Project:
Building national and local capacity for the treatment of healthcare waste in countries impacted by the Ebola epidemic using environmentally friendly technologies

De-briefing on the project in Liberia
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Ebola waste and incinerators
Air Emissions From a Medical Waste Incinerator

Rationale for the Project

Liberia is a party to the Stockholm Convention on Persistent Organic Pollutants which requires the country to take measures to reduce or eliminate the releases of dioxins (Article 5 & Annex C).
What are Dioxins?

- Among the **most toxic substances** known to science
- Remain in the environment for **hundreds of years**
- Enter the body primarily through ingestion of **fish, meat, eggs, milk and other dairy products**

**Health Effects of dioxins**

- Different types of cancers
- Birth defects
- Effects on the learning ability and development of children
- Suppression of the immune system
- Effects on male and female reproductive systems
Findings of the WHO Risk Assessment Study
“Assessment of Small-Scale Incinerators for Health Care Waste,” January 2004

<table>
<thead>
<tr>
<th>Risk Scenario</th>
<th>Compared to WHO ADI</th>
<th>Compared to EPA Cancer Risk</th>
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<tr>
<td>Worst Case: High Use</td>
<td>unacceptable</td>
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<td>Worst Case: Medium</td>
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<td>Worst Case: Low Use</td>
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<td>Expected: High Use</td>
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<td>Expected: Medium Use</td>
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<td>Expected: Low Use</td>
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<td>Best Practice: High Use</td>
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Rationale for the Project
Examples of the Closure of Medical Waste Incinerators (MWI) in Developed Countries

- **United States**
  - 1988: 6200 MWIs
  - 1997: 2100 MWIs
  - 2006: 72 MWIs
  - 2013: 33 MWIs

- **Canada**
  - 1995: 219 MWIs
  - 2000: 101 MWIs
  - 2003: 56 MWIs
  - 2005: 42 MWIs

- **Germany**
  - 1984: 554 MWIs
  - 2002: 0 MWIs

- **Portugal**
  - 1995: 40 MWIs
  - 2004: 1 MWI

- **Ireland**
  - 1990s: 150 MWIs
  - 2005: 0 MWIs
Medical Waste Autoclave for Africa

- Developed in collaboration with the UNDP GEF Project for use in Africa
- Based on well-established designs
- Manufactured by Medi-Clave Pty Ltd (Pretoria, South Africa)
- Designed for 150 beds

- Exceeds international STAATT II standard by 10 times
- Medical waste shredder also provided
Non-Incineration Treatment Technology

1. Place waste inside stainless steel barrel and close the lid
2. When barrel is full, take to autoclave
3. Slide barrel into autoclave
4. Close sliding door
5. Start heating, multi-vacuum and sterilization cycles
6. When finished, open door and remove sterilized barrel
7. Unlock & rotate barrel to dump treated waste at the bottom
8. Barrel and trolley are ready to pick up more waste

www.medi-clave.co.za
This project is under UNDP’s Ebola Crisis Response and Resilience Programme

- Strengthening essential services in the health sector

Goals:

- To reduce the risk of Ebola contamination in the affected countries
- To enhance resilience in order to manage future outbreaks

Specific Focus:

- To improve the infrastructure and capacity for the treatment of infectious waste using state-of-the-art clean technologies
- To improve infection control, including healthcare waste management practices in healthcare facilities

Three Outputs

1) Treatment technologies installed and operational
2) Staff trained in healthcare waste management
3) Technologies and approaches integrated into long-term programs, infrastructure, policies and plans
1) Two Waste Treatment Autoclaves Installed and Operational so far

- JFK Memorial Hospital, Monrovia

- Broken incinerator that does not meet international standards
- Infectious waste piled up due to broken incinerators
Output 1: UNDP Project - Liberia

1) Two Waste Treatment Autoclaves Installed and Operational so far
   - JFK Memorial Hospital, Monrovia

