Republic of Kenya

MINISTRY OF HEALTH

The National Health Care Waste Management Plan

2008-2012
ACKNOWLEDGEMENT

The Ministry of Public Health and Sanitation, Department of Environmental Health wishes to acknowledge the contribution of all those who participated in the development of this National Plan of Action on Health Care Waste Management. Indeed, we are grateful to both individuals and organizations whose support and commitment made this Plan a reality. In particular, we wish to single out the World Health Organization, (WHO) Kenya Country Office and John Snow Inc. – Making Medical Injections Safer Project (JSI-MMIS) for providing both material and technical support during the development of this Plan.

The Ministry also wishes to thank the management of all the health facilities that participated in the national assessment on health care waste management whose findings provided the basis for the formulation of this Plan. We would like to sincerely express our gratitude to all the public health officers in the various health institutions who coordinated the quantification of health care waste generated within the health facilities.

Special thanks go to Engineer Wilfred Ndegwa of WHO, Fredrick Okuku of JSI-MMIS, Joanie Robertson and Adriane Berman of Programme on Appropriate Technology in Health (PATH) Seattle, USA, who participated in all the crucial stages in the development of this document. Special gratitude goes to the members of the National Working Committee on Health Care Waste Management for their useful inputs and recommendations.

Lastly, special thanks also go to Ibrahim Longolomoi of the Ministry of Public Health and Sanitation for his dedication in leading the entire process of developing this document.

Mr. Kepha Ombacho
Chief Public Health Officer.
FOREWORD

Health care waste management planning covers not only the technical aspects related to waste management such as waste handling, storage, transportation, treatment and disposal, but also human resource development. It is prudent to note that success in waste management can occur when the members of staff working in the health sector dedicate themselves to surmounting the challenges that are experienced in the areas mentioned.

In order to confront these challenges, this national plan has been developed to provide viable technical options as well as a roadmap for the management of health-care waste in Kenya for the next 5 years. The national survey of health-care waste that was conducted provided the Ministry of Public health and Sanitation with a basis for identifying specific actions at the district, provincial, and national level, taking into account the conditions, needs, and possibilities at each level both at the public health sector and the private sector.

This initiative of the Ministry of Public Health and Sanitation, together with its development partners notably the World Health Organization, JSI-MMIS Kenya, CDC and World Bank as well as the National AIDS Control Council (NACC) has renewed the focus on health care waste management in Kenya. This action plan brings out a deliberate strategy aimed at improving the management of health care waste both within hospitals and community settings. The immediate benefit of implementing this plan is to reduce the risk of transmission of infections likely to be acquired from poor waste management. The plan provides feasible options of achieving best practices available in terms of technology for the management of health care waste.

This ministry therefore encourages the use of appropriate, safe, and cost-effective methods and techniques to segregate, contain, transport, treat, and dispose HCW. In this regard therefore, I wish to call upon all the stakeholders to join hands with the Ministry of Health and Sanitation together with its sister ministry of Medical Services in ensuring consistent support for the successful implementation of this plan.

Mark Bor, CBS
Permanent Secretary, Ministry of Public Health and Sanitation
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Executive Summary

The National Health Care Waste Management Plan of Action is a document intended for use by health managers and programme officers across the health sector (including those in the private health sector). The purpose of developing this plan is to provide a tool that gives health managers guidance in planning, implementing and monitoring the activities of health care waste management in health facilities.

This plan describes the situation of health care waste management on the basis of a desk review and a survey which were conducted in order to document the situation of waste management in Kenya. The survey utilized questionnaires and checklists together with other data collection tools which were used to record waste quantities generated from all the selected hospitals. The findings of both the desk review and survey were then analyzed and presented to stakeholders.

Previously, health care waste management in most public health facilities including in some private facilities has been given very little attention. The renewed impetus from the Ministry of Public Health & Sanitation and other stakeholders provides the desired opportunity of addressing the issues of health care waste management. A holistic approach has been recommended to include, clear delineation of responsibilities, occupational health and safety programmes, waste minimization and segregation. This document is designed to provide viable options to address the challenges encountered in planning for health care waste management in Kenya.

The recommendations proposed here are as a result of discussions and consultations with the various stakeholders under the leadership of the National Working Group on Health Care Waste Management covered under the following thematic areas:

1. Legal and regulatory framework which should be revised to provide guidance to health care managers on minimum operation requirements. There is also need to standardize HCWM practices in all health care facilities in the country.

2. Financing the implementation of HCWM plan of action in order to reduce if not eliminate infection transmission which is contracted through improper waste management practices. Capacity building should as well be done in order to bring the envisaged uniformity of practice that cuts across the entire health sector in a bid to effect the desired policy changes.

3. The process of operational research in pollution reduction through the development or adoption of environmentally friendly technologies that is appropriate for Kenya. It is also the endeavour of this ministry to drive a monitoring and evaluation process that shall guide the implementation of the action plan.

This Plan therefore, underscores the need for serious involvement of health managers at all levels of health care service delivery system in order to invoke the desired high level commitment. It is envisaged that the implementation of this
plan over the next five years will result in improvement of health care waste management and the general cleanliness within the health care facilities and reduce risks and hazards associated with poor HCWM in the community. The sister ministries of Medical Services and Public Health and Sanitation will review the plan regularly to ensure that it is relevant and meets the challenges of HCWM in the context of global changes in technology and practice.

Dr. Francis Kimani  
Director of Medical Services
<table>
<thead>
<tr>
<th>ACRONYMS</th>
<th>Description</th>
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<tbody>
<tr>
<td>AIDS</td>
<td>Acquired Immune Deficiency Syndrome</td>
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<tr>
<td>ARV</td>
<td>Anti Retro Viral</td>
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<tr>
<td>BBC</td>
<td>Behaviour Change and Communication.</td>
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<tr>
<td>CAT</td>
<td>Cost Assessment Tool.</td>
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<tr>
<td>CBO</td>
<td>Community Based Organization</td>
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<tr>
<td>CHEW</td>
<td>Community Health Extension Worker</td>
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<tr>
<td>CPHO</td>
<td>Chief Public Health Officer</td>
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<tr>
<td>CME</td>
<td>Continuing Medical Education</td>
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<td>CNO</td>
<td>Chief Nursing Officer.</td>
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<tr>
<td>CORP</td>
<td>Community Own Resource Persons</td>
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<td>CSO</td>
<td>Civil Society Organization</td>
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<tr>
<td>DFRD</td>
<td>District Focus for Rural Development.</td>
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<td>DHMT</td>
<td>District Health Management Team.</td>
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<td>DHMB</td>
<td>District Health Management Board.</td>
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<td>DMS</td>
<td>Director of Medical Services.</td>
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<td>EA</td>
<td>Environment Audit</td>
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<td>EIA</td>
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<td>FBO</td>
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<td>FHI</td>
<td>Family Health International</td>
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<td>GAVI</td>
<td>Global Alliance for Vaccines and Immunization.</td>
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<td>GOK</td>
<td>Government of Kenya</td>
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<td>HCF</td>
<td>Health Care Facility</td>
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<td>HCW</td>
<td>Health Care Waste</td>
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<td>HCWM</td>
<td>Health Care Waste Management</td>
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<tr>
<td>HIV</td>
<td>Human Immune Virus</td>
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<tr>
<td>IEC</td>
<td>Information Education and Communication.</td>
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<td>Infection Prevention and Control</td>
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<td>IPCC</td>
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<tr>
<td>JSI MMIS</td>
<td>John Snow Incorporated – Making Medical Injections Safe.</td>
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<td>JICA</td>
<td>Japan International Cooperative Agency</td>
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<td>KMTC</td>
<td>Kenya Medical Training College</td>
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<td>Kenya Bureau of Standards</td>
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<td>Kenya Medical Association.</td>
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<td>KMTC</td>
<td>Kenya Medical Training College</td>
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<td>KQM</td>
<td>Kenya Quality Model</td>
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<td>MoH</td>
<td>Ministry of Health</td>
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<td>MoPH &amp; S</td>
<td>Ministry of Public Health and Sanitation</td>
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<td>MMS</td>
<td>Ministry of Medical Services.</td>
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<td>MSF</td>
<td>Medicines San Frontiers</td>
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<td>NEMA</td>
<td>National Environment Management Authority</td>
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<td>NGO</td>
<td>Non-Governmental Organization</td>
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<td>NWMC</td>
<td>National Waste Management Coordinator.</td>
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<td>PATH</td>
<td>Project for Appropriate Technology in Health</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
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<td>POP</td>
<td>Permanent Organic Pollutants.</td>
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<tr>
<td>PHO</td>
<td>Public Health Officer</td>
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<td>PHMT</td>
<td>Provincial Health Management Team.</td>
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<tr>
<td>PHT</td>
<td>Public Health Technician</td>
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<tr>
<td>SIGN</td>
<td>Safe Injection Global Network</td>
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<tr>
<td>WB</td>
<td>World Bank</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<tr>
<td>WMO</td>
<td>Waste Management Officer</td>
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<tr>
<td>WMT</td>
<td>Waste Management Team.</td>
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CHAPTER ONE: INTRODUCTION

In Kenya and the world over, health-care services in rural or urban settings inevitably generate wastes that may be hazardous to health or have harmful environmental effects. Potentially infectious waste such as; sharps, cultures from medical laboratories or infected blood, carry a higher risk for infection and injury than any other type of waste. Other wastes of significant importance include; body fluids, all body parts, human tissues, placenta and radioactive waste among others. The absence of proper management measures to prevent exposure to hazardous health-care waste (HCW) results in important health risks to the general public, in- and out-patients as well as the medical and the supportive staff. Improper disposal of health care waste may result in syringes and needles being scavenged and reused thus leading to significant numbers of hepatitis B, hepatitis C, and HIV infections among others. Even after the formulation of policies and laws on health care waste management, many health care establishments in Kenya still lack enforcement of legislation for handling, and disposal of health care waste. Furthermore, improper treatment or disposal of HCW such as open-air burning can constitute a significant source of pollution to the environment through the release of substances such as dioxins, furans or mercury.

Safe management of HCW is key in controlling and reducing nosocomial infections inside a hospital and ensure that the environment outside is well protected. Studies conducted earlier in Kenya by Japan International Cooperation Agency (JICA) and the Kenya Expanded Programme on Immunization (KEPI) in conjunction with WHO reveal that the health care waste management (HCWM) practices encountered in most of the health care facilities do not comply with the international requirements to guarantee a safe and environmentally sound management of HCW. The full spectrum of HCWM practices are found in the health-care facilities (HCFs), from the most hazardous ones where no segregation system is applied and the waste is simply dumped in the backyard of hospitals, to safer procedures where the waste is segregated and the part considered to be hazardous is incinerated separately.

In order to reach to the current situation where the profile of waste management in Kenya has been elevated, the government of Kenya, together with its development partners has made significant attempts in addressing the HCWM problems. The introduction of the following health care waste management initiatives and concepts are listed below although some initiatives found to be harmful have since changed:

1. The concept of removing needles from syringes and placing the needles into five litre jerry cans was an attempt to reduce the harmful nature of waste generated from health care facilities but turned out to be needle-stick-prone.
2. The adoption of the WHO recommended use of safety boxes for the containment of all sharps waste generated in health care settings. The initiative was first used in Kenya by the expanded immunization programme.
3. The construction of De Montfort incinerators by the Ministry of Health (MoH) countrywide through the assistance of United Nations Children’s Fund (UNICEF), Medicines San Frontiers (MSF), JHPIEGO and Family
Health International (FHI) are also some of the organizations that have supported the construction of De Montfort incinerators in some of their programme supported HCFs in the country.

4. The concept of waste segregation resulted in some institutions following colour coding practices in waste handling using varying bin colours.

5. The comprehensive approach of Injection Safety and Health Care Waste Management (HCWM) which was piloted in 2004 and is being scaled up by the MoH and JSI-MMIS.

Other attempts made include putting in place various legislative and regulatory mechanisms for the purpose of strengthening enforcement and compliance on waste generation and handling.

It is important to mention that for most HCFs, lack of resources tends to affect negatively the way HCW is managed. Furthermore, the situation differs significantly from the public sector to the private sector. Under adverse circumstances where resources (financial, human and material) are limited, planning becomes a problem since the definition of strategy will require taking into account the given constraints and opportunities, clear formulation of objectives, appropriate allocation of resources, and listing practical indicators of achievement.

Following consultative meetings in 2005/2006 between the National AIDS Control Council (NACC), the Ministry of Health and its development partners mainly the World Bank (WB), Ministry of Health found it necessary to develop a national plan on health care waste management. The plan spelt out medium-term and long-term goals for safe management of HCW. The Global Alliance for Vaccines and Immunization (GAVI) through the World Health Organization (WHO) supported the development of this plan to complement the initiative and take HCWM in Kenya to next level.

The preparation of this plan therefore was preceded by an assessment that was conducted in four of the eight provinces in Kenya. The results obtained were then analyzed and shared with the National Working Group on Health Care Waste Management (NWGHCM). From the results, a number of recommendations were arrived which have helped in providing a framework for this action plan. This plan attempts to comprehensively address the problem of planning, resource allocation and implementation of HCWM programme in Kenya.

1.1 BACKGROUND

The National Health Sector Strategic Plan I (NHSSP I) running between 1999-2004 re-stated the Kenya Health Policy Framework (KHPF) strategic imperatives and articulated a large number of strategies and activities including how to address the deteriorating environmental health status as one of the factors responsible for increasing health problems in the country. The goals of the national environmental sanitation and hygiene policy among other things underscores the need to have clean human dwelling that is free from waste and unpleasant odours. For a long time, Kenya has lacked a comprehensive management plan for handling and disposing domestic, agricultural, industrial, and health care waste. The government of Kenya in taking cognizance of the risks
of mismanagement of health care waste or use of inadequate or harmful treatment technologies has set forth a framework of activities aimed at jumpstarting better health care waste management practices in Kenya.

This makes it necessary that HCWM should be given priority in order to reduce if not eliminate its adverse environmental effects on human health. Kenya has been grappling with the problem of poor and ineffective management of HCW from HCFs in the country. While the rest of the waste is handled on an ad hoc basis by both the local authorities and the private sector, HCW poses a serious challenge in both public and private sector since no serious planning arrangements have so far been put in place.

Because of the immense challenges experienced in the area of health care waste management, the World Health Organization (WHO) selected Kenya with other 36 countries for support in the development of its national plans under Global Alliance for Vaccine and Immunization (GAVI) initiative.

1.2 ORGANISATION OF HEALTH SERVICES

The Ministry of Health has made shifts towards decentralization of health services as part of the broad policy framework in the recent past. In 1984, the country was transformed through the District Focus for Rural Development, (DFRD) programme, which decentralized most government services including health systems management to the district level through District Health Management Boards (DHMB). District health management boards were created in 1992 so that it could represent community interests in health planning, coordination and the implantation of projects in public facilities at the district level.

In order to make health management boards and health facility committees active, the Exchequer and Audit (Cap. 412) was amended to provide for the creation of health care service fund where 75% of the revenue generation are utilized by the collecting facility and 25% directed to the source districts to support primary health care activities at community level.

In Kenya, the hospital system with a total of 306 hospitals and 191 Nursing homes (public hospitals and sub district hospitals - 158, FBO/ NGO - 74 and Private - 74), MoH, 2006, is the backbone of health care provision. The health sector has facilities ranging from the national referral and provincial, district and sub district hospitals that provide integrated curative, rehabilitative care and supportive activities for peripheral facilities. The facilities offering healthcare services in Kenya are inclusive of government managed facilities through the Ministry of Medical Services and Ministry of Local Government, mission or Faith Based Organizations (FBOs) and those that are privately-managed. The vision of the Ministry of Public Health and Sanitation and the Ministry of Medical Services is to create an enabling environment for the provision of sustainable quality of health care that is acceptable, affordable, and accessible for all Kenyans. The government is a major player in health services provision where it owns slightly more than half of health facilities while the rest belongs to private organizations which are classified as; for profit and not-for profit.
The overall mandate for the health services promotion in Kenya is vested with the Ministry of Health under the public health Act, Cap 242 of the Laws of Kenya. This mandate is also placed under various subsidiary legislations dealing with specific areas by various boards and councils, which regulate the performance of services and institutions and of health workers themselves in general.

