E1730

HEALTH SECTOR RECONSTUCTION AND DEVELOPMENT PROJECT (HSRDP) FOR SIERRA LEONE

Environmental Assessment

October 29, 2002
Revised May 2007

FINAL REPORT

By:

Dr. Raymond Geoffrey Johnson, Data Collection and Inputting
Dr. Reynolds Godfrey Johnson, Environmental Assessment Specialist
Mr. John Tommy, Environmental Health Specialist/ Team Leader

TABLE OF CONTENTS

Page

ACRONYMS

ADA	Area Development Association
ARG	Aids Response Group
CBO	Community Based Organisation
DHMT	District Health Management Team
EA	Environmental Assessment
EHD	Environmental Health Division
EPA	Environmental Protection Act
EPD	Environment Protection Department
FCC	Freetown City Council
MLHCPE	Ministry of Lands, Housing, Country Planning and the Environment
MOHS	Ministry of Health and Sanitation
NaCSA	National Commission for Social Action
NGO	Non Governmental Organisation
NMCP	National Malaria Control Programme
OCHA	Organisation for the Coordination of Humanitarian Assistance
OCP	Onchocerciasis Control Programme
SHARP	Sierra Leone HIV/AIDS Response Group
WB	World Bank

EXECUTIVE SUMMARY

The report presents the final results of the Environmental Assessment (EA) carried out in accordance with the World Bank safeguard policies for rehabilitation and development of health-facilities and technical programmes for Moyamba, Kono, Koinadugu, and Bombali districts of Sierra Leone on behalf of the Ministry of Health and Sanitation (MOHS).

The E.A. was carried out in two phases. The first phase dealt with desktop research on the areas of project influence and the second phase consisted of site visits. During the site visits biophysical characteristics of the various project sites were collected and questionnaires were administered in order to assess the socio-cultural impacts of the proposed project. The local people were also consulted on the potential positive and negative environmental and social impacts of the project.

The E.A. findings established that the proposed Sierra Leone – Health Sector Reconstruction and Development Project (P074128) is a Category B project since it's potential negative impacts are site-specific and easily manageable.

The issues addressed in the EA mainly focused on the impact of the proposed project on the biophysical and socio-cultural environments of Koinadugu, Kono, Moyamba and Bombali Districts of Sierra Leone.

These include:

Landscaping
The development of landfill sites, rehabilitation of buildings for health centres, and staff quarters require some form of clearing of land cover and landscaping. This will lead to deforestation and land cover changes at the specific sites.

Creation of Pits
During the rehabilitation of health facilities and provision of sanitation facilities, open pits will inevitably be created, mainly on a temporary basis. These pits if not covered after rehabilitation works can pose a threat to lives, cause injuries, serve as receptacles for rubbish and breeding grounds for mosquitoes etc.

Deforestation
Deforestation is associated with loss of biodiversity and soil fertility through erosion. Deforestation always occurs where building or rehabilitation projects are implemented. Although here the deforestation is site specific, nonetheless, the environmental concerns are still valid at this micro-scale. The impacts on the social environment seem to be on the positive side, as the project is community demand driven.

Pollution
Pollution can be caused as a result of the abandoning and poor disposal of spoil and paint materials. Dust associated with earth preparation for rehabilitation works can impair the quality of air around the sites.

Loss of agricultural land
Agriculture is the dominant economic activity in the rural areas covered by the E.A. The agricultural activities are mostly food and cash crop production. Livestock rearing was at a very low ebb at the time of the assessment. The main food crop grown in the EA areas are rice (upland swamp), groundnuts, sweet potatoes, cassava and other assorted vegetables.

Impacts on Water Resources
Ineffective methods of waste disposal can have serious impacts on water resources with undesirable health effects. These effects may range from not only impairing water quality but may also lead to water contamination and subsequent outbreak of water-borne diseases.

The Main Findings Are As Follows:
There are no significant environmental issues and the overall environmental impact is expected to be favourable as the project will finance a sanitation component: building of incinerators within existing hospital compounds for health-facility wastes, development of new sanitary landfill sites, rehabilitation of existing latrines and staff quarters within the health-facilities compound. Existing water wells within the hospital compounds will be deepened to increase their current yields and consequently increase their water supplies. Staff will be trained and communities sensitised.

Target beneficiaries were happy that health facilities are to be rehabilitated.

The critical mass of the beneficiaries ranges from illiterates to semi-illiterates who could not quite discern the environmental issues of the project until after the public consultations wherein these issues were addressed.

New land will be acquired by the project for the proposed landfill sites. This will involve land acquisition, which may lead to loss of incomes or assets, and possibly involuntary resettlement. There is no clear national policy for involuntary resettlement. Consequently, the project under review is developing a Resettlement Policy Framework (RPF) consistent with the World Bank's OP 4.12. The negative environmental impacts of the rehabilitation components of the project and the technical programmes were found to be manageable.

It is against the backdrop of the above findings of the EA that the following recommendations are suggested: -

1. The proponent and its development partners consider the mitigation measures suggested for each impact during the implementation of the project.

2. Non-lead based paint is used for the project under review.

3. Efforts are made to carry out the mitigation and monitoring plans for expected impacts provided in the annexes.

Appropriate consultations with MOHS headquarter staff, staff of priority technical programmes, District Health Management Teams of the four proposed priority districts, potentially would-be affected groups, local communities, and non-governmental organisations (NGOs) have been undertaken during the preparation of the EA.

Finally the conclusion of the EA includes the following:

The project was well conceived and environmental concerns seemed to have been taken onboard implicitly. *The environmental impacts of the project are site-specific and manageable.* The mitigation measures suggested in this report will enhance the quality of the environment in the post project period.

The SHARP is finalising a national master plan for the safe management of healthcare wastes, wherein environmental and social issues relating to incineration and sanitary landfills are fully addressed, including monitoring and mitigation plans. Since SHARP and HSRDP will be operating within the same areas, and SHARP became effective October 2002 whilst HSRDP is expected to be effective in January 2003, it will be prudent to reconcile efforts to

avoid duplication.

Consequently, it is the opinion of this consultant that the impact monitoring measures relating to medical waste management that are being addressed by SHARP could serve both projects. Hence, there is no need for a separate one but to reference it. SHARP has also finalised a medical waste management training plan as a mitigation measure, which will suffice for both projects.

The analysis of the acquired information revealed that there is need for the current environmental legislation and policy to be explained to the local people and that they be encouraged to develop Local Environmental Action Plans (LEAPS) as part of the overall National Environmental Action Plan (NEAP).

1.0 INTRODUCTION

The proposed Sierra Leone Health Sector Reconstruction and Development Project's (HSRDP) overall development objective is to help restore the most essential functions of the health delivery system. The project will also help achieve the more specific objectives of:

Increasing access to affordable essential health services by improving primary and first referral health facilities in four districts of the country.

Improving the performance of key technical programs responsible for coping with the country's major public health problems.

Strengthening health sector management capacity to improve efficiency and further decentralise decision-making to the districts.

Supporting development of the private health sector and involvement of the civil society in decision-making.

Independent assessments covered the following:

i. Increase access to health facilities including rehabilitation of damaged health facilities and provision of water supply and sanitation.
ii. Improving the quality of health delivery systems, which includes the establishment of health centres; and the deployment and settlement of health workers.
iii. Enhancing institutional capacity of MOHS.
iv. Issues associated with measures to reduce the environmental impact of health facility wastes with reference to the technical programmes

A team of consultants and field workers based in Sierra Leone (part of a national consultation-working group) has completed these tasks in accordance with the World Bank (WB) safeguard policies.

The rehabilitation of damaged health facilities programme has not yet commenced since MOHS is currently seeking funding from the World Bank with regards to (i) and (ii) above.

Purposes and Requirement of the Environmental Assessment (EA)
The purpose of the environmental analysis (EA) is to assess the potential environmental and social impacts of the proposed project, particularly with regard to rehabilitation activities, medical waste disposal and the use of insecticide–treated bed nets; to be funded under the component for the restoration of essential health facilities.

The EA includes a full environmental, socio-economic and socio-cultural assessment of potential impacts of the above activities in the future and appropriate mitigation and monitoring plans. It is also intended to satisfy all requirements of the national and local authorities.

2.0 DESCRIPTION OF THE OF PROPOSED PROJECT

According to the Project Appraisal Document and interviews conducted with officials of the Ministry of Health and Sanitation (MOHS), the project for which this current Environmental Assessment (EA) is being prepared has two components:

Component 1: Restoring essential health services
This component will (a) provide assistance to four priority districts to deliver adequate health services and (b) support key technical programs to improve their performance and control infectious diseases of high public health importance in Sierra Leone (i.e. Malaria, TB, and Sanitation). *These technical programmes all fall under the MOHS' Directorate of Primary Health Care and employs the integrated approach in the implementation of their respective responsibilities. They are directly related to one another.*

Component 2: Strengthening Public and Private Sector Capacity
Under this component the HSRDP will support: (a) in all the districts of the country the decentralization process by (i.) strengthening the district teams and creating capacity for appropriate planning, management, financial management and supervision and (ii) improving the decision making process, and (b) five key programs of the MOHS (i.e. Planning, Monitoring and Evaluation, Financial Management Procurement, Donor Coordination and Human Resources Development) whose performance is essential for raising efficiency and improving the administrative performance at the central level.

This component will help develop incentives for private health providers, with focus on not-for-profit provides, to develop and discharge services in the four districts supported by the project. Another thrust of this sub-component will be to enact regulation to foster private sector development and the provision of quality affordable services. It is also expected that the health policy will be updated and civil society will be involved in the decision-making during the project.

From the above project description, it can be seen, that the focus of the Environment Assessment (EA) is on component 1 of the project.

This component of the Health Sector Reconstruction and Development Project will involve amongst others the equipping of 50 health posts with support from the IDA funded community Reintegration and Rehabilitation Projects. The project will finance civil works (rehabilitation of buildings), provide water supply and sanitation facilities, develop 4 project-districts sanitary landfill sites, incinerators, essential staff quarters for 12 health centres and four first-referral hospitals amongst other activities. ***Apart from the development of landfill sites, which is likely to involve land acquisition, all other activities will be carried out at existing sites.***

The proposed project sites (existing) are in conformity with the local development structures and are demand driven, as there is no evidence of a concrete development plan at the local level. A criterion for the selection, development, and operation of landfill sites is annexed.

The project sites (existing) are in accordance with the provision of the National Environmental Protection Act 2000, and the Labour and Public Health Acts of Sierra Leone. The EA will therefore address the potential environmental and social impacts of the civil works associated with rehabilitation, waste management, water supply and sanitation, landfill sites, and incinerators.

With regards to the technical programmes, the EA will deal with issues associated with measures to reduce the environmental impacts in the context of the medical waste management plan prepared under SHARP.

3.0 DESCRIPTION OF THE AREA OF INFLUENCE

The project will cover the following areas: -

1. Kono District
2. Moyamba District
3. Bombali District
4. Koinadugu District

3.1 The Biophysical Characteristics

3.1.1 Kono District

Kono district is located in the eastern province of Sierra Leone. The district is bordered on the north by Koinadugu district, on the east by the Republic of Guinea, the southeast by Kailahun and Kenema districts in the southwest and by Tonkolili districts in the west.

This area has a topography characterized by hills to the east and low land covered with savannah grassland to the north. Inland valley swamps occupy a vast area of the district and are relatively fertile.

The climate of the area is typical of the eastern region of Sierra Leone. This area has a mean annual rainfall of over 250mm, 80% occurring between May and November. Mean monthly air temperature ranges between 20^0C and 28^0C.

In terms of biological diversity, the district is now covered in most parts by low grassland and most of the forest cover that has been lost was due to intense mining activities and the rebel war. Wildlife is poor, restricted to a limited species of birds and other wild animals e.g. monkeys.

Administration
Kono District comprises fourteen (14) chiefdoms. The headquarter town is Koidu which is also the administrative headquarter town.

Socio-Economic Activities
The population of Kono district (1985, census) was estimated to be around 7,000 with density of 69 persons per square kilometres. Presently, the population of the district has not been fully determined as it only now that government authority is gradually returning to the area.
Kono district is well known as the main economic activity there centres around mining of diamonds which is widely believed to be the dominant source of funding for the ten year old brutal civil war, the country experienced.

Agricultural activity is modest in the area, as the land for most part has been degraded by mining activities with little or no rehabilitation. Most of the soils are ferralitic shallow and of low fertility, except for the inland valley swamps which are relatively fertile. Presently, government control is returning to almost the entire district and there is little commercial or other related activities taking place in the district.

3.1.2 Moyamba District

Moyamba district is situated roughly between $7^0$45' and $8^0$25' North Latitude, and between $11^0$45' and 13^0 West Longitude. It covers an estimated area of 86,902 square kilometres and has fourteen (14) chiefdoms.

Relief
The district has a varying topography with a general plateau surface, which has an elevation of 230ft() to 300ft() above sea level. Swamps are limited to a few hollows in the plateau as yet unaffected by the back cutting of the rejuvenated streams.

Hills are also found in the district, prominent amongst which is the Moyamba hill on which there is a forest reserve. It is also characterised by an extensive coastal plain. The up-standing hill masses diversify the coastal plain. One such mass is deeply cleft by through valleys into a series of sub-conical hills, the most elevated of which Yuvini reaches 1,439 feet.

Climate
The climate in Moyamba district is similar to that of the rest of the rest of the country with two season; these are the dry (November – May) and wet (May – November) seasons. Lack of metrological information on this district precludes one from providing further details.

Drainage System
There are various streams and rivers that incise the district, amongst which is the southward–flowing Yambafui stream, which is constrained into passing around the eastern flank of the hills, where its waters mixing with those of the Gbangabia, a series of rapids are actively, cutting into skirts of the upland between Gondama and Bonjema.

Vegetation and Soils
Under uniformly warm conditions, with abundant, though seasonal precipitation, the vegetation is characterised by high rain – forest and mangrove swamps along the coastal areas. There are also areas of derived grass on flatter areas. The soil is compared of infertile duricrust as a result of intense laterisation.

Socio-economic activities
The main activities here are agriculture and mining. The traditional suites of crops are grown in this area, but in addition, ginger has been a local cash crop speciality.

Amongst the minerals mined commercially are bauxite and rutile. As a result of rutile mining, the traditional agricultural, forestry, hunting and fishing activities are giving way to mining and other associated activities.

3.1.3 Bombali District

This district is bordered on the north by the Republic of Guinea and on the south and west by Tonkolili, Port Loko and Kambia districts respectively and shares its eastern boundary with Koinadugu District. It comprises 13 chiefdoms amongst which the Biriwa and Bombali-Sheboro chiefdoms are the largest having about 30% of the district's total population.

Relief
The district is also part of the interior hills and plateaux region of Sierra Leone with scarp zones separating the interior plateau and hills from the inland plains. Scarp erosion is eminent in this area as is evident in the granite residuals and inselberg concentration in the areas especially north of the headquarter town of Makeni. A typical example is the Gbenge hills consisting of a group of inselbergs. The geomorphology of the district also displays gently rolling plains, comprising, broad rounded interfluves with occasional isolated rocky hills, dissected by ill-defined, narrow valley swamps (FAO, TRI, 1979). There is the general presence of foot slopes and alluvium terraces. The inhabitants to provide basic foodstuffs cultivate the foot slopes and terraces.

Drainage
A few streams are present and are associated with narrow flood plains and terraces. The drainage comprise a trunk stream – Makpenta – which is a third order stream formed by the second order stream descending to Sendugu and Kagbouka hills. The flow is from a northeast to southwest direction revealing a dendrite drainage pattern. In general the streams descending the watershed are swift, and punctuated by rapids in various places, striated floors and potholes with steep – sided V-shaped valleys and gorges. Gullies and hills, which drain farm plots, are common features in the study area.

Geology
Most of the land is under pain by strongly folded igneous and metamorphic rocks belonging to various formations. Structurally known as the Kenema assemblage, which is part of the West African eraton. The igneous rocks of which biotile – granite is predominant vary in colour from light grey to brownish grey and from pink to dull salmon-red. The chief accessory minerals that make up these rocks include zireon, magnetite, epidote, apatite, rutile and pyrite.

Climate
Bombali district, like the rest of the country, experiences two seasons; dry and wet seasons. The dry season last from late November to early May and the wet season from late May to Mid-November. The Harmattan season (Mid-December to Mid –February) is sometimes severe in this region when compared with other regions in the country.

The wet season commences from April or May to Mid-November. The absence of meteorological data for this district makes it difficult to provide annual average air temperature or rainfall with the highest rainfall in July and August.

Soils and Vegetation
The soils in this area are formed from solid basement rocks of granite and gneisses under secondary bush and forest. Those on the hill slopes and foot slopes are underlain by red gravel duricrust or mottled soils belonging to the group known as Oxosols. These soils are relatively infertile and support agriculture on a rotational bush fallow system.

The alluvial soils brought down the hills by fluvial and other weathering processes belong to the group known as Inceptisols and can support intense agricultural cultivation.

In terms of vegetation, there is little primary forest as most of the existing forest is secondary. Presently, deciduous woodland vegetation predominates. Savannah and herbaceous shrubs and grasses of the Andropogon spp. and Lacryma jobi. are prevalent. The eroded hillslopes have to some extent been colonised by a mantle of adolescent sedge called catgria pilose.

The trees comprise mainly of the oil palm (Elaeis guineensis) Mango (Magnifera indica), Orange (citrus spp) and the Kola ‘tree (cola nitida).

The swamps are dominated with herbaceous upright sedges such as scypus brizziformis.

Demography and Economic Activity
The Bombali district has an average population density of 78 persons per square mile (Thomas 1983). According to the 1974 Census the total population of the district was 233,626.

The economic activities in the area include agriculture, animal husbandry, palm wine tapping, hunting and crafts. The prevalent farming system here is the rotational bush fallow system. Commercial activities are low in the district and there are no mining activities.

3.1.4 Koinadugu District

This district lies between latitude $9^0$20' and $9^0$42'N and longitude $11^0$16' and $11^0$44'W. It comprises 11 chiefdoms the major ones being Wara-Wara Yagala and Sengbe and the total area involved is approximately 587 sq. miles, 120 and 467 sq. miles for Wara-Wara and Sengbe respectively.

Relief
The district is part of the interior hills and plateaux regions of Sierra Leone, which forms a broken plateau lying at an elevation ranging between 1000 – 2000' above sea level. A characteristic feature of the district is its numerous steeply sloping hills and narrow valleys covering the area. Prominent geomorphologic features the Wara-Wara Mountains and hills rising to about 3000 ft. above sea level. This rugged terrain is the precursor for the relative underdevelopment of the district especially with increasing distance from headquarter town of Kabala.

Climate
Mean annual rainfall values range between 70" and 90" of which 85-90% of the precipitation takes place between the months of May and November.

Mean monthly temperatures have a seasonal rhythm with minimum in July – August ranging (74-84^{0}F), 256-28.9^{0}C) and (88-94^{0}F) (31.1-34.4^{0}C) for March – April. Minimum mean temperature is lowest in January and December of being 15.6^{0}C (60^{0}F) or less.

Soils
The soils are lateritic or reddish brown soils derived from the basement complex of granite and gneisses.

Vegetation
The predominant vegetation in the area is open bush and grassland. Small patches of forest are also found scattered over the area together with inland fresh water swamps. The latter are found mostly at the bottom of valleys along the courses of streams rising from the mountains

Population
In general the population is made up of a number of ethnic groups but numerically the Korankos and Limbas are the most important. Also found in significant numbers are the Madingoes and Fullahs. The latter are the main cattle rear and they derive their main source of income from the sale of cattle. The other groups are largely agriculturists. The population is largely rural. Over 85% of the population are estimated to be directly dependent on the land for that livelihood. The density of the population ranges from as low as 24.9 persons per square mile in Sengbe to as high as 144.2 in Wara-Wara. Also found in significant numbers are the Madingoes and Fullahs. The latter's income comes from the sale of cattle. The Madingoes are largely agriculturists.

3.2 The Social Structures

The Social structures of the districts covered by the EA are similar. In the districts there are chiefdoms each of which are ruled locally by chiefs representing the various tribes in the chiefdom. The paramount chief is the overall local head of the chiefdom. The chiefdom councils are made up of tribal authorities (chiefdom councillors), which are set up to administer the chiefdoms, and to advice the paramount chief which in turn coordinates with the district councils. Headmen head the village and village area committees administer the villages. The lowest level in village is the household level.

Of all the districts visited, only Freetown has a pipe borne water supply system. The districts depend of underground water sources. The healthcare facilities use wells and overhead storage tanks for water supplies. Three forms are in use; septic tank systems, traditional pit latrines and ventilated improved pit latrines. There are no conventional sewerage systems in the districts. Freetown has a trunk sewer for the central business area, which leads directly into the Atlantic Ocean.

Land Tenure/Ownership
The indigenous system of land tenure and that, which still exists in the districts, is based on community property rights. Land belongs to the local community as a whole and every individual is considered to have a right to a piece of land for his use. The paramount chief is the custodian of the land and he is responsible for the primary allocation of land.

Farming Practices
The predominant farming practice here is one of subsistence shifting cultivation or progressive extension of cultivation into new land with regular periods of cropping and resting.

The main crop grown is upland rice, which continue to be the primary charges of all the farm families of the district. However, the fertility status of the upland farming alone has not been able to provide subsistence to the farm family. As a result, swamplands in the valleys of the area have now received the attention of the farmers.
Before the war started in 1991, the rotation of fields was speeded up, particularly in the Wara-Wara chiefdom because of the increase in population, but one year's rice followed by about 6-10 years bush fallow is still fairly common: the more usual period is estimated as being 7-8 years. However, the system of arable upland farming depends on the maintenance of soil fertility.

This social structure is important to take cognisance of, for the development of environmental management strategies for the health sector.

4.0 DESCRIPTION OF THE LEGAL, REGULATORY AND ADMINISTRATIVE FRAMEWORKS

4.1 Organisational Structure of Environmental Management at the National and Local levels

The political head of the department of the Environment at present is the Minister of Lands, Housing and Country Planning and the Environment (MLHCPE).

At the head of Administration is a Permanent Secretary who is responsible for co-ordinating the functions of the three departments within the Ministry viz. Department of Housing and Country Planning (DHCP), Department of Surveys and Lands (DSL) and the Department of the Environment, (DOE). He is also the Principal Adviser to the Minister and the Vote Controller of the Ministry's budget.

The National Environmental Action Plan (NEAP) was adopted in 1996, providing a framework for environmental management in the country. It is in two volumes. Volume I outlines the various environmental and resource management issues affecting the country, prioritises them and indicate strategies to mitigate the problems. Volume II contains investment proposals, which are to be founded. These proposals are divided into six programme areas:

1. Support Programmes
2. Naturel Ressource Management

3. Durban Management
4. Environnemental Education
5. Training and Information
6. Women and the Environment

Each programme area has a number of projects, which are to be implemented over a five-year period.

The National Environmental Protection Act (NEPA) 2000 empowers the Environmental Protection Department to perform the following tasks amongst others:

- Screen projects for Environmental Impact Assessment (EIS)
- Issuance of Environmental Impact Assessment Licences
- Formulate or promote the formulation of, and monitor the implementation of environmental policies, programmes, projects, standards and regulations.

The NEPA 2000 also provides for the establishment of an Environmental Protection Board. The Board consist of 13 members including a chairman, charged with the task of facilitating coordination, cooperation and collaboration among government ministries, local authorities and other agencies in areas of environmental protection; reviewing national and sector policies and environmental impact assessments as well as investigating activities and transactions that are considered harmful to the environment amongst others.

Other sector instruments for the management of the environment include:

1. The Forestry and wildlife Act
2. The Mines and Mineral Act
3. The Fisheries Management Act
4. The Public Health Act

Apart from the above instruments, a number of sector policies have been developed which have a bearing on the improvement of the environment. Amongst these are: The National Health Policy; The Draft National Environmental Health Policy; The Transport Sector Policy; The National Water Policy; The Agricultural Policy and The National Housing Policy.

4.2 Local Level

At the local level, the environmental functions are carried out by provincial officers of the DOE of the MLHCPE through its Assistant Environmental Officers in the Northern, Southern, Eastern Provinces, and an officer for the Western Area. It is envisaged that these officers will be part of the area town planning committees set within Town Councils.

At present the main tasks of the Assistant Environmental Officers operating at provincial levels basically include monitoring of environmental programmes and projects, evaluation of environmental degradation and completion of reports. At present Town Councils, including the Freetown City Council (FCC) with statutory powers as a Local Authority (LA) does not participate in any arrangement affecting environmental management in accordance with the National Environmental Protection Act, 2000. However, as the Act is implemented these Councils will start playing pivotal roles. The City and Town councils however have environmental units which focus mainly on health and sanitation issues.

4.3 The World Bank Safeguard Policies

The World Bank safeguards policies (WBSPs) cover ten (10) areas. These are Environmental Assessment, Natural Habitats, Forestry, Pest Management, Safety of Dams, International Waters, Indigenous peoples, Involuntary Resettlement, Cultural property and Disputed Areas. With regards to the current study, the relevant areas of the WBSPs are (i) Environmental Assessment (OP 4.01), which deals with project screening; and (ii) Involuntary Resettlement (OP 4.12) which deals with impacts due to land acquisition.

According to the screening criteria of the WB as well as that in the schedule of the Sierra Leone Environmental Protection Act, 2000, the following classifications exist.

Projects are classified into category A if they are likely to have significant adverse impacts that are sensitive, diverse, or unprecedented, or that affect an area broader than the sites or facilities subject to physical works.

The impacts of category B projects are site-specific in nature and do not significantly affect human populations or alter environmentally important areas, including wetlands, native forests, grasslands and other natural habitats. Few if any of the impacts are irreversible and in most cases mitigation measures can be designed more readily than for category A projects.

In practice, therefore, the significance of impacts, and the selection of the screening category depend on the type and scale of the project, the location and sensitivity of environmental issues, and the nature and magnitude of the potential impacts.

The features of the present project are such that the potential negative impacts of the project are site-specific, minimal and can be mitigated more easily (Category B).

According to the project description, no new construction of health care facilities will be undertaken only existing facilities will be rehabilitated, and there will be development of new sanitary landfills.

The component that deals with the technical programmes will not purchase insecticides for outdoor or indoor spraying for vector control regarding malaria. With regards to the sanitation components, the project will not purchase disinfectants.

In light of the above, the project is not likely to have any adverse impacts on the environment or if any, such impacts are likely to be manageable.

The National Environmental Action Plan (NEAP) also covers activities related to mitigation measures, monitoring and Institutional strengthening. The mitigation and monitoring plans for this current EA study is provided in the annexes.

The World Bank's OP 4.12 Involuntary Resettlement provides for, among other things, the preparation of a Resettlement Policy Framework (RPF) in the event that future project activities involve land acquisition, which may lead to loss of incomes or assets among the affected population. **Such an RPF has been prepared as a separate document in light of the development of sanitary landfills planned under the proposed project. This RPF would also apply to other project activities that might involve land acquisition.**

5. 0 METHODOLOGY AND TECHNIQUES USED IN ASSESSING AND ANALYZING THE IMPACTS

5.1 Sampling

According to project documents, two stages were involved based on the following clusters: -

Stage 1 - Districts
The first stage of stratification – the four participating districts to deliver health services and implement key programme activities under the project was purposefully and very specifically pre-selected by MOHS and agreed upon with the World Bank.

These are:

- Moyamba district
- Kono District
- Bombali District
- Koinadugu District

These districts reflect a homogeneous setting in terms of socio-economic activities.

Stage 2 - Chiefdoms
This stage involved the villages/settlements in which Community Health Centres (three in each of the above districts) in areas of project influence. The DHMTs using the criteria agreed upon with the WB and the MOHS team provided the respective district lists of proposed community health centres.

Both primary and secondary data were collected.

The secondary data was collected from the Ministry of Health and Sanitation, NGOs and other organisations.

The primary data collection was undertaken primarily to provide field data to enable the consultants to fulfil the objective of the study. Secondly, it was used to cross check some of the information gathered from secondary sources.

The information collected was used to assess the potential environmental and social impacts of the components of rehabilitation activities and redeployment of health personnel.

5.2 Environmental analysis

The environmental analysis covered the issues as provided in the Draft-Terms of Reference (DTOF).

Data collection

Both primary and secondary data were collected.

Primary data

Site visits

Visits to the identified sites were conducted. Structured questionnaires were administered. The information was related to the following issues: -

- Assessment of potential environmental and social impacts of rehabilitation activities in the rural.

- Assessment of the environmental and social impacts of increased provisions of water supply and sanitation facilities.
- Assessment of the need for liquid and solid waste collection, disposal and management
- Assessment of the existing capacity to implement and management plans under the proposed project.

Secondary data

Desktop research and visits

Information on previous and related assessments was collected from various sources/institutions (e.g. Ministry of Health and Sanitation and NGOs) to complement the present assessment.
The information sought was related to the following: -

- Biophysical characteristics of the environment in the rural area/urban areas covered by the project
- Review of the social legislation with regard to resettlement
- Review of the national environmental policies, legislation regulatory and
- Administrative framework in conjunction with the WB's safeguard policies.

6.0 CONSULTATIONS WITH AFFECTED PEOPLE

Past situation
Health facilities have been in Moyamba, Kono, Koinadugu and Bombali Districts since the period after independence. The sites where the health facilities were located i.e. hospitals; peripheral health units were initially acquired by the Ministry of Health and Sanitation. However destruction of these health facilities were systematically carried out during the ten-year civil war.

Present situation
The DHMTs of Moyamba, Bombali, Koinadugu and Kono districts in collaboration with Regional Environmental Officers based in Kenema in the east and Port Loko in the north respectively facilitated consultations with communities in the Moyamba, Koinadugu, Bombali and Kono, districts. Structured questionnaires were used to obtain information for the environmental analysis.

The team visited the headquarter town of Moyamba, Koinadugu, Bombali and Kono plus each of the three rural communities (sites for community health centres) in each of the target districts. The principal aim of the visit was to assess the possible potential negative impacts of the project in these towns and villages. On arrival at the various districts headquarter towns and villages, the team held initial meetings with the paramount chiefs or chiefs and elders of the various communities. The administering of the structured questionnaires followed these initial consultations. General meetings involving the old and young including women and local NGOs followed the initial meetings with the elders and chiefs in each of the target communities. *After the opening of each meeting, the EA team asked the people whether they have been officially informed on the potential negative social and environmental impacts of the project*. The reply in all cases was negative. Nonetheless, they said that they were involved in the project development stages. Consequently, the EA team presented the project and described the potential adverse and beneficial effects. It was stressed that the objective of the meeting was to inform and gather information (comments) and that it should be seen as a public hearing where the participants should feel free to come forward with their concerns so

that they can be integrated in the EA report. General discussions were concluded with "Question and Answer" sessions to clarify and note the respective issues and concerns.

Project's Impact Perceptions at the district levels.
Analysis of responses to the administered questionnaires showed that:

1. An appreciable number of those interviewed in the various districts expressed the desire to see the strengthening of their local capacities to handle environmental mitigation plans and activities.
2. The perceptions on environmental impacts of the project amongst the interviewed varied slightly. The majority view seems to be that the project poses little or no treat to the environment. There were those who agreed that some degree of environmental degradation is associated with the project, however, they were of the view that these impacts are manageable.

Below are selected relevant questions and answers at the general meetings.

Q. When will the Project commence?
A. Now, as these consultations are part of the project. However, the actual rehabilitation work will start in January 2003. The project is expected to close in 2006.

Q. With reference to the incinerators, what will the project do about the smoke nuisance and the toxic emissions to air?
A. The incinerators will be appropriately sited and installed with appropriate chimney heights and provided with exhaust gas cleaning devices. The emission will be regularly monitored to assess the effluent quality to control air pollution.

Q. Will any new land be acquired and or will people be displaced by the Project?
A. No new land will be acquired and people will not be displaced only existing structures will be rehabilitated.

Q. Will drugs be given free of costs by the project
A. No. However drugs will be made cheap and made available to the community at the health–care facilities

Each general meeting ended with the understanding that the community could contact the local environmental officers or the EA team should they want to bring up any further issues. The participants seemed to be very satisfied with the information provided.

The purpose of the site visits and meetings were:

1. To acquaint the people with details of the project
2. To educate them about environmental concerns of the project
3. To seek information on potential environmental and social negative impacts of the projects on the communities
4. To assess the capacity for implementation of mitigation and management plans
5. To assess the performance of the various technical programmes.

Land acquisition for landfills was not discussed. However, the Resettlement Policy Framework recently developed, for the project under review, addresses this issue.

7.0 ANALYSIS OF POTENTIAL NEGATIVE AND POSITIVE ENVIRONMENTAL IMPACTS

According to the terms of reference, the EA has identified a number of negative and positive potential environmental impacts of the civil works (rehabilitation) component of the project as well as the potential environmental and social impacts of incinerators and landfill sites on the biophysical environment in the different districts, in both urban and rural areas.

Below are discussed the impacts on land, water and air:

7.1 POTENTIAL IMPACTS ON LAND

- Deforestation
- Loss of biodiversity
- Pollution
- Loss of agricultural land
- Creation of open pits
- Land striping

Deforestation
This is one of the most common environmental problems associated with building rehabilitation and the development of landfill sites. Deforestation is associated with loss of biodiversity and soil fertility. It enhances erosion and affects evapo-transpiration processes and watershed hydrological regimes. Deforestation can also affect or alter the microclimate regime. However, the project under review envisages limited deforestation at potential sites for landfill development. A criterion for the selection, development and operation of landfill sites is annexed to minimise potential negative impacts of the biophysical and social environment.

Loss of biodiversity
The possible impact of the project on biodiversity is mainly related to deforestation and physical landscaping and may be restricted to only the areas of rehabilitation and landfill development. It is therefore site specific and manageable.

Pollution
Pollution can be caused as a result of the abandoning and poor disposal of spoil and paint materials. Dust associated with earth preparation for rehabilitation works can impair the quality of air around the sites. This is also true for open dumping of wastes.

Loss of agricultural land
Agriculture is the dominant economic activity in the rural areas covered by the E.A. The agricultural activities are mostly food and cash crop production. Livestock rearing was at very low ebb at the time of the assessment. The main food crops grown in the EA areas are rice (upland swamp), groundnuts, sweet potatoes, cassava and other assorted vegetables.

The project is preparing a resettlement policy framework, as possible loss of agricultural land may be occasioned as a consequence of land acquisition for the development of sanitary landfill sites.

Creation of open pits
Open pits are often associated with rehabilitation sites. These pits are created during landscaping for construction of building foundations, rehabilitation of toilets and water delivery and storage facilities.

If not well protected, these pits can pose threats to lives, can cause injuries and can also inadvertently serve as rubbish dumps as well as mosquito breeding sites if left to collect water.

Land stripping
The development of landfill sites, rehabilitation of hospitals, health centres and staff quarters would require the clearing of land cover and land stripping. The establishment of foundations for the buildings would require earth removal and soil modification. The environmental

issues relating to land stripping are related to land cover change, dust pollution and noise amongst others. However, the environmental effect of any earthwork associated with the project will be negligible.

7.2 IMPACT ON WATER BODIES

Rehabilitation activities would require water for mortar mixing, bathing, laundering, drinking etc. The clearing and preparation of the land will increase river and stream sediment loadings through soil erosion and transported sediments (dusts). The release of sediments into streams and rivers is likely to have an impact on ecosystems such as mangroves. However the volume of such releases is expected to be so small, and no serious impact on water resources and related ecosystems is expected. Leachates from landfill sites can also greatly deteriorate nearby or underlying water bodies.

7.3 IMPACT ON AIR

The above-mentioned impacts of rehabilitation on land have implications for air quality. When the land cover is removed i.e. forests or vegetation is cleared for building purposes, the soil is exposed to the direct effects of wind. Thus, dust particles can be easily raised and carried about in the air causing short-term respiratory problems for both humans and animals. Land stripping produces a similar effect on air quality of the surrounding areas by causing dusty conditions. No significant impact on air quality due to the project under review is anticipated.

7.4 IMPACT ON THE SOCIAL ENVIRONMENT

Impact on the local economy
In the short term, the influx of job seekers may bring some problems to the local sites, as there will be competition for limited jobs. This will put pressure on the already limited food supply and social services. MOHS will work with local authorities to address these problems and identify possible solutions. To support the overall development of the project areas MOHS will establish working relationships with relevant ministries and development partners to attract development support.

Impact on the affected population
Land acquisition due to the development of landfill sites is likely to affect the surrounding population; potential losses will be addressed in the context of the RPF prepared for the proposed project.

7.5 POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS OF INCREASED PROVISION OF WATER SUPPLY AND SANITATION FACILITIES

Currently in the areas covered by the EA, there are very poor sanitary conditions as well as environmental degradation resulting from unhealthy refuse and excreta disposal system, as well as poor sources of drinking water. The potential negative impact of providing water and sanitation includes unhygienic use of these facilities, which can actually increase disease transmission, as could poor construction techniques, lack of maintenance, and incorrect siting of latrines and wells.

The results of the EA showed that the health status of the communities covered in the EA areas are very low. Water borne diseases are common particularly in areas that derive their drinking water from streams or make use of bush and streams for toilet purposes and sewage disposal.

It is against this backdrop that the increased provision of water supply and sanitation facilities would be seen to have a positive impact, on the communities around the health facilities. Most of the areas covered by the EA reported either having a well or pipe borne water before the rebel assaults. Aside from Gorama Kono chiefdom, all other chiefdoms had wells before the war.

The chiefdoms covered by the EA in the various districts and wards in the Western area reported having pit latrines. They however occasionally use village streams and the bush for excreta disposal. At present over 50% of these latrines were completely destroyed. For the purpose of resettlement and rehabilitation generally there is urgent need of not only restoring the old pit latrine, but also constructing new ones to correspond with the returning population.

Another potential impact of increased provision of water supply and sanitation facilities therefore is the reduction of diseases like malaria, diarrhoea, dysentery, bilharzias, lassa fever, measles, polio, etc

Aside of these positive impacts the project provides for increased provisions of water supply and sanitation facilities. Apart from the overall positive impact of this proposal, the provision will cause an influx of the local people into the proposed project site in order to make use of these facilities. This may lead to conflicts and misuse of such facilities.

It is therefore recommended that the following activities should be embarked upon.

- Mass sensitisations on purpose and use of such facilities
- Community protection schemes for public facilities.

7.6 ACTUAL IMPACTS

Notwithstanding the above general description of the potential environmental impacts, which are likely to result from the project, civil works activities relating to rehabilitation are site-specific. Therefore the actual likely impacts are discussed under the same headings as before.

7.6.1 IMPACT ON LAND

Deforestation
As previously indicated, impact of the project on deforestation will be minimal as most of the project sites visited are occupied by low shrubs and grass.

Biodiversity
Clearing of any piece of land is always associated with loss of biodiversity. The low shrubs and grass are often composed of plants with medicinal potential (medicinal herbs). However, the sites visited are not inhabited by such species.

Loss of agricultural land
In the rural areas where rehabilitation of community health centres is planned, subsistence farming is one of the main preoccupations of the inhabitants. These can take the form of small vegetable gardens. The sites visited have not been encroached upon and therefore no loss of arable land is expected. However, the development of new landfill sites may encroach on agricultural land. This may result in land acquisition. The project under review is developing a resettlement policy framework, which will mitigate the loss of agricultural land.

Creation of open pits

It is expected that open pit associated with the rehabilitation of buildings will be temporarily created but will lose environmental significance once the rehabilitation works have been completed.

Land stripping

The establishment of foundations for the buildings would require earth removal and soil modification. However, these activities will have little impact on land topography as the existing sites for the rehabilitation works are on relatively flat land. However, the environmental effect of any earthwork associated with the project will be more easily manageable.

7.6.2 IMPACT ON WATER BODIES

Rehabilitation activities would actually require water for mortar mixing, bathing, laundering, drinking etc. The clearing and preparation of the land will not significantly increase river and stream sediment loadings through soil erosion and transported sediments, since the rehabilitation works will not be on new sites and or on hilly terrains. Therefore the release of sediments into streams and rivers is not likely to have an appreciable negative impact on ecosystems such as mangroves. However the volume of such releases is expected to be so small, and no serious impact on water resources and related ecosystems is expected.

7.6.3 IMPACT ON AIR

The above-mentioned impacts of rehabilitation on land have implications for air quality. When the land cover is removed i.e. forests or vegetation is cleared for building purposes, the soil is exposed to the direct effects of wind. Thus, dust particles can be easily raised and carried about in the air causing short-term respiratory problems for both humans and animals. Land stripping produces a similar effect on air quality of the surrounding areas by causing dusty conditions. No significant impact on air quality due to the project under review is anticipated.

8.0 THE NEGATIVE ENVIRONMENTAL IMPACTS OF THE TECHNICAL PROGRAMMES OF THE PROJECT

The various technical programmes of the project relate to the control of infectious diseases of high public health importance in Sierra Leone. That is Malaria, TB, and Sanitation. These technical programmes are under the Directorate of Primary Health Care within the MOHS administrative structure, headed by a Director. These programmes are directly related and employ the integrated approach in the implantations of their respective activities.

The wastes generated by these programmes should be disposed of in such a manner, that they would pose little or no threat to the environment. These wastes may include, amongst others, tissue, faeces, chemicals, fluids, needles, bottles, plastics and cans.

The potential negative environmental impacts of these wastes include pollution of the land, water resources and the air. The sanitation programme under the EHD of MOHS has overall responsibility to ensure safe management of wastes in Sierra Leone. ARG, a sub-component of SHARP, which will work directly with MOHS, provides for strengthening of the EHD in the light of its above-mentioned responsibility. See annex IV. SHARP has also developed a medical waste management-training plan and is developing a comprehensive waste management plan with its associated monitoring and mitigation plans. This consultant is involved with these activities, which are financed by SHARP. Since SHARP will become

effective before the HSRDP and both projects will be operating in the same four districts, there is no need for duplication.

8.1 Potential Impacts on Land

In Sierra Leone, mixed solid wastes are either disposed of indiscriminately or at designated open-dumpsites. At present there are no other methods of disposal. Poor disposal practices can lead to unsightly sites, transmission of infectious diseases, as well as the threat of injury to people and animals from needles, broken bottles and cans.

8.2 Potential Impacts on Water Resources

In the regions covered by the present EA, the only available public facilities for water supply are hand-dug and drilled wells, spring boxes and recently, simple gravity systems. Most of these facilities are still in a state of disrepair and the majority of the people rely on natural sources such as streams and rivers.

Ineffective methods of waste disposal can have serious impacts on water resources with undesirable health effects. These effects may range from not only impairing water quality but may also lead to water contamination and subsequent outbreak of water-borne diseases.

8.3 Potential Impact on Air

One of the major scourges of modern life is the rising level of air pollution from various sources.

There are no records or perhaps evidences of serious air pollution in the areas earmarked for this component of the project. However, air pollution should be considered in planning and layout of projects, which are likely to pollute the air.

The direction of the dominant wind is an important parameter in determining project sites or activities that might pollute the air. The present project for which this EA is being done envisages the use of incinerators as a method of disposal of health-care wastes. Incineration is further discussed under section 10.

Research results worldwide have shown that the primary possible sources of environmental contamination with dioxins and furans are waste incineration. It is therefore important, that a programme for air sampling and measurement be considered as a mitigation measure. This is provided for in the SHARP medical waste management plan for Sierra Leone.

8.4 Miscellaneous Impacts

There are a few issues such as noise, dust, visual impact which may require remediation rather than mitigation, none are considered significant, but will be covered within the framework of the National Environmental Action Plan which will ensure appropriate controls and monitoring where necessary.

The EA has also identified a number of impacts due to the planned activities of the project. All the impacts are manageable. This involves the redeployment of health workers in these districts, although no land will be given to them. Other impacts are culturally related in that the rehabilitation process of the hospitals would be a source of temporary employment for the people particularly the youths, as well as providing them with an informal building training experience.

9.0 DESCRIPTION OF THE INSTITUTIONAL ARRANGEMENTS FOR THE MANAGEMENT OF INSECTICIDE-TREATED BED-NETS AND AWARENESS RISING CAMPAIGNS AMONG USERS

9.1 Institutional arrangements

Insecticide-treated bed-nets intended to protect against mosquitoes are donated by UNICEF, WHO, and the World Bank to the Malaria Control Programme of the Ministry of Health and Sanitation. A programme manager, Dr. Sarian Kamara who is based at the national level, heads the malarial control programme.

At the district level, the respective DHMTs appoint, amongst its members, a "Malaria Focal Point" for the district. His/her name is communicated to the programme manager.

At the local level, Bed-net Committees are established within the respective Area Development Committees.

Initially, the nets are stored at the central medical stores at the national level. Respective district and area requisitions are submitted to the managers who subsequently endorse it and make the requisitions to the central medical stores. The District Medical Officer receives the nets. At the chiefdom level, nets are stored at the PHUs.

The community members supervised by the respective programme representatives do the dipping of the nets. The insecticide presently used by the programme is permethrin, a pyrethroid. This is a WHO recommended insecticide for treating bed-nets.

After dipping, the nets are given two marks, firstly they are marked "MCP" with an indelible ink to denote the Malaria Control Programme (MCP). Finally, they are marked with a washable ink indicating, (a) the dipping and (b) re-dipping dates. This second marking helps the programme to check whether nets have been washed. This is ascertained during the routing field checks, done in collaboration with the PHU staff and Area Development Committees.

The programme provides basic sanitation tools (wheelbarrows, rakes, shovels, etc) to the communities.

The nets are sold on a cost-recovery basis to the community supervised by the PHU staff.

9.2 Awareness raising

This starts with a Knowledge, Attitudes and Practice (KAP) survey on malaria within the community. This is followed by sensitisation of community leaders including the Area Development Committee (ADC).

A training of trainers (TOT) is then organised for each community, selecting community members. Topics covered include: -

- What is malaria
- Malaria prevention and control within the community
- Environmental sanitation and malaria control
- Insecticide-treated bed-nets
- Dipping of bed-nets
- Disposal of chemicals/insecticides
- Plan of action

Within the ADC, a bed-net committee is formed. The members hold regular meetings with the net-users.

The programme also organises TV and radio discussions, develops and posts posters in strategic locations and conducts regular health education sessions within the communities.

10.0 MEDICAL WASTE MANAGEMENT AND PREVENTION OF NOSOCOMIAL INFECTIONS

Currently, there are no policy, laws, regulations or guidelines for the management of health-care wastes in Sierra Leone. Up to now, the authorities have had limited knowledge about the characteristics, quantities and qualities of health-care wastes produced in the country. Consequently, specific instructions for the waste handling inside and outside the health-care facilities are unknown. Health care staffs are little conscious about the risks of nosocomial infections; measures to prevent these are rarely enforced. SHARP provides for incineration of medical wastes.

Incineration

This option is chosen for treatment and/or disposal of medical wastes for the project under review. On-site incineration followed by burial of residues (ash) in lined pits is proposed. The incinerators will be installed within the existing hospital compounds; no new land will be acquired for this.

Incineration of medical wastes has the following advantages and disadvantages:

Advantages

- Good disinfection efficiency
- Drastic reduction of weight and volume (up to 5%)

Disadvantages

- Efficiency of chemical & pharmaceutical waste treatment good for rotary kiln, ~ 95% for pyrolytic incinerator, very limited for lower temperatures/
- Toxic emission to air if no control devices
- Maintaining temperature levels (and efficiency) in field incinerators is difficult
- Usually high costs for high temperature incineration

Waste not to be incinerated

- Pressurized gas containers
- Large amounts of reactive chemical waste
- Radioactive waste
- Silver salts or radiographic waste
- Mercury or cadmium
- Ampoules of heavy metals

Social and environmental impacts of Incineration

Smoke nuisance and the generation of toxic emissions into the atmosphere are potential negative impacts of incineration. The ash and wastewater produced by the process also contain toxic compounds, which have to be treated to avoid adverse effects on health and the environment. Consequently, certain precautions must be taken to prevent human exposure and to ensure that the waste is efficiently treated.

Based on the above discussion the following mitigation measure are suggested: -

1. Incinerators should be appropriately sited and installed with appropriate chimney heights to avoid smoke nuisance
2. Exhaust gas cleaning facilities must be installed to minimise or control air pollution
3. Operators must be trained
4. Regular monitoring of flue gas to determine effluent quality.
5. Incineration ash must be deposited in lined-pits within the hospital compound nearby the incinerator and area fenced to allow limited access.
6. Wastes not to be incinerated must be disposed of otherwise or recycled

Nosocomial infections

Concerning prevention of nosocomial infection, there is no systematic approach in the country. Because of the AIDS epidemic there is a growing interest to prevent nosocomial infections. Recently there was a strike of nurses because of poor conditions of service, including the lack of protective medical supplies such as gloves. However there is still lack of consciousness about the risk of contracting infections in the health facilities. Currently, the only preventive measure in case of accidental needle injury is a tetanus injection.

The issue is not easy to address but it is possible. It should start with making people realize the risks of their daily work. Standards and procedures must be developed to handle sharp instruments and soiled materials. Everyone involved in performing surgical procedures should be equipped with proper instruments and protective clothing. Special attention should be given to the lower cadre, because they are often unaware of the risks and are usually neither trained nor do they dispose of proper handling materials or protective clothing. Training materials do exist in appropriate form and can be used with little adaptation necessary.

A comprehensive medical waste management plan prepared under SHARP is annexed for use under the proposed project.

In the action plan, the following issues will be addressed:

- Advocacy at national level to secure government commitment.
- Develop a national policy and regulatory framework on waste management
- Integrate waste minimization into national purchasing policies.
- Make instruments to develop plan of action with practical targets and budget for the health institutions
- Develop educational materials and training modules for:
    a. Health workers;
    b. Medical waste handlers;
    c. Municipal waste handlers;
    d. The population
- Organize training at District and Chiefdom levels for health-care workers and the community on the risk associated with health-care waste and safe management practices, with priority for waste-handlers;
- Make available the materials to facilitate medical waste management.
- Ensure that all health-care establishments segregate their waste into harmful and non-harmful categories;
- Ensure that all health-care establishments implement safe handling, storage, transportation, treatment and disposal options;
- Include health-care waste management and prevention of nosocomial infection into the training curricula of Nurses, Public Health Inspectors, Community Health Officers and Doctors;
- Ensure incinerator flue gas cleaning by installing cleaning devices;
- Ensure routine monitoring of impact through process indicators.