Hospital maintenance technicians trained during the assembly and installation
1) Two Waste Treatment Autoclaves Installed and Operational so far

- JFK Memorial Hospital, Monrovia

Training of the operators
Two Waste Treatment Autoclaves Installed and Operational so far

- JFK Memorial Hospital, Monrovia

Control wheel, gauges, instructions and front panel

Sterile compact waste mass after treatment; to be collected by NC Sanitary company (except sharps)
1) Two Waste Treatment Autoclaves Installed and Operational so far
   - JFK Memorial Hospital, Monrovia

Completed installation at the back of JFK- Maternity Hospital
1) Two Waste Treatment Autoclaves Installed and Operational so far
   - Jackson F. Doe Hospital, Tappita, Lower Nimba

Chinese incinerator that does not meet international standards (used for sharps)

Open burning for infectious waste and burial pit for regular waste
1) Two Waste Treatment Autoclaves Installed and Operational so far
   - Jackson F. Doe Hospital, Tappita, Lower Nimba

Training maintenance and repair technicians during the installation

Installation completed in 1 day
1) Two Waste Treatment Autoclaves Installed and Operational so far

- Jackson F. Doe Hospital, Tappita, Lower Nimba
1) Two Waste Treatment Autoclaves Installed and Operational so far

- Jackson F. Doe Hospital, Tappita, Lower Nimba
1) Two Waste Treatment Autoclaves Installed and Operational so far

- Jackson F. Doe Hospital, Tappita, Lower Nimba

**Turnover ceremony:**
handing over the operating and maintenance manual

1 autoclave, 3 waste barrel trolleys and 8 reusable sharps containers
2) Staff trained in healthcare waste management and infection control at the 2 hospitals so far

Five types of training provided:

- **For medical and nursing staff**: WHO guidelines for classification and segregation, general healthcare waste management, and infection control
- **For waste workers, cleaners**: WHO guidelines on collection and transport, general healthcare waste management, and infection control
- **For administrators**: Organizational and institutional measures, assessment tools, roadmap and plans to sustain healthcare waste management
- **For operators**: Practical training on operations
- **For maintenance technicians**: Basic maintenance and repair of the equipment
Waste Management is a whole system not just a technology. It must include …

- Procedures for …
  - Waste Classification
  - Waste Segregation
  - Waste Minimization
- Use of Proper Containers
- Placement of Containers
- Posters, Signs, Communication
- Color Coding
- Labeling
- Handling
- Transport
- Storage
- Treatment
- Final Disposal
- Contingency Planning

- Policies, Administrative Measures
  - Organization
  - HCWM subcommittee
  - HCWM coordinator
  - Integrated into Health and Safety Committee
- Situational Analysis, Developing Plans, Roadmap, Grid
- Training
  - Training of trainers
  - Periodic, multi-level training
- System of Monitoring, Evaluation and Continuous Improvement
- Incentives
- Enforcement
- Human & Financial Resources
3) Technologies and approaches integrated into long-term programs, infrastructure, policies and plans
- Training provided to the Environmental & Occupational Health Division of the Ministry of Health
- Support to UNICEF on their assistance to MOH on national policies and plans
- Presentation to Dr. Bernice Dahn, Chief Medical Officer
- Presentation to and collaboration with IMS and IMS WASH team
- Presentation at Monrovia City Council’s Medical Waste Management System for Ebola Response Committee
- Greater collaboration with WHO WASH Liberia and WHO WASH regional
- Initial collaboration with Accel on infection control training in Nimba
The Ebola crisis highlighted the weakness in healthcare waste management (HCWM) and infection control and prevention (IPC) in the three countries. The crisis is an opportunity to raise the level of HCWM and IPC nationwide.

In the framework of the recovery period, the future HCWM and IPC program should benefit from the gains of the UNDP Project.

The installation of state-of-the-art waste treatment autoclaves and training in HCWM and IPC will enhance the resiliency of the countries to future outbreaks.