

# worm



# WASTE IN HUMANITARIAN OPERATIONS: REDUCTION AND MINIMIZATION



## List of Abbreviations

CDH	County Department of Health
CHMT	County Health Management Team
CME	Continuing Medical Education
CIPCAC	County Infection Prevention Advisory Committee.
DHIS	District Health Information System
DEH	Division of Environmental Health
EIA	Environment Impact Assessment
EMC	Environment Management and Coordination Act of 1999
FBO	Faith-Based Organization
GOK	Government of Kenya
HCF	Health Care Facility
HCWM	Health Care Waste Management
HMT	Health Management Team
IPC	Infection Prevention and Control
JOOTRH	Jaramogi Oginga Odinga Teaching and Referral Hospital
MOH	Ministry of Health
MTaPS	Medicines, Technologies and Pharmaceutical Services
NEMA	National Environment Management Authority
NGO	Non-Governmental Organization
OPD	Out-Patient Department
PHC	Primary Health Care
PHO	Public Health Officer
PPE	Personal Protective Equipment
PPP	Public-Private Partnerships
SOP	Standard Operating Procedure
TOR	Terms of Reference
TWG	Technical Working Group
WHO	World Health Organization
WORM	Waste in Humanitarian Operations: Reduction and Minimization

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COCREATION FOR

## KISUMU COUNTY HEALTHCARE WASTE MANAGEMENT PLAN IMPLEMENTATION ROADMAP

### Executive Summary

The Kisumu Health Care Waste Management (HCWM) implementor cocreation workshop held on the 26<sup>th</sup> and 27<sup>th</sup> of September, involved a two-day review of the state of the Kisumu health care waste value chain and defining existing root causes that may provide opportunities or obstacles for the execution of a sustainable healthcare waste management plan in the county. With stakeholders ranging from sub county Public Health Officers, regulatory bodies like The National Environment Management Authority (NEMA) and representatives from the County level 6A referral hospital: JOOTRH, the session provided an overview of HCWM both within the urban zones and the rural areas of the county. The cocreation session thus provided what the implementation of the Kisumu County Health Care Waste Management (KHCWM) plan would require particularly the specific stakeholder needs for its success.

### Cocreation Outputs

The session recommendations were as follows:

1. The creation of an implementation cadre technical working group. This feeds into the already existing TWG at the administrative level at the County Department of Health. The implementation cadre TWG would then focus on streamlining the implementation of the action points presented in this paper. These include:
2. Streamlining capacity development for the various stakeholders at the implementation level of the KHCWM Plan
3. Design stakeholder-based IEC materials for the sensitization and dissemination of the KHCWM plan as well as underlying regulator policies and guidelines
4. Define pathways for advocacy towards sensitization of budget makers on the prioritization of waste management expenditure budgets allocation within CDH, PHO and facility budgets as well as collaborate for joint resource mobilization.

### Introduction

Medical waste poses significant risks to human health and the environment, comprising materials that are hazardous and potentially infectious. According to the World Health Organization (WHO), while 85% of the waste generated by healthcare facilities is non-infectious, the remaining 15% consists of hazardous materials, including those that are infectious, toxic, or radioactive. Alarmingly, poor segregation and management practices can lead to up to 50% of this waste becoming infectious. Improper disposal of healthcare waste can expose patients, healthcare workers, and the public to serious infections, with a single needle stick injury from contaminated materials carrying a risk of transmission for Hepatitis B (30%), Hepatitis C (1.8%), and HIV (0.3%) (WHO, 2018). Additionally, the inadvertent release of chemical and biological hazards, alongside drug-resistant microorganisms, can further compromise both public health and environmental safety.

## Project Overview

In response to these challenges, The Waste in Humanitarian Operations, Reduction and Minimization (WORM) consortium is dedicated to minimizing the environmental impact of humanitarian operations. This collaborative initiative unites medical and humanitarian organizations, logistics providers, waste management experts, and academic institutions to address waste management in a multifaceted manner. The consortium aims to achieve several key objectives:

1. Identify and integrate bio-based waste treatment solutions within humanitarian contexts.
2. Leverage sustainable procurement as a mechanism for waste reduction and the implementation of innovative solutions.
3. Propose safer and environmentally responsible waste treatment methods.
4. Raise local awareness of improved waste management through targeted community campaigns.
5. Provide guidelines and policy recommendations to mitigate environmental impact while maximizing the socio-economic benefits of humanitarian efforts.

Pamela Steele Associates (PSA) is keen to contribute to WORM's primary objective: to design safe waste management guidelines and to support actions for circular economy in field hospitals and humanitarian livelihood programs. During its visit to Kisumu County, PSA team visited several Facilities to assess level of preparedness in handling medical wastes and upon reviews, a few gaps were noted.

By engaging the stakeholders directly or indirectly involved in Health Care Waste Management in Kisumu County, PSA aims to achieve two primary objectives:

1. Propose safer and more environmentally responsible waste treatment methods.
2. Enhance local awareness of improved waste management through targeted, community-based campaigns.

### Objectives of the cocreation workshop

A two-day event to validate the findings from the prior facilities assessments and interviews conducted by PSA on the present state of Health Care Waste Management in Kisumu County.

The workshop's specific objectives included:

1. Sharing insights from recent studies on current waste management practices.
2. Fostering collaboration among community members, environmental authorities, and the county government.
3. Developing a sustainable waste management plan for field hospitals.

## Methodology

PSA organized a 2-day Validation and Co-Creation workshop, held at Elle Gardens in Kisumu on September 26<sup>th</sup> and 27<sup>th</sup> 2024. This workshop involved 15 participants representing various stakeholders in Health Care within the County. Discussions were conducted using Human Centered Design (HCD) in the form of co-creation sessions.

*Conceptualization Session:* A presentation on the current state of Health Care Waste Management in sampled public health facilities and interviews with Key Informants was shared with the participants which set the pace for context mapping, understanding and creating scenarios that would help validate the findings and co-create solutions. The participants were sorted into three main groups, FG1 (sub-county Public Health Officials), FG2 (Stakeholders at Jaramogi Oginga Odinga Teaching and Referral Hospital), FG3 (Regulatory bodies as represented by National Environment Management Authority, NEMA and Kenya Medical Research Institute, KEMRI). Each group had at least 5 participants.

The first session is built upon a scenario specific to each of the groups. The next step involved tracking the journey of their Lead Characters identifying the stakeholders they interacted with, places of engagement, whether waste was generated or not and what type of waste it was, and finally the people responsible for waste management at each of the points of interaction.

The participants and Facilitators analyzed and interpreted the responses generated from the scenarios in the next stage, the Ideation stage.

*Ideation Session:* The goal of the ideation session was to generate insights from the responses obtained in the Conceptualization session and identify design opportunities. The participants were guided through four HCD inspiration rounds by the Facilitators. The first, Synthesis, was to identify and state based on the current situation of health care waste management; what was working well, what needs to stop, what needs to be implemented, action points and hypothesis for success. The second round, root causing, involved design thinking to delve into the root cause of the problems they shared in the synthesis round. The groups focused on three main root causes as follows, FG1: Inadequate resources, FG2: Inadequate capacity and FG3: Compliance Enforcement.