11.0 PROPOSED MITIGATING MEASURES AND COST ESTIMATES

This section attempts to provide a detailed account of measures that shall be adopted to avoid, reduce or remedy all those adverse impacts as identified in the section dealing with environmental and social impacts of the proposed project.

Cost estimates of mitigating measures are annexed.

11.1 Creation of open pits

The borrow pits created as a result of excavation for rehabilitation and other purposes can be refilled after rehabilitation of buildings. Nearby materials, (earth) can be used for this purpose.

11.2 Production of rehabilitation waste materials

A clean up programme will have to be put in place. This should involve the clearing of dangerous materials like nails, pieces of timber, broken blocks, scattered sand and gravel, pieces of iron, mortar mixing waste water, saw dust etc. where recycling or reuse is possible, this should be done e.g. sawdust can be used as manure in the experiment health-facility gardens.

11.3 Loss of biodiversity

Community based tree planting will be undertaken as far as the terrestrial environment is concerned.

11.4 Pollution

This is more relevant at the rehabilitation stage of the project and would be minimised once the health-care facilities become fully operational. Post-rehabilitation materials should be cleared and properly disposed of. Residual paint can be used in arts & crafts classes. Non-lead based paints are recommended in order to further safeguard the health of humans and the environment. Dust pollution should be reduced after post rehabilitation era, through paving of alleys and planting of grass. ***Potential air quality reduction due to incineration should be considered through constant monitoring and cleaning of incinerator flue gas.***

The potential negative environmental impacts of improper healthcare wastes disposal include pollution of the land, water resources and the air. As mentioned earlier, SHARP has developed a medical waste management-training plan and will also develop a comprehensive waste management plan with its associated monitoring and mitigation plans. It will only be reiterated that since SHARP will become effective before HSRDP and both projects will be operating in the same four districts, there is no need for duplication. It is highly recommended that both project reconcile their resources.

12.0 PROPOSED INSTITUTIONAL FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT

The national and local institutional framework for environmental management and protection is the overall structure, which is designed to protect, conserve and restore our environment.

The social structure in each district described earlier is important for the development of environmental management strategy at the local level therefore; any proposed framework should take cognisance of this structure.

Environmental and social management at the local level is for now carried out by Community Based Organisations (CBOs) and Non-Governmental Organisations (NGOs), which operate through local groups, mainly youths. Environmental Management activities are often associated with reforestation programmes, sensitisations and regulation enforcement. These CBOs and NGOs are co-ordinated by the Department of Environment that has posted environmental officers to Northern, Southern and Eastern regions of the country.

At the chiefdom levels the community groups are often empowered to arrest people who degrade the environment and pose a threat to the health and wealth of the community.

The National Environment Protection Board (see section 4) is at the helm of the environmental management in the country and facilitates co-ordination, co-operation and collaboration amongst government ministries, local authorities, international and local NGOs and other agencies. The National Focal Point (NFP), which is the Department of Environment (DOE) acts as secretariat to the Board. The Department of Environment is expected to establish Provincial, District and Chiefdom Environmental Committees to implement policies at the local level.

The proposed framework therefore envisages a bottom – up approach wherein the local communities (rural areas) will be assisted to develop and execute projects related to mitigation measures identified in the EA. The respective District Health Management Teams have agreed to work in collaboration with their District Environmental Officers on this issue. At the project level, environmental management will involve the coordination of activities, which will be taken onboard by the health facilities rehabilitation project management committees, which will include people (one environmental officer per district) knowledgeable in environmental matters. The Environment Ministry has already assigned these trained officers to the respective districts to the respective districts to the respective districts.

13.0 ENVIRONMENTAL AND SOCIAL MONITORING INDICATORS

The EA shows that new land will be acquired for landfill sites, and temporal open pits will be created.

The social indicators include: Employment rates, access to basic social services and economic governance.

Some of the above indicators can be used during the project implementation phase.

These could include but not restricted to:

- Number and size of open pits that can be used during rehabilitation period.
- Amount of agricultural land that will be lost as a consequence of landfill site development.

On the social front the indicators can include:

- Number of labourers employed
- Level of remuneration for employees
- Amount and type of sanitation facilities provided
- Number of local people trained in various skills of rehabilitation during the project

- Types of water-borne diseases prevalent in the areas

14.0 ENVIRONMENTAL AND SOCIAL MONITORING PLANS

14.1 Management Goals and Objectives

The main goal of this plan is to aid the management of hospitals, health centres and other health infrastructure, so that adverse effects on the localities and physical environment and any other adjacent socio-economic activities are minimized.

The objectives of the plans are to:
- Recommend standards and guidelines for rehabilitation activities
- Recommend improvements on the procedures and monitoring.
- Provide a criterion for the selection, development and operation of sanitary landfill sites.

GENERAL RECOMMENDATIONS

1. The E.A. showed that the environmental impacts are manageable, therefore it is recommended that the project as proposed be carried out with the mitigation measures as proposed by this summary report

2. That this report be made available to all stake holders involved in the project.

PERSONS AND INSTITUTION CONTACTED

- The Ministry of Lands, housing, country planning and the environment, at National Level.

- Ministry of Health and Sanitation at National level

- Paramount Chiefs, Elders, general public of target communities and local NGOs of Koinadugu, Moyamba, Bombali and Kono districts.

- The respective District Health Management Team Members.

- Programme Managers of the Malaria Control, Tuberculosis Control, HIV/AIDs and Environmental Health Programmes of the Ministry of Health and Sanitation and their respective District Focal Point Persons in Moyamba, Bombali, Kono and Koinadugu Districts.

- The Regional Environmental Officers.

- World Bank Supervision Mission for the Integrated Health Sector Investment Project – April 15 – 27, 2002.

- Mr. Foday Koroma - Entomologist, MOHS

- Mr Daniel Tholley - Hydro geologist, National Onchocerciasis Control Programme.

REFERENCES

1. National Environmental Protection Act, 2000

2. National Environmental Policy

3. National Environmental Action Plan Vol. I and Vol. II

4. World Bank Safeguard policies (Environmental Assessment (OP 4.01 October 1998)
.
5. Sierra Public Health Ordinance

6. Draft National Environmental Health Policy

7. Health-care waste Management Study for Sierra Leone, November 2001

8. Preserving the environment: a major OCP concern over the past twenty-five years, 2002 World Health Organisation

9. Sierra Leone Health Sector Rehabilitation and Development Project, Project Appraisal Document, November 2001.

10. Sierra Leone Integrated Health Sector Investment Project (IHSIP), Supervision Mission (April 15 – 27, 2002); AIDE-MEMOIRE

ANNEX 1: Mitigation Plan and Estimated

Activity	Objective	Funding Source	Responsible Organisation	Estimated Costs USD	Time Frame	Supervising Agency
Covering up of open pits	To ensure that water born and related diseases are minimised	HSRDP/MOHS	MOHS/Local authorities/ Community groups, Govt. Agencies.	4,000	Construction Phase	Department of Environment
Environmental Education	To ensure community sensitisation and long term environmental management	HSRDP/MOHS	Environmental Officers and DHMTs	40,000	Project Duration	Department of Environment
Conduct Capacity Building Workshops	To train Environmental Health Officers on Environmental protection issues.	HSRDP/MOHS	-Do-	20,000	-Do-	Department of Environment
Tree Planting	To restore the aesthetic value of the environment	HSRDP/MOHS	The Communities	4,000	-Do-	Department of Environment
Develop 4 district sanitary landfill sites	To ensure safe disposal of wastes	HSRDP/MOHS	Environmental Officers and DHMTs	190,000	2003	Department of Environment
Community Participation	**To ensure waste are transported to the 4 district landfill sites**	**Respective District Communities**	**Respective District Communities**	**40,000**	**Project Duration**	**Environmental Health Division**
Construct 4 Incinerators and lined ash pits	To ensure safe disposal of the infectious medical wastes	HSRDP/MOHS	Environmental Officers and DHMTs	23,000	2003	Department of Environment
Technical Assistance to advice on landfills and environmental issues	To ensure proper siting, development and operation of landfill sites	HSRDP/MOHS	Environmental Officers and DHMTs	10,000	2003	Department of Environment
Train EHO on operation and maintenance of incinerators in 4 districts	To ensure efficient operation and maintenance of incinerators	HSRDP/MOHS	Environmental Officers and DHMTs	19,000	2003	Department of Environment
Empty septic tanks and lined ash pits	To avoid overflowing of sewage and ashes	HSRDP/MOHS	Environmental Officers and DHMTs	20,000	Project duration	Department of Environment
Monitoring and supervision	To assess status and supportive supervision	HSRDP/MOHS	Environmental Officers and DHMTs	20,000	Project duration	Department of Environment
			Total USD	**390,000**		

NOTE: $40,000 will come from community participation and $350,000 from HSRDP

Annex 2 - Monitoring Plan

Activity	Technical Details	Parameters To be Measured	Methods to be used	Sampling Locations	Frequency Of Measurements	Institution for implementation	Institution for monitoring implementation	Duration	Costs Estimates in USD.
Water quality Tests	Relates to pollution/ Contamination	Chemical and micro organisms	Laboratory and physical analysis	Landfill effluents and potentially affected watercourses	Monthly	Public Health Laboratory	Environment Officers NAS/ARG/EHD	2003-2007	78,600
Air Quality analysis	-Do-	Odour, visibility, chemicals	Visual observation and laboratory analysis	Construction Sites, incinerator-chutes	Daily for odour and visibility, and monthly for air analysis	Public Health Laboratory	Environment Officers NAS/ARG/EHD	2003-2007	117,000
Soil analysis	-Do-	Chemical and micro organisms	Laboratory and physical analysis	Construction and landfill sites	Monthly	Public Health Laboratory	Environment Officers NAS/ARG/EHD	2003-2007	156,000
								Total USD	**351,600**

NOTE: THESE ACTIVITIES ARE TO BE FUNDED BY SHARP

Annex 3 - Medical Waste Management ACTION PLAN FOR THE FOUR SHARP DISTRICTS

No.	ACTIVITY	2002	2003	2004
1	Strengthen Environmental Health Division	X	X	
2	Adapt modules for nosocomial infections		X	
3	Adapt modules for medical waste management		X	
4	Training of Trainers and District Supervision		X	
5	Training on nosocomial infections		X	
6	Training on medical waste management		X	
7	Preparation of a national plan for medical waste management	X		

NOTE: THESE ACTIVITIES ARE TO BE FUNDED BY SHARP

Annex 4: CRITERIA FOR SECLECTING, DEVELOPING AND OPERATING SANITARY LANDFILL SITES.

A sanitary landfill is a contained and engineered structure, which leads to anaerobic biodegradation and consolidation of compacted waste materials within confining layers of compacted soil. In a sense, a sanitary landfill is a bioreactor. At a sanitary landfill, there are no nuisance impacts of constant burning, smoke, flies, and unsightly rubbish heaps. However, because the waste is not exposed to rainfall, surface runoff or groundwater, leachates consists largely of the waters generated during biodegradation. Therefore, leachates generated from a sanitary landfill is typically much more concentrated in organics and metals than the leachates generated from an open dump, often by a factor of more than 10, and thus needs to be properly treated. Similarly, because of the anaerobic nature of decomposition, methane is generated and needs to be properly ventilated.

Sanitary landfills located in arid areas with limited potential infiltration may have more relaxed design requirements than those located in wet areas. Similarly, sanitary landfills located on coastal lands underlain by naturally undrinkable groundwater may have more relaxed design requirements than those in inland areas overlying potential usable groundwater regimes.

In summary, as described below, a sanitary landfill design would need to have structural integrity over the long term, provide for daily cover of fresh waste, and incorporate mitigating measures to manage leachates and gas produced within the landfill cells.

A Sanitary landfill is a step-by-step construction activity involving daily layering, compacting, and soil covering of waste into cells. The site should not be subject to seasonally high groundwater levels or to periodic flooding. The site preparation and landfill operations must be designed to minimize contact of surface runoff and percolating rainwater with the waste. This requires diversion of up gradient surface drainage away from the landfill operational area, sloping of the cells to avoid ponding of waters on top of them, and compaction of waste and soil as each cell is being constructed so that infiltration potential is minimized.

At sites where potentially usable groundwater exists in unconfined layers, any rain and surface runoff waters, which percolate through the waste and become contaminated leachates, need to be collected. The leachates collection system consists of a network of perforated pipe within a gravel bed, which is placed over the landfill liner. At a minimum the liner would consist of a layer of impermeable clay soil placed in thin layers at optimum moisture content and compacted with a roller. At large landfills receiving municipal waste for major metropolitan areas or at co-disposal landfills where hazardous waste quantities could be received in significant quantities, additional liners made from impermeable geomembrane material may be necessary to protect sensitive groundwater resources. The landfill liner and the leachates collection network need to be properly sloped to enable gravity flow of contaminated water to treatment ponds.

The ponds would be designed to encourage anaerobic decomposition, followed by aerobic decomposition. To the extent possible, full evaporation in the final pond is desired so that no discharge of treated effluent is necessary. If full evaporation is not possible, recycling of treated effluent back to the landfill (on the completed areas of fill), discharge to a sewage treatment plant, or tanker haul to a sewage treatment plant is recommended. Discharge to surface water is not acceptable unless the treated effluent can be assured of not having a significant adverse impact on the water quality requirements of the receiving water.

In addition to leachates management, landfill gas management is a critical component of every sanitary landfill design. Minimum requirements are that the landfill gases would need to be properly ventilated. During site preparation, the landfill side slopes are lined with impermeable clay to curtail lateral migration of the gases, and then lined with coarse rock or gravel to allow gases to escape to the atmosphere. Within every 0.1 hectare, or less, of the waste cell development area, landfilling would be conducted around a gas ventilation structure consisting of either a perforated pipe packed in gravel or a rock-filled wire mesh enclosure.

Construction of a sanitary landfill occurs in regular phases, over the life of the site. At the start of construction, the access road, entrance gate, weighbridge, fencing, water supply and Phase I waste cell areas are constructed. Leachates treatment facilities to handle flows generated at the peak period over the life of the site are constructed from the onset. Once the capacity of the Phase I waste cell area is nearly utilized, the Phase II waste cell area requires site preparation and construction (i.e., the Phase II liners, leachates collection networks, gas ventilation systems etc). And so on, over the life of the site, until each Phase of the landfill is completed. Each Phase typically has 3 to 5 years of waste capacity.

Each sanitary landfill is uniquely designed to conform to the soil, geologic, topographic, and water resource conditions of the site. To minimize the costs of operating a sanitary landfill, the first and most critical step is proper siting in a location, which enables economic operations and cost-effective environmental protection. Also, proper siting is essential to minimizing the cost of waste collection.

The following site selection criteria are provided as guidance. A proposed landfill site can be selected even though it does not meet each of the screening criteria. Engineering design can mitigate inadequate site conditions, but at a cost. When selecting a site, which does not meet all of the screening criteria, possible engineering solutions, which would bring the site into conformance with the intent of the unmet criteria, shall be incorporated in the design. Criteria, which shall be addressed as part of a screening process, neither includes, but is not limited to, the following:

- Adequate land area and volume to provide sanitary landfill capacity to meet projected needs for at least 10 years.
- A site accessible within 30 minutes travel time (a function of road and traffic conditions) is to be sought, even if it means buying land, because of the need to avoid adversely affecting the productivity of collection vehicles. At distances greater than 30 minutes travel, for collection operations to be economic, investment in either large capacity collection vehicles (5 tons. per load or greater) or transfer stations with large capacity vehicles (20 tons. or greater) would be necessary.
- If transfer stations are necessary, landfill sites should be accessible within 2 hours travel time one-way from the transfer station.
- Groundwater's seasonally high table level (i.e., 10 year high) is at least 1.5 meters below the proposed base of any excavation or site preparation to enable landfill cell development
- Soils above the groundwater's seasonable high table level are relatively impermeable (preferably, less than 10^{-9} meters/second permeability when undisturbed).
- No environmentally significant wetlands of important biodiversity or reproductive value are present within the potential area of the landfill cell development, unless they have adequate capacity to absorb/assimilate the pollution loadings anticipated.
- None of the areas within the landfill boundaries are part of the 10-year groundwater recharge area for existing or pending water supply development.
- No private or public drinking, irrigation, or livestock water supply wells within 500 meters down gradient of the landfill boundaries, unless alternative water supply sources are readily and economically available and the owner(s) gives written consent to the risk of well abandonment.
- No known environmentally rare or endangered species breeding areas or protected living areas are present within the site boundaries.
- No significant protected forests are within 0.5km of the landfill cell development area.
- No major lines of electrical transmission or other infrastructure (i.e., gas, sewer, water mains) are crossing the landfill cell development area, unless the landfill operation would clearly cause no concern or rerouting is economically feasible.
- No underlying limestone, carbonate or other porous rock formations which would be incompetent as barriers to leachates and gas migration, where the formations are more than 1.5 meter in thickness and present as the uppermost geologic unit.

- No underlying underground mines which could be adversely affected by surface activities of landfilling, or mines resources, which could be rendered less accessible by landfilling, unless the owner(s) gives explicit consent.
- No residential development within 0.25km from the perimeter of the proposed landfill cell development.
- No visibility of the proposed landfill cell development area from residential neighbourhoods within 1km. If residents live within 1km of the site, landscaping and protective berms would need to be incorporated into the design to minimize visibility of operations.
- No perennial stream within 0.03km down gradient of the proposed landfill cell development, unless culverting or channelling is economically and environmentally feasible to protect the stream from potential contamination.
- No significant seismic risk within the region of the landfill, which could cause destruction of berms, drains or other civil works, or require unnecessarily costly engineering measures.
- No fault lines or significantly fractured geologic structure within 0.5 km of the perimeter of the proposed landfill cell development, which would allow unpredictable movement of gas or leachates.
- Topography amenable to development of sanitary landfill by the Cell (Bund) and/or Trench method. The Area method is not preferred because of its higher energy and soil cover requirements.
- Availability on-site of suitable soil covers materials to meet the needs for intermediate (minimum of 30cm depth) and final cover (minimum of 60cm depth), as well as bund construction (for the Cell method of landfill). Preferably, the site would also have adequate soil to also meet daily cover needs. However, daily cover (usually a minimum of 15cm depth of soil) needs can be alternatively met by using removable tarps or by removing the previously laid daily soil cover at the start of each day for reuse at the end of the same day. For purposes of this siting, assume that at least 1 cubic meter of daily, intermediate, and final soil cover is needed for every 10 cubic meters of compacted waste.
- No Siting within 3 km of a turbojet airport and 1.6 km of a piston-type airport. For sites located more than 3 km and less than 8 km from nearest turbojet airport (or more than 1.6 km and less than 8 km from the nearest piston-type airport), no consideration is to be given unless the aviation authority has provided written permission stating that it considers the location as not threatening to air safety.
- No siting within a floodplain subject to 10-year floods and, if within areas subject to a 100-year flood, must be amenable to an economic design, which would eliminate the potential for washout.
- Avoid siting within 1km of socio-politically sensitive sites where public acceptance might by unlikely (i.e., memorial sites, churches, schools).
- Area accessible by a competent paved public road, which can accommodate the additional truck traffic without significant effect on traffic flow rates. From the public road into the site, the access road to be constructed should be less than 10km for large landfills serving metropolitan areas and less than 1km for small landfills serving secondary cities.

Sierra Leone

HIV/AIDS Response Project (SHARP)

&

Health Sector Reconstruction and Development Project (HSRDP)

Waste Management Plan

OCTOBER 2002

By
John Tommy

Table of Contents

ACRONYMS

ADA	Area Development Association
ADC	Area Development Committee
ARG	Aids Response Group (ARG)
CBO	Community Based Organisation
DHMT	District Health Management Team
EA	Environmental Assessment
EHD	Environmental Health Division
NEPA	Environmental Protection Act
EPD	Environment Protection Department
FCC	Freetown City Council
MLHCPE	Ministry of Lands, Housing, Country Planning and the Environment
MOHS	Ministry of Health and Sanitation
NaCSA	National Commission for Social Action
NGO	Non Governmental Organisation
NMCP	National Malaria Control Programme
OCHA	Organisation for the Coordination of Humanitarian Assistance
OCP	Onchocerciasis Control Programme
SHARP	Sierra Leone HIV/AIDS Response Group
WB	World Bank

Preface

This Waste Management Plan (WMP) is prepared in accordance with the requirement of the World Bank for the Sierra Leone HIV/AIDS Response Project (SHARP) and Health Sector Reconstruction and Development Project (HSRDP). This plan is intended for both projects.

This plan is prepared as a guideline for all those involved in the implementation of SHARP and HSRDP, this includes primarily the Ministry of Health and Sanitation (MOHS), National HIV/AIDS Secretariat (NAS), Health Sector AIDS Response Group (ARG) local and foreign NGOs and the private sector who would participate in the implementation of the projects, especially the SHARP. It describes the general waste management issues (with particular emphasis on healthcare waste) in Sierra Leone, objectives and implementation strategy for all institutions and persons to be involved and available inputs and resources to successfully implement the plan in an efficient and effective manner over the next 5 year period.

The content of this document is subject to change during implementation depending on the implementation experience, problems faced and changes in strategies. However, amendments/additions to the document will be subject to the MOHS, NAS and the World Bank's agreement.

2. Executive summary

The medical waste study (November 2001) established the need to for a comprehensive waste management plan for Sierra Leone.

Healthcare waste is total waste stream from Healthcare-Waste (HCW) generators, major and scattered sources. It may be **solid** (hazardous or non-hazardous) or **liquid**

SOLID WASTE - Typically composed of,

1. 75-90% is general waste similar to domestic waste and may follow the normal municipal waste stream.
2. 10-25% is hazardous (infectious, toxic, etc) and must be segregated and treated with care to prevent associated risk. This category of waste can be subjected to incineration under supervision by trained staff.

Presently these categorises are mixed together and disposed of indiscriminately. The resultant negative consequences cannot be overemphasised. Hence, there is need for this Comprehensive National Medical Waste Management Plan for Sierra Leone.

This action plan for all levels, from chiefdom to national is part of the Sierra Leone Government's process of developing a HIV/AIDS Response Project (SHARP) and a Health Sector Reconstruction and Development Project (HSRDP). It was executed on behalf of the Ministry of Health and Sanitation, Sierra Leone.

Current situation

From a health and environmental point of view, the following summarized problems were identified.

- Lack of policy, legal framework, guidelines and effective control
- Lack of focused health education and staff training, concerning waste management, particularly medical wastes.
- Deficiency of appropriate equipment and materials.
- Unhygienic handling of wastes within hospitals, posing a threat to health of personnel, patients and visitors.
- Improper handling of wastes by waste handlers, exposing these wastes to scavengers, and causing a serious threat not only to their own health but also to that of the general public and the environment.
- Open dumping and or burning.

Plan of implementation

1. Advocacy at national level to ensure government commitment and financial support,
2. Train staff of the environmental health division in supervision,
3. Develop modules for training; the prevention of Nosocomial infections and healthcare waste management,
4. Training of Trainers (TOT) for all levels,
5. Organize training at District and Chiefdom levels for healthcare workers on the risk associated with Nosocomial infections and the preventive measures,
6. Organize training at District and Chiefdom levels for waste-handlers.

Strategies

- Strengthen the Clinical Waste and Occupational Safety Unit of the EHD
- Advocacy at national level to secure government commitment.
- Develop a national policy and regulatory framework on waste management
- Integrate waste minimization into national purchasing policies.
- Make instruments to develop plan of action with practical targets and budget for the health institutions
- Develop educational materials and training modules
- Organize training at District and Chiefdom levels for healthcare workers and the community on the risk associated with healthcare waste and safe management practices, with priority for waste-handlers;
- Make available the materials to facilitate medical waste management.
- Ensure that all healthcare establishments segregate their waste into harmful and non-harmful categories;
- Ensure that all healthcare establishments implement safe handling, storage, transportation, treatment and disposal options;
- Include healthcare waste management and prevention of Nosocomial infection into the training curricula of Nurses, Public Health Inspectors, Community Health Officers and Doctors;
- Ensure routine monitoring of impact through process indicators.

Key partners in the implementation of this plan include but not limited to: Ministries of Health and Land, Housing, and the Environment, non-governmental organizations, and waste producers. The target groups are health workers, medical waste handlers, scavengers, municipal waste handlers, managers of healthcare institutions and the general public.

The EHD of MOHS has the statutory responsibility for the safe management of waste (including medical) nationwide. Presently, medical wastes are mixed with municipal waste and disposed of indiscriminately. The existing system of municipal waste collection (public skips and skip trucks) in Freetown has been appraised (Freetown Waste Management Study, June1995) as economical. It should be improved and elaborated to ensure the safe management of healthcare waste and replicated in the Districts.

A combination of both sanitary landfill and incineration is considered for the comprehensive waste (municipal and healthcare) treatment and or final disposal option for the Sierra Leone situation.

New land will be acquired for purposes of District landfill sites development; hence involuntary resettlement of relocated socio-economic activities (farming, societal bushes etc) is possible. Consequently compensation will be inevitable. There is no national policy on involuntary resettlement, however, HSRDP is developing one for Sierra Leone, which can be of benefit to this project.

3. Introduction

3.1 The country (post-conflict situation)

The ten-year old conflict (1991 to 2001) has been accompanied by a deterioration of the health status of majority of Sierra Leoneans. The Human Development Report, July2000, estimates a life expectancy of 37.9 years. Sierra Leone ranks last in the world in quality of life with a per capita income of US$448.

The healthcare delivery system is divided into National, District, and Chiefdom levels. The epidemiological picture is characterised by a high prevalence of communicable diseases like malaria, respiratory tract and skin infections. There is an explosion of sexually transmitted infections, and data trends suggest an emerging epidemic of HIV/AIDS. According to Ministry of Health and Sanitation sources, over half the healthcare facilities country-wide do not function due to a variety of reasons that include damaged infrastructure, lack of staff, lack of drugs, and medical supplies. The Ministry of Health and Sanitation expects that the thrust of their activities for 2002 will be targeted at rehabilitating the devastated healthcare services, and extending them to newly accessible areas countrywide.

Large and small healthcare facilities, home healthcare, drug users, as well as research and industrial operations generate medical waste. It presents a high risk to human health and the environment because of the hazardous and infectious characteristics of some of its components. The patients and the personnel who handle the waste inside share these risks. Outside the healthcare establishments, the risks are increased due to the non-homogenous nature and the presence of sharp objects such as syringes and scalpels; blades or broken glass that may cause infected injuries. Please see Annex 1(Tables of Healthcare Facilities in Sierra Leone).

3.2 Sierra Leone HIV/AIDS Response Project (SHARP)

The Sierra Leone HIV/AIDS Response Project will assist the Government of Sierra Leone organize a response to the growing Human Immunodeficiency Virus (HIV) which causes the Acquired Immune Deficiency Syndrome (AIDS), in short HIV/AIDS. In accordance with the main goal of the SHARP the development objectives of this four-year project in Sierra Leone are to (a) contribute to reducing HIV/AIDS prevalence and (b) mitigate the impact of HIV/AIDS on persons infected or affected by HIV/AIDS. It will do so through a multi-sector approach, facilitating activities undertaken in various sectors by public and private organizations, and by communities in the fight against HIV/AIDS. Project-supported activities will complement government, donor, and private sector initiatives. These activities will vary by sector and the specific partner, but will be consistent with the national policy against HIV/AIDS, and premised on the development and expansion of local responses to the epidemic.

In collaboration with other members of the International Partnership Against AIDS in Africa (IPAA), the project will help step up and mainstream the national response against HIV/AIDS, and an array of related infections, including sexually transmitted infections (STIs), Tuberculosis (TB), and other opportunistic infections. The Government of Sierra Leone (Ministry of Development and Economic Planning), UN Theme Group on HIV/AIDS and regional officials of UNAIDS worked closely in the development of this effort and see it as an integral part of the common effort. Thus the project will address HIV/AIDS prevention, care, and support, as well as impact mitigation at the national and sub-national levels. Emphasis will be on prevention among youth,

women of child-bearing age, orphans and other vulnerable children, and groups that are particularly vulnerable to HIV/AIDS, including sex workers, the military and ex-combatants, internally displaced people, and refugees.

The proposed project will finance the full spectrum of HIV/AIDS activities including prevention, care, support, and impact mitigation over a four-year period. It will have four components: (1) capacity building, policy coordination and refugee activities; (2) multi-sector responses to HIV/AIDS prevention and care; (3) health-sector responses to HIV/AIDS, STI/TB and other opportunistic infection management, including prevention, care, and support; and (4) civil society initiatives (including communities, NGOs, religious groups and the private sector). These activities will take into account the existing conditions and level of capacity at each administrative structure (national, regional, district, and chiefdoms).

3.3 Health Sector Reconstruction and Development Project (HSRDP)

The project's overall development objective is to help restore the most essential functions of the health delivery system. The project will also help achieve the more specific objectives of:

(a) Increasing access to affordable essential health services by improving primary and first referral health facilities in four districts of the country.

(b) Improving the performance of key technical programs responsible for coping with the country's major public health problems.

(c) Strengthening health sector management capacity to improve efficiency and further decentralize decision-making to the districts.

(d) Supporting development of the private health sector and involvement of the civil society in decision-making.

The first specific objective is limited in scope to the four Districts, which met specific selection criteria (such as importance to the demobilization, resettlement and peace processes; magnitude of the public health problems; clear need to rehabilitate the delivery of services, etc.). Within these four districts, the project focuses on the rehabilitation of priority health facilities, and on support for the delivery of affordable and good quality care by all health facilities of these districts. Through its second specific objective, the project will contribute to reducing the burden of the most important infectious diseases countrywide (i.e., by supporting Malaria, and TB control activities and the Sanitation program). The third specific objective aims to improve efficiency and make decisions in the health sector more responsive to the needs of the population by supporting district health teams country-wide and five key services of the MOHS (i.e., Human Resources Development; Planning, Monitoring and Evaluation; Financial Management; Procurement; and Donor and NGO coordination). The fourth specific objective will improve the quality of services by enacting legislation promoting the private sector, providing incentives to the health providers to establish practices in rural areas and smaller cities, contracting out clinical and non-clinical services with the private sector, and by involving the civil society in decision making in the health administration and in health facilities.

3.4 Project Description

Within the SHARP Project, this study aims to address the Healthcare waste management in Sierra Leone, under the following specific tasks,

Task I:

- Assess the policy, legal, Administrative, as well as the Regulatory Framework concerning health-care waste management and treatment/destruction facilities in Sierra Leone;
- Identify functioning healthcare facilities under Government authority in the country and provide basic information for each facility, such as number of beds, bed occupancy rate, divided into categories: national hospitals, regional hospitals, municipal hospital, military hospitals, private clinics and laboratories, and secondary health-care facilities.
- Assess the healthcare waste generation at (i) Connaught hospital (ii) one major regional hospital (iii) one district hospital, and (iv) one private clinic. To the degree available, details

should include the minimum weight of total generated waste at each healthcare facility per week. Composition of the waste should be determined through segregation at the waste end point. Provide an extrapolation of the results to cover the entire country based on agreed assumptions.

- Assess the level of scavenging, recycling taking place inside healthcare facilities; along transportation routes, and at final disposal sites. Identify social issues in relation to scavenging taking place.

Task II:

- Review existing training and public awareness programs on healthcare waste management in hospitals, other healthcare establishments and municipalities and prepare training needs assessment. This would be based on discussions with relevant authorities and personnel to incorporate their views and concerns. Working in conjunction with the relevant Government institutions and municipal councils, prepare a draft-training programme for health-care institutions and municipal councils.
- Taking into account the IEC/BCC HIV/AIDS strategy work being developed under Sierra Leone HIV/AIDS Response Project and other IEC/BCC efforts, suggest themes and modalities for HIV/AIDS/STI waste awareness campaign programme to reach the general public, health-care workers, dumpsite managers, military personnel, scavengers/pickers families and street children.

Task III:

- Review existing waste management technologies and discuss alternative technologies; storage, transportation, treatment and or final disposal.

Task IV:

- Discuss appropriate waste disposal sites

3.4.1 Methodology

For the purpose of data collection, the following selected health-care facilities were investigated. (1) Connaught hospital (main referral hospital), (2) Port Loko district hospital, (3) Moyamba district hospital, (4) Bo district hospital, (5) Kenema district hospital, (6) George Brook Community Health Centre, (7) Macauley Street Satellite Clinic, and (8) the Brookfield community hospital (Private).

To provide basic data for the study, the following activities were performed:

- Assessment of existing policy, legal, administrative, as well as the regulatory framework concerning health-care waste management and treatment/destruction facilities.
- A survey on generation, collection and disposal of health-care wastes, and the Knowledge, Attitudes and Practices (KAP) of relevant staff concerning hospital waste management from seven-selected health-care facilities was executed. The selected health-care facilities were (1) Connaught hospital (main referral hospital), (2) Bo district hospital, (3) Port Loko district hospital, (4) Moyamba district hospital, (5) Kenema district hospital, (6) George Brook Community Health Centre, (7) Macauley Street Satellite Clinic and (8) Brookfields community hospital (Private).
- Meetings with concerned authorities and hospital officials were held with the following programme.
  (a) Discussion of the structure of the Ministry of Health and Sanitation with specific reference to Hospital Waste Management.

(b) Current management of waste inside the health facilities with special emphasis on equipment, regulations and training of personnel.
(c) Current management of hospital waste outside the hospital, focusing on storage places, transportation and disposal.

- Meetings were organised with health authorities, municipal councils, community leaders, heads of healthcare training institutions, military and police personnel: (a) to discuss develop a training assessment programme and (b) to determine IEC/BCC messages and the most suitable modalities for communicating such messages.

3.5 Health Care Waste Management (HCWM) policies practice and challenges

3.5.1 Policy, Legislations and Control

The Ministry of Health and Sanitation has the executive authority for waste management, inside as well as outside the healthcare facilities, in Sierra Leone. The Environmental Health Division of the ministry currently has the direct responsibility of waste management in the country.

Presently, a "Legal Unit" does not exist within the ministry to formulate, promulgate and implement new legislation for the handling and disposal of health care wastes.

There is currently no policy on healthcare waste management in Sierra Leone. However, the ministry's Environmental Health programme has developed a draft Environmental Health policy as an addendum to the existing National Health Policy. Section 3 of the draft policy deals with sanitation of healthcare facilities in general, and clinical waste management in particular. *It states "clinical waste are special and should be separated from other rubbish, protected from foraging animals (including humans) and vermin and properly disposed of at a convenient distance from the health care establishment".*

The draft policy list as goals:

1. Constant maintenance of special care and concern for clinical wastes,
2. Effective destruction of all clinical wastes.

The priorities set are as follows:

1. All discarded human and animal tissues should be effectively buried deep in the earth daily.
2. All health care institutions should identify a site for incineration of all clinical wastes.
3. Such sites should be at a distance so that fumes, smoke and other toxic gases do not pose health hazards to the persons working at or using the services of the facility or those staying in the vicinity.
4. Clinical wastes, including human tissues, discarded dressings, used syringes, needles, blades etc., should be protected from foraging animals and vermin.
5. Such special concern should be manifested in all areas of health care institution/office.
6. Once a day, or at other regular intervals not longer than once a week, the collected material should be properly disposed of.
7. Expired drugs should be returned to the Directorate of Drugs and Medical supplies for efficient technical destruction.

With regard to existing laws, the topic of safe healthcare waste management is not specifically dealt with in either the Public Health Ordinance Act No. 23 of 1960 or the Environmental Protection Act No.2 of 2000, now in force. However, the Public Health Ordinance specifically deals with the control of infectious patients and the materials associated with them. Sections 44 and 45 of the ordinance make provision for temporary and permanent isolation accommodation of infectious patients for the following reasons.

- To control the movement of patients in order not to spread the infection through their coming into contact with healthy persons.

- To control any waste matter produced by the infectious patients.

Section 50 (1) specifically deals with premises, clothing, bedding, etc., that are infected by an infectious disease patient. It reads:

"Subject to the provision of Section 57, a Medical Officer of Health, being aware of, or reasonably suspecting, the presence of a notifiable disease in his area, may by notice in writing order the evacuation, disinfection, fumigation or demolition of any infected premises or any premises reasonably suspected of being infected; or the disinfection, fumigation or destruction of such articles, including bedding and clothing, as he may suspect as infected.

Provided that no premises shall be demolished unless they are of temporary construction, or are so dilapidated, or in such disrepair that efficient disinfection is impracticable".

The Environmental Protection Act, like the Public Health Ordinance does on specifically deal with healthcare waste. However, Section 2 makes provision for the establishment of an Environmental Protection Board, Section 34 deals with Environmental standards and states that the Minister may by statutory instrument make regulation establishing national environmental standards for waste amongst others.

Also Section 35 which deals with Toxic and hazardous substances makes the following provisions:

(1) The Minister may on the advice of the Board prescribe activities or substances, which shall be considered hazardous.
(2) The Minister shall take all necessary and appropriate measures to monitor, control and regulate the manufacture, sale, transportation, handling or disposal of toxic and hazardous substances, including toxic and hazardous wastes.
(3) The introduction or importation of toxic or hazardous wastes into Sierra Leone for storage or disposal by any means whatsoever is prohibited.
(4) The possession, introduction or importation into Sierra Leone of internationally banned chemicals or substances is prohibited.
(5) The discharge of any toxic and hazardous substance into the air or in, or under the land and waters of Sierra Leone is prohibited.
(6) Any person who contravenes the provisions of subsection (3), (4) or (5) commits an offence and is liable on conviction to a fine not exceeding two million leones or to a term of imprisonment not exceeding two years or to both the fine and imprisonment.

The Environmental Protection Board, which is Multisectorial, has recently been established in the Ministry of Lands and the Environment.

There are yet no other laws, bylaws or regulations dealing with healthcare waste management in Sierra Leone. In the same manner, there are no proper control systems for hospital waste management.

A survey executed in eight selected healthcare facilities in Sierra Leone revealed that **the Ministry of Health and Sanitation does not exercise full control over non-governmental or private hospitals**. Likewise, in the hospitals themselves no internal regulations for the nursing and environmental health staff exists on how hygienically and sanitarily to identity and handle hospital-specific wastes.

3.5.2 Hygiene Standard of the Healthcare facilities

There is no organised and effective waste handling and disposal system in the healthcare facilities visited. However, with the exception of Port Loko hospital which practice open burning of its wastes, NGOs have introduced some form of waste segregation and treatment in all the other facilities visited by providing sharp boxes and plastic buckets for other infectious wastes, and low-scale incinerators. Unfortunately, these facilities are not properly and effective utilised. Mixed wastes can be seen in the plastic buckets and storage drums or open storage points outside the hospital.

All the facilities have malfunctioning water tanks, some out of order and not supplying water to the buildings, others too small or rusting. The septic tanks require a clean out and rehabilitation.
In cases where toilets (WCs and pit latrines) do not function, patients and visitors have to defecate in the hospital compounds.

Steps are now being taken to rectify this situation in the western area. A "Feasibility and Design Study" has been completed and tender documents for the rehabilitation works is currently in active progress. The African Development Bank is funding the rehabilitation of the three government hospitals (Connaught, P. C. M. H, and Children's) plus five Community Health Centres (Cline town, Ross Road, Jenner Wright, Kissy, and Regent).

The new direction of the government healthcare delivery system focuses on the development of preventive services while simultaneously strengthening the existing health delivery system. Sanitary healthcare waste management is a very important preventive service.

3.5.3 Communicable Diseases in Sierra Leone

The last statistical National Medical report was published in 1983. There is hardly any centralised data collection, which can be used for decision-making purposes. Consequently, no statistical data of communicable diseases exist at present.

According to the Ministry of Health and Sanitation, the major causes of morbidity and mortality in Sierra Leone are infectious/communicable diseases, the most common of which are the following:

- Malaria
- Hepatitis
- Respiratory infectious
- Meningitis
- Diarrhoea, Cholera
- Typhus and Para typhus
- Tuberculosis
- Worm Infection
- Infectious skin diseases
- Poliomyelitis
- HIV/AIDS
- Measles

Most of these diseases can be transmitted by unhygienic waste handling, not only in the healthcare facilities amongst the patients and staff, but also in the surrounding community, if the waste is exposed openly to visitors, scavengers of waste and animals. To prevent and control these infectious diseases, effective and safe healthcare waste management is essential.

3.5.4 Existing Waste Management Practices

Inside the Healthcare facilities

The current hygiene standard of waste handling inside the visited HCFs is, compared with the international standard, very low and a cause of great concern. The wastes from the operating theatres, patient wards and laboratories are not collected in one-way receptacles such as bags or containers, but directly in waste or used cardboard boxes without any plastic bags placed within the receptacle to prevent its contamination as they are reused.

Due to the lack of regulations and control, the hazardous infectious wastes are disposed of together with the normal waste. There is no segregation of the waste in the patient wards, and syringes and needles are not separated either.

The interviewed nurses and cleaning staff in the visited hospitals showed very little knowledge of the risks which improper handling of hospital wastes constitutes to them and to the patients, and are not instructed and trained in this area.

After being collected in unsuitable receptacles, the infectious and hazardous waste is handled and transported in the hospital by untrained porters who bring them to general on-site treatment and disposal points or transfer area in the case of Connaught hospital. Therefore, the waste transporting personnel are also highly exposed to health risks.

The on-site storage and disposal areas are located inappropriately, with access for unauthorized personnel. Patients, visitors and animals have the possibility of coming in contact with dangerous items, as there is no effective and conscientious separation of infectious sharp or pointed articles

In all of the HCFs visited, the lack of rules and standard procedures for regulating management of the waste generated could be observed. The interviewed hospital staff displayed only limited knowledge of the topic in hand, and the lack of standards, awareness, and proper allocation of resources subject both patients and HCF staff to otherwise avoidable risks. These risks take the form of:

- Use of inappropriate receptacles without lids and without bags.
    - General lack of hygiene; failure to disinfect receptacles.
    - Loose collection of disposable syringes with attached needles and other contaminated sharp objects.
    - Complete lack of packaging materials for waste transportation.
    - Internal transport of waste under unhygienic and unsanitary conditions.
    - Improper disposal of hazardous radioactive waste.

3.5.5 Outside the Healthcare facilities

Off all the eight HCFs visited, only Connaught hospital and other government healthcare institutions in Freetown store their wastes in open public skips (dustbins) which are collected by EHD skip-trucks for off-site final disposal. This service is currently contracted in Freetown, Bo, and Kenema, supervised by the Environmental Health Division of the Ministry of Health and Sanitation (MOHS).

The staff employed to drive the vehicles as well as to manage the open dumpsites have neither the training nor adequate equipment to deal with waste of a hazardous natures, such as infectious HCF waste.

Wastes generated in the healthcare facilities are mostly stored in open drums or areas of MOHS container (Connaught) located within the compound. The storage places are not covered by a shelter or secured by a fence in any of the visited facilities.

The skip (Connaught) is the same as used for carting household waste with a volume of $5m^3$ slightly conical shaped and open. Due to the active prevalence of scavengers and animals, the contents were seen strewn all over the place. This is true of all the Healthcare facilities visited.

The container (Connaught hospital) is transported to the landfill site by a skip-truck without taking the precaution of covering the top. The potential danger of this situation cannot be over-emphasized.

At the open dumpsites, the content of these containers is dumped on the top together with the other municipal garbage. There is no specific location at the dumpsites for infectious waste, and there is no special treatment before or on arrival. The dumpsites are not restricted areas; scavenger activity is in evidence.

Apart from Connaught, all the other Healthcare facilities (7) visited use on-site facilities. They store their wastes in drums without tight-fitting covers; located outside the wards or dump their wastes either on the ground or behind the wards, or burn them either in pits or low-scale incinerators. It is not uncommon to find animals, scavenging in that unsanitary garbage. The drums are emptied either directly into the incinerators or on the ground nearby when the incinerators are either filled or non-functional.

Apart from Connaught hospital and George Brook Community Health Centre, all other HCFs visited have lined pits for the disposal of incinerator ashes. Unfortunately, save for Moyamba hospital, all the other pits are filled with all sorts of HCWs and are over spilling.

During the course of the survey, most of the health institutions reported that hospital wastes such as human body parts, placentas and deceased foetuses are routinely buried. This method of disposal is either done by the hospitals themselves on hospital premises or by relatives in certified burial sites such as cemeteries and is traditionally interned. However, noteworthy is the statement of a landfill supervisor that this type of waste also finds its way to the MOHS garbage containers.

The incinerators at all the visited HCFs, except at Port Loko District hospital which does not have one, show signs of deteriorations.

In summary, infectious and hazardous waste as well as human body parts are collected, transported and disposed off (on-site) together with common waste, exposing it to unauthorized persons and to animals at the storage, treatment (incineration) and disposal sites. Only in Freetown is medical wastes transported off-site to open dumpsites. All district facilities visited practice on-site waste management, which requires a lot of improvement in segregation, storage, transportation, treatment and or final disposal.

3.5.6 Water Supply and Sanitation

Healthcare waste is total waste stream from Healthcare-Waste (HCW) generators, major and scattered sources. It may be **solid** (hazardous or non-hazardous) or **liquid**

Solid Waste - Typically composed of,

- 75-90% is general waste similar to domestic waste and may follow the normal municipal waste stream.
- 10-25% is hazardous (infectious, toxic, etc) and must be segregated and treated with care to prevent associated risk. This category of waste can be subjected to incineration under supervision by trained staff.

Presently these categorises are mixed together and disposed of indiscriminately. SHARP will initially provide incinerators for the four-SHARP District and has funded the development of this Comprehensive National Medical Waste Management Plan for Sierra Leone.

Sanitation - Liquid waste mainly composed of,

1. Used water (Sullage) which are presently led into open drains that ends in either soak-away pits or nearby grass fields as the case may be.

2. Sewage (water fouled with excreta) from water closets, which are led into septic tanks followed by soak-away pits.

***Latrines* - t**oilet facilities in the hospitals are generally inadequate and there are signs of unsightliness**.** An endemic problem in the healthcare facilities visited seems to be the with the wastewater systems. Clogged sewage pipes and open drains cause permanent unsanitary conditions. Sewage and sullage over-flowing, offensive odour, and mosquito breeding are evident. Cause for the clogging is the improper disposal of wastes, which are sometimes flushed down the water closets.

We presently have three types of latrines for excreta disposal in our healthcare facilities. These are:
1. Traditional Pit Latrines
2. Ventilated Improved Pit (VIP) Latrine
3. Septic Tank System (water closet – septic tank – soak-away pit)

Freetown (capital city) and the District Hospitals have a combination of 3 plus 1 or 2 above. The Peripheral Health Units have either 1 or 2 or both as the case may be.

Toilet facilities are inadequate and there are signs on unsightliness. An endemic problem in the healthcare facilities visited seems to be the wastewater systems. Clogged sewage pipes cause permanently unsanitary conditions, sewage over-flowing from septic tanks, offensive odour, and mosquito breeding. Cause for the clogged sewage pipes is, in most cases, improper disposal of wastes, which for the lack of receptacle are sometimes ignorantly flushed down the water closets

The septic tanks are desludged by means of Sucker Trucks and the sludge is eventually either emptied in Sludge Polders were available or grass fields away from the community, for drying. Generally, sewage is led into a septic tank, from where the effluent ends into clogged soak-away pits. However, emptying and cleaning of these septic tanks are not performed regularly, reducing the effect of their treatment function to practically zero. *They're no central sewage systems throughout the country.*

Water Supply - Unlike hospitals in Freetown, which are connected to public water mains, district hospitals have, hand-dug wells fitted with electric lift-pumps to overhead storage tanks. The water yield of the wells does not meet the daily water needs of the healthcare facilities. There are problems with storage tank leaks due to rust**.**

3.5.7 Awareness and Training on medical waste

The staffs at the hospitals are little conscious about the risk associated with medical waste and/or nosocomial infections; measures to prevent these are rarely enforced. In the wards or outside the facility, they do not segregate wastes. Waste handlers are not provided with protective clothing (gloves, mask, boots, apron and overall).

Investigations reveal that there is no specifically structured training and awareness on medical waste management in the country. The following institutions exist for the local training of Healthcare personnel in Sierra Leone:

- College of Medicine and Allied Health Sciences; trains Medical Doctors
- Paramedical School; trains Community Health Officers
- National School of Hygiene; trains Public Health Inspectors
- School of Midwifery; trains Nurse Midwives
- Dispensing Technician School; trains Pharmacy Technicians
- MCH Programme; trains Maternal and Child Health Aides and Traditional Birth Attendants

Meetings with the respective heads of these institution reveals that Healthcare waste management is not elaborated in any of their curriculum/syllabuses.

Instruction and Training of Personnel

The first and most important step towards sanitary waste management inside the hospitals is to settle the matter of responsibilities.

Each healthcare facility should have a Public Health Inspector to be responsible for the hygiene of the entire hospital activities, which naturally includes the waste management inside the HCF area. This responsible person must be endowed with the necessary authority to carry out this task. He has to supervise and must have the right and duty to report directly to the Medical Superintendent.

It has been previously stated that untrained personnel directly involved in handling hospital solid wastes are exposed to a high risk of infection, which is extended to patients and other health personnel. Training, together with proper equipment for collection and transportation, is the only way to improve the present unsanitary conditions.

Not only doctors and nurses, but also all the hospital staff has to be made aware of the hazards of mishandling hospital wastes. They must be able to recognised the types of waste and know how to handle each type correctly.

The self-learning process is recommended for medical staff training. This is elaborated in annex 6.

IEC/BCC Messages

The following messages were determined at meetings with Health Educationists, National AIDS Control Programme Staff and other related partners:

1. Make sure that clean needles are used for injections.
2. Unclean needles and syringes transmit deadly diseases like AIDS.
3. Put sharps into sharp boxes for disposal.
4. Dispose of used condom in a safe manner to prevent access to children.
5. Exposure to hospital waste can make you sick.
6. Always put on gloves, overalls, and boots ad mask when handling medical wastes.
7. Mark your segregated wastes as infectious and non-infectious for easy identification.
8. Put infectious wastes in yellow plastic bags and normal wastes in black plastic bags.
9. Picking in hospital wastes exposes you to deadly diseases.
10. Never re-open sealed infectious waste bags.
11. HIV can be transmitted when the skin is cut or pierced using an unsterilised needle, razor blade, knife or any other tool.
12. Store all infectious waste in sealable containers.

