation



20 0 20 40 Kilometers

Key HCRW Generators

● > 15,000 kg/m

HCRW Generators [kg/m]

● 0 - 2000

● 2000 - 5000

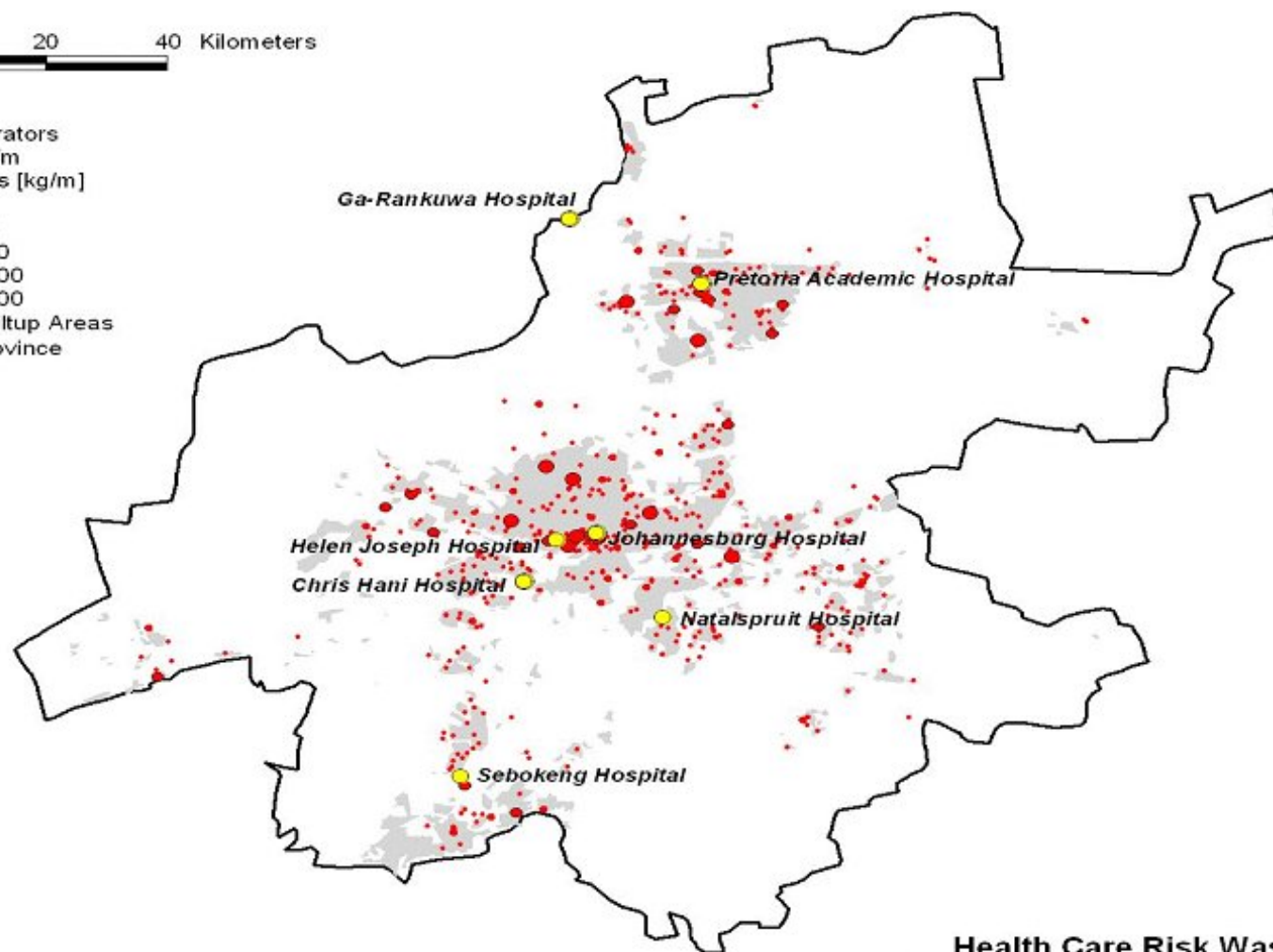
● 5000 - 10000

● 10000 - 20000

● 20000 - 60000

■ Gauteng Builtup Areas

□ Gauteng Province



**Health Care Risk Waste Generators**  
(scaled by mass of HCRW waste/month)

# 1.4

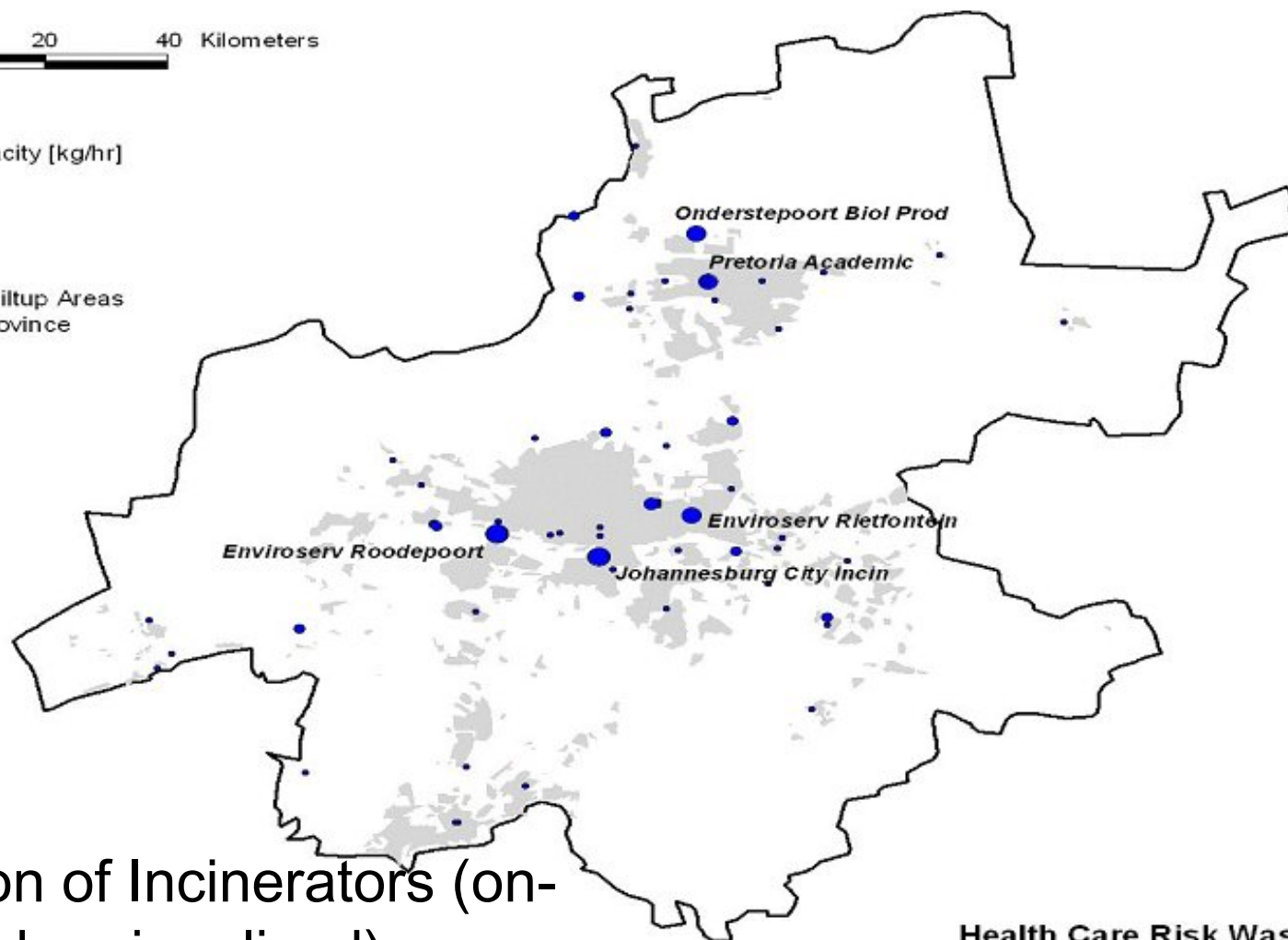
## Disposal



20 0 20 40 Kilometers

Incinerators Capacity [kg/hr]

- 0 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- 200 - 350
- Gauteng Builtup Areas
- Gauteng Province



Location of Incinerators (on-site and regionalised)

Health Care Risk Waste Incinerators  
(scaled by Incinerator Capacity)

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## 2.1 Health Care Risk Waste Regulations

- **Why:** In order to ensure ongoing improvement in HCRW Management Systems and to implement the findings of the Strategy Development Process
- **How:** Section 24 of the Environmental Conservation Act provides for making regulations with regard to waste management including classification of waste, handling, storage, transport and disposal. This was assigned to provinces in 1996

## 2.2

# The Principles

- Regulate a management system for HCRW in Gauteng
- Recognize OH&SA & Min Requi. & third party protection
- Prohibit the disposal of HCRW with General waste
- Ensure duty of care of Health Care Institutions
- Set performance standards for thermal and non-thermal treatment technologies
- Requirement for treatment facilities and transporters to be authorized by DACEI to operate
- Ensure that HCRW is only treated at compliant treatment plants, including waste generated in Gauteng & treated outside of the province



## 2.3

# Principles (continued)



- Allow for the closure of non-compliant treatment plants through a regulated process
- Tracking of waste from major generators
- Set minimum monitoring and reporting requirements to authorities and from authorities
- Provides for registration of major generators, all transporters, and treatment facilities
- Provide for the management of the waste from minor generators including home based care givers through Local Government structures
- Set timeframes for the implementation of systems, and compliance with systems
- Provide enforcement tools, and set realistic expectations for enforcement