The third round focused on “How Might We” questions, an HCD technique where challenges are framed as questions to prompt innovative solutions. The final round that sums up the ideation stage included a brief brainstorming session drawn from their inspiration to key action points. The results of this final round in the ideation session would be the starting point of the next session as the participants then select and vote for 3 key action points from each of the groups.

*Validation Session:* This session culminates the HCD co-creation process and the participants through story boards identified eight key action steps then proceeded to validate them, through identifying the available resources, the users involved, systems and structures in place and scaling that across a timeline for implementation.

### Insights from Literature

The literature review was conducted through a structured literature search focusing on waste management, waste streams, humanitarian field hospital settings, infectious waste, waste pickers, bio-based solutions, and humanitarian livelihood programs. The articles included in this review were obtained using multiple databases including Science Direct, Google Scholar, PubMed, Springer Link, Sage Publications, Oxford Academic and a shared drive. Only papers published within the last 20 years were reviewed and included, with conference papers, preliminary works and grey literature excluded during the screening process.

The challenges present within health-care waste management during periods of normalcy are of huge concern and need to be both identified and addressed. Numerous works of literature noted the quality of HCW management practices in Global South countries as being bound by **inadequate resources and infective policies**, thus rendering HCWM procedures poor in these regions. In Kenya, it is estimated that up to 50% of waste in some facilities is infectious due to **inadequate segregation practices** (Ministry of Health, 2015: 9). The literature identified a multitude of existing, **harmful waste management practices** when it came to **disposal methods**, with some listed below (Chisholm et al., 2021; Kenny & Priyadarshini, 2021) including open dumping, incineration and landfilling. The research showed that the training curricula at Moi, Nairobi, and Egerton Universities in Kenya failed to cover HCWM practices, and, instead, focused predominantly on liquid and solid waste management instead. Consequently, health **professionals are not equipped with the necessary knowledge for HCWM**, exacerbating the challenges in its management (Nkonge et al. (2012). Furthermore, the Government of Kenya’s Ministry of Health 2015) report on HCWM plans in the country demonstrated a lack of clear definition of responsibilities for HCWM plans. A key issue raised from the research indicates **Poor occupational safety**

**practices** expose waste pickers to harmful substances at landfills like dust, bacteria, and chemicals, leading to a higher risk of being infected by injuries and diseases (Mochungong et al, 2010; Uhunamure et al, 2021).

Despite the gaps in HCWM there are key advancements towards environmentally sustainable solutions. The first is the possibility of transforming **medical waste to fluorescent carbon dots (CDs)** which are nanoparticles that can be used for high value applications sensing, drug delivery, gene transfer, biological imaging, and food safety. The second is the conversion of **medical waste to e-fuel**. A recent study by Zhou et al (2024) studied the economic efficiency of the new novel co-valorization process integrating plasma gasification and Fischer-Tropsch synthesis in converting medical and bio-mass wastes into e-fuels.

### Insights from Key Informant Interviews

The study involved key informative interviews with humanitarian organizations, waste management service providers, public and private health facilities, the Ministry of Health (MOH), policymakers, and a research institution. By examining the types of medical waste, disposal methods, regulatory frameworks, and challenges, the report sought to provide comprehensive insights and practical recommendations for improving waste management practices in these field hospitals and similar settings.

The findings revealed significant variability in waste segregation, treatment, and disposal practices and challenges in medical waste management, including issues related to infrastructure, training, compliance, and innovative practices. Implementing these recommendations can bring about significant improvements in medical waste management practices, leading to a safer and healthier environment. Recommendations include prioritizing waste management as a critical area, properly allocating financial resources for waste management, enhancing training programs, proper collaborations, upgrading infrastructure, and advocating for clearer policies to improve medical waste management practices. These measures, if implemented, can pave the way for a more efficient and effective medical waste management system.

### Insights from the Kisumu Health Care Waste Management Plan

The Kisumu Health Care Waste Management Plan 2023 –2025 was developed in September 2023 by the HCWM technical working group with support from USAID MTaps. The plan was developed in line with the Kenya National Healthcare Management Guidelines 2022-2027. With the general objective to strengthen the management of healthcare waste in public, faith based, private health facilities and community health units the plan provides policy and regulatory frameworks for HCWM towards standardization of HCWM in Kisumu County. The plan also provides a guideline for roles and tools for executing responsibilities within HCWM in the county. This includes guidelines for monitoring and evaluation as well as trackers and quantifiers for HCWM commodities in the county. As the primary tool to guide medical waste management stakeholders the plan provides the foundational frameworks upon which the action points proposed by the implementors from the cocreation session shall base their reference for execution guidelines.

### Key findings from the co-creation session

The cocreation session conducted by PSA in collaboration with the County directorate of public health and sanitation focused on understanding HCWM in Kisumu County from the implementor perspective. Given the KHCWM Plan is meant to be executed at the sub-county level, a joint session with the sub-county PHOs was necessary to understand the current implementation gaps as well as possible implementation solutions towards streamlining HCWM in Kisumu County. The session provided key insights from sub-county public health officers (PHOs) on expected action points towards strengthening HCWM in the county.



The two-day session held on the 26<sup>th</sup> and 27<sup>th</sup> of September brought together 15 sub-county PHOs, partner facilities like KEMRI and the key environmental regulation body, that is, NEMA.

## Inspiration

The inspiration session involved three activities starting with scenario setting then a contextual analysis in two parts; the first was an interaction audit with waste points mapping followed by a synthesis activity mapping out what was working well and areas of improvement. Each group scenario was based on the user they represented out of the three possible options which included a patient, a healthcare facility and a waste management service provider. The results from the session were as follows:

**Scenario setting:** FG1 shared the story of Susan, a patient who visits Nyanga'nde Level 4 Public Hospital with her one-and-a-half-year-old son, and followed the trail of her entry, movement and departure from the facility. FG2 followed the daily management of a Level 6A Public Health Facility taking into account a story of a young woman who is admitted to the facility for treatment. FG3's story was of a Waste Management Company called Ojijo Oteko and the steps it took from registration to customer service provision, outlining the necessary regulations and policies it complied with.



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**Interaction Audit:** The journey mapping process tracked various stakeholder interaction within the healthcare value chain, the type of and whether waste was generated with each interaction point. Th participants then went ahead to define the parties responsible for handling the waste generated, if any, with each interaction point. The results were as follows:



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FG1: Interactions between a patient and their healthcare facility

User	Stakeholder	Interaction	Platform	Is waste generated? Yes/No	Type of Waste	Person Responsible
Susan	Clerk	Registration Card Payment	Registration/Reception	Yes	Paper	Clerk Cleaners
	Out Patient Department (OPD) Nurse	Triaging	Triage	Yes	Masks Gloves	OPD Nurse Cleaner
	Clinician	Consultation	Consultation Room	Yes	Masks Gloves Paper	RCO Cleaner
	Laboratory Technician	Lab tests	Laboratory	Yes	Slides, Prickers Gloves, Blood Swabs, Stool Urine, Specimen Waste water	Lab tech Cleaner Client/Susan
	Susan	Changing of diapers	Washroom	Yes	Used diaper, Pads wrapper, Tissue paper	Susan Cleaner
	Pharmacist/Pharm Tech	Dispensary	Pharmacy	Yes	Plastic bottles, boxes, expired drugs, paper, spoilt drugs	Pharm tech, cleaner, Public Health Officer
	Susan/ Shopkeeper	Buying/ selling	Hospital canteen	yes	Wrapper, papers, food leftovers, plastic bottles	Susan, Cleaner, shopkeeper

