Waste in humanitarian Operations:
Reduction and Minimisation

Stakeholder Workshop on Safer Medical Waste Management

Pamela Steele Associates Ltd (PSA)

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Workshop Objectives

The goals of this workshop is to:

- To showcase the key outcomes of the EU-funded WORM Project's community-based awareness campaign in Kisumu.
- To further raise awareness on the dangers of incineration and benefits of non-destructive alternatives.
- Facilitate discussions for developing specialized guidelines/protocols aligned with national standards.
- Share adaptable tools/resources for humanitarian/low-resource contexts.
- Strengthen collaboration across health, environment, and humanitarian sectors.

Key Focus: Dangers of incinerating mixed medical waste and promotion of sustainable alternatives.

Target Participants: Local health authorities, facility managers, environmental regulators, humanitarian partners and broader community.

Speakers: Local experts and medical waste specialists to share specialized guidelines, experiences and practical alternatives

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Local Awareness Campaigns

- A dedicated and targeted awareness-raising campaign to engage local communities and healthcare facilities in Kisumu, Kenya, on safe, hygienic, and environmentally sound waste handling practices, emphasising alternative sound treatment methods. We used local talent and tech to deliver practical, lasting impact.
- **Knowledge drives behaviour. Behaviour drives policy.**

Purpose of the Awareness Campaign

- Raise community understanding of medical waste management, dangers of incineration and promote safer alternatives.
- Promote sustainable behaviours through youth engagement
- Empower communities through inclusive engagement and creative expression.
- Provide practical guidance to healthcare facilities and the public.

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Campaign Activities

Development of Relevant Awareness Materials

To support awareness, we developed comprehensive **pamphlets, brochures, and posters** specifically highlighting the dangers of incineration and promoting safer alternatives. These materials are visually engaging and easy to understand. The materials were distributed across Kisumu County.

- Pamphlets with infographics on waste segregation and safe handling.
- Brochures outlining the dangers of incineration and alternative treatment options.
- Posters for display in healthcare facilities and public spaces to reinforce messaging.

All materials highlights:

Color-coded waste bin usage, Health risks of toxic emissions and Sustainable disposal techniques.

- **Pamphlet-**WORM_PSA_Campaign_pamphlet.pdf
- **Brochure-**WORM_PSA_Campaign_Brochure.pdf
- **Poster-**WORM_PSA_Campaign_Poster.pdf

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Youth Engagement Activities

Engaged Unemployed Youth In Brochure Distribution

- Partnered with Misango Arts Ensemble a performing arts group based in Kisumu, using theatre and arts as tools for social change, education, and cultural preservation to identify and recruit unemployed youth in Kisumu County who distributed printed brochures in healthcare facilities and during the World Environment Day.
- Provided training on effective brochure distribution techniques and key messaging about medical waste hazards.
- Coordinated campaign timelines and activities to align with environmental events (World Environment Day on 5th June).

Utilized Youth Artists for Mural Creation

- Collaborated with Misango Arts Ensemble youth artists who designed and created impactful murals focusing on educating the general public and hospital personnel about hazards of incineration in 3 selected healthcare facilities within Kisumu County. Murals communicate the dangers of incineration, importance of waste segregation, and promotion of safer alternatives.

- **Jaramogi Oginga Odinga Teaching and Referral Hospital Mural**-JOOTRH_Mural.jpeg
- **Lumumba Sub-County Hospital Mural**-Lumumba_Sub_County_Hospital_Mural.jpeg
- **Kisumu County Referral Hospital Mural**-Kisumu_County_Referral_Hospital_Mural.jpeg

WORM_PSA_Campaign_Video.mp4

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Theatre Performance

- Collaborated with **Misango Arts Ensemble** to develop and perform a drama piece and poems illustrating risks of incinerating waste and poor waste disposal.
- Preview held on **31st May at Mama Grace Onyango Social Hall** and was attended by attended by **university students, county government department of environment, healthcare professionals, community members, civil societies and NEMA representative.**
- The preview was followed by the main performance on **World Environment Day on June 5th.** Attendees included: students, community, Healthcare professionals, county government, NGOs and the community
- WORM through PSA participated in a Civil Society organisation Network which was conducting a stakeholder meeting on beating plastic pollution, a pre activity of the World Environment day. Shared insights on proper waste disposal and circular economy of plastics and campaign goals with local stakeholders and reinforced collaboration with government, private sector, community and NGOs.