The following strategies could be employed to implement the above.

1. Advocacy at national level
2. Community meetings
3. Radio and television discussions
4. Workshops and seminars
5. Newspapers and leaflets

The following methods can be considered for public education on risks, waste segregation, or waste disposal practices;

- Poster exhibitions on healthcare waste issues, including the risks involved in scavenging discarded syringes and hypodermic needles.
- Explanation by staff of healthcare establishment to incoming patients and visitors on waste management policy. This may be difficult to achieve, in which case the distribution of leaflets, TV and radio discussion should be considered.

- Information poster exhibitions in hospitals, at strategic points such as waste bin locations, giving instructions on waste segregation. Posters should be explicit using diagrams and illustrations to convey the message to as broad an audience as possible, including illiterate people.

Training Plan of action

- Assess and establish training needs.
- Adopt modules for nosocomial infections and medical waste management.
- Train District trainers and develop District and Chiefdom level training plans.
- Secure training materials.
- Plan and organise District and Chiefdom level training.

3.5.8 Healthcare facilities

According to MOHS' Directorate of Planning and Information, there are currently 32 and 417 functioning Hospitals and Peripheral Health Units (PHU) in the country; as detailed in table below.

The Peripheral Health Units according to the MCH/EPI Programme Manager, Dr. A. L. Seisay, and his programme has an operational policy to ensure that all PHUs are equipped with incinerators and staff train to manage medical waste. All sharps will put in sharp-boxes for final disposal.

Table Showing the Number and Distribution of Functioning Hospitals and Peripheral Health Unit as of 6-Jan-02

	Hospitals				PHUs
Region/Districts	**Tertiary**	**Secondary**	**Total**	**Total Beds**	**Total**
Sierra Leone	**9**	**23**	**32**	**2622**	**417**
Eastern Province	**1**	**2**	**3**	**425**	**67**
Kailahun	0	0	0	0	5
Kenema	1	2	3	365	52
Kono	0	0	0	60	20
Northern Province	**0**	**5**	**5**	**446**	**121**
Bombali	0	1	1	60	6
Kambia	0	0	0	0	20
Koinadugu	0	1	1	100	15
Port Loko	0	3	3	286	40
Tonkolili	0	0	0	0	40
Southern Province	**1**	**4**	**5**	**501**	**149**
Bo	1	0	1	334	50
Bonthe	0	2	2	64	18
Moyamba	0	1	1	60	51
Pujehun	0	1	1	43	30
Western Area	**7**	**12**	**19**	**1207**	**80**

Infectious waste classification and generation

A classification of hospital wastes has been worked out for the special needs of Sierra Leone according to the kind of treatment and disposal they require.

Classification

Type A: **Normal Waste similar to domestic waste**
Type B: **Patient's waste requiring special management within the hospital**
Type C: **Infectious Waste requiring special management inside and outside the hospital**
Type D: **Human Parts requiring special treatment for ethical reasons**
Type E: **Other Hazardous Waste similar to industrial wastes**
Type F: **Recyclable material**
Type G: **Sludge from the hospital wastewater treatment plant**.

Generation

For the purpose of estimating the amount of infectious waste (Types C and D) that would requires special care for the country, the adopted unit values from Ghana will be considered for this project under the current situation.

- Waste Types A and B 1.20 kg/bed/day
- Waste Type C 0.15 kg/bed/day
- Waste type D 0.05 kg/bed/day

- **Specific weight of waste Type A, B and C 200 kg/m^3**

Taking into account the above-listed unit values, the total amount of wastes Types C and D in the respective districts considered are estimated to come to:

Waste Type C

1. Port Loko District
268 beds x 0.15 kg/bed/ day x 7 days 300 kg/week
2. Koinadugu District
100 beds x 0.15 kg/bed/ day x 7 days 105 kg/week
3. Bombali District
60 beds x 0.15 kg/bed/ day x 7 days 63 kg/week
4. Kenema District
365 beds x 0.15 kg/bed/ day x 7 days 383 kg/week
5. Kono District
60 beds x 0.15 kg/bed/ day x 7 days 63 kg/week
6. Bo District
334 beds x 0.15 kg/bed/ day x 7 days 351 kg/week
7. Bonthe District
64 beds x 0.15 kg/bed/ day x 7 days 67 kg/week
8. Pujehun District
43 beds x 0.15 kg/bed/ day x 7 days 45 kg/week
9. Moyamba District
60 beds x 0.15 kg/bed/ day x 7 days 63 kg/week
10. Western Area (Freetown)

1207beds x 0.15 kg/bed/ day x 7 days — 1267 kg/week

Waste Type D

1. Port Loko District
268 beds x 0.05 kg/bed/ day x 7 days — 100 kg/week

2. Koinadugu District
100 beds x 0.05 kg/bed/ day x 7 days — 35 kg/week

3. Bombali District
60 beds x 0.05 kg/bed/ day x 7 days — 21 kg/week

4. Kenema District
365 beds x 0.05 kg/bed/ day x 7 days — 128 kg/week

5. Kono District
60 beds x 0.05 kg/bed/ day x 7 days — 21 kg/week

6. Bo District
334 beds x 0.05 kg/bed/ day x 7 days — 117 kg/week

7. Bonthe District
64 beds x 0.05 kg/bed/ day x 7 days — 22 kg/week

8. Pujehun District
43 beds x 0.05 kg/bed/ day x 7 days — 15 kg/week

9. Moyamba District
60 beds x 0.05 kg/bed/ day x 7 days — 21 kg/week

10. Western Area (Freetown)
1207 beds x 0.05 kg/bed/ day x 7 days — 422 kg/week

These estimates will assist in determining capacities of incinerator required for the respective Districts.

Wastes Type E (hazardous wastes) has not been separately collected up to now. Only after implementing a new classification and separation of all wastes generated in the hospitals can practicable give information on this waste fraction be obtained.

Waste receptacles and collection

According to the investigations made at the hospitals, one of the main problems of hygienic waste handling is the lack of appropriate receptacles. In nearly all cases, infectious waste together with syringes and needles, etc. are openly collected and transported in open buckets, intended for the cleaning service but not for infectious hospital waste handling.

Therefore, thorough attention has to be given to providing the hospitals with adequate equipment for the collection of the waste.

- Waste type A and B can be handled as is done now, drums and plastic buckets with tight-fitting covers respectively.
- The collection and transport of Waste Types C and D must be improved substantially.

In areas where waste of Type C is generated, metallic circular bag-holders with lid shall be employed. In these bag holders, polythene bags should be provided. For better identification the bags should be coloured, and sharp and pointed objects such as syringes blades or glass must be collected in puncture-resistant containers (sharp boxes) before being disposed of in the bags.

The filled bags should be closed off using plastic strips, which, once fastened in place, should not be reopened. Then, they are removed from the bag holder and placed at the transfer area for their removal by the collection service direct to the disposal sites. Neither re-use of the disposable receptacles nor compression of the waste is permissible.

The most appropriate receptacles for waste Type D (human body parts) are conical shaped plastic buckets with a hermetically sealing plastic lid and a handle for easy handling. If, for economic reasons, it is not possible to acquire this type of receptacle, plastic bags can be used as for the waste Type C. They must have a different colour so that the collection service can distinguish them.

A general upgrading of the hospital's internal collection equipment (bins, carts, storage areas and protection equipment, etc.) is recommended.

Transport and Storage in the Hospital

The waste has to be removed each day from the transfer areas and taken to a storage place. Rubber-wheeled carts with a bin made of plastic or non-rusting metal should be used for this should have a smooth surface for easy cleaning and disinfecting. Moreover, the dimensions must be appropriate for easy manoeuvrability along the route to be followed inside the hospital.

The storage of the different types of waste has to be done in the corresponding places according to the following requirements.

- Solid waste types A and B should be deposited in the containers used for domestic refuse.
- Waste Type C should be deposited in a special storage room to which only authorized personnel have access.
- Waste Type D should be immediately transported to a cemetery and buried as existing cultural practices demands.
- Waste Type E must be stored according to the regulations for industrial hazardous waste.
- Radioactive wastes must be stored in a radiation-safe place until their radioactivity has decreased to the point where they are no longer considered radioactive, and then disposed of according to the instructions given by authorized officials.

In none of the visited hospitals was there an appropriate room for the storage of the waste Type C. Therefore, in most of the hospitals remodelling will be necessary.

Treatment of Waste

The management of the hospital wastes outside the hospital depends on the kind of treatment they have to undergo:

- Waste Types A and B, normal waste and patient's waste can be transported and disposed of together with other urban waste, once they have been removed from the hospital premises.
- Wastes Types C and D, infectious waste and human body parts, require special transport and treatment, which will be described further.
- Waste Type E, other hazardous waste, must be disposed of according to the regulations for industrial hazardous waste.

Treatment of hospital waste means any method, technique or process designed to change the biological character or composition of any regulated medical waste so as to reduce or eliminate its potential for causing disease.
Regarding the adequate sanitary disposal of healthcare waste as a treatment method, and by considering the specific needs and possibilities for Sierra Leone, only two technical alternatives can be taken into consideration for waste Type C:

1. Incineration (modern for regional referral hospitals and improvised for District hospitals and PHUs)
2. Controlled disposal in sanitary landfills

Controlled disposals in sanitary landfills have the following reported advantages

- It is a recognised and proven method of deposal of this waste category
- The technology is applicable to all infectious wastes and does not require pre-processing of the waste.
- The control is easy and evident
- It is the most economic method.

However, current practices (open dumping) at the existing dumpsites (Freetown, Bo, and Kenema) militate against this option for the time being. Consequently, and taking into consideration the dangers associated with healthcare waste and in particular HIV, HBV, and HCV transmissions, incineration followed by ash burial in lined pits within the compound should be improved and promoted. Nevertheless, since typically almost 80% of the total wastes generated by healthcare institutions are generally comparable to domestic wastes, sanitary landfill is inevitable. Consequently, the existing (4) open dumpsites should be upgraded to sanitary landfills and new sanitary landfills developed in every district currently without one. This will then allow for the landfilling

of those categories of waste that should not be incinerated. Recommended criteria for the selection, development and operation of sanitary landfill sites are attached as annex 6.

As outlined earlier, infectious hospital waste Type C can be buried at sanitary landfills, provided the following precautions are taken:

- The hospital waste must be transported to an already filled-up area of the sanitary landfill. This landfill, or at least the selected area, should be fenced in so that it will have restricted access.
- The hospital waste has to be dumped directly from the truck into the pit without any handling by labourers.
- The same excavation material from the pit must cover it immediately, preferably.
- The areas where infectious wastes have been buried must be marked and documented to avoid re-opening by further disposal of hospital wastes.

Instruction and training of solid waste personnel, as described in this report, must also be extended to the personnel working on the sanitary landfill.

3.5.9 Legal Requirements

Legislation

There is a lack of legislative framework, by-laws and guidelines for the management of hospital wastes in Sierra Leone. The objective should be to set up a legal structure that will be maintained and updated by a Ministry of Health and Sanitation legislation unit. By-laws or regulations on the following themes should be laid down.

- Precise definition of all terms to describe the management of hospital waste
- Classification of hospital wastes
- Internal management of solid waste in health care institutions
- External management of solid waste from health care institutions
- Guidelines for the section of hospital solid waste-handling equipment and materials
- Determination of responsibilities
- Fines and penalties for non-compliance.

The general guidelines for the management of healthcare wastes is attached as annex 7

Control Institutions

Legislation alone is a useless instrument without an official organ to monitor compliance and the power to enforce it by punishing non-compliance

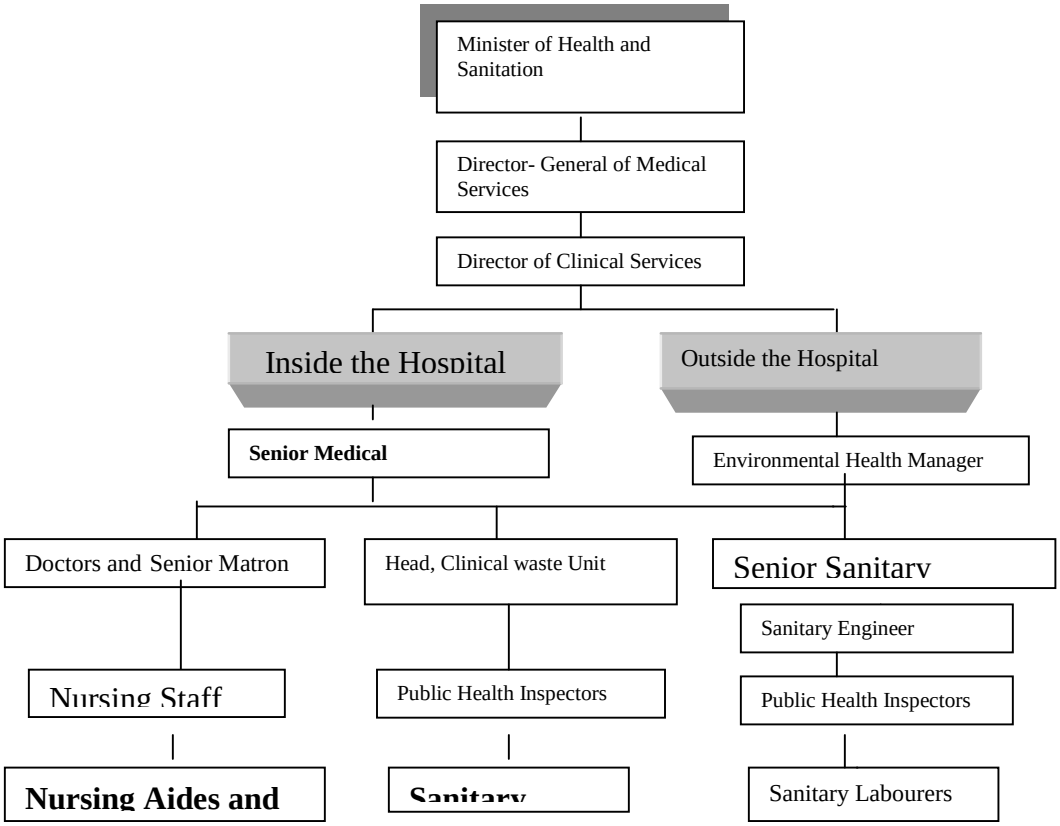
Therefore, an effective control system of the hospital waste management must be established. As described before, it can be organised on two levels.

1. Responsible self-control by a qualified member of their own staff for the executing institutions, the hospitals for sanitary hospital-internal handling, and the Environmental Health Division for the management outside the hospital. This should cover collection transportation, treatment and disposal.
2. Official control by health inspectors of the ministry who should exercise control over governmental, private and mission operated health care institutions and has the legal power to caution and/or punish.

3.6 Existing institutional arrangements

3.6.1 Structure of Government Health Authority

STRUCTURE OF CONTROL – RESPONSIBLITIES OF WASTE MANAGEMENT



***Minister of Health and Sanitation*:** *She is the head of the ministry and responsible for the formulation of policies and legislation.*

Director-General of Medical Services: *He is the professional head of the ministry and adviser to the minister on all professional matters.*

Director of Clinical Services: *He is one of the two Deputies and assists the Director-General Medical Services with his functions, with particular reference to clinical services.*

Senior Medical Superintendent: *He is the overall head of the hospital administration and reports to the Director-General Medical Services. He is therefore also head of the hospital waste management. He supervises the day-to-day running of the hospital, and the doctors as well as the senior matron reports to him. In turn, the matrons, nurses and ward staff report to the doctors and the senior matron.*

Environmental Manager*: He is the head of all public health inspectors based in the hospital. He assigns the health inspector to exercise hospital waste handling. All public health inspectors are in theory, controlled by the Chief Health Superintendent. In practice, they are supervised by the respective senior medical superintendents in hospitals were public health inspectors are posted.*

Senior Sanitary Engineer: *He heads the Waste Management Unit within the MOHS. He and his staff are currently responsible for the sanitary transport and disposal of all (municipal and hospital) wastes disposal in the country.*

3.6.2 Healthcare Institutions

The Healthcare institutions in Sierra Leone can be divided into five groups on the basis of the mode of management and ownership.

1. Government

Government healthcare facilities (hospitals, health-centres, and clinics) are the most extensive of these groups. These comprise a network of institutions spread throughout the country. The functionaries that run and administer these institutions are directly employed and remunerated by the Government of Sierra Leone through the Ministry of Health and Sanitation. The effects of National Health Policy and activities are most significantly felt in these institutions.

Government health institutions are sub-divided into four groups.

1. Referral Hospitals (secondary at district levels and tertiary at regional levels).
2. Community Health Centres
3. Maternal Child Health Posts
4. Community Health Posts

Items 2, 3, and 4 above constitute the Peripheral Health Units.

2. Industry

Industrial Hospitals and Clinics are healthcare facilities usually established and administered by specific industrial enterprises. Even though they are subject to overall National Health Policy guidelines and regulations, they are to all intents and purposes autonomous. The staff are employed and remunerated by the respective industries. Unlike government hospitals that cater to the general public, industrial health care institutions usually only service employees of the respective industries and dependent relatives.

3. Missions

These were established and run by religious groups. Their staff are employed and remunerated by these Missionaries. In general, they are subject to national health policy conditions and regulations. Their clientele include members of the general public.

4. Defence (Military and Police) and Education

The ministries of defence and education run these as the case may be. The clientele of these hospitals in principle comprise members of the Sierra Leone Military, Police, Educational Institutions and their dependant relatives. Government pays the bulk of the staff in these hospitals.

5. Private Organizations

Next to government-run organizations, private healthcare facilities comprise the bulk of support in Sierra Leone. Due to their higher quality of services rendered or provided, they cater to the most privileged members of the Sierra Leone community. Individual doctors or associates thereof mainly own these health institutions. The administration is autonomous, and they pay their own staff. They are operated very often without subventions from external sources, and they charge cost-covering fees for their services.

4. The HCWM Plan

4.1 Plan description

4.1.1 Goal and objectives

The overall goal is to establish a comprehensive system of waste management in Sierra Leone in order to improve public health and reduce environmental impacts from handling of healthcare waste (municipal and healthcare) by its proper disposal.

Objectives:

1 To improve the management of wastes in all healthcare institutions
2 To support private initiative (Private sector and NGOs) in safe healthcare waste management
3 To raise awareness of managers, health staff (public, private and NGO) and the general public about the importance of safe management of healthcare waste.
4 To develop the institutional capacity of EHD in the safe management of healthcare wastes

Problems/Issues	Objective to be achieved
1. Lack of policy, legal framework, guidelines, and effective control. 2. Deficiency and lack of appropriate technology, equipment and materials 3. Lack of Advocacy, focused health education and staff training, concerning hospital waste management	To improve the management of wastes in all healthcare institutions
1. Private not motivate 2. Lack of compliance	To support private initiative (Private sector and NGOs) in safe healthcare waste management
1. Unhygienic handling of wastes within the hospitals, posing a threat to personnel, patients, and visitors 2. Lack of training	To raise awareness of managers, health staff (public, private and NGO) and the general public about the importance of safe management of healthcare waste.
1. Improper handling of wastes outside the institutions, exposing these wastes to scavengers, and causing a serious threat not only to their own health but also to that of the public and the environment.	To develop the institutional capacity of EHD in the safe management of healthcare wastes

4.1.2 Target groups and benefits

Target groups	Benefits
1. Health staff	• Existing Health staff trained on medical waste • Safe management of healthcare waste • Safe environment (land, water, and air) • Prevention and control of disease transmission
2. Private healthcare institutions	
3. Healthcare training institutions	
4. Waste Handlers	
5. Landfill staffs	

6. General Public 7. Scavengers	• Healthy Population • Economic Growth • Improved life expectancy

Amongst the priority health problems of Sierra Leone are malaria and water/sanitation related diseases. These diseases can be transmitted by unhygienic waste handling, not only in the healthcare facilities amongst the patients and staff, but also in the surrounding community, if the waste is exposed openly to visitors, scavengers of waste and animals. To prevent and control these infectious diseases, effective and safe healthcare waste management is essential. Regarding the lack of appropriate waste management policies and legislation, the EHD of MOHS should develop these instruments through a collaborative workshop involving all stakeholders including the Law officers department. The ensuing ordinance should be enacted and enforced by the public health inspectors through sanitary courts established by law.

4.1.3 Key interventions (activities) per objectives and performance indicators

Objectives	Activities/Actions to be undertaken to achieve the objective	Key performance indicators
1. To improve the management of wastes in all healthcare institutions	1.1 Equip all healthcare facilities with appropriate equipments and material for collection of healthcare waste. 1.2 Equip all healthcare facilities with appropriate facilities (trolleys, waste bags, sharp boxes and bins and skips) for medical waste management. 1.3 Provide adequate and wholesome water supplies in all facilities 1.4 Provide wheelbarrows for all healthcare facilities for transportation to medical wastes to incinerators 1.5 Construct adapted incinerators for District hospitals and PHUs 1.6 Equip personnel involved in medical waste management with adequate and sufficient protective clothing (boots, gloves, nose masks, overalls, etc)	**Process/outputs** By the end of the project: -All healthcare wastes are collected and Disposed in a safe and environment-Friendly manner - All personnel involved in medical Waste management must possess Appropriate safety equipment in all Public and private healthcare Facilities. - A national policy for healthcare waste Management is developed - The public health ordinance is Reviewed, enacted and enforced. **Outcome:** - All healthcare facilities (public, Private and NGO) possess equipment for Waste storage. - All healthcare facilities (public, Private and NGO) has dust bin for Storage of normal waste within their Compound - All healthcare facilities has equipments For safe internal transportation of their Waste - All Referral and regional hospitals Has modern incinerators - All District hospitals and PHUs has Improvised incinerators.
2. To support private initiative (Private sector and NGOs) in safe healthcare waste management.	2.1 Private and NGO healthcare Facilities manage their waste in a safe And environment-friendly manner. 2.2 Private and NGO healthcare Facilities provide protective clothing For their waste handlers 2.3 Private and NGO healthcare facilities Train their staffs and sensitise patients And visitors on risks	**Process/outputs** - The private sector and NGOs are Motivated and pay more interest in Medical waste management **Outcome:** - All private and NGOs healthcare Facilities manage their waste in a safe And environment-friendly manner. - All private and NGOs healthcare Facilities provide protective clothing for Their medical waste handler.
3. To raise awareness of managers, health staff (public, private and NGO) and the general public about the importance of safe management of healthcare waste.	3.1 To train health staffs (private, public And NGO), Trainer Trainers, Paramedics, and sanitary worker in Healthcare facilities. 3.2 To sensitise patients and the general public	**Process/outputs** - Personnel involved in are conscious of The risk related to medical waste, Appropriate behaviour and practices in Their handling and are capable to Formulate internal strategies for safe Medical waste management. - Training modules on medical waste **Outcome:** - All medical and paramedical staff Trained in medical waste management - All aides, cleaners and maintenance Staffs are sensitised about medical Waste management - At least 90% of the population are Sensitised about risk related to medical Waste management.

4. To develop the institutional capacity of EHD in the safe management of healthcare wastes	4.1 Design and or adapt an improvised incinerator 4.2 Design and or adapt tools for the pre-collection of medical wastes in healthcare facilities 4.3 Elaborate internal guidelines for medical waste management 4.4 Develop a healthcare waste management policy 4.5 Review and update Public Health Ordinance 4.6 Enact and enforce the Public Health Ordinance 4.7 Rehabilitate existing dumpsites to sanitary landfills 4.8 Construct new sanitary landfills 4.9 Provide technical and training assistance 4.10 Overseas Training 4.11 Strengthen the Pubic Health Laboratory at Connaught Hospital	**Process/outputs** **- Tools and appropriate infrastructures** **Are elaborated, tested, evaluated and** **Installed in healthcare facilities.** **- Programme activities are prepared,** **Formulated, monitored and evaluated** **- Sanitary courts established nationwide** **- Staff trained overseas** **- Public Health Laboratory Strengthened** **Outcome:** - 100% of healthcare facilities manage Their waste in a safe and environment-Friendly manner. - Effluent Standards Established - 100% Compliance - All project activities monitored - 100% Written reports

4.1.4 Risks and mitigating actions

Risks	**High/ Substantial/ Moderate/**	**Mitigating Actions**
1. Contamination of Drinking	Moderate	Appropriate design, sites and operation of sanitary landfills, leachate treatment and control, water quality testing.
2. Release of Pollutants into the air	High	High temperature (1000-1200^{0}C) incineration, installation of flue gas cleaning devices, air quality testing and materials containing chlorine or heavy metals will not be incinerated
3. Occupational hazards	Substantial	Provision and ensuring routine use of protective clothing, staff training and first aid
4. Diseases transmission	Moderate	Limited access to disposal sites, fencing of disposal sites, separate cells for medical wastes, public sensitisation (radio, TV, posters, leaflets, newspapers, etc)

4.1.5 Implementation strategy/methodology

Waste receptacles and collection
According to the investigations made at the hospitals, one of the main problems of hygienic waste handling is the lack of appropriate receptacles. In nearly all cases, infectious waste together with syringes and needles, etc. are openly collected and transported in open buckets, intended for the cleaning service but not for infectious hospital waste handling. Therefore, thorough attention has to be given to providing the hospitals with adequate equipment for the collection of the waste.

In Annex 7 of this plan, the general requirements for receptacles are described. According to this, the following system will be recommended for the hospitals in Sierra Leone.

- Waste type A and B can be handled as is done now, drums and plastic buckets with tight-fitting covers respectively.
- The collection and transport of Waste Types C and D must be improved substantially.

In areas where waste of Type C is generated, metallic circular bag-holder with lid shall be employed. In these bag holders, polythene bags will be provided. For better identification the bags will be coloured, and sharp and pointed objects such as syringes blades or glass must be collected in puncture-resistant containers (sharp boxes) before being disposed of in the bags.

The filled bags are closed off using plastic strips, which, once fastened in place, should not be reopened. Then, they are removed from the bag holder and placed at the transfer area for their removal by the collection service direct to the on-site disposal site. Neither re-use of the disposable receptacles nor compression of the waste is permissible.

The most appropriate receptacles for waste Type D (human body parts) are conical shaped plastic buckets with a hermetically sealing plastic lid and a handle for easy handling. If, for economic reasons, it is not possible to acquire this type of receptacle, plastic bags can be used as for the waste Type C. They must have a different colour so that the collection service can distinguish them.

A general upgrading of the hospital's internal collection equipment (bins, carts, storage areas and protection equipment, etc.) is recommended.

Transport and Storage in the Hospital
The waste has to be removed each day from the transfer areas and taken to a storage place. Rubber-wheeled carts with a bin made of plastic or non-rusting metal should be used for this should have a smooth surface for easy cleaning and disinfecting. Moreover, the dimensions must be appropriate for easy manoeuvrability along the route to be followed inside the hospital.

The storage of the different types of waste has to be done in the corresponding places according to the following requirements.

- Solid waste types A and B should be deposited in the containers used for domestic refuse.
- Waste Type C should be deposited in a special storage room to which only authorized personnel have access.

- Waste Type D should be immediately transported to a cemetery and buried as existing cultural practices demands.
- Waste Type E must be stored according to the regulations for industrial hazardous waste.
- Radioactive wastes must be stored in a radiation-safe place until their radioactivity has decreased to the point where they are no longer considered radioactive, and then disposed of according to the instructions given by authorized officials.

In none of the visited hospitals was there an appropriate room for the storage of the waste Type C. Therefore, in most of the hospitals remodelling will be necessary.

Treatment of Waste

The management of the hospital wastes outside the hospital depends on the kind of treatment they have to undergo:

- Waste Types A and B, normal waste and patient's waste can be transported and disposed of together with other urban waste, once they have been removed from the hospital premises.
- Wastes Types C and D, infectious waste and human body parts, require special transport and treatment, which will be described further.
- Waste Type E, other hazardous waste, must be disposed of according to the regulations for industrial hazardous waste.

Treatment of hospital waste means any method, technique or process designed to change the biological character or composition if any regulated medical waste so as to reduce or eliminate its potential for causing disease. Regarding the adequate sanitary disposal of health-care waste as a treatment method, and by considering the specific needs and possibilities for Sierra Leone, only two technical alternatives can be taken into consideration for waste Type C:

1. Special incineration
2. Controlled disposal in sanitary landfills

Controlled disposals in sanitary landfills have the following reported advantages

- It is a recognised and proven method of deposal of this waste category
- The technology is applicable to all infectious wastes and does not require pre-processing of the waste.
- The control is easy and evident
- It is the most economic method.

However, current practices (open dumping) at the existing dumpsites (Freetown, Bo, and Kenema) militate against this option for the time being. Consequently, and taking into consideration the dangers associated with health-care waste and in particular HIV, HBV, and HCV transmissions, the current practice of incineration without flue-gas cleaning should be improved and promoted until the dumpsite are upgraded to sanitary landfills.

As outlined earlier, infectious hospital waste Type C can be buried at sanitary landfills, provided the following precautions are taken:

- The hospital waste must be transported to an already filled-up area of the sanitary landfill. This landfill, or at least the selected area, should be fenced in so that it will have restricted access.
- The hospital waste has to be dumped directly from the truck into the pit without any handling by labourers.
- The same excavation material from the pit must cover it immediately, preferably.
- The areas where infectious wastes have been buried must be marked and documented to avoid re-opening by further disposal of hospital wastes.

Instruction and training of solid waste personnel, as described in this report, must also be extended to the personnel working on the sanitary landfill.

The operation of incinerators proposed within this plan may result in certain nuisances that will negatively impact the existing environmental and social set up.

However, considering the reduced daily quantities of waste to be incinerated by the healthcare facilities, it is evident that the negative social and environmental impacts will be relatively negligible and the nuisance caused will be less harmful. Nevertheless, it would be necessary to take the precautions in the installation and operations of the incinerators:

- To select a site for the incinerator at a considerable distance from the hospital, far away from the medical wards.
- It is necessary to preferable operate the incinerators at night to reduce smoke nuisance.
- All ash residues should be buried in lined pits within the compound.

The De Mont fort Family of Incinerators is recommended for the purposes of this plan. Please see annex 9.

Water Supply and Sanitation

The existing water and sanitation system needs to be improved. New reliable wells and adequate toilets facilities should be provided. The drains should be rehabilitated to facilitate free-flow of used water. Sucker trucks should be provided for routing desludging of fill septic tanks. Healthcare staff should have related training. Please see annex 10.

Legal Requirements

Legislation

There is a lack of legislative framework, by-laws and guidelines for the management of hospital wastes in Sierra Leone. The objective should be to set up a legal structure that will be maintained and updated by a Ministry of Health and Sanitation legislation unit. By-laws or regulations on the following themes should be laid down.

- Precise definition of all terms to describe the management of hospital waste
- Classification of hospital wastes
- Internal management of solid waste in health care institutions
- External management of solid waste from health care institutions
- Guidelines for the section of hospital solid waste-handling equipment and materials
- Determination of responsibilities
- Fines and penalties for non-compliance.

There are no effluent standards; it is therefore recommended that WHO the Environmental Protection Board in establishing national standards for Sierra Leone adapts guidelines for effluent standards. Defaulters should be prosecuted and appropriately punished by the sanitary courts, which should be so empowered by the proposed reviewed Public Health Ordinance.

Control Institutions

Legislation alone is a useless instrument without an official organ to monitor compliance and the power to enforce it by punishing non-compliance

Therefore, an effective control system of the hospital waste management must be established. As described before, it can be organised on two levels.

- Responsible self-control by a qualified member of their own staff for the executing institutions; the hospitals for sanitary hospital-internal handling, and the Environmental Health Division for the management outside the hospital. This should cover collection transportation, treatment and disposal.

- Official control by health inspectors of the ministry who should exercise control over government, private and mission operated health care institutions and has the legal power to caution and/or punish.

4.1.6 Institutional arrangements and implementation responsibilities

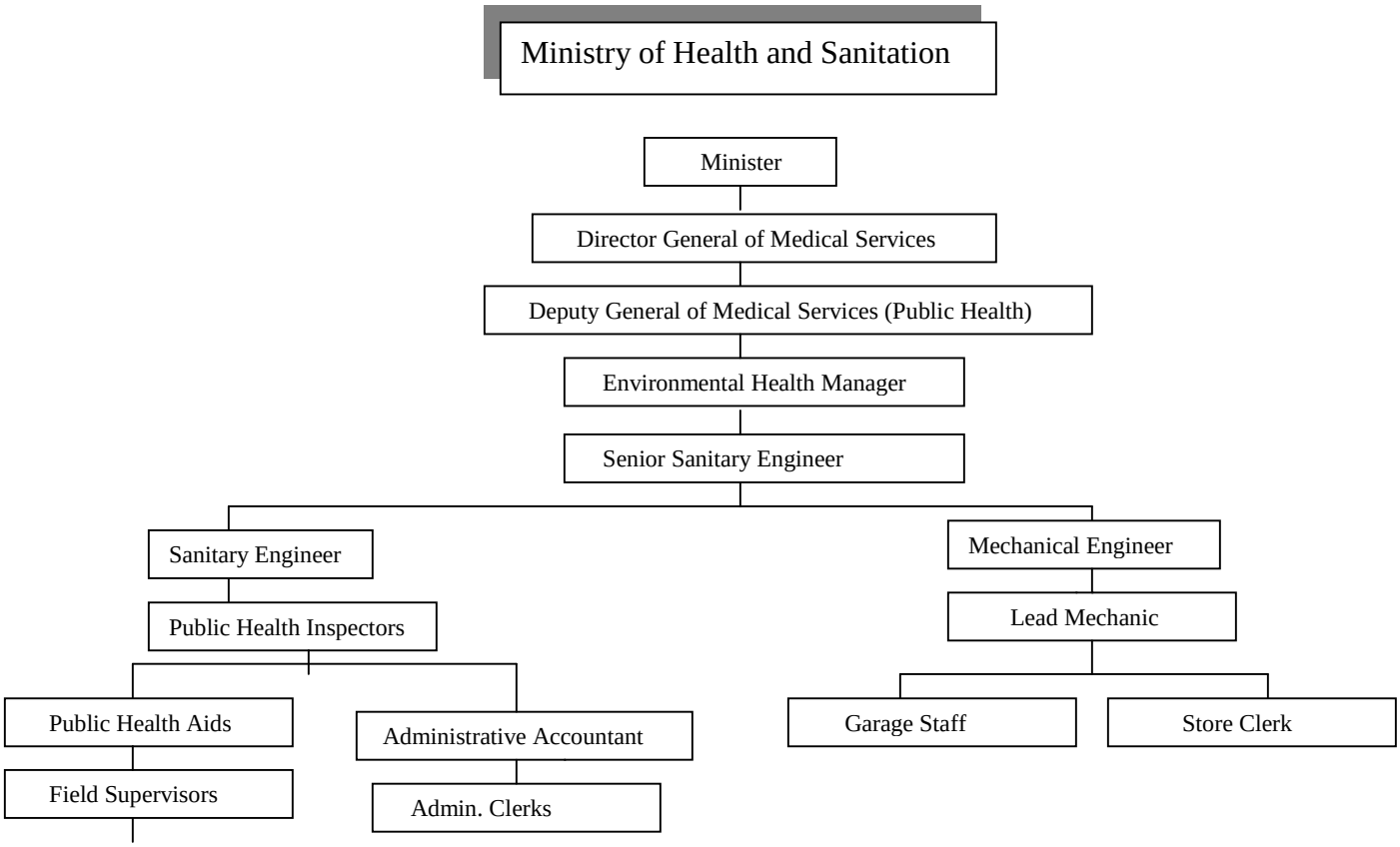
(a) Institutional arrangements

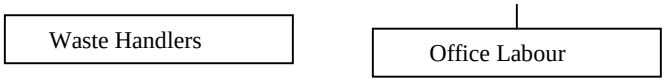
MOHS as the responsible national body for the country's healthcare system is, in the exercise of its activities most closely related to environmental protection issues. MOHS derives its duties and powers from the Public Health Ordinance; Act No.23 of 1960, whereby it is responsible for overall sanitation services.

The Environmental Health Division (EHD) is currently entrusted with the comprehensive waste management throughout the country. From 1982 to 1994, the Freetown services received German Technical and Financial Assistance. Since 08/94 EHD performs this service without exterior support

Within the hierarchical structure of MOHS, EHD is placed under the Environmental Health (Sanitation) Manager. It is headed by the Senior Sanitary Engineer, who reports, via the Manager, via the Deputy Director General of Medical Services, via the Director General Medical Services, to the Minister of Health and Sanitation.

EHD Hierarchical Position within MOHS





(b) Implementation responsibilities

Since 1993, the EHD of MOHS has overall responsibility for ensuring safe waste management countrywide. Its duties cover:

- Planning and budgeting
- Management, monitoring and control
- Operation performance (collection, disposal and treatment)
- Maintenance and repair of vehicle fleet and equipment
- Overall administration and accounting.

Monitoring Staff

The EHD monitoring staffs consist of the Senior Sanitary Engineer, Sanitary Engineer (2), Mechanical Engineer and Public Health Inspectors. The monitoring staff's professional qualification and experience comply fully with most of their monitored duties. However, due to lack of the involved professional background, certain responsibilities, in particular in the fields of impact monitoring and mitigation and waste treatment, are despite remarkable efforts, carried out only in a rudimentary way.

The Senior Sanitary Engineer, with his overall supervisory and controlling functions within the Division and coordination of its activities with bordering performances of the other Departments' divisions is particularly overburdened. He is not in a position, neither from his workload nor (despite his eager interest and commitment) from his professional training point of view, to perform and pursue the waste management in an environmentally friendly manner, unless he has undergone intensive relevant training, possibly including on-site experience in overseas. The senior of the two sanitary engineers has recently been assigned with the special responsibilities of healthcare waste management and occupational safety. **This unit requires immediate strengthen of its capacity to supervise/implement this plan.**

In the Districts, this responsibility is carried out by Senior Health Inspectors who like the Senior Sanitary Engineer needs training in waste management in an environmentally friendly manner. It is therefore, considered as a need measure to the implantation of this subproject, to engage an international advisory services in the field of design, planning, construction and landfill operations for a project duration s/he will also be expected to carryout on the job training of the staff. EHD lacks the capacity. In effect, this provision will ensure capacity building and training. The Public Health Laboratory at Connaught should be strengthened to carry out sampling and laboratory analysis of water sources, landfill leachates and incineration emissions; the laboratory manager will require transportation, equipments, and materials to perform this responsibilities.

.

SHARP makes provision for the strengthening of the EHD to ensure effective supervision and safe management of healthcare waste. It also makes provision for the four SHARP-Districts in terms of provision of equipment and materials, construction of incinerators, staff training and community sensitisation.

It is the view of the consultant that for effective coordination of this plan at the national level, the EHD Sanitary Engineer charged with the responsibilities of clinical waste and occupational safety unit be seconded to ARG. S/he will be at the level of a programme to ensure a sufficiently high profile to enable the officer to report directly to the directly to the Director General of Medical Services and participate in the Top Management Team meetings of the MOHS. This is in line with the position of Programme Managers within MOHS. The ARG team includes professionals in Health Education, Monitoring and Evaluation, and Health Administration. This proposed arrangement would allow for dependency on these professionals for their respective expertise in implementation of this plan for the five-year project duration and ensure continuity, as the officer will simply revert to the mainstream of MOHS.

(c) Implementation coordination

The EHD sanitary engineer responsible for healthcare waste management will be seconded ARG. ARG help the NAS and NAC in formulating the health part of the control and prevention of HIV/AIDS. This will not only pertain to the public health sector but also to the private sector and even beyond the health sector, defining norms and standards for all medical activities undertaken by NGOs CBOs. Regular coordinating meetings will be held as directed by NAS wherein progress will be reviewed and where necessary implementation adjustments will be made as deemed necessary.

4.2 Implementation schedule/plan

	START YEAR	FINIST YEAR	2003				2004				2005				2006				2007			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Objective 1; To improve the management of wastes in all healthcare institutions																						
1.1 Equip all healthcare facilities with appropriate equipments and material for collection of healthcare waste.	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1.2 Equip all healthcare facilities with appropriate facilities (trolleys, waste bags, sharp boxes and bins and skips) for medical waste management.	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1.3 Provide adequate and wholesome water supplies in all facilities	2003	2004	X	X	X	X	X	X	X	X												
	2003	2004	X	X	X	X	X	X	X	X												
1.4 Provide wheelbarrows for all healthcare facilities for transportation of medical wastes to incinerators	2003	2004	X	X	X	X	X	X	X	X												
1.5 Construct adapted incinerators and lined pits for healthcare facilities																						
1.6 Equip personnel involved in medical waste management with adequate and sufficient protective clothing (boots, gloves, nose masks, overalls, etc)																						

Objective 2: To support private initiative (Private sector and NGOs) in safe healthcare waste management.																							
2.1 Ensure private and NGO healthcare Facilities manage their waste in a Safe and environment-friendly Manner.	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2.2 Ensure private and NGO healthcare Facilities provide protective clothing for their waste handlers	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Objective 3: To raise awareness of managers, health staff (public, private and NGO) and the general public about the importance of safe management of healthcare waste.																							
3.1 Train health staffs (private, public and NGO), Trainers, Paramedics, and sanitary worker in healthcare facilities.	2003	2004	X	X	X	X	X	X	X	X													
	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3.2 Sensitise patients and the general public																							

Objective 4: To develop the institutional capacity of EHD in the safe management of healthcare wastes																						
4.1 Design and or adapt an improvised incinerator	2003	2003	X																			
4.2 Design and or adapt tools for the pre-collection of medical wastes in healthcare facilities	2003	2003	X																			
4.3 Elaborate internal guidelines for medical waste management	2003	2003	X	X																		
4.4 Develop a healthcare waste management policy	2003	2003			X	X																
4.5 Review and update Public Health Ordinance	2003 2004	2007 2004	X	X	X	X	X X	X X	X X	X X	X	X	X	X								
4.6 Enact and enforce the Public Health Ordinance	2003	2003	X	X	X	X																
4.7 Rehabilitate existing dumpsites to sanitary landfills																						
4.8 Construct new sanitary landfills																						
4.9 Provide technical and training assistance																						
4.10 Overseas Training																						
4.11 Strengthen the Pubic Health Laboratory at Connaught Hospital																						

4.3 HCWM Plan implementation monitoring and evaluation

4.3.1 Monitoring activities and strategy

- Monthly supervision and reports at District Level by Senior Health Inspector
- Quarterly Supervision from national level by Sanitary Engineer and ARG
- Quarter meetings both at District and national level to review progress by Sanitary Engineer, DHMT, ARG

4.3.2 Evaluation activities and strategy

- Annual review, midterm evaluation and end of project evaluation (ARG and Sanitary Engineer)

4.3.3 Reporting

Report name	What will it contain?	Frequency of production (quarterly and annually)	Production responsibility	To whom it will be submitted?
1.Supervisory	Status of project implementation, activities, constrains	Monthly (Districts) Quarterly (national)	Senior Health Inspector Sanitary engineer	DHT, HQ, ARG, NAS
2. Minutes	Proceedings of meeting	Quarterly meetings	Designated reporter	HQ, MOHS,ARG, NAS
3. Review	Progress report	Annually	ARG	HQ, MOHS, ARG, NAS
4. Laboratory	Concentrations of the various constituents in air, soil, and water samples.	Monthly	Laboratory Manager	HQ, MOHS, ARG, NAS
4. Evaluation	Project achievements and challenges	Midterm End of Project	ARG	HQ, MOHS, ARG, NAS

5. ANNEXES

Annex 1 – Tables on Healthcare Facilities in Sierra Leone as of November 2001

An enquiry of nearly all-existing healthcare facilities in Sierra Leone are summarise in the following tables.

Table 1: Summary of the hospitals by districts, type, and ownership as of November 2001

No	District	HOSPITALS						
		G	P	M	I	*TOTAL*	FUNCTIONAL	Not FUNCTIONAL
1	Bo	1	0	1	0	2	1	1
2	Moyamba	1	0	1	1	3	1	2
3	Pujehun	1	0	0	0	1	1	0
4	Bonthe	1	0	1	1	3	1	2
5	Kenema	1	1	2	1	5	2	3
6	Kono	1	1	0	1	3	1	2
7	Kailahun	2	1	1	0	4	1	3
8	Bombali	1	0	2	0	3	1	2
9	Koinadugu	1	0	0	0	1	1	0
10	Kambia	1	0	0	0	1	0	1
11	Port Loko	2	1	2	0	5	3	2
12	Tonkolili	1	0	0	0	1	0	1
13	Western Urban	8	9	1	1	19	19	0
14	Western Rural	1	0	0	0	1	1	0
	TOTAL	**23**	**13**	**11**	**5**	**52**	**33**	**19**

Source: MCH/EPI progress report July 2001

Note: OWNERSHIP KEY
G=Government=Private=Mission, **I=**Industrial.

Table 2: Summary of the Peripheral Health Units (PHUs)

No	District	No. of PHUs	No of functioning PHUs	No. of non-functioning PHUs	No. PHUs supported by NGOs	No. of PHUs to be rehabilitated
1	Kenema	66	49	17	46	13
2	Kono	52	4	48	4	48
3	Port Loko	86	58	28	32	23
4	Moyamba	85	55	30	8	52
5	Pujehun	46	34	12	25	37
6	Kailahun	55	10	45	5	52
7	Bonthe	39	21	18	20	21
8	Tonkolili	65	34	31	15	51
9	Bo	68	65	3	29	27
10	Kambia	31	21	10	9	32
11	Koinadugu	37	9	28	9	30
12	Bombali	79	16	63	16	3
13	Western Area Urban	20	20	0	4	3
14	Western Area Rural	13	10	3	2	1
		742	**406**	**336**	**224**	**393**

Source: MCH/EPI progress report July 2001

Table 3: **Summary of government hospitals by category, number of existing beds, bed occupancy rates, functioning and not functioning.**

No	HOSPITAL	No of beds	Average Bed Occupancy	TYPE OF HOSPITAL	LOCATION	REMARKS
1	Bo District	334	250	Regional	Bo	Functional
2	Bonthe District	64	20	District	Bonthe	Functional
3	Moyamba District	60	36	District	Moyamba	Functional
4	Pujehun District	43	40	District	Pujehun	Functional
5	Kenema District	255	204	District	Kenema	Functional
6	Kailahun Hospital	0	0	District	Kailahun	**Destroyed**
7	Daru Hospital	7	5	District	Daru	Functional
8	Kono District	60	30	District	Kono	Functional
9	Bombali District	60	42	District	Makeni	Functional
10	Koinadugu District	100	70	District	Kabala	Functional
11	Magburaka	0	0	Regional	Magburaka	**Vandalised**
12	Mile 91	20	14	District	Mile 91	Functional
13	Port Loko	68	50	District	Port Loko	Functional
14	Lungi	50	40	District	Lungi	Functional
15	Kambia	0	0	District	Kambia	**Destroyed**
16	Connaught	300	221	Main Referral	Freetown	Functional
17	Rukupa	42	40	District	Freetown	Functional
18	Macauley Street Hospital	40	35	District	Freetown	Functional
19	Military Barracks	250	150	Military	Freetown	Functional
20	Police Barracks	30	25	Police	Freetown	Functional
21	Macauley street	40	35	District	Freetown	Functional
22	PCM Hospital	150	122	Referral	Freetown	Functional

23	Children's Hospital	146	117	Referral	Freetown	Functional
24	Goderich Hospital	42	20	District	Freetown	Functional
	Total	**2161**	**1566**			

Functioning PHUs refers to those providing, at least the following services, maternal health, promotion of growth monitoring and breast-feeding and immunisation.

Table 4: Current Statistics (November 2001) in visited hospitals.

No.	Name of hospital	**HOSPITAL TYPE**	**No. Of beds**	**Ave. No. Of Outpatients per month**	**No. Of Hospital Staff**
1.	Connaught l	Referral	300	1200	634
2.	Bo Government	Regional	334	1650	219
3.	Port Loko District	District	68	1500	92
4	Brookfields Community	Private	40	90	30
5	Kenema Government	Regional	255	900	105
6	Moyamba Government	District	60	1050	175
7	Macauley Street Satellite Clinic	District	40	4500	30
8	George Brook Community Centre	Health Centre	3	450	21
Total			**1100**	**11340**	**1306**

These healthcare facilities are all functional and the statistics are as of November 2001.

Annex 2: Monitoring Plan

Activity	**Technical Details**	**Parameters To be Measured**	**Methods to be used**	**Sampling Locations**	**Frequency of Measurements**	*INSTITUTION FOR IMPLEMENTATION*	*INSTITUTION FOR MONITORING IMPLEMENTATION*	*DURATION*
Water quality Tests	Relates to pollution/ Contamination	Chemical and micro organisms	Laboratory and physical analysis	Landfill effluents and potentially affected watercourses	Monthly	Public Health Laboratory	Environment Officers NAS/ARG/EHD	2003-2007
Air Quality analysis	-Do-	Odour, visibility, chemicals	Visual observation and laboratory analysis	Landfill sites and incinerator-chutes	Daily for odour and visibility, and monthly for air analysis	Public Health Laboratory	Environment Officers NAS/ARG/EHD	2003-2007
Soil analysis	-Do-	Chemical and micro organisms	Laboratory and physical analysis	Construction and landfill sites	Monthly	Public Health Laboratory	Environment Officers NAS/ARG/EHD	2003-2007
								Total USD

Annex 3: PERSONS AND INSTITUTION CONTACTED

- The Ministry of Lands, housing, country planning and the environment, at National Level.
- Ministry of Health and Sanitation at National level
- Paramount Chiefs, Elders, general public of target communities and local NGOs of Koinadugu, Moyamba, Bombali and Kono districts.
- The respective District Health Management Team Members.
- Programme Managers of the Malaria Control, Tuberculosis Control, Onchocerciasis Control, HIV/AIDs and Environmental Health Programmes of the Ministry of Health and Sanitation and their respective District Focal Point Persons in Moyamba, Bombali, Kono and Koinadugu Districts.
- Regional Environment Officers.
- Mr. Foday Koroma - Entomologist, MOHS
- Mr Daniel Tholley - Hydro geologist, National Onchocerciasis Control Programme.
- Dr. Br ma Kargbo - Current National AIDS Control Programme Manger; he is the outgoing OCP Manager.
- Dr. Abdulai Jalloh – OCP Manager, Sierra Leone.