FG2: Interactions between a level 6A healthcare facility and its patients and waste management personnel

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User	Stakeholder	Interaction	Platform	Is waste generated? Yes/No	Type of Waste	Person Responsible
JOOTRH	Patient	Director Patient management	Consultation room	Yes	General Infectious	Cleaner (CSP)
	Health Care Worker (HCW) Clinician	Consultation	Consultation room	Yes	General waste	Clinician Cleaner
	Nurse	Triage Injection	MCH	Yes	Sharps Infectious wastes	Cleaner Nurse
	Labtech	Diagnostics	Laboratory	Yes	Highly Infectious Waste Sharps	Cleaner Lab in-charge
	Pharmtech	Dispensing	Pharmacy	Yes	General waste Psychotoxic waste	Cleaner Pharmacist
	HCW Patient Consultant Caregiver	management	Ward	Yes	General Infectious Sharps	Ward in-charge caregiver
	Cooks Nutritionist Patient	Sewing tools Preparation of food	Kitchen	Yes	General	Cleaners
	Cleaners	Daily cleaning	laundry	yes	Waste water	Cleaners HCW
	Morgue attendance	Handling of body waist	Funeral home	yes	Pathological waste, highly infectious waste	Morgue attendant, mortician
	Waste handlers, HCW	Waste management	Waste holding area	yes	General waste, Infectious waste, sharps	Public health official

F

FG3: Interaction between a private waste management company and a health facility

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User	Stakeholder	Interaction	Platform	Is waste generated? Yes or No	Type of waste	Person Responsible
NEMA, County Government	IPC Personnel/ Safety personnel	Licensing guidelines	E-citizen	No		NEMA
County Government	IPC Personnel/ Safety personnel	Licensing guidelines	E-citizen	No		County Government
Driver	hospitals	Waste generators	Hospital facility	Yes	Medical waste	IPC Personnel
Department of Occupational Health and Safety (DOHS)/Occupational Safety Health A	Waste handlers	License and policies	e-citizen website	no		IPC Personnel, OSHA
Private Companies, KEBS	Receiver	Checklist capacity building	website	yes	Medical waste, non-medical waste	Manager/Safety officer
Poison board	Poison board	License and policies	e-citizen website	no		Pharm poison board
Ojjo	Safety officer	Verification/ approval	Entrance/ holding area	Yes	Medical waste	Ojjo
	Waste handler	Offloading & incineration	Holding area/ incinerator	yes	Medical waste	Ojjo
	PC personnel/driver	Disinfection and cleaning	Vehicle disinfection on site	yes	Medical waste	Ojjo

## Synthesis

The synthesis process involved breaking down what is currently working within the existent systems, what is not working and any new practices the stakeholders thought would improve current waste management practices in the county. This was followed by a prioritization exercise in which participants mapped out the three most important action items.

The results were as follows:

FG1:

What is working well	What needs to stop	What needs to start
<ul style="list-style-type: none"> <li>• Holding areas are well secured</li> <li>• Private-Public partnership on health care waste disposal</li> <li>• Update of training on HCWM</li> <li>• SOPs o waste management mounted on walls in every service delivery point</li> <li>• Collaborative effort by major stakeholders is evident</li> <li>• Continuous education for health care workers in waste management</li> <li>• Attention given to health care waste management is commendable</li> </ul>	<ul style="list-style-type: none"> <li>• Under budgeting for Health care waste management</li> <li>• Waste not segregated as required</li> <li>• Irregularity of IPC meetings</li> <li>• Filling of safety boxes 100% to the brim</li> <li>• Most of Health care waste management responsibilities left for support staff</li> </ul>	<ul style="list-style-type: none"> <li>• Allocation of adequate resources for health care waste management</li> <li>• Designate transfer stations for health care waste in the country</li> <li>• Construction of on-site waste disposal systems for all health facilities to reduce waste</li> <li>• NEMA to work closely with public health department when granting licenses.</li> </ul>
<p><b>KEY ACTION POINTS</b></p> <ol style="list-style-type: none"> <li>1. Aligning waste management to the Public Health department</li> <li>2. Prioritize health care waste management in budgeting</li> <li>3. Ranking and motivation of good management practices in waste management at facility level</li> </ol>		

FG2:

WASTE IN HUMANITARIAN OPERATIONS: REDUCTION AND MINIMIZATION

What is working well	What needs to stop	What needs to start
<ul style="list-style-type: none"> <li>• Multi-sector collaboration</li> <li>• Systems in place</li> <li>• Available policies</li> <li>• Kisumu county has a costed medical waste management plan</li> </ul>	<ul style="list-style-type: none"> <li>• Open burning of waste due to climate change issues</li> <li>• Poor waste management practices</li> <li>• Use of untrained waste handlers</li> <li>• Lack of prioritization and resource allocation of health care waste</li> <li>• Poor waste segregation</li> <li>• Stock out of waste collection liners and sharp boxes</li> </ul>	<ul style="list-style-type: none"> <li>• Allocate a percentage of FIF from hospitals towards medical waste management</li> <li>• Segregation at source</li> <li>• Adherence to existing laws and policies</li> <li>• Waste minimization</li> <li>• Reduce of emissions of Greenhouse gases</li> <li>• Sensitization of Health care workers on hospital waste management</li> </ul>
<p><b>KEY ACTION POINTS:</b></p> <ol style="list-style-type: none"> <li>1. Disseminate policies and guidelines on health care waste management</li> <li>2. Capacity building- train waste management focal persons (PHOs), sensitize health care workers on waste segregation, conduct needs-based capacity building, strengthen health care waste management committees</li> <li>3. Advocate for green health care waste management practices</li> </ol>		

FG3:

What is working well	What needs to stop	What needs to start
<ul style="list-style-type: none"> <li>• Good policies</li> <li>• Stakeholder engagement</li> <li>• Proper coordination among partners and stakeholders</li> <li>• Policies of waste collection are working well from segregation to packing, labeling, handling and storing.</li> </ul>	<ul style="list-style-type: none"> <li>• Time wasting</li> <li>• Delayed responses during medical crises e.g. COVID and Anthrax</li> <li>• Green business development companies setting up and running waste management business</li> <li>• Failure to follow/adhere to policy</li> <li>• Poor attitude, negligence in waste management</li> <li>• Weak enforcement</li> <li>• Limited waste treatment</li> <li>• Waste of resource in recycling</li> </ul>	<ul style="list-style-type: none"> <li>• Timely management of waste</li> <li>• Sensitization</li> <li>• Partnership and collaboration</li> <li>• Start paying for pollution</li> <li>• Pre-training waste management handlers</li> </ul>