Kenya’s second National Health Sector Strategic Plan (NHSSP II 2005-2010) defines a new approach in the way the sector will deliver health care services to Kenyans. The NHSSP II aims to improve the health and well being of all Kenyans, based on a lifecycle approach for ensuring that each age cohort receives health services according to its needs. The plan expects to achieve that goal through selective, highly cost-effective service package interventions for each age cohort that is likely to result in health improvement in the overall population. The proposed structure of the health services delivery system is hierarchical in nature and can therefore be discussed under life cycle cohorts and six health delivery levels.

1.2.1 Level One Services

The Kenya Essential Package for Health (KEPH) is designed as an integrated collection of cost-effective interventions that address common diseases, injuries and risk factors, including diagnostic and health care services, to satisfy the demand for prevention and treatment of these conditions. Strategy for the delivery of Level One Services, intends to make KEPH a reality through empowering Kenyan households and communities to take charge of improving their own health.

This new approach clearly defines the type of services to be provided, the type of human resources required to deliver and support this level of care, the minimum commodity kits required, and the management arrangements to be used in implementation. The strategy sets out an ambitious target of reaching 16 million Kenyans (3.2 million households) in the next four years (2007-2010). It envisages building the capacity of households not only to demand services from all providers, but to know and progressively realize their rights to equitable, good quality health care. This strategy introduces innovative approaches for accomplishing these challenging but realizable targets. The approaches include:

- Establishing a level 1 care unit to serve a local population of 5,000 people.
- Instituting a cadre of well trained community-owned resource persons (CORPs) who will each provide level 1 services to 20 households.
- Supporting every 25 CORPs with a Community Health Extension Worker (CHEW).
- Ensuring that the recruitment and management of CORPS is carried out by village and facility health committees.

The levels of action to support level 1 services at; Household, Village, School, or Congregation includes; organizational, coordination structures, entry steps to roll out the strategy, planning and management of operations, and linkages with facility based health systems.
The activities at this level entails to:
- Plan, implement, monitor, evaluate and provide feedback on activities.
- Mobilize and manage resources.
- Undertake health promotion, hygiene, lifestyle and care seeking initiatives.

1.2.2 Level Two Services (Sub location, parish, and dispensary)

Dispensaries provide the bulk of services and form the first level contact with the community. This level should have dispensary committees with representation from locational and sub locational levels. This level forms the main linkage between the community and the health system and they report to the location/sub locational development committee on matters of health. The technical resource persons here include the CHEW who are trained to train and coached to support CORPs. The committee in addition to the formal roles assigned to it through the various guidelines should:
- Plan, implement, monitor, evaluate and provide feedback on level 1 services.
- Mobilize resources for development of the health facility as well as supporting out reach and referral activities.
- Facilitate regular dialogue between the community and health service providers based on available information.
- Promote inter-sector collaboration.
- Organize the community for health action.
- Strengthen community involvement in decision making process.
- Facilitate planning, budgeting, budget controls and accountability, to ensure availability of all the resources needed for level one services.
- Establish linkage between the health system and the community by helping to market the health facility to enhance its credibility based on quality of care and thus promote a culture of good health promotion at the community level
- Use the services as the place of first when in need of care.
- Listen to and address complaints of clients.
- Coordinate the recruitment of CORPs and CHEWs.
- Convene monthly community health days for joint health action.

1.2.3 Level Three Services (Division, health centre)

A district health committee will be established to be responsible for health services in the whole division. The health centres committees shall be responsible for facilitating level one services by reporting to the health centre committees, and providing day to day support of CORPs in their service delivery. At this level also is where the CHEWs:
- Plan, implement, monitor, evaluate and provide feedback on activities for continuous improvement.
- Provide training and supportive supervision.
- Coordinate, collaborate, network, exchange ideas and pool resources.
1.2.4 Level Four Services (District, Diocese Hospital)

The district hospitals and other diocese hospitals provide both referral and outpatient services in addition to the requisite technical support and responsibility to the health care facilities at the periphery. The DHMB and District Health Management Team (DHMT) provide governance and technical support respectively to the level three facilities which include planning, implementation, monitoring and supervision. Other responsibilities mandated to the district level includes to:

- Carry out comprehensive district planning, implementation, monitoring, evaluation and feedback, budgeting, and supervision.
- Identify and increase the utilization of existing community organizations and structures and sensitize them on rights for health.
- Strengthen health boards.
- Build capacity of villages on safe water supply, sanitation facilities.
- Train extension staff and leaders on level one services and ensure that resources reach level one to implement their village health plans.
- Facilitate community capacity for providing technical and material support.
- Coordinate input of development partners/NGOs/CBOs through the district health stakeholders forum.

This package has to be incorporated into comprehensive district health plans organized by cohorts to enable districts to properly utilize available scarce resources. Similarly, the filtered health service delivery packages targeted at community level should be incorporated into the community-based health plans in which HCWM is among them.

1.2.5 Level Five Services (Province)

The Provincial Health Management Team (PHMT) is responsible for integrating health services into normal health care system in Kenya through provincial or regional coordination. Apart from the provision of support in capacity building and quality assurance by the provincial team, the Provincial hospitals perform the role of referral to the district hospitals in the province. It is also at this level that feedback of projects and programmes run from the district level is transmitted to the national level. The provincial team gives supervisory support to district teams by:

- Building capacity of districts for implementation of level one services and assure quality, including rights.
- Provide technical and material support on planning, implementation, monitoring, evaluation and feedback.
1.2.6 Level Six (National)

At the national level is where policies, regulations and national guidelines are formulated and reviewed in relation to the national health policy. The national level is responsible for:

- Developing strategic plans and implementation plans for lower level action.
- Ensuring multi-sector and donor coordination in health and resource allocation.
- Ensuring equity of health services, quality assurance, and technical support.
- Building the capacity of districts in planning and action process.
- Ensuring health information is passed to the Kenyan populace.

Kenyatta National Hospital is at the apex; with Moi Teaching and Referral Hospital following it at a distance in service provision. The two national referral hospitals have the referral duties to perform both to the provincial general hospitals and district hospitals.

1.2.7 Private Health Services

The Ministry of Medical Services is the main provider of health services in Kenya but Kenya’s strategy of pluralism in health care provision has nevertheless facilitated the growth of diverse non government health sector which is well developed. An elaborate network of non-governmental or private health providers (both for profit and not-for profit) supplements the public health system. The private sector health services are mainly concentrated in the urban areas essentially providing curative services.

Despite its importance, the private sector, safe for few occasions, hasn’t been involved in the national health policy formulation. Since there has been little cooperation and coordination of planning regarding the delivery of health services between public and private actors, it is incumbent upon the Ministry of Health and its stakeholders to open up this avenue for successful implementation of programmes.

1.2.8 Faith Based and Community Based Organizations

Faith based organizations are coordinated by religious groups which run health services and they include; Christian Health Association of Kenya (CHAK), the Catholic Health Secretariat, the Supreme Council of Kenya Muslims, and other religious organizations. In particular, the experiences of Faith Based Organizations, Non Governmental Organizations (NGOs) and Community Based Organizations (CBOs) in working with community are an asset for the implementation of health programmes at grassroots level.

NHSSP II sets out the approach to be taken to ensure that Kenyan Communities have the capacity and motivation to take up essential roles in health care delivery.
Through Civil Society Organizations (CSOs), these community based groups offer not-for-profit health services. They often consist of local initiatives such as women groups that respond to felt needs, e.g. building a small maternity or dispensary. Their source of income most often comes from local contributions among those interested or money from cost sharing. The quality of services provided by these organizations attracts many people thus translating into service provision to an important segment of the Kenya population.

1.2.9 Home Based Health Care Services

Home Based Care (HBC) health services in Kenya have been practiced through the Primary Health Care /Community Based Health Care (PHC/CBHC) since the Alma-Ata Declaration of 1978. The treatment for HIV/AIDS patients have been complicated by stigma and discrimination attached to the disease and the fact that HIV mode of transmission is surrounded with a lot of myths. Prolonged hospital care for patients with HIV/AIDS puts too much constraints in the hospital budgets and compromises the resources that should be utilized on emergency cases.

Patients put on Anti Retro-Viral (ARV) drugs are not mostly admitted to hospitals but take drugs home and therefore require adherence follow-up, nutritional support, spiritual support, social support among other things. Effective home based care will help to decongest hospitals, where currently 65% of hospitals bed occupants suffer from AIDS related illnesses. However, the community systems are faced with the challenge of coping with growing demand for care, in the face of deepening poverty and dwindling resources.

In the new approach, the DHMT will advocate for support by religious, government and political leaders, other influential people, and NGOs and CBOs for resource mobilization and allocation for level one services at community level. Social mobilization through sensitizing and motivating social partners to work together in raising awareness and pooling resources, targeted interested organizations, individuals and health related sectors, along with CBOs, NGOs, professional associations and the private sector. A clear organizational structure with well defined roles and responsibilities of all sectors at all levels is necessary to ensure the success of level one services.

1.2.10 Monitoring and Evaluation

Monitoring is the process of regularly reviewing achievements towards the goal. In order to carry out monitoring and evaluation activities, critical issues are; the goals, objectives, targets, inputs, outputs and indicators must be clearly defined. An effective monitoring and evaluation system needs monitoring structures with appropriate staff, a good information network system, and appropriate reporting formats/ registers and procedures. The work performance expected to be delivered at the various levels of services provision provide the bench marks of expected out puts. Likewise HCWM needs to be bench marked.
Fundamentally, monitoring should be established from the beginning as part of the planned activities. The purpose is to ensure that KEPH activities are implemented according to the set plan, that lessons are derived from the way the programme is implemented, and health extension programmes are effectively implemented. Monitoring involves comparing what is actually happening with what was planned. On the other hand, evaluation asks whether we succeeded or failed to meet stated goals, whether we used resources appropriately, and whether our actions will have long-term results. In this context, therefore, there have to be specific tasks identified for implementation with targeted expected outputs at the community level based on invested required inputs. The aspects to be monitored and evaluated on health care waste management should be identified based on the injection safety and medical waste management policy guidelines and the National Environment Management Authority (NEMA) standards.

1.2.11 Conclusion

All efforts to improve health sector performance, irrespective of which approved provider runs it, are ultimately geared towards improving people's health. Stakeholders in the health sector are many and they range from other government ministries, the private sector institutions including non-governmental organizations, professional associations, and development partners. The re-organization of health services through the NHSSP II aims at improving service efficiency and effectiveness at level one in the community.

Management of HCW is an integral part of hospital hygiene and infection control. Infectious HCW contributes to the risk of nosocomial infections, putting the health of medical workers and the community at risk. Proper HCW practices should be strictly followed as part of a comprehensive and systematic approach to hospital hygiene and infection control. Harmonization of health systems especially on health care waste management can be an asset if it is enforced in all health care providing institutions. Efforts by government institutions and development partners namely; the World Bank, WHO, JSI-MMIS among others are so far commendable. This partnership has provided the required financial support to HCWM assessments and plan of action development, an area that for a long time has been neglected. The development of the plan reflects the integral effort that is necessary to set up a safe and environmentally sound HCWM practices acceptable by the national environmental legislations.
CHAPTER TWO: SITUATION ANALYSIS

A national assessment was done in October 2007 and was aimed at exposing legislative, institutional and infrastructural problems touching on health care waste management in the country. The assessment done in a desk review and a rapid assessment are detailed in the sections that follow:

2.1 LEGAL AND REGULATORY FRAMEWORK

In the desk review, the current legal provisions for HCWM in Kenya as well as the current rules that are applied within the health sector were explored. This was to bring out the inter-linkages and synergies aimed at improving the management of HCW. The documents used for this purpose were:

i) The Public Health Act, Cap 242.
iii) National policy on injection safety and medical waste management.
v) National Environmental Sanitation and Hygiene Policy.

In reviewing the legislative provisions and other related documents, it was imperative to consider their significant roles in the management of HCW.

2.1.1 The Public Health Act, Cap 242, Laws of Kenya, on Waste Management

The Public Health Act Cap 242, part IX deals with sanitation and housing. The Act imposes responsibility on local authorities to take measures and maintain their areas in clean and sanitary condition. It also prevents the occurrence of nuisances and aspires to remedy nuisances or other conditions liable to be injurious or dangerous to health. Section 118 defines nuisances and includes any accumulation or deposit of refuse which is offensive or which is injurious or dangerous to health.

Where the Medical Officer of Health of a local authority is satisfied that a nuisance exists he shall serve a nuisance abatement notice to the owner or occupier. This notice can be enforced by taking criminal proceedings against the owner, occupier or the person responsible for the nuisance. It is instructive that the provisions in Public Health Act are not really designed to deal specifically with health care waste. However, these provisions address the conditions which render premises dangerous to health. There can be circumstances in which the danger to health arises from the handling of infectious health care waste, in which case the provisions of the Public Health Act can be used.
2.1.2 The Environmental Management and Coordination Act, 1999

The National Environmental Management Authority (NEMA) Regulations made under the EMCA 1999, imposes duty of care on the occupier of premises where health care waste are handled to take measures to ensure that such waste is handled without adverse effects on human health and to the environment and natural resources. A waste generator is expected to minimize the waste generated by adopting cleaner production methods that focuses on; reclamation and recycling and elimination of use of toxic raw materials, and reducing toxic emissions and wastes among others.

These provisions also impose segregation as a means of waste minimization in order to make the choice of waste treatment easy. In hospital settings, Persistent Organic Pollutants (POPs) will be produced if the health care waste to be incinerated contains any chlorinated products such as blood bags, catheters, IV bags, tubing, and some surgical gloves. Worldwide, it is estimated that 10% of dioxins pollution occurs after the incineration of medical waste containing chlorinated substances. It is therefore important for health care institutions to segregate and carefully separate chlorinated waste from waste earmarked for incineration. The NEMA Regulations on waste management permit emission of dioxins and furans that do not exceed 80ng/m$^3$. This however does not mean that the Authority allows air pollution but the emissions should be within allowable limits. The regulation imposes standards for treatment and disposal of biomedical waste, including standards of air emissions from incineration and other related activities.

The NEMA regulations also deals with the transport of waste and prohibits the transport of waste without license issued by NEMA, or transporting waste to a disposal site which is not licensed by NEMA. Further, the section prohibits the operation of a site or plant without being licensed by NEMA. It further directs that no person shall be granted a license under the Act to transport waste, operate a waste disposal site or plant unless such a person complies with all conditions that apply to waste transport vehicles and waste disposal sites.

NEMA has also operationalized part VI of EMCA which deals with environmental impact assessment licensing. This section requires that project proponents apply for and obtain an Environmental Impact Assessment (E.I.A.) license from NEMA, before commencing, carrying out or proceeding with a project that is generally considered to be hazardous. The EMCA, 1999 provides that NEMA may appoint inspectors who may enter any premises to determine compliance with environmental management requirements and demand for an Environmental Audit (EA) of a premises, plant or project.


The provisions of these guidelines describe a series of steps that need to be followed in order to dispose unwanted pharmaceuticals. The steps required include; identification of pharmaceutical waste, sorting of pharmaceutical waste
by category, filling the relevant forms to seek authority from the DHMT and the Chief Pharmacist among other persons to dispose such waste. Upon obtaining all the relevant approvals, the disposal of the pharmaceutical waste shall be effected under the supervision of the local pharmaceutical waste disposal team or the Waste Management Team (WMT).

The recommended methods for disposing of unwanted pharmaceuticals include:

- The use of either medium temperatures incineration at a minimum of 850°C or high temperature incineration exceeding 1200°C with two chamber incinerator for solids, semi-solids and powders for controlled substances e.g. antineoplastics.
- Engineered sanitary landfill to be used for disposal of expired or unwanted pharmaceuticals.
- Sewer disposal for diluted liquids, syrups, intravenous fluids, small quantities of diluted disinfectants and antiseptics.