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Impact Achieved

1. Raised awareness among hundreds of residents and local healthcare staff on: Risks of open burning/incineration, Practical, safer treatment alternatives

2. Empowered youth and local creatives as waste awareness champions

3. Fostered cross-sectoral partnerships (environment, health, policy)

4. Influenced behaviour at the healthcare facility level

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Q & A

Local Awareness Campaign

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Common Waste Streams & Waste Management Process

Shadrack Mahonga

Public Health Specialist

County Government of Kisumu (Department of Health)

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Common Waste Streams

General/ non-hazardous waste:

Waste with no chemical, biological, radioactive or physical hazard.

Highly infectious waste:

Wastes from diagnostic laboratory samples; waste from infectious patients in isolation.

Other Infectious/ hazardous waste:

Waste contaminated with blood and other body fluids; laboratory cultures and microbiological stocks; human tissues, organs or fluids; body parts; foetuses; unused blood products

Pathological waste:

Human organs, tissues or fluids, body parts and contaminated animal carcasses

Source: Bureau of International Recycling Healthcare or Medical Waste Factsheet

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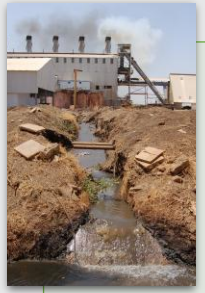
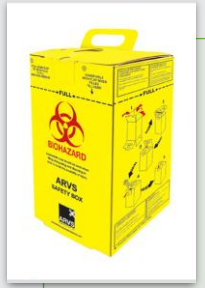
Common Waste Streams...cnt



Chemical waste:

Reagents and solvents used for laboratory preparations, disinfectants, sterilant and heavy metals contained in medical devices.



Sharps waste:

Syringes, needles, disposable scalpels and blades, etc

Radioactive waste

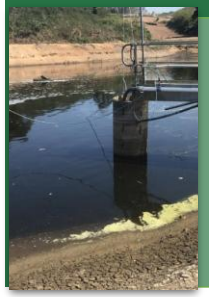
Products contaminated by radionuclides including radiotherapeutic materials or radioactive diagnostic materials.

Cytotoxic waste:

Waste containing substances with genotoxic properties, such as cytotoxic drugs used in cancer treatment and their metabolites.

Pharmaceutical Waste:

Unused, expired and contaminated drugs and vaccines.



Liquid waste

Contaminated and used water, spilled blood, reagents.

Source: Bureau of International Recycling Healthcare or Medical Waste Factsheet

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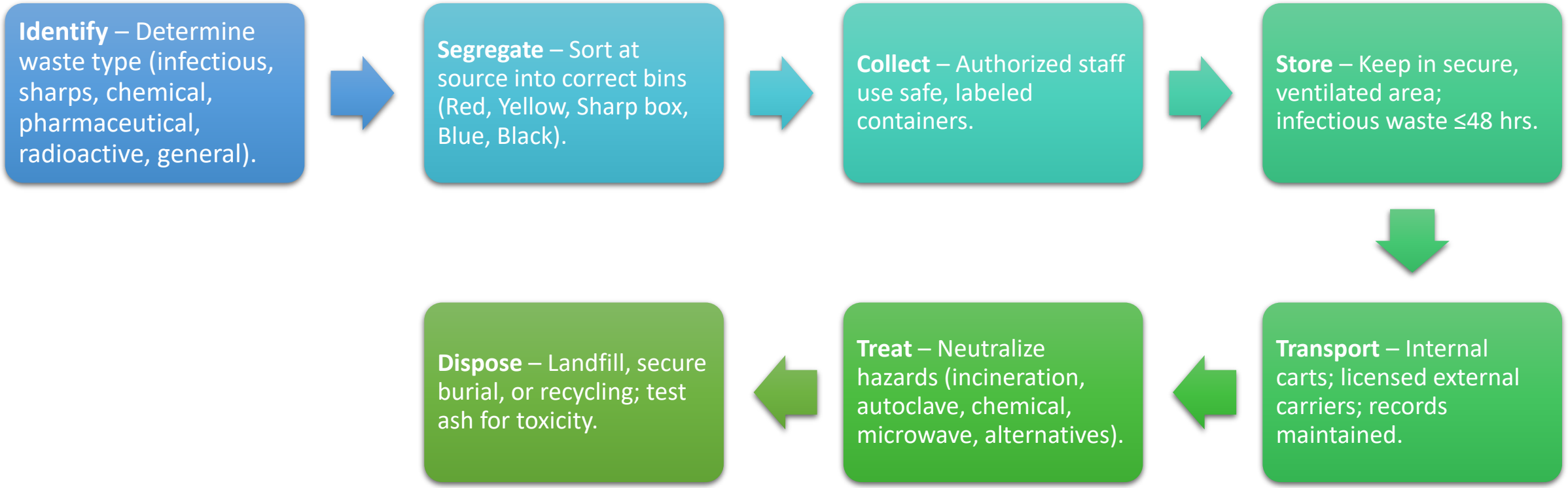
Medical Waste Management Process & Best Practices



