Clinical Waste Disposal Methodology and its impact

Report No: PER/B/2018/04

National Audit Office

Environmental Audit Division

1. Executive Summary

Clinical Waste dispose of by daily functions of hospitals can be broadly categorized as Non-hazardous waste and Hazadous waste. Of this, separate identification of hazadous waste from other normal waste and they need to be disposed of systematically and safetly.

A National Policy for Sri Lanka on Clinical Waste Managament has been drafted in the year 2001 and it has not been approved even up to the year 2018. Furthermore, the existence of knowledge, necessity, sufficient resource for the implementation of hospital waste management efficiently and maintenance of an updated data system to evaluate that purpose is a foremost necessity. It is expected that as a result of the requirement of obtaining the environmental protection licence introduced by the Central Enviornmental Authority and the Schedule waste management licence, this process is monitored. As the methodology adopled for monitoring such process not at a satisfactorily level underlies on this audit.

Segregation of clinical waste in terms of colour at the time of being generated clinical waste itself is very important. Even though many hospitals have introduced methodologies to separate clinical waste at the time of being generated it was observed that the required physical resources in terms of relevant colour have not been supplied.

It was observed that unprotective action taken place such as burning clinical waste in the hospital premises combustion of waste by burners exist in the hospital premises with lesser temperatures, burial of waste in the hospital premises etc. It was also observed that the balance ash and sludge after being incinerated and metamized is buried not in an environmental friendly manner in the open premises, instead of directing them to a secured earth filling.

In order to regularize the Clinical Waste Management, an integrated project with the private sector has been started by the Government in the year 2014 but its operations was stopped since 30 October 2018 as a result of a court order.

It was observed that the Clinical Waste Management Project implemented under the Australian aids had not been operated with a maximum productivity in the hospitals subjected to audit examination.

Even though, it was aimed to improve infrastructure facilities relates to waste management under the second Health Sector Development Project with the World Bank aids in order to improve waste management functions, it was observed that the provisions thereof had not been utilized at a maximum extent and the hospital utilized those funds had not been effectively utilized them.

Accordingly, action needs to be taken to make aware of the relevant sectors in order to perform the Clinical Waste Management health fully and eco-friendly and to get the projects being executed therefor done effectively and efficiently. Furthermore, laws, rules, regulations and policies, applicable for the Clinical Waste Management need to be established in conformity with the Nationally and Internationally recognized coventions and to provide sufficient human and physical resources as required. Being followed up the performance levels of the projects executed for the Clinical Waste Management and maintaining the institutional performance thereon in a maximum level these issues can be satisfactorily faced. Due to informality of these functions Clinical Waste may distress the livelihood and create various environmental problems and therefor this has become a soluble problem in reaching sustainable development in a country.

2. Background and Nature of the Report

2.1 Background

2.1.1 Institutional Function

The clinical Waste Management of hospitals in Sri Lanka is a collective responsibility of the Ministry of Health, Central Enviornmental Authority Hospital Staff, Local Authorities and the Atomic Energy Authority, Clinical Waste Management is not successfully carried out in many hospitals and as a result, various health, sanitary and enviornmantal issues have arisen. This has become wosened as a result of diminution of environmental accountability, insufficient financial resources, dearth of technological facilities, lack of proper planning, insufficient supervision of responsible entities and non-paying of sufficient attention of the relevant authorities on hospital waste management.

As a remedy, a national policy and a national action plan for the management of clinical waste generates in hospitals had been prepared in the year 2001. Even though it has been presented as a draft but not approved even by the end of the year 2018, as a national policy.

According to the draft the objectives of the national policy include,

i. Assume the responsibility of proper waste management of the hospital by the hospital itself.
ii. Design plans for waste management.
iii. Use of financial and human resources require for waste management.
iv. Overall evaluation of the National Action Plan by the National Steering Committee.
v. Obtaining private sector participation for the awareness of civil society on equipment requires for Clinical Waste Management, disposal methodology and training.

2.1.2 Nature of Clinical Waste

The whole quantity of waste generates from places where health services are carried out including diagnosis and treatments is denoted as clinical waste. Careful management of waste is very important as it will be able to restraining from many problems which might severely effect on health, environment and economy by mixing up clinical waste with general waste flow. Clinical Waste can be broadly categroised under 7 types and they enhance various infections and clinical radiant, chemical and varied hazardous susbstance will make great impact on organism. Particulars appear in schedule No.01.

2.1.3 Managament of Clinical Waste

Letting infected clinical waste to mix with general waste flow and inappropriate disposal of waste creates massive problems, comprising sanitary environmental and economical, as per details below.

(a) In disposing infections clinical waste by adding general urban waste, the whole waste becomes hazardouns waste and there is a risk of spreading deceases amog the people having being spread germs and pathogenic. (e.g.Hepatities ‘B’ and ‘C’, HIV Aids, Skin deceases, Tubacalosis, Infuenza) Similarly, there is a risk that sanitary employees and the people are infected with hepatitis, HIV etc. through blood as a result of being wounded by bloody injection shells, blades and scalps.

(b) As injected impurities are not disposed of protectively and environment friendly it impairs environment badly. As prescribed temperature is not used in incineration clinical waste, steam emitted therefrom is not benevolent to environment and the remaining ash after combustion may contain hazardous sunstance. If they are not emitted protectively and environment friendly there is a risk of adding those hazards to soil and water nutrient.

(c) Increasing the cost to be incurred by the Government on health safety, increasing social and health problems influenced by persons on the impact of environmental pollution and the resultant increase of expanses may cause.

2.1.4 Hazardous substance disposal methods

A number of methodologies to treat hazardous waste can be recognized. Particulars appear below.

I. Chemical process – E.g.Treatment by using chemicals.

II. Thermal process – Treatment subjected to burn wate – e.g.incineration, gasification, autoclaving, microwave, metamizeration (use in both occations of mechanical and thermal)

III. Treatment by irradiation process. E.g.Ultra-violat

IV. Biological Process - Treatment by using organism exists in natural environment.

V. Treatment by mechanical process. This method does not disinfect pathogenic or toxic of waste and uses as a pre and additional treatment method. e.g.the process of fragmentization, grinding, mixing compression etc. This will reduce the volume of waste and waste can be converted into unrecognizable condition (Source: By Internet Access)

2.1.5 Infectious waste Treatment/ Disposal

Particulars appear below.

(a) According to the nature of infectious waste, the most suitable treatment method needs to be selected to remove hazards contain therein, and mostly use treatments based on heat. Treatment methods makes by heat can be classified as low head and high heat. Under the low heat method, sterilization made in the autoclave lives of all micro-organism are completely destroyed. In this method heated steam is supplied to waste with a pressure. Under this technology sharp waste, cultured/ stock blood, infected waste, goose, bandage infected cloths, small tissues can be treated.

However, it is impossible to treat pharmaceutical waste, large tissues and elements. It is not suitable to treat waste contains mercury, radio active waste, cytotoxic waste, toxin waste, cancer treatment waste, large