2.1.4 National Policy on Injection Safety and Medical Waste Management

The mission statement of this policy is to ensure safety of health workers, patients, and the community and to maintain a safe environment through the promotion of safe injection practices and proper management of related medical waste. This is the first document of the Ministry of Public Health and Sanitation that is explicit on the need to address health waste management problems. The policy objectives spell out the need to advocate for support and implementation of proper management of medical waste among others.

Some of the guiding principles for the implementation of this policy include:

- Establishment of organizational structures at all levels for all the implementation of injection safety and related medical waste.
- The policy also addresses the need for environmental protection through appropriate waste disposal methods.
- Minimization of risks to patients, health workers, communities and the environment through application of safer injection devices and sharps waste disposal methods.
- Advocating for the strengthening of the necessary human resource capacity through training and sensitization for safe waste disposal.

One of the key policy strategies indicated in this policy is the need for appropriate financial mobilization and allocation of the components of injection safety and medical waste management for effective policy implementation. The provision of sustained supplies and equipment for waste management through strengthened logistics system addresses the need for commensurate investment in waste handling requirements. A unique strategy recommended also is the advocacy of best waste management practices through behaviour change communication as a key element in the strategy.
2.1.5 Radiation Protection Act, Cap 243

The Radiation Protection Act, Chapter 243, aims to control the; import, export, possession and use of radioactive substances and irradiating apparatus. Under this Act in section 9, a license is required to handle any radioactive substances or irradiating apparatus from the National Radiation Protection Board. Handling here includes the method of disposing of radioactive waste products, transportation of radioactive materials, storage, use and maximum working hours that employees are expected to work with radioactive materials. Under this Act also, institutions generating this category of waste shall be expected to apply for a license from the same board.

2.1.6 International Conventions

The documents reviewed did not mention the existence of Stockholm Convention which is explicit on protecting human health and the environment from Persistent Organic Pollutants (POPs) specifically dioxins and furans. The Kenyan Government ratified this convention and the main objective of this convention is to reduce/eliminate POPs. POPs is generated by various health care institutions whose activities may directly or indirectly produce these harmful substances during the incineration by oxidation of chlorinated waste products.

The Basel Convention (Trans-boundary movement of hazardous waste convention) to which Kenya is a signatory was given mention in the waste management regulations where the waste imported or exported is expected to meet the ambient soil or water standards as shall be determined by the lead agency. The standards issue here is vaguely handled and should be clear on permissible levels.

2.2 ASSESSMENT OF HCWM PRACTICES

This section presents the findings of the rapid assessment which was conducted in four provinces in Kenya, namely Nairobi, Central, Rift Valley and Western. 24 hospitals were selected from four of the eight provinces in Kenya.

- Six hospitals from each province were randomly selected each from a stratified sample based on ownership of the hospital.
  - Public hospitals at provincial and district hospitals were included.
  - Faith Based hospitals and private (private-for-profit) hospitals were also included.
- Questionnaires were administered to the Medical Superintendents or Hospital Matron of the visited hospitals.
- Observational Checklists were administered by the assessment team leader who assessed the health care waste management facilities/ tools and practices in the hospitals.
- The weighing of the various categories of health care waste generated in the selected hospitals was done.

The assessment was aimed at bringing out the issues which were seen to be part of the problems afflicting health care waste management practices in Kenyan hospitals.
2.2.1 HCW Production and Containment

Generally speaking, health care waste in most hospitals in Kenya is separated into three main categories. The commonest practice is the use of three bins system to accommodate waste as follows;

1. Infectious or hazardous health.
2. General waste or non-infectious waste
3. Sharps in puncture proof safety boxes.

Appropriate handling, treatment, and disposal of waste by type can help to reduce costs and does much to protect public health. However, the assessment revealed the findings discussed under the following themes;

i) **Waste Generation.** The measurement of waste was conducted in 23 hospitals by field officers who were each given a spring dial weighing machine. Weighing of wastes was done for a continuous seven days so as to obtain the weeks’ trend of waste generation. The results obtained from the targeted facilities were very much varying in their weight range from one hospital to another.

ii) **Waste Minimization:** Health care waste minimization is considered one of the possible strategies of managing health care waste in a sound manner. However, most health facilities did not practice any form of waste minimization or show any efforts geared towards waste minimization.

iii) **Waste receptacles:** The assessment showed that sharps waste was well contained in (95%) of the hospitals visited therefore implying that special attention was being given to sharps waste management both in government facilities and in faith based hospitals. Most areas generating sharps in the private hospitals (private-for-profit) were using 5 litre sharps boxes and in some cases 2 litre plastic sharps containers.

For non-sharps waste, the 10 litre and 30 litre bins were the commonest bins provided in most clinical areas. However, improvisation of carton boxes, and buckets to take the place of waste bins was observed in some hospitals. The use of bins without liners was also evident.

2.2.2 Waste Handling Practices

i) **The Practice of Waste Segregation:** Segregation of HCW was done according to the following categories; infectious or clinical waste (hazardous waste), Non-infectious or general waste, highly infectious waste, and sharps waste. In few hospitals, glass waste was placed in its own category. Use of colour codes for waste containers was low. The following colour codes for HCW are recommended by NEMA:

- yellow for infectious and sharps waste;
- black for non infectious.
Further, WHO recommends red for pathological and/or highly infectious waste. The use of colour coding system is to enhance segregation practices. Careful segregation of waste into different categories helps to minimize the quantities of hazardous waste.

ii) **Packaging of HCW:** The exercise of packaging was seen in few health care facilities that were using an off-site waste treatment facility to dispose their waste. The packaging involved putting waste in larger bags, some of which had not been sealed. Most of the waste for on-site treatment was simply loaded on waste transport utilities without sealing. Few waste bags were tied up before as they awaited transportation.

iii) **Labelling:** Even though labeling of waste receptacles is a recommended practice to ensure each waste category is easily identified, it was observed that only few hospitals labelled their waste.

### 2.2.3 Waste Storage and Transportation

i) **Waste Transportation:** Most hospitals were using wheelbarrows for the transportation of waste within the compound, while only a few of the facilities were using trolleys. The use of wheelbarrows should be discouraged since it leads to spillage of waste. It was noted that more than half of the hospitals had noticeable waste spillage within. The recommended practice for waste transportation within hospitals should be dedicated trolleys with separate ones for infectious waste. The frequency of collection of waste in most hospitals was once daily. Few hospitals had identified some areas with high waste generation for two or three collections daily.

ii) **Storage of Waste:** 47% of hospitals visited were found to have refuse storage areas/rooms. In some of these hospitals, disused rooms, some with leaking roofs were used to store waste. Of the waste storage areas provided however, 61% of them were fenced or had restricted entry.

### 2.2.4 Waste Treatment and Disposal

i) **Treatment of Health Care Waste on-site.** Most of the hospitals visited were treating their waste onsite. The commonest method of waste treatment was incineration at 62% using functional incinerators. Most of the wastes taken from hospitals for treatment off-site were glass waste and domestic waste while open burning, open dumping was still being practiced along with incineration. Of those taking their waste off-site, it was found out that most facilities never kept records of the waste they contract for off-site disposal.

For the incinerators observed in hospitals, majority of them were in functional status while a quarter were dysfunctional; either undergoing repair or in a non-working status. Other waste treatment facilities available
in these hospitals included; compost pits for non hazardous biodegradable waste, and shredders which were found in only Kenyatta National Hospital, Mater Mission Hospital and Nairobi Hospital. Most of the hospitals did not have an alternative waste treatment option apart from incineration.

ii) **Final Waste Disposal.** Almost half of the hospitals visited had well kept compounds around the final waste disposal areas in the hospitals, while less than half did not maintain cleanliness around their waste disposal areas. 64% of the hospitals had done good siting of their waste disposal areas while 12% of the facilities had tried to site the disposal area or facility fairly well. 24% however did not do good siting of their waste disposal areas. Good siting of waste disposal sites or facilities entails locating them where they do no cause pollution or injury to the occupants of adjacent dwellings.

Most rural hospitals were doing onsite disposal of waste in pits or open dump sites which in some cases were fenced off. Most hospitals dumped their anatomical waste in placenta pits. Pumwani Maternity hospital was using a contracted company to dispose off maternity waste off site.

### 2.2.5 Occupational Health & Safety

**Personal Protective Equipment.** All the waste operators said they had gumboots for protection of their feet, and most of them had them on. They also had the possession of heavy duty gloves for hand protection. The provision of respirators or face masks, overalls, helmets, and plastic goggles for eyes protection was poor on an overall average of 37%. In most waste treatment sites where waste operators had possession of respirators or goggles, most of those found handling waste did not have them on but wore them on noticing visitors.

### 2.2.6 Institutional Capacity.

i) **Training and awareness:** Best practices in health care waste management require that all staff receive induction and repeated training on health care waste management. However, 61% of technical staff had received training on how to management health care waste. About a similar percentage (65%) of the waste operators had been trained on incinerator operation. The deployed members of staff for waste management duties was expressed as adequate in 57% of the hospitals visited, while the rest of the staff complained of lack of enough staff for waste management. Most staff members deployed to handle waste were engaged in doing other chores apart from waste management.

ii) **Development of Waste Management Plans:** On the development of Annual Operational Plans (AOPs) from the facility level, the assessment revealed that only 16.7% of hospitals visited had health care waste management plans, verified with copies seen.
iii) **Finance and Resources:** Most health managers did not know the costs involved in managing health care waste in their hospitals. In some cases the difficulty of separating cost of managing waste was expressed since the costs had been lumped up with other operational costs. Obtaining resources to purchase bins, bin-liners and maintenance of incinerators was difficult in most facilities.

2.3 ESTIMATION OF QUANTITIES OF WASTE GENERATED

Understanding the quantities or volumes of waste generated in a HCF is very crucial to health managers and planners. Measurements of waste generated in the selected HCFs were considered necessary for informed decision making to those in charge of planning and financing of health care services. The quantities of HCW generated can guide decisions on what disposal method(s) is required for a particular HCF. This assessment was aimed at determining the average daily quantity of waste in each category generated by each hospital.

The types of waste targeted were mainly of three categories; Infectious waste or hazardous waste (soft waste), Sharps waste which is also infectious and the Non-Infectious waste or general waste. Other categories anticipated included; highly infectious waste, glass waste, food waste and other special waste from major hospitals.

2.3.1 Estimation Methodology

The measurements of waste were done in 23 hospitals for one week (7 days) in order to obtain the desired waste generation trends in a week. Public Health Officers were involved in supervising the measurements which was handled by the waste operators in those institutions. The hospital administration was informed about the exercise and their support sought. An induction was conducted by the principal assessor to ensure that the waste operator and their supervisors understood the tasks well. Staff members in the various departments were likewise informed of the exercise. Waste operators identified for measuring the waste were induced to understand what types of waste was targeted and how the data entries were to be done.

The weights were obtained using appropriate spring dial weighing scales and were tabulated on a recording tool provided. The total weight of the various waste categories in the seven days was used to calculate the daily average from each facility. The data obtained was then divided by the total number of both in- and out-patients in order to achieve quantities of particular category of waste per patient per day.

The weights of waste were obtained under the assumption that whatever was placed in yellow bags meant for infectious waste was accepted as such and were not adjusted. The limitation of the study however, was the small sample and the few days for weight measurements. Some facilities lacked waste bin liner bags and some also lacked waste categorization in their practice.
2.3.2 Quantities of Waste Generated

From the data of the 23 facilities whose waste was weighed and analyzed; 39% of the waste was infectious, while 61% were non-infectious. The varying levels of waste segregation practices observed in the sampled hospitals brought out the difference which doesn’t agree with the WHO health care waste proportions where 80% of the waste is considered non-infectious while 20% is infectious.

Table 1: Estimated health care waste production in Kenyan Hospitals.

<table>
<thead>
<tr>
<th>Material</th>
<th>Overall Average waste per patient per day (Kg/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharps</td>
<td>0.031</td>
</tr>
<tr>
<td>Infectious waste</td>
<td>0.175</td>
</tr>
<tr>
<td>Non infectious waste</td>
<td>0.135</td>
</tr>
<tr>
<td>Food waste</td>
<td>0.184</td>
</tr>
<tr>
<td>Total waste produced</td>
<td>0.525</td>
</tr>
<tr>
<td>Per person per day</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Results of waste generation in Kgs. from selected hospitals in Kenya.

<table>
<thead>
<tr>
<th></th>
<th>Eldoret Private Hospital</th>
<th>Bungoma District Hospital</th>
<th>Nazareth Mission Hospital</th>
<th>Nyeri Provincial G. Hospital</th>
<th>Kenyatta National Hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of all Patients (in-and out patients)</td>
<td>97</td>
<td>625</td>
<td>318</td>
<td>1000</td>
<td>2936</td>
</tr>
<tr>
<td>Bed capacity of Hospital (official)</td>
<td>141</td>
<td>167</td>
<td>216</td>
<td>38</td>
<td>1845</td>
</tr>
<tr>
<td>Sharps waste</td>
<td>1.8</td>
<td>22.8</td>
<td>8</td>
<td>19.4</td>
<td>45.7</td>
</tr>
<tr>
<td>Infectious waste</td>
<td>7.4</td>
<td>54.4</td>
<td>69.6</td>
<td>188</td>
<td>1212.4</td>
</tr>
<tr>
<td>Non-Infectious waste</td>
<td>3.6</td>
<td>27.3</td>
<td>22.2</td>
<td>172.5</td>
<td>579.2</td>
</tr>
<tr>
<td>Food Waste</td>
<td>3.6</td>
<td>62.7</td>
<td>47.2</td>
<td>216.8</td>
<td>963</td>
</tr>
<tr>
<td>Total Waste in Kgs.</td>
<td>16.4</td>
<td>165.2</td>
<td>147</td>
<td>596.7</td>
<td>2800.3</td>
</tr>
</tbody>
</table>

In table 2 above, the selected results presented just reinforces the disparity observed from the measurements from the WHO expected standard practice on HCWM.
2.4. DISCUSSION OF THE FINDINGS

2.4.1 Capacity and Resource Availability for Handling HCW

The handling of waste requires both technical and financial resources for effective management of waste emanating from health care services. This issue is not properly addressed in the documents under review. Most of the documents are not clear on waste management responsibilities but in EMCA 1999, a provision is made for a waste transporter to transport waste by obtaining waste transportation license. The national policy on injection safety and medical waste by Ministry of Health only mentions appropriate financial mobilization and allocation by health care institution and more so relies on development partners, NGOs, faith based organizations and the community as potential sources of funds to handle waste. This does not provide clarity on how to generate sustainable funding to effectively handle HCW through government’s national budgets.

The inadequate health care waste receptacles discussed in health care waste management plan have not been adequately addressed in the policy document and only safety box has been mentioned under logistics as covered by national injection safety and related medical waste management policy. Documents reviewed have not shown interest in knowing the volumes of the waste generated and what scales of measurement to apply although the injection safety policy has indicated the need to come up with standards at some stage.

2.4.2 Roles of Different Sectors towards HCWM

The national injection safety and medical waste policy recognizes the roles played by the division of nursing and division of environmental health. Management of HCW needs well-coordinated approach in ensuring effective handling of the waste in order to reduce its adverse effects. Except the EMCA Act, the other documents under review did not mention private sector health care providers in waste management and as such more relationship needs to be built between public and private sectors. EMCA, 1999 is clear on enforcement and the need for EIA, prior to the siting and approval of disposal areas or the disposal of hazardous waste.

The policy on injection safety and related medical waste management is clear on the need for stakeholders to provide logistics to support HCWM in institutions, including support for operational research. Most of the documents under review did not provide defined roles of the wider community when it comes to the management of HCW. The national policy on injection safety and medical waste management has some mention on community roles, although their real participation in terms of increasing information sharing and communication on HCW was not addressed.