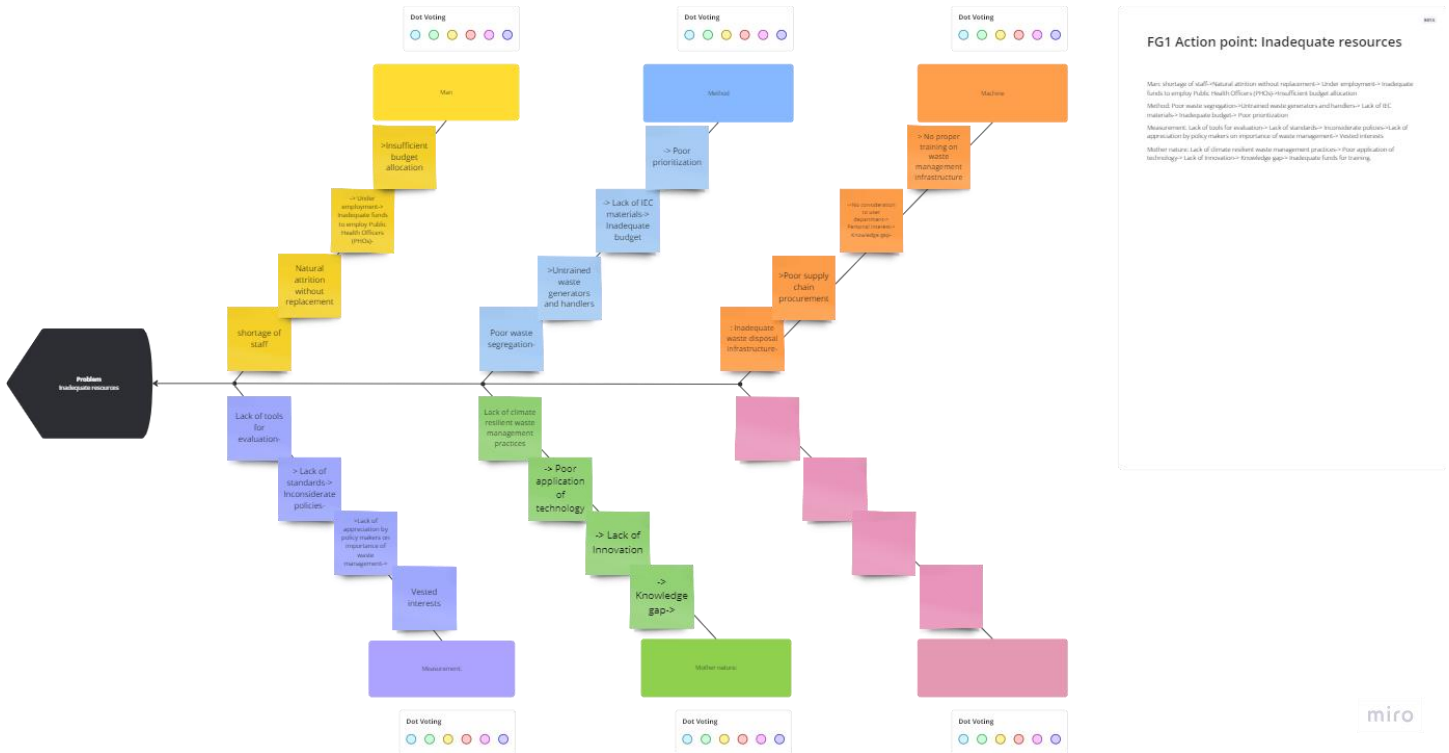
	<ul style="list-style-type: none"><li>• Condition of the vehicle for transporting waste needs to be defined</li></ul>	
<p><b>KEY ACTION POINTS:</b></p> <ol style="list-style-type: none"><li>1. Standard enforcement of guidelines</li><li>2. Sensitization</li><li>3. Fostering collaboration for resource mobilization.</li></ol>		



Root causing

Each selected action point was further broken down through a root causing process intended to create an understanding of the foundational causes for the gaps the stakeholders had witnessed in HCWM. The results were as follows

FG1 Action point: Inadequate resources



Man: shortage of staff->Natural attrition without replacement-> Under employment-> Inadequate funds to employ Public Health Officers (PHOs)->Insufficient budget allocation

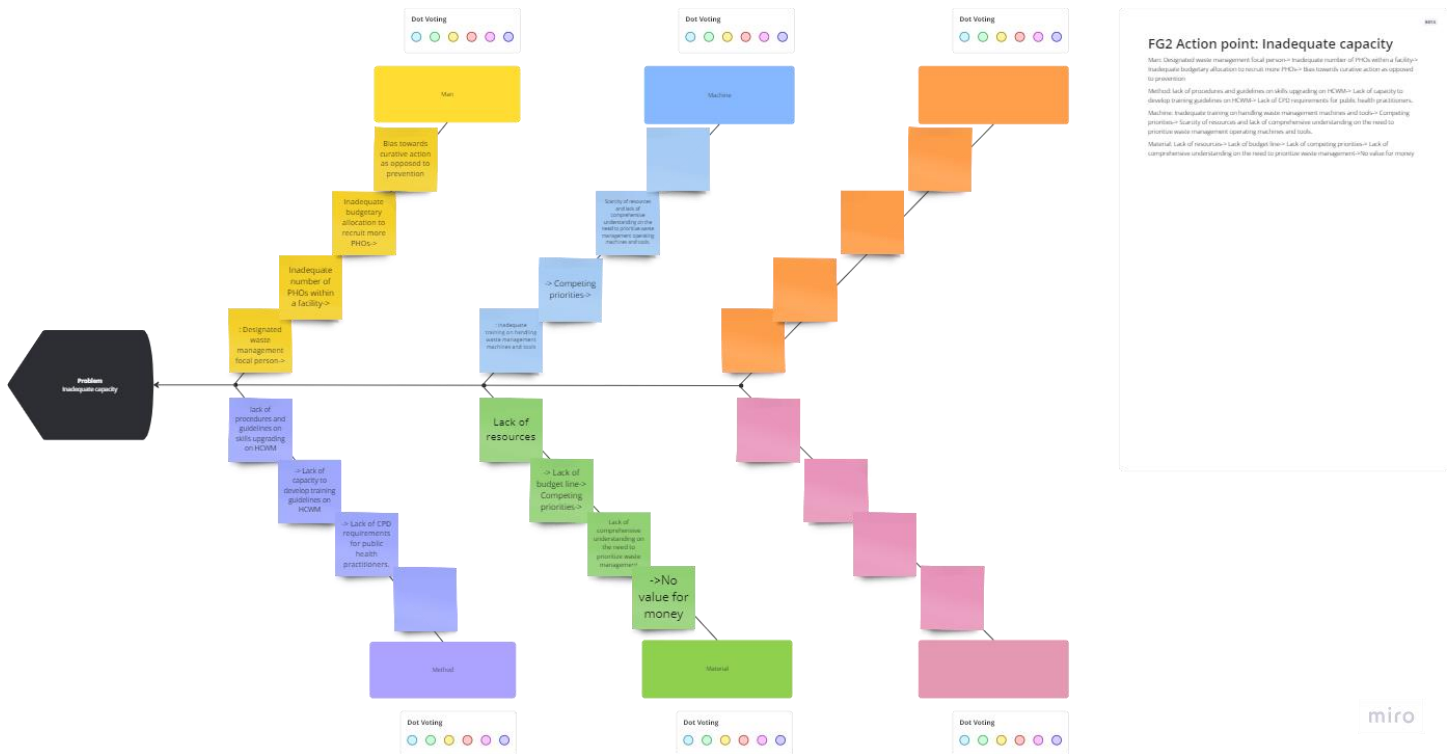
Method: Poor waste segregation->Untrained waste generators and handlers-> Lack of IEC materials-> Inadequate budget-> Poor prioritization

Measurement: Lack of tools for evaluation-> Lack of standards-> Inconsiderate policies->Lack of appreciation by policy makers on importance of waste management-> Vested interests

Mother nature: Lack of climate resilient waste management practices-> Poor application of technology-> Lack of Innovation-> Knowledge gap-> Inadequate funds for training.