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The problem: Incineration of Mixed Waste

"All Waste Must Be Handled Safely and Hygienically"

This fundamental principle is often violated when mixed waste, including hazardous and toxic materials, is incinerated.

Different waste treatment options yield varying levels of toxicity. Incineration, far from being a clean solution, can create new and more dangerous byproducts. It can increase health and environmental risks if not managed properly.

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Health Impacts of Mixed Waste Incineration

Emission of dioxins, furans, and heavy metals

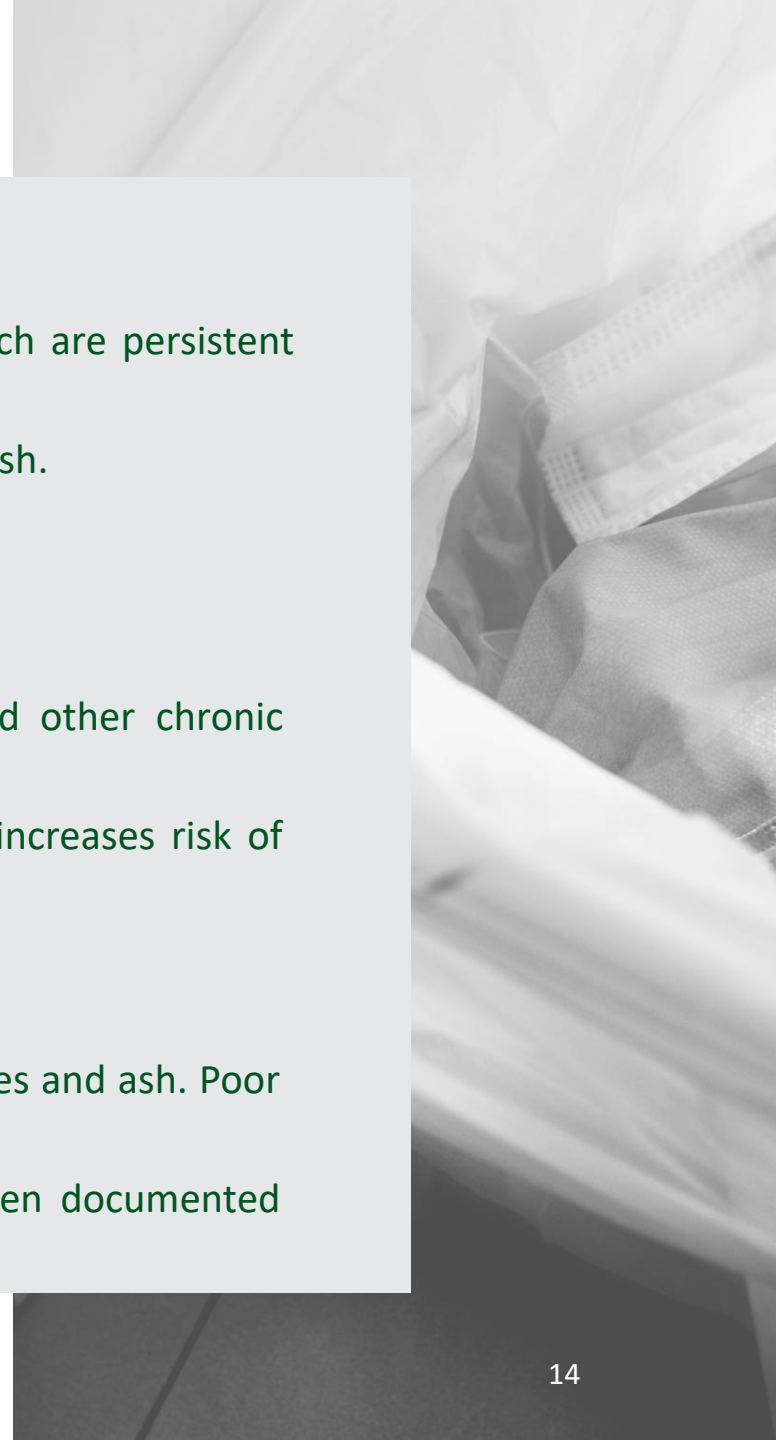
- Burning mixed waste releases highly toxic chemicals such as dioxins and furans, which are persistent organic pollutants (POPs).
- Heavy metals like mercury, lead, and cadmium are emitted in both smoke and bottom ash.
- These toxins accumulate in the food chain, especially in meat, fish, and dairy products.