However, in the Waste Management Regulations 2006, assignment of responsibility to all players in HCWM has been spelt out and this document
therefore reinforces specification of roles and responsibilities for all, including funding and training needs.

2.4.3 Point of Linkages

The management of HCW is a crucial issue that requires synergistic approach where all relevant sectors and sub sectors agree on what constitutes hazardous waste, with special preference given to waste generated from health care institutions. In the National Environmental Sanitation and Hygiene Policy, the protection of the environment from pollution and its negative effects has been mentioned, and the government’s commitment to protecting its citizens from adverse environmental consequences.


The Medical Practitioners and Dentist Board Act, which regulates the licensing of private health care establishments within the country has addressed dental units as generators of dental health care waste which has not been given mention in other documents. Whereas NEMA has talked on the need for zoning HCWM facilities with relevant lead agency, there is section 36 of the Physical Planning Act, Chapter 286 Laws of Kenya which gives power to local authorities to call for an EIA study with respect to application for planning permission for among other development, waste disposal sites.

2.4.4 Sharps waste Management

The practice of proper segregation of sharps materials in rigid, puncture proof containers was the commonest practice in the assessment conducted. It is noteworthy that only 10% or less portion of the waste stream that is potentially infectious, is the most immediate threat to human health (patients, workers, public) if indiscriminate disposal of sharps (needles, syringes, lancets, and other invasive tools) is allowed. However, beside the effort that has been shown by the Kenyan government in the provision of sharps boxes for use in most public and faith based facilities (95%), it is apparent that if proper sharps waste management were instituted in all health care facilities, most of the risk of disease transmission from health care waste would be reduced markedly.

2.4.5 Segregation Practices

It is possible that segregation can be achieved through training, and designing of clear standards to be followed by all players in waste generation in hospitals. Segregation consists of separating the different waste streams based on the
hazardous properties of the waste, the type of treatment, and disposal methods that are applied to each. The current waste management practices observed was fair segregation posted from some hospitals (55%) who were observing good segregation practices in some departments and in some cases waste mixing was observed in some waste receptacles within the same hospitals and this needs to be captured as an attempt towards best practice.

Poor segregation, and poor choice of technology for treatment and disposal of waste are two problems identified that are due in part to inadequate management practices or simply because of absence of adequate provision of waste receptacles. The results analyzed showed that Kenya was still way below the WHO recommended standards, where 80% of waste should be non-infectious and can be recommended to join the municipal waste stream, while 20% is the infectious wastes that require special waste treatment methods. In best practices, segregation is expected to be systematically maintained all along the waste stream for easy and cheaper treatment and final disposal.

2.4.6 Benefits of Good Segregation Practices

The benefits of waste segregation can be realized when secure internal and external transport system for waste is provided and the segregation practice is appreciated by the technical staff and waste collectors. Evidence shows that in hospitals such as; Nairobi hospital and Gertrude Children’s Hospital, HCWM practices are institutionalized through continuing training programmes coupled with provision of the necessary resources. In these hospitals therefore, it is noteworthy that great levels of segregation and general hospital cleanliness have been achieved.

However, if waste is segregated at the points of generation only to be mixed together by labourers as they collect it, or to have waste collection company workers mix it together upon a single collection, then the ultimate value of segregation is lost. In some hospitals, there is still evident failure to establish and follow segregation protocols and put in place the required infrastructure for handling waste.

It is best practice in HCWM that items that could potentially be used illegitimately must be either rendered unusable after their use or secured for legitimate recycling by vendors or systems that can be monitored for compliance. A recommended way of identifying HCW categories is by sorting the waste into colour-coded, well packed and labelled containers. It is cardinal that segregation must always be applied at source.

2.4.7 Waste Treatment Practices

Most of the visited hospitals treated their waste using incineration processes. Whereas medical waste incinerators are effective in volume reduction of waste to a small quantity of ash, the incinerator at the same time also releases into the air a wide variety of pollutants including dioxins and furans, metals (such as lead,
mercury, and cadmium), particulate matter, acid gases (hydrogen chloride and sulfur dioxide), carbon monoxide, and nitrogen oxides. These emissions have serious consequences on worker safety, public health and the environment. The concern of NEMA has been to raise the incineration temperatures to over 800°C and the stack height to over 10 metres so as to enhance the dissipation of the emissions and subsequently lower its adverse effects.

2.4.8 Technology Choice

Choices of treatment technologies should be made in line with particular waste stream to be managed and the goal to be achieved through treatment. If the technology for use is environmentally sound, the waste stream should be able to be treated without creating other hazardous by-products. Because of the challenges touching on incineration technology on HCW, it is necessary to explore other environmentally friendly technologies as HCWM solutions for the future. The technology for adoption should fix the situation and work in the management system to achieve the final goal as part of the overall system, not as a replacement for the system. The current practices in Kenya are not giving clarity in technology choices for use. This therefore brings to the fore the need to identify better operational conditions for small scale incinerators to operate under, as they meet stipulated NEMA requirements.

2.4.9 Risks Associated With the Current HCWM Practices

A policy for the management of health care waste cannot be effective unless it is applied carefully, consistently and nationally. Improper disposal of health care wastes, especially; syringes, needles and other materials that are scavenged and later reused, may lead to significant numbers of hepatitis B, hepatitis C, HIV/AIDS and other infections among ignorant persons.

It was clear that infectious waste generated in Kenyan hospitals were usually all items contaminated, or suspected of being contaminated with body fluids such as bandages and gauze, swabs, intravenous fluid lines, maternity and incontinence pads and disposable spatulas, bowls and caps. The assessment revealed that good segregation practice was at only 27%, with most hospital departments mixing their waste. The wanting segregation practices coupled with lack of colour coded bags, poor labeling practices and inadequately provided bins for waste containment encouraged the mixing of waste. Poor transport facilities (mainly wheelbarrows) used also encouraged the spillage (in 63% of hospitals visited) of waste and only helped to make the situation deplorable and an obvious potential for injury and infection.

It was clear that most waste disposal and storage areas were not secured from unauthorized entry. This means that risks exist especially to people (“Chokora groups”) who eke their living from salvaging items for resale and who even retrieve food waste to eat. It is apparent therefore that health and safety at the workplace and environmental awareness is a crucial responsibility for all in the interest of all.
2.4.10 Financial Support for HCWM

In Kenya, financial support for waste management is little and this calls for better use of available resources consigned for waste management. Funds available should be used well by targeting a small portion of the waste stream that needs special treatment. To ensure continuity and clarity in these practices, health care institutions should designate a responsible person for HCWM who shall develop clear plans and follow policies for proper management and disposal of waste. The managers of health care institutions including planners in the Ministries of Medical Services and Public Health and Sanitation should be encouraged to put interest towards the enforcement of best practices in health care waste management through financial commitment and investment. Advocacy and sensitization for senior health managers in both the private sector and the public sector should be provided in order to fast-track their participation.

2.5 CONCLUSION

The findings of the assessment provide the required guidance in the preparation of this action plan. The identified areas of weakness in the law and structures of management give a pointer as to which areas need to be addressed for a successful programme implementation. The review of the regulations concerned with health care waste shall assist implementers in designing programme goals while trying to fit in the legislative and regulatory framework that is acceptable in Kenya. The exploration of systems of HCW similarly provides planners with what is at stake in programme implementation. Clearly evident was the lack of targeted resources necessary to put in place the required infrastructure for health care waste management at facility level and at home in the case of home based care. The resources identified here as lacking include; adequate financial and human resources which have emerged as key planning problems that mostly require the commitment of the two sister ministries of health at policy level and the health managers concerned at health facility level.
CHAPTER THREE: RECOMMENDATIONS

The array of issues identified from this rapid assessment and those conducted earlier form the basis for the recommendations in this chapter. The recently launched national policy on injection safety and medical waste management therefore has been used in providing an opportunity to identifying priority areas of improvement for the entire health sector by focusing on the following recommendations;

3.1 CONSOLIDATING THE LEGAL AND REGULATORY FRAMEWORKS.

The management of health care waste in Kenya remains a sensitive issue since highly infectious waste continues to be generated and sometimes disposed off poorly and indiscriminately thus causing a lot of acrimony in the society. The aim of legislative provisions on biomedical waste is to guide health professionals in serving the public in a safe working environment and also protect the community from adverse effects of poor disposal practices. The recommendations given below therefore underscore the fulfillment of gaps identified in the review;

3.1.1 Legal and Regulatory Framework:

i) Review existing national and local regulations, policies, and guidelines to identify existing rules that should guide practice and also fill any gaps that should be addressed with additional policy.

ii) Revise the Public Health Act, Chapter 242 Laws of Kenya, to regulate operation of health care facilities in order to stipulate minimum requirements for operating such an institution which should include waste management practices and minimum waste treatment standards. Harmonization of these regulations should work in tandem with those of the Kenya Medical Association (KMA).

iii) Finalize National Guidelines of the Ministry of Public Health and Sanitation for HCWM so that they can be used to guide the renewed focus on health care waste management. There is also need to develop standards of practice for managing healthcare waste. In this context, a code of hygiene for all working in the health sector should be developed and implemented.
3.2 STRENGTHENING THE INSTITUTIONAL CAPACITIES FOR HCWM

3.2.1 Designate the National Health Care Waste Management Coordinator

Due to the weakness in institutional capacities identified, a recommendation is hereby made to the Chief Public Health Officer (CPHO) to designate a person with overall responsibility of coordinating the implementation of Annual Operational Plans on National HCWM. The secretariat for driving health care waste management issues at the ministry should be drawn from the CPHO’s office. The office should coordinate the operations of the national steering committee on HCWM. At the national level, there is need to designate a Public Health Officer to be the National Waste Management Coordinator (NWMC). This officer should be responsible for the coordination of activities of waste management at the national level. The officer shall be directly responsible to the Chief Public Health Officer. His / her duties among others to be identified shall include:

- To run the secretariat of HCWM at the Ministry of Public Health and Sanitation.
- To coordinate in liaison with the CPHO the activities of the National Steering Committee on Health Care Waste management.
- To convene meetings in liaison with the CPHO for donors and other stakeholders.
- To coordinate the preparation of district plans on the component of HCWM and compile a national budget.
- To implement the Programme nationally through the District Health Management Teams (DHMTs).
- To coordinate monitoring and evaluation activities of health care waste management.
- To identify areas for operational research in waste management practices and treatment technologies.

3.2.2 Designate a Waste Management Officer

A Waste Management Officer (WMO) or a PHO in Charge of hospital sanitation should be designated in all major health-care facilities and assigned the responsibility for the day-to-day operation and monitoring of the HCWM system.

The WMO will be responsible for the day-to-day operation and monitoring of the waste management system. It is therefore essential that he or she has direct access to all members of staff. He or she should be directly responsible to the Head of Hospital. He or she should liaise with the Infection Prevention and Control Officer (IPCO), the Pharmacist in Charge, and the Radiation Officer in order to become familiar with the correct procedures for handling and disposing of pathological, pharmaceutical, chemical, and radioactive wastes. In the area of waste collection, the WMO should:

i) Control internal collection of waste containers and their transport to the central waste storage facility of the hospital on a daily basis;
ii) Liaise with the Supplies Department to ensure that an appropriate range of bags and containers for health-care waste, protective clothing, and collection trolleys are available at all times;

iii) Ensure that support staff immediately replace used bags and containers with the correct new bags or containers;

iv) Directly supervise supportive staff assigned to collect and transport health-care waste;

v) Be responsible for installing and maintaining waste treatment and storage facilities and handling equipment to comply with the specifications in the NEMA standards;

vi) Be responsible for coordinating maintenance and repair of waste treatment facilities;

vii) Develop maintenance standards for HCWM equipment. It is normal that most equipment require preventive maintenance to avoid it grinding to a halt. Facilities such as incinerators require regular preventive maintenance and scheduled maintenance for effective performance all the year round. Likewise, equipment such as trolleys, trolley bins, wheelbarrows, waste vans/tractors will require maintenance. It is incumbent upon institutions to ensure they set aside funds as a matter of routine for maintenance purposes, while also providing alternative facilities or options for use at the time of breakdowns or repairs;

viii) Develop HCWM plans of the facility in liaison with the Waste Management Team;

ix) Ensure that written emergency procedures are available;

x) Be responsible for the staff involved in waste treatment, ensuring that:
   • staff receive training in the principles of health care waste disposal and
   • they are aware of their responsibilities under the hospital waste management plan.

xi) Monitor all HCW management operations to comply with set standards and guidelines.

3.2.3 Staff Training and Information

For staff training and information, the WMO should:

i) Liaise with the Matron (or Senior Nursing Officer) and the Hospital Manager to ensure that the nursing staff and clinicians are aware of their own responsibilities for segregation and storage of waste and also understand the responsibilities of supportive staff in handling and transporting sealed waste bags and containers;

ii) Liaise with Departmental Heads to ensure that all doctors and other qualified clinical staff are aware of their own responsibilities regarding segregation and storage of waste.

iii) Ensure that supportive staffs understand waste segregation and that they handle waste bags and containers that have been sealed in the correct manner.
3.2.4 Matron and Hospital Manager

The Matron (or Senior Nursing Officer) and the Hospital Manager are responsible for training nursing staff, clinical officers, supportive staff in the correct procedures for segregation, storage, transport, and disposal of waste. They should therefore:

i) liaise with the WMO and the advisers (Infection Prevention and Control Officer, Pharmacist in Charge and Radiation Officer) to maintain the established standards;

ii) participate in staff introduction to, and continuous training in, the handling and disposal of health-care waste;

iii) liaise with Department Heads to ensure coordination of training activities, and help in address other waste management issues specific to particular departments, etc.

3.2.5 Departmental Heads

Departmental Heads are responsible for the segregation, storage, and removal of waste generated in their departments. They should ensure that all doctors, nurses, and clinical and non-clinical professional staff in their departments are aware of the segregation and storage procedures and that all personnel comply with the established standards, so that they:

i) continuously liaise with the WMO to monitor working practices for failures or mistakes;

ii) ensure that key staff members in their departments are given training in waste segregation and disposal procedures;

iii) Encourage medical and nursing staff to be vigilant so as to ensure that supportive staff follow correct procedures at all times.

3.2.6 Pharmacist in Charge

The Pharmacist in Charge is responsible for the sound management of pharmaceutical stores and for pharmaceutical waste minimization. His or her duties are to:

i) liaise with Department Heads, the WMO, the Matron, and the Hospital Manager, giving advice, in accordance with the national policy and guidelines, on the appropriate procedures for pharmaceutical waste disposal;

ii) coordinate continuous monitoring of procedures for the disposal of pharmaceutical waste;

iii) Ensure that personnel involved in pharmaceutical waste handling and disposal receive adequate training.

The Pharmacist in Charge also has the special responsibility of ensuring the safe management of genotoxic waste.
3.2.7 Radiation Officer

The duties and responsibilities of the Radiation Officer are the same as those of the Pharmaceutical Officer but relate to radioactive waste.

3.2.8 Supply Officer

The Supply Officer should liaise with the WMO to ensure a continuous supply of the items required for waste management (plastic bags and containers of the right quality, spare parts for on-site health-care waste treatment equipment, purchase of waste transport trolleys, etc.). These items should be ordered in good time to ensure that they are always available, but accumulation of excessive stores should be avoided. The Supply Officer should also investigate the possibility of purchasing environmentally friendly products through liaison with technical officers in the IPCC.

3.2.9 Infection Prevention and Control Officer (IPCO)

The IPCO should liaise with the WMO on a continuous basis and provide advice concerning the control of infection and the standards of the waste disposal system. His or her duties are to:

i) Identify training requirements according to staff grade and duties.

ii) Organize and supervise staff training courses on safe waste management;

iii) Liaise with the Department Heads, the Matron, and the Hospital Administrator to coordinate the training.