Annex 4: REFERENCES

1. Health-care waste Management Study for Sierra Leone, November 2001

2. Environmental Assessment (OP 4.01 October 1998).

3. Involuntary Resettlement (OD 4.30, June 1990)

4. Indigenous Peoples (OD 4.20, September 1991)

6. National Environmental Policy

7. National Environmental Protection Act. 2000

8. Sierra Public Health Ordinance

9. Draft National Environmental Health Policy

10. Sierra Leone Health Sector Rehabilitation and Development Project, Project Appraisal Document, November 2001.

11. Sierra Leone Integrated Health Sector Investment Project (IHSIP), Supervision Mission (April 15 – 27, 2002); AIDE-MEMOIRE

12. Safe management of wastes from health-care activities, WHO 1999

13. George Tchobanoglus, Hilary Theisen & Samuel Vigila. *Integrated Solid Waste Management*

Annex 5: The SELF-LEARNING PROCESS

The training of medical staff will heavily rely on a self-learning process. The advantages of self-learning are several: It diminishes the absence of staff from their sites. It gives the student time to reread and to ponder over difficult issues. It might stimulate a discussion between members of a Health center team. It might be a cheaper solution than calling health staff to a central training venue, which includes per diems and overnight costs (but this should not be a decisive factor).

Practically it will take this form:
A group of up to 20 health staff, preferably of mixed level will be brought together for 1 or 2 days and will be taught general principles of the subject. A pre-test is essential to assess the level of knowledge and possibly to probe the attitude. The result of the test should be used to address the identified weaknesses.

The participants then will be sent back to their working place with the task to study the module(s). It should be emphasized that the materials must not be studied alone but mutual assistance is recommended; making use of the existing experiences and knowledge in the team. An underlying assignment is to strengthen the teamwork. During the process, if at all possible, the Trainer/Supervisor will visit the sites to resolve existing difficulties.

After about 4 weeks the same groups will be recalled and the learning process will be discussed and evaluated. This should take 2-3 days, depending of the level of achievement. The theory should be reviewed extensively to assess the students' accomplishments. Some practical exercises can be added as well as some case studies for which the participants can propose answers after working in groups on possible solutions.
This process can be repeated; if necessary a limited number of modules can be treated in one cycle.

At the end of the training the students have to sit for an exam and –if possible– pass a practical exercise like a role-play. The agent then receives a certificate and will be entitled to be responsible for the safe management of healthcare wastes. Above average students can be integrated in the trainer/supervisory team.

Limitations of the approach
It will be obvious that not everything can be taught by this approach. It has to be supplemented by other ways of learning; interpersonal communication, attitudes, practical procedures etc. must be learned in a different setting. Anyhow, a continuous training needs assessment using; a variety of different methods to reinforce the knowledge and skills of the health staff and positively change their attitude can be employed.

It might be difficult to motivate the health workers to study at home. The classical seminar type of training has been a source of additional income. To stimulate interest for this form of learning a process of certification should be introduced. This can go together with another form of motivation, again within the context of continuing training, e.g. an attractive medical book, a specific medical instrument, a rewindable radio to listen to educational broadcasts etc.

Another important issue that has to be addressed is that each training session needs in addition to written material for the participants, also a guide for the trainers. Adult education needs a different

approach than formal education. There seems to be sufficient expertise and experience in Sierra Leone to elaborate these trainer modules.

Recommendations

- Develop and introduce the self-learning method
- Develop additional innovative approaches to inform health staff
- Every training module should come together with instructions for the trainer.

Plan of implementation

1. Select cooperating NGOs and CBOs
2. Elaborate the theoretical model of self-learning
3. Define instructions for the self-learning method

Annex 6: CRITERIA FOR SECLECTING, DEVELOPING AND OPERATING SANITARY LANDFILL SITES.

A sanitary landfill is a contained and engineered structure, which leads to anaerobic biodegradation and consolidation of compacted waste materials within confining layers of compacted soil. In a sense, a sanitary landfill is a bioreactor. At a sanitary landfill, there are no nuisance impacts of constant burning, smoke, flies, and unsightly rubbish heaps. However, because the waste is not exposed to rainfall, surface runoff or groundwater, leachate consists largely of the waters generated during biodegradation. Therefore, leachate generated from a sanitary landfill is typically much more concentrated in organics and metals than the leachate generated from an open dump, often by a factor of more than 10, and thus needs to be properly treated. Similarly, because of the anaerobic nature of decomposition, methane is generated and needs to be properly ventilated.

Sanitary landfills located in arid areas with limited potential infiltration may have more relaxed design requirements than those located in wet areas. Similarly, sanitary landfills located on coastal lands underlain by naturally undrinkable groundwater may have more relaxed design requirements than those in inland areas overlying potential usable groundwater regimes.

In summary, as described below, a sanitary landfill design would need to have structural integrity over the long term, provide for daily cover of fresh waste, and incorporate mitigating measures to manage leachate and gas produced within the landfill cells.

A Sanitary landfill is a step-by-step construction activity involving daily layering, compacting, and soil covering of waste into cells. The site should not be subject to seasonally high groundwater levels or to periodic flooding. The site preparation and landfill operations must be designed to minimize contact of surface runoff and percolating rainwater with the waste. This requires diversion of up gradient surface drainage away from the landfill operational area, sloping of the cells to avoid ponding of waters on top of them, and compaction of waste and soil as each cell is being constructed so that infiltration potential is minimized.

At sites where potentially usable groundwater exists in unconfined layers, any rain and surface runoff waters which percolate through the waste and become contaminated leachate need to be collected. The leachate collection system consists of a network of perforated pipe within a gravel bed, which is placed over the landfill liner. At a minimum the liner would consist of a layer of impermeable clay soil placed in thin layers at optimum moisture content and compacted with a roller. At large landfills receiving municipal waste for major metropolitan areas or at co-disposal landfills where hazardous waste quantities could be received in significant quantities, additional liners made from impermeable geomembrane material may be necessary to protect sensitive groundwater resources. The landfill liner and the leachate collection network need to be properly sloped to enable gravity flow of contaminated water to treatment ponds.

The ponds would be designed to encourage anaerobic decomposition, followed by aerobic decomposition. To the extent possible, full evaporation in the final pond is desired so that no discharge of treated effluent is necessary. If full evaporation is not possible, recycling of treated effluent back to the landfill (on the completed areas of fill), discharge to a sewage treatment plant, or tanker haul to a sewage treatment plant is recommended. Discharge to surface water is not acceptable unless the treated effluent can be assured of not having a significant adverse impact on the water quality requirements of the receiving water.

In addition to leachate management, landfill gas management is a critical component of every sanitary landfill design. Minimum requirements are that the landfill gases would need to be properly ventilated. During site preparation, the landfill side slopes are lined with impermeable clay to curtail lateral migration of the gases, and then lined with coarse rock or gravel to allow gases to escape to the atmosphere. Within every 0.1

hectare, or less, of the waste cell development area, landfilling would be conducted around a gas ventilation structure consisting of either a perforated pipe packed in gravel or a rock-filled wire mesh enclosure.

Construction of a sanitary landfill occurs in regular phases, over the life of the site. At the start of construction, the access road, entrance gate, weighbridge, fencing, water supply and Phase I waste cell areas are constructed. Leachate treatment facilities to handle flows generated at the peak period over the life of the site are constructed from the onset. Once the capacity of the Phase I waste cell area is nearly utilized, the Phase II waste cell area requires site preparation and construction (i.e., the Phase II liners, leachate collection networks, gas ventilation systems etc). And so on, over the life of the site, until each Phase of the landfill is completed. Each Phase typically has 3 to 5 years of waste capacity.

Each sanitary landfill is uniquely designed to conform to the soil, geologic, topographic, and water resource conditions of the site. To minimize the costs of operating a sanitary landfill, the first and most critical step is proper siting in a location, which enables economic operations and cost-effective environmental protection. Also, proper siting is essential to minimizing the cost of waste collection.

The following site selection criteria are provided as guidance. A proposed landfill site can be selected even though it does not meet each of the screening criteria. Engineering design can mitigate inadequate site conditions; but at a cost. When selecting a site, which does not meet all of the screening criteria, possible engineering solutions, which would bring the site into conformance with the intent of the unmet criteria, shall be incorporated in the design. Criteria, which shall be addressed as part of a screening process, neither includes, but is not limited to, the following:.

- Adequate land area and volume to provide sanitary landfill capacity to meet projected needs for at least 10 years.
- A site accessible within 30 minutes travel time (a function of road and traffic conditions) is to be sought, even if it means buying land, because of the need to avoid adversely affecting the productivity of collection vehicles. At distances greater than 30 minutes travel, for collection operations to be economic, investment in either large capacity collection vehicles (5 tons. per load or greater) or transfer stations with large capacity vehicles (20 tons. or greater) would be necessary.
- If transfer stations are necessary, landfill sites should be accessible within 2 hours travel time one-way from the transfer station.
- Groundwater's seasonally high table level (i.e., 10 year high) is at least 1.5 meters below the proposed base of any excavation or site preparation to enable landfill cell development
- Soils above the groundwater's seasonable high table level are relatively impermeable (preferably, less than 10^{-9} meters/second permeability when undisturbed).
- No environmentally significant wetlands of important biodiversity or reproductive value are present within the potential area of the landfill cell development, unless they have adequate capacity to absorb/assimilate the pollution loadings anticipated.
- None of the areas within the landfill boundaries are part of the 10-year groundwater recharge area for existing or pending water supply development.
- No private or public drinking, irrigation, or livestock water supply wells within 500 meters down gradient of the landfill boundaries, unless alternative water supply sources are readily and economically available and the owner(s) gives written consent to the risk of well abandonment.
- No known environmentally rare or endangered species breeding areas or protected living areas are present within the site boundaries.
- No significant protected forests are within 0.5km of the landfill cell development area.
- No major lines of electrical transmission or other infrastructure (i.e., gas, sewer, water mains) are crossing the landfill cell development area, unless the landfill operation would clearly cause no concern or rerouting is economically feasible.

- No underlying limestone, carbonate or other porous rock formations which would be incompetent as barriers to leachate and gas migration, where the formations are more than 1.5 meter in thickness and present as the uppermost geologic unit.
- No underlying underground mines which could be adversely affected by surface activities of landfilling, or mines resources, which could be rendered less accessible by landfilling, unless the owner(s) gives explicit consent.
- No residential development within 0.25km from the perimeter of the proposed landfill cell development.
- No visibility of the proposed landfill cell development area from residential neighbourhoods within 1km. If residents live within 1km of the site, landscaping and protective berms would need to be incorporated into the design to minimize visibility of operations.
- No perennial stream within 0.03km down gradient of the proposed landfill cell development, unless culverting or channelling is economically and environmentally feasible to protect the stream from potential contamination.
- No significant seismic risk within the region of the landfill, which could cause destruction of berms, drains or other civil works, or require unnecessarily costly engineering measures.
- No fault lines or significantly fractured geologic structure within 0.5 km of the perimeter of the proposed landfill cell development, which would allow unpredictable movement of gas or leachate.
- Topography amenable to development of sanitary landfill by the Cell (Bund) and/or Trench method. The Area method is not preferred because of its higher energy and soil cover requirements.
- Availability on-site of suitable soil covers materials to meet the needs for intermediate (minimum of 30cm depth) and final cover (minimum of 60cm depth), as well as bund construction (for the Cell method of landfill). Preferably, the site would also have adequate soil to also meet daily cover needs. However, daily cover (usually a minimum of 15cm depth of soil) needs can be alternatively met by using removable tarps or by removing the previously laid daily soil cover at the start of each day for reuse at the end of the same day. For purposes of this siting, assume that at least 1 cubic meter of daily, intermediate, and final soil cover is needed for every 10 cubic meters of compacted waste.
- No Siting within 3 km of a turbojet airport and 1.6 km of a piston-type airport. For sites located more than 3 km and less than 8 km from nearest turbojet airport (or more than 1.6 km and less than 8 km from the nearest piston-type airport), no consideration is to be given unless the aviation authority has provided written permission stating that it considers the location as not threatening to air safety.
- No sitting within a floodplain subject to 10-year floods and, if within areas subject to a 100-year flood, must be amenable to an economic design, which would eliminate the potential for washout.
- Avoid sitting within 1km of socio-politically sensitive sites where public acceptance might by unlikely (i.e., memorial sites, churches, schools).
- Area accessible by a competent paved public road, which can accommodate the additional truck traffic without significant effect on traffic flow rates. From the public road into the site, the access road to be constructed should be less than 10km for large landfills serving metropolitan areas and less than 1km for small landfills serving secondary cities.

Annex 7: GENERAL GUIDELINES FOR THE MANAGEMENT OF HEALTHCARE WASTES.

1. Definitions and Classification of Health-care Wastes

Health-care waste includes all waste generated by health-care establishments, research facilities, and laboratories. In addition, it includes the waste originating from "minor" or "scattered" sources – such as that produced in the course of health care undertaken in the home (dialysis, insulin injections, etc.). These residues can be more or less hazardous depending on their origin within the hospital.

According to WHO, from the total of wastes generated by health-care facilities, almost 80% are general waste comparable to domestic waste. It comes mostly from the administrative and housekeeping functions of health-care establishments and may also include waste generated during maintenance of health-care premises. The remaining approximately 20% of wastes are regarded as hazardous materials that may be infectious, toxic or radioactive and may create a variety of health risks. This study is concerned almost exclusively with the hazardous health-care wastes.

The correct treatment of health-care waste must be based upon consideration of various aspects, including the health and safety of all persons within the hospital (staff, patients and visitors), and the protection of the population outside the hospital from contagious diseases. The specific physical and or chemical properties of the waste with regard to its potential to harm the environment must also be considered.

Consequently, health-care wastes may be classified into groups based on the management techniques which experience has shown are appropriate in each case. Thus, depending on the **kind of treatment** they require, healthcare waste in Sierra Leone can be classified as follows:

Type A: Normal Waste

Waste similar to domestic waste and not requiring any special treatment. This is the waste produced by the hospital administration, the cleaning service, the kitchens, stores and workshops.

Type B: Patients' Waste

Waste that requires special handling within the hospital. The aim of such handling is to prevent dispersal of pathogens within the hospital, since these are potentially able to infect persons whose resistance has already been diminished due to illness, advanced age, stress, trauma, lesions, etc. This risk is being aggravated by the concentration of germs in certain areas. Outside the hospital, these wastes can be handled similarly to those of Type A. This waste type generally derives from normal inpatient wards: outpatient examinations room, and first aid areas.

Type C: Infectious Waste

Waste that requires special handling inside and outside the hospital. This group comprises all waste from isolation wards in which patients with highly infectious diseases are accommodated and infectious residues from clinical laboratories for microbiological investigations.

This category of waste also includes all disposable waste from all hospital areas that constitute a real risk of infection when being disposed of, such as needles and sharp objects and objects that are covered with blood or human secretion.

Type D: Human Parts
This waste type requires special treatment, not so much to prevent infections, but rather for ethical reasons. This group comprises parts of human bodies generated in operating theatres, delivery rooms, morgues, autopsies, etc.
Examples are organic tissue, placentas and amputated limbs.

Type E: Other Hazardous Waste
This group covers waste types that, for legal reasons or because of their physical or chemical properties necessitate special handling.
Hospitals provide a service and hence have technical infrastructures that can also generate hazardous wastes similar to industrial wastes.
This type also includes radioactive material that may also be handles by authorised personnel, and other wastes classified by legal regulations as hazardous.

Type F: Recyclable Material
Non-contaminated materials from the administration, stores, workshops and so on, should be recycled or reused for reasons of environmental protection.

Type G: Sludge from the Hospital Wastewater Treatment Plant
This sludge can be heavily contaminated and requires additional treatment before being disposed off.

The present study is primarily concerned with the infectious and pathological wastes, Type C and Type D.

2. Segregation and Collection
Every site within the HCF at which waste is generated must be equipped with a sufficient number of waste containers, and emphasis should be placed on the need to segregate "risk waste" from other waste, and to use appropriate packaging and marking.

HCF wastes Types B and C should always be collected in disposable receptacles that meet the following requirements.

- Leak-resistant
- Impervious to moisture
- Of sufficient strength to prevent tearing or bursting under normal conditions of use and handling
- Non-transparent
- Seal-able to prevent transmission of micro-organisms

Polythene bags with a minimum thickness of 100 microns and a size of approx. 60cm x 100cm fulfil these conditions if sharp and pointed objects (syringes, scalpel blades, etc.) are previously placed in cut- and puncture-resistant containers, such as disposable plastic bottles or cardboard boxes.

The filled bags are closed off using a plastic strip, which, once fastened in place, cannot be reopened. It is then removed from the bag holder and placed at the transfer area for its removal by the collection service/waste handler in cases of on-site disposal.

Neither re-use of the disposable receptacles nor compression of the waste is permissible.

For Type D waste, the receptacles should be placed directly in the area where the waste is generated. They must then be sealed and deposited in the corresponding transfer area.

The transfer or storage areas should be set apart from other facilities, be sufficiently well ventilated, and have sanitary facilities for personnel to wash and disinfect their hands.

3. Transports and Storage within the Hospital

The waste should be removed each day from the transfer areas and taken to a storage place. This must be done with care in order to prevent the rupturing or opening of the bags, resulting in release of harmful pathogens into the environment.

Waste of Types A and B, once from within the HCF, can be treated as domestic wastes.

Waste of Types C and D must be transported to a special storage room. This depot must be situated so as not to affect other facilities of the hospital, such as kitchen, laundry, wards, etc. in anyway. It must take the form of an enclosed space to which only authorized personnel have access.

The waste stored in the depot must be picked up daily, and the depot area must be washed out afterwards each time. The carts used for internal transport of the waste must also be regularly cleaned and disinfected.

4. Transports Outside the Hospital

Waste belonging to the Types A and B can be transported by the same service that collects municipal household waste or the waste handler in the case of on-site disposal.

If waste Type C is not treated and disinfected in the hospital area, this waste must be transported by special collection tours. The vehicles used for this transportation can be of varying standards, according to the destination of the waste.

(a) Transport to a central treatment plant:

It is recommended to transport the infectious waste to the central treatment plants in specially designed vehicles which do not compress the waste and which have equipment that prevents the bags from sliding around during transport. The interior of the vehicle must be easy to clean and the floors have raise edges to retain any liquids that may escape from the bags, and it must be adequately ventilated.

(b) Transport to a sanitary landfill site:

In the case that the infectious waste is not to be transported to a central treatment plant but directly to the sanitary landfill site for burying in restricted areas, transport can be carried out in a different way. In the special case where the bags with the waste no longer have to be manipulated by personnel but can be dumped directly onto the prepared excavations, transportation can be done by normal waste collection trucks.

HCF wastes Type D (human body parts and deceased foetuses) should be sealed in plastic containers or plastic bags, which can be transported in the special vehicles, designed for transport of wastes Type C or in any other pick-up or delivery van that is suitable.

5. Medical waste treatment methods

Studies carried out recently have shown that common patients' waste, with the exception of that from patients with infectious-contagious diseases, is no more contaminated with micro-organisms than domestic waste, which means that its transport and final disposal does not pose a major risk to the health of the general community outside the hospital.

Accordingly, in the case of the waste included in Types A and B, there is no sanitation-related reason for not transporting and disposing of them together with other urban waste, once they have been removed from the HCF premises.

In contrast, the waste types included in groups C and D, namely infectious and human part, definitely require special management and handling from their production all the way to their final; disposal, including treatment which ensures elimination of their harmful properties in order to minimize the risk of contamination and infection.

The terms "sterilization", "disinfection" and "decontamination" are used in discussions of medical waste. They need to be precisely defined in any regulation:

> Sterilization denotes the killing of all living organism in a material. If it is done thermally, it needs temperatures over 134 ^{o}C and is, in the opinion of experts, too restrictive for the treatment of all hospital waste materials.

By including in the term "treatment" as the adequate ways of disposal of HCF waste, the following methods of treatment can be distinguished:

- **Special Incineration**

Incineration of both the infectious and the organic types of HCF waste is a recognized and proven method of eliminating their hazardous properties. This method of treatment also has the advantages of great reduction of the waste volume and the gaining of calorific energy, which can be used for heating and steam production. Various different technologies and patents for combustion are available on the market today, most of which are adequate.

- **Sterilisation by Heat**

This type of waste treatment is generally performed in autoclaves by steam treatment at high temperatures. It is recommended for microbiological cultures from clinical or research laboratories, which should not leave the investigation area.

It is not adequate for the large total volume of HCF waste that needs treatment.

- **Disinfecting by Steam**

Another type of thermal; treatment used for pathological waste is the application of heat at about 100^{0}C, thus transforming infectious wastes into harmless residues. The waste is collected in bags consisting of several layers of paper, with the inside reinforced by a layer of plastic. These bags are placed in a hermetically sealed chamber into which steam is pressed in order to inactivate the pathogens. To ensure that the steam penetrates all parts of the charged waste, the air in the chamber is first evacuated to create a vacuum prior to admitting the pressurized stream. This process is repeated several times following a set pattern lasting approximately 25 minutes.

Once this treatment has been completed, the waste can be handled as household waste and disposed of in sanitary landfills.

- **Microwave Disinfecting**

Another method used to disinfect clinical waste in stationary or mobile plants is heating it by microwave energy.

The waste material to be treated by microwaves must first be broken down and shredded to a certain size. As the microwave-process only works in the presence of water, and as clinical wastes are generally rather dry, the shredded waste mixture must be moistened beforehand by adding water and stream.

In a pipe-shaped screw conveyor, the shredded and dampened material is continuously transported under microwave generators to be heated by irradiation. The waste temperature to guarantee the temperature time schedule of decontamination regulates the screw conveyor speed.

- **Chemical Disinfecting**

There are many techniques for disinfection by chemical means, but none of them has been proven to be effective for treatment of hospital waste.

Equipment is available for shredding or granulating and then disinfecting waste by means of disinfectant liquid; however, its use is generally quite problematic, and there is no guarantee that the disinfectant liquid used will penetrate to all parts of the batch of waste undergoing treatment.

In addition, chemical liquids impose an additional burden on the environment, as chemical disinfectants themselves are inherently hazardous chemicals. Therefore, the use of chemical disinfectants may actually increase personal and environmental risks associated with the management of HCF wastes.

- **Controlled Disposal in Sanitary Landfills**

Human pathogens live and grow best in an environment that most closely resembles the conditions prevailing in the human body. Conditions in the exterior environment are, for the most part, not conducive to the survival and growth of human pathogens. Studies have demonstrated the rapid death of selected human pathogens after burial in a sanitary landfill, and indicate that land filling can be a satisfactory mechanism for the treatment and disposal of health-care wastes.

For these reasons, infectious Health-care waste of Type C can be buried in sanitary landfills if certain precautions are taken.

- **Burial in Cemetery or Incineration in Crematorium**

Health-care wastes Type D, human body parts and placentas, can be buried in certain areas of cemeteries or be incinerated in crematoria.

- **Chemical-Physical Treatment**

As far as the wastes included in Type E are concerned, discussion of details is dispensed with here, since these wastes are not restricted to Health-care facilities and their management should be generally regulated by legislation covering industrial hazardous wastes.

Radioactive waste produced in health-care establishments is of very low-level radioactivity and has a short-life. Residues should be stored safely until their radioactivity has decayed to the point that they are no longer considered radioactive, and then be disposed of according to their other characteristics (e.g. chemical, infectious or general) and in conformity with national regulations

6. Instructions and Training of Personnel

The technological advance which have been made in health-care call for control of microbiological contamination and hospital infections to be interdisciplinary; in other words, involving not only the

physicians, as in the past, but instead spanning an entire groups of professionals with different specialised tasks. Only in this way is it possible, for example, to prevent infections stemming from poor handling of waste. This aspect ought to be of great concern to all persons working in the field of medicine since it imposes additional problems on the basic task of treating patients in order to restoring their health.

Every health-care facility should implement and supervise training and maintenance programmes for the health-care, maintenance and technical personnel. Doctors, paramedics and administrative health-care personnel must, for example, know how to separate infectious and other hazardous waste from non-hazardous refuse and how to handle it.

Training of solid waste personnel should also be directed at the municipal collection and disposal services. Solid waste personnel on collection trucks or at disposal sites must be able to differentiate wastes by colour or other codes in order to handle each type properly. Programmes should include the following themes:

- Categories of health-care waste and rapid assessment
- Segregation, storage and collection methods and equipment
- Treatment and disposal methods.

The general public needs to be informed about the risk associated with exposure to infectious health-care wastes. This can be achieved by advocacy, seminars with groups, workshops, print media (flyers, posters, newspapers, etc), radio and television discussions and jingles.

7. MONITORING AND CONTROL

Together with an appropriate legislation regulating waste management inside and outside the health-care institutions and the installation of the appropriate infrastructure, an effective control system of the health-care waste management must be established.

The control of the safe management of waste from health-cares facilities should be organized on two levels.

Level 1
Responsible self-control of the executing institutions by a qualified member of their own staff, both for the internal sanitary handling, as well as of the municipal services for the management outside the hospital, the collection, transportation, treatment and disposal.

Level 2
Public Health Inspectors of the Ministry of Health and Sanitation should be charged with official control, with the power of caution and sanction over all health-care facilities.

8. Waste receptacles and collection

According to the investigations made at the hospitals, one of the main problems of hygienic waste handling is the lack of appropriate receptacles. In nearly all cases, infectious waste together with syringes and needles, etc. are openly collected and transported in open buckets, intended for the cleaning service but not for infectious hospital waste handling.

Therefore, thorough attention has to be given to providing the hospitals with adequate equipment for the collection of the waste.

In Annex B of this study, the general requirements for receptacles are described. According to this, the following system will be recommended for the hospitals in Sierra Leone.

- Waste type A and B can be handled as is done now, drums and plastic buckets with tight-fitting covers respectively.
- The collection and transport of Waste Types C and D must be improved substantially.

In areas where waste of Type C is generated, metallic circular bag-holder with lid shall be employed. In these bag holders, polythene bags will be provided. For better identification the bags will be coloured, and sharp and pointed objects such as syringes blades or glass must be collected in puncture-resistant containers (sharp boxes) before being disposed of in the bags.

The filled bags are closed off using plastic strips, which, once fastened in place, should not be reopened. Then, they are removed from the bag holder and placed at the transfer area for their removal by the collection service direct to the on-site disposal site. Neither re-use of the disposable receptacles nor compression of the waste is permissible.

The most appropriate receptacles for waste Type D (human body parts) are conical shaped plastic buckets with a hermetically sealing plastic lid and a handle for easy handling. If, for economic reasons, it is not possible to acquire this type of receptacle, plastic bags can be used as for the waste Type C. They must have a different colour so that the collection service can distinguish them.

A general upgrading of the hospital's internal collection equipment (bins, carts, storage areas and protection equipment, etc.) is recommended.

9. Transports and Storage in the Hospital

The waste has to be removed each day from the transfer areas and taken to a storage place. Rubber-wheeled carts with a bin made of plastic or non-rusting metal should be used for this should have a smooth surface for easy cleaning and disinfecting. Moreover, the dimensions must be appropriate for easy manoeuvrability along the route to be followed inside the hospital.

The storage of the different types of waste has to be done in the corresponding places according to the following requirements.

- Solid waste types A and B should be deposited in the containers used for domestic refuse.
- Waste Type C should be deposited in a special storage room to which only authorized personnel have access.
- Waste Type D should be immediately transported to a cemetery and buried as existing cultural practices demands.
- Waste Type E must be stored according to the regulations for industrial hazardous waste.
- Radioactive wastes must be stored in a radiation-safe place until their radioactivity has decreased to the point where they are no longer considered radioactive, and then disposed of according to the instructions given by authorized officials.

In none of the visited hospitals was there an appropriate room for the storage of the waste Type C. Therefore, in most of the hospitals remodelling will be necessary.

10. Treatment of Waste

The management of the hospital wastes outside the hospital depends on the kind of treatment they have to undergo:

- Waste Types A and B, normal waste and patient's waste can be transported and disposed of together with other urban waste, once they have been removed from the hospital premises.

- Wastes Types C and D, infectious waste and human body parts, require special transport and treatment, which will be described further.

- Waste Type E, other hazardous waste, must be disposed of according to the regulations for industrial hazardous waste.

Treatment of hospital waste means any method, technique or process designed to change the biological character or composition if any regulated medical waste so as to reduce or eliminate its potential for causing disease. Regarding the adequate sanitary disposal of health-care waste as a treatment method, and by considering the specific needs and possibilities for Sierra Leone, only two technical alternatives can be taken into consideration for waste Type C:

1. Special incineration
2. Controlled disposal in sanitary landfills

Controlled disposals in sanitary landfills have the following reported advantages

- It is a recognised and proven method of deposal of this waste category
- The technology is applicable to all infectious wastes and does not require pre-processing of the waste.
- The control is easy and evident
- It is the most economic method.

However, current practices (open dumping) at the existing dumpsites (Freetown, Bo, and Kenema) militate against this option for the time being. Consequently, and taking into consideration the dangers associated with health-care waste and in particular HIV, HBV, and HCV transmissions, the current practice of incineration without flue-gas cleaning should be improved and promoted until the dumpsite are upgraded to sanitary landfills.

As outlined earlier, infectious hospital waste Type C can be buried at sanitary landfills, provided the following precautions are taken:

- The hospital waste must be transported to an already filled-up area of the sanitary landfill. This landfill, or at least the selected area, should be fenced in so that it will have restricted access.
- The hospital waste has to be dumped directly from the truck into the pit without any handling by labourers.
- The same excavation material from the pit must cover it immediately, preferably.
- The areas where infectious wastes have been buried must be marked and documented to avoid re-opening by further disposal of hospital wastes.

Instruction and training of solid waste personnel, as described in this report, must also be extended to the personnel working on the sanitary landfill.

11. LEGAL REQUIREMENTS

Legislation
There is a lack of legislative framework, by-laws and guidelines for the management of hospital wastes in Sierra Leone. The objective should be to set up a legal structure that will be maintained and updated by a Ministry of Health and Sanitation legislation unit. By-laws or regulations on the following themes should be laid won.

- Precise definition of all terms to describe the management of hospital waste
- Classification of hospital wastes
- Internal management of solid waste in health care institutions
- External management of solid waste from health care institutions
- Guidelines for the section of hospital solid waste-handling equipment and materials
- Determination of responsibilities
- Fines and penalties for non-compliance.

Control Institutions
Legislation alone is a useless instrument without an official organ to monitor compliance and the power to enforce it by punishing non-compliance

Therefore, an effective control system of the hospital waste management must be established. As described before, it can be organised on two levels.

1. Responsible self-control by a qualified member of their own staff for the executing institutions, the hospitals for sanitary hospital-internal handling, and the Environmental Health Division for the management outside the hospital. This should cover collection transportation, treatment and disposal.

2. Official control by health inspectors of the ministry who should exercise control over governmental, private and mission operated health care institutions and has the legal power to caution and/or punish.

Annex 8: The De Montfort Family of Medical Waste Incinerators

All the incinerators (displayed on the following page) are variations on the same basic design. The **Mark 1** incinerator is now used in many parts of the world. It burns up to 12kg/h of waste. The **Mark 2** is the Mark 1 with a larger secondary combustion chamber to increase the retention time and improve the flue gas emission quality.

The **Mark 3** is designed for hospitals up to 1000 beds, and burns at about 4 times the rate of Marks 1 & 2. (50-kg/h approx.)

The **Mark 4** is a version of the Mark 1 specifically designed for use in emergency situations where low cost and a minimum of expensive materials and techniques are priorities. It contains only two metal components, and uses firebricks only where these are absolutely necessary. It will nevertheless attain very similar combustion temperatures as the others but the expected life is less than 1 year.

The **Mark 5** incinerator is thermodynamically the same as the Mark 3, but modified to carry the weight of a much higher chimney for use where a high chimney is a legal requirement or where the proximity of other buildings makes a high chimney necessary to disperse smoke and fumes.

Incinerator **Mark 7** is the flat pack version for use in disaster or emergency situations and in settings where necessary materials or skills are not available in the country or area.

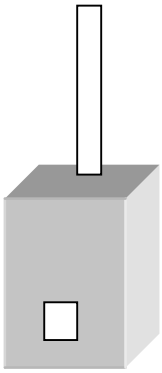
The Mark 8 has the same throughput as the Mark 1, is as Mark 4 in terms of construction but is designed for an extended life. The Mark 8 can also be built in those countries where firebricks are not of uniform dimensions and cannot therefore be bound together.

For information and construction plans please contact Professor D.J Pickens:

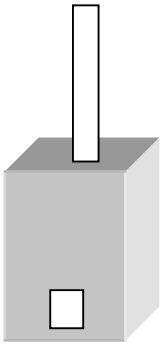
The Innovative Technology Centre
26 Oaks Road
Great Glen
Leicester
LE8 9EG

E: djp@picken98.freeserve.co.uk or djpicken@iee.org.uk

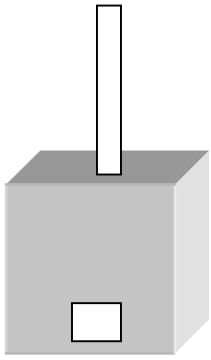
The De Montfort Family of Medical Waste Incinerators



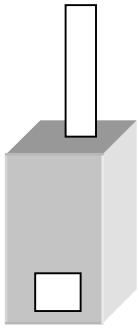
Mark 1
(12kg/h)



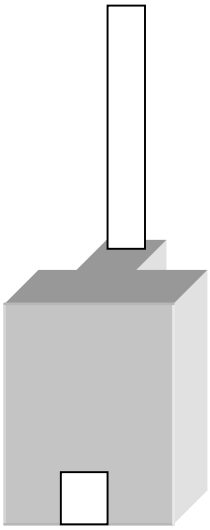
Mark 2
(12kg/h)
With
Emission
Reduction
System



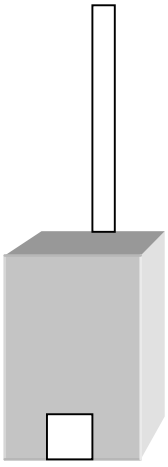
Mark 3
(50kg/h)
With Emission
Reduction
System



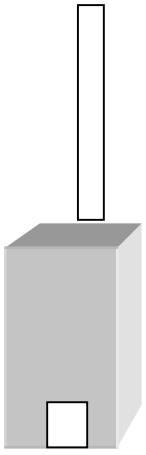
Mark 4
(12 kg/h, 1-year
life, minimum cost)



Mark 5
As Mark 3 but modified
for tall chimney



Mark 7
(12 kg/h) Built from
Pre-fabricated
Components for rapid
assembly



Mark 8
As Mark 4 but for
extended life

Annex 9: HEALTHCARE WASTE MANAGEMENT TRAINING PLAN

Rationale for training in health-care waste management

The medical waste study (November, 2001) established a lack of awareness about risks associated with unhygienic management of healthcare waste in Sierra Leone. Hence, the needs for a national training plan.

Healthcare waste is special in that it has a higher potential of infection and injury than any other type of waste. Therefore, it has to be handled with sound and safe methods wherever generated. Inadequate handling of health-care waste may have serious public health consequences and impact on the environment. Healthcare waste management is, therefore, an important and necessary component of environmental health protection.

Hospitals and healthcare establishments have responsibilities and a "duty of care" for the environment and public health, particularly in relation to the waste they produce. They also carry a responsibility to ensure that there are no adverse health and environmental consequences as a result of waste handling, treatment and disposal activities. Unfortunately, health-care waste management is, in many regions, not yet carried out with a satisfactory degree of safety.

The proposed training programme aims at transmitting the basic skills for the development and implementation of a healthcare waste management policy, including the components outlined in this programme. In this way, healthcare facilities can take steps towards securing a healthy and safe environment for their employees and communities.

The objectives of the training on HCW

1. To raise awareness on public health and environment hazards that may be associated with inappropriate segregation, storage, collection, transport, handling, treatment and disposal of health-care waste;

2. To provide information on hazards and sound management practices of health-care waste for the formulation of policies and the development or improvement of legislation and technical guidelines;

3. To identify waste management practices and technologies that are safe, efficient, sustainable, economic and culturally acceptable; to enable the participants to identify the systems suitable for their particular circumstances;

4. To enable managers of health-care establishments to develop their waste Management plans;

5. To enable course participants to develop training programmes for the different categories of staff that handle, treat or dispose of health-care waste.

At the end of the course the participants should be able to demonstrate individually that they have achieved the course objectives and competence in health-care waste management.

Target groups for the course on HCW

The course is targeted at managers, regulators and policy makers, which are involved in health-Care waste management. The main professional categories are the following:

1. Officials from national or regional authorities involved with developing policies
2. In health-care waste management;
3. Environmental or health and safety regulators;
4. Environmental health professionals;
5. Hospital managers and other administrators of health-care establishments;
6. Representatives of local authorities;
7. Waste collection, treatment and disposal managers;
8. Manufacturers of medical devices, chemicals and pharmaceutical

HEALTH SECTOR RECONSTRUCTION AND DEVELOPMENT PROJECT FOR SIERRA LEONE (HSRDP – H0210-SL)

ENVIRONMENTAL ASSESSMENT UPDATE

MARCH, 2007

DRAFT REPORT

BY:
Dr. Raymond G. Johnson - Environmental Assessment Specialist/Team Leader
Dr. Reynold G. Johnson - Environmental Assessment Specialist

ACRONYMS AND ABBREVIATIONS

HPAI	Highly Pathogenic Avian Influenza
HSRDP	Health Sector Reconstruction and Development Project
AI	Avian Influenza
CTI	Community Directed Treatment with Ivermectin
EA	Environmental Analysis
GOSL	Government of Sierra Leone
HKI	Hellen Keller International
NaCSA	National Commission for Social Action
NOCP	National Onchocerciasis Control Programme
NGOs	Non-Governmental Organisations
OCP	Onchocerciasis Control Programme
SHARP	Sierra Leone HIV/AIDS Response Project
SSI	Sight Savers International
SIZ	Special Intervention Zones
UNFPA	United Nations Fund for Population Activity
VDCs	Village Development Communities

ACKNOWLEDGEMENT

The authors wish to specially acknowledge the technical inputs and support received from Mr. John Tommy, Environment Health Specialist in the Ministry of Health and Sanitation, Sierra Leone.

TABLE OF CONTENTS

Executive Summary

The report presents an update of the Environmental Assessment (EA) 2001 carried out in accordance with the World Bank safeguard policies for rehabilitation and development of health-facilities and technical programmes for Moyamba, Kono, Koinadugu, and Bombali districts of Sierra Leone under the Health Sector Reconstruction and Development Project (HSRDP H-0210-SL).

The Government of Sierra Leone is requesting supplementary funding for the following programmes/ activities:

- Civil Works
- Onchocerciasis Control Programme (OCP)
- Avian Influenza Prevention and Control

The purpose of the study is to update the 2001 Health Environmental Assessment (EA) to include these programmes/ activities.

The Update was carried out using desktop research, public consultations, and interviews. Questionnaires were administered in order to assess the socio-cultural impacts of the proposed supplementary project activities. The local people were also consulted on the potential positive and negative environmental and social impacts of the project.

The 2001 EA findings established that the Sierra Leone – Health Sector Reconstruction and Development Project (H-0210-SL) is a Category B project since its potential negative impacts are site-specific and easily manageable. The proposed supplementary programmes/ activities will not change the environmental status as determined in 2001.

The EA update mainly focused on the impact of the proposed programmes/ activities on the biophysical and socio-cultural environments within the project area of influence. The proposed civil works will be carried out in areas covered by the four HSRDP districts; Moyamba, Bombali, Koinadugu and Kono. The proposed activities under Onchocerciasis Control and Avian Influenza Prevention and Control programmes will not require any new land. As such, involuntary resettlement will not be an issue. However, it must be noted that a Resettlement Policy Framework for Sierra Leone has been developed since 2002.

The biophysical and socio-cultural concerns of the project are compressively and fully addressed in sections 3.1 and 3.2 respectively of the HSRDP 2001 EA report.

This study revealed that there is need for the current environmental legislation and policy to be explained to the local people and that they should be encouraged to develop Local Environmental Action Plans (LEAPS) as part of the overall National Environmental Action Plan (NEAP).

1.0 BACKGROUND AND INTRODUCTION

1.1 Purpose of the Study

The purpose of the study is to update the 2001 Health Environmental Impact Assessment to include the following programme:

- Civil Works;
- Onchocerciasis Control Programme (OCP); and
- Avian Influenza Prevention And Control

2.0 Description of the requested supplemental projects

2.1 Onchocerciasis Control Programme (OCP)

The Onchocerciasis Control Programme (OCP) was not included in the initial implementation stage, because it was to be supported by a separate Grant. This was not forthcoming as anticipated, and there was an urgent need to initiate support for the OCP as lack of control activities in Sierra Leone posed a threat to all OCP gains in the sub-region. Based on this, an Agreement was reach with the Bank in the year 2005 for the inclusion of the Onchocerciasis control Programme in the project implementation with an estimated cost of US$2,800,000 (two million eight hundred thousand United States Dollars). In that particular period no extra funds were made available to the project to make up for this shortfall.

2.2 CIVIL WORKS:

2.2.1 Omissions and Variations

During the construction phase of the HSRDP, imposing site conditions such as the need to create basements in certain buildings at the New Makeni Government Hospital warranted the need to vary the works substantially thereby resulting in the upward movement of costs. Also, since April 2003 when the inception Report on the status of the Civil Works Component was prepared, to the actual commencement of construction works between April and June 2005, the structures, particularly, the roof had deteriorated further. In fact, some of the poor conditions of the roof structures were in some cases only observed after the removal of the ceilings. This gave rise to the need to vary the works to accommodate the increase in the scope of works.

2.2.2 Additional Facilities to the Government Hospitals

Additional facilities are required to complement works in the four hospitals i.e., Moyamba Government hospital, Makeni Government hospital, Kabala government hospital and Kono Government hospital.

2.2.3 Additional Facilities to Community Health Centres.

There is also need to make available additional facilities to the Community Health Centres within the project districts.

Details of additional facilities for both the Hospitals and Community Health Centres are attached (appendix V11).

2.3 Avian Influenza

The global outbreak of the AI required the Government of Sierra Leone to conform to the International Protocol by putting in place certain logistic arrangement in response to this outbreak. The total cost of the health component of the Emergency Preparedness and Response Action Plan for the prevention and control of Avian Influenza is attached in appendix V1.

3.0 PURPOSE AND REQUIREMENT OF THE ENVIRONMENTAL ASSESSMENT (EA) UPDATE

The purpose of the environmental assessment (EA) update is to determine the potential environmental and social impacts of the proposed supplementary programmes/ activities, namely Civil Works, Onchocerciasis Control Programme (OCP), and Avian Influenza Prevention and Control Programmes.

The study includes an update of the 2001 environmental, socio-economic and socio-cultural assessment of potential impacts of the above activities and appropriate mitigation and monitoring plans. It is intended to satisfy all requirements of the international, national and local authorities.

Appropriate consultation with stakeholders, potentially would-be affected groups, local communities, and non-governmental organisations (NGOs) has been undertaken during the preparation of this EA update.

4.0 Objectives

The objectives of the environmental analysis are to:

1. Predict and assess any potential environmental and social impacts and benefits that could emanate from the financing of productive and non-productive investments, including capacity building activities under the proposed project;

2. Analyse alternative interventions an process that may pose less environmental social damage than the one(s) proposed under the project;

3. Recommend practical and less costly but effective actions and processes to mitigate any potential adverse environmental and social impacts that could emanate during project implementation;

4. Identify capacity building needs and recommend actions to strengthen MOHS and its partners' capacity for ensuring sustained environmental and social compliance monitoring; and

5. Prepare an Environmental Management Plan (EMP).

5.0 Synergies between previous related studies and present EIA update

MOHS with support from World Bank through HSRDP funds have concluded the following related studies, which are referenced:

(a) HSRDP inception EA in 2001;
(b) Sierra Leone Waste Management Plan 2002;

(c) Resettlement Policy Framework 2002; and
(d) Study to Adapt and develop De Mont Fort Incinerator 2006.

The above documents complement the present EA update.

6.0 Methodology and Techniques used in Assessing and analyzing the Impacts

The consultants were guided by the terms of reference and employed the following methodology.

1. **Desktop Research**

Various documents were consulted and relevant information extracted.

2. **Public Consultations**

Public consultations were held in the various districts covered by the project at different levels in order to acquaint people with the supplemental programmes/ activities and educate them about the environmental concerns. Those consulted at the various levels included:

- Affected people;
- District Health Management Teams;
- Local government officials;
- Traditional rulers;
- Other government organisations;
- Non-Governmental Organisations; and
- Community Based Organizations

3. **Interviews**

Interviews were conducted at various levels in order to obtain information on the following:

a) Possible negative environmental impacts of the supplementary programmes/projects;
b) Possible mitigation measures to reduce identified negative environmental impacts; and
c) Capacity at the various levels to implement environmental management plans.

7.0 Situational Analysis for Onchocerciasis and Avian Influenza Control Programmes in Sierra Leone

Detailed descriptions of the programmes for Avian Influenza Prevention and Control and Onchocerciasis Control under the HSRDP are attached as appendices V and VI.

8.0 Description of the Legal, Regulatory and Administrative Frameworks

This is well documented in section 4 of the HSRDP inception EA Report 2001. Other sector instruments for the management of the environment include the Public Health Ordinance. It must be noted that Part IV of the Sierra Leone Public Health Ordinance; Act No. 23 of 1960 is in force and covers the Prevention, Notification and Treatment of Diseases (Sections 34 – 57). This PART of the ordinance covers the control of communicable diseases exhaustively; which applies to Onchocerciasis, Avian Influenza and other communicable diseases.

The MOHS has established a National Programme for the Safe Management of Medical Waste since 2003. SHARP has finalised a national master plan for the safe management of healthcare wastes, wherein environmental and social issues relating to incineration and sanitary landfills are fully addressed, including monitoring and mitigation plans. The District Councils are responsible for waste management in their respective councils in collaboration with the Environmental Division of MOHS.

8.1 Reinforcement of import procedures and systems, quarantine etc.

In Sierra Leone, the following institutional arrangements exist for the control of import and export items that might pose public health related threats to the nation:

1. The National Standards Bureau,
2. The Public Health Inspectorate of MOHS
3. Veterinary Division, Ministry of Agriculture and Food Security

The Standards Bureau is responsible for the protection of consumers through its Consumers Protection Department. Part of its mandate includes inspecting and certifying goods entering and leaving the country according to existing quality standards.

The Public Health Inspectorate is responsible for carrying out inspections of meat and other foodstuffs in order to certify their fitness for human consumption.

The Veterinary Division of the Ministry of Agriculture and Food Security has as part of its mandate the responsibility to inspect and certify livestock and plants for import and export.

It is also noteworthy that a Biosafety Framework is being developed by the National Commission for Environment and Forestry which on completion will reinforce the control of the import and export of animals and plants.

These institutions collaborate and use the integrated approach. Quarantine measures are applied as described in the Public Health Ordinance.

9.0 The Potential Negative Environmental Impacts of the Technical Programmes of the Project

9.1 Assessing and Analyzing the Impacts

The results of the desktop research, public consultations, and interviews are discussed below.

The wastes generated by these programmes should be disposed of in such a manner, that they would pose little or no threat to the environment. These wastes may include: Laboratory waste, culled birds, infectious materials, and farm waste (manure, eggs, feathers, contaminated equipment). See Appendix II for details of disposal options.

The potential negative environmental impacts of these wastes include pollution of the land, water resources and the air. The respective local councils have overall responsibilities to ensure safe management of waste in their localities in collaboration with the sanitation programme under the Environmental Health Division of MOHS. Management of the impacts associated with poor disposition of health care wastes and infections from infected birds can be achieved through preventive and curative measures (Waste Management Plan 2002 refers).

The additional civil works for which supplementary funding is requested are either construction of complementary facilities or omissions within the four HSRDP hospitals: i.e. Moyamba, Makeni, Kabala and Kono. These works will involve improvements to existing facilities. No new sites are involved as such; involuntary resettlement will not be triggered. These are the facilities covered by the 2001 inception EA report.

The technical programmes, i.e., Onchocerciasis Control Programme (OCP) and Avian Influenza Prevention and Control are new inclusions in HSRDP. Fortunately, like Malaria, these programmes are both under the recently created Directorate of Disease Control and Prevention in the Ministry of Health and Sanitation and they employ the integrated approach in the implantations of their respective activities.

Onchocerciasis control activities in Sierra Leone include Training of Healthcare Staffs, Community Sensitisation, and Community Directed Treatment with Ivermectin. Vector control with insecticides has been discontinued. The potential negative environmental impacts of this component can be managed within the framework of the Waste Management Plan of 2002.

Avian Influenza is also new and can potentially affect the entire country. Its activities include surveillance, community sensitisation, training of healthcare personnel and case management. However, management of potential environmental impacts associated with the disposal of infected birds and related wastes have been catered for by the EMP (appendix 1).

The wastes generated by these programmes should be disposed of in such a manner, that they would pose little or no threat to the environment. These wastes may include amongst others, tissue, faeces, chemicals, fluids, needles, bottles, plastics, cans and culled birds.

10.0 Update on the implementation of the 2001 ESMP

Status on the implementation of the 2001 EMP is appendixed. See Appendix VII.

The following activities have been conducted in line with the ESMP in Sierra Leone:

1. MOHS has established a National Medical Waste Management programme within its Environmental Health Division with a programme manager appointed. The programme has since 2004 Financial Year been made a COST CENTER with annual GOSL budgetary allocations.

2. GOSL funds are annually allocated to the programme.

3. All health facilities nationwide, **at least, segregate their SHARPS**.

4. The programme has designed and distributed a burn pit to all government facilities nationwide. This is working well, under existing circumstances.