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## FG2 Action point: Inadequate capacity



**Man:** Designated waste management focal person-> Inadequate number of PHOs within a facility-> Inadequate budgetary allocation to recruit more PHOs-> Bias towards curative action as opposed to prevention

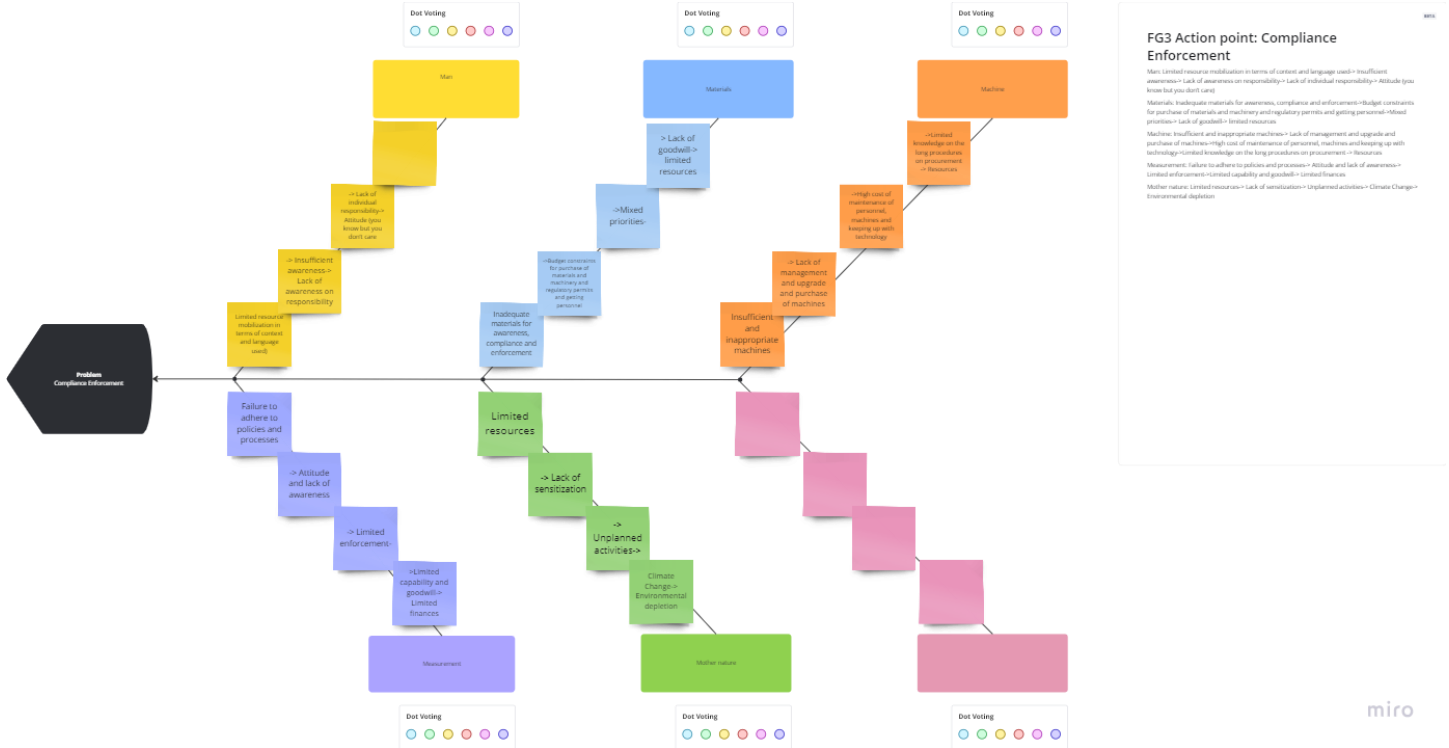
**Method:** lack of procedures and guidelines on skills upgrading on HCWM-> Lack of capacity to develop training guidelines on HCWM-> Lack of CPD requirements for public health practitioners.

**Machine:** Inadequate training on handling waste management machines and tools-> Competing priorities-> Scarcity of resources and lack of comprehensive understanding on the need to prioritize waste management operating machines and tools.

**Material:** Lack of resources-> Lack of budget line-> Lack of competing priorities-> Lack of comprehensive understanding on the need to prioritize waste management->No value for money

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## FG3 Action point: Compliance Enforcement



**Man:** Limited resource mobilization in terms of context and language used -> Insufficient awareness -> Lack of awareness on responsibility -> Lack of individual responsibility -> Attitude (you know but you don't care)

**Materials:** Inadequate materials for awareness, compliance and enforcement -> Budget constraints for purchase of materials and machinery and regulatory permits and getting personnel -> Mixed priorities -> Lack of goodwill -> limited resources

**Machine:** Insufficient and inappropriate machines -> Lack of management and upgrade and purchase of machines -> High cost of maintenance of personnel, machines and keeping up with technology -> Limited knowledge on the long procedures on procurement -> Resources

**Measurement:** Failure to adhere to policies and processes -> Attitude and lack of awareness -> Limited enforcement -> Limited capability and goodwill -> Limited finances

**Mother nature:** Limited resources -> Lack of sensitization -> Unplanned activities -> Climate Change -> Environmental depletion

## How might we

The participants then set ideal goals and crafted how might we questions to jumpstart the ideation process. The defined HMW questions were as follows:

- FG1: How Might we have adequate and well-resourced HCWM system?
- FG2: How Might we achieve adequate skills and competency in health care waste management?

- FG3: How might we achieve complete compliance to medical waste management policies, guidelines, laws and regulations?

### Ideation

#### Brainstorming

The ideation process started with a collection of best practices case studies on HCWM around the world and within the county. This was followed by a brainstorming and voting exercise. The case studies and ideas presented were as follows:

FG1:

Design Question: How Might we have adequate and well-resourced HCWM system?

Case studies for inspiration: Publicly displayed SOPs at most service points in facilities, Established HCWM plan at Aga Khan Hospital, Incinerator at KEMRI, Competent PHOs diligently doing their work.

Ideas presented for action: Allocation of 30% facility budget to HCWM, Research in new affordable and efficient health care waste technology, Specialized training for all PHOs

Selected idea for action: Resource allocation to HCWM

FG2:

Design Question: How Might we achieve adequate skills and competency in health care waste management?

Case studies for inspiration: Kisumu HCWM plan

Ideas presented for action: Adequate budgetary allocation, Regular training, and capacity building of HC waste handlers, Institutionalize HCWM focal persons, Sensitize HCW on HCWM segregation.

Selected idea for action: Capacity building.

FG3

Design Question: How might we achieve complete compliance to medical waste management policies, guidelines, laws and regulations?

Case studies for inspiration: Japan, PSA, KEMRI, Germany, Netherlands

Ideas presented for action: Advocate for continuous sensitization of HCWM programmes at every level, Conducting proper regular compliance checks and inspections, Digitization

Selected idea for action: Advocate for continuous sensitization of HCWM programmes at every level

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The selected ideas for action were further validated based on the desirability, feasibility and viability scorecard. Participants teams were required to present their chosen area for action alongside the justification based on the three-level scorecard.