The Infection Prevention and Control Officer has an overall responsibility for chemical disinfection, sound management of chemical stores, and chemical waste minimization. Incidents resulting in injury, “near misses”, or failures in the handling, separation, storage, transport, or disposal system, should be reported to the IPCO so that he or she will plan for preventive measures against recurrences.

3.2.10 Health and Safety Practices for Health Workers

Health care waste management policies or plans should include provision for continuous monitoring of workers’ health and safety through the observation of essential occupational health and safety measures. The IPCC should ensure that;

i) Personal protection equipment is supplied.

ii) Workers are properly trained on the aspects of their job concerning waste management, and informed on how to avoid infection transmission.

iii) An effective occupational health programme that includes immunization, post-exposure prophylaxis treatment, and medical surveillance is established.

iv) There is also need for handlers of patients at home to be trained on how to manage medical waste generated at home.
3.3 STANDARDISING HCWM PRACTICES

3.3.1 Regulation of Standards.

The Kenya Quality Model (KQM) which was developed by the Ministry of Health strives to regulate standards in the service delivery to Kenyans through quality assurance strategies. One among the strategies for service quality is to mainstream staff motivation, staff competence and provision of required resources to allow for quality work. With this in mind, it is obvious that the kind of service delivery envisaged by the Ministry of Public Health and Sanitation to Kenyans can only be achieved widely through standardization of processes. The limiting factor in proper management of waste include; inadequate training and supplies, and lack of standards and guidelines. The provision of standards and guidelines as a remedy should be accompanied with allocation of required resources to all health facilities in order to achieve success in standardizing HCWM practices.

3.3.2. Establish National HCWM Standard Practices in HCFs

Through this plan, the sister ministries in the health sector envisage to establish standard HCWM practices in the country. It is for this reason that Waste Management Teams from hospitals are recommended to first and foremost define acceptable procedures of health care waste management and requirements for HCW disposal technologies that should be embraced by the HCF. By using a code of practice it is possible to describe the roles and responsibilities of each staff group member. This decision should form the baseline document against which the waste management system of the facility can be monitored.

If health workers are not aware of their roles and responsibilities it becomes very difficult for a supervisor to manage staff effectively. It is advisable for institutions to develop standard operating procedures consistent with the national standards of practice and with the facility operations. The standards so adopted should endeavour to harmonize operations of waste management across the health sector and be able to reinforce good practices.

The standards should address need for uniform practice in waste containment, storage, transportation, treatment and disposal. Peculiarities in the category of health facilities and their levels of operation should be addressed as well. The HCF waste management practices play a critical role in the overall waste management system. Some of the key procedures that require to be complied by the waste management team should include; waste minimization, waste segregation, labeling waste receptacles or containers, waste containment collection, internal transport, internal storage, special storage areas and waste treatment as discussed in the recommendations below:

3.3.3 Minimization of waste generation/production

Waste minimization usually benefits the waste producer in terms of costs for; the purchase of goods, waste treatment, and disposal of hazardous waste. It is
important to investigate options for waste minimization / reduction, recycling, and disseminate information to health care facilities explaining feasible options. The procurement department and the relevant heads of departments should be involved in making these important decisions on the choice of health products or equipment for use. At the national level, consultations with KEMSA should explore all options in applicable areas.

Significant reduction of waste generated in hospitals and research facilities may be encouraged by the implementation of certain policies and practices such as:

i) Source reduction: measures such as purchasing restrictions to ensure the selection of methods or supplies that are less wasteful or generate less hazardous waste.

ii) Recyclable products: use of materials that may be safely recycled, either on-site or off-site.

iii) Good management and control practices: apply particularly to the purchase and use of chemicals and pharmaceuticals. i.e. frequent ordering of small quantities of supplies and using old batches of a product first.

3.3.4 Segregation of waste

The key to minimization and effective management of health care waste is segregation and identification of the waste. Appropriate handling, treatment, and disposal of waste by type can help to reduce costs and does much to protect public health. Segregation should always be the responsibility of the waste producer and should take place as close as possible to where the waste is generated and should be maintained in storage areas and during transport. Since most Kenyan health staff/workers can be transferred from one place to another, it is advisable that the same system of waste segregation should be in force throughout the country.

However challenging it may be, waste segregation can succeed in a health care institution when there is commitment by the health care managers and the staff so long as the approach chosen for waste segregation meets local needs. We now need to focus on feasible set of practices that should be followed in Kenyan hospitals as outlined below:

1. 3-Bin System: Health care waste can be separated into three main categories as follows:

   i) Non infectious or general waste placed into black polythene bags in matching colour of bins. Food waste may be collected separately. General waste or non-infectious waste should join the stream for domestic refuse for disposal to the local authority disposal site.

   ii) Non-sharp Infectious or hazardous health care waste should be placed in yellow bags in matching colour of bin.

   iii) Sharps should be placed into preferably yellow puncture-proof safety boxes or yellow plastic containers with a biohazard symbol inscription.

2. Other Waste Bins. Other categories of waste that require separate bins or receptacles include:

   i) Highly infectious waste placed into red bags in red bins. Highly infectious waste should, whenever possible be sterilized immediately by
autoclaving. It needs to be packaged in bags that are compatible with the proposed treatment process: red bags with a suitable gauge for autoclaving, are recommended.

ii) Glass waste resulting from used medicine bottles or laboratory specimen bottles may be collected in separate bins or containers.

iii) Cytotoxic waste, most of which is produced in major hospitals such as Kenyatta National Hospital or Research facilities, should be collected in strong, leak proof containers clearly labeled ‘cytotoxic wastes’ and stored according to established guidelines.

iv) Small quantities of chemical or pharmaceutical waste may be collected together with infectious waste. Large quantities of obsolete or expired pharmaceuticals from hospital wards or stores should be well packaged and returned to pharmacy to await verification and later disposal.

v) Waste with high content of heavy metals (cadmium or mercury) should be collected separately and not incinerated or burned.

vi) Aerosol containers may be collected with general health care waste once they are completely empty, provided that they are not destined for incineration.

vii) Low-levels of radioactive infectious waste (swabs, syringes for diagnostic or therapeutic use) may be collected in yellow bags or containers for infectious waste if these are destined for incineration.

3.3.5 Colour Codes system and Segregation

The most appropriate way of identifying the categories of health care waste is by sorting the categories of waste into colour-coded plastic bags or containers. The NEMA waste regulations are recommending a colour coding system which is given in the Table below:

*Table 3: Colour Codes system used in Kenya.*

<table>
<thead>
<tr>
<th>Type of Waste</th>
<th>Colour of Container and Markings</th>
<th>Type of Container</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sharps</td>
<td>Yellow (Marked ‘Sharps’)</td>
<td>Puncture proof</td>
</tr>
<tr>
<td>Infectious</td>
<td>Yellow</td>
<td>Strong leak proof plastic bag with biohazard symbol</td>
</tr>
<tr>
<td>Highly Infectious</td>
<td>Red (Marked Highly Infectious)</td>
<td>Containers capable of being autoclaved</td>
</tr>
<tr>
<td>Non-Infectious/ non-hazardous (non-clinical)</td>
<td>Black</td>
<td>Plastic Bag or container.</td>
</tr>
</tbody>
</table>
## 3.3.6 Labeling Waste Receptacles or Containers

For the bins to be used well, it is necessary to ensure clear labeling of bags and containers to differentiate between waste categories. Use of posters and stickers, or preprinted bins and liners should help the members of staff and patients and their visiting relatives to segregate the waste. This omission was evident during the assessment and could be one of the causes of poor waste segregation in most hospitals. There is need therefore to label waste bins and waste bags so that waste operators in hospitals and company workers managing health care waste can be able to know:

1. The precautions necessary for each bag of waste as per its place of origin and waste category.
2. Where segregation problems are arising from especially when poorly segregated waste is loaded to the incinerator for combustion.
3. The appropriate final disposal method for particular waste.
4. The quantities of waste generated from various departments in the hospital.

Labelling can also help to facilitate a waste tracking system where quantities of waste are recorded at a waste transfer station. In poorly segregated waste small explosions and poor burning of the waste can be identified by the incinerator operators. Since labeling of waste can be challenging to implement, it is necessary for a hospital waste management team to make a decision as to which strategy they need to follow in order to ensure a labeling system is put in place. Stickers with prepared printed details can either be used or tags that shall be written at the time of replacing the waste bags could do.

### 3.3.7 Waste Containment and Collection

Clinical staff and waste operators should ensure that waste bags are tightly closed when they are about three quarters full. Waste should not be allowed to accumulate at the point of production. A routine programme for their collection should be established as part of the health care waste management plan. Certain recommendations should be followed up by a WMO who will ensure that:

i) Waste is collected as frequently as required and transported to the designated site or storage area.

ii) He or she knows the daily requirements for waste bags and coordinates the supply and collection schedules.
3.3.8 Internal storage

A storage location for health care waste should be designated inside the health care establishment. The waste, in bags or containers, should be stored in a separate area, room, or building of a size appropriate to the quantities of waste produced bearing in mind the frequency of collection and final disposal. Segregation of hazardous waste from general waste should be maintained in storage. There should be planned periodic cleaning and disinfection of temporary storage areas and containers.

**Recommendations for storage facilities for health care waste.**

- The storage area should have an impermeable, hard-standing floor with good drainage; it should be easy to clean and disinfect.
- There should be a water supply for cleaning purposes.
- The storage area should afford easy access for staff in charge of handling waste.
- It should be possible to lock the store to prevent access by unauthorized persons.
- Easy access for waste-collection vehicles is essential.
- There should be protection from the sun.
- The storage area should be inaccessible to animals, insects, and birds.
- There should be good lighting and at least passive ventilation.
- The storage area should not be located close to patient areas, or to fresh food stores or food preparation areas.
- A supply of clean equipment, protective clothing, and waste bags or containers should be located conveniently close to the storage areas.

3.3.9 Special Storage Areas

i) **Cytotoxic waste** should be stored separately from other health care waste in a designated secure location.

ii) **Radioactive waste** should be stored in containers that prevent dispersion, behind lead shielding. Waste that is stored during radioactive decay should be labelled with the type of radionuclide, the date, and details of required storage conditions.

3.3.10 Internal Transport

Health care waste within a hospital or other facility should be transported by means of wheeled trolleys, trolley bins or containers, or carts that are not used for any other purpose and meet the following specifications:

- Easy to load and unload.
- Leak-proof with cover.
- Dedicated to waste removal and colour-coded to maintain segregation of hazardous from non-hazardous waste.
• No sharps edges that could damage waste bags or containers during loading and unloading.
• Easy to clean with smooth bends.
• Vessels should be cleaned and disinfected daily with an appropriate disinfectant. Ensure periodic disinfection and cleaning of trolleys and wheeled containers.
• Easy to access most places and negotiate bends in hospital buildings.

3.4 TRAINING STRATEGY FOR HEALTH CARE PERSONNEL

A policy for the management of health care waste cannot be effective unless it is applied carefully, consistently and universally. It is through training that standardization of waste handling practices and its management can be achieved.

3.4.1 Cadres to be trained

Training activities should be targeted to the following main categories of health care personnel both from the public sector and the private sector:

i) Health facility managers and administrative staff responsible for the implementation of health care waste management plans and regulations.
ii) Hospital management board members.
iii) Medical doctors
iv) Public Health Officers/Technicians.
v) Nurses, Clinical Officers, Lab Technicians and Radiographers.
v) Cleaners, incinerator operators and waste handlers.
vii) Pre-service students from KMTCs and University Medical and Nursing Schools.

3.4.2 Training Needs

At the National level, a Trainer of Trainers’ Course should be carried out to senior Public Health Officers who will in turn train the staff in their areas of jurisdiction. Since training is continuous in all the leading medical training institutions in Kenya, the training needs for health workers undergoing training requires to be catered for through:

i) Inclusion of approved waste management practices in the curricula of all health workers.
ii) The establishment of a HCWM plan that should progressively lead medical institutions and administrative authorities to consider HCWM as a routine issue.
iii) Review of curricula in the medical schools for doctors and in all the faculties training at Kenya Medical Training Colleges.
iv) Development of a national training package for staff under continuing medical education, (CME).
v) Creation of a participative and practical training of trainers.
v) Organized regular welcome training sessions in the health facility for new staff members.
3.4.3 Training Package for Health Care Waste Management

The content of staff education on infection prevention and health care waste management programme should contain the following:

1) Justification for all aspects of health care waste policy;
2) Explanation of the role and responsibilities of each hospital staff member in implementing the policy.
3) Technical instructions relevant for the target group under some or all of the following headings:
   i) Definition of health care waste
   ii) Importance of proper waste disposal
   iii) Classification of health care waste
   iv) Handling health care waste
   v) Segregation of health care waste
   vi) Safety measures when handling health care waste
   vii) Recording and reporting accidents
   viii) Health care waste disposal methods
   ix) Laws relating to waste management.
4) Education of health risks associated with bio-medical waste to health workers and members of the public through Information Education and Communication (IEC) materials in all media.
5) Education on safe disposal practices and methods to all. The public has a right and responsibility to know how to handle home based care medical waste and condoms waste.

Table 4: Awareness creation plan for health care waste management.

<table>
<thead>
<tr>
<th>Target Group</th>
<th>Awareness Building strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Public</td>
<td>Posters, Radio, TV, participatory education theatre and targeted pamphlets.</td>
</tr>
<tr>
<td>Health workers (all cadres)</td>
<td>Distribute pamphlets and brochures on HCWM, Distribute the acceptable code of practice for HCWM in the institution, and use relevant video clips. Workshops could also be used.</td>
</tr>
<tr>
<td>Scavengers</td>
<td>Public education awareness meeting for all at the dumpsite and use of participatory awareness theatre.</td>
</tr>
</tbody>
</table>

3.4.4 Follow up and Refresher Courses

Follow-up/ refresher courses should be undertaken to provide refresher training as well as orientation for both old and new employees with new responsibilities. The employees will also be updated on knowledge in line with policy changes. Follow up training is necessary for trainers in order to indicate how much has
been retained by course participants and the likely need for future refresher courses.

The training should be organized by the Public Health Department in collaboration with the Infection Prevention and Control Committees (IPCC) of health institutions. This committee should be in the forefront of ensuring that training needs assessment for staff members is conducted regularly through monitoring of staff performance in their areas of duty. The performance indicators set out by the IPCC should match with the Waste Management Team’s set standards.

3.5 SAFE TREATMENT OF WASTE

Globally, incineration used to be the method of choice for most hazardous health care waste and is still widely used. However, waste management options chosen for use should be efficient, safe and environmentally friendly to protect people from voluntary and accidental exposure to waste when collecting, handling, storing, transporting, treating or disposing of waste.

3.5.1 Determinants of Waste Treatment Method.

Important activities include: identification of available centralized waste management and disposal resources. The final choice of treatment system should be made carefully, on the basis of various factors, many of which depend on local conditions:

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Factors to consider in choice of health care waste treatment technology.