5. The programme is supported by SHARP and HSRDP;

Under SHARP

1. Completed the assessment of healthcare waste management situation in Sierra Leone;

2. Developed a comprehensive waste management plan;

3. Trained three (DMO and two EHOs) trainers (TOT) per district on safe management of healthcare waste and prevention of Nosocomial infections;

4. Every District Medical Officer has assigned one of the trained Environmental Health Officers (EHOs) as the District Healthcare Waste Officer (Programme Focal Point);

5. Develop and distributed Guidelines for Medical Waste Management in Sierra Leone;

6. Strengthened the functional capacity of the programme with one 4WD pick-up van, one desktop computer, one printer, and photocopier;

7. Trained Staffs of the four Government Satellite Hospitals in Freetown;

8. Technical Assistance to develop a national medical waste management policy; this is on going.

Under HSRDP

1. Print and distribute of guidelines for medical waste management;

2. Technical Assistance to develop De Mont Fort Incinerator; it concluded with Mark 8a for the PHUs and the Mark 9 for District Hospital and is MOHS **technology of choice for the time being, since WHO approves of its application in tropical developing countries.**

3. Trained NGOs, Public, Private and Paramedical Health Care Staffs countrywide on healthcare waste management;

4. Training of Technicians to operate medical waste management equipments in healthcare facilities; this is on going.

With regards to the management of avian flu, the consultants considered the following:

(i) That laboratories to be setup and equipped will generate additional medical waste;
(ii) The diagnosis of avian flu cases would require measures to prevent infections;
(iii) The disposal sites can contaminate ground water and soils if not managed professionally;
(iv) That the avian flu virus is slowly increasing its area of influence in the sub- region.

Therefore, and Environmental Management Plan (EMP) to mitigate potential Adverse Impacts of Avian Influenza Outbreak in Sierra Leone is consistent with the World Bank's guidance (April 2006). See Appendix I.

In the EA of 2001, the following activities were to be conducted:

- Advocacy at national level to secure government commitment.
- Develop a national policy and regulatory framework on waste management.
- Integrate waste minimization into national purchasing policies.
- Make instruments to develop plan of action with practical targets and budget for the health institutions
- Develop educational materials and training modules for:

    a. Health workers;
    b. Medical waste handlers;
    c. Municipal waste handlers;
    d. The population

- Organise training at District and Chiefdom levels for health-care workers and the community on the risk associated with health-care waste and safe management practices, with priority for waste-handlers;
- Make available the materials to facilitate medical waste management.

- Ensure that all health-care establishments segregate their waste into harmful and non-harmful categories;
- Ensure that all health-care establishments implement safe handling, storage, transportation, treatment and disposal options;
- Include health-care waste management and prevention of nosocomial infection into the training curricula of Nurses, Public Health Inspectors, Community Health Officers and Doctors;
- Ensure incinerator flue gas cleaning by installing cleaning devices;
- Ensure routine monitoring of impact through process indicators.

Supplementary Management Plan Relating to Avian Influenza

In addition to the above, the following activities are included in the present supplementary management plan relating to Avian Flu taking cognisance of the World Bank's guidance.

- Improving HPAI Prevention and Control Planning;
- Strengthening of Veterinary Services;
- Strengthening Animal Disease Surveillance and Diagnostic Capacity;
- Strengthening Applied Veterinary Research;
- Refurbishing of existing diagnostic laboratories;
- Collection and disposal of wild birds;
- Transport of infective materials and dead birds;
- Disposal of farm waste (manure, eggs, feathers, and contaminated equipment);
- Decontamination;
- Improvements of Laboratory Networks; and
- Medical Services (includes support to rehabilitate and equip selected health facilities for the delivery of critical medical services)

11.0 Conclusions

The main findings are as follows:

1. The overall environmental impact is expected to be favourable as the project supports a sanitation component: building of incinerators within existing hospital compounds for health-facility wastes, development of new sanitary landfill sites, rehabilitation of existing latrines and staff quarters within the health-facilities compound. Existing water wells within the hospital compounds will be deepened to increase their current yields and consequently increase their water supplies. Staff will be trained and communities sensitised.

2. Target beneficiaries were happy that Avian Influenza will be addressed if it reaches Sierra Leone and Onchocerciasis control will be continued.

3. Most of the beneficiaries are illiterates and semi-illiterates who could not quite discern the environmental issues of the project until after the public consultations wherein these issues were addressed.

4. No new land will be acquired by the project for the proposed supplementary activities.

5. Appropriate consultations with MOHS headquarter staff, staff of priority technical programmes, District Health Management Teams, potentially would-be affected groups, local communities, and non-governmental organisations (NGOs) have been undertaken during the preparation of the EA update.

6. The project was well conceived and environmental concerns seemed to have been taken onboard implicitly. The environmental impacts of the project are site-specific and manageable. The mitigation measures suggested in this report will enhance the quality of the environment in the post project period.

7. The MOHS has since 2003 established a National Programme for the Safe Management of Medical Waste with a programme manager appointed. SHARP has finalised a national master plan for the safe management of healthcare wastes, wherein environmental and social issues relating to incineration and sanitary landfills are fully addressed, including monitoring and mitigation plans. The District Councils are now responsible for waste management in their respective councils in collaboration with the Environmental Division of MOHS.

8. The analysis of the acquired information revealed that there is need for the current environmental legislation and policy to be explained to the local people and that they are encouraged to develop Local Environmental Action Plans (LEAPS) as part of the overall National Environmental Action Plan (NEAP).

9. Safeguard Policies that might apply

Safeguard Policies Triggered	Yes	No	TBD
Environmental Assessment (OP/BP 4.01)	**X**		
Activities under the proposed project are not expected to generate significant adverse environmental effects as they focus largely on public sector capacity building and improved readiness for prevention activities. They are expected to have positive environmental and social impacts.			
Natural Habitats (OP/BP 4.04)		**X**	
Forests (OP/BP 4.36)		**X**	
Pest Management (OP 4.09)		**X**	
Cultural Property (OPN 11.03)		**X**	
Indigenous Peoples (OP/BP 4.10)		**X**	
Involuntary Resettlement (OP/BP 4.12		**X**	
Safety of Dams (OP/BP 4.37)		**X**	
Projects on International Waterways (OP/BP 7.50)		**X**	
Projects in Disputed Areas (OP/BP 7.60		**X**	

12.0 Recommendations

1. That sensitisation/education on Oncho and Avian flu with regards to causes, effects, preventive measures and response strategies including community mobilisation and environmental issues be instituted and intensified.

2. That institutional capacities to implement the EMP (Appendix 1) be strengthened and programmes to deal with the above diseases particularly AI be emphasised.

3. That provision of medical and other services e.g. good roads to so called remote areas and sanitation facilities in such are to be improved.

4. That the current environmental legislation and policy be explained to the local people and that they are encouraged to develop Local Environmental Action Plans (LEAPS) as part of the overall National Environmental Action Plan (NEAP).

APPENDIX I

Environmental Management Plan (EMP) for Avian Influenza (AI) Prevention and Control in Sierra Leone

Activities	Potential Major Impacts/issues	Mitigation Measures	Monitoring Requirements	Budget $	Responsibility for Mitigation	Responsibility for Monitoring and Supervision
Improving HPAI Prevention and Control Planning	**No potential environmental impacts**	**None**	**National emergency contingency plan**	**500**	MOHS/Local authorities/ Community groups, Govt. Agencies.	MOHS/Local authorities/ Community groups, Govt. Agencies.
Strengthening of Veterinary Services	Construction related impacts from limited civil works financed as part of upgrading priority infrastructure.	These impacts are to be mitigated by following standard good construction practices/FIDIC standards.[1]	Regular supervision of construction activities will include monitoring the implementation of FIDIC standards.	**1,000**	MOHS/Local authorities and DHMTs	Environmental Officers and DHMTs
Strengthening Animal Disease Surveillance and Diagnostic Capacity	Cross-contamination or infections caused by viral agents. Poor management of lab waste.	Follow appropriate Biosafety Level Standards[2] by supporting upgrading of labs and training of staff. Follow internationally accepted lab waste management practices.[3]	Inspection of premises, staff training and introduction of safety procedures at all diagnostic labs, prior to installation of equipment and at six month intervals thereafter.	**2,000**	-Do-	-Do-
Strengthening Applied Veterinary Research (Both these activities may include construction and or refurbishing of existing diagnostic laboratories)	Construction related adverse impacts while upgrading or constructing new diagnostic laboratory.	Any potential adverse impacts arising out of the limited civil works (during the construction period) will be addressed by following standard good construction practices/FIDIC standards.	Regular supervision of construction activities will include monitoring the implementation of FIDIC standards.	**2,000**	MOHS/Local authorities and DHMTs	The Communities

Collection and disposal of wild birds	Poses risks of spreading the virus and of exposure of personnel.	Policy and operating procedures, manual for collecting dead wild birds, use of personnel protective equipment (PPE), decontamination equipment and procedures in place.	During regular supervision, verify availability and use of PPE and certification of personnel; and monitor health status/record of personnel involved in collection/transport/disposal.	**2,000**	MOHS/Local authorities and DHMTs	Environmental Officers and DHMTs
Activities	**Potential Major Impacts/issues**	**Mitigation Measures**	**Monitoring Requirements**	**Budget**	**Responsibility for Mitigation**	**Responsibility for Monitoring and Supervision**
Culling of birds	Poses risks of spreading the virus and of exposure of personnel. Risks of intoxication when using chemicals for culling.	Follow FAO/OIE guidelines on culling Use PPE. Code of conduct on distribution, handling and use of chemicals.	Verify guidelines in operations manual Procurement documents Training manuals Monitor health status/record of personnel involved in culling.	**2,000**	Respective District Communities	Respective District Communities
Transport of infective materials and dead birds	Pose risks of spreading the virus and of exposure of personnel	Collection and transport in closed containers. Only use trained and certified personnel that have access too and use the recommended protective gear. Only use personnel that have been vaccinated.	During regular supervision, verify availability and use of PPE and certification of personnel; and monitor health status/record of personnel involved in collection/transport/disposal.	**2,000**	MOHS/Local authorities/ Community groups, Govt. Agencies.	MOHS/Local authorities/ Community groups, Govt. Agencies.
Disposal of culled birds	Poor choice of disposal options and disposal sites may pose risk of spreading the virus.	See Annex 3 on comparison of different disposal options for choosing a disposal option and disposal site most suitable for local conditions.	During regular supervision, confirm whether environmental and safety considerations are met; verify certification of personnel; availability and use of PPE	**1,000**	MOHS/Local authorities and DHMTs	Environmental Officers and DHMTs
Disposal of farm waste (manure, eggs, feathers, contaminated equipment etc.).	Risk of dissemination of the virus during movement and transport of manure. Risk of dissemination of virus when handling contaminated eggs and hatchery waste and/or equipment. Risk of groundwater pollution.	Composting, burning or burial on site (not accessible to other animals) when feasible. Use of PPE and limit aerosols. Site selection (away from residences, lakes, ponds, streams and water tables).	Use of PPE. Proper site selection. Proper transport equipment. Isolation from residences and other birds.	**1,000**	-Do-	-Do-

Decontamination	Risk of virus dissemination. Risk of groundwater pollution. Risk of intoxication when using chemicals.	Use recommended detergents. Thoroughly disinfect materials that come in contact with bird droppings. Clear decontamination procedures.	Procurement of disinfectants and detergents. Verify procedures and training manuals.	**1,000**	The Communities	The Communities
Improvements of Laboratory Networks	Cross-contamination or infections caused by viral agents. Poor management of lab waste.	Follow appropriate Biosafety Level Standards[4] by supporting upgrading of labs and training of staff. Follow internationally accepted lab waste management practices.[5]	Inspection of premises, staff training and introduction of safety procedures at all diagnostic labs, prior to installation of equipment and at six month intervals thereafter.	**2,000**	MOHS/Local authorities and DHMTs	Environmental Officers and DHMTs
	Construction related adverse impacts while upgrading or constructing new diagnostic laboratory.	Any potential adverse impacts arising out of the limited civil works (during the construction period) will be addressed by following standard good construction practices/FIDIC standards.	Regular supervision of construction activities to include monitoring the implementation of FIDIC standards.	**Nil**	Respective District Communities	Respective District Communities
	Potential social safeguard impacts (loss of livelihoods, incomes, involuntary resettlement) due to land acquisition for construction of new labs.	Implement a land acquisition and resettlement policy framework describing the process for land acquisition, in accordance with the requirements of OP 4.12 Involuntary Resettlement.	Satisfactory implementation of land acquisition plan/ resettlement plan, if applicable, before beginning construction.	**Nil**	MOHS/Local authorities and DHMTs	Environmental Officers and DHMTs
Medical Services (includes support to rehabilitate and equip selected health facilities for the delivery of critical medical services)	Cross-contamination or infections caused by viral agents due to poor management of: infectious health care wastes; and laboratory wastes; and Construction related impacts, when expansion of existing, or construction of new facilities, is funded.	Develop hospital/health clinic specific comprehensive laboratory waste management and health care waste management plans.[6]		**1,000**	MOHS/Local authorities and DHMTs	Environmental Officers and DHMTs

APPENDIX II
COMPARISION OF DISPOSAL METHODS FOR ANIMAL WASTE GENERATED FROM AVIAN INFLUENZA OUTBREAKS

DESCRIPTION	ENVIRONMENTAL CONSIDERATIONS	SAFETY CONSIDERATIONS	ADVANTAGES/ DISADVANTAGES
OPTION 1: BURIAL IN A PIT			
Decomposition of dead birds/ carcasses and other wastes through biological degradation in a pit and involves: • Excavation of a burial pit. • Placing carcasses in a deep burial pit. • Covering carcasses and other wastes with soil (about 40 cm) to: (a) prevent carcasses from rising out of the pit; (b) prevent scavengers digging up carcasses; (c) help filter out odours; and (d) absorb the fluids of decomposition. • Adding an unbroken layer of slaked lime [$Ca(OH)_2$] to protect carcasses from being uncovered by carnivores and earthworms after pit closure (lime should not be placed directly on carcasses because in wet conditions it slows, and may prevent, decomposition). • Closing the pit to ground level with soil (at least 2 meters of soil	Site Selection Considerations: • Distance to watercourses, bores, and dug wells. • Height of water table (the base of the pit must be well above the water table). • Slope of the land at the burial site to the nearest watercourse (drainage to and from the pit). • Soil permeability. • Distance to human settlements and public lands (including roads). • Prevailing wind direction (for odour emission). • Availability of space for temporary storage of excavated soil. • Accessibility of the burial site by digging equipment (e.g., excavator). Burial Site Inspection: Three (3) months after closure, inspection of the burial site to identify any potential problems (e.g., seepage) and take corrective measures. Transportation-Related Waste/Wastewater Treatment: • Any wastewater generated from cleaning/disinfection of vehicles/ containers should be disinfected before discharge. • Any waste generated during loading and unloading of vehicles as well as cleaning/disinfection of vehicles/containers should be safely disposed.	• Use of personal protection equipment (PPE) to ensure hygiene and safety of personnel working at the site. • Availability of emergency response measures and equipment for safety breaches (e.g., availability of first aid and rescue equipment if the personnel fall into the pit). • Established and documented cleaning/disinfection procedures. • Availability of cleaning/ disinfection supplies/equipment. • Personnel training on personnel hygiene and safety measures. Transportation of Carcasses/Wastes to an Environmentally Suitable Site: If carcasses and other contaminated materials need to be transported off-site for disposal, then: • The vehicles must be leak-proof and covered. • The vehicles and external surfaces of containers should not leave the culling area without first being thoroughly cleaned/ disinfected. • The vehicles and internal, external surfaces of containers should be cleaned/ disinfected after unloading carcasses and other wastes at the environmentally suitable site.	Advantages: • Safe disposal if environmental conditions are met. • Risk of disseminating the virus to other sites can be avoided if burial can be done on site. • Low cost. Disadvantages: • Likely to be affected by surface water, groundwater, soil or topographical conditions. • If transportation to an environmentally suitable site is required, then: (a) increases the risk of disseminating the virus to other sites, and (b) higher costs for transportation and associated mitigation measures. • Risk of groundwater contamination if site selection is not appropriate.

DESCRIPTION	ENVIRONMENTAL CONSIDERATIONS	SAFETY CONSIDERATIONS	ADVANTAGES/ DISADVANTAGES
is required in total).			
OPTION 2: OPEN AIR BURNING (CREMATION)			
This method is based on destruction of infective pathogens, animal carcasses and other wastes through thermal destruction in open air. It involves: • Digging trenches, which act as air vents. • Placing pyre (wood) on top of trenches (upwind, at right angle to the prevailing wind direction). • Placing carcasses and other wastes at the opposite side. • Pouring fuel (e.g., kerosene) onto carcasses, other wastes and pyre and starting fire (adequate supply of fuel must be at the site to ensure complete cremation).	Site Selection Considerations: • Potential adverse impacts of heat, smoke or odour on nearby people, infrastructure (structures, underground and aerial utilities, roads, etc.) and environment (e.g., trees). • Accessibility of equipment to construct and maintain the fire and for delivery of fuel and carcasses • The ashes should be buried and the site should be restored. Waste Pre-treatment/Containment: • To avoid emission of dioxins or furans during cremation, carcasses should not be pre-treated with a chlorine-bearing disinfectant or should not be contained in PVC bags. For the same reason, no other material destined for cremation should contain chlorine-bearing chemicals.	• Maintaining adequate fire break around the pyre (consult local fire brigades or residents for advice). • Use of PPE to ensure hygiene of personnel working at the site. • Availability of emergency response measures and equipment for safety breaches (e.g., availability of first aid equipment and availability of fire fighting equipment and personnel if fire spreads around). • Established and documented cleaning/disinfection procedures. • Availability of cleaning/ disinfection supplies/equipment. • Personnel training on personnel hygiene and safety measures.	Advantages: • Cremation is not affected by surface water, groundwater, soil, and topographical conditions. • Low cost, compared to incinerator option. Disadvantages: • Infective pathogens may not be effectively destroyed if combustion of carcasses and wastes is incomplete, especially under adverse atmospheric conditions (wind, precipitation). • It is not possible to easily verify that all infective pathogens are destroyed in the incomplete combustion process. • Air emissions from open air burning (PM, CO2). • Disposal of ash from cremation requires consideration for surface water, groundwater, soil and topographical conditions. • More expensive than option 1 (burial).
OPTION 3: COMPOSTING			
This method is based on thermal deactivation of the virus and decomposition of carcasses, litter and other contaminated organic wastes through aerobic biological degradation. Success of composting depends on: (a) proper nutrient mix; (b) moisture; (c) temperature; and (d) pH. Details can be found in technical documentation and websites listed.	Site Selection Considerations: • Must be done at the affected farm in a secure area not accessible by other animals (such as birds, rodents, cats, or dogs). • Proximity to residential areas and water sources (must be away).	• Use of PPE to ensure hygiene of personnel working at the site. • Availability of emergency response measures and equipment for safety breaches. • Established and documented cleaning/disinfection procedures. • Availability of cleaning/ disinfection supplies/equipment. • Personnel training on personnel hygiene and safety measures.	Advantages: • Effective for manure and litter waste. • Can be undertaken within sheds or otherwise on site to avoid the risks of disseminating the virus through transport. • No transportation cost. Disadvantages: • Maintaining optimum temperatures for many days in cold climate areas/seasons may not be possible (or may be costly). • Infective pathogens may not be effectively destroyed if ideal conditions are not achieved. • Risk of disseminating the virus if the composting area is not effectively secured/isolated. • It may not be possible to easily verify

DESCRIPTION	ENVIRONMENTAL CONSIDERATIONS	SAFETY CONSIDERATIONS	ADVANTAGES/ DISADVANTAGES
			that all infective pathogens are destroyed.
OPTION 5: INCINERATION (FIXED)			
This method is based on thermal destruction of infective pathogens, carcasses and other wastes in an incinerator. It involves: • Transporting carcasses and other wastes to the incineration site. • Cleaning containers and vehicles transporting carcasses and wastes, with treatment of the resulting wastewaters. • Incinerating carcasses and other wastes (using fuel and air) at a high temperature. • Transporting incineration residues (bottom ash/slag and fly ash) to the disposal site and disposal at the sanitary landfill.	Site Selection Considerations: • Should not be in a floodplain. • Distance to human settlements. • Human settlements upwind of the prevailing wind direction (for odours before incineration and emissions from incineration). Technology Requirements: • Incinerator at a minimum temperature of 850ºC and with a minimum residence time of 2 seconds. Temperature must be measured and recorded. • Incinerator equipped with an auxiliary burner that can be switched on when the temperature falls below 850ºC. • Incinerator automatic feed system connected to temperature measurement. • Site security and inaccessibility by animals (such as birds, rodents, insects and other vermin). • Storage areas for animal carcasses and other wastes as well as incineration residues must be covered. These areas must be labelled and designed and operated to prevent accidental releases of polluting substances to the environment. Storage capacity provided to collect contaminated storm water and wastewater from spillage or firefighting. • Transportation of bottom ash/slag and fly ash in closed containers to prevent environmental releases. • Disposal of bottom ash/slag and fly ash in a sanitary landfill. Waste Pre-treatment/Containment: To avoid emission of dioxins or furans during incineration, carcasses should not be pre-treated with a chlorine-bearing disinfectant or should not be contained in PVC bags. For the same reason, no other material destined for incineration should contain chlorine-bearing chemicals.	• Use of PPE to ensure hygiene of personnel working at the site (incinerator operators must change their PPE before handling animal carcasses and other wastes). • Established and documented cleaning/disinfection procedures. • Established and documented emergency response procedures. • Availability of cleaning/ disinfection supplies/equipment. • Availability of emergency response equipment (e.g., first aid, fire fighting) • Personnel training on personnel hygiene/cleaning, safety and emergency response measures. • Regular inspections of the environment and equipment, with documented inspection schedules and results. Transportation of Carcasses/Wastes to the Incineration Site: When carcasses and other contaminated materials are transported to the fixed incineration site, then: • The vehicles must be leak-proof and covered; • The vehicles and the external surfaces of containers should not leave the culling area without first being thoroughly cleaned/disinfected; and • The vehicles and internal/external surfaces of containers should be cleaned/ disinfected after unloading carcasses and other wastes at the incineration site. Transportation of Incineration Residues to the Disposal Site: • The vehicles must be covered. • The vehicles and containers should not leave the incineration area without first being thoroughly disinfected.	Advantages: • Complete destruction of infective pathogens. • Over 95% waste reduction. Disadvantages: • Complex technology which may be imported to the country. • High investment cost. • High operating cost (especially fuel cost). • Some spare parts may need to be imported (cost and downtime of incinerator in case of AI outbreak). • High level of operator training. • Scrutinized administrative requirements (recordkeeping, etc.). • The incineration facility may be too far from the location with the AI outbreak, requiring extensive transportation of carcasses and other wastes with infective pathogens, resulting in: (a) increased risks of disseminating the virus to other sites; and (b) higher costs for transportation and associated mitigation measures. • Air emissions from the incinerator (PM, SO_2, CO_2).
OPTION 6: INCINERATION (MOBILE)			
This method is based on thermal destruction of infective pathogens, animal carcasses and other wastes in an incinerator. It involves:	Technology Requirements: • Incinerator at a minimum temperature of 850ºC and with a minimum residence time of 2 seconds. Temperature must be measured and recorded.	• Use of PPE to ensure hygiene of personnel working at the site (incinerator operators must change their PPE before handling animal carcasses and other wastes).	Advantages: • Complete destruction of infective pathogens.

DESCRIPTION	ENVIRONMENTAL CONSIDERATIONS	SAFETY CONSIDERATIONS	ADVANTAGES/ DISADVANTAGES
• Transporting the mobile incinerator to the culling site. • Incinerating carcasses and other wastes (using fuel and air) at a high temperature. • Transporting incineration residues (bottom ash/slag and fly ash) to the disposal site and disposal at the sanitary landfill.	Temperature must be measured and recorded. • Incinerator equipped with an auxiliary burner that can be switched on when the temperature falls below 850^{o}C • Incinerator automatic feed system connected to temperature measurement. • Storage areas for animal carcasses and other wastes as well as incineration residues must be covered. These areas must be ventilated, labelled, and designed and operated to prevent accidental releases of polluting substances to the environment. • Transportation of bottom ash/slag and fly ash in closed containers to prevent environmental releases. • Disposal of bottom ash/slag and fly ash in a sanitary landfill. <u>Waste Pre-treatment/Containment</u>: To avoid emission of dioxins or furans during incineration, carcasses should not be pre-treated with a chlorine-bearing disinfectant or should not be contained in PVC bags. For the same reason, no other material destined for incineration should contain chlorine-bearing chemicals.	and other wastes). • Established and documented cleaning/disinfection procedures. • Established and documented emergency response procedures. • Availability of cleaning/ disinfection supplies/equipment. • Availability of emergency response equipment (e.g., first aid, fire fighting) • Personnel training on personnel hygiene/cleaning, safety and emergency response measures.	• Over 95% waste reduction. • Avoids the need to transport the infective pathogens, carcasses, and other wastes to the incinerator (i.e., reduced risk of disseminating the virus to other sites compared to the fixed incineration case). <u>Disadvantages</u>: • Complex technology which may be imported to the country. • High investment cost. • High operating cost. • Some spare parts may need to be imported (cost and downtime of incinerator in case of AI outbreak). • High level of operator training. • Scrutinized administrative requirements (recordkeeping, etc.). • Transportation of the mobile incinerator to the culling site is associated with: (a) the risk of exposing the incinerator (i.e., the investment) to damage/total loss in case of an accident (contributed by poor road conditions, severe weather, etc.); and (b) high cost of transporting incinerator to the culling site. • Accessibility of the culling site by the mobile incinerator. • Air emissions from the incinerator (PM, SO_2, CO_2).

APPENDIX III

PERSONS AND INSTITUTION CONTACTED

- The Ministry of Lands, housing, country planning and the environment, at National Level
- Ministry of Health and Sanitation at National level
- Paramount Chiefs, Elders, general public of target communities and local NGOs of Koinadugu, Moyamba, Bombali and Kono districts
- The respective District Health Management Team Members
- Programme Managers of the Onchocerciasis Control Programme, Civil Works, in MOHS and their respective District Focal Point Persons in the District Headquarter towns
- Regional Environment Officers
- Mr. Foday Koroma - Entomologist, MOHS
- Mr Daniel Tholley - Hydro geologist, National Onchocerciasis Control Programme
- Dr. Alhassan Lans Seisay – Director of Disease Prevention and Control; MOHS
- *Dr. J. B. Koroma – OCP Manager, Sierra Leone.*

APPENDIX IV

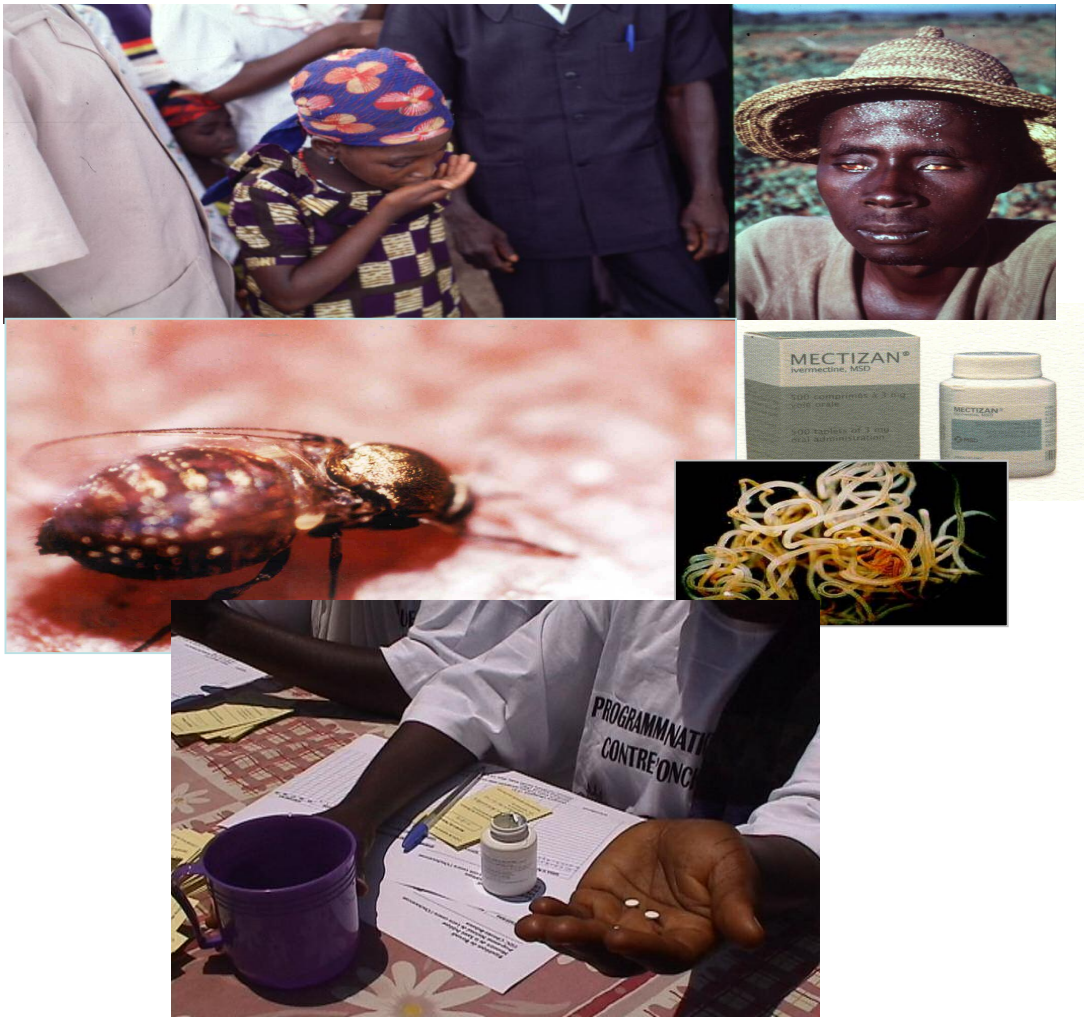
REFERENCES

1. HSRDP inception Environmental Assessment Report 2002.
2. Health-care waste Management Study for Sierra Leone, November 2001
3. Sierra Leone Waste Management Plan 2002
4. Sierra Leone Resettlement Policy Framework 2002
5. Technical Assistance to Adapt and develop De Mont Fort Incinerator 2006
6. Environmental Assessment (OP 4.01 October 1998).
7. Involuntary Resettlement (OD 4.30, June 1990)
8. Indigenous Peoples (OD 4.20, September 1991)
9. National Environmental Policy
10. National Environmental Protection Act. 2000
11. Sierra Public Health Ordinance
12. Draft National Environmental Health Policy
13. Sierra Leone Health Sector Rehabilitation and Development Project, Project Appraisal Document, November 2001.
14. Sierra Leone Integrated Health Sector Investment Project (IHSIP), Supervision Mission (April 15 – 27, 2002); AIDE-MEMOIRE
15. Safe management of wastes from health-care activities, WHO 1999
16. George Tchobanoglus, Hilary Theisen & Samuel Vigila. *Integrated Solid Waste Management*
17. Interim Guidelines for Managing Potential Environmental and Social Safeguard Issues in Bank-Assisted Avian Influenza Control Projects; April 2006

APPENDIX V
DETAILS OF ONCHOCERCIASIS CONTROL PROGRAMME IN SIERRALEONE

NATIONAL ONCHOCERCIASIS CONTROL PROGRAMME
MINISTRY OF HEALTH AND SANITATION
FREETOWN

PROPOSAL FOR WORLD BANK SUPPORT TO COMMUNITY DIRECTED TREATMENT WITH IVERMECTIN (CDTI) IN SIERRA LEONE FOR THE PERIOD 2005-2007.



PREPARED BY THE NATIONAL ONCHOCERCIASIS CONTROL PROGRAMME (NOCP)
MINISTRY OF HEALTH AND SANITATION (MOHS)
SIERRA LEONE

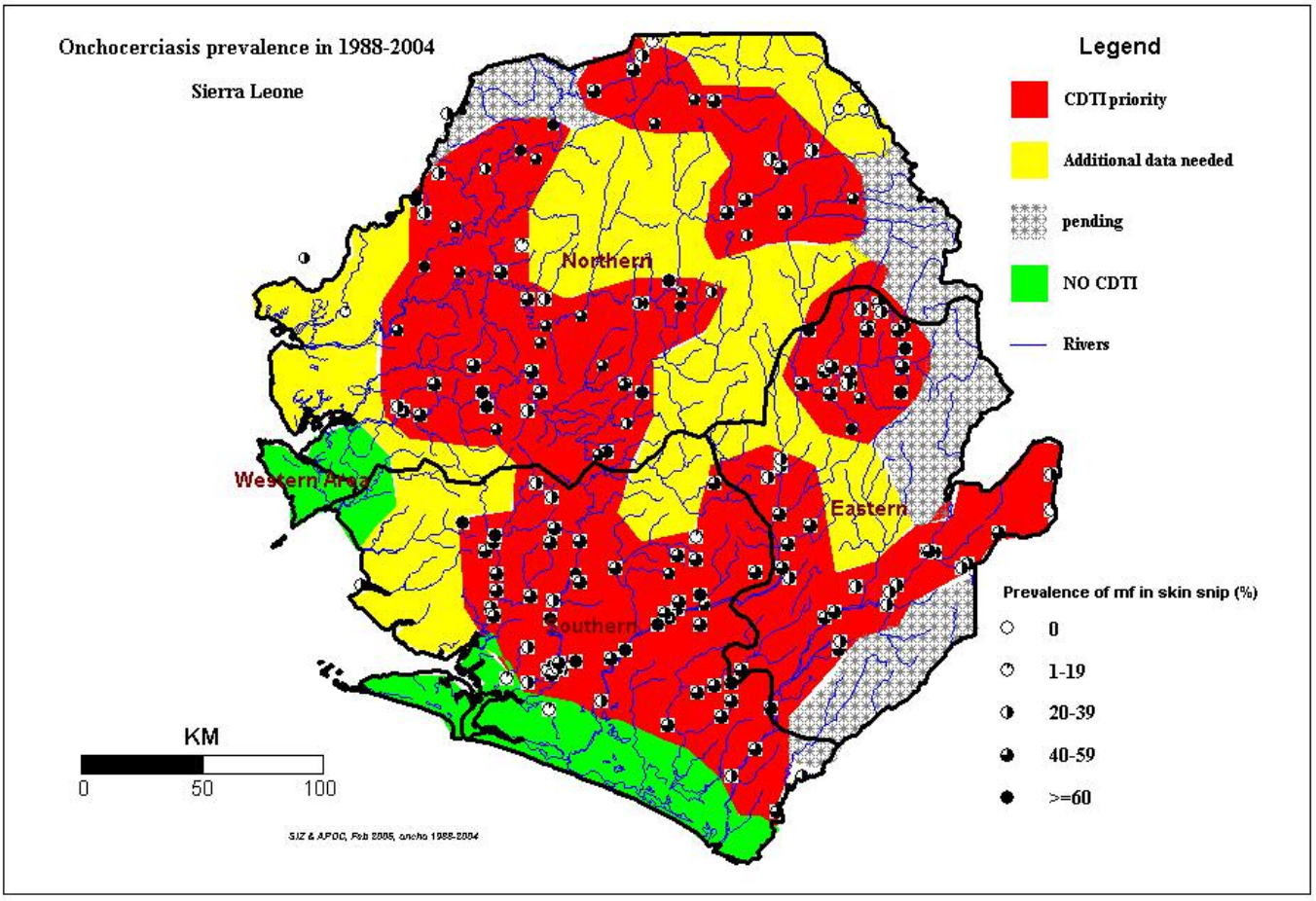
INTRODUCTION

This project proposal is submitted to the World Bank by the National Onchocerciasis Control Programme (NOCP) for improvement of the implementation of Community Directed Treatment with Ivermectin (CDTI) in Sierra Leone, as the main strategy for Onchocerciasis Control. Funding for this projected is expected from five partners, namely the Government of Sierra Leone (GOSL), Sight savers International (SSI), Hellen Keller International (HKI), Special Intervention Zones (SIZ) and the World Bank. It should be noted that the World Bank will be making the greatest contribution to this project. Furthermore, the NOCP has signed a Letter of Agreement with Management of the SIZ for their contribution to this project for 2005, and also a Memorandum of Understanding with HKI and SSI for their contribution to this project for 2005-2007. It is understood that the NOCP will be signing Letters of Agreement with SIZ Management each year for the duration of the project.

SITUATIONAL ANALYSIS

Sierra Leone is located on the West Coast of Africa and has an estimated population of 5 million people (National Census December 2004). Approximately 38% of this population live in urban areas (UNFPA 2OO3). It is bordered in the North and North East by Guinea, in the East by Liberia and in the West and South West by the Atlantic Ocean.

Map 1: Areas in Sierra Leone for CDTI 2005 - 2007



The country is divided administratively into four regions: Northern, Southern, Eastern Provinces, and the Western area. The 3 Provinces are divided into 12 districts (5 in North, 3 in the East, and 4 in the South). The Capital Freetown is located in the Western Area.

With the ongoing Decentralisation in Sierra Leone, Districts are administered by District Councils. The Districts are divided into Chiefdoms, each of which is headed by a Paramount Chief and administered by Chiefdom Councils. Chiefdoms are divided into Sections and Sections into Villages, which are headed by Section Chiefs and Village Chiefs respectively. Villages are administered by Village Development Committees (VDCs).

A total of 60% of the country lies in the Onchocerciasis belt of West Africa and is drained by a network of several large rivers with numerous breeding sites for black flies – the vector of Onchocerciasis. The 12 districts in the country are traversed by 7 major rivers (Rokel, Taia, Waanjie, Sewa, Kaba, Gbanbaia and Moa) and numerous big streams that empty into the Atlantic Ocean. This water course passes through forested vegetation and rocky landscape providing rapids that increase the oxygen concentration in the water and make it a potential breeding site for the black fly. Therefore, all 12 Districts are endemic for Onchocerciasis with meso and hyper endemic areas (see Map 1). The Western Area and the riverrine areas of Bonthe Districts are hypo endemic for Onchocerciasis (Map 1).

Total population at risk is the total population living in meso/hyper-endemic communities within the project area (based on skin snip and census taking). In 2005 it is estimated that the total population at risk is about 1 993 126 people (Table1 and Map 2 show projected population at risk for 2005-2010).

TABLE 1: Projected Population at Risk and Annual Treatment Objectives for 2005-2010 for Oncho control in Sierra Leone

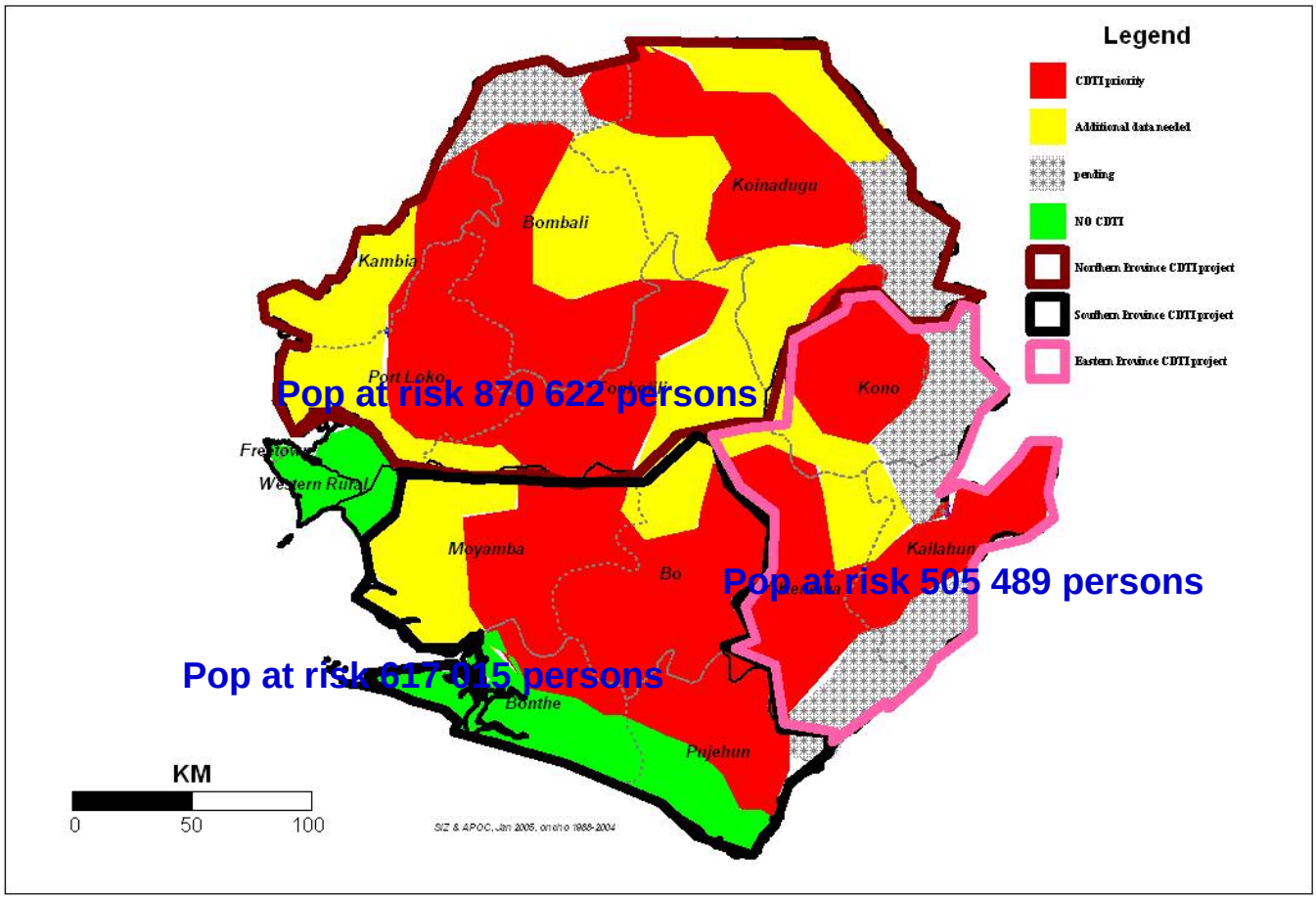
	2005	2006	2007	2008	2009	2010
Projected Population at Risk	**1,993,126**	2,023,022	2,053,368	2,084,168	2,115,431	2,147,162
Projected Annual Treatment Objective (ATO)	**1,096,219**	1,213,813	1,334,689	1,563,126	1,692,345	1,825,088
Set % for ATO	**55**	**60**	**65**	**70**	**80**	**85**

The ten-year rebel war in Sierra Leone had led to a total disruption of control activities vis-à-vis Vector Control and Ivermectin Distribution. The end of the war in 2002, combined with the Rehabilitation, Resettlement and Disarmament Programmes have resulted in many people returning to their villages to rebuild their homes. After successful elections in 2002, Sierra Leone now operates under a multi-party democratic system of Government.

Onchocerciasis was being controlled in Sierra Leone by Aerial Larviciding and Ivermectin Distribution since 1990. Larviciding was interrupted in 1992/1993 in the South of Sierra Leone because it was subsequently discovered that transmission of Onchocerciasis in that area involved non-migratory forest –type black fly species and the disease can be controlled with Ivermectin alone.

The North of Sierra Leone however continued to undergo Larviciding together with Ivermectin distribution because the main vector responsible for transmitting the disease is the savannah species of the black fly.

MAP 2: Total Population at Risk in 2005: 1,993,126 Persons



The North of Sierra Leone continued to undergo larviciding until April 1994 (1990-1994), representing five years of vector control on the Rokel, Mongo, Kaba, Kolenten and Bagbe (tributary of Sewa) rivers. Attempts to resume larviciding in 1997 only lasted for five weeks (week 10 to 14) due to insecurity in the area.

After 4 to 5 years of combined vector control and Ivermectin distribution in the Northern Sierra Leone (1990-1994), the results were very good. Savannah flies populations were reduced (about 98% reduction compared to pre-treatment) and their role in transmission was insignificant, less than 1%. However, the epidemiological evaluation conducted in 1996 showed little or no improvement in the prevalence and the CMFL (67% prevalence and 15.8 mf/s at Kukuna on the Rokel basin).

The Onchocerciasis Control programme resumed operations in 2003 under the Special Intervention Zone (SIZ). After 2 years (2003/4) entomo – epidemiological indicators are still very alarming in the entire country:

- Annual transmission potential (ATP) varies from 3848 on the Gbanbaia River to 294 on Kaba River in 2003 (acceptable ATP should be less than 100).
- Prevalence of Oncho is still up to 80% in some places: 77% in Kaba river basin (2002), 86.24% in Waanjie basin (2003), 69.1% in Taia basin (2004) (should be less than 5%).
- Active transmission is still going on. In some areas up to 17% of children in the age group 0 – 4 years are infected as in Kamba/Bodu villages (2004).
- Treatment results for 2003 and 2004 show therapeutic coverage of 35% and 28% respectively.
- The geographic coverage is patchy, and there are not figures available presently to show the geographical coverage for Ivermectin distribution in the last 2 years.

With peace now back in Sierra Leone, Oncho patients are returning to their home villages and therefore will contribute in the transmission.

S. sirbanum movements from Sierra Leone to Guinea and Mali at the beginning of the rainy season and from these countries to Sierra Leone with the Harmattan winds are well documented. Even if the infectivity rate of savannah flies is quite low, there is no evidence that the flies coming from the Northern Sierra Leone are not contributing to the transmission in Guinea. In fact, an increase of transmission at Yalawa on the Mafou River started at the same time as the interruption of larviciding in Sierra Leone. Furthermore, the decrease coincides with the displacement of populations from the north as from 1998;

On the other side, the reservoir of the parasite in the Mafou-upper Niger river basin has not been completely eliminated. Therefore, even if the flies are not infected in Sierra Leone, they might become infected when they migrate to Guinea through Monsoon winds and contribute to the transmission locally as well as in the Oncho-freed zones. There is yet no evidence of this fact but the risk exists. With the peace back in Sierra Leone and with all the efforts made by partners to control Onchocerciasis in West Africa, it will be unacceptable and too risky to leave this area without control measures or to suspend control measures too early. It is important to know remember that more that 500 million dollars have been invested by the international community for Oncho control in West Africa, and a failure in eliminating Oncho as a public health importance in Sierra Leone, could jeopardize all these efforts.

Health services in Districts are managed by District Health Management Teams (DHMTs). Each District has at least 1 Secondary Hospital and a network of health facilities. There are presently about 800 health facilities in the 12 districts.

PROBLEM STATEMENTS

- Onchocerciasis is still endemic in Sierra Leone and continues to constitute a serious public health problem.
- There is poor knowledge of the disease and its method of cure among health workers ;

- There is poor knowledge of the disease and its method of cure among members of the community.
- There is poor distribution of Ivermectin within communities ;
- There is poor supervision and monitoring of Oncho Control activities ;
- There is inadequate logistics for monitoring and supervision during distribution of Ivermectin;
- There is poor involvement of communities in planning and implementation of the Oncho Control Programme.

AIM/OBJECTIVES OF THE PROJECT

The **Aim** of the project is to reach 100% of the meso and hyper endemic areas of the country (Geographical coverage) and treat 85% of this population (therapeutic coverage).
Since the therapeutic coverage for the last 2 years is below 40%, the project aims to achieve a therapeutic coverage of 55% and a geographical coverage of 100% this year (2005). If the therapeutic coverage increases by approximately 5% each year, the target of 85% therapeutic coverage is achievable in 2010 (see Table 1 for projected therapeutic coverage/annual treatment objective).

According to the Onchocerciasis Control Programme (OCP) onchosim simulations, it is necessary to have a therapeutic coverage of at least 65% and a geographical coverage of 100% over a period of 14 years and above in order to break transmission of Onchocerciasis.

Objectives of the project include the following:
1. To improve knowledge of Onchocerciasis and its cure within all affected communities of Sierra Leone.
2. To train 58 members of the NOCP and DHMTs as trainers, who will train the peripheral health unit (PHU) staff.
3. To train 800 PHU staff on CDTI, who will train the Community Drug Distributors (CDDs).
4. To train 16,902 CDDs in the 12 Provincial Districts of Sierra Leone.
5. To distribute Ivermectin through CDDs in all meso and hyper endemic areas of Sierra Leone.
6. To conduct proper monitoring and supervision of CDTI activities at all levels (from national level to community level).

STRATEGIES

Strategies for Oncho Control during the project period include the following:
1. Sensitization (including advocacy at national, district and chiefdom levels and emphasis on social mobilization at community /village level).
2. Training and refresher training of PHU staff and CDDs.
3. Distribution of Ivermectin in all meso and hyper endemic communities using CDDs (i.e. people selected within affected communities) to distribute Ivermectin.
4. Proper monitoring and supervision.

Justification of Strategies

Sensitization- Sensitisation and social mobilisation will be conducted by the National Onchocerciasis Control Programme (NOCP), District Health Management Teams (DHMTs), MOHS Staff In-Charge of Peripheral Health Units (PHU) and Community Drug Distributors (CDDs), together with the Chiefs of all affected communities.
Advocacy is needed at national level to obtain the support of the Top Management Team of the Ministry of Health and Sanitation (MOHS) and also other Ministries, such as the Ministry of Internal affairs that handles the affairs of Paramount Chiefs and other Local Chiefs. At District level advocacy is needed to ensure the support of DHMTs, Representatives of Line Ministries, Representatives of Recognized Organizations, such as Women's Organizations, and the support of Local Political and Administrative Bodies.

The bulk of the activities of sensitization will be in villages and each village endemic for Onchocerciasis will be targeted so as to increase knowledge of the disease and also to get their cooperation during distribution of the drugs.

Training and Refresher training- a training of trainers should first be conducted at national level. Trainers should be members of the various DHMTs and staff of the National Onchocerciasis Control programme (NOCP). These trainers will train the PHU staff, who will in turn train the CDDs in their catchment areas. Training is needed because Oncho Control has not been effective in Sierra Leone and there is need to refresh the knowledge of health staff on Oncho Control and to teach CDDs well as they will be in charge of distribution within their communities.