Key insights gathered from participants about current waste management practices and what needs to be implemented for effective HCWM included:

- (a) Adequate budget allocation, (b) regular training and capacity building of HC waste handlers, (c) Institutionalize HC waste management focal persons, (d) Sensitize HCW on best segregation practices, (e) conducting proper and regular inspections, (f) digitalization, (g) standard enforcement of guidelines, (h) fostering collaboration for resource mobilization.

### Prototyping

The prototyping session involved participants storyboarding eight key steps required to implement their chosen action point. The results for each team were as follows:

### Storyboard

FG1 Key action point: Allocation of resources to HCWM

<b>1.Needs assessment:</b> -Facility PHOs -Facility scorecard -Rules and regulations -Stakeholders -Waste handlers	<b>2.Mapping of key players</b> -Facility stakeholders -NEMA -Partners	<b>3.Formation of TWGs</b>	<b>4.Budgeting and planning</b>
<b>5. Sensitization of TWGs</b>	<b>6.Resource mobilization</b>	<b>7.Resource allocation</b>	<b>8. M&amp;E Sustainability</b>

FG2 Key Action point: Capacity building in HCWM

<b>1.Review HCWM TWG workshop</b>	<b>2.Sampling</b>	<b>3.Surveys Checklist</b>	<b>4.Review/consolidation of modules/policies guidelines</b>
<b>5.Identifying targeted participants and persons for Waste Management committee</b>	<b>6.Identification of resources/activities mapping</b>	<b>7. Execution of activities</b>	<b>8.Designing MEAL</b>

FG3: Advocate for compliance with and enforcement of policies and regulations

<b>1. Training, needs assessment, gap analysis</b>	<b>2. Set clear goals and objectives/ determine target audience</b>	<b>3. Determine audience and specific content</b>	<b>4. Develop key measures and compliance requirements</b>
<b>5. Select effective communication channels</b>	<b>6. Train the TOT</b>	<b>7. Train medical waste generators</b>	<b>8. Enforcement and compliance and M&amp;E</b>

## Implementation

The implementation session involved the participants defining a combined service blueprint and roadmap for the implementation of their chosen action point. This was based on the storyboards developed earlier. The roadmaps developed were as follows:



## Resource Mobilization Roadmap

FG1

Episodes	Needs assessment	Mapping of key players	Formation of TWGs	Budgeting and planning	Sensitization of TWGs	Resource mobilization	Resource allocation	M&E Sustainability
User action	FGDs with facility PHOs	Mobilization of PHOs, facility cleaners, partners, CDH, FIF	PHO HMT	HMT Board CDH	TOT-waste specialist PHO Facility cleaner	HMT CMC Board CDH Partners	Facility HMT Partners CDH	TWG CDH SCHMT
Above ground touch points	Scorecard Waste inventory	Inception meeting	Meetings and correspondence, appointment letters	Budgeting Presentations	Trainings IEC materials distribution	Proposal writing correspondences	Budgeting and funds disbursement Procurement	Data reviews Support supervision Score card
Below ground touch points	Preparation of tools for data collection	Invitation letters venue	Draft formal requests to stakeholders in the TWG	PowerPoint presentation Assessment report	Venue preparation Media press-kit slides	Background study Desktop review emails	Budget approvals Tendering	Report writing auditing
Below ground systems	KOBO collect Google forms	Emails whatsapp	Emails, Sms	Procurement plans	Google WASH hub	Published journals	Recurrent funds FIF	KHIS
Challenges/opportunities	Staff attitude Available human resource	Competing tasks Readily available players	Knowledge gap Available human resource	Prioritization Admins of accounts execution	Competing tasks Available training manuals County roadmap	Competing tasks Partners available	Prioritization Scarcity of funds	Tools to carry out M&E Allocation for data review

TIMELINE	1 month	2 weeks	3 weeks	3 months	Quarterly/ Continuous	6 months	Quarterly	Quarterly/ Continuous
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## Capacity Development Roadmap

Road Mapping Tables: FG2

Episodes								
User action	Review HCWM TWG workshop	Sampling	Surveys Checklist	Review/consolidation of modules/policies guidelines	Identifying targeted participants and persons for Waste Management committee	Identification of resources/activities mapping	Execution of activities	Designing MEAL
Above ground touch points	List of TWG members	TWG list of high-volume facilities	Report tools	Training module/policies guidelines	WM committee and training participants	Activity budgeting	Trained HCW Effective Waste Management TOTs	MEAL framework
Below ground touch points	Invitation letters, appointment letters	Selection criteria based on facility level workshop	Knowledge attitude Practice checklist	MOH/Sites	Selection criteria Existing structures e.g. IPC/OSHA	Needs assessment report	Training package SOPs/policies guidelines	Train Health care waste ward handlers managers
Below ground systems	CDH, county director of public	CDH/MOH	CDH/MOH TWG	CDH/MOH TWG	Sub county facilities	TWG	TWG	CDH/MOH Focal person



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	health and sanitation							
Challenges/opportunities	Capacity desks Venue/location Human capital	Accessibility Defined facility checklist by MOH	Accessibility Partners	Internet access learning	Selection criteria Functional committees	Budget constraints FIF/Partners	High turnover partners	Limited resources
<b>TIMELINE:</b>	<b>2-3 weeks</b>	<b>2-3 weeks</b>	<b>1 month</b>	<b>2-3 months</b>	<b>2-3 months</b>	<b>3-6 months</b>	<b>18 months</b>	<b>Quarterly audits</b>

Policy Sensitization and Dissemination Roadmap

Road Mapping Tables: FG3

Episodes	Training, needs assessment, gap analysis	Set clear goals and objectives/determine target audience	Determine audience and specific content	Develop key measures and compliance requirements	Select effective communication channels	Train the TOT	Train medical waste generators	Enforcement and compliance and M&E
User action	PHOs, policy makers, waste handlers, waste generator	Consultant, PHOs, policy makers				PHOs, IPC personnel, Safety team	Waste handlers Waste generators	PHOs Policy makers Generators of waste
Above ground touchpoints	IEC materials Venue Refreshments /meals	Assessment report IEC materials Venue		User specific platforms	Communication strategy	IEC materials Venue refreshment	IEC materials Venue refreshment	Policy guidelines, regulations laws that are user specific,

WASTE IN HUMANITARIAN OPERATIONS: REDUCTION AND MINIMIZATION

								inspection/audit guidelines Compliance monitoring schedules
Below ground touchpoints	Printing manuals, developing		Material, assessment reports	Development of user specific platforms	Development of communication materials (IEC)	Training manuals Training logs	IEC training materials User guidelines Training logs	Audit schedules Compliance schedules Performance rewarded schedules
Below ground systems	Venue, allocated budget, expertise consultant		Policy, user specific laws and regulations	Policies, regulations, laws & guidelines that are user specific, competent communication team	Relevant/ target specific IEC materials, communications team	TOT/user guidelines	Allocate budget line	Allocated budget line Inspectors Compliance officers
Challenges/opportunities	Resources Expertise/ collaboration/ partnership		Availability of policies, laws, regulations and guidelines	Resources Digital communication solutions	Resources Expertise Collaboration/partnership	Resources expertise	Participation resources	Resource compliance
<b>TIMELINE:</b>	<b>4months</b>	<b>2 weeks</b>	<b>2 weeks</b>	<b>4 months</b>	<b>1 week</b>	<b>1 month</b>	<b>Continuous</b>	<b>Always/ Consistently</b>

## Guiding Frameworks

The session design and activities were carried out with reference to existing frameworks and guidelines which can be categorized into activity frameworks and legal frameworks.