- Disinfection efficiency;
- Health and environmental considerations;
- Occupational health and safety considerations;
- Quantity of wastes for treatment and disposal/capacity of the system;
- Types of waste for treatment and disposal;
- Infrastructure requirements;
- Training requirements for operation of the method;
- Operation and maintenance considerations;
- Available space;
- Location and surroundings of the treatment site and disposal facility;
- Investment and operating costs;
- Public acceptability;
- Regulatory requirements.
```

The choice of sustainable management and disposal options for waste should be done according to:

i) Affordability
ii) Environmental-friendliness
iii) Efficiency or operation cost.
iv) Worker safety
v) Prevention of the re-use of disposable medical equipment (e.g. syringes)
vi) Social acceptability monitoring and evaluation of safety and efficiency
Table 5: Synopsis of the HCW Stream.

<table>
<thead>
<tr>
<th>Step</th>
<th>Location</th>
<th>Healthcare</th>
<th>Key points</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>In medical unit</td>
<td>Waste minimization</td>
<td>Purchasing policy stock management recycling of certain types of waste.</td>
</tr>
<tr>
<td>2</td>
<td>In health facility</td>
<td>Segregation at source</td>
<td>One of the most important steps to reduce risks and amount of hazardous waste</td>
</tr>
<tr>
<td>3</td>
<td>Outside of health facility</td>
<td>Collection + on-site transport</td>
<td>Protective equipment; sealed containers; specific easy to wash trolleys</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>On-site storage</td>
<td>Lockable easy to clean storage room: limited storage time of 24-28 hours.</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>On-site treatment/disposal</td>
<td>Adequate storage room, limited time of max 48 hours</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Off-site transport</td>
<td>Appropriate vehicle and consignment note; HCF is informed about final destination</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Off-site treatment/disposal</td>
<td>Appropriate vehicle and consignment note to ensure delivery to disposal site.</td>
</tr>
</tbody>
</table>

3.6 TREATMENT OPTIONS AVAILABLE FOR HCW

Effective treatment of infectious HCW can be considered to be the most important objective of health care waste management, which eliminates the risk of infection. In this context the range of HCW treatment options can be grouped as burn and non-burn technologies.

3.6.1 Incineration

Definition: Incineration is a high temperature dry oxidation process that reduces organic and combustible waste to inorganic, incombustible matter and results in a very significant reduction of waste volume and weight.

This process is usually selected to treat waste that cannot be recycled, reused, or disposed of in a landfill site. Incineration is the dominant technology for health care waste treatment in Kenya. Steam sterilization, micro-waving and other non-incineration health care waste treatment technologies are however rapidly becoming the dominant treatment technologies in the first world countries, primarily due to stricter emission standards that are set for incinerators.

The combustion of organic compounds produces mainly gaseous emissions, including steam, carbon dioxide, nitrogen oxide, and certain toxic substances (e.g. metals, halogenic acids), all particulate matter, plus solid residues in the form of ashes. If the conditions of the combustion are not properly controlled, toxic carbon monoxide will also be produced. It is therefore advisable that the waste that is meant for incineration should contain moisture of less than 30% with a combustible content of at least 60%.
3.6.2 Waste Types Not To Be Incinerated

- Pressurized gas containers.
- Large amounts of reactive chemical waste.
- Silver salts and photographic or radiographic waste.
- Halogenated plastics such as polyvinyl chloride (PVC) materials.
- Waste with high mercury or cadmium content, such as broken thermometers, used batteries, and lead-lined wooden panels.
- Sealed ampoules or ampoules containing heavy metals.

3.6.3 Type of Incinerators

Incinerators range from extremely sophisticated, high-temperature operating plants to very basic combustion units that operate at much lower temperatures. All types of incinerators if operated properly eliminate pathogens from waste and reduce the waste to ashes. However certain types of health care waste, e.g. pharmaceutical or chemical waste, require higher temperatures for complete destruction. Higher operating temperatures and cleaning of exhaust gases limit the atmospheric pollution and odours produced by the incineration process.

Incineration equipment should be carefully chosen on the basis of the available resources and the local situation, and the risk benefits of pathogen elimination before waste disposal against the potential risk of air or ground water pollution caused by inadequate destruction of certain wastes. Three basic kinds of incineration technologies are of interest for treating health care waste:

- Double-chamber pyrolytic incinerators, which may be specially designed to burn infectious health care waste;
- Single chamber furnaces with static grate, which should be used only if pyrolytic incinerators are not affordable.
- Rotary kilns operating at high temperature, capable of causing decomposition of genotoxic substances and heat resistant chemicals.

3.6.4 Assessment of Waste Parameters

Specific waste parameters should be assessed at the planning stage to determine the most suitable type and size of incinerator:

i) Current extent of waste production and type of health care waste;
ii) Estimated future waste production;
iii) All the physical parameters that determine the suitability of waste for incineration, such as low heating value and low moisture content.

3.6.5 Pyrolytic Incinerators

The most reliable and commonly used treatment process for health care waste is pyrolytic incineration, also called air incineration or double chamber incineration. The pyrolytic incinerators comprises of a pyrolytic chamber and a post combustion chamber and functions as follows:
In the pyrolytic chamber, the waste is thermally decomposed through an oxygen-deficient, medium-temperature combustion process (800-900°C), producing solid ashes and gases. The pyrolytic chamber includes a fuel burner used to start the process. The waste is loaded in suitable bags or containers.

The gases produced in this way are burned at high temperatures (900-1200°C) by a fuel burner in the post-combustion chamber, using an excess of air to minimize smoke and odours.

Larger pyrolytic incinerators (capacity 1-8 tonnes/day) are usually designed to function on a continuous basis.

### 3.6.6 Other Thermal Technologies

i) **Rotary Kilns** are generally used in lime and cement industries and can be used in the treatment of chemical hazardous waste. Rotary kilns are versatile and also capable of handling slurries, bulk solids and sludge. The unit treatment cost for the operation and maintenance of smaller rotary kiln plants are however expensive and therefore not frequently used in the treatment of infectious health care waste only.

One such incinerator has been installed by Environment Combustion Limited Company at Kitengela for handling mainly industrial waste and sometimes health care waste. In some countries, rotary kilns are used to treat certain types of hazardous/chemical waste as well as health care waste. Separation at source of especially chemicals, pharmaceuticals etc. is not critical where a rotary kiln is used, although radioactive HCW is still to be separated from the remainder of the HCW stream.

ii) **Fluidized bed technology** is sometimes used for the treatment of hazardous waste, but mainly for end of pipe applications, i.e. for the destruction of a single hazardous waste stream from a chemical plant. Passing air through it fluidizes a bed of sand and the rapid motion allows heat exchange to occur between the hot bed and the hazardous waste thus providing effective combustion efficiencies. To date, this technology has not been used for the treatment of HCW in Africa. Rotating fluidized bed incinerators are used in Japan.

iii) **Plasma Arc Technology**; achieves extremely high temperatures of between 2000°C and up to 8,000°C, thus resulting in effective destruction of hazardous waste. It is evident that all waste streams, except for radioactive waste, can be treated using this technology. The cost of treatment however, is very high, thus making this technology inappropriate for cost effective treatment of infectious HCW.

### 3.6.7 Environmental, Health and Safety Impact of Incineration

Incineration, undertaken at high temperatures, has proven to be not only a very effective way of sterilizing infectious HCW but also for significant volume reduction of waste and no special tests to determine the efficiency of the
sterilization process is normally required. However, the technical standards of incinerators in Kenya as well as the standard of operation have been poor. If the long term objective of HCWM in Kenya is to meet the European Union or North American air emission standards, then wet or dry gas cleaning equipment will be needed for all incinerators in Kenya. However, problems associated with the emissions of dioxins and furans by incinerators as well as generally poor management of incineration facilities, has resulted in a significant anti-incineration lobby in many parts of Africa.

Incineration is internationally still a very common technology for HCW treatment. It can meet the strict environmental requirements, provided the incinerators are well operated and have good emissions control equipment. However, in parts of the world where no or limited mass incineration of domestic or commercial waste is done, steam sterilization, microwave treatment and other non-burn technologies are fast becoming the more cost effective infectious HCW treatment technology due to increasing costs of flue gas cleaning and imposed government (NEMA) fees for incinerator operation. Such increased costs, together with negative perception of incineration in many parts of the world have led to the development of a range of sterilization / disinfection technologies for the treatment of infectious HCW.

3.7 NON-INCINERATION TREATMENT OPTIONS

3.7.1 Chemical Disinfection

Chemical disinfection is generally done by adding bleach or other disinfectants to syringes or other types of infectious wastes. It is uncertain whether or how harmful the syringes still are after such treatment, but in case no more satisfying option is available, such disinfection certainly reduces the risk of infection in case of accidental needle stick before transportation for further treatment. Disinfection of infectious HCW can serve as a pre-treatment step and may be required prior to employing subsequent treatment technologies, e.g. size reduction by shredding.

3.7.2 Shredding

Shredders cut sharps into small pieces. This technology requires a worker skilled in the operation and maintenance of sometimes heavy-duty, rotating equipment. Simple shredders can be made from a manually operated grain mill. Due to the presence of workers during operation, only disinfected needles and syringes should be processed. Shredding can help facilitate plastic and needle recycling technologies in developing countries when large quantities of used needles and syringes are available, implying that a centralized system involving collection and transportation from various settings can be considered.

3.7.3 Microbial Inactivation Using Sterilization Technologies

Some of the non-incineration technologies recently introduced on the African continent include Autoclaving, Micro waving, Electro-thermal Deactivation
(ETD) and Dry Heat Sterilization (DHS). The discussion of these four technologies does not imply specific endorsement of these technologies or incineration when compared to any other technologies discussed above. All these methods sterilize infectious HCW by heating it to moderate temperatures of between 90°C and 160°C, provided all HCW is subjected to the required temperatures for sufficient time. These technologies have both advantages and disadvantages compared to incineration.

The inactivation norm generally required for non-incineration or non-thermal infectious HCW sterilization technologies is to demonstrate for vegetative bacteria, fungi, lipophilic viruses, parasites and mycobacteria at $\geq 6 \log_{10}$ reduction (99.99% or 1 survival probability in a million). Inactivation of B. steroothermophilus spores or B. subtilis spores are set at $\geq 4 \log_{10}$ reduction (99.99% or 1 survival in 10000 in a spore population).

### 3.7.4 Autoclaving / Steam Sterilization

Steam sterilization of HCW has been practiced worldwide for some decades, firstly as a simple sterilization process and later by inclusion of volume reduction/shredding prior to or after treatment. In a modern autoclave, shredded/unshredded infectious HCW is placed inside an autoclave, where, after evacuation of air, steam is introduced under pressure from a boiler. A combination of temperature (130°C to 160°C), pressure and time for periods of around 30 minutes ensures that the numbers of pathogens are reduced to below the permitted levels. Steam sterilization has made progress in some markets, because compared to incineration, this technology results in no or limited emission of gases and is increasingly competitive for especially on-site HCW treatment in countries where advanced flue cleaning is required.

The process is however not suitable for treatment of all categories of infectious HCW (e.g. pathological and pharmaceutical infectious HCW). Special measures are further to be introduced for the disposal of treated infectious HCW as unshredded residues should under no circumstances be accessible to waste recyclers due to the presence of sharps as well as the remaining risk of infection.

Shredding and compaction reduces the volume of the final HCW residue with the mass of the residue being about 80% to 90% of the original, as some drying occurs subsequent to sterilization.

*Figure 1: Flow diagram of a typical Autoclave/ Steam Sterilization Plant.*
3.7.5 Microwave Irradiation

Most microorganisms are destroyed by the action of microwave of a frequency of about 2450 MHz and a wavelength of 12.24 cm. The water contained within the wastes is rapidly heated by the microwaves and the infectious components are destroyed by heat conduction.

In a microwave treatment unit, a loading device transfers the waste into a shredder, where it is reduced to small pieces. The waste is then humidified, transferred to the irradiation chamber, which is equipped with a series of microwave generators, and irradiated for about 20 minutes. After irradiation, the waste is compacted inside a container and enters the municipal waste stream.

The efficiency of microwave disinfection should be routinely measured through bacteriological and virological tests. In the USA, a routine bacteriological test using *Bacillus subtilis* is recommended to demonstrate a 99.99% reduction of viable spores.

The process is not suitable for the treatment of pathological, chemical or radioactive infectious HCW. Large quantities of metal in the infectious HCW stream can reduce the effectiveness of microwaves penetrating the infectious HCW. Air emissions from shredder and treatment plant are usually treated to remove moisture and volatile organic carbon compounds. Shredding and compaction of the final product significantly reduces the volume of the final waste residue, but no mass reduction occurs. The microwave process is widely used in several countries and is becoming increasingly popular. However, relatively high costs coupled with potential operation and maintenance problems mean that it is not yet recommended for use in developing countries. Similar processes using other wavelengths or electron beams are also being developed.

3.8 FINAL DISPOSAL METHODS

3.8.1 Landfilling in Municipal disposal sites

The two basic forms of land disposal in developing countries include controlled and uncontrolled. A variety of controlled land disposal options range from small pits to a modern sanitary landfill. Land disposal for untreated waste is not recommended and should only be used as a last resort option. When this solution has been used, it is important that HCW is disposed of in a sanitary landfill and rapidly covered.

Waste may be landfilled in municipal disposal sites if it cannot be treated before disposal. However, HCW should not be deposited or scattered on the surface of open dumps. If landfilling is planned, the following minimal requirements should be met:

i) Measures established by a municipal authority for the rational and organized depositing of municipal waste should be used to dispose off health care wastes;

ii) Engineering work instigated by the municipal authority should be prepare the disposal site to retain waste more effectively;
iii) Rapid burial of the HCW should be done so that human or animal contact is as limited as possible.

In addition, it is recommended that HCW should be deposited in one of the following two ways:

i) In a shallow hollow excavated in a mature municipal waste site in the layer below the base of the working face. Then immediately cover the waste using a 2-m layer of fresh municipal waste so that scavenging in this part of the site must be prevented.

ii) In a deeper pit (1-2m) that is excavated in mature municipal waste (at least 3 months since being landfilled), this should then be backfilled with the mature waste that was dug out. Also, scavenging in this part of the site must be prevented.

Alternatively, a specially constructed burial pit can be used. Ideally, the pit should be lined with a material of low permeability such as clay to prevent pollution of shallow ground water. There is also need to provide a fence around it to prevent scavengers accessing the waste. HCW should be covered immediately with a layer of soil over each waste load. Once the pit is filled, it should be sealed off.

3.8.2 Encapsulation

Encapsulation (or solidification) refers to the containment of a small number of hazardous or dangerous items or materials in a mass of inert material. The purpose of the treatment is to isolate the dangerous items from humans and the environment by encapsulating them in an impervious mass. Encapsulation involves filling containers with waste, adding an immobilizing material, and sealing the containers. The process uses either cubic boxes made of high-density polythene or metallic drums, which are three-quarters filled with sharps and chemical or pharmaceutical residues. The containers or boxes are then filled up with a medium such as plastic foam, bituminous sand, cement mortar, or clay material.

The main advantage of the process is that it is very effective in reducing the risk of scavengers gaining access to the hazardous HCW. Encapsulation of used sharps is generally not practiced and can definitely not provide a long term solution. Encapsulation of sharps or unwanted vaccines could however be envisaged in temporary settings such as camps, or mass campaign, provided that raw materials such as cement for encapsulation are available.

3.9 PLANNING A HCW DISPOSAL SITE

Planning for a facility health care waste disposal entails putting in place the following considerations:

1. Identifying the appropriate site for disposal by;
   - Locating this site away from residential area in order to avoid dissipation of noxious emissions to the community.
   - Locating it away from agricultural areas to avoid contamination of food products by effluents.