Respiratory and cancer risks

- Communities living near incinerators face increased risks of asthma, bronchitis, and other chronic respiratory diseases.
- Dioxins are classified by WHO as a Group 1 human carcinogen. Long-term exposure increases risk of cancers (lung, liver, soft tissue sarcoma).

Occupational hazards for workers

- Plant operators and waste handlers are at high risk due to direct exposure to toxic fumes and ash. Poor protective equipment and weak monitoring increase vulnerability.
- Cases of skin disorders, reproductive health issues, and neurological effects have been documented among waste incineration workers.



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Environmental Consequences of Mixed Waste Incineration

Air pollution and climate change contribution

- Incinerators emit large amounts of CO_2 and nitrous oxides, contributing to greenhouse gas emissions.
- Black carbon particles worsen local air quality and accelerate global warming.
- Incineration is often presented as “energy recovery,” but it is far less climate-friendly compared to recycling or composting.

Soil and water contamination from ash

- Bottom ash and fly ash contain concentrated toxic metals and unburnt pollutants.
- Improper disposal can leach heavy metals into soil and groundwater.
- Contaminated soil reduces agricultural productivity and harms biodiversity.

Long-term ecosystem damage

- Bioaccumulation of persistent toxins in wildlife, especially fish and birds.
- Acid rain from emissions damages forests, aquatic ecosystems, and crops.
- Once ecosystems are contaminated, recovery can take decades.

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Economic Consequences of Mixed Waste Incineration

High capital and operational costs

- Incinerators are among the most expensive waste management technologies to build and maintain.
- Require advanced air pollution control systems, skilled staff, and continuous monitoring.
- Developing countries often depend on donor funding, making sustainability difficult.
- Regulatory penalties, such as fines for violations, are costly.

Hidden health costs

- Medical expenses from treating respiratory diseases, cancers, and other illnesses linked to incinerator emissions burden national health systems.
- Loss of productivity from sick workers reduces economic output.

Cost of environmental damage

- Soil and water remediation from toxic ash contamination is expensive and long-term.
- Ecosystem loss reduces economic benefits from agriculture, fisheries, and tourism.
- Expensive to conduct environmental clean-ups.

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Economic Consequences of Mixed Waste Incineration

Lost opportunities for circular economy

- Incineration destroys recyclable and reusable materials that could generate income.
- Recycling and composting industries create more jobs and add value to local economies.

Stranded assets risk

- As global policies move toward zero-waste and carbon reduction, expensive incinerator plants risk becoming obsolete before their investment is recovered.

Cost of environmental damage

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Q & A

Ppt2 and 3

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Policy & Regulatory Perspectives

Stella Kamwasir: Regional Director (Nyanza)

National Environment Management Authority (NEMA)

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Policy & Regulatory Perspectives

National and international regulations on incineration

- The Basel Convention restricts cross-border movement of hazardous waste.
- WHO guidelines discourage incineration of medical waste in low-resource settings due to high risks.
- NEMA legal regulatory provisions that cover healthcare waste mandate EIA licenses, colour-coded segregation, and adherence to circular economy principles.
- Many countries have national emission standards, but enforcement varies widely.