The activity frameworks included:

- a. **Kisumu County Waste Management Plan:** The plan developed in September 2023 provides standardized guidelines for the management of health care waste within Kisumu County. The plan provides the key reference point for all stakeholders as well as required procedures, tools and commodities for healthcare waste management.

The legal frameworks referenced included:

- b. **Environmental Management and Coordination (Waste Management) Regulations** of 2006 in the Responsibility of the Generator, Regulation 2 which states that, “Any person whose activities generate waste shall collect, segregate and dispose or cause to be disposed of such waste in the manner provided for under these Regulations”. Regulation 5 on the Segregation of waste by a generator state that, “(1) Any person whose activities generate waste, shall segregate such waste by separating hazardous waste from non-hazardous waste and shall dispose of such wastes in such facility as is provided for by the relevant Local Authority”. The Occupational Safety and Health Act, 2007.
- c. **The Occupational Safety and Health Act, 2007 Part IX**, Chemical Safety, Section 83 Subsection IV which states that at every workplace where chemicals or other toxic substances are manipulated, the employer shall develop a suitable system for the safe collection, recycling and disposal of chemical wastes, obsolete chemicals, and empty containers of chemicals to avoid the risks to safety, health of employees and to the environment. The Public Health Act, 2012.
- d. **The Public Health Act Revised Edition 2012, Part 126**. Rules under Part, The Minister, on the advice of the board, may make rules and may confer powers and impose duties in connection with the carrying out and enforcement thereof on local authorities, magistrates, owners, and others as to—(d) the drainage of land, streets or premises, the disposal of offensive liquids and the removal and disposal of rubbish, refuse, manure, and waste matters. Section 118–What constitutes nuisance-1. The following shall be deemed to be nuisances liable to be dealt with in the manner provided in this. • Part—(c) any street, road or any part thereof, any stream, pool, ditch, gutter, watercourse, sink, water-tank, cistern, water-closet, earth-closet, privy, urinal, cesspool, soak-away pit, septic tank, cesspit, soil-pipe, waste-pipe, drain, sewer, garbage receptacle, dust-bin, dung pit, refuse pit, slop-tank, ash-pit or manure heap so foul or in such a state or so situated or constructed as in the opinion of the medical officer of health to be offensive or to be injurious or dangerous to health. Part (e) states that any noxious matter, or wastewater, flowing or discharged from any premises, wherever situated, into any public street, or into the gutter or side channel of any street, or into any or watercourse, irrigation channel or bed thereof not approved for the reception of such discharge constitutes to be a nuisance. Section 126–Rules under Part, The Minister, on the advice of the board, may make rules and may confer powers and impose duties in connection with the carrying out and enforcement thereof on local authorities, magistrates, owners, and others as to—part (d) the drainage of land, streets or premises, the disposal of offensive liquids and the removal and disposal of rubbish, refuse, manure, and waste matters

## Analysis and Reflections

### Analysis of cocreation findings against literature review

The literature review indicated that a failure to prioritize medical waste in training curricula, inadequate resources and infective policies, inadequate segregation practices, harmful waste disposal practices and poor occupational safety practices were some of the key gaps in HCWM.

During root causing the participants mapped specific root causes of these gaps indicating action areas that if not considered would lead to gaps in the implementation of the KHCWMP guidelines. At the core of the root causes was the failure to prioritize waste management as a key expenditure point during budgeting. This was an occurrence both at facility and public health office level.

Competing priorities and a failure to understand how waste management affects the rest of the healthcare system was the origin of the limited resource issue. There were other factors like human attitude, a gap in the understanding of guidelines due to limited dissemination. Issues such as harmful disposal practices were linked to limited access to resources and in the case of rural facilities, environmental issues such as flooding. There was the proposal of upskilling incentives for waste management stakeholders with a focus on covering training gaps or keeping up with technological advances.

A key element of consideration was the contextualization of sustainable waste disposal methods versus facility technological competencies and access levels. For instance, in the case of incinerators with scrubbers for air quality, a combination of resources limitation and the urgency of disposal of waste already in holding leads to facilities resorting to disposal methods that may be categorized as harmful while waiting in line for the upgraded incinerators. The implementation particularly for those considering circularity therefore required further consideration for cocreation with implementors to create roadmaps that would improve facility HCWM capabilities without paralyzing day to day operations.

### Analysis of implementor insights against recommendations from the KHCWMP Plan 2023-2025

The KHCWMP plan provides guidelines defined at the policy level for HCWM in Kisumu County. The implementation guidelines are specifically meant for sub-county PHOs as lead implementation stakeholders; therefore, implementation success depends on the stakeholder ability to reconcile the defined implementation level gaps. Both the guidelines and participant action areas are in alignment. Participants prioritized capacity development, policy and guidelines dissemination and sensitization as well as resource mobilization. The plan provides general activity guidelines while the participants listed expected specific action points under most overlapping activities. For instance, on capacity development the plan simply states that HCWM training should be conducted for multiple stakeholders while the participants further indicated the training cadres and incentive proposals to actualize the training process.

## Recommendations for Action

The recommendations for the implementation of the Kisumu Healthcare Waste Management Plan involved the creation of an implementation cadre technical working group. This feeds into the already existing TWG at the administrative level at the County Department of Health. The implementation cadre TWG would then focus on streamlining the implementation of the action points presented in this paper. These include:

1. Streamlining capacity development for the various stakeholders at the implementation level of the KHCWM Plan
2. Design stakeholder-based IEC materials for the sensitization and dissemination of the KHCWM plan as well as underlying regulator policies and guidelines
3. Define pathways for advocacy towards sensitization of budget makers on the prioritization of waste management expenditure budgets allocation within CDH, PHO and facility budgets as well as collaborate for joint resource mobilization.

## Conclusion

The evolution of sustainable HCWM in Kisumu County starts with considering the existing systemic and cultural root causes that have resulted to waste management in its current state. It is clear from the cocreation session that the expected impact from implementation of the guidelines requires the participation of stakeholders at every level of the value chain thus creating an implementation roadmap owned and driven by stakeholders at every level.

## Appendices

### Appendix I: Workshop Concept and Agenda

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## VALIDATION AND COCREATION WORKSHOP

### Medical Waste Management Practices

26<sup>th</sup> and 27<sup>th</sup> September

Venue: Elle Gardens

#### Introduction

Medical Waste contains potentially harmful materials that are hazardous, infectious, and can pose serious threats to both human health and the environment. According to the WHO, 85% of the total amount of solid waste generated by health-care facilities is non-infectious waste, with the remaining 15% considered hazardous material that may be infectious, toxic, or radioactive. Due to poor segregation and waste management practices, up to 50% of waste become infectious. If not disposed of properly, healthcare wastes can infect hospital patients, health workers and the public. 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 of becoming infected with Hepatitis B Virus, Hepatitis C Virus and HIV ([WHO, 2018](#)). Other potential hazards may include unintended release of chemical or biological hazards, drug-resistant microorganisms which spread from health facilities into the environment, and other adverse health and environmental impacts.