Having it located in a well drained site preferably down hill or away from any water wells. The site can also be drained to avoid stagnation of storm water that can result in to surface pollution or underground pollution.

- Locate site at least 50 metres away from any ground water source.

2. Once the disposal area has been selected, secure it with a fence in order to limit access from unauthorized persons thus protecting the community from infections likely to be contracted from the disposal area.

3. Plan the layout of the waste disposal area so that the order of utilizing the excavated pits can be determined. Such plans should be able to inform the construction of future new pits at the site since plan drawings are expected to remain in the records of waste disposal units.

4. Plan for the future and use the opportunity to identify ways of optimizing and improving the health care waste management system in health institutions through:
   - Constructing improved pits for controlled burying of infectious waste.
   - Introducing needle removers and needle pits to manage sharps.
   - Installing an incinerator
   - Initiating off-site transportation of infectious waste (all waste or safety boxes only) for centralized treatment and disposal.

3.10 ENCOURAGING THE INVOLVEMENT OF THE CIVIL SOCIETY

Thermal treatment of medical waste has a long and controversial history. Incineration which is the commonest method of managing medical waste in Kenya has used different technology application in its design. Innovations by Public Health Officers and Sanitary Engineers have resulted in many designs of “incinerator” types. The key aim is to provide greater control of the combustion process. However since chlorine-containing materials are typically included in medical waste, toxic products of incomplete combustion such as dioxins and furans are inevitably released in stack gases and other residues which are a concern to environmentalists. The National Steering Committee on health care waste management therefore should explore more ways of involving civil society organizations or environmental groups apart from ensuring closer participation of NEMA representatives in the discussions of technologies preferred in the treatment of health care waste.

Since technologies change quickly in a dynamic market, it is incumbent upon health care stakeholders to explore other ways that do not pollute the environment in the process of managing health care waste. However, the non-incineration technologies advocated for by the “Global Anti-Incinerator Alliance” group who are also members of Safe Injection Global Network (SIGN) have not been successful in Kenya leaving incineration as the only effective “transitional technology” available in the market at the moment. Collaboration of the MoH with organizations such as; Project for Appropriate Technology in Health (PATH), WHO, JSI-MMIS and NEMA should be encouraged to explore the possibility of introducing into Kenya environmental friendly technologies through operational research.
3.11 PROCESS MONITORING AND EVALUATION

Every project or programme no matter how small needs a simple monitoring and evaluation strategy that is put in place at the design stage. Process monitoring should be done as a routine of gathering information on key aspects of the implementation process of the action plan of HCWM. This process shall provide the understanding of how activities are progressing.

Monitoring should provide information for incremental planning and for regular feedback about the progress of the project to stakeholders, implementers and the health facilities benefiting from the Action Plan. On the other hand process evaluation is the periodic assessment of the value of what a project or programme has achieved in relation to planned activities and overall objectives and can help in providing solutions that can then be implemented. Process evaluations for the waste management should be conducted at strategic intervals in planned five of the project life cycle.

Process monitoring and evaluation therefore are often seen as the most important type of monitoring and evaluation activity for project managers, as it helps to identify successful aspects that can be continued or expanded as well as deficiencies that can be addressed and the means of addressing them. In this context therefore, it is important for the National Steering Committee for HCWM to;

i) Develop monitoring and evaluation tools that can be integrated into existing M&E systems.

ii) Determine indicators of achievement.

iii) Develop a tool for auditing.

iv) Develop supportive supervision plan.

v) Develop a simple reporting format on what to monitor in order to create a feedback process.

vi) Determine and execute a plan for follow-up assessment to measure improvements against earlier assessments. Stakeholder participation in the analysis and interpretation of findings from process evaluation, including the formulation of conclusions and linkages with future plans, is critical to ensure that results become accepted and used.

3.12 FUNDING FOR HCWM ACTIVITIES

Each health care establishment according to “polluter pays” principle should be financially liable for the safe management of any waste it generates. The costs of waste containment, collection, appropriate packaging, and on-site handling and treatment are internal to the establishment and paid as labour and supplies costs. The costs of off-site transport, treatment, and final disposal are external and should be paid to the contractors who provide the service. Most health facilities have not adequately given HCWM the serious profile it deserves in terms of direct funding towards waste management activities.

On this basis, health facilities are therefore required to regularly dedicate funds in hospital budgets for health care waste management. Since most health managers were not clear on how much funds were being used in the management of health care waste, it is needful to;
i) Determine the costs associated with all action items in the plan. Plans should be drawn and costs itemized in a logical framework analysis. Some of the items to plan for include: installation of infrastructure, provision of waste containment and transportation equipment.

ii) Link up with key agencies that are supporting HCWM activities in Kenya and other development partners willing to support the National Action Plan. It is logical for the Ministry of Health to bring together all its development partners interested in supporting HCWM activities so that their areas of support can be defined and roles assigned in order to achieve synchrony and avoid duplication of activities.

iii) Determine the funding available within the GoK, and establish a plan for raising additional funding needed to execute the plans. Resource gaps contained in the GoK implementation plan can be filled in with funds from development partners. However, it is advisable that the implementation of such a process should be incremental rather than a snapshot.

iv) Develop multi-year budgets to accomplish the activities in the National Action Plan. The construction of a multi-year budget should be done carefully with a logical sequence of events rolling out from a focal area incrementally. The sequencing of events should be weighed carefully to avoid implementation hiccups.

3.13 CONCLUSION

The recommendations given here were based on the assessment made and recommendations from a meeting of the National Steering Committee on Health Care Waste Management held in November 2007. Among these recommendations was to review the legal and regulatory framework where the need to finalize the national guidelines on HCWM was identified. This is in order to standardize HCWM practices while assigning responsibility to key actors in the sector. The operationalisation of the laws governing HCWM also needs to be harmonized among stakeholders and lead agencies. The Public Health Act, Cap 242 Laws of Kenya was recommended for review on the laws regulating the issuance of license to HCFs so that they may meet minimum waste treatment standards as a pre-condition to issuance of license. The need to engage other regulatory bodies on enforcement of all the laws touching on HCWM were also recommended.

For any meaningful progress to be achieved in Kenya on HCWM matters, it is important that these recommendations should be implemented across the board in public facilities and also in the private sector HCFs. It is of utmost importance that the Ministry of Medical Services and the Ministry of Public Health and sanitation implement the new HCWM procedures in close cooperation with all stakeholders who include; local authorities, development partners, NGOs, FBOs and CBOs. Good waste segregation and hygiene practices require constant follow up. Staff can be reminded in various ways, such as training on recruitment, posters and signs, hygiene inspections, staff newsletters and information literature. An integrated effort is necessary to set up safe and environmentally sound HCWM practices. Focus is now turned on to minimizing waste,
standardizing waste management practices and need to identify alternative technologies that are environmentally friendly.
CHAPTER FOUR: NATIONAL PLAN OF ACTION

This plan is based on the results of the situation analysis presented in chapter two and subsequent recommendations arrived at in chapter 3. This chapter gives the detailed short and long term actions, coordination and supervision structures, indicators for achievement and the cost implications. The plan also provides recommendations for the implementation of each component.

Planning of HCWM is not limited to the preparation of internal guidelines/instructions for the management of health care waste but rather a process to sustain and optimize the operation of HCWM systems in health care establishments. It is the ambition of the Ministry of Public Health and Sanitation and its development partners that through the setting up of institutional structures, the implementation of this action plan will result in improved HCW management in Kenya.

4.1 STRATEGY FOR THE IMPLEMENTATION OF PLAN

In the planned strategy, all health care facilities in Kenya that generate HCW should set up comprehensive waste management systems based on the most appropriate means of achieving the environmentally safe management of health care waste. The implementation of this plan is proposed to run for 5 years beginning from 2008 to 2012. The resources needed for successful implementation of this plan of action are both human and financial. The systems should start with basic measures that are improved gradually. The most important step is to begin with commitment of Health System Managers at all levels to address Kenya’s waste management challenges.

This plan therefore endeavours to tackle the HCWM challenges in Kenya that comprise the following components as addressed in the recommendations of Chapter Three:

1. Legal and Regulatory (Including institutional framework)
3. Funding for healthcare waste management activities.
5. Monitoring and Evaluation.
6. Reduce the pollution associated with HCWM.

4.2 SETTING UP HEALTH CARE WASTE MANAGEMENT SYSTEMS

In order to set up the required systems, financial resources are necessary. In the WHO core principles for achieving safe and sustainable management of HCW, it recommends that countries should identify and progressively allocate sufficient funds to the management of HCW. This is in view of the fact that funding of HCWM shall translate into measurable outcomes, such as reductions in needle stick injuries, lower disease burdens, economic savings, etc. Further, countries are urged to view waste management expenses as a new category of overhead costs built into programmes, just as administrative costs are seen as normal costs of doing business.
Currently in Kenya, the Ministry of Medical Services finances the waste management activities in all public health facilities. The financial resources are allocated as a block fund together with other activities hence it is difficult to quantify exactly how much goes specifically to waste management. This is because there is no specific budget line for HCW and this can be frustrating for a committed worker. In some large facilities however, funds are allocated for incinerator operation, purchase of the necessary supplies such as bins, bin liners and protective clothing.

In order to implement this plan therefore, it is necessary for policy makers and those in decision making positions to appreciate the need for financial allocation to the management of HCW based on plans which have been developed, budgeted and discussed and further approved by a recognized body in that institution e.g. the WMT and the IPCC.

The areas that will need financial allocation include;

i) Investment on waste handling facilities, e.g. waste storage areas or refuse transfer stations, incinerators and fencing off the waste handling site.

ii) Fuel for operating on-site incinerator.

iii) Purchase of equipment such as;

- trolleys, trolley bins,
- waste bins,
- weighing scales for weighing waste generated on daily basis in the hospitals,
- Workers’ personal protective gear (helmets, plastic goggles, respirators, heavy duty gloves, gumboots, overall and aprons).

iv) Funds for maintenance of HCWM equipment such as:

- Repairing incinerators, and replacing them as they become obsolete.
- Repairing and replacing trolleys and trolley bins,
- Performing regular maintenance for the building structures and fences that surround waste management storage and treatment areas.

v) Waste operation tools such as;

- shovels,
- steel rods for poking the fire,
- brooms,
- Waste-ash-buckets for use at the refuse storage areas, incinerator and final waste disposal area.

vi) Purchase consumable materials required for daily implementation of good segregation practices which include;

- Safety boxes for sharps,
- Bin-liners of different colours and sizes for different waste generation areas.
- Stickers for labelling waste.

vii) Funds for contractual services for out sourced waste from the facility and cleansing services.

viii) Meeting transportation cost within the facility or to the waste treatment sites.
## 4.3 LOGICAL FRAMEWORK

### 4.3.1 Legal and Regulatory (Including institutional framework)

<table>
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<tr>
<th>Actions</th>
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<td></td>
<td></td>
<td></td>
<td>8.82 million</td>
</tr>
<tr>
<td>SUB TOTAL for two years.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13.82 million</td>
</tr>
</tbody>
</table>

Recommendations:

- National Guidelines should include standards of practice to help guide HCFs in their development of SOPs. There is also need to incorporate the management of health care waste for home based care patients. The activity of 1.01 will also result in an annex for the National Guidelines, this one to do with NEMA rules and regulations.

- National Guidelines should be urgently written and distributed to the HCFs by the MOH. Ideally, a Catalogue of the Equipment available in Kenya for the safe management of HCW should be annexed to these guidelines.
### 4.3.2 Standardize Healthcare Waste Management Practices

<table>
<thead>
<tr>
<th>Actions</th>
<th>Coordination</th>
<th>Supervision</th>
<th>Indicators of achievement</th>
<th>Time frame (Years)</th>
<th>Cost in KES.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td>1  2   3   4   5</td>
<td>Initial</td>
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<tr>
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</tr>
<tr>
<td>2.01</td>
<td>Designate a WMO and set up Waste Management Teams at each facility, to be headed by the WMO.</td>
<td>-NSCHCWM -CPHO &amp; CNO</td>
<td>DMS</td>
<td>-Circulars made -Teams formed at HCFs. -Train WMO and IPCC</td>
<td>X X X</td>
</tr>
<tr>
<td>2.02</td>
<td>Develop National Specifications and Standards for all HCWM equipment and supplies.</td>
<td>-NSCHCWM - KEBS</td>
<td>MoPH &amp; S, MMS</td>
<td>Specification/ Standards developed and circulated</td>
<td>X X</td>
</tr>
<tr>
<td>2.03</td>
<td>Develop standard operating procedures consistent with the National Guidelines.</td>
<td>-NSCHCWM</td>
<td>MoPH &amp; S</td>
<td>-SOPs in place both for HCFs and for home based care waste.</td>
<td>X X</td>
</tr>
<tr>
<td>2.04</td>
<td>Develop facility-based HCWM plans.</td>
<td>-District based WMTs.</td>
<td>MoPH &amp; S, MMS</td>
<td>Plans in place</td>
<td>X X X X X</td>
</tr>
<tr>
<td>2.05</td>
<td>Set up pilot facilities at different levels of healthcare delivery that demonstrate best practices of HCWM, and make them available for observation by staff from other facilities.</td>
<td>NSCHCWM</td>
<td>MoPH &amp; S, MMS</td>
<td>- 4 Pilot sites in place -Visits taking place.</td>
<td>X X X X X</td>
</tr>
<tr>
<td>2.06</td>
<td>Develop and disseminate tools to assist HCW Managers in their planning and carrying out HCWM activities.</td>
<td>NSCHCWM</td>
<td>CPHO</td>
<td>MoPH &amp; S, MMS</td>
<td>Planning tools developed -Workshop for tools dissemination held. - Pamphlets developed for Home based care waste.</td>
</tr>
<tr>
<td>2.07</td>
<td>Incorporate HCWM supplies, especially bins and bin liners, into KEMSA for centralized procurement for GoK facilities.</td>
<td>NSCHCWM</td>
<td>KEMSA</td>
<td>MMS</td>
<td>HCWM supplies are available thru KEMSA</td>
</tr>
<tr>
<td>2.08</td>
<td>Equip healthcare facilities with proper supplies for managing and handling waste.</td>
<td>CPHO</td>
<td>KEMSA</td>
<td>MoPH &amp; S, MMS</td>
<td>HCWM supplies are available thru KEMSA</td>
</tr>
<tr>
<td>Section</td>
<td>Activity</td>
<td>Implementing Agencies</td>
<td>Details</td>
<td>X</td>
<td>Y</td>
</tr>
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</tr>
<tr>
<td>2.09</td>
<td>Equip healthcare facilities with new equipment where needed for treatment and final disposal of HCW.</td>
<td>CPHO KEMSA, MoPH &amp; S</td>
<td>Incinerators installed and are working</td>
<td>X</td>
<td>X</td>
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<tr>
<td>2.10</td>
<td>Create linkages with industry and put in place systems that will allow recycling or other treatment of waste.</td>
<td>NSCHCWM, MoPH &amp; S</td>
<td>Factory identified. Recyclable waste collected by factory</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
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<tr>
<td>Long-term</td>
<td>Create liaison with researchers to identify new waste management technologies for use in Kenya.</td>
<td>NSCHCWM, MoPH &amp; S, NEMA</td>
<td>Liaison meetings held. No. of technologies tested.</td>
<td>X</td>
<td>X</td>
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<td></td>
<td><strong>SUB TOTAL</strong></td>
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<td></td>
<td><strong>Sub Total for five years</strong></td>
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</tbody>
</table>

Recommendations:

- SOPs should be in place for the following activities:
  - Segregation of waste
  - Storage of waste
  - On-site transportation of waste
  - Treatment of waste
  - Off-site transportation of waste if relevant
  - Final disposal of waste
- SOPs should address use and maintenance of HCWM equipment and supplies.
- In writing SOPs, facilities should take into account efforts to minimize and reduce waste wherever possible.
- Facilities should choose equipment and supplies that minimize dangerous pollution, for example, replacing mercury thermometers.

Proper supplies for managing and handling HCW to include:

- Colour-coded bins and bin-liners
- Transport trolleys
### 4.3.2 Funding for healthcare waste management activities.

<table>
<thead>
<tr>
<th>Actions</th>
<th>Coordination</th>
<th>Supervision</th>
<th>Indicators of achievement</th>
<th>Time frame (Years)</th>
<th>Cost in KES.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td>1 2 3 4 5 Initial</td>