Distribution through CDDs- distribution of Ivermectin through CDDs or community Directed Treatment with Ivermectin (CDTI) is proven to be very effective in countries where it is applied. The NOCP plans to use 2 CDDs in each affected community for distribution. Using census data from Epidemiological Evaluation results of 2004 it was estimated that a mean number of 8451 communities/villages could be found in the CDTI zones in Sierra Leone.

Monitoring and supervision- Monitoring and supervision is needed to ensure that activities are conducted and they are conducted in the proper way. Monitoring and supervision of all CDTI activities will be conducted at all levels from national level down to community level. The NOCP will provide national supervisors together with supporting partners such as Hellen Keller International (HKI) and Sight Savers International (SSI), and members of the Top Management Team of the MOHS. DHMTs are responsible for supervision and monitoring at PHU and community level. However, all supervisors will be encouraged to supervise at all levels and to involve the Local Leaders and members of the community whenever they conduct monitoring and supervision.

ACTION PLAN

Table 2 below shows the activities planned for 2005 and the timeframe within which they will be implemented.

TABLE 2: Chronology of Activities for Cdti in Sierra Leone In 2005

No	Activity	Time frame
1	**Sensitization**	July 1- October 31, 2005

2	**Training**	
	TOT	August 15- 30, 2005
	PHU	Sept15 - October 15, 2005
	CDDs	October 15-30, 2005
3	**Positioning of Ivermectin**	
	Central Level	June 2005
	District	July 2005
	PHU	October 1-15, 2005
	Community	October 15-30, 2005
4	**Distribution of Ivermectin and collection of returns**	November-December 2005
5	**Monitoring and supervision**	October-December 2005
6	**Reporting**	December 15-31, 2005

BUDGET

Since most of the activities for CDTI will be co-funded by the Government of Sierra Leone (GOSL), SSI, HKI, SIZ and the World Bank, the budget is divided into 2 parts. Part 1 (see Table 3) shows cost of each activity that will be conducted in 2005 and projection for the years 2006/7. The second part (see Tables 4-1 to 4-4) shows the total figures for each group of activities and the contribution expected from each of the above partners.

Table 3: Estimated budget for CDTI activities in Sierra Leone in 2005 Part 1

Activities					2,005 Total (Leones)	2006	2007
SENSITIZATION/MOB/ADVOCACY							
1.1 COMMUNITY SENSITIZATION/MOB							
Community meetings x Le160,000(8000x20pers)	160,000	8451			1,352,160,000	676,080,000	338,040,000
2 Experts on TV/Radio x Le250,000 x 8 districts	250,000	2		13	6,500,000	812,500	812,500
Radio discussions 4 slots/wk x 4mths x 4 districts	200,000	4	4	5	16,000,000	16,000,000	500,000
Audiovisual TV set	700,000			12	8,400,000	0	0
VIDIO SET	300,000			12	3,600,000	0	0
Generator	2,500,000			12	30,000,000		
Airing of jingles x16WKx 4 districts	150,000	16		5	12,000,000		
					1,428,660,000		
Fuel:							
National(50 gallon)	9,500	50		12	5,700,000		
District	12,000	50		12	7,200,000		
Chiefdom/ward(12 chiefdoms/districts)x12 districts	12,000	25	12	12	43,200,000		
PHU	12,000	20		706	169,440,000		
Transport for 10 facili x 5days/mthx4mthX3gallon	12,000	10	60	12	86,400,000		
Perdiem 10 facilitatorsx5dysx4mthsx30000x12	30,000	10	20	12	72,000,000		
					383,940,000		
Sub Total 1 Sensitization					**1,812,600,000**		339,352,500
1.2 ADVOCACY							130,520
National level(Ministries, Partners NGDO)	15,000	100			1,500,000		
Hall rental	250,000	1			250,000		

District level(75 people/district: 12 districts)	10,000	75	2	12	9,000,000
Hall rental	150,000	1		12	1,800,000
Transport(40 Persons)	50,000	40	2	12	48,000,000
Perdiem(75)	60,000	75	2	12	108,000,000
Subtotal II Sensitization					**168,550,000**
1.3 NATIONAL ONCHO DAY					
National					10,000,000
District	5,000,000			12	60,000,000
Chiefdom/ward	2,000,000			150	300,000,000
Subtotal III Sensitization					**370,000,000**
1.4 STATIONERY					
Charts, A4 paper, markers, pencils, pens files,	1,000,000			12	**12,000,000**
1.5 Flip charts, posters, T-shirts, Flyer, banners, brochures	20,000,000			12	**240,000,000**
1.6 12 Billboards x Le12,000000	12,000,000			12	**144,000,000**
TOTAL SENSITISATION					**2,747,150,000**

2. Training of 800 nurses and PHU staff in 20 sessions of 4 days of maximum 40 participants/session	**Perdiem**	**Workers**	**Days**	**Session**	**Amount**		
Participants PERDIEM	35,000	800	4		112,000,000	56,000,000	22,400,000

Transport	50,000	800	1		40,000,000	20,000,000	5,000,000
Tee break	15,000	800	4	20	48,000,000	24,000,000	9,600,000
Facilitators	50,000	4	4	20	16,000,000	2,000,000	1,333,333
Coordinating team	80,000	1	4	20	6,400,000	1,600,000	1,066,667
DMHT(DMO)	60,000	1	4	20	4,800,000	1,200,000	800,000
Sec & Admin	35,000	2	2	20	2,800,000	700,000	466,667
driver	26,000	2	4	20	4,160,000	1,040,000	933,333
Sub Total Perdiem Training and transport					234,160,000	106,540,000	41,600,000
2.2 Hall rental	100,000		4	20	8,000,000		
2.2. Training materials							
Stationary x Le200,000 per session x 20 sessions of Nurses	200,000			20	4,000,000	1,000,000	666,667
Photocopies of training manual 40 pages for 800 copies	150		40	800	4,800,000		
Photocopies of household register	150			800	120,000		
photocopies of summary forms	150			800	120,000		
2.3. Fuel & Lubricant coordination of training							
20 galloons/session x 20 session x Le12,000	12,000		20	20	4,800,000	1,200,000	800,000
sub Total materials/lubricants					13,840,000		
Subtotal training 800 PHU staff					256,000,000		
3. TRAINING OF COMMUNITY DRUG DISTRIBUTORS (CDDs)							
16 902 Distributors Perdiem	10,000	16902	2		338,040,000	169,020,000	84,510,000

Tea Break	5,000	16902	2		169,020,000		
Sub Total Perdiem Training CDDs					338,040,000	169,020,000	84,510,000
Printing Reporting forms, pencils, ex-books	150			16902	2,535,300		
Sub Total Training materials for CDDs					2,535,300		
PHU staff perdiem	30,000		2	800	48,000,000		
Fuel PHU	12,000		2	800	19,200,000		
					67,200,000		
Subtotal CDD training					405,240,000	155,862	
TRAINING OF TRAINERS							
Perdiem:							
DMO	**110,000**		**6**	**13**	**8,580,000**		
39 particp	**90,000**		**6**	**39**	**21,060,000**		
Prog. Manager	**130,000**		**12**	**1**	**1,560,000**		
Nat team members	**100,000**		**6**	**4**	**2,400,000**		
Drivers DMO	**26,000**		**6**	**13**	**2,028,000**		
Secretary	**80,000**		**12**	**1**	**960,000**		
Admin. Assistant	**100,000**		**12**	**1**	**1,200,000**		
Subtotal TOT					**37,788,000**		
Transport:							
DMO	**12,000**		**20**	**12**	**2,880,000**		
DMO Western area	**9,500**		**5**	**1**	**47,500**		
39 particp							40,905,500
Nat Coord	**9,500**		**20**	**1**	**190,000**		
Drivers DMO							
Secretary							

Admin Assistant						
Subtotal transport TOT					**3,117,500**	
CONSULTANTS FOR TRAINING						
Perdiem, Honorarium, Travel					**9,100,000**	
Stationary						
A4 paper	**15,000**	**2**			**30,000**	
Pens	**25,000**	**1**			**25,000**	
Pencils	**10,000**	**1**			**10,000**	
Files	**1,500**	**60**			**90,000**	
Flip chart	**50,000**	**2**			**100,000**	
Rental of Equipment (photocopying & PA)	**150,000**	**5**	**2**		**1,500,000**	
Rental of Hall	**150,000**	**5**	**2**		**1,500,000**	
Subtotal Stationary					**3,255,000**	
Printing of Training Manuals 60 copies	**150**	**47**	**60**		**423,000**	
Tea break for two sessions of 5days each	**20,000**	**5**	**65**		**6,500,000**	
Total TOT					**60,183,500**	23,148

5. COMMUNITY DIRECTED TREATMENT WITH IVERMECTIN

Production of 8451 household registers	7,800	8451			65,917,800		
pencils x Le2500/set	2,500	8451			21,127,500	0	0
Intensive CDTI activities-A mini mass campaign							

of Ivermectin distribution in schools, provincial barracks and hard to reach areas to increase the geographical and therapeutic coverage of the drug x Le 5 000 000 x 10 activities (treatment of 10 refugee camps)	5,000,000		10		50,000,000	50,000,000	50,000,000
Copies of reporting forms	150		70000		10,500,000		
Plastic files	1,500		16902		25,353,000		
Sub Total CDTI					172,898,300	50,000,000	50,000,000

6. MONITORING AND SUPERVISION

6.1. Coordination Perdiem					
1 Coordinator xLe60000 x 5 days/months x 12 districts	60,000	1	5	3	900,000
2 Nat Supervisors x Le50000 x 5days/month x 12 districts	50,000	2	5	12	6,000,000
1 Administrator of Finances Le50000x5days/monthx12 districts	48,000	1	5	12	2,880,000
Sub Total Nat. coordination Perdiem					9,780,000
6.2. District Perdiem					
12 District DMO x Le50000 x 5 days x 12 Districts	50,000	**1**	5	12	3,000,000
Focal Oncho officer x Le48000 x 5 days/month x 3 months x 12 Districts	48,000	1	15	12	8,640,000
6.3 Peripheral Health staff					
800 PHU staff @ 30000 x 5 days for 3months	30,000	800	5	3	360,000,000

Sub Total District and PHU Perdiem					**371,640,000**		
6.4. Nat Coordination & Supervision Fuel							
Fuel - Diesel 100 galls x Le 10000 x 3 months for 12 Districts.	12,000	300			3,600,000		
Sub total fuel Nat. coordination					**3,600,000**		
6.4. Fuel for District level							
6.4.1. Fuel - Diesel 20 galls x Le10000 x 3 months x 12 districts =2880 gallons /year for DMO/Oncho focal point	12,000	20	3	12	2,160,000		
6.4.2. Petrol 5 galls xLe10000x500 PHU	10,000	5	800		40,000,000		
Sub Total fuel District supervision					**42,160,000**		
Total Monitoring/supervision					**427,180,000**	427,180,000	427,180,000
					164,300		

Summary

Community sensitization and mobilization	**2,747,150,000**	1,923,005,000	1,373,575,000
TOT	**60,183,500**	42,128,450	30,091,750
Training of 800 nurses and PHU staff	256,000,000	179,200,000	128,000,000
CDD Training	405,240,000	283,668,000	202,620,000
Distribution Of Ivermectin	172,898,300	121,028,810	86,449,150
Monitoring/Supervision Data Collection And Analysis	427,180,000	299,026,000	213,590,000
Annual Review & Prize Giving		40,607,500	40,607,500
GRAND TOTAL	**4,068,651,800**	**2,888,663,760**	**2,074,933,400**

1 US Dollar is 2600 leones in March 2600	1	$ =	2600	leones	**1,564,866**	**1,111,025**	**798,051**	USD	

Budget Part 2

Table 4-1: SUMMARY TABLE OF PARTNERS CONTRIBUTIONS

Source of Funds	2005	2006	2007	TOTAL
SIZ	108,535	108,535	108,535	325,605
HKI	7,500	9,000	8,500	25,000
SSI	45,000	43,000	41,000	129,000
GOSL	134,630	148,094	162,902	445,626
World Bank	1,408,020	1,084,677	1,009,205	3,501,902
GRAND TOTAL	**1,703,685**	**1,393,306**	**1,330,142**	**4,427,133**

Table 4-2: Budget for CDTI Activities in Sierra Leone in Year 2005

Budget Item	Item Cost and Expected Contribution by Source of Funds					
	GOSL	SIZ	SSI	HKI	World Bank	Total
Community sensitization and mobilization	0	10,455	0	0	1,046,141	1,056,596
TOT	0	10,836	8,712	3,600	0	23,148
Training of 800 nurses and PHU staff	0	12,422	24,288	0	61,752	98,462
CDD Training	0	22,005	0	0	133,857	155,862
Distribution Of Ivermectin	0	10,769	0	0	55,730	66,499
IEC	0	4,188	0	0	0	4,188
Monitoring/Supervision Data Collection And Analysis	0	37,860	12,000	3,900	110,540	164,300
Other recurrent expenditures						
Water, Electricity	784	0	0	0	0	784
Telephone/communication	769	0	0	0	0	769
Maintenance of machinery and equipment	2,308	0	0	0	0	2,308
Vehicle and maintenance	5,769	0	0	0	0	5,769
Office and General	3,846	0	0	0	0	3,846

Budget Item	Item Cost and Expected Contribution by Source of Funds					
	GOSL	SIZ	SSI	HKI	World Bank	Total
Capital Expenditure		0	0	0	0	0
Furniture and Office equipment	2,539	0	0	0	0	2,539
Construction/reconstruction of building/structures	3,846	0	0	0	0	3,846
Computer and ancillary equipment	7,692	0	0	0	0	7,692
Personnel Expenditure	107,077	0	0	0	0	107,077
GRAND TOTAL	**134,630**	**108,535**	**45,000**	**7,500**	**1,408,020**	**1,703,685**

Table 4-3: Budget for CDTI activities in Sierra Leone in Year 2006

Budget Item	Item Cost and Expected Contribution by Source of Funds					
	GOSL	SIZ	SSI	HKI	World Bank	Total
Community sensitization and mobilization	0	10,455	0	0	729,162	739,617
TOT	0	10,836	5,368	0	0	16,204
Training of 800 nurses and PHU staff	0	12,422	20,632	0	35,869	68,923
CDD Training	0	22,005	7,000	0	80,098	109,103
Distribution Of Ivermectin	0	10,769	0	0	35,780	46,549
IEC	0	4,188	0	0	0	4,188
Monitoring/Supervision Data Collection And Analysis	0	37,860	10,000	9,000	65,150	115,010
Annual Review and Prize Giving	0	0	0	0	15,618	15,618
Other recurrent expenditures						
Water, Electricity	**862**	0	0	0	0	862
Telephone/communication	**846**	0	0	0	0	846
Maintenance of machinery and equipment	**2,539**	0	0	0	0	2,539
Vehicle and maintenance	**6,346**	0	0	0	0	6,346
Office and General	**4,231**	0	0	0	0	4,231

Budget Item	Item Cost and Expected Contribution by Source of Funds					
	GOSL	SIZ	SSI	HKI	World Bank	Total
Capital Expenditure	**0**	0	0	0	0	0
Furniture and Office equipment	**2,793**	0	0	0	0	2,793
Construction/reconstruction of building/structures	**4,231**	0	0	0	0	4,231
Computer and ancillary equipment	**8,461**	0	0	0	0	8,461
Purchase 10 motorbikes		0	0	0	30,000	30,000
Purchase 1000 bicycles		0	0	0	100,000	100,000
Personnel Expenditure	**117,785**	0	0	0		117,785
GRAND TOTAL	**148,094**	**108,535**	**43,000**	**9,000**	**1,084,677**	**1,393,306**

Table 4-4: Budget for CDTI Activities in Sierra Leone in Year 2007

Budget Item	Item Cost and Expected Contribution by Source of Funds					
	GOSL	SIZ	SSI	HKI	World Bank	Total
Community sensitization and mobilization	0	10,455	0	0	517,843	528,298
TOT	0	10,836	738	0	0	11,574
Training of 800 nurses and PHU staff	0	12,422	12,809	0	24,000	49,231
CDD Training	0	22,005	19,453	0	36,473	77,931
Distribution Of Ivermectin	0	10,769	0	0	22,481	33,250
IEC	0	4,188	0	0	0	4,188
Monitoring/Supervision Data Collection And Analysis	0	37,860	8,000	8,500	27,790	82,150
Evaluation of sustainability	0		0	0	40,000	40,000
Annual Review and Prize Giving	0	0	0	0	15,618	15,618
Other recurrent expenditures						
Water, Electricity	**949**	0	0	0	0	949
Telephone/communication	**930**	0	0	0	0	930
Maintenance of machinery and equipment	**2,793**	0	0	0	0	2,793

Budget Item	Item Cost and Expected Contribution by Source of Funds					
	GOSL	**SIZ**	**SSI**	**HKI**	**World Bank**	**Total**
Vehicle and maintenance	**6,980**	0	0	0	0	6,980
Office and General	**4,654**	0	0	0	0	4,654
Capital Expenditure	**0**	0	0	0	0	0
Furniture and Office equipment	**3,072**	0	0	0	0	3,072
Construction/reconstruction of building/structures	**4,654**	0	0	0	0	4,654
Computer and ancillary equipment	**9,307**	0	0	0	0	9,307
Purchase 5 Toyota Hilux	**0**	0	0	0	125,000	125,000
Purchase 2000 bicycles	**0**	0	0	0	200,000	200,000
Personnel Expenditure	**129,563**	0	0	0		129,563
GRAND TOTAL	**162,902**	**108,535**	**41,000**	**8,500**	**1,009,205**	**1,330,142**

MONITORING AND SUPERVISION

Joint monitoring of all trainings- these visits will ascertain that training is proper and the right numbers of trainees are trained.

Joint monthly monitoring of all districts during drug distribution- these visits will ensure that the drug distribution is on course with the total involvement of the communities.

Joint monitoring of all sensitisation meetings- The total number of sensitized communities can be monitored and PHU staff can be encouraged to involve the communities themselves in the activities.

Joint review of CDTI results will be helpful in assessing the overall impact and achievement of our goal. Budget for Annual review of CDTI activities and prize giving is attached as Annex 1.

Quarterly and annual reports will be provided to all partners.

Routing monitoring and supervision will be conducted at different levels.

- PHU staff and community leaders monitor CDDs activities during distribution and recording of Ivermectin, and the collection of drugs.
- The DHMTs conduct routine monitoring and supervision of all PHUs and the returns and supplies of Ivermectin in their respective catchment areas.
- The National ONCHO Team conducts routine monthly supervision per district to ensure the proper flow of data/information from communities to national management office.
- All partners and Top Management Team (TMT) of the MOHS assist with the monitoring of the programme in liaison with the national Oncho Team.

To ensure maximum involvement of communities a comprehensive supervision is conducted once every year in every District involving the NOCP, all Partners, Members of the TMT of the MOHS, and DHMTs.

The NOCP recommends the following indicators for monitoring and evaluation of all project activities:

Sensitization
a. # of sensitization meetings conducted per village; per chiefdom; per district.
b. % of people with knowledge of Onchocerciasis in any village.

Training
a. # of DHMT and NOCP staff trained as National Trainers on CDTI.
b. # of PHU staff trained on CDTI.
c. # of CDDs trained on CDTI.

Monitoring and Supervision
a. # of supervisory/monitoring visits by NOCP staff/PARTNERS per district/per month.
b. # of supervisory/monitoring visits by DHMT staff per chiefdom per month; per PHU per month.
c. # of supervisory/monitoring visits by PHU staff per village per quarter.

Distribution
a. % of people treated with Ivermectin among those eligible for treatment.
b. % of people treated with Ivermectin among those who are at risk of catching the disease (ATO = 55% for 2005).

EVALUATION OF THE PROJECT

The following arrangements will be made to evaluate the effectiveness of the programme:

- The NOCP will organise in collaboration with all partners an annual review of the project, which will serve as a form of Formative Evaluation;
- Management of SIZ will undertake an evaluation to determine the sustainability of CDTI in Sierra Leone. The costs of both evaluation processes are included in the budget summary (See Tables 4-3 and 4-4). Detailed budget for the annual review is attached as Annex 1. The breakdown of the budget for Evaluation of sustainability of CDTI will be provided by SIZ against 2007.

CONCLUSION

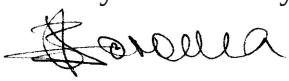
The eventual reduction of the number of people getting blind through Onchocerciasis within affected communities will have a positive effect on the socio-economic life of the people in these affected areas.

The projects will involve DHMTs and Communities, which can provide possibility of integration with other Primary Health Care activities. Community involvement can lead to community

empowerment and make the project more sustainable as communities may contribute in terms of personnel, materials and funds in the future.

It is expected that with successful implementation of CDTI, other control programmes can be integrated with CDTI such as control of Lymphatic Filariasis and distribution of Vitamin A, to name a few.

Faithfully Submitted by:



Dr J B Koroma
Programme Manager

Abbreviations

ATO **Annual Treatment Objectives**

CDD **Community Directed Distributor**

CDTI **Community Directed Treatment with Ivermectin**

DHMTs **District Health Management Teams**

HKI **Hellen Keller International**

MOHS **Ministry of Health and Sanitation**

NOCP **National Onchocerciasis Control Programme**

OCP **Onchocerciasis Control Programme**

PHU **Peripheral Health Units**

SSI **Sight Savers International**

SIZ **Special Intervention Zones**

TOT **Training of Trainers**

Annex 1: Budget for Annual Review of CDTI in Sierra Leone and Prize giving ceremony in 2006/2007

Opening ceremony (will include Prize Giving)

Snack at Le 30,000 per person x 80 people	= Le 2,400,000
Media coverage (National Television and Radio)	= Le 300,000
Subtotal	**= Le 2,700,000**

Per Diem for participants

3 MOHS/TMT @ Le 200,000 x 3 days	= Le 1,800,000
1 National Coordinator @ Le 150,000/day x 3 days	= Le 450,000
13 DMOs @ Le 130,000/day x 3 days	= Le 5,070,000
1 Admin. Assistant @ Le 130,000/day x 3 days	= Le 390,000
1 Oncho/SIZ Public Health Sister @ Le 100,000/day x 3 days	= Le 300,000
1 Oncho/SIZ Secretary @ Le 80,000/day x 3 days	= Le 240,000
12 District Oncho Focal Points @ Le 100,000/day x 3 days	= Le 3,600,000
13 DMO Drivers @ Le 50,000/day x 3 days	= Le 1,950,000
Subtotal	**= Le 13, 800,000**

Tea Breaks

65 persons @ Le 30,000 per day x 3 days	= Le 5, 850,000
Subtotal	**= Le 5, 850,000**

Stationery

2 Ream A4 Papers @ Le 15,000	= Le 30,000
2 pkt Pens @ Le 25,000	= Le 50,000
2 pkt Pencils @ Le 10,000	= Le 20,000
65 File Covers @ Le 1,500	= Le 97,500
4 Flip Chart @ Le 50,000	= Le 200,000
Subtotal	**= Le 397,500**

Rental of equipments @ Le 150,000 per day x 3days (Photocopiers and PA system)	= Le 450,000
Subtotal	**= Le 450,000**

Hall Rental @ Le 600,000 per day x 3days (Photocopiers and PA system)	= Le 1,800,000
Subtotal	**= Le 1,800,000**

Transport/Fuel	
20 gallons per DMO x 12 districts @ Le 12,000/gall	= Le 2,880,000
5 gallons for DMO Western Area @ Le 10,000/gall	= Le 50,000
20 gallons fuel for coordination @ Le 10,000/gall	= Le 200,000
Subtotal	**= Le 3,130,000**

Sub Total for Review **= Le 28,127,500**

Prize of a return ticket to Accra, Ghana and back plus per diem for the following:

Best District Medical Officer	Le 3,120,000
Best Onchocerciasis Focal Point	Le 3,120,000
Best Paramount Chief	Le 3,120,000
Best Community Drug Distributor	Le 3,120,000
Subtotal for Prize Giving	Le 12,480,000
Grand Total	Le 40,607,500
	($ 15,619)

NB- Exchange Rate in March 2005 was Le 2,600 to $1.00.

APPENDIX VI

DETAILS OF AVIAN FLU CONTROL PROGRAMME IN SIERRALEONE

Objective	Activities	Expected outcome	Responsible Person	Time Frame (April - December ,2006)	Budget (US$)
1.SURVEILLANCE					
To strengthen the surveillance system for the detection of Avian Influenza in all districts	To develop and print a standard protocol for the detection and management of Avian Influenza in Human	Material development workshop conducted	DPC,WHO,MAFS, UNICEF,FAO	Mar-06	**3,000**
	Training of district surveillance officers on case detection and investigation	40 surveillance officers trained on case detection investigation and immediate reporting in the 13 districts	DPC, MAFFS	April, 06	**3,000**
	Support district active surveillance activities	Reporting tools, stationery, fuel, specimen transport, protective gear, vehicle/Motor Bike maintenance provided.	DPC,WHO, FAO	Mar-06	**15,000**
	Focus surveillance for migrating birds	Possible areas for migratory birds visited regularly (risk allowance protective gears provided)	DPC,MAFFS	Mar-06	**2,000**
	Data collection analysis and report writing	Weekly surveillance report prepared and disseminated to all stake holders	DPC	Mar-06	**5,000**
	Strengthen immediate reporting system at all levels- National,	Mobile Phones and Top up cards provided at all levels for prompt reporting	DPC, DHMT	Mar-06	**8,000**

	Districts, Chiefdom Village				
SUBTOTAL	**6**				**36,000**
2. INFORMATION EDUCATION AND COMMUNICATION					
To intensified public awareness on the Prevention and Control of the Disease in all communities	Revise and print Avian Influenza Information Kit	Material development workshop conducted to revise current Avian(AI) Influenza Information kit	DPC,MAFFS, WHO,UNICEF	Mar-06	**3,000**
		Print and distribute 10,000 Information kits on AI	DPC		**10,000**
	Conduct Radio discussion programmes.	4 Radio discussion programmes conducted per month in local FM Stations in all 13 Districts	DPC,MAFFS, WHO,UNICEF,FAO,DHMT	Mar-06	**3,000**
	Airing of jingles in local languages	2 slots aired per day per week on 13 FM Stations	DHMT	Mar-06	**2,500**
	Ogainse TV Spots programmes on SLBS and ABC TV		DPC	Mar-06	**3,000**
	Conduct Sensitization meetings for religious(ISALG	One Sensitization meetings conducted for religious , traditional and opinion leaders(100 Participant per district)	DPC,MAFFS, WHO,UNICEF,FO	Mar-06	**30,000**

	&CHRISTAG) , traditional and opinion leaders				
	Conduct orientation for Blue flag Volunteers , TBAs, Village health volunteers, farmers	100 community based volunteers sensitized in each district	DPC,DHMT	Mar-06	**20,000**
	Conduct regional sensitization meeting for teachers and extension workers.	One Sensitization meetings in each regional head quarter - Bo, Makeni, Kenema, (50 Participant per district) and Freetown(60 Participant per district)	DPC,MAFFS, WHO,UNICEF,FO	Mar-06	**20,000**
SUBTOTAL	**7**				**91,500**
3. CASE MANAGEMENT					
To Increase the knowledge and skills of Health staff on the detection and management of suspected cases of AI	Identify Isolation unit in Districts and Chiefdom Levels	District Isolation units established and functional	DPC, DHMT, WHO	Mar-06	**2,000**
	Develop and print clinical management guidelines for health staff	Material development workshop conducted to develop guidelines	DPC, DHMT, WHO,UNICEF	Mar-06	**3,000**
		2000 guidelines printed and distributed	DPC	May-06	**2,000**

	Train clinical staff on detection and case management in the 13 Districts	Clinical staff trained at all levels (Medical officers 20, Nurses 65, Private Practitioners 20)	DPC	May-06	**8,000**
	Provide protective gears and barrier nursing kits for isolation unit	Protective gears and barrier nursing kits provided to enhance safety precaution in all isolation unit	DPC, WHO, UNICEF	May-06	**15,000**
	Provide drugs and medical supplies.	Drugs and medical supplies Provided for case management	DPC, WHO, UNICEF	May-06	**70,000**
SUBTOTAL	**5**				**100,000**
4. LABORATORY					
To Strengthen the Laboratory capacity for preliminary analysis AI	To Identify reference laboratory for confirmatory diagnosis				
	Provide reagents and other laboratory equipment for existing labs.	Reagents and other laboratory equipment provided for existing labs to conduct preliminary diagnosis	DPC, WHO	Apr-06	**20,000**
	Provide protective clothing, mask, goggles, gloves etc	Protective clothing, mask, goggles, gloves etc provided	DPC, WHO	Apr-06	**8,000**
	Support for shipment of specimen	Support provided for shipment to enhance confirmatory test	DPC, WHO	Mar-06	**2,000**
SUB TOTAL	**5**				**30,000**
5. COORDINATION					

To Strengthen the Disease Prevention and Control Directorate for coordination, monitoring and supportive supervision at National, District, Chiefdom and Community.	Provide one long face Toyota land cruiser	Land cruiser provided to facilitate coordination and supervision of AI Activities	DPC	March, ongoing	**70,000**
	Provide three XL motor bikes	Motor bikes provided to facilitate Monthly supervision of AI Activities	DPC	March, ongoing	**18,000**
	Provide fuel for coordination, monitoring and supervision.	Fuel provided to facilitate coordination, monitoring and supervision of AI Activities	DPC	March, ongoing	**10,000**
	Provide two laptop computers and accessories	Two laptop computers and accessories Provide for field data analysis	DPC	March, ongoing	**5,000**
	Provide one desktop computer and accessories	One desktop computer and accessories Provided for documentation.	DPC	March, ongoing	**800**
	Support for monthly and quarterly monitoring and supervision	DSAs, allowances provided for ten staff for six months	DPC	March, ongoing	**15,000**
	Provide one photocopier	One Photocopier provided	DPC	March, ongoing	**9,000**
	Provide Stationery	Stationery provided for documentation and reporting	DPC	March, ongoing	**8,000**
	Provide telephone, email, and fax facilities	Telephone, email and fax facilities for prompt communication	DPC	March, ongoing	**5,000**
	Support AI Task Force meetings	Weekly meetings conducted	DPC	March, ongoing	**5,200**
	Provide one 10 KVA generator	Generator provided for constants power supply to enhance documentation and reporting.	DPC	March, ongoing	**10,000**
SUBTOTAL	**11**				**156,000**
Grand Total					**US $ 413,500**

Sierra Leone

HIV/AIDS Response Project (SHARP)

&

Health Sector Reconstruction and Development Project (HSRDP)

Waste Management Plan

OCTOBER 2002

By
John Tommy

Table of Contents

ACRONYMS

ADA	Area Development Association
ADC	Area Development Committee
ARG	Aids Response Group (ARG)
CBO	Community Based Organisation
DHMT	District Health Management Team
EA	Environmental Assessment
EHD	Environmental Health Division
NEPA	Environmental Protection Act
EPD	Environment Protection Department
FCC	Freetown City Council
MLHCPE	Ministry of Lands, Housing, Country Planning and the Environment
MOHS	Ministry of Health and Sanitation
NaCSA	National Commission for Social Action
NGO	Non Governmental Organisation
NMCP	National Malaria Control Programme
OCHA	Organisation for the Coordination of Humanitarian Assistance
OCP	Onchocerciasis Control Programme
SHARP	Sierra Leone HIV/AIDS Response Group
WB	World Bank

Preface

This Waste Management Plan (WMP) is prepared in accordance with the requirement of the World Bank for the Sierra Leone HIV/AIDS Response Project (SHARP) and Health Sector Reconstruction and Development Project (HSRDP). This plan is intended for both projects.

This plan is prepared as a guideline for all those involved in the implementation of SHARP and HSRDP, this includes primarily the Ministry of Health and Sanitation (MOHS), National HIV/AIDS Secretariat (NAS), Health Sector AIDS Response Group (ARG) local and foreign NGOs and the private sector who would participate in the implementation of the projects, especially the SHARP. It describes the general waste management issues (with particular emphasis on healthcare waste) in Sierra Leone, objectives and implementation strategy for all institutions and persons to be involved and available inputs and resources to successfully implement the plan in an efficient and effective manner over the next 5 year period.

The content of this document is subject to change during implementation depending on the implementation experience, problems faced and changes in strategies. However, amendments/additions to the document will be subject to the MOHS, NAS and the World Bank's agreement.

2. Executive summary

The medical waste study (November 2001) established the need to for a comprehensive waste management plan for Sierra Leone.

Healthcare waste is total waste stream from Healthcare-Waste (HCW) generators, major and scattered sources. It may be **solid** (hazardous or non-hazardous) or **liquid**

SOLID WASTE - Typically composed of,

3. 75-90% is general waste similar to domestic waste and may follow the normal municipal waste stream.
4. 10-25% is hazardous (infectious, toxic, etc) and must be segregated and treated with care to prevent associated risk. This category of waste can be subjected to incineration under supervision by trained staff.

Presently these categorises are mixed together and disposed of indiscriminately. The resultant negative consequences cannot be overemphasised. Hence, there is need for this Comprehensive National Medical Waste Management Plan for Sierra Leone.

This action plan for all levels, from chiefdom to national is part of the Sierra Leone Government's process of developing a HIV/AIDS Response Project (SHARP) and a Health Sector Reconstruction and Development Project (HSRDP). It was executed on behalf of the Ministry of Health and Sanitation, Sierra Leone.

Current situation

From a health and environmental point of view, the following summarized problems were identified.

- Lack of policy, legal framework, guidelines and effective control
- Lack of focused health education and staff training, concerning waste management, particularly medical wastes.
- Deficiency of appropriate equipment and materials.
- Unhygienic handling of wastes within hospitals, posing a threat to health of personnel, patients and visitors.
- Improper handling of wastes by waste handlers, exposing these wastes to scavengers, and causing a serious threat not only to their own health but also to that of the general public and the environment.
- Open dumping and or burning.

Plan of implementation

7. Advocacy at national level to ensure government commitment and financial support,
8. Train staff of the environmental health division in supervision,
9. Develop modules for training; the prevention of Nosocomial infections and healthcare waste management,
10. Training of Trainers (TOT) for all levels,
11. Organize training at District and Chiefdom levels for healthcare workers on the risk associated with Nosocomial infections and the preventive measures,
12. Organize training at District and Chiefdom levels for waste-handlers.

Strategies

- Strengthen the Clinical Waste and Occupational Safety Unit of the EHD
- Advocacy at national level to secure government commitment.
- Develop a national policy and regulatory framework on waste management
- Integrate waste minimization into national purchasing policies.
- Make instruments to develop plan of action with practical targets and budget for the health institutions
- Develop educational materials and training modules
- Organize training at District and Chiefdom levels for healthcare workers and the community on the risk associated with healthcare waste and safe management practices, with priority for waste-handlers;
- Make available the materials to facilitate medical waste management.
- Ensure that all healthcare establishments segregate their waste into harmful and non-harmful categories;
- Ensure that all healthcare establishments implement safe handling, storage, transportation, treatment and disposal options;
- Include healthcare waste management and prevention of Nosocomial infection into the training curricula of Nurses, Public Health Inspectors, Community Health Officers and Doctors;
- Ensure routine monitoring of impact through process indicators.

Key partners in the implementation of this plan include but not limited to: Ministries of Health and Land, Housing, and the Environment, non-governmental organizations, and waste producers. The target groups are health workers, medical waste handlers, scavengers, municipal waste handlers, managers of healthcare institutions and the general public.

The EHD of MOHS has the statutory responsibility for the safe management of waste (including medical) nationwide. Presently, medical wastes are mixed with municipal waste and disposed of indiscriminately. The existing system of municipal waste collection (public skips and skip trucks) in Freetown has been appraised (Freetown Waste Management Study, June1995) as economical. It should be improved and elaborated to ensure the safe management of healthcare waste and replicated in the Districts.

A combination of both sanitary landfill and incineration is considered for the comprehensive waste (municipal and healthcare) treatment and or final disposal option for the Sierra Leone situation.

New land will be acquired for purposes of District landfill sites development; hence involuntary resettlement of relocated socio-economic activities (farming, societal bushes etc) is possible. Consequently compensation will be inevitable. There is no national policy on involuntary resettlement, however, HSRDP is developing one for Sierra Leone, which can be of benefit to this project.

3. Introduction

3.3 The country (post-conflict situation)

The ten-year old conflict (1991 to 2001) has been accompanied by a deterioration of the health status of majority of Sierra Leoneans. The Human Development Report, July2000, estimates a life expectancy of 37.9 years. Sierra Leone ranks last in the world in quality of life with a per capita income of US$448.

The healthcare delivery system is divided into National, District, and Chiefdom levels. The epidemiological picture is characterised by a high prevalence of communicable diseases like malaria, respiratory tract and skin infections. There is an explosion of sexually transmitted infections, and data trends suggest an emerging epidemic of HIV/AIDS. According to Ministry of Health and Sanitation sources, over half the healthcare facilities country-wide do not function due to a variety of reasons that include damaged infrastructure, lack of staff, lack of drugs, and medical supplies. The Ministry of Health and Sanitation expects that the thrust of their activities for 2002 will be targeted at rehabilitating the devastated healthcare services, and extending them to newly accessible areas countrywide.

Large and small healthcare facilities, home healthcare, drug users, as well as research and industrial operations generate medical waste. It presents a high risk to human health and the environment because of the hazardous and infectious characteristics of some of its components. The patients and the personnel who handle the waste inside share these risks. Outside the healthcare establishments, the risks are increased due to the non-homogenous nature and the presence of sharp objects such as syringes and scalpels; blades or broken glass that may cause infected injuries. Please see Annex 1(Tables of Healthcare Facilities in Sierra Leone).

3.3 Sierra Leone HIV/AIDS Response Project (SHARP)

The Sierra Leone HIV/AIDS Response Project will assist the Government of Sierra Leone organize a response to the growing Human Immunodeficiency Virus (HIV) which causes the Acquired Immune Deficiency Syndrome (AIDS), in short HIV/AIDS. In accordance with the main goal of the SHARP the development objectives of this four-year project in Sierra Leone are to (a) contribute to reducing HIV/AIDS prevalence and (b) mitigate the impact of HIV/AIDS on persons infected or affected by HIV/AIDS. It will do so through a multi-sector approach, facilitating activities undertaken in various sectors by public and private organizations, and by communities in the fight against HIV/AIDS. Project-supported activities will complement government, donor, and private sector initiatives. These activities will vary by sector and the specific partner, but will be consistent with the national policy against HIV/AIDS, and premised on the development and expansion of local responses to the epidemic.

In collaboration with other members of the International Partnership Against AIDS in Africa (IPAA), the project will help step up and mainstream the national response against HIV/AIDS, and an array of related infections, including sexually transmitted infections (STIs), Tuberculosis (TB), and other opportunistic infections. The Government of Sierra Leone (Ministry of Development and Economic Planning), UN Theme Group on HIV/AIDS and regional officials of UNAIDS worked closely in the development of this effort and see it as an integral part of the common effort. Thus the project will address HIV/AIDS prevention, care, and support, as well as impact mitigation at the national and sub-national levels. Emphasis will be on prevention among youth,

women of child-bearing age, orphans and other vulnerable children, and groups that are particularly vulnerable to HIV/AIDS, including sex workers, the military and ex-combatants, internally displaced people, and refugees.

The proposed project will finance the full spectrum of HIV/AIDS activities including prevention, care, support, and impact mitigation over a four-year period. It will have four components: (1) capacity building, policy coordination and refugee activities; (2) multi-sector responses to HIV/AIDS prevention and care; (3) health-sector responses to HIV/AIDS, STI/TB and other opportunistic infection management, including prevention, care, and support; and (4) civil society initiatives (including communities, NGOs, religious groups and the private sector). These activities will take into account the existing conditions and level of capacity at each administrative structure (national, regional, district, and chiefdoms).

3.4 Health Sector Reconstruction and Development Project (HSRDP)

The project's overall development objective is to help restore the most essential functions of the health delivery system. The project will also help achieve the more specific objectives of:

(a) Increasing access to affordable essential health services by improving primary and first referral health facilities in four districts of the country.

(b) Improving the performance of key technical programs responsible for coping with the country's major public health problems.

(c) Strengthening health sector management capacity to improve efficiency and further decentralize decision-making to the districts.

(d) Supporting development of the private health sector and involvement of the civil society in decision-making.

The first specific objective is limited in scope to the four Districts, which met specific selection criteria (such as importance to the demobilization, resettlement and peace processes; magnitude of the public health problems; clear need to rehabilitate the delivery of services, etc.). Within these four districts, the project focuses on the rehabilitation of priority health facilities, and on support for the delivery of affordable and good quality care by all health facilities of these districts. Through its second specific objective, the project will contribute to reducing the burden of the most important infectious diseases countrywide (i.e., by supporting Malaria, and TB control activities and the Sanitation program). The third specific objective aims to improve efficiency and make decisions in the health sector more responsive to the needs of the population by supporting district health teams country-wide and five key services of the MOHS (i.e., Human Resources Development; Planning, Monitoring and Evaluation; Financial Management; Procurement; and Donor and NGO coordination). The fourth specific objective will improve the quality of services by enacting legislation promoting the private sector, providing incentives to the health providers to establish practices in rural areas and smaller cities, contracting out clinical and non-clinical services with the private sector, and by involving the civil society in decision making in the health administration and in health facilities.

3.4 Project Description

Within the SHARP Project, this study aims to address the Healthcare waste management in Sierra Leone, under the following specific tasks,

Task I:

- Assess the policy, legal, Administrative, as well as the Regulatory Framework concerning health-care waste management and treatment/destruction facilities in Sierra Leone;
- Identify functioning healthcare facilities under Government authority in the country and provide basic information for each facility, such as number of beds, bed occupancy rate, divided into categories: national hospitals, regional hospitals, municipal hospital, military hospitals, private clinics and laboratories, and secondary health-care facilities.
- Assess the healthcare waste generation at (i) Connaught hospital (ii) one major regional hospital (iii) one district hospital, and (iv) one private clinic. To the degree available, details

should include the minimum weight of total generated waste at each healthcare facility per week. Composition of the waste should be determined through segregation at the waste end point. Provide an extrapolation of the results to cover the entire country based on agreed assumptions.

- Assess the level of scavenging, recycling taking place inside healthcare facilities; along transportation routes, and at final disposal sites. Identify social issues in relation to scavenging taking place.

Task II:

- Review existing training and public awareness programs on healthcare waste management in hospitals, other healthcare establishments and municipalities and prepare training needs assessment. This would be based on discussions with relevant authorities and personnel to incorporate their views and concerns. Working in conjunction with the relevant Government institutions and municipal councils, prepare a draft-training programme for health-care institutions and municipal councils.
- Taking into account the IEC/BCC HIV/AIDS strategy work being developed under Sierra Leone HIV/AIDS Response Project and other IEC/BCC efforts, suggest themes and modalities for HIV/AIDS/STI waste awareness campaign programme to reach the general public, health-care workers, dumpsite managers, military personnel, scavengers/pickers families and street children.

Task III:

- Review existing waste management technologies and discuss alternative technologies; storage, transportation, treatment and or final disposal.

Task IV:

- Discuss appropriate waste disposal sites

3.4.2 Methodology

For the purpose of data collection, the following selected health-care facilities were investigated. (1) Connaught hospital (main referral hospital), (2) Port Loko district hospital, (3) Moyamba district hospital, (4) Bo district hospital, (5) Kenema district hospital, (6) George Brook Community Health Centre, (7) Macauley Street Satellite Clinic, and (8) the Brookfield community hospital (Private).

To provide basic data for the study, the following activities were performed:

- Assessment of existing policy, legal, administrative, as well as the regulatory framework concerning health-care waste management and treatment/destruction facilities.
- A survey on generation, collection and disposal of health-care wastes, and the Knowledge, Attitudes and Practices (KAP) of relevant staff concerning hospital waste management from seven-selected health-care facilities was executed. The selected health-care facilities were (1) Connaught hospital (main referral hospital), (2) Bo district hospital, (3) Port Loko district hospital, (4) Moyamba district hospital, (5) Kenema district hospital, (6) George Brook Community Health Centre, (7) Macauley Street Satellite Clinic and (8) Brookfields community hospital (Private).
- Meetings with concerned authorities and hospital officials were held with the following programme.
  (d) Discussion of the structure of the Ministry of Health and Sanitation with specific reference to Hospital Waste Management.

(e) Current management of waste inside the health facilities with special emphasis on equipment, regulations and training of personnel.
(f) Current management of hospital waste outside the hospital, focusing on storage places, transportation and disposal.

- Meetings were organised with health authorities, municipal councils, community leaders, heads of healthcare training institutions, military and police personnel: (a) to discuss develop a training assessment programme and (b) to determine IEC/BCC messages and the most suitable modalities for communicating such messages.

3.5 Health Care Waste Management (HCWM) policies practice and challenges

3.5.1 Policy, Legislations and Control

The Ministry of Health and Sanitation has the executive authority for waste management, inside as well as outside the healthcare facilities, in Sierra Leone. The Environmental Health Division of the ministry currently has the direct responsibility of waste management in the country.

Presently, a "Legal Unit" does not exist within the ministry to formulate, promulgate and implement new legislation for the handling and disposal of health care wastes.

There is currently no policy on healthcare waste management in Sierra Leone. However, the ministry's Environmental Health programme has developed a draft Environmental Health policy as an addendum to the existing National Health Policy. Section 3 of the draft policy deals with sanitation of healthcare facilities in general, and clinical waste management in particular. *It states "clinical waste are special and should be separated from other rubbish, protected from foraging animals (including humans) and vermin and properly disposed of at a convenient distance from the health care establishment".*

The draft policy list as goals:

3. Constant maintenance of special care and concern for clinical wastes,
4. Effective destruction of all clinical wastes.

The priorities set are as follows:

8. All discarded human and animal tissues should be effectively buried deep in the earth daily.
9. All health care institutions should identify a site for incineration of all clinical wastes.
10. Such sites should be at a distance so that fumes, smoke and other toxic gases do not pose health hazards to the persons working at or using the services of the facility or those staying in the vicinity.
11. Clinical wastes, including human tissues, discarded dressings, used syringes, needles, blades etc., should be protected from foraging animals and vermin.
12. Such special concern should be manifested in all areas of health care institution/office.
13. Once a day, or at other regular intervals not longer than once a week, the collected material should be properly disposed of.
14. Expired drugs should be returned to the Directorate of Drugs and Medical supplies for efficient technical destruction.

With regard to existing laws, the topic of safe healthcare waste management is not specifically dealt with in either the Public Health Ordinance Act No. 23 of 1960 or the Environmental Protection Act No.2 of 2000, now in force. However, the Public Health Ordinance specifically deals with the control of infectious patients and the materials associated with them. Sections 44 and 45 of the ordinance make provision for temporary and permanent isolation accommodation of infectious patients for the following reasons.

- To control the movement of patients in order not to spread the infection through their coming into contact with healthy persons.

- To control any waste matter produced by the infectious patients.

Section 50 (1) specifically deals with premises, clothing, bedding, etc., that are infected by an infectious disease patient. It reads:

"Subject to the provision of Section 57, a Medical Officer of Health, being aware of, or reasonably suspecting, the presence of a notifiable disease in his area, may by notice in writing order the evacuation, disinfection, fumigation or demolition of any infected premises or any premises reasonably suspected of being infected; or the disinfection, fumigation or destruction of such articles, including bedding and clothing, as he may suspect as infected.

Provided that no premises shall be demolished unless they are of temporary construction, or are so dilapidated, or in such disrepair that efficient disinfection is impracticable".

The Environmental Protection Act, like the Public Health Ordinance does on specifically deal with healthcare waste. However, Section 2 makes provision for the establishment of an Environmental Protection Board, Section 34 deals with Environmental standards and states that the Minister may by statutory instrument make regulation establishing national environmental standards for waste amongst others.

Also Section 35 which deals with Toxic and hazardous substances makes the following provisions:

(1) The Minister may on the advice of the Board prescribe activities or substances, which shall be considered hazardous.
(2) The Minister shall take all necessary and appropriate measures to monitor, control and regulate the manufacture, sale, transportation, handling or disposal of toxic and hazardous substances, including toxic and hazardous wastes.
(3) The introduction or importation of toxic or hazardous wastes into Sierra Leone for storage or disposal by any means whatsoever is prohibited.
(4) The possession, introduction or importation into Sierra Leone of internationally banned chemicals or substances is prohibited.
(5) The discharge of any toxic and hazardous substance into the air or in, or under the land and waters of Sierra Leone is prohibited.
(6) Any person who contravenes the provisions of subsection (3), (4) or (5) commits an offence and is liable on conviction to a fine not exceeding two million leones or to a term of imprisonment not exceeding two years or to both the fine and imprisonment.

The Environmental Protection Board, which is Multisectorial, has recently been established in the Ministry of Lands and the Environment.

There are yet no other laws, bylaws or regulations dealing with healthcare waste management in Sierra Leone. In the same manner, there are no proper control systems for hospital waste management.

A survey executed in eight selected healthcare facilities in Sierra Leone revealed that **the Ministry of Health and Sanitation does not exercise full control over non-governmental or private hospitals**. Likewise, in the hospitals themselves no internal regulations for the nursing and environmental health staff exists on how hygienically and sanitarily to identity and handle hospital-specific wastes.

3.5.2 Hygiene Standard of the Healthcare facilities

There is no organised and effective waste handling and disposal system in the healthcare facilities visited. However, with the exception of Port Loko hospital which practice open burning of its wastes, NGOs have introduced some form of waste segregation and treatment in all the other facilities visited by providing sharp boxes and plastic buckets for other infectious wastes, and low-scale incinerators. Unfortunately, these facilities are not properly and effective utilised. Mixed wastes can be seen in the plastic buckets and storage drums or open storage points outside the hospital.

All the facilities have malfunctioning water tanks, some out of order and not supplying water to the buildings, others too small or rusting. The septic tanks require a clean out and rehabilitation.
In cases where toilets (WCs and pit latrines) do not function, patients and visitors have to defecate in the hospital compounds.

Steps are now being taken to rectify this situation in the western area. A "Feasibility and Design Study" has been completed and tender documents for the rehabilitation works is currently in active progress. The African Development Bank is funding the rehabilitation of the three government hospitals (Connaught, P. C. M. H, and Children's) plus five Community Health Centres (Cline town, Ross Road, Jenner Wright, Kissy, and Regent).