Focusing on the humanitarian livelihood programs and field hospital deployments, Waste in Humanitarian Operations, Reduction and Minimization (WORM) consortium is keen to reduce the environmental impact of humanitarian operations. WORM brings together medical and humanitarian organizations, procurement and logistics service providers, waste management services and academic partners through a collaborative and multi-actor approach. The project focuses on the following objectives:

1. To identify and integrate **biobased solutions** in humanitarian context for waste treatment
2. To use the full potential of **sustainable procurement** as a gatekeeper for waste avoidance and gateway for innovative solutions implementation.
3. To propose safer and more environmentally responsible **waste treatment** methods
4. To enhance **local awareness** of improved waste management through targeted community-based campaigns.
5. To provide **guidelines and policy recommendations** for reducing the environmental impact and maximizing the socio-economic effects of humanitarian operations.

Pamela Steele Associate (PSA) is keen to contribute to WORM's primary objective: to design safe waste management guidelines and to support actions for circular economy in field hospitals and humanitarian livelihood programs.

During its visit to Kisumu County, PSA team visited several Facilities to assess the level of preparedness in handling medical waste and upon reviews, a few gaps were noted. It is against this observation that PSA intent to have a 2 days' workshop in Kisumu targeting Health care workers involved in medical wastes management either directly or indirectly at management level at both County and Sub County levels. We also wish to take advantage of this workshop to disseminate the Kisumu County medical wastes policy subject to County approval.

Through this workshop, PSA is looking to steer the stakeholders through engagement to achieve two objectives:

1. To propose **safer and more environmentally responsible waste treatment** methods
2. To enhance **local awareness** of improved waste management through targeted and community-based campaigns.

#### Objectives of the workshop:

1. Share lessons learned from study findings on current waste management practices
2. Foster collaboration between the community, environmental authorities, and the county government.
3. Develop a sustainable waste management plan for field hospitals.

Cocreation Agenda

DAY 1					
	Time	Session	Activities/Outputs	Lead	
INSPIRATION	8.00am - 8.30am	Introduction	Welcome and Opening Remarks:	Pamela Steele	
			Introduction by key stakeholders.		
	8.30 - 10.00 am	Validation	Overview of Medical Waste Management: Presentation of initial findings ~ PSA	Hellen Wanza-PSA	
			Plenary discussion: Q&A session	Akinyi Awora/ Dora Okeyo- PSA	
	Tea Break: 30 minutes				
	10.30-11.30	Context Mapping	Scenario Setting: contextualizing medical waste generation and management in Kisumu County based on multiple user perspectives	Akinyi Awora/ Dora Okeyo- PSA	
			<i>Use case mapping: an interaction audit mapping the various points at which waste is generated within the medical value chain in Kisumu County</i>		
			<i>Stakeholder mapping: understanding the medical waste chain of custody and the various stakeholder interactions involved</i>		
	11.30am-12.30 pm	Synthesis	Evaluating existing processes:	Akinyi Awora/ Dora Okeyo- PSA	
	Defining areas of action				
	Developing hypothesis for action				
	Root causing on action areas				
12.30- 1.00 pm	HMW	Identifying thematic areas of action	Akinyi Awora/ Dora Okeyo- PSA		
		Prioritizing action points			
		Identifying the desired impact			
		Crafting the 'How Might we' questions			
Lunch Break: 1 hour					
IDEATION	2.00pm-3pm	Ideation	Inspiration: defining case studies of effective waste management practises from across the globe	Akinyi Awora/ Dora Okeyo- PSA	
			Brainstorming		
			1 <sup>st</sup> review: blind feedback on proposed ideas		



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	3pm -4pm	Iteration	Crazy eights: defining the first key steps for the most viable ideas	
			Voting: prioritizing ideas based on feasibility, viability and desirability	
			Defining a hypothesis for success for the finalized action points	
		Closing session	Overview of day 2 expectations/ closing remarks	Pamela Steele
Tea and Departure/Networking				
DAY 2				
	Time	Session	Activities/Outputs	Lead
IMPLEMENTATION	8.30 am -9.00 am	Day 2 Introduction and Day 1recap	A review of day 1 milestones and introduction of day 2 activities	Pamela Steele
	9.00am to 10.00.am	Storyboarding	Mapping the key action and interaction points for the proposed solution	Akinyi Awora/Dora Okeyo
Tea Break: 30 minutes				
	10.30am- 1pm	Service Blueprinting	Mapping key outputs from the proposed solution	Akinyi Awora/ Dora Okeyo- PSA
			Defining key supporting systems	
			Defining key stakeholders	
Lunch Break: 1 hour				
	2pm -4pm	Road mapping	Defining key defining milestones	Akinyi Awora/ Dora Okeyo- PSA
			Identifying key MEARL metrics	
			Assigning stakeholder roles	
			Defining key timelines for implementation	
		Closing session	Vote of thanks/ way forward	Pamela Steele
Tea and Departure/Networking				

### Executive Summary

Waste management remains one of the major development challenges globally, nationally and at the County level. In the year 2010, the new constitution prescribes the responsibilities and functions of all the county government ministries. Therefore, the County Government of Kisumu tasked both the Department of Water, Environment, Natural Resources and Sanitation and Department of Public Health and Sanitation to be responsible for waste management in the County. However, management of healthcare waste is the responsibility of the Department of Public Health and Sanitation. As part of broader infection prevention and control, safe management of health care waste reduces risk of health care related infection, increases trust and uptake of services, increases efficiency, and decreases cost of service delivery.

The purpose of the Kisumu County Healthcare Waste Management (HCWM) Plan is to guide sustainable healthcare waste management by ensuring a healthy, safe, and secure environment for all. It is proposed that this plan will cover a period of two (2) years with a midterm review after one (1) year of implementation. With the full implementation of the plan, it is expected that the Kisumu County Government will have embraced environmentally sound healthcare waste management technologies and best practices.

The HCWM plan consists of different chapters as follows; highlights on the background information on HCWM, challenges and what the plan aims to achieve. It also demonstrates the current situation of solid waste management in Kisumu including waste generation; collection and transportation; human resource management including roles and responsibilities; annual quantification, cost, design, and specifications of HCWM commodities and supply; stakeholders in solid waste management and the way forward. Monitoring and Evaluation plan for this document is also highlighted.

This county HCWM plan brings out a deliberate strategy aimed at strengthening the management of HCW within both hospitals and community settings to improve and safeguard public health and realize a sustainable safe environment. The immediate benefit of implementing this plan is to prevent, reduce and mitigate the likely risks of transmission of infections likely to be acquired from unsound HCWM, such as HIV/AIDS, hepatitis B, and other health care associated infections (HAIs) as well as safeguard the environment for sustainable development. The plan provides feasible options of applying the best available technologies (BAT) and best environmental practices (BEP) in HCWM.

The Department, therefore, encourages the use of appropriate, safe, and cost-effective methods and techniques to segregate, contain, transport, treat, and dispose of HCW. In this regard, therefore, we wish to call upon all the stakeholders to join hands with the Ministry of Health department of medical services, public health and sanitation in ensuring consistent support for the successful implementation of the HCWM plan. Finally, the department is grateful to its staff and USAID Medicines, Technology and Pharmaceutical Services (MTaPS) Program and other partners through Transforming Health Systems for Universal Care (THS-UC) program for their contributions either technically or financially towards the development of this plan