<td>Annual</td>
</tr>
<tr>
<td>Short-term</td>
<td></td>
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<tr>
<td>3.01</td>
<td>Determine the costs associated with all action items in the National Action Plan.</td>
<td>NSCHCWM</td>
<td>MoPH &amp; S</td>
<td>-Summarize district plans to form national budget.</td>
<td>X X X</td>
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<tr>
<td>3.02</td>
<td>Link with key agencies who are supporting HCWM activities in Kenya and other development partners willing to support the National Action Plan.</td>
<td>NSCHCWM</td>
<td>DMS</td>
<td>-ICC on HCWM held</td>
<td>X X X X X</td>
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<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>3.03</td>
<td>Set up specific budget lines at all levels (HCF to National level) for rehabilitation of incinerators, HCWM supplies, equipment, and activities.</td>
<td>NSCHCWM - KEMSA</td>
<td>PS MoH</td>
<td>Line items reflected on Ministry of Health budget and AIEs to districts.</td>
<td>X X X X X</td>
</tr>
<tr>
<td>Long-term</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3.04</td>
<td>Develop a framework to clearly define potential areas for public-private partnerships with industry to support safe management of healthcare waste.</td>
<td>NSCHCWM</td>
<td>MoPH &amp; S NEMA</td>
<td>-Consultative meeting held.</td>
<td>X X X X X</td>
</tr>
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</tr>
<tr>
<td>3.05</td>
<td>Develop a framework for use by partners who contribute to healthcare activities in Kenya so that they factor in costs of healthcare waste management and contribute appropriately.</td>
<td>NSCHCWM</td>
<td>DMS</td>
<td>-Framework or Guidelines for health care activities developed.</td>
<td>X X</td>
</tr>
<tr>
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</tr>
<tr>
<td>Sub Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>450,000  600,000</td>
</tr>
<tr>
<td>Sub Total for five years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.45 million</td>
</tr>
</tbody>
</table>

**Recommendations:**

- Hold a national stakeholders meeting where all can have an opportunity to review and finalize the plan, and partners can make commitments to support the activities going forward especially providing funds for building waste management capacities in the country.

- Plans should be entered into the annual Operational Plans of the Ministry so as to be fast tracked along with other Ministry budget priorities.

The framework for potential public-private partnership should be developed in collaboration with potential partners, and should define the opportunities and the steps to realize them.
### 4.3. 4 Capacity-building, training, and awareness-building measures

<table>
<thead>
<tr>
<th>Actions</th>
<th>Coordination</th>
<th>Supervision</th>
<th>Indicators of achievement</th>
<th>Time frame (Years)</th>
<th>Cost in KES.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NSCHCWM</td>
<td>MoH</td>
<td>-Curricula developed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-Trainees trained.</td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-Training taking place.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-term</td>
<td>DMS</td>
<td>MoH</td>
<td>-Messages developed and tested.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>-IEC materials published.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-Messages disseminated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.01</td>
<td>Develop Curriculum and training materials and implement training for appropriate audiences.</td>
<td></td>
<td>X X X X X</td>
<td>2 million</td>
<td>80,000</td>
</tr>
<tr>
<td>4.02</td>
<td>Carry out an awareness campaign in the community through media, public barazas, in schools, and through other outlets.</td>
<td></td>
<td>X X X X X</td>
<td>3 million</td>
<td>3 million</td>
</tr>
<tr>
<td>4.03</td>
<td>Include waste handlers as essential positions within HCFs and recruit staff for long-term employment to enhance consistency with safe operating practices.</td>
<td></td>
<td>X X</td>
<td>20 million</td>
<td>20 million</td>
</tr>
<tr>
<td>Long-term</td>
<td>4.04</td>
<td>Create pools of trainers at multiple levels who are available to facilitate training on HCWM.</td>
<td>NSCHCWM CPHO MoH</td>
<td>-Critical mass of Trainer of Trainees trained.</td>
<td>X X X X X</td>
</tr>
<tr>
<td>Sub Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50 m</td>
</tr>
<tr>
<td>Sub Total for five years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>106.32 million</td>
</tr>
</tbody>
</table>

**Recommendations:**
- Curricula should be developed for both pre-service and in-service audiences.
- Training materials should also be developed for use during trainings.
### 4.3.5 Monitoring and Evaluation

<table>
<thead>
<tr>
<th>Actions</th>
<th>Coordination</th>
<th>Supervision</th>
<th>Indicators of achievement</th>
<th>Time frame (Years)</th>
<th>Cost in KES.</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
<td>1  2  3  4  5</td>
<td>Initial</td>
</tr>
<tr>
<td>Short-term</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.01</td>
<td>NSCHCWM</td>
<td>MoPH &amp; S, MMS</td>
<td>-Monitoring &amp; Evaluation tools developed and integrated into existing tools.</td>
<td>X X</td>
<td>300,000</td>
</tr>
<tr>
<td>5.02</td>
<td>NSCHCWM</td>
<td>MoPH &amp; S</td>
<td>-Assessment done.</td>
<td>X X X</td>
<td>1.7 million</td>
</tr>
<tr>
<td>5.03</td>
<td>NSCHCWM</td>
<td>MoPH &amp; S, MMS</td>
<td>Audit tools for HCWM developed. -Supervisory plans developed. Supervisory budgets done</td>
<td>X X</td>
<td>122,000</td>
</tr>
<tr>
<td>5.04</td>
<td>NSCHCWM</td>
<td>MoPH &amp; S, MMS</td>
<td>-Monitoring visits done - Checklists filled in -Monitoring reports done.</td>
<td>X X X X</td>
<td>350,000</td>
</tr>
<tr>
<td>5.05</td>
<td>DMS</td>
<td>MoPH &amp; S, MMS</td>
<td>-Monitoring visits done - Checklists filled in -Monitoring reports done.</td>
<td>X X X X</td>
<td>2.3 million</td>
</tr>
<tr>
<td>On-going</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.06</td>
<td>CPHO NEMA</td>
<td>MoPH &amp; S, MMS</td>
<td>Develop waste tracking tools for off site disposal</td>
<td>X X X X</td>
<td>75,500</td>
</tr>
<tr>
<td>Long-term</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.07</td>
<td>NSCHCWM</td>
<td>MoPH &amp; S, MMS</td>
<td>-Reporting &amp; Recording tools developed. -Records being kept.</td>
<td>X X</td>
<td>1.25 million</td>
</tr>
<tr>
<td>5.08</td>
<td>NSCHCWM</td>
<td>MoPH &amp; S, MMS</td>
<td>-Baseline survey carried out. -Assessments done Reports made.</td>
<td>X X X X</td>
<td>6,097,500</td>
</tr>
<tr>
<td>Sub Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>19,727,500</td>
</tr>
</tbody>
</table>

**Recommendations:**
- Monitoring and Evaluation systems should be developed and incorporated into the existing monitoring and evaluations systems.
### 4.3.6 Reduce the pollution associated with HCWM

<table>
<thead>
<tr>
<th>Actions</th>
<th>Coordination</th>
<th>Supervision</th>
<th>Indicators of achievement</th>
<th>Time frame (Years)</th>
<th>Cost in KES.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.01</td>
<td>CPHO NEMA</td>
<td>MoPH &amp; S, NEMA</td>
<td>- Number of evaluations /Audits carried out</td>
<td>X X X X X</td>
<td>3.6 million 2 million.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Types of emissions recorded</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.02</td>
<td>NSCHCWM</td>
<td>MoPH &amp; S,</td>
<td>- Improved methods of waste management practices.</td>
<td>X X X X X</td>
<td>50,000 20,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NEMA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.03</td>
<td>NSCHCWM</td>
<td>NSCHCWM NEMA</td>
<td>Number of meetings done with minutes, Proposed solutions passed for testing, New technology tested.</td>
<td>X X X X X</td>
<td>72,000 50,000</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>6.04</td>
<td>NSCHCWM</td>
<td>MoPH &amp; S, NEMA</td>
<td>- Researcher identified. -Pilot studies begun -Models of new technology availed</td>
<td>X X X X X</td>
<td>5 million 3.2 million</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Sub Total</td>
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<td></td>
<td></td>
<td></td>
<td>8.722 million 5.27 million</td>
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<tr>
<td>Sub Total for five years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>29,802,000</td>
</tr>
</tbody>
</table>

**Recommendations:**

- Operational research to be conducted by lead persons involved in seeking technological improvements in waste treatment solutions should be encouraged.

Sub Totals for first year and second year of implementation of HCWM plans.  
191,289,500 | 103,280,00

Grand Total for the implementation of the five year plan.  
521,619,500.00

The proposed budget for the operationalisation of the plan during the first year of implementation is pegged at **KShs. 191,289,500.00**

**The Grand Total in the first two years is placed at KShs. 294,569,000.00**
4.4 COST ESTIMATIONS FOR HCW

The safe and sustainable management of health care waste is a public health imperative and a responsibility of all. Currently, the cost of non-incineration alternative for HCW treatment and disposal technologies is beyond reach due to limited funding for health care waste management. The lack of policy that gives direction on what choice of technology is required for different health care settings has also contributed to the current situation. The right investment of resources and commitment will result in a substantive reduction of disease burden and corresponding savings in health expenditure.

The purpose of costing programmes such as HCWM is to help senior managers and policy makers to estimate costs and annual budgets related to HCWM. Costing done at national level or facility level annualizes capital costs based on discount rate and equipment lifespan. The Cost Assessment Tool (CAT) requires input data such as waste generated per year, total number of beds, total number of facilities, along with indicative values (such as an average cost to treat a kilogram of waste) to compute initial estimates of the national costs.

This method also allows the user to input typical values for small, medium and large facilities (e.g.) the number of bins or the number of safety boxes needed in a health facility) to compute annual capital and recurrent costs. The CAT then adds up the annualized capital and recurrent costs for the three levels of HCFs, then multiplies them by the corresponding total numbers of each size of facility, and then computes the total costs for the whole country.

This method fits the proposed Kenyan situation where no established data on costs for managing HCW has been made. HCFs are therefore encouraged to start collecting data on waste quantities generated and the funds used to manage such waste for ease of evaluation and future recommendations.

4.5 CONCLUSION

This strategic plan sets out a number of objectives and interventions which seek to address HCWM problems in the context of the ongoing health sector reforms over a five year period. The plan focuses on the critical areas and tries to provide solutions to problems that have persisted for long. The legal and regulatory issues identified as gaps require attention. Similarly, institutional structures aimed at fast tracking implementation have been recommended to the Ministry of Health. There is therefore need for all the stakeholders to take a proactive role to operationalise these recommendations. The National Steering Committee on Health Care Waste Management is depended upon to steer the process as the government is required to take charge of stewardship of the whole process that is expected to spread to the private sector. The major role for government is to ensure coordination of activities with all the players including raising funds for the implementation of the planned activities.
GLOSSARY OF TERMS COMMONLY USED IN HEALTH CARE WASTE MANAGEMENT

**Anatomic waste**: consisting of recognizable body parts.

**Biomedical and health-care waste**: solid or liquid waste arising from health-care (medical) activities such as diagnosis, monitoring, treatment, prevention of disease or alleviation of handicap in humans or animals, including related research, performed under the supervision of a medical practitioner or veterinary surgeon or another person authorized by virtue of his professional qualifications.

**Chemical waste**: consisting of/or containing chemical substances.

**Collection**: the act of removing accumulated containerized solid waste from the generating source. In Kenya, collection of solid and liquid waste is either done by local authorities or privately by individuals or companies from residential, commercial, health facility or industrial premises. The arrangements for the service are made directly between the owner or occupier of the premises and the collector.

**Colour coding**: Designates the use of different colours for the storage of various categories of HCW.

**Container**: vessel in which waste is placed for handling, transportation, storage and/or eventual disposal. The waste container or receptacle is a component of the waste package.

**Cytotoxic waste**: drugs possessing a specific destructive action on certain cells.

**Decontamination**: the process of reducing or eliminating the presence of harmful substances such as infectious agents so as to reduce the likelihood of disease transmission from those substances.

**Disinfectant**: chemical agent that is able to reduce the viability of micro-organisms.

**Disposal**: intentional burial, deposit, discharge, dumping, placing or release of any waste material into or on any air, land or water.

**Fly ash**: the finely divided particles of ash entrained in the flue gases arising from combustion. The particles of ash may contain incompletely burned material. The particles are frequently glassy spheres but may also be crystalline or even fibrous in structure.

**Handling**: the functions associated with the movement of waste materials.

**Hepatitis B**: Hepatitis caused by a virus and transmitted by exposure to blood or blood products or during sexual intercourse. It causes acute and chronic hepatitis. Chronic hepatitis B can cause liver disease, cirrhosis, and liver cancer.

**HIV/AIDS**: Human Immunodeficiency Virus, a virus transmitted through exposure to blood or blood products or during sexual intercourse. HIV cause the Acquired immunodeficiency Syndrome (AIDS).

**Incineration**: the controlled burning of solid, liquid or gaseous combustible wastes to produce gases and residues containing little or no combustible material.
**Infection control:** The activities aiming at the prevention of the spread of pathogens between patients, from healthcare workers to patients and from patients to healthcare workers in the healthcare setting.

**Irradiation exposure:** to radiation of wavelengths shorter than those of visible light (gamma, x-ray or ultraviolet) for medical purposes, the destruction of bacteria in milk or other foodstuffs or initiation of polymerization of monomers or vulcanization of rubber.

**Infectious health-care waste:** discarded materials from health-care activities on humans or animals which have the potential of transmitting infectious agents to humans. These include discarded materials or equipment from the diagnosis, treatment and prevention of disease, assessment of health status or identification purposes, which have been in contact with blood and its derivatives, tissues, tissue fluids, or wastes from isolation wards.

**Minimization of waste:** the application of activities such as waste reduction, reuse and recycling to minimize the amount of waste that requires disposal.

**Monitoring:** periodic or continuous surveillance or testing to determine the level of compliance with statutory requirements and/or pollutant levels in various media or in humans, animals and other living things.

**Off-site facility:** a clinical and related waste treatment, storage or disposal facility that is located away from the generating site.

**On-site facility:** a clinical and related waste treatment, storage or disposal facility that is located on the generating site.

**Open dump:** characterized by the uncontrolled and scattered deposit of wastes

**Pathogen:** A microorganism capable of causing diseases.

**Pharmaceutical waste:** consisting of/or containing pharmaceuticals. (Includes: pharmaceuticals expired, no longer needed, their containers, items contaminating pharmaceuticals (bottles))

**Pressurized containers:** consists of containers (full or empty) with pressurized liquid, gas or powdered materials.

**Pyrolysis:** the decomposition of organic material by heat in the absence of or with limited supply of oxygen.

**Radioactive waste:** material contaminated with a radioisotope which arises from the medical or research use of radionuclide. It may be in a solid, liquid or gaseous form.

**Recycle:** A term embracing the recovery and reuse of scrap or waste material for manufacturing or other purposes.

**Residual waste:** those materials (solid or liquid) which still require disposal after the completion of a treatment or resource recovery activity (e.g. slag and liquid effluents following a pyrolysis operation and the discards from front-end separation systems.

**Safe injection:** An injection that does not harm the recipients neither does it expose health worker to risks or results in waste that puts communities at risk.
**Safety (sharps) box:** A puncture proof/liquid proof container designed to hold used sharps safely during disposal and destruction

**Sanitary landfill:** characterized by the controlled and organized deposit of wastes which is then covered regularly (daily) by the staff present on site. Appropriate engineering preparations of the site and a favourable geological setting (providing an isolation of wastes from the environment) are required.

**Sanitation:** the control of all the factors in the physical environment that exercise or can exercise a deleterious effect on human physical development, health and survival.

**Segregation:** the systematic separation of waste into designated categories.

**Sharps:** sharps are a subcategory of infectious health-care waste and include objects that are sharp and can cause injuries.

**Sterilization:** a process used to reach a state of free of viable micro-organisms. Note that in a sterilization process, the nature of microbiological death or reduction is described by an experimental function. Therefore, the number of micro-organisms that survive a sterilization process can be expressed in terms of probability. While the probability may be reduced to a very low number, it can never be reduced to zero.

**Storage:** the placement of waste in a suitable location or facility where isolation, environmental and health protection and human control (e.g. monitoring for radioactivity, limitation of access) are provided. This is done with the intention that the waste will be subsequently retrieved for treatment and conditioning and/or disposal (or clearance of radioactive waste).

**Treatment:** any method, technique or process for altering the biological, chemical or physical characteristics or waste to reduce the hazards it presents and facilitate, or reduce the costs of disposal. The basic treatment objective include volume reduction, disinfection, neutralization or other change of composition to reduce hazards, including removal of radio nuclides from radioactive waste.

**Waste management:** all the activities - administrative and operational - involved in the handling, treatment, conditioning, storage, transportation and disposal of waste.
REFERENCES