The new direction of the government healthcare delivery system focuses on the development of preventive services while simultaneously strengthening the existing health delivery system. Sanitary healthcare waste management is a very important preventive service.

3.5.3 Communicable Diseases in Sierra Leone

The last statistical National Medical report was published in 1983. There is hardly any centralised data collection, which can be used for decision-making purposes. Consequently, no statistical data of communicable diseases exist at present.

According to the Ministry of Health and Sanitation, the major causes of morbidity and mortality in Sierra Leone are infectious/communicable diseases, the most common of which are the following:

- Malaria
- Hepatitis
- Respiratory infectious
- Meningitis
- Diarrhoea, Cholera
- Typhus and Para typhus
- Tuberculosis
- Worm Infection
- Infectious skin diseases
- Poliomyelitis
- HIV/AIDS
- Measles

Most of these diseases can be transmitted by unhygienic waste handling, not only in the healthcare facilities amongst the patients and staff, but also in the surrounding community, if the waste is exposed openly to visitors, scavengers of waste and animals. To prevent and control these infectious diseases, effective and safe healthcare waste management is essential.

3.5.4 Existing Waste Management Practices

Inside the Healthcare facilities

The current hygiene standard of waste handling inside the visited HCFs is, compared with the international standard, very low and a cause of great concern. The wastes from the operating theatres, patient wards and laboratories are not collected in one-way receptacles such as bags or containers, but directly in waste or used cardboard boxes without any plastic bags placed within the receptacle to prevent its contamination as they are reused.

Due to the lack of regulations and control, the hazardous infectious wastes are disposed of together with the normal waste. There is no segregation of the waste in the patient wards, and syringes and needles are not separated either.

The interviewed nurses and cleaning staff in the visited hospitals showed very little knowledge of the risks which improper handling of hospital wastes constitutes to them and to the patients, and are not instructed and trained in this area.

After being collected in unsuitable receptacles, the infectious and hazardous waste is handled and transported in the hospital by untrained porters who bring them to general on-site treatment and disposal points or transfer area in the case of Connaught hospital. Therefore, the waste transporting personnel are also highly exposed to health risks.

The on-site storage and disposal areas are located inappropriately, with access for unauthorized personnel. Patients, visitors and animals have the possibility of coming in contact with dangerous items, as there is no effective and conscientious separation of infectious sharp or pointed articles

In all of the HCFs visited, the lack of rules and standard procedures for regulating management of the waste generated could be observed. The interviewed hospital staff displayed only limited knowledge of the topic in hand, and the lack of standards, awareness, and proper allocation of resources subject both patients and HCF staff to otherwise avoidable risks. These risks take the form of:

- Use of inappropriate receptacles without lids and without bags.
- General lack of hygiene; failure to disinfect receptacles.
- Loose collection of disposable syringes with attached needles and other contaminated sharp objects.
- Complete lack of packaging materials for waste transportation.
- Internal transport of waste under unhygienic and unsanitary conditions.
- Improper disposal of hazardous radioactive waste.

3.5.5 Outside the Healthcare facilities

Off all the eight HCFs visited, only Connaught hospital and other government healthcare institutions in Freetown store their wastes in open public skips (dustbins) which are collected by EHD skip-trucks for off-site final disposal. This service is currently contracted in Freetown, Bo, and Kenema, supervised by the Environmental Health Division of the Ministry of Health and Sanitation (MOHS).

The staff employed to drive the vehicles as well as to manage the open dumpsites have neither the training nor adequate equipment to deal with waste of a hazardous natures, such as infectious HCF waste.

Wastes generated in the healthcare facilities are mostly stored in open drums or areas of MOHS container (Connaught) located within the compound. The storage places are not covered by a shelter or secured by a fence in any of the visited facilities.

The skip (Connaught) is the same as used for carting household waste with a volume of $5m^3$ slightly conical shaped and open. Due to the active prevalence of scavengers and animals, the contents were seen strewn all over the place. This is true of all the Healthcare facilities visited.

The container (Connaught hospital) is transported to the landfill site by a skip-truck without taking the precaution of covering the top. The potential danger of this situation cannot be over-emphasized.

At the open dumpsites, the content of these containers is dumped on the top together with the other municipal garbage. There is no specific location at the dumpsites for infectious waste, and there is no special treatment before or on arrival. The dumpsites are not restricted areas; scavenger activity is in evidence.

Apart from Connaught, all the other Healthcare facilities (7) visited use on-site facilities. They store their wastes in drums without tight-fitting covers; located outside the wards or dump their wastes either on the ground or behind the wards, or burn them either in pits or low-scale incinerators. It is not uncommon to find animals, scavenging in that unsanitary garbage. The drums are emptied either directly into the incinerators or on the ground nearby when the incinerators are either filled or non-functional.

Apart from Connaught hospital and George Brook Community Health Centre, all other HCFs visited have lined pits for the disposal of incinerator ashes. Unfortunately, save for Moyamba hospital, all the other pits are filled with all sorts of HCWs and are over spilling.

During the course of the survey, most of the health institutions reported that hospital wastes such as human body parts, placentas and deceased foetuses are routinely buried. This method of disposal is either done by the hospitals themselves on hospital premises or by relatives in certified burial sites such as cemeteries and is traditionally interned. However, noteworthy is the statement of a landfill supervisor that this type of waste also finds its way to the MOHS garbage containers.

The incinerators at all the visited HCFs, except at Port Loko District hospital which does not have one, show signs of deteriorations.

In summary, infectious and hazardous waste as well as human body parts are collected, transported and disposed off (on-site) together with common waste, exposing it to unauthorized persons and to animals at the storage, treatment (incineration) and disposal sites. Only in Freetown is medical wastes transported off-site to open dumpsites. All district facilities visited practice on-site waste management, which requires a lot of improvement in segregation, storage, transportation, treatment and or final disposal.

3.5.6 Water Supply and Sanitation

Healthcare waste is total waste stream from Healthcare-Waste (HCW) generators, major and scattered sources. It may be **solid** (hazardous or non-hazardous) or **liquid**

Solid Waste - Typically composed of,

- 75-90% is general waste similar to domestic waste and may follow the normal municipal waste stream.
- 10-25% is hazardous (infectious, toxic, etc) and must be segregated and treated with care to prevent associated risk. This category of waste can be subjected to incineration under supervision by trained staff.

Presently these categorises are mixed together and disposed of indiscriminately. SHARP will initially provide incinerators for the four-SHARP District and has funded the development of this Comprehensive National Medical Waste Management Plan for Sierra Leone.

Sanitation - Liquid waste mainly composed of,

3. Used water (Sullage) which are presently led into open drains that ends in either soak-away pits or nearby grass fields as the case may be.

4. Sewage (water fouled with excreta) from water closets, which are led into septic tanks followed by soak-away pits.

***Latrines* - t**oilet facilities in the hospitals are generally inadequate and there are signs of unsightliness**.** An endemic problem in the healthcare facilities visited seems to be the with the wastewater systems. Clogged sewage pipes and open drains cause permanent unsanitary conditions. Sewage and sullage over-flowing, offensive odour, and mosquito breeding are evident. Cause for the clogging is the improper disposal of wastes, which are sometimes flushed down the water closets.

We presently have three types of latrines for excreta disposal in our healthcare facilities. These are:

4. Traditional Pit Latrines
5. Ventilated Improved Pit (VIP) Latrine
6. Septic Tank System (water closet – septic tank – soak-away pit)

Freetown (capital city) and the District Hospitals have a combination of 3 plus 1 or 2 above. The Peripheral Health Units have either 1 or 2 or both as the case may be.

Toilet facilities are inadequate and there are signs on unsightliness. An endemic problem in the healthcare facilities visited seems to be the wastewater systems. Clogged sewage pipes cause permanently unsanitary conditions, sewage over-flowing from septic tanks, offensive odour, and mosquito breeding. Cause for the clogged sewage pipes is, in most cases, improper disposal of wastes, which for the lack of receptacle are sometimes ignorantly flushed down the water closets

The septic tanks are desludged by means of Sucker Trucks and the sludge is eventually either emptied in Sludge Polders were available or grass fields away from the community, for drying. Generally, sewage is led into a septic tank, from where the effluent ends into clogged soak-away pits. However, emptying and cleaning of these septic tanks are not performed regularly, reducing the effect of their treatment function to practically zero. *They're no central sewage systems throughout the country*.

Water Supply - Unlike hospitals in Freetown, which are connected to public water mains, district hospitals have, hand-dug wells fitted with electric lift-pumps to overhead storage tanks. The water yield of the wells does not meet the daily water needs of the healthcare facilities. There are problems with storage tank leaks due to rust**.**

3.5.7 Awareness and Training on medical waste

The staffs at the hospitals are little conscious about the risk associated with medical waste and/or nosocomial infections; measures to prevent these are rarely enforced. In the wards or outside the facility, they do not segregate wastes. Waste handlers are not provided with protective clothing (gloves, mask, boots, apron and overall).

Investigations reveal that there is no specifically structured training and awareness on medical waste management in the country. The following institutions exist for the local training of Healthcare personnel in Sierra Leone:

- College of Medicine and Allied Health Sciences; trains Medical Doctors
- Paramedical School; trains Community Health Officers
- National School of Hygiene; trains Public Health Inspectors
- School of Midwifery; trains Nurse Midwives
- Dispensing Technician School; trains Pharmacy Technicians
- MCH Programme; trains Maternal and Child Health Aides and Traditional Birth Attendants

Meetings with the respective heads of these institution reveals that Healthcare waste management is not elaborated in any of their curriculum/syllabuses.

Instruction and Training of Personnel

The first and most important step towards sanitary waste management inside the hospitals is to settle the matter of responsibilities.

Each healthcare facility should have a Public Health Inspector to be responsible for the hygiene of the entire hospital activities, which naturally includes the waste management inside the HCF area. This responsible person must be endowed with the necessary authority to carry out this task. He has to supervise and must have the right and duty to report directly to the Medical Superintendent.

It has been previously stated that untrained personnel directly involved in handling hospital solid wastes are exposed to a high risk of infection, which is extended to patients and other health personnel. Training, together with proper equipment for collection and transportation, is the only way to improve the present unsanitary conditions.

Not only doctors and nurses, but also all the hospital staff has to be made aware of the hazards of mishandling hospital wastes. They must be able to recognised the types of waste and know how to handle each type correctly.

The self-learning process is recommended for medical staff training. This is elaborated in annex 6.

IEC/BCC Messages

The following messages were determined at meetings with Health Educationists, National AIDS Control Programme Staff and other related partners:

1. Make sure that clean needles are used for injections.
2. Unclean needles and syringes transmit deadly diseases like AIDS.
13. Put sharps into sharp boxes for disposal.
14. Dispose of used condom in a safe manner to prevent access to children.
15. Exposure to hospital waste can make you sick.
16. Always put on gloves, overalls, and boots ad mask when handling medical wastes.
17. Mark your segregated wastes as infectious and non-infectious for easy identification.
18. Put infectious wastes in yellow plastic bags and normal wastes in black plastic bags.
19. Picking in hospital wastes exposes you to deadly diseases.
20. Never re-open sealed infectious waste bags.
21. HIV can be transmitted when the skin is cut or pierced using an unsterilised needle, razor blade, knife or any other tool.
22. Store all infectious waste in sealable containers.

The following strategies could be employed to implement the above.

6. Advocacy at national level
7. Community meetings
8. Radio and television discussions
9. Workshops and seminars
10. Newspapers and leaflets

The following methods can be considered for public education on risks, waste segregation, or waste disposal practices;

- Poster exhibitions on healthcare waste issues, including the risks involved in scavenging discarded syringes and hypodermic needles.
- Explanation by staff of healthcare establishment to incoming patients and visitors on waste management policy. This may be difficult to achieve, in which case the distribution of leaflets, TV and radio discussion should be considered.

- Information poster exhibitions in hospitals, at strategic points such as waste bin locations, giving instructions on waste segregation. Posters should be explicit using diagrams and illustrations to convey the message to as broad an audience as possible, including illiterate people.

Training Plan of action

- Assess and establish training needs.
- Adopt modules for nosocomial infections and medical waste management.
- Train District trainers and develop District and Chiefdom level training plans.
- Secure training materials.
- Plan and organise District and Chiefdom level training.

3.5.8 Healthcare facilities

According to MOHS' Directorate of Planning and Information, there are currently 32 and 417 functioning Hospitals and Peripheral Health Units (PHU) in the country; as detailed in table below.

The Peripheral Health Units according to the MCH/EPI Programme Manager, Dr. A. L. Seisay, and his programme has an operational policy to ensure that all PHUs are equipped with incinerators and staff train to manage medical waste. All sharps will put in sharp-boxes for final disposal.

Table Showing the Number and Distribution of Functioning Hospitals and Peripheral Health Unit as of 6-Jan-02

	Hospitals				PHUs
Region/Districts	**Tertiary**	**Secondary**	**Total**	**Total Beds**	**Total**
Sierra Leone	**9**	**23**	**32**	**2622**	**417**
Eastern Province	**1**	**2**	**3**	**425**	**67**
Kailahun	0	0	0	0	5
Kenema	1	2	3	365	52
Kono	0	0	0	60	20
Northern Province	**0**	**5**	**5**	**446**	**121**
Bombali	0	1	1	60	6
Kambia	0	0	0	0	20
Koinadugu	0	1	1	100	15
Port Loko	0	3	3	286	40
Tonkolili	0	0	0	0	40
Southern Province	**1**	**4**	**5**	**501**	**149**
Bo	1	0	1	334	50
Bonthe	0	2	2	64	18
Moyamba	0	1	1	60	51
Pujehun	0	1	1	43	30
Western Area	**7**	**12**	**19**	**1207**	**80**

Infectious waste classification and generation

A classification of hospital wastes has been worked out for the special needs of Sierra Leone according to the kind of treatment and disposal they require.

Classification

Type A: **Normal Waste similar to domestic waste**
Type B: **Patient's waste requiring special management within the hospital**
Type C: **Infectious Waste requiring special management inside and outside the hospital**
Type D: **Human Parts requiring special treatment for ethical reasons**
Type E: **Other Hazardous Waste similar to industrial wastes**
Type F: **Recyclable material**
Type G: **Sludge from the hospital wastewater treatment plant**.

Generation

For the purpose of estimating the amount of infectious waste (Types C and D) that would requires special care for the country, the adopted unit values from Ghana will be considered for this project under the current situation.

- Waste Types A and B 1.20 kg/bed/day
- Waste Type C 0.15 kg/bed/day
- Waste type D 0.05 kg/bed/day

- **Specific weight of waste Type A, B and C 200 kg/m^3**

Taking into account the above-listed unit values, the total amount of wastes Types C and D in the respective districts considered are estimated to come to:

Waste Type C

1. Port Loko District
268 beds x 0.15 kg/bed/ day x 7 days 300 kg/week
2. Koinadugu District
100 beds x 0.15 kg/bed/ day x 7 days 105 kg/week
3. Bombali District
60 beds x 0.15 kg/bed/ day x 7 days 63 kg/week
4. Kenema District
365 beds x 0.15 kg/bed/ day x 7 days 383 kg/week
5. Kono District
60 beds x 0.15 kg/bed/ day x 7 days 63 kg/week
6. Bo District
334 beds x 0.15 kg/bed/ day x 7 days 351 kg/week
7. Bonthe District
64 beds x 0.15 kg/bed/ day x 7 days 67 kg/week
8. Pujehun District
43 beds x 0.15 kg/bed/ day x 7 days 45 kg/week
9. Moyamba District
60 beds x 0.15 kg/bed/ day x 7 days 63 kg/week
10. Western Area (Freetown)

1207beds x 0.15 kg/bed/ day x 7 days — 1267 kg/week

Waste Type D

1. Port Loko District
268 beds x 0.05 kg/bed/ day x 7 days — 100 kg/week

2. Koinadugu District
100 beds x 0.05 kg/bed/ day x 7 days — 35 kg/week

3. Bombali District
60 beds x 0.05 kg/bed/ day x 7 days — 21 kg/week

4. Kenema District
365 beds x 0.05 kg/bed/ day x 7 days — 128 kg/week

5. Kono District
60 beds x 0.05 kg/bed/ day x 7 days — 21 kg/week

6. Bo District
334 beds x 0.05 kg/bed/ day x 7 days — 117 kg/week

7. Bonthe District
64 beds x 0.05 kg/bed/ day x 7 days — 22 kg/week

8. Pujehun District
43 beds x 0.05 kg/bed/ day x 7 days — 15 kg/week

9. Moyamba District
60 beds x 0.05 kg/bed/ day x 7 days — 21 kg/week

10. Western Area (Freetown)
1207 beds x 0.05 kg/bed/ day x 7 days — 422 kg/week

These estimates will assist in determining capacities of incinerator required for the respective Districts.

Wastes Type E (hazardous wastes) has not been separately collected up to now. Only after implementing a new classification and separation of all wastes generated in the hospitals can practicable give information on this waste fraction be obtained.

Waste receptacles and collection

According to the investigations made at the hospitals, one of the main problems of hygienic waste handling is the lack of appropriate receptacles. In nearly all cases, infectious waste together with syringes and needles, etc. are openly collected and transported in open buckets, intended for the cleaning service but not for infectious hospital waste handling.

Therefore, thorough attention has to be given to providing the hospitals with adequate equipment for the collection of the waste.

- Waste type A and B can be handled as is done now, drums and plastic buckets with tight-fitting covers respectively.
- The collection and transport of Waste Types C and D must be improved substantially.

In areas where waste of Type C is generated, metallic circular bag-holders with lid shall be employed. In these bag holders, polythene bags should be provided. For better identification the bags should be coloured, and sharp and pointed objects such as syringes blades or glass must be collected in puncture-resistant containers (sharp boxes) before being disposed of in the bags.

The filled bags should be closed off using plastic strips, which, once fastened in place, should not be reopened. Then, they are removed from the bag holder and placed at the transfer area for their removal by the collection service direct to the disposal sites. Neither re-use of the disposable receptacles nor compression of the waste is permissible.

The most appropriate receptacles for waste Type D (human body parts) are conical shaped plastic buckets with a hermetically sealing plastic lid and a handle for easy handling. If, for economic reasons, it is not possible to acquire this type of receptacle, plastic bags can be used as for the waste Type C. They must have a different colour so that the collection service can distinguish them.

A general upgrading of the hospital's internal collection equipment (bins, carts, storage areas and protection equipment, etc.) is recommended.

Transport and Storage in the Hospital

The waste has to be removed each day from the transfer areas and taken to a storage place. Rubber-wheeled carts with a bin made of plastic or non-rusting metal should be used for this should have a smooth surface for easy cleaning and disinfecting. Moreover, the dimensions must be appropriate for easy manoeuvrability along the route to be followed inside the hospital.

The storage of the different types of waste has to be done in the corresponding places according to the following requirements.

- Solid waste types A and B should be deposited in the containers used for domestic refuse.
- Waste Type C should be deposited in a special storage room to which only authorized personnel have access.
- Waste Type D should be immediately transported to a cemetery and buried as existing cultural practices demands.
- Waste Type E must be stored according to the regulations for industrial hazardous waste.
- Radioactive wastes must be stored in a radiation-safe place until their radioactivity has decreased to the point where they are no longer considered radioactive, and then disposed of according to the instructions given by authorized officials.

In none of the visited hospitals was there an appropriate room for the storage of the waste Type C. Therefore, in most of the hospitals remodelling will be necessary.

Treatment of Waste

The management of the hospital wastes outside the hospital depends on the kind of treatment they have to undergo:

- Waste Types A and B, normal waste and patient's waste can be transported and disposed of together with other urban waste, once they have been removed from the hospital premises.
- Wastes Types C and D, infectious waste and human body parts, require special transport and treatment, which will be described further.
- Waste Type E, other hazardous waste, must be disposed of according to the regulations for industrial hazardous waste.

Treatment of hospital waste means any method, technique or process designed to change the biological character or composition of any regulated medical waste so as to reduce or eliminate its potential for causing disease.
Regarding the adequate sanitary disposal of healthcare waste as a treatment method, and by considering the specific needs and possibilities for Sierra Leone, only two technical alternatives can be taken into consideration for waste Type C:

1. Incineration (modern for regional referral hospitals and improvised for District hospitals and PHUs)
2. Controlled disposal in sanitary landfills

Controlled disposals in sanitary landfills have the following reported advantages

- It is a recognised and proven method of deposal of this waste category
- The technology is applicable to all infectious wastes and does not require pre-processing of the waste.
- The control is easy and evident
- It is the most economic method.

However, current practices (open dumping) at the existing dumpsites (Freetown, Bo, and Kenema) militate against this option for the time being. Consequently, and taking into consideration the dangers associated with healthcare waste and in particular HIV, HBV, and HCV transmissions, incineration followed by ash burial in lined pits within the compound should be improved and promoted. Nevertheless, since typically almost 80% of the total wastes generated by healthcare institutions are generally comparable to domestic wastes, sanitary landfill is inevitable. Consequently, the existing (4) open dumpsites should be upgraded to sanitary landfills and new sanitary landfills developed in every district currently without one. This will then allow for the landfilling

of those categories of waste that should not be incinerated. Recommended criteria for the selection, development and operation of sanitary landfill sites are attached as annex 6.

As outlined earlier, infectious hospital waste Type C can be buried at sanitary landfills, provided the following precautions are taken:

- The hospital waste must be transported to an already filled-up area of the sanitary landfill. This landfill, or at least the selected area, should be fenced in so that it will have restricted access.
- The hospital waste has to be dumped directly from the truck into the pit without any handling by labourers.
- The same excavation material from the pit must cover it immediately, preferably.
- The areas where infectious wastes have been buried must be marked and documented to avoid re-opening by further disposal of hospital wastes.

Instruction and training of solid waste personnel, as described in this report, must also be extended to the personnel working on the sanitary landfill.

3.5.9 Legal Requirements

Legislation

There is a lack of legislative framework, by-laws and guidelines for the management of hospital wastes in Sierra Leone. The objective should be to set up a legal structure that will be maintained and updated by a Ministry of Health and Sanitation legislation unit. By-laws or regulations on the following themes should be laid down.

- Precise definition of all terms to describe the management of hospital waste
- Classification of hospital wastes
- Internal management of solid waste in health care institutions
- External management of solid waste from health care institutions
- Guidelines for the section of hospital solid waste-handling equipment and materials
- Determination of responsibilities
- Fines and penalties for non-compliance.

The general guidelines for the management of healthcare wastes is attached as annex 7

Control Institutions

Legislation alone is a useless instrument without an official organ to monitor compliance and the power to enforce it by punishing non-compliance

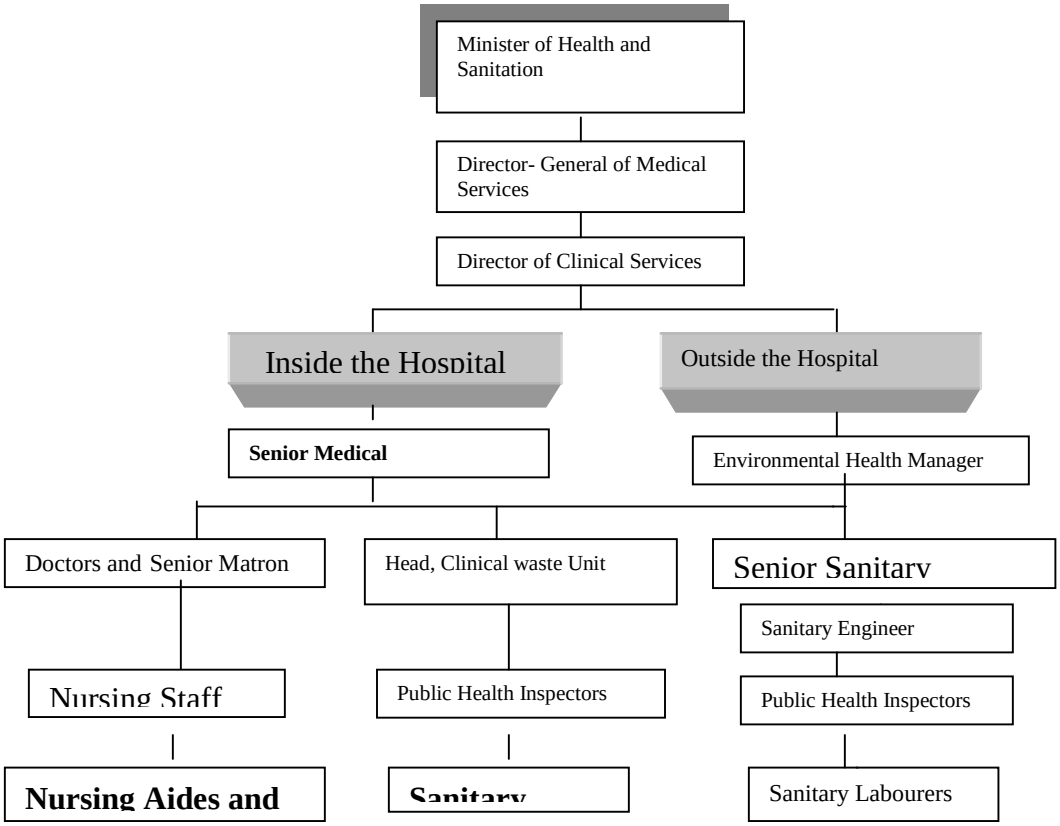
Therefore, an effective control system of the hospital waste management must be established. As described before, it can be organised on two levels.

3. Responsible self-control by a qualified member of their own staff for the executing institutions, the hospitals for sanitary hospital-internal handling, and the Environmental Health Division for the management outside the hospital. This should cover collection transportation, treatment and disposal.
4. Official control by health inspectors of the ministry who should exercise control over governmental, private and mission operated health care institutions and has the legal power to caution and/or punish.

3.6 Existing institutional arrangements

3.6.1 Structure of Government Health Authority

STRUCTURE OF CONTROL – RESPONSIBLITIES OF WASTE MANAGEMENT



***Minister of Health and Sanitation*:** *She is the head of the ministry and responsible for the formulation of policies and legislation.*

Director-General of Medical Services: *He is the professional head of the ministry and adviser to the minister on all professional matters.*

Director of Clinical Services: *He is one of the two Deputies and assists the Director-General Medical Services with his functions, with particular reference to clinical services.*

Senior Medical Superintendent: *He is the overall head of the hospital administration and reports to the Director-General Medical Services. He is therefore also head of the hospital waste management. He supervises the day-to-day running of the hospital, and the doctors as well as the senior matron reports to him. In turn, the matrons, nurses and ward staff report to the doctors and the senior matron.*

Environmental Manager*: He is the head of all public health inspectors based in the hospital. He assigns the health inspector to exercise hospital waste handling. All public health inspectors are in theory, controlled by the Chief Health Superintendent. In practice, they are supervised by the respective senior medical superintendents in hospitals were public health inspectors are posted.*

Senior Sanitary Engineer: *He heads the Waste Management Unit within the MOHS. He and his staff are currently responsible for the sanitary transport and disposal of all (municipal and hospital) wastes disposal in the country.*

3.6.2 Healthcare Institutions

The Healthcare institutions in Sierra Leone can be divided into five groups on the basis of the mode of management and ownership.

1. Government

Government healthcare facilities (hospitals, health-centres, and clinics) are the most extensive of these groups. These comprise a network of institutions spread throughout the country. The functionaries that run and administer these institutions are directly employed and remunerated by the Government of Sierra Leone through the Ministry of Health and Sanitation. The effects of National Health Policy and activities are most significantly felt in these institutions.

Government health institutions are sub-divided into four groups.

6. Referral Hospitals (secondary at district levels and tertiary at regional levels).
7. Community Health Centres
8. Maternal Child Health Posts
9. Community Health Posts

Items 2, 3, and 4 above constitute the Peripheral Health Units.

2. Industry

Industrial Hospitals and Clinics are healthcare facilities usually established and administered by specific industrial enterprises. Even though they are subject to overall National Health Policy guidelines and regulations, they are to all intents and purposes autonomous. The staff are employed and remunerated by the respective industries. Unlike government hospitals that cater to the general public, industrial health care institutions usually only service employees of the respective industries and dependent relatives.

3. Missions

These were established and run by religious groups. Their staff are employed and remunerated by these Missionaries. In general, they are subject to national health policy conditions and regulations. Their clientele include members of the general public.

4. Defence (Military and Police) and Education

The ministries of defence and education run these as the case may be. The clientele of these hospitals in principle comprise members of the Sierra Leone Military, Police, Educational Institutions and their dependant relatives. Government pays the bulk of the staff in these hospitals.

10. Private Organizations

Next to government-run organizations, private healthcare facilities comprise the bulk of support in Sierra Leone. Due to their higher quality of services rendered or provided, they cater to the most privileged members of the Sierra Leone community. Individual doctors or associates thereof mainly own these health institutions. The administration is autonomous, and they pay their own staff. They are operated very often without subventions from external sources, and they charge cost-covering fees for their services.

4. The HCWM Plan

4.1 Plan description

4.1.1 Goal and objectives

The overall goal is to establish a comprehensive system of waste management in Sierra Leone in order to improve public health and reduce environmental impacts from handling of healthcare waste (municipal and healthcare) by its proper disposal.

Objectives:

5 To improve the management of wastes in all healthcare institutions
6 To support private initiative (Private sector and NGOs) in safe healthcare waste management
7 To raise awareness of managers, health staff (public, private and NGO) and the general public about the importance of safe management of healthcare waste.
8 To develop the institutional capacity of EHD in the safe management of healthcare wastes

Problems/Issues	Objective to be achieved
1. Lack of policy, legal framework, guidelines, and effective control. 2. Deficiency and lack of appropriate technology, equipment and materials 3. Lack of Advocacy, focused health education and staff training, concerning hospital waste management	To improve the management of wastes in all healthcare institutions
1. Private not motivate 2. Lack of compliance	To support private initiative (Private sector and NGOs) in safe healthcare waste management
1. Unhygienic handling of wastes within the hospitals, posing a threat to personnel, patients, and visitors 2. Lack of training	To raise awareness of managers, health staff (public, private and NGO) and the general public about the importance of safe management of healthcare waste.
1. Improper handling of wastes outside the institutions, exposing these wastes to scavengers, and causing a serious threat not only to their own health but also to that of the public and the environment.	To develop the institutional capacity of EHD in the safe management of healthcare wastes

4.1.2 Target groups and benefits

Target groups	Benefits
1. Health staff	• Existing Health staff trained on medical waste • Safe management of healthcare waste • Safe environment (land, water, and air) • Prevention and control of disease transmission
2. Private healthcare institutions	
3. Healthcare training institutions	
4. Waste Handlers	
5. Landfill staffs	

6. General Public	• Healthy Population • Economic Growth • Improved life expectancy
7. Scavengers	

Amongst the priority health problems of Sierra Leone are malaria and water/sanitation related diseases. These diseases can be transmitted by unhygienic waste handling, not only in the healthcare facilities amongst the patients and staff, but also in the surrounding community, if the waste is exposed openly to visitors, scavengers of waste and animals. To prevent and control these infectious diseases, effective and safe healthcare waste management is essential. Regarding the lack of appropriate waste management policies and legislation, the EHD of MOHS should develop these instruments through a collaborative workshop involving all stakeholders including the Law officers department. The ensuing ordinance should be enacted and enforced by the public health inspectors through sanitary courts established by law.

4.1.3 Key interventions (activities) per objectives and performance indicators

Objectives	Activities/Actions to be undertaken to achieve the objective	Key performance indicators
1. To improve the management of wastes in all healthcare institutions	1.7 Equip all healthcare facilities with appropriate equipments and material for collection of healthcare waste. 1.8 Equip all healthcare facilities with appropriate facilities (trolleys, waste bags, sharp boxes and bins and skips) for medical waste management. 1.9 Provide adequate and wholesome water supplies in all facilities 1.10 Provide wheelbarrows for all healthcare facilities for transportation to medical wastes to incinerators 1.11 Construct adapted incinerators for District hospitals and PHUs 1.12 Equip personnel involved in medical waste management with adequate and sufficient protective clothing (boots, gloves, nose masks, overalls, etc)	**Process/outputs** By the end of the project: -All healthcare wastes are collected and Disposed in a safe and environment-Friendly manner - All personnel involved in medical Waste management must possess Appropriate safety equipment in all Public and private healthcare Facilities. - A national policy for healthcare waste Management is developed - The public health ordinance is Reviewed, enacted and enforced. **Outcome:** - All healthcare facilities (public, Private and NGO) possess equipment for Waste storage. - All healthcare facilities (public, Private and NGO) has dust bin for Storage of normal waste within their Compound - All healthcare facilities has equipments For safe internal transportation of their Waste - All Referral and regional hospitals Has modern incinerators - All District hospitals and PHUs has Improvised incinerators.
2. To support private initiative (Private sector and NGOs) in safe healthcare waste management.	2.1 Private and NGO healthcare Facilities manage their waste in a safe And environment-friendly manner. 2.2 Private and NGO healthcare Facilities provide protective clothing For their waste handlers 2.3 Private and NGO healthcare facilities Train their staffs and sensitise patients And visitors on risks	**Process/outputs** - The private sector and NGOs are Motivated and pay more interest in Medical waste management **Outcome:** - All private and NGOs healthcare Facilities manage their waste in a safe And environment-friendly manner. - All private and NGOs healthcare Facilities provide protective clothing for Their medical waste handler.
3. To raise awareness of managers, health staff (public, private and NGO) and the general public about the importance of safe management of healthcare waste.	3.1 To train health staffs (private, public And NGO), Trainer Trainers, Paramedics, and sanitary worker in Healthcare facilities. 3.4 To sensitise patients and the general public	**Process/outputs** - Personnel involved in are conscious of The risk related to medical waste, Appropriate behaviour and practices in Their handling and are capable to Formulate internal strategies for safe Medical waste management. - Training modules on medical waste **Outcome:** - All medical and paramedical staff Trained in medical waste management - All aides, cleaners and maintenance Staffs are sensitised about medical Waste management - At least 90% of the population are Sensitised about risk related to medical Waste management.

4. To develop the institutional capacity of EHD in the safe management of healthcare wastes	4.12 Design and or adapt an improvised incinerator 4.13 Design and or adapt tools for the pre-collection of medical wastes in healthcare facilities 4.14 Elaborate internal guidelines for medical waste management 4.15 Develop a healthcare waste management policy 4.16 Review and update Public Health Ordinance 4.17 Enact and enforce the Public Health Ordinance 4.18 Rehabilitate existing dumpsites to sanitary landfills 4.19 Construct new sanitary landfills 4.20 Provide technical and training assistance 4.21 Overseas Training 4.22 Strengthen the Pubic Health Laboratory at Connaught Hospital	**Process/outputs** **- Tools and appropriate infrastructures Are elaborated, tested, evaluated and Installed in healthcare facilities.** **- Programme activities are prepared, Formulated, monitored and evaluated** **- Sanitary courts established nationwide** **- Staff trained overseas** **- Public Health Laboratory Strengthened** **Outcome:** - 100% of healthcare facilities manage Their waste in a safe and environment-Friendly manner. - Effluent Standards Established - 100% Compliance - All project activities monitored - 100% Written reports

4.1.4 Risks and mitigating actions

Risks	**High/ Substantial/ Moderate/**	**Mitigating Actions**
1. Contamination of Drinking	Moderate	Appropriate design, sites and operation of sanitary landfills, leachate treatment and control, water quality testing.
2. Release of Pollutants into the air	High	High temperature (1000-1200^{0}C) incineration, installation of flue gas cleaning devices, air quality testing and materials containing chlorine or heavy metals will not be incinerated
3. Occupational hazards	Substantial	Provision and ensuring routine use of protective clothing, staff training and first aid
4. Diseases transmission	Moderate	Limited access to disposal sites, fencing of disposal sites, separate cells for medical wastes, public sensitisation (radio, TV, posters, leaflets, newspapers, etc)

4.1.5 Implementation strategy/methodology

Waste receptacles and collection
According to the investigations made at the hospitals, one of the main problems of hygienic waste handling is the lack of appropriate receptacles. In nearly all cases, infectious waste together with syringes and needles, etc. are openly collected and transported in open buckets, intended for the cleaning service but not for infectious hospital waste handling. Therefore, thorough attention has to be given to providing the hospitals with adequate equipment for the collection of the waste.

In Annex 7 of this plan, the general requirements for receptacles are described. According to this, the following system will be recommended for the hospitals in Sierra Leone.

- Waste type A and B can be handled as is done now, drums and plastic buckets with tight-fitting covers respectively.
- The collection and transport of Waste Types C and D must be improved substantially.

In areas where waste of Type C is generated, metallic circular bag-holder with lid shall be employed. In these bag holders, polythene bags will be provided. For better identification the bags will be coloured, and sharp and pointed objects such as syringes blades or glass must be collected in puncture-resistant containers (sharp boxes) before being disposed of in the bags.

The filled bags are closed off using plastic strips, which, once fastened in place, should not be reopened. Then, they are removed from the bag holder and placed at the transfer area for their removal by the collection service direct to the on-site disposal site. Neither re-use of the disposable receptacles nor compression of the waste is permissible.

The most appropriate receptacles for waste Type D (human body parts) are conical shaped plastic buckets with a hermetically sealing plastic lid and a handle for easy handling. If, for economic reasons, it is not possible to acquire this type of receptacle, plastic bags can be used as for the waste Type C. They must have a different colour so that the collection service can distinguish them.

A general upgrading of the hospital's internal collection equipment (bins, carts, storage areas and protection equipment, etc.) is recommended.

Transport and Storage in the Hospital
The waste has to be removed each day from the transfer areas and taken to a storage place. Rubber-wheeled carts with a bin made of plastic or non-rusting metal should be used for this should have a smooth surface for easy cleaning and disinfecting. Moreover, the dimensions must be appropriate for easy manoeuvrability along the route to be followed inside the hospital.

The storage of the different types of waste has to be done in the corresponding places according to the following requirements.

- Solid waste types A and B should be deposited in the containers used for domestic refuse.
- Waste Type C should be deposited in a special storage room to which only authorized personnel have access.

- Waste Type D should be immediately transported to a cemetery and buried as existing cultural practices demands.
- Waste Type E must be stored according to the regulations for industrial hazardous waste.
- Radioactive wastes must be stored in a radiation-safe place until their radioactivity has decreased to the point where they are no longer considered radioactive, and then disposed of according to the instructions given by authorized officials.

In none of the visited hospitals was there an appropriate room for the storage of the waste Type C. Therefore, in most of the hospitals remodelling will be necessary.

Treatment of Waste

The management of the hospital wastes outside the hospital depends on the kind of treatment they have to undergo:

- Waste Types A and B, normal waste and patient's waste can be transported and disposed of together with other urban waste, once they have been removed from the hospital premises.
- Wastes Types C and D, infectious waste and human body parts, require special transport and treatment, which will be described further.
- Waste Type E, other hazardous waste, must be disposed of according to the regulations for industrial hazardous waste.

Treatment of hospital waste means any method, technique or process designed to change the biological character or composition if any regulated medical waste so as to reduce or eliminate its potential for causing disease. Regarding the adequate sanitary disposal of health-care waste as a treatment method, and by considering the specific needs and possibilities for Sierra Leone, only two technical alternatives can be taken into consideration for waste Type C:

1. Special incineration
2. Controlled disposal in sanitary landfills

Controlled disposals in sanitary landfills have the following reported advantages

- It is a recognised and proven method of deposal of this waste category
- The technology is applicable to all infectious wastes and does not require pre-processing of the waste.
- The control is easy and evident
- It is the most economic method.

However, current practices (open dumping) at the existing dumpsites (Freetown, Bo, and Kenema) militate against this option for the time being. Consequently, and taking into consideration the dangers associated with health-care waste and in particular HIV, HBV, and HCV transmissions, the current practice of incineration without flue-gas cleaning should be improved and promoted until the dumpsite are upgraded to sanitary landfills.

As outlined earlier, infectious hospital waste Type C can be buried at sanitary landfills, provided the following precautions are taken:

- The hospital waste must be transported to an already filled-up area of the sanitary landfill. This landfill, or at least the selected area, should be fenced in so that it will have restricted access.
- The hospital waste has to be dumped directly from the truck into the pit without any handling by labourers.
- The same excavation material from the pit must cover it immediately, preferably.
- The areas where infectious wastes have been buried must be marked and documented to avoid re-opening by further disposal of hospital wastes.

Instruction and training of solid waste personnel, as described in this report, must also be extended to the personnel working on the sanitary landfill.

The operation of incinerators proposed within this plan may result in certain nuisances that will negatively impact the existing environmental and social set up.

However, considering the reduced daily quantities of waste to be incinerated by the healthcare facilities, it is evident that the negative social and environmental impacts will be relatively negligible and the nuisance caused will be less harmful. Nevertheless, it would be necessary to take the precautions in the installation and operations of the incinerators:

- To select a site for the incinerator at a considerable distance from the hospital, far away from the medical wards.
- It is necessary to preferable operate the incinerators at night to reduce smoke nuisance.
- All ash residues should be buried in lined pits within the compound.

The De Mont fort Family of Incinerators is recommended for the purposes of this plan. Please see annex 9.

Water Supply and Sanitation

The existing water and sanitation system needs to be improved. New reliable wells and adequate toilets facilities should be provided. The drains should be rehabilitated to facilitate free-flow of used water. Sucker trucks should be provided for routing desludging of fill septic tanks. Healthcare staff should have related training. Please see annex 10.

Legal Requirements

Legislation

There is a lack of legislative framework, by-laws and guidelines for the management of hospital wastes in Sierra Leone. The objective should be to set up a legal structure that will be maintained and updated by a Ministry of Health and Sanitation legislation unit. By-laws or regulations on the following themes should be laid down.

- Precise definition of all terms to describe the management of hospital waste
- Classification of hospital wastes
- Internal management of solid waste in health care institutions
- External management of solid waste from health care institutions
- Guidelines for the section of hospital solid waste-handling equipment and materials
- Determination of responsibilities
- Fines and penalties for non-compliance.

There are no effluent standards; it is therefore recommended that WHO the Environmental Protection Board in establishing national standards for Sierra Leone adapts guidelines for effluent standards. Defaulters should be prosecuted and appropriately punished by the sanitary courts, which should be so empowered by the proposed reviewed Public Health Ordinance.

Control Institutions

Legislation alone is a useless instrument without an official organ to monitor compliance and the power to enforce it by punishing non-compliance

Therefore, an effective control system of the hospital waste management must be established. As described before, it can be organised on two levels.

- Responsible self-control by a qualified member of their own staff for the executing institutions; the hospitals for sanitary hospital-internal handling, and the Environmental Health Division for the management outside the hospital. This should cover collection transportation, treatment and disposal.

- Official control by health inspectors of the ministry who should exercise control over government, private and mission operated health care institutions and has the legal power to caution and/or punish.

4.1.6 Institutional arrangements and implementation responsibilities

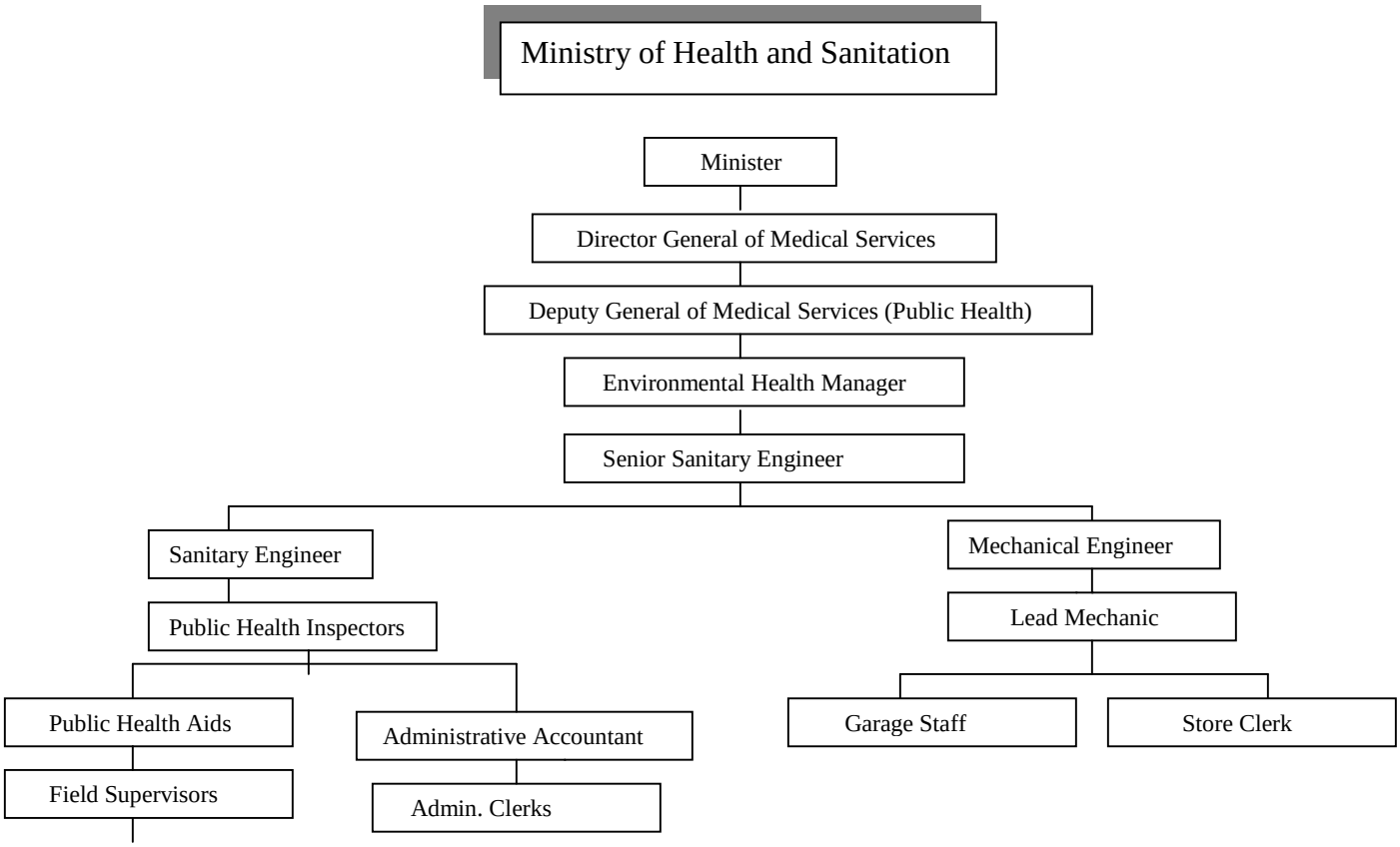
(d) Institutional arrangements

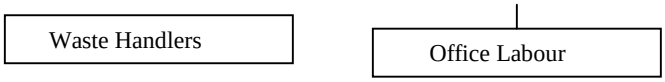
MOHS as the responsible national body for the country's healthcare system is, in the exercise of its activities most closely related to environmental protection issues. MOHS derives its duties and powers from the Public Health Ordinance; Act No.23 of 1960, whereby it is responsible for overall sanitation services.

The Environmental Health Division (EHD) is currently entrusted with the comprehensive waste management throughout the country. From 1982 to 1994, the Freetown services received German Technical and Financial Assistance. Since 08/94 EHD performs this service without exterior support

Within the hierarchical structure of MOHS, EHD is placed under the Environmental Health (Sanitation) Manager. It is headed by the Senior Sanitary Engineer, who reports, via the Manager, via the Deputy Director General of Medical Services, via the Director General Medical Services, to the Minister of Health and Sanitation.

EHD Hierarchical Position within MOHS





(e) Implementation responsibilities

Since 1993, the EHD of MOHS has overall responsibility for ensuring safe waste management countrywide. Its duties cover:

- Planning and budgeting
- Management, monitoring and control
- Operation performance (collection, disposal and treatment)
- Maintenance and repair of vehicle fleet and equipment
- Overall administration and accounting.

Monitoring Staff

The EHD monitoring staffs consist of the Senior Sanitary Engineer, Sanitary Engineer (2), Mechanical Engineer and Public Health Inspectors. The monitoring staff's professional qualification and experience comply fully with most of their monitored duties. However, due to lack of the involved professional background, certain responsibilities, in particular in the fields of impact monitoring and mitigation and waste treatment, are despite remarkable efforts, carried out only in a rudimentary way.

The Senior Sanitary Engineer, with his overall supervisory and controlling functions within the Division and coordination of its activities with bordering performances of the other Departments' divisions is particularly overburdened. He is not in a position, neither from his workload nor (despite his eager interest and commitment) from his professional training point of view, to perform and pursue the waste management in an environmentally friendly manner, unless he has undergone intensive relevant training, possibly including on-site experience in overseas. The senior of the two sanitary engineers has recently been assigned with the special responsibilities of healthcare waste management and occupational safety. **This unit requires immediate strengthen of its capacity to supervise/implement this plan.**

In the Districts, this responsibility is carried out by Senior Health Inspectors who like the Senior Sanitary Engineer needs training in waste management in an environmentally friendly manner. It is therefore, considered as a need measure to the implantation of this subproject, to engage an international advisory services in the field of design, planning, construction and landfill operations for a project duration s/he will also be expected to carryout on the job training of the staff. EHD lacks the capacity. In effect, this provision will ensure capacity building and training. The Public Health Laboratory at Connaught should be strengthened to carry out sampling and laboratory analysis of water sources, landfill leachates and incineration emissions; the laboratory manager will require transportation, equipments, and materials to perform this responsibilities.

.

SHARP makes provision for the strengthening of the EHD to ensure effective supervision and safe management of healthcare waste. It also makes provision for the four SHARP-Districts in terms of provision of equipment and materials, construction of incinerators, staff training and community sensitisation.

It is the view of the consultant that for effective coordination of this plan at the national level, the EHD Sanitary Engineer charged with the responsibilities of clinical waste and occupational safety unit be seconded to ARG. S/he will be at the level of a programme to ensure a sufficiently high profile to enable the officer to report directly to the directly to the Director General of Medical Services and participate in the Top Management Team meetings of the MOHS. This is in line with the position of Programme Managers within MOHS. The ARG team includes professionals in Health Education, Monitoring and Evaluation, and Health Administration. This proposed arrangement would allow for dependency on these professionals for their respective expertise in implementation of this plan for the five-year project duration and ensure continuity, as the officer will simply revert to the mainstream of MOHS.