Case studies of enforcement challenges

- In some regions, incinerators operate without adequate pollution control systems.
- Weak monitoring capacity leads to unchecked emissions and illegal waste burning.
- Low enforcement and compliance (16% in some facilities), poor funding, inadequate monitoring, and mixing/dumping issues at county/national levels.
- Case: Some hospitals in Africa and Asia continue open burning due to lack of infrastructure, despite national bans.

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Stakeholder Roles

- Authorities enforce audits; NGOs advocate; staff implement protocols; communities monitor implementation of improvements.

Policy gaps and opportunities for improvement

- Lack of strict penalties for non-compliance.
- Limited incentives for adopting non-burn technologies.
- Opportunity: Integrating circular economy principles into waste policy, promoting recycling and safe alternatives.

Regulatory compliance

- Adhere to local and international regulations (e.g., WHO guidelines, EPA standards, or country-specific laws like the U.S. Resource Conservation and Recovery Act).
- Maintain records of waste generation, treatment, and disposal for audits and compliance checks
- Train staff regularly on proper handling, safety protocols, and legal requirements.

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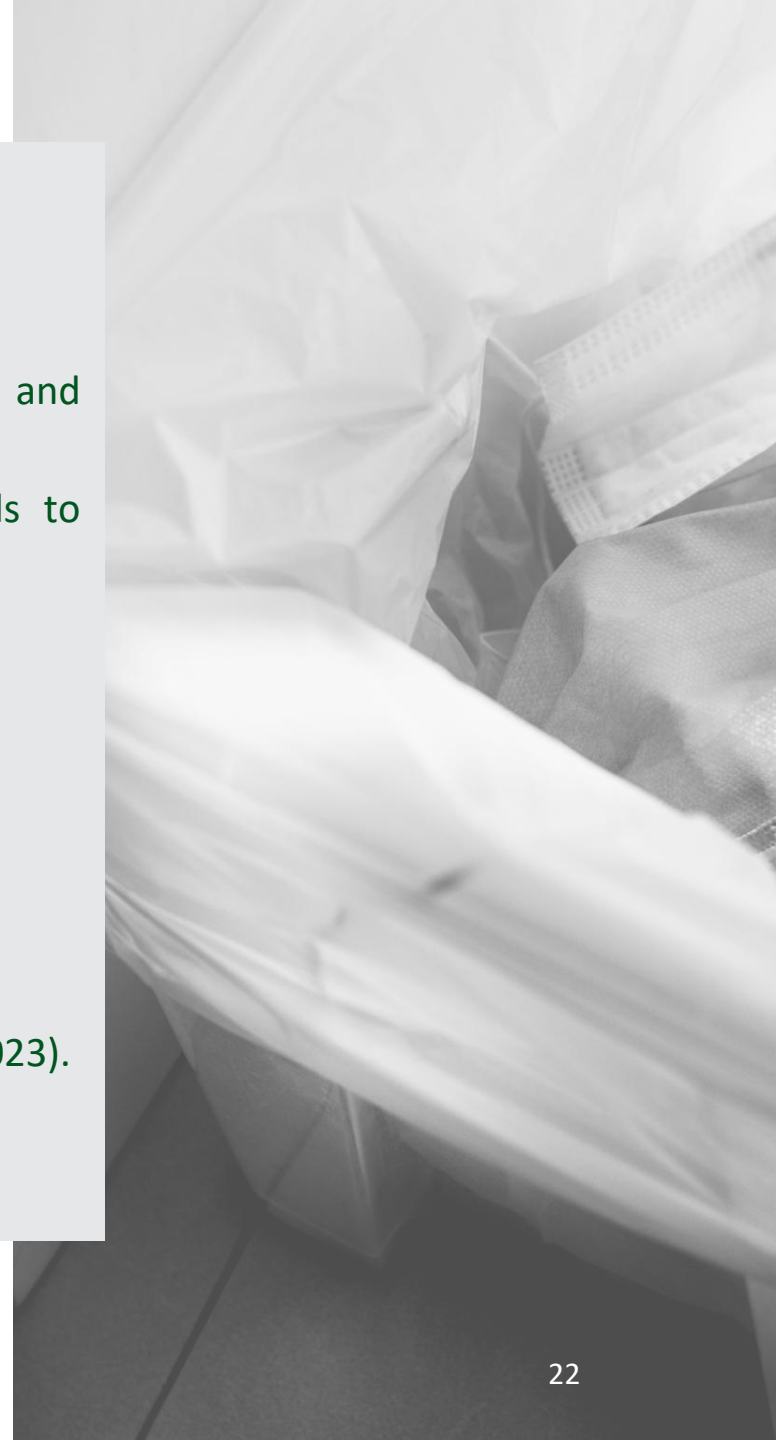
Monitoring and Risk Management