## 2.4

# Requirements for Incineration



Type	Maximum allowable emission to the air from controlled combustion treatment facilities (Daily average values)	Monitoring frequency samples per year Standard (may be reduced after period of documented compliance)
Units	mg/Nm <sup>3</sup>	
PM/dust	25	Continuous
CO	50	Continuous
Dioxin/furan (nanogram) TEQ	0.2	1
HCl	30	Continuous
HF	-	-
SO <sub>2</sub>	25	Continuous
NO <sub>x</sub>	-	-
NH <sub>3</sub>	-	-
Pb, (same for Cr, Be, Ar, As, Sb, Ba, Ag, Co, Cu, Mn, Sn, V, Ni)	0.5	4 (1)
Cd (same for Tl)	0.05	4 (1)
Hg	0.05	4 (1)
Reference Conditions and definitions	11% O <sub>2</sub> , 273 Kelvin, 101.3 kPa. All parameters to be defined and measured as in the Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on Incineration of Waste	

## 2.5 Requirements for Non-burn Plants

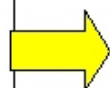
- (1) Emissions to the atmosphere
- (2) Microbial inactivation standards which must be achieved at all times by all non-combustion treatment facilities are as follows:
  - (a) Vegetative bacteria, fungi, lipophilic/hydrophilic viruses, parasites and mycobacteria:  $\geq 6 \text{ Log}_{10}$  reduction;
  - (b) *G. stearothermophilus* spores or *B. atrophaeus* spores:  $\geq 4 \text{ Log}_{10}$  reduction;
- (3) Representative biological indicators
- (4) Performance testing requirements
- (5) Regular testing programme
- (6) Reduced routine testing programme

### 3.1

## Purpose of the Feasibility Study

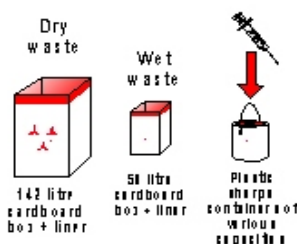
1. Provide decision making basis for deciding which systems to test in the HCW Pilot Projects in Gauteng that in turn would inform the next HCW Tender for the Gauteng Department of Health
2. Provide information on Environmental, Financial and Socio-economic/Safety impacts of Status Quo compared to selected Scenarios

## Scenario:

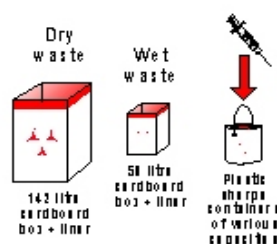


**"Status-Quo"**

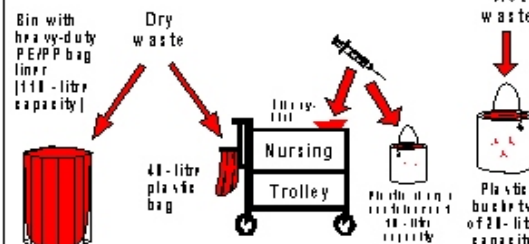
Ward



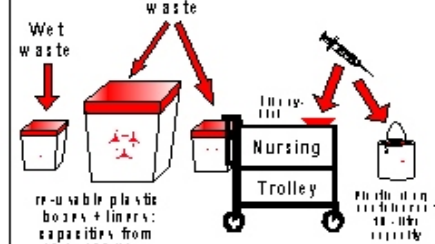
**1**



**2**

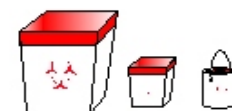
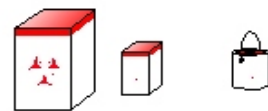
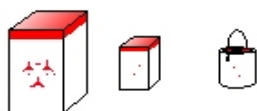


**3**



**4**

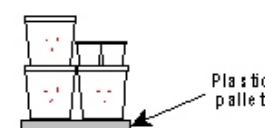
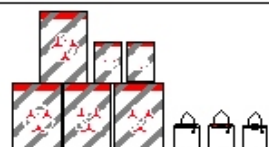
Internal storage (e.g. sluice room)



Internal movement



Central storage at hospital/clinic



Transport to external treatment facility



At treatment facility

Containers destroyed

Containers destroyed

Sterilized & returned

Sterilized & returned



Baseline & Alt. Scenarios

## 3.3 Methodology: Environmental Assessment of Scenarios

1. Selection of key relevant emission parameters only
2. "Cradle to Grave" inclusion of all indicator emission parameters (in principle).
3. Negligible contributions omitted
4. Emissions include: Manufacturing, transport, treatment, landfill impacts/decomposition of residues, washing of containers
5. Emissions exclude: construction of treatment plants, landfills and other secondary emissions (e.g. transporation of workers to/from work, supplies etc.)

# 3.4 Results: Environmental Analyses

Impact from container manufacturing		Status Quo	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Impact prod. cardboard boxes/wheelie bins		Status Quo	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Total Energy	MJ	3,347,493	3,347,493	365,372	294,601	308,146
Water	kg water	6,500,265	6,500,265	641,582	360,737	317,127
Waste	kg waste	8,743	8,743	6,146	5,268	7,684
Loss of land	m2 land	1.2	1.2	0.9	0.7	1.1
CO	kgCO	87.8	87.8	2.6	2.2	0.7
CO2	kgCO2	121,628	121,628	16,795	12,229	28,657
Dust	kgDust	157	157	10	8	14
HF	kgHF	0.0200	0.0200	0.0054	0.0046	0.0015
Hg	kgHG	0.0054	0.0054	0.0014	0.0012	0.0004
NOx	kgNOx	375	375	51	40	54
SO2	kgSO2	802	802	71	55	77
COD	kgCOD	1,370	1,370	22	14	21
HCl	kgHCl	0.4	0.4	0.1	0.1	0.0
CH4	kgCH4	79	79	22	19	6

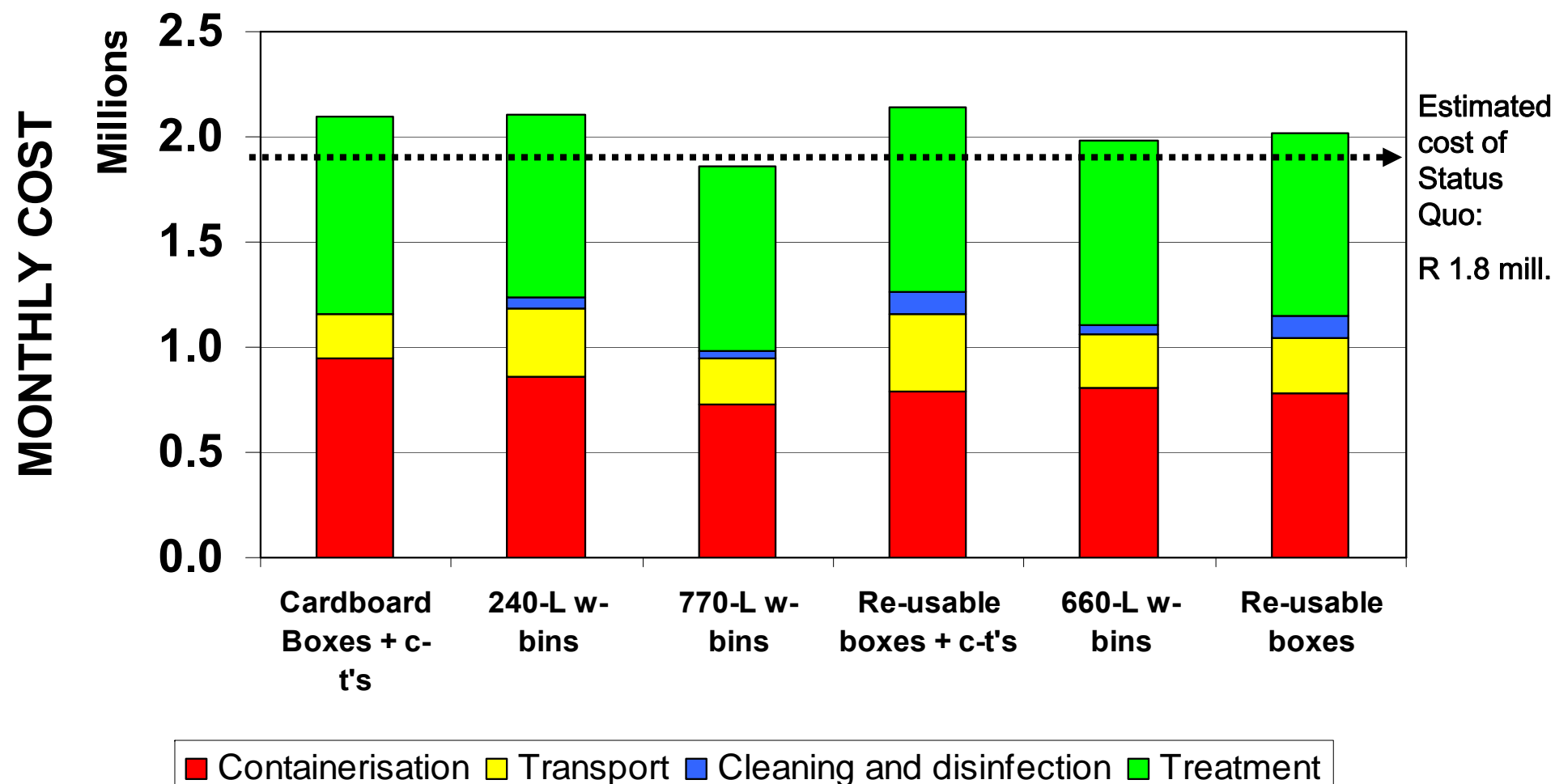
# 3.5 Results: Environmental Analyses

TOTAL Incl. Manufacturing of conta			SQ	SC 1 (cardbox)		Sc 2 (240 WB)		Sc 3 (770 WB)		Sc 4 (reuse bins)	
Total Impact			Status Quo	Regional Incin.	Regional Non-burn	Regional Incin.	Regional Non-burn	Regional Incin.	Regional Non-burn	Regional Incin.	Regional Non-burn
CH4	Air	kgCH4	79	79	363,399	22	363,342	19	363,339	6	363,326
CO	Air	kgCO	3,576	787	91	702	6	702	5	706	9
CO2	Air	kgCO2	2,755,813	2,755,813	1,191,664	2,650,980	1,086,831	2,646,414	1,082,265	2,634,191	1,070,042
COD	Water	kgCOD	1,370	1,370	2,659	22	1,311	14	1,304	6	1,295
Dust	Air	kgDust	2,675	653	193	506	46	503	44	502	42
HCl	Air	kgHCl	2,092	418		419	0	419	0	424	6
Hg	Air	kgHg	3	0.72	0.01	0.71	0.00	0.71	0.00	7	6
NOx	Air	kgNOx	4,585	3,191	502	2,868	179	2,857	168	2,823	133
SO2	Air	kgSO2	4,325	1,187	980	456	248	440	233	391	183
Dioxin (TEQ-I)	Air	mgTEQ	0.014	0.0031	0.0004	0.0031	0.0004	0.0031	0.0004	0.0031	0.0004
Green-house (CO2)	Air	kgCO2	2,757,786	2,757,786	10,276,636	2,651,528	10,170,378	2,646,883	10,165,734	2,634,336	10,153,187
<i>Land/Waste Impacts</i>											
Leachate	Water	liter	1,992	1,992	11,720	1,992	11,720	1,992	11,720	1,992	11,720
Liter fuel/kg	Resource	liter	7,314	12,716	17,580	12,716	17,580	12,716	17,580	12,716	17,580
Loss of land	Resource	m2	5	6.0	165.3	5.6	164.9	5.5	164.8	5.8	165.2
<i>Energy Impacts</i>											
Energy (ex diesel)	Resource	MJ	3,727,221	3,727,221	3,980,373	745,100	998,252	674,329	927,481	687,874	941,026
Use of diesel	Resource	Liter	7,314	12,716	17,580	12,716	17,580	12,716	17,580	12,716	17,580
Total energy (excl.	Resource	MJ	3,988,338	4,181,189	4,607,979	1,199,069	1,625,858	1,128,297	1,555,087	1,141,842	1,568,632



# 3.6

## MONTHLY COSTS: PROVINCIAL HCRW ONLY (Incineration at 3 locations)



## 3.7 Summery of Feasibility Study



1. The use of on-site treatment plants, in particular on-site incinerators, should be discontinued over a period of time
2. There should be a move towards fewer and larger HCRW treatment facilities in Gauteng;
3. Internal and external handling of HCRW receptacles should be mechanised and the manual handling should be reduced to avoid damaging workers' health and creating more meaningful and dignified jobs and working conditions;
4. It is not clear if incineration or non-burn treatment is environmentally significantly better than the other. Hence, both technologies are recommended for use provided that the stringent emission standards are enforced.

# Pilot Projects at Leratong Hospital and Itireleng Clinic

# 4.1



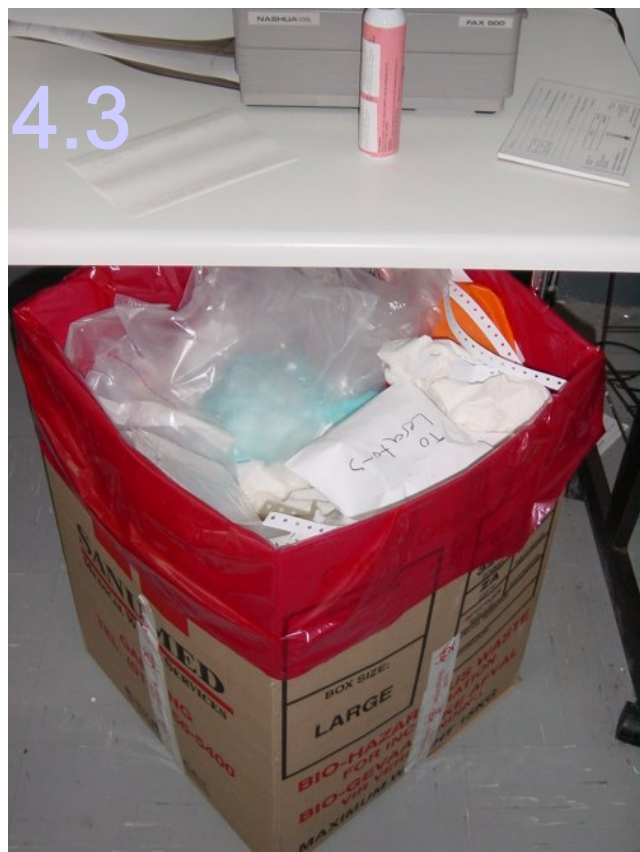
	Pre-intervention Situation	Post-intervention Situation 50% of Leratong Hospital	Post-intervention Situation 50% of Leratong Hospital
Ward	<p>Dry waste: 140 litre cardboard box + liner</p> <p>Wet waste: 50 litre cardboard box + liner</p> <p>Sharps: Sharps container not in close proximity</p>	<p>Dry waste: Bin with inter-daily PEP bag (not 110 litre capacity)</p> <p>Wet waste: 40 litre plastic bag</p> <p>Sharps: Sharps container not in close proximity</p> <p>Nursing Trolley</p>	<p>Wet waste: 110 litre capacity</p> <p>Wet waste: 110 litre capacity</p> <p>Sharps: Sharps container not in close proximity</p> <p>Nursing Trolley</p>
Internal storage (e.g. sluice room)	<p>140 litre cardboard box + liner</p> <p>50 litre cardboard box + liner</p> <p>Sharps container</p>	<p>240 litre cardboard box + liner</p> <p>Wet waste not in close proximity</p>	<p>140 litre cardboard box + liner</p> <p>50 litre cardboard box + liner</p> <p>Sharps container</p>
Internal movement	<p>Person carrying box</p>	<p>Person carrying box</p> <p>270 litre wheeled bin</p>	<p>"Cage" trolley</p>
Central storage at hospital/clinic	<p>Stacked boxes</p> <p>Sharps container</p>	<p>240 litre cardboard box + liner</p> <p>270 litre wheeled bin</p>	<p>Stacked boxes</p> <p>Sharps container</p> <p>Plastic pallet</p>
Transport to external treatment facility	<p>Van</p>	<p>Truck</p>	<p>Truck</p>
At treatment facility	<p>Containers destroyed</p>	<p>Sterilized &amp; returned</p>	<p>Sterilized &amp; returned</p>

4.2





4.3



## 4.4



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Danish Cooperation for Environment and Development  
Ministry of Environment and Energy

**RAMBOLL**

## 4.5





4.6



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4.7



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4.8



# SEGREGATE WASTE CORRECTLY

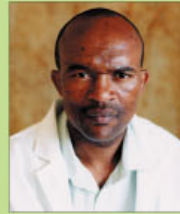
4.9



Health Care Waste Officer



Nurse



Pharmacist



General Assistant



Doctor



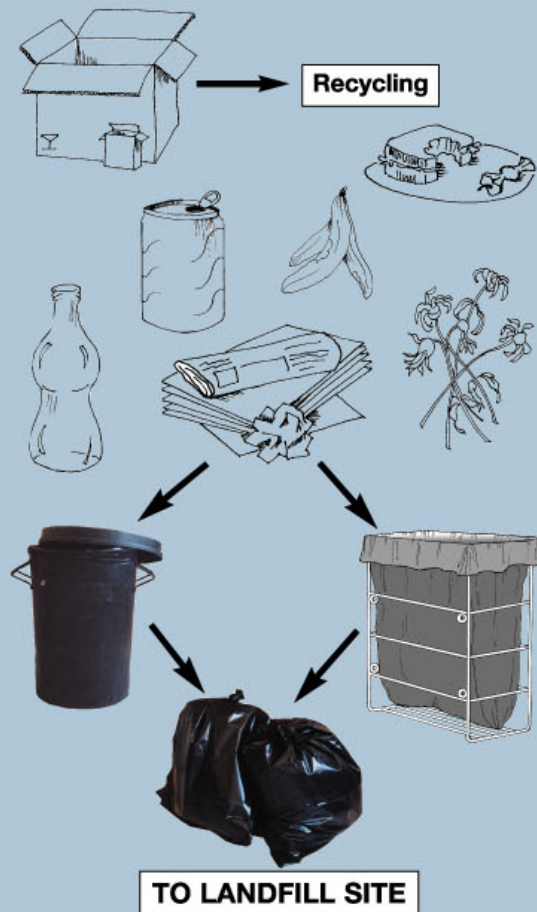
Administrator

Gauteng Sustainable Health Care  
Waste Management Project



Everyone who works in a health facility is a member of the Waste Team. Make sure you know how to segregate waste.

## GENERAL WASTE

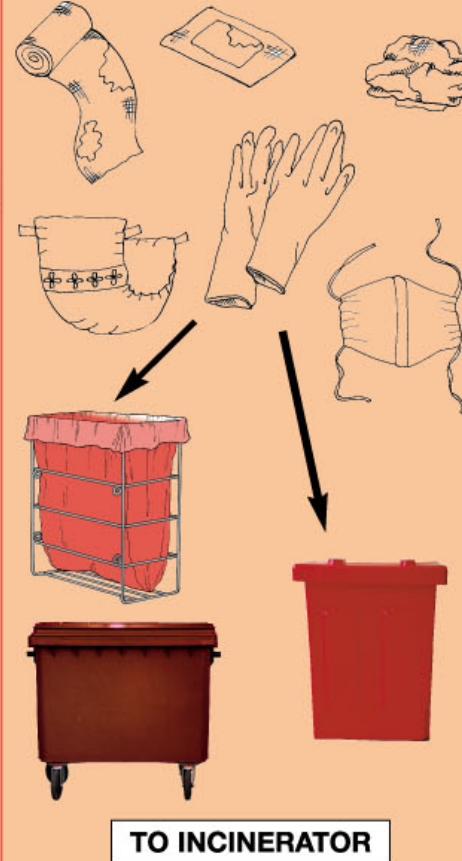


## BIOHAZARDOUS OR MEDICAL WASTE

### SHARPS



### INFECTIOUS



### ANATOMICAL





**A O APERETSE GO DIRA?**

**ARE YOU DRESSED FOR WORK?**

**4.10 WEARING PROTECTIVE CLOTHING IS YOUR RIGHT!**  
**GO APARA DIAPARO TSA TSHIRELETSO KE TOKA YA GAGO!**



**Wear thick nitrile gloves when you are working with waste.**

**Apara disokisi tsa matsogo tsa nitrile tse tiileng go o dira ka matlakala.**



**Wear nitrile or yellow gloves for cleaning.**

**Apara disokisi tsa matsogo tse serolwana ge o phepafatsa.**



**Wear thick nitrile gloves and a strong pair of shoes when you are collecting waste with a trolley or a wheelie bin.**

**Apara disokisi tsa matsogo tsa nitrile tse tiileng le ditlhako tse tiileng ge o tsaya matlaka mo kolotsaneng ya matlakala.**

**CONTACT YOUR SUPERVISOR ABOUT PROTECTIVE CLOTHING**

## EVERYONE WHO WORKS IN A HEALTH FACILITY IS A MEMBER OF THE WASTE TEAM

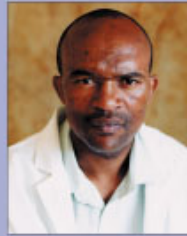
4.11



Health Care Waste Officer



Nurse



Pharmacist



General Assistant

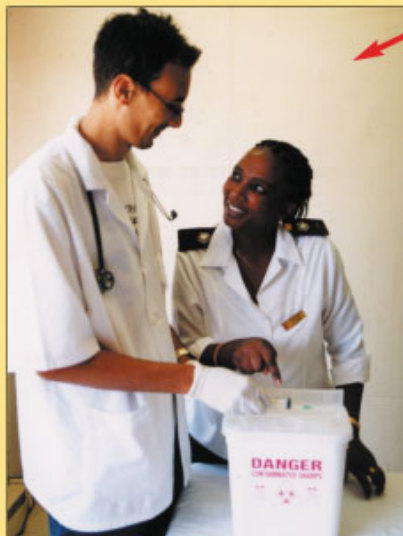
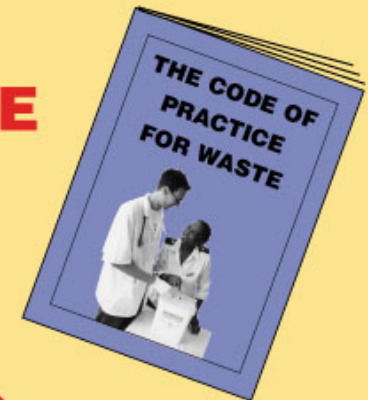


Doctor



Administrator

### WHAT DOES THE CODE OF PRACTICE FOR WASTE TELL US ABOUT?



We all have a responsibility to teach others about waste.



It is important to thank people for good work.



It is a legal requirement that we report unsafe incidents and accidents such as needlestick injuries to our supervisor or safety representative.



The occupational health and safety committee must discuss all injuries.



# PROTECT YOUR HEALTH AND SAFETY

## 4.12 HOKOMELA PHOLO LE PABELESEGO YA GAGO

**When you pick up a sealed or closed liner:**

- wear gloves
- hold the liner away from your body
- use one hand to hold the liner.

**Fa o kuka kgetsana e e kwetsweng:**

- rwala disokisi tsa matsago
- tshwarela kgetsana kgakala le mmele wa gago
- dirisa letsogo le le lengwe go tshwara kgetsana.



**Always bend your knees when you pick up a red waste box. This will protect your back from injury.**

**Koba mangwele a gago nako le nako fa o kuka lepokisi le le khibidu. Se se ka sireletsa mokwatla wa gago gore o seka wa utlwa botlhoko kgotsa wa tswa kgobalo.**



**Always pull or push one trolley or wheelie bin at a time. This will protect your back from injury.**

**Goga kgotsa kgatlametsa kolotsana e le nwe ka nako. Se se ka sireletsa mokwatla wa gago gore o seke wa utlwa botlhoko kgotsa wa tswa kgobalo.**



**REPORT ALL UNSAFE INCIDENTS AND ACCIDENTS TO YOUR SUPERVISOR OR SAFETY REPRESENTATIVE**

Gauteng Sustainable Health Care  
Waste Management Project





4.13



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# 4.14 Results Pre/Post Leratong H



**Leratong Pre- and Post-Intervention Studies**

	Correctly Disposed				Incorrectly Disposed				Total			
	HCGW		HCRW		HCGW		HCRW		HCGW		HCRW	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Gen Infectious W			224.6	276.5	76.4	19.0	1.9	2.7	76.4	19.0	226.5	279.3
Sharps			17.0	1.6	0.0	0.0	2.8	0.5	0.0	0.0	19.8	2.1
Laboratory			13.8	18.5							13.8	18.5
Morgue				14.2								14.2
Pathological			5.6	16.6							5.6	16.6
Blood bank			6.9	2.2							6.9	2.2
Sub-total			268.0	329.8	76.4	19.0	4.6	3.2	76.4	19.0	272.6	332.9
Percentage			76.8%	93.7%	21.9%	5.4%	1.3%	0.9%	21.9%	5.4%	78.1%	94.6%
General Waste	1713.9	1869.9					80.0	56.4	1713.9	1869.9	80.0	56.4
Percentage	95.5%	97.1%					4.5%	2.9%	95.5%	97.1%	4.5%	2.9%
GRAND TOTAL	1713.9	1869.9	268.0	329.8	76.4	19.0	84.7	59.6	1790.2	1888.9	352.6	389.4
Percentage	80.0%	82.1%	12.5%	14.5%	3.6%	0.8%	4.0%	2.6%	83.6%	82.9%	16.5%	17.1%
Kg/patient/day	3.37	3.74	0.53	0.66	0.15	0.04	0.17	0.12	3.52	3.78	0.69	0.78

5.1

# Health Care Risk Waste Tender Specifications & Tender Document

## 5.2 Background to Tender Process

- Existing HCRW Contract expired 31/3/2003; but were extended + 6 months (option for extra 6 months)
- Needs analysis highlighted various shortcomings in current process;
- Pilot projects undertaken to test improved HCRW management;
- Regulations on HCRW management in process of promulgation;
- Need to introduce improved HCRW management into Facilities;
- Rollout of improved system will impact on 50% of Gauteng HCRW.

# 5.3 Important considerations in Project Specification



1. 5 years in stead of 3 year contract period
2. One contract per Region (A, B and C)
3. Contractor responsible for collection, treatment, supply of durable and disposable containers, training and reporting (all inclusive)
4. Payment structure change to i) mass/container, and ii) penalties for service failures
5. Prescribed standards for equipment (durable & disposable), transport and treatment + Overall Service
6. Overall requirement and possibility for alternative tenders, evaluation, GSSC/DoH;
7. Treatment plant;
8. Reporting;
9. Training Provision;
10. Link to HCW Officers/Assistants & 5-day training course

## 6

# FINAL CONCLUSIONS

1. There is much room for improvement of HCRW Management in Southern Africa!
  - Inefficiency = high cost & poor standards, poor segregation, workers & communities at risk, limited awareness, roles/responsibilities unclear, poor awareness, poor appreciation of staff at risk etc.
2. Considerable improvements can be achieved with limited efforts!
  - Better segregation, better equipment, involvement/empowerment of staff, reduce cost or get better service for same price!
3. There is considerable experience from Gauteng that can be applied/adapted for other provinces and African countries



## Gauteng Department of Agriculture, Conservation, Environment and Land Affairs (DACEL)

[HOME](#)[Status Quo](#)

Current Projects:

[Health Care Waste](#)

Documents:

[Background Report](#)[Status Quo Report](#)

Legislation:

[Health Care Waste](#)[Waste Information](#)

Information System:

[Registration](#)[Logon](#)[Public Reports](#)[Statistics](#)[News](#)[Links](#)[Contact Details](#)

## Sustainable Health Care Waste Management in Gauteng

Gauteng DACEL, in conjunction with DANIDA and Rambøll, are currently addressing the issue of sustainable Health Care Waste Management within Gauteng Province ([Project Fact Sheet](#)). The immediate objectives of the project are to develop an:

- Integrated Health Care Waste Management Strategy and Action Plan for Gauteng.
- HCW guidelines, technical specifications and tender material for Gauteng.
- Institutional arrangements for sustainable Health Care Waste Management in Gauteng.

The project which started in October 2000 will continue until April 2004. An [International Conference](#) on Health Care Waste Management was held in Johannesburg in August 2003 to present to outcomes of the project.

The following documentation and graphics provides both background and progress to date on the project:

- [Technical Project Reports and Documents](#)
- [General Project Documents and Workshop Proceedings](#)
- [Pilot Projects](#)
- [Video clips and graphics](#)
- [Project team](#)

The outcomes of the project are being tested through two pilot projects, which began in January 2003 at Leratong Hospital and Itireleng Clinic.

7.2

# THANK YOU!

- Documents available at :  
[WWW.CSIR.CO.ZA/CIWM/HCRW](http://WWW.CSIR.CO.ZA/CIWM/HCRW)
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