(f) Implementation coordination

The EHD sanitary engineer responsible for healthcare waste management will be seconded ARG. ARG help the NAS and NAC in formulating the health part of the control and prevention of HIV/AIDS. This will not only pertain to the public health sector but also to the private sector and even beyond the health sector, defining norms and standards for all medical activities undertaken by NGOs CBOs. Regular coordinating meetings will be held as directed by NAS wherein progress will be reviewed and where necessary implementation adjustments will be made as deemed necessary.

4.2 Implementation schedule/plan

	START YEAR	FINIST YEAR	2003				2004				2005				2006				2007			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Objective 1; To improve the management of wastes in all healthcare institutions																						
1.7 Equip all healthcare facilities with appropriate equipments and material for collection of healthcare waste.	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1.8 Equip all healthcare facilities with appropriate facilities (trolleys, waste bags, sharp boxes and bins and skips) for medical waste management.	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1.9 Provide adequate and wholesome water supplies in all facilities	2003	2004	X	X	X	X	X	X	X	X												
	2003	2004	X	X	X	X	X	X	X	X												
1.10 Provide wheelbarrows for all healthcare facilities for transportation of medical wastes to incinerators	2003	2004	X	X	X	X	X	X	X	X												
1.11 Construct adapted incinerators and lined pits for healthcare facilities																						
1.12 Equip personnel involved in medical waste management with adequate and sufficient protective clothing (boots, gloves, nose masks, overalls, etc)																						

Objective 2: To support private initiative (Private sector and NGOs) in safe healthcare waste management.																							
2.1 Ensure private and NGO healthcare Facilities manage their waste in a Safe and environment-friendly Manner.	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2.2 Ensure private and NGO healthcare Facilities provide protective clothing for their waste handlers	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Objective 3: To raise awareness of managers, health staff (public, private and NGO) and the general public about the importance of safe management of healthcare waste.																							
3.1 Train health staffs (private, public and NGO), Trainers, Paramedics, and sanitary worker in healthcare facilities.	2003	2004	X	X	X	X	X	X	X	X													
3.3 Sensitise patients and the general public	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Objective 4: To develop the institutional capacity of EHD in the safe management of healthcare wastes																						
8.1 Design and or adapt an improvised incinerator	2003	2003	X																			
8.2 Design and or adapt tools for the pre-collection of medical wastes in healthcare facilities	2003	2003	X																			
8.3 Elaborate internal guidelines for medical waste management	2003	2003	X	X																		
8.4 Develop a healthcare waste management policy	2003	2003	X	X	X	X																
8.5 Review and update Public Health Ordinance	2003 2004	2004 2004	X	X	X	X	X X	X X	X X	X X												
8.6 Enact and enforce the Public Health Ordinance	2003	2003	X	X	X	X																
8.7 Rehabilitate existing dumpsites to sanitary landfills	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X								
8.8 Construct new sanitary landfills	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X								
8.9 Provide technical and training assistance	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X								
8.10 Overseas Training	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X								
8.11 Strengthen the Pubic Health Laboratory at Connaught Hospital	2003	2007	X	X	X	X	X	X	X	X	X	X	X	X								

4.3 HCWM Plan implementation monitoring and evaluation

4.3.1 Monitoring activities and strategy

- Monthly supervision and reports at District Level by Senior Health Inspector
- Quarterly Supervision from national level by Sanitary Engineer and ARG
- Quarter meetings both at District and national level to review progress by Sanitary Engineer, DHMT, ARG

4.3.2 Evaluation activities and strategy

- Annual review, midterm evaluation and end of project evaluation (ARG and Sanitary Engineer)

4.3.3 Reporting

Report name	What will it contain?	Frequency of production (quarterly and annually)	Production responsibility	To whom it will be submitted?
1.Supervisory	Status of project implementation, activities, constrains	Monthly (Districts) Quarterly (national)	Senior Health Inspector Sanitary engineer	DHT, HQ, ARG, NAS
2. Minutes	Proceedings of meeting	Quarterly meetings	Designated reporter	HQ, MOHS,ARG, NAS
3. Review	Progress report	Annually	ARG	HQ, MOHS, ARG, NAS
4. Laboratory	Concentrations of the various constituents in air, soil, and water samples.	Monthly	Laboratory Manager	HQ, MOHS, ARG, NAS
4. Evaluation	Project achievements and challenges	Midterm End of Project	ARG	HQ, MOHS, ARG, NAS

5. ANNEXES

Annex 1 – Tables on Healthcare Facilities in Sierra Leone as of November 2001

An enquiry of nearly all-existing healthcare facilities in Sierra Leone are summarise in the following tables.

Table 1: Summary of the hospitals by districts, type, and ownership as of November 2001

No	District	HOSPITALS						
		G	**P**	**M**	**I**	***TOTAL***	**FUNCTIONAL**	**Not FUNCTIONAL**
1	Bo	1	0	1	0	2	1	1
2	Moyamba	1	0	1	1	3	1	2
3	Pujehun	1	0	0	0	1	1	0
4	Bonthe	1	0	1	1	3	1	2
5	Kenema	1	1	2	1	5	2	3
6	Kono	1	1	0	1	3	1	2
7	Kailahun	2	1	1	0	4	1	3
8	Bombali	1	0	2	0	3	1	2
9	Koinadugu	1	0	0	0	1	1	0
10	Kambia	1	0	0	0	1	0	1
11	Port Loko	2	1	2	0	5	3	2
12	Tonkolili	1	0	0	0	1	0	1
13	Western Urban	8	9	1	1	19	19	0
14	Western Rural	1	0	0	0	1	1	0
	TOTAL	**23**	**13**	**11**	**5**	**52**	**33**	**19**

Source: MCH/EPI progress report July 2001

Note: OWNERSHIP KEY
G=Government=Private=Mission, **I=**Industrial.

Table 2: Summary of the Peripheral Health Units (PHUs)

No	District	No. of PHUs	No of functioning PHUs	No. of non-functioning PHUs	No. PHUs supported by NGOs	No. of PHUs to be rehabilitated
1	Kenema	66	49	17	46	13
2	Kono	52	4	48	4	48
3	Port Loko	86	58	28	32	23
4	Moyamba	85	55	30	8	52
5	Pujehun	46	34	12	25	37
6	Kailahun	55	10	45	5	52
7	Bonthe	39	21	18	20	21
8	Tonkolili	65	34	31	15	51
9	Bo	68	65	3	29	27
10	Kambia	31	21	10	9	32
11	Koinadugu	37	9	28	9	30
12	Bombali	79	16	63	16	3
13	Western Area Urban	20	20	0	4	3
14	Western Area Rural	13	10	3	2	1
		742	**406**	**336**	**224**	**393**

Source: MCH/EPI progress report July 2001

Table 3: **Summary of government hospitals by category, number of existing beds, bed occupancy rates, functioning and not functioning.**

No	HOSPITAL	No of beds	Average Bed Occupancy	TYPE OF HOSPITAL	LOCATION	REMARKS
1	Bo District	334	250	Regional	Bo	Functional
2	Bonthe District	64	20	District	Bonthe	Functional
3	Moyamba District	60	36	District	Moyamba	Functional
4	Pujehun District	43	40	District	Pujehun	Functional
5	Kenema District	255	204	District	Kenema	Functional
6	Kailahun Hospital	0	0	District	Kailahun	**Destroyed**
7	Daru Hospital	7	5	District	Daru	Functional
8	Kono District	60	30	District	Kono	Functional
9	Bombali District	60	42	District	Makeni	Functional
10	Koinadugu District	100	70	District	Kabala	Functional
11	Magburaka	0	0	Regional	Magburaka	**Vandalised**
12	Mile 91	20	14	District	Mile 91	Functional
13	Port Loko	68	50	District	Port Loko	Functional
14	Lungi	50	40	District	Lungi	Functional
15	Kambia	0	0	District	Kambia	**Destroyed**
16	Connaught	300	221	Main Referral	Freetown	Functional
17	Rukupa	42	40	District	Freetown	Functional
18	Macauley Street Hospital	40	35	District	Freetown	Functional
19	Military Barracks	250	150	Military	Freetown	Functional
20	Police Barracks	30	25	Police	Freetown	Functional
21	Macauley street	40	35	District	Freetown	Functional
22	PCM Hospital	150	122	Referral	Freetown	Functional

23	Children's Hospital	146	117	Referral	Freetown	Functional
24	Goderich Hospital	42	20	District	Freetown	Functional
	Total	**2161**	**1566**			

Functioning PHUs refers to those providing, at least the following services, maternal health, promotion of growth monitoring and breast-feeding and immunisation.

Table 4: Current Statistics (November 2001) in visited hospitals.

No.	Name of hospital	**HOSPITAL TYPE**	**No. Of beds**	**Ave. No. Of Outpatients per month**	**No. Of Hospital Staff**
1.	Connaught l	Referral	300	1200	634
2.	Bo Government	Regional	334	1650	219
3.	Port Loko District	District	68	1500	92
4	Brookfields Community	Private	40	90	30
5	Kenema Government	Regional	255	900	105
6	Moyamba Government	District	60	1050	175
7	Macauley Street Satellite Clinic	District	40	4500	30
8	George Brook Community Centre	Health Centre	3	450	21
Total			**1100**	**11340**	**1306**

These healthcare facilities are all functional and the statistics are as of November 2001.

Annex 2: Monitoring Plan

Activity	**Technical Details**	**Parameters To be Measured**	**Methods to be used**	**Sampling Locations**	**Frequency of Measurements**	*INSTITUTION FOR IMPLEMENTATION*	*INSTITUTION FOR MONITORING IMPLEMENTATION*	*DURATION*
Water quality Tests	Relates to pollution/ Contamination	Chemical and micro organisms	Laboratory and physical analysis	Landfill effluents and potentially affected watercourses	Monthly	Public Health Laboratory	Environment Officers NAS/ARG/EHD	2003-2007
Air Quality analysis	-Do-	Odour, visibility, chemicals	Visual observation and laboratory analysis	Landfill sites and incinerator-chutes	Daily for odour and visibility, and monthly for air analysis	Public Health Laboratory	Environment Officers NAS/ARG/EHD	2003-2007
Soil analysis	-Do-	Chemical and micro organisms	Laboratory and physical analysis	Construction and landfill sites	Monthly	Public Health Laboratory	Environment Officers NAS/ARG/EHD	2003-2007
								Total USD

Annex 3: PERSONS AND INSTITUTION CONTACTED

- The Ministry of Lands, housing, country planning and the environment, at National Level.

- Ministry of Health and Sanitation at National level

- Paramount Chiefs, Elders, general public of target communities and local NGOs of Koinadugu, Moyamba, Bombali and Kono districts.

- The respective District Health Management Team Members.

- Programme Managers of the Malaria Control, Tuberculosis Control, Onchocerciasis Control, HIV/AIDs and Environmental Health Programmes of the Ministry of Health and Sanitation and their respective District Focal Point Persons in Moyamba, Bombali, Kono and Koinadugu Districts.

- Regional Environment Officers.

- Mr. Foday Koroma - Entomologist, MOHS

- Mr Daniel Tholley - Hydro geologist, National Onchocerciasis Control Programme.

- Dr. Br ma Kargbo - Current National AIDS Control Programme Manger; he is the outgoing OCP Manager.

- Dr. Abdulai Jalloh – OCP Manager, Sierra Leone.

Annex 4: REFERENCES

1. Health-care waste Management Study for Sierra Leone, November 2001

2. Environmental Assessment (OP 4.01 October 1998).

3. Involuntary Resettlement (OD 4.30, June 1990)

4. Indigenous Peoples (OD 4.20, September 1991)

6. National Environmental Policy

7. National Environmental Protection Act. 2000

8. Sierra Public Health Ordinance

9. Draft National Environmental Health Policy

10. Sierra Leone Health Sector Rehabilitation and Development Project, Project Appraisal Document, November 2001.

11. Sierra Leone Integrated Health Sector Investment Project (IHSIP), Supervision Mission (April 15 – 27, 2002); AIDE-MEMOIRE

12. Safe management of wastes from health-care activities, WHO 1999

13. George Tchobanoglus, Hilary Theisen & Samuel Vigila. *Integrated Solid Waste Management*

Annex 5: The SELF-LEARNING PROCESS

The training of medical staff will heavily rely on a self-learning process. The advantages of self-learning are several: It diminishes the absence of staff from their sites. It gives the student time to reread and to ponder over difficult issues. It might stimulate a discussion between members of a Health center team. It might be a cheaper solution than calling health staff to a central training venue, which includes per diems and overnight costs (but this should not be a decisive factor).

Practically it will take this form:
A group of up to 20 health staff, preferably of mixed level will be brought together for 1 or 2 days and will be taught general principles of the subject. A pre-test is essential to assess the level of knowledge and possibly to probe the attitude. The result of the test should be used to address the identified weaknesses.

The participants then will be sent back to their working place with the task to study the module(s). It should be emphasized that the materials must not be studied alone but mutual assistance is recommended; making use of the existing experiences and knowledge in the team. An underlying assignment is to strengthen the teamwork. During the process, if at all possible, the Trainer/Supervisor will visit the sites to resolve existing difficulties.

After about 4 weeks the same groups will be recalled and the learning process will be discussed and evaluated. This should take 2-3 days, depending of the level of achievement. The theory should be reviewed extensively to assess the students' accomplishments. Some practical exercises can be added as well as some case studies for which the participants can propose answers after working in groups on possible solutions. This process can be repeated; if necessary a limited number of modules can be treated in one cycle.

At the end of the training the students have to sit for an exam and –if possible– pass a practical exercise like a role-play. The agent then receives a certificate and will be entitled to be responsible for the safe management of healthcare wastes. Above average students can be integrated in the trainer/supervisory team.

Limitations of the approach
It will be obvious that not everything can be taught by this approach. It has to be supplemented by other ways of learning; interpersonal communication, attitudes, practical procedures etc. must be learned in a different setting. Anyhow, a continuous training needs assessment using; a variety of different methods to reinforce the knowledge and skills of the health staff and positively change their attitude can be employed.

It might be difficult to motivate the health workers to study at home. The classical seminar type of training has been a source of additional income. To stimulate interest for this form of learning a process of certification should be introduced. This can go together with another form of motivation, again within the context of continuing training, e.g. an

attractive medical book, a specific medical instrument, a rewindable radio to listen to educational broadcasts etc.

Another important issue that has to be addressed is that each training session needs in addition to written material for the participants, also a guide for the trainers. Adult education needs a different approach than formal education. There seems to be sufficient expertise and experience in Sierra Leone to elaborate these trainer modules.

Recommendations

- Develop and introduce the self-learning method
- Develop additional innovative approaches to inform health staff
- Every training module should come together with instructions for the trainer.

Plan of implementation

1. Select cooperating NGOs and CBOs
2. Elaborate the theoretical model of self-learning
3. Define instructions for the self-learning method

Annex 6: CRITERIA FOR SECLECTING, DEVELOPING AND OPERATING SANITARY LANDFILL SITES.

A sanitary landfill is a contained and engineered structure, which leads to anaerobic biodegradation and consolidation of compacted waste materials within confining layers of compacted soil. In a sense, a sanitary landfill is a bioreactor. At a sanitary landfill, there are no nuisance impacts of constant burning, smoke, flies, and unsightly rubbish heaps. However, because the waste is not exposed to rainfall, surface runoff or groundwater, leachate consists largely of the waters generated during biodegradation. Therefore, leachate generated from a sanitary landfill is typically much more concentrated in organics and metals than the leachate generated from an open dump, often by a factor of more than 10, and thus needs to be properly treated. Similarly, because of the anaerobic nature of decomposition, methane is generated and needs to be properly ventilated.

Sanitary landfills located in arid areas with limited potential infiltration may have more relaxed design requirements than those located in wet areas. Similarly, sanitary landfills located on coastal lands underlain by naturally undrinkable groundwater may have more relaxed design requirements than those in inland areas overlying potential usable groundwater regimes.

In summary, as described below, a sanitary landfill design would need to have structural integrity over the long term, provide for daily cover of fresh waste, and incorporate mitigating measures to manage leachate and gas produced within the landfill cells.

A Sanitary landfill is a step-by-step construction activity involving daily layering, compacting, and soil covering of waste into cells. The site should not be subject to seasonally high groundwater levels or to periodic flooding. The site preparation and landfill operations must be designed to minimize contact of surface runoff and percolating rainwater with the waste. This requires diversion of up gradient surface drainage away from the landfill operational area, sloping of the cells to avoid ponding of waters on top of them, and compaction of waste and soil as each cell is being constructed so that infiltration potential is minimized.

At sites where potentially usable groundwater exists in unconfined layers, any rain and surface runoff waters which percolate through the waste and become contaminated leachate need to be collected. The leachate collection system consists of a network of perforated pipe within a gravel bed, which is placed over the landfill liner. At a minimum the liner would consist of a layer of impermeable clay soil placed in thin layers at optimum moisture content and compacted with a roller. At large landfills receiving municipal waste for major metropolitan areas or at co-disposal landfills where hazardous waste quantities could be received in significant quantities, additional liners made from impermeable geomembrane material may be necessary to protect sensitive groundwater resources. The landfill liner and the leachate collection network need to be properly sloped to enable gravity flow of contaminated water to treatment ponds.

The ponds would be designed to encourage anaerobic decomposition, followed by aerobic decomposition. To the extent possible, full evaporation in the final pond is desired so that no discharge of treated effluent is necessary. If full evaporation is not possible, recycling of treated effluent back to the landfill (on the completed areas of fill), discharge to a sewage treatment plant, or tanker haul to a sewage treatment plant is recommended. Discharge to surface water is not acceptable unless the treated effluent can be assured of not having a significant adverse impact on the water quality requirements of the receiving water.

In addition to leachate management, landfill gas management is a critical component of every sanitary landfill design. Minimum requirements are that the landfill gases would need to be properly ventilated. During site preparation, the landfill side slopes are lined with impermeable clay to curtail lateral migration of the gases, and then lined with coarse rock or gravel to allow gases to escape to the atmosphere. Within every 0.1 hectare, or less, of the waste cell development area, landfilling would be conducted around a gas ventilation structure consisting of either a perforated pipe packed in gravel or a rock-filled wire mesh enclosure.

Construction of a sanitary landfill occurs in regular phases, over the life of the site. At the start of construction, the access road, entrance gate, weighbridge, fencing, water supply and Phase I waste cell areas are constructed. Leachate treatment facilities to handle flows generated at the peak period over the life of the site are constructed from the onset. Once the capacity of the Phase I waste cell area is nearly utilized, the Phase II waste cell area requires site preparation and construction (i.e., the Phase II liners, leachate collection networks, gas ventilation systems etc). And so on, over the life of the site, until each Phase of the landfill is completed. Each Phase typically has 3 to 5 years of waste capacity.

Each sanitary landfill is uniquely designed to conform to the soil, geologic, topographic, and water resource conditions of the site. To minimize the costs of operating a sanitary landfill, the first and most critical step is proper siting in a location, which enables economic operations and cost-effective environmental protection. Also, proper siting is essential to minimizing the cost of waste collection.

The following site selection criteria are provided as guidance. A proposed landfill site can be selected even though it does not meet each of the screening criteria. Engineering design can mitigate inadequate site conditions; but at a cost. When selecting a site, which does not meet all of the screening criteria, possible engineering solutions, which would bring the site into conformance with the intent of the unmet criteria, shall be incorporated in the design. Criteria, which shall be addressed as part of a screening process, neither includes, but is not limited to, the following:.

- Adequate land area and volume to provide sanitary landfill capacity to meet projected needs for at least 10 years.
- A site accessible within 30 minutes travel time (a function of road and traffic conditions) is to be sought, even if it means buying land, because of the need to avoid adversely affecting the productivity of collection vehicles. At distances greater than 30 minutes travel, for collection operations to be economic, investment in either large capacity collection vehicles (5 tons. per load or greater) or transfer stations with large capacity vehicles (20 tons. or greater) would be necessary.
- If transfer stations are necessary, landfill sites should be accessible within 2 hours travel time one-way from the transfer station.
- Groundwater's seasonally high table level (i.e., 10 year high) is at least 1.5 meters below the proposed base of any excavation or site preparation to enable landfill cell development
- Soils above the groundwater's seasonable high table level are relatively impermeable (preferably, less than 10^{-9} meters/second permeability when undisturbed).
- No environmentally significant wetlands of important biodiversity or reproductive value are present within the potential area of the landfill cell development, unless they have adequate capacity to absorb/assimilate the pollution loadings anticipated.

- None of the areas within the landfill boundaries are part of the 10-year groundwater recharge area for existing or pending water supply development.
- No private or public drinking, irrigation, or livestock water supply wells within 500 meters down gradient of the landfill boundaries, unless alternative water supply sources are readily and economically available and the owner(s) gives written consent to the risk of well abandonment.
- No known environmentally rare or endangered species breeding areas or protected living areas are present within the site boundaries.
- No significant protected forests are within 0.5km of the landfill cell development area.
- No major lines of electrical transmission or other infrastructure (i.e., gas, sewer, water mains) are crossing the landfill cell development area, unless the landfill operation would clearly cause no concern or rerouting is economically feasible.
- No underlying limestone, carbonate or other porous rock formations which would be incompetent as barriers to leachate and gas migration, where the formations are more than 1.5 meter in thickness and present as the uppermost geologic unit.
- No underlying underground mines which could be adversely affected by surface activities of landfilling, or mines resources, which could be rendered less accessible by landfilling, unless the owner(s) gives explicit consent.
- No residential development within 0.25km from the perimeter of the proposed landfill cell development.
- No visibility of the proposed landfill cell development area from residential neighbourhoods within 1km. If residents live within 1km of the site, landscaping and protective berms would need to be incorporated into the design to minimize visibility of operations.
- No perennial stream within 0.03km down gradient of the proposed landfill cell development, unless culverting or channelling is economically and environmentally feasible to protect the stream from potential contamination.
- No significant seismic risk within the region of the landfill, which could cause destruction of berms, drains or other civil works, or require unnecessarily costly engineering measures.
- No fault lines or significantly fractured geologic structure within 0.5 km of the perimeter of the proposed landfill cell development, which would allow unpredictable movement of gas or leachate.
- Topography amenable to development of sanitary landfill by the Cell (Bund) and/or Trench method. The Area method is not preferred because of its higher energy and soil cover requirements.
- Availability on-site of suitable soil covers materials to meet the needs for intermediate (minimum of 30cm depth) and final cover (minimum of 60cm depth), as well as bund construction (for the Cell method of landfill). Preferably, the site would also have adequate soil to also meet daily cover needs. However, daily cover (usually a minimum of 15cm depth of soil) needs can be alternatively met by using removable tarps or by removing the previously laid daily soil cover at the start of each day for reuse at the end of the same day. For purposes of this siting, assume that at least 1 cubic meter of daily, intermediate, and final soil cover is needed for every 10 cubic meters of compacted waste.
- No Siting within 3 km of a turbojet airport and 1.6 km of a piston-type airport. For sites located more than 3 km and less than 8 km from nearest turbojet airport (or more than 1.6 km and less than 8 km from the nearest piston-type airport), no consideration is to be given unless the aviation authority has provided written permission stating that it considers the location as not threatening to air safety.

- No sitting within a floodplain subject to 10-year floods and, if within areas subject to a 100-year flood, must be amenable to an economic design, which would eliminate the potential for washout.
- Avoid sitting within 1km of socio-politically sensitive sites where public acceptance might by unlikely (i.e., memorial sites, churches, schools).
- Area accessible by a competent paved public road, which can accommodate the additional truck traffic without significant effect on traffic flow rates. From the public road into the site, the access road to be constructed should be less than 10km for large landfills serving metropolitan areas and less than 1km for small landfills serving secondary cities.

Annex 7: GENERAL GUIDELINES FOR THE MANAGEMENT OF HEALTHCARE WASTES.

1. Definitions and Classification of Health-care Wastes

Health-care waste includes all waste generated by health-care establishments, research facilities, and laboratories. In addition, it includes the waste originating from "minor" or "scattered" sources – such as that produced in the course of health care undertaken in the home (dialysis, insulin injections, etc.). These residues can be more or less hazardous depending on their origin within the hospital.

According to WHO, from the total of wastes generated by health-care facilities, almost 80% are general waste comparable to domestic waste. It comes mostly from the administrative and housekeeping functions of health-care establishments and may also include waste generated during maintenance of health-care premises. The remaining approximately 20% of wastes are regarded as hazardous materials that may be infectious, toxic or radioactive and may create a variety of health risks. This study is concerned almost exclusively with the hazardous health-care wastes.

The correct treatment of health-care waste must be based upon consideration of various aspects, including the health and safety of all persons within the hospital (staff, patients and visitors), and the protection of the population outside the hospital from contagious diseases. The specific physical and or chemical properties of the waste with regard to its potential to harm the environment must also be considered.
Consequently, health-care wastes may be classified into groups based on the management techniques which experience has shown are appropriate in each case. Thus, depending on the **kind of treatment** they require, healthcare waste in Sierra Leone can be classified as follows:

Type A: Normal Waste
Waste similar to domestic waste and not requiring any special treatment. This is the waste produced by the hospital administration, the cleaning service, the kitchens, stores and workshops.

Type B: Patients' Waste
Waste that requires special handling within the hospital. The aim of such handling is to prevent dispersal of pathogens within the hospital, since these are potentially able to infect persons whose resistance has already been diminished due to illness, advanced age, stress, trauma, lesions, etc. This risk is being aggravated by the concentration of germs in certain areas. Outside the hospital, these wastes can be handled similarly to those of Type A. This waste type generally derives from normal inpatient wards: outpatient examinations room, and first aid areas.

Type C: Infectious Waste
Waste that requires special handling inside and outside the hospital. This group comprises all waste from isolation wards in which patients with highly infectious diseases are accommodated and infectious residues from clinical laboratories for microbiological investigations.

This category of waste also includes all disposable waste from all hospital areas that constitute a real risk of infection when being disposed of, such as needles and sharp objects and objects that are covered with blood or human secretion.

Type D: Human Parts
This waste type requires special treatment, not so much to prevent infections, but rather for ethical reasons. This group comprises parts of human bodies generated in operating theatres, delivery rooms, morgues, autopsies, etc.
Examples are organic tissue, placentas and amputated limbs.

Type E: Other Hazardous Waste
This group covers waste types that, for legal reasons or because of their physical or chemical properties necessitate special handling.
Hospitals provide a service and hence have technical infrastructures that can also generate hazardous wastes similar to industrial wastes.
This type also includes radioactive material that may also be handles by authorised personnel, and other wastes classified by legal regulations as hazardous.

Type F: Recyclable Material
Non-contaminated materials from the administration, stores, workshops and so on, should be recycled or reused for reasons of environmental protection.

Type G: Sludge from the Hospital Wastewater Treatment Plant
This sludge can be heavily contaminated and requires additional treatment before being disposed off.

The present study is primarily concerned with the infectious and pathological wastes, Type C and Type D.

2. Segregation and Collection
Every site within the HCF at which waste is generated must be equipped with a sufficient number of waste containers, and emphasis should be placed on the need to segregate "risk waste" from other waste, and to use appropriate packaging and marking.

HCF wastes Types B and C should always be collected in disposable receptacles that meet the following requirements.

- Leak-resistant
- Impervious to moisture
- Of sufficient strength to prevent tearing or bursting under normal conditions of use and handling
- Non-transparent
- Seal-able to prevent transmission of micro-organisms

Polythene bags with a minimum thickness of 100 microns and a size of approx. 60cm x 100cm fulfil these conditions if sharp and pointed objects (syringes, scalpel blades, etc.) are previously placed in cut- and puncture-resistant containers, such as disposable plastic bottles or cardboard boxes.

The filled bags are closed off using a plastic strip, which, once fastened in place, cannot be reopened. It is then removed from the bag holder and placed at the transfer area for its removal by the collection service/waste handler in cases of on-site disposal.

Neither re-use of the disposable receptacles nor compression of the waste is permissible.

For Type D waste, the receptacles should be placed directly in the area where the waste is generated. They must then be sealed and deposited in the corresponding transfer area.

The transfer or storage areas should be set apart from other facilities, be sufficiently well ventilated, and have sanitary facilities for personnel to wash and disinfect their hands.

3. Transports and Storage within the Hospital

The waste should be removed each day from the transfer areas and taken to a storage place. This must be done with care in order to prevent the rupturing or opening of the bags, resulting in release of harmful pathogens into the environment.

Waste of Types A and B, once from within the HCF, can be treated as domestic wastes.

Waste of Types C and D must be transported to a special storage room. This depot must be situated so as not to affect other facilities of the hospital, such as kitchen, laundry, wards, etc. in anyway. It must take the form of an enclosed space to which only authorized personnel have access.

The waste stored in the depot must be picked up daily, and the depot area must be washed out afterwards each time. The carts used for internal transport of the waste must also be regularly cleaned and disinfected.

4. Transports Outside the Hospital

Waste belonging to the Types A and B can be transported by the same service that collects municipal household waste or the waste handler in the case of on-site disposal.

If waste Type C is not treated and disinfected in the hospital area, this waste must be transported by special collection tours. The vehicles used for this transportation can be of varying standards, according to the destination of the waste.

(a) Transport to a central treatment plant:

It is recommended to transport the infectious waste to the central treatment plants in specially designed vehicles which do not compress the waste and which have equipment that prevents the bags from sliding around during transport. The interior of the vehicle must be easy to clean and the floors have raise edges to retain any liquids that may escape from the bags, and it must be adequately ventilated.

(b) Transport to a sanitary landfill site:

In the case that the infectious waste is not to be transported to a central treatment plant but directly to the sanitary landfill site for burying in restricted areas, transport can be carried out in a different way. In the special case where the bags with the waste no

longer have to be manipulated by personnel but can be dumped directly onto the prepared excavations, transportation can be done by normal waste collection trucks.

HCF wastes Type D (human body parts and deceased foetuses) should be sealed in plastic containers or plastic bags, which can be transported in the special vehicles, designed for transport of wastes Type C or in any other pick-up or delivery van that is suitable.

5. Medical waste treatment methods

Studies carried out recently have shown that common patients' waste, with the exception of that from patients with infectious-contagious diseases, is no more contaminated with micro-organisms than domestic waste, which means that its transport and final disposal does not pose a major risk to the health of the general community outside the hospital.

Accordingly, in the case of the waste included in Types A and B, there is no sanitation-related reason for not transporting and disposing of them together with other urban waste, once they have been removed from the HCF premises.

In contrast, the waste types included in groups C and D, namely infectious and human part, definitely require special management and handling from their production all the way to their final; disposal, including treatment which ensures elimination of their harmful properties in order to minimize the risk of contamination and infection.

The terms "sterilization", "disinfection" and "decontamination" are used in discussions of medical waste. They need to be precisely defined in any regulation:

> Sterilization denotes the killing of all living organism in a material. If it is done thermally, it needs temperatures over 134 ^{o}C and is, in the opinion of experts, too restrictive for the treatment of all hospital waste materials.

By including in the term "treatment" as the adequate ways of disposal of HCF waste, the following methods of treatment can be distinguished:

- **Special Incineration**

Incineration of both the infectious and the organic types of HCF waste is a recognized and proven method of eliminating their hazardous properties. This method of treatment also has the advantages of great reduction of the waste volume and the gaining of calorific energy, which can be used for heating and steam production. Various different technologies and patents for combustion are available on the market today, most of which are adequate.

- **Sterilisation by Heat**

This type of waste treatment is generally performed in autoclaves by steam treatment at high temperatures. It is recommended for microbiological cultures from clinical or research laboratories, which should not leave the investigation area.

It is not adequate for the large total volume of HCF waste that needs treatment.

- **Disinfecting by Steam**

Another type of thermal; treatment used for pathological waste is the application of heat at about 100^{0}C, thus transforming infectious wastes into harmless residues. The waste is collected in bags consisting of several layers of paper, with the inside reinforced by a

layer of plastic. These bags are placed in a hermetically sealed chamber into which steam is pressed in order to inactivate the pathogens. To ensure that the steam penetrates all parts of the charged waste, the air in the chamber is first evacuated to create a vacuum prior to admitting the pressurized stream. This process is repeated several times following a set pattern lasting approximately 25 minutes.

Once this treatment has been completed, the waste can be handled as household waste and disposed of in sanitary landfills.

- **Microwave Disinfecting**

Another method used to disinfect clinical waste in stationary or mobile plants is heating it by microwave energy.

The waste material to be treated by microwaves must first be broken down and shredded to a certain size. As the microwave-process only works in the presence of water, and as clinical wastes are generally rather dry, the shredded waste mixture must be moistened beforehand by adding water and stream.

In a pipe-shaped screw conveyor, the shredded and dampened material is continuously transported under microwave generators to be heated by irradiation. The waste temperature to guarantee the temperature time schedule of decontamination regulates the screw conveyor speed.

- **Chemical Disinfecting**

There are many techniques for disinfection by chemical means, but none of them has been proven to be effective for treatment of hospital waste.

Equipment is available for shredding or granulating and then disinfecting waste by means of disinfectant liquid; however, its use is generally quite problematic, and there is no guarantee that the disinfectant liquid used will penetrate to all parts of the batch of waste undergoing treatment.

In addition, chemical liquids impose an additional burden on the environment, as chemical disinfectants themselves are inherently hazardous chemicals. Therefore, the use of chemical disinfectants may actually increase personal and environmental risks associated with the management of HCF wastes.

- **Controlled Disposal in Sanitary Landfills**

Human pathogens live and grow best in an environment that most closely resembles the conditions prevailing in the human body. Conditions in the exterior environment are, for the most part, not conducive to the survival and growth of human pathogens. Studies have demonstrated the rapid death of selected human pathogens after burial in a sanitary landfill, and indicate that land filling can be a satisfactory mechanism for the treatment and disposal of health-care wastes.

For these reasons, infectious Health-care waste of Type C can be buried in sanitary landfills if certain precautions are taken.

- **Burial in Cemetery or Incineration in Crematorium**

Health-care wastes Type D, human body parts and placentas, can be buried in certain areas of cemeteries or be incinerated in crematoria.

- **Chemical-Physical Treatment**

  As far as the wastes included in Type E are concerned, discussion of details is dispensed with here, since these wastes are not restricted to Health-care facilities and their management should be generally regulated by legislation covering industrial hazardous wastes.

Radioactive waste produced in health-care establishments is of very low-level radioactivity and has a short-life. Residues should be stored safely until their radioactivity has decayed to the point that they are no longer considered radioactive, and then be disposed of according to their other characteristics (e.g. chemical, infectious or general) and in conformity with national regulations

6. Instructions and Training of Personnel

The technological advance which have been made in health-care call for control of microbiological contamination and hospital infections to be interdisciplinary; in other words, involving not only the physicians, as in the past, but instead spanning an entire groups of professionals with different specialised tasks. Only in this way is it possible, for example, to prevent infections stemming from poor handling of waste. This aspect ought to be of great concern to all persons working in the field of medicine since it imposes additional problems on the basic task of treating patients in order to restoring their health.

Every health-care facility should implement and supervise training and maintenance programmes for the health-care, maintenance and technical personnel. Doctors, paramedics and administrative health-care personnel must, for example, know how to separate infectious and other hazardous waste from non-hazardous refuse and how to handle it.

Training of solid waste personnel should also be directed at the municipal collection and disposal services. Solid waste personnel on collection trucks or at disposal sites must be able to differentiate wastes by colour or other codes in order to handle each type properly. Programmes should include the following themes:

- Categories of health-care waste and rapid assessment
- Segregation, storage and collection methods and equipment
- Treatment and disposal methods.

The general public needs to be informed about the risk associated with exposure to infectious health-care wastes. This can be achieved by advocacy, seminars with groups, workshops, print media (flyers, posters, newspapers, etc), radio and television discussions and jingles.

7. MONITORING AND CONTROL

Together with an appropriate legislation regulating waste management inside and outside the health-care institutions and the installation of the appropriate infrastructure, an effective control system of the health-care waste management must be established.

The control of the safe management of waste from health-cares facilities should be organized on two levels.

Level 1
Responsible self-control of the executing institutions by a qualified member of their own staff, both for the internal sanitary handling, as well as of the municipal services for the management outside the hospital, the collection, transportation, treatment and disposal.

Level 2
Public Health Inspectors of the Ministry of Health and Sanitation should be charged with official control, with the power of caution and sanction over all health-care facilities.

8. Waste receptacles and collection

According to the investigations made at the hospitals, one of the main problems of hygienic waste handling is the lack of appropriate receptacles. In nearly all cases, infectious waste together with syringes and needles, etc. are openly collected and transported in open buckets, intended for the cleaning service but not for infectious hospital waste handling.

Therefore, thorough attention has to be given to providing the hospitals with adequate equipment for the collection of the waste.
In Annex B of this study, the general requirements for receptacles are described. According to this, the following system will be recommended for the hospitals in Sierra Leone.

- Waste type A and B can be handled as is done now, drums and plastic buckets with tight-fitting covers respectively.
- The collection and transport of Waste Types C and D must be improved substantially.

In areas where waste of Type C is generated, metallic circular bag-holder with lid shall be employed. In these bag holders, polythene bags will be provided. For better identification the bags will be coloured, and sharp and pointed objects such as syringes blades or glass must be collected in puncture-resistant containers (sharp boxes) before being disposed of in the bags.

The filled bags are closed off using plastic strips, which, once fastened in place, should not be reopened. Then, they are removed from the bag holder and placed at the transfer area for their removal by the collection service direct to the on-site disposal site. Neither re-use of the disposable receptacles nor compression of the waste is permissible.

The most appropriate receptacles for waste Type D (human body parts) are conical shaped plastic buckets with a hermetically sealing plastic lid and a handle for easy handling. If, for economic reasons, it is not possible to acquire this type of receptacle, plastic bags can be used as for the waste Type C. They must have a different colour so that the collection service can distinguish them.

A general upgrading of the hospital's internal collection equipment (bins, carts, storage areas and protection equipment, etc.) is recommended.

9. Transports and Storage in the Hospital

The waste has to be removed each day from the transfer areas and taken to a storage place. Rubber-wheeled carts with a bin made of plastic or non-rusting metal should be used for this

should have a smooth surface for easy cleaning and disinfecting. Moreover, the dimensions must be appropriate for easy manoeuvrability along the route to be followed inside the hospital.

The storage of the different types of waste has to be done in the corresponding places according to the following requirements.

- Solid waste types A and B should be deposited in the containers used for domestic refuse.
- Waste Type C should be deposited in a special storage room to which only authorized personnel have access.
- Waste Type D should be immediately transported to a cemetery and buried as existing cultural practices demands.
- Waste Type E must be stored according to the regulations for industrial hazardous waste.
- Radioactive wastes must be stored in a radiation-safe place until their radioactivity has decreased to the point where they are no longer considered radioactive, and then disposed of according to the instructions given by authorized officials.

In none of the visited hospitals was there an appropriate room for the storage of the waste Type C. Therefore, in most of the hospitals remodelling will be necessary.

10. Treatment of Waste

The management of the hospital wastes outside the hospital depends on the kind of treatment they have to undergo:

- Waste Types A and B, normal waste and patient's waste can be transported and disposed of together with other urban waste, once they have been removed from the hospital premises.

- Wastes Types C and D, infectious waste and human body parts, require special transport and treatment, which will be described further.

- Waste Type E, other hazardous waste, must be disposed of according to the regulations for industrial hazardous waste.

Treatment of hospital waste means any method, technique or process designed to change the biological character or composition if any regulated medical waste so as to reduce or eliminate its potential for causing disease. Regarding the adequate sanitary disposal of health-care waste as a treatment method, and by considering the specific needs and possibilities for Sierra Leone, only two technical alternatives can be taken into consideration for waste Type C:

1. Special incineration
2. Controlled disposal in sanitary landfills

Controlled disposals in sanitary landfills have the following reported advantages

- It is a recognised and proven method of deposal of this waste category
- The technology is applicable to all infectious wastes and does not require pre-processing of the waste.
- The control is easy and evident
- It is the most economic method.

However, current practices (open dumping) at the existing dumpsites (Freetown, Bo, and Kenema) militate against this option for the time being. Consequently, and taking into consideration the dangers associated with health-care waste and in particular HIV, HBV, and HCV transmissions, the current practice of incineration without flue-gas cleaning should be improved and promoted until the dumpsite are upgraded to sanitary landfills.

As outlined earlier, infectious hospital waste Type C can be buried at sanitary landfills, provided the following precautions are taken:

- The hospital waste must be transported to an already filled-up area of the sanitary landfill. This landfill, or at least the selected area, should be fenced in so that it will have restricted access.
- The hospital waste has to be dumped directly from the truck into the pit without any handling by labourers.
- The same excavation material from the pit must cover it immediately, preferably.
- The areas where infectious wastes have been buried must be marked and documented to avoid re-opening by further disposal of hospital wastes.

Instruction and training of solid waste personnel, as described in this report, must also be extended to the personnel working on the sanitary landfill.

11. LEGAL REQUIREMENTS

Legislation
There is a lack of legislative framework, by-laws and guidelines for the management of hospital wastes in Sierra Leone. The objective should be to set up a legal structure that will be maintained and updated by a Ministry of Health and Sanitation legislation unit. By-laws or regulations on the following themes should be laid won.

- Precise definition of all terms to describe the management of hospital waste
- Classification of hospital wastes
- Internal management of solid waste in health care institutions
- External management of solid waste from health care institutions
- Guidelines for the section of hospital solid waste-handling equipment and materials
- Determination of responsibilities
- Fines and penalties for non-compliance.

Control Institutions
Legislation alone is a useless instrument without an official organ to monitor compliance and the power to enforce it by punishing non-compliance

Therefore, an effective control system of the hospital waste management must be established. As described before, it can be organised on two levels.

1. Responsible self-control by a qualified member of their own staff for the executing institutions, the hospitals for sanitary hospital-internal handling, and the Environmental

Health Division for the management outside the hospital. This should cover collection transportation, treatment and disposal.

2. Official control by health inspectors of the ministry who should exercise control over governmental, private and mission operated health care institutions and has the legal power to caution and/or punish.

Annex 8: The De Montfort Family of Medical Waste Incinerators

All the incinerators (displayed on the following page) are variations on the same basic design. The **Mark 1** incinerator is now used in many parts of the world. It burns up to 12kg/h of waste. The **Mark 2** is the Mark 1 with a larger secondary combustion chamber to increase the retention time and improve the flue gas emission quality.

The **Mark 3** is designed for hospitals up to 1000 beds, and burns at about 4 times the rate of Marks 1 & 2. (50-kg/h approx.)

The **Mark 4** is a version of the Mark 1 specifically designed for use in emergency situations where low cost and a minimum of expensive materials and techniques are priorities. It contains only two metal components, and uses firebricks only where these are absolutely necessary. It will nevertheless attain very similar combustion temperatures as the others but the expected life is less than 1 year.

The **Mark 5** incinerator is thermodynamically the same as the Mark 3, but modified to carry the weight of a much higher chimney for use where a high chimney is a legal requirement or where the proximity of other buildings makes a high chimney necessary to disperse smoke and fumes.

Incinerator **Mark 7** is the flat pack version for use in disaster or emergency situations and in settings where necessary materials or skills are not available in the country or area.

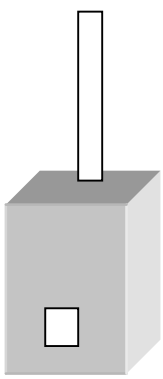
The Mark 8 has the same throughput as the Mark 1, is as Mark 4 in terms of construction but is designed for an extended life. The Mark 8 can also be built in those countries where firebricks are not of uniform dimensions and cannot therefore be bound together.

For information and construction plans please contact Professor D.J Pickens:

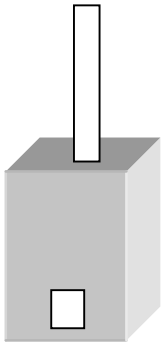
The Innovative Technology Centre
26 Oaks Road
Great Glen
Leicester
LE8 9EG

E: djp@picken98.freeserve.co.uk or djpicken@iee.org.uk

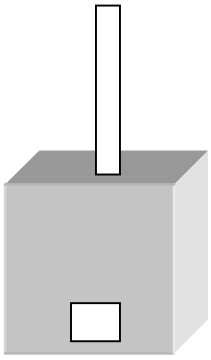
The De Montfort Family of Medical Waste Incinerators



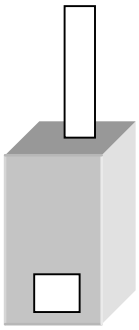
Mark 1
(12kg/h)



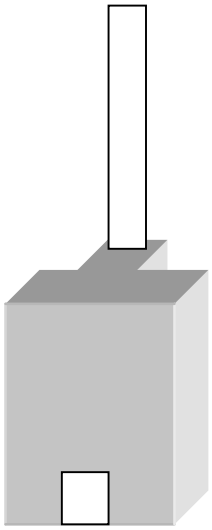
Mark 2
(12kg/h)
With
Emission
Reduction
System



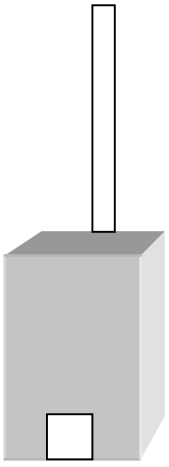
Mark 3
(50kg/h)
With Emission
Reduction
System



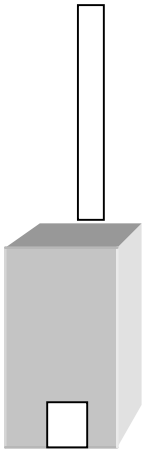
Mark 4
(12 kg/h, 1-year
life, minimum cost)



Mark 5
As Mark 3 but modified
for tall chimney



Mark 7
(12 kg/h) Built from
Pre-fabricated
Components for rapid
assembly



Mark 8
As Mark 4 but for
extended life

Annex 9: HEALTHCARE WASTE MANAGEMENT TRAINING PLAN

Rationale for training in health-care waste management

The medical waste study (November, 2001) established a lack of awareness about risks associated with unhygienic management of healthcare waste in Sierra Leone. Hence, the needs for a national training plan.

Healthcare waste is special in that it has a higher potential of infection and injury than any other type of waste. Therefore, it has to be handled with sound and safe methods wherever generated. Inadequate handling of health-care waste may have serious public health consequences and impact on the environment. Healthcare waste management is, therefore, an important and necessary component of environmental health protection.

Hospitals and healthcare establishments have responsibilities and a "duty of care" for the environment and public health, particularly in relation to the waste they produce. They also carry a responsibility to ensure that there are no adverse health and environmental consequences as a result of waste handling, treatment and disposal activities. Unfortunately, health-care waste management is, in many regions, not yet carried out with a satisfactory degree of safety.

The proposed training programme aims at transmitting the basic skills for the development and implementation of a healthcare waste management policy, including the components outlined in this programme. In this way, healthcare facilities can take steps towards securing a healthy and safe environment for their employees and communities.

The objectives of the training on HCW

6. To raise awareness on public health and environment hazards that may be associated with inappropriate segregation, storage, collection, transport, handling, treatment and disposal of health-care waste;

7. To provide information on hazards and sound management practices of health-care waste for the formulation of policies and the development or improvement of legislation and technical guidelines;

8. To identify waste management practices and technologies that are safe, efficient, sustainable, economic and culturally acceptable; to enable the participants to identify the systems suitable for their particular circumstances;

9. To enable managers of health-care establishments to develop their waste Management plans;

10. To enable course participants to develop training programmes for the different categories of staff that handle, treat or dispose of health-care waste.

At the end of the course the participants should be able to demonstrate individually that they have achieved the course objectives and competence in health-care waste management.

Target groups for the course on HCW

The course is targeted at managers, regulators and policy makers, which are involved in health-Care waste management. The main professional categories are the following:

9. Officials from national or regional authorities involved with developing policies
10. In health-care waste management;
11. Environmental or health and safety regulators;
12. Environmental health professionals;
13. Hospital managers and other administrators of health-care establishments;
14. Representatives of local authorities;
15. Waste collection, treatment and disposal managers;
16. Manufacturers of medical devices, chemicals and pharmaceutical

APPENDIX VII – STATUS ON THE IMPLEMENTATION OF EMP 2001

Activity	Objective	Funding Source	Responsible Organisation	Time Frame	Supervising Agency	Status
Covering up of open pits	To ensure that water born and related diseases are minimised	HSRDP/MOHS	MOHS/Local authorities/ Community groups, Govt. Agencies.	Construction Phase	Department of Environment	On going
Environmental Education	To ensure community sensitisation and long term environmental management	HSRDP/MOHS	Environmental Officers and DHMTs	Project Duration	Department of Environment	On going
Conduct Capacity Building Workshops	To train Environmental Health Officers on Environmental protection issues.	HSRDP/MOHS	-Do-	-Do-	Department of Environment	On going
Tree Planting	To restore the aesthetic value of the environment	HSRDP/MOHS	The Communities	-Do-	Department of Environment	On going
Develop 4 district sanitary landfill sites	To ensure safe disposal of wastes	HSRDP/MOHS	Environmental Officers and DHMTs	2003	Department of Environment	On going
Community Participation	To ensure waste are transported to the 4 district landfill sites	Respective District Communities	Respective District Communities	Project Duration	Environmental Health Division	On going
Construct 4 Incinerators and lined ash pits	To ensure safe disposal of the infectious medical wastes	HSRDP/MOHS	Environmental Officers and DHMTs	2003	Department of Environment	On going
Technical Assistance to advice on landfills and environmental issues	To ensure proper siting, development and operation of landfill sites	HSRDP/MOHS	Environmental Officers and DHMTs	2003	Department of Environment	Done
Train EHO on operation and maintenance of incinerators in 4 districts	To ensure efficient operation and maintenance of incinerators	HSRDP/MOHS	Environmental Officers and DHMTs	2003	Department of Environment	Ongoing
Empty septic tanks and lined ash pits	To avoid overflowing of sewage and ashes	HSRDP/MOHS	Environmental Officers and DHMTs	Project duration	Department of Environment	Ongoing
Monitoring and supervision	To assess status and supportive supervision	HSRDP/MOHS	Environmental Officers and DHMTs	Project duration	Department of Environment	Ongoing