- Conduct regular inspections of waste management processes to ensure compliance and safety.
- Implement spill response plans and personal protective equipment (PPE) protocols to mitigate risks.
- Monitor environmental impact to prevent contamination of soil, water, or air.

Circular economy solutions

- Promoting reuse, repair, and material recovery before disposal.
- Investing in community awareness programs for waste segregation.
- Transitioning from “waste disposal” to “resource management” to close the loop.
- ·Policy shifts work: Kenya’s 2017 plastic bag ban cut single-use plastics by 80% (NEMA, 2023).



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Safe Alternatives to Waste Incineration

Speaker : Walter Oloo

Senior lab analyst / Space health & safety officer /

Quality assurance & risk management officer /

Integrity assurance officer cghr.

KEMRI

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Safe Alternatives to Waste Incineration

- Autoclaving: uses pressurized steam to sterilize infectious waste, making it safe for disposal. It's emission-free. Used in Kisumu & Nairobi hospitals; India (>70% hospitals).
- Microwaving: achieves disinfection using moist heat and microwave energy. 99% pathogen kill. Piloted at Mulago Hospital, Uganda (UNEP, 2023).
- Chemical disinfection: uses chlorine-based or other agents to destroy pathogens in liquid waste. Used during Ebola outbreak (West Africa).
- Sanitary landfills: Properly engineered landfills prevent leachate contamination and capture methane for energy use. Example: Dandora landfill upgrade, Nairobi.

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Safe Alternatives to Waste Incineration

- **The Waste Hierarchy:** prioritize waste management strategies from most to least preferable: reduce, reuse, recycle, recover (energy from waste), and dispose (landfill).. Incineration falls low on this hierarchy.
- S**ource Reduction and Reuse:** Tackling waste at its source is critical. This includes promoting policies that encourage manufacturers to reduce packaging and design products for durability and repair.
- **Advanced Recycling and Composting:** This includes mechanical biological treatment (MBT), where waste is mechanically separated and then treated biologically (e.g., anaerobic digestion for organic waste to produce biogas). Anaerobic digestion, a process that turns food scraps and other organic waste into clean energy and nutrient-rich fertilizer, without the harmful emissions of incineration. Recycling reduces the volume of waste requiring treatment and preserves valuable resources. Example: Kigali Green Park, Rwanda.
- **Policy and Community Action:** Advocate for policies that prioritize recycling and composting, opposing new incinerator construction, and supporting local businesses and organizations that promote a circular economy.

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Case Study: KEMRI-CGHR, Kisumu

Segregation at source:

Red = Highly infectious | Yellow = Infectious | Black = General | Sharps = Containers.

Autoclaving: Infectious waste sterilized first.

Liquid Waste: Treated at Effluent Discharge Laboratory (EDL) using aerobic process → clean water recycled via sprinklers.

Verification: Water sampled at collection points and tested in NEMA-approved labs (Govt Chemist).

Security Measures: Gate screening, full vehicle checks, 24/7 CCTV, fire alarms → prevent intentional/unintentional release of VBMs.

Incinerator: Advanced, scrubber-equipped, but alternatives (autoclaving, effluent treatment, segregation) remain central.

KEMRI shows safer alternatives are real, practical, and effective in Kenya

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Key Considerations

- Safety: Protect healthcare workers, waste handlers, and the public from exposure to hazardous materials.
- Environmental Impact: Minimize pollution and ensure eco-friendly disposal methods.
- Cost Management: Balance effective waste management with cost-efficient practices.
- Public Awareness: Educate communities about proper medical waste disposal to prevent illegal dumping or scavenging.
- This process ensures that medical waste is managed responsibly, reducing health risks and environmental harm while complying with regulatory standards.

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Q & A

PPT 4 and 5
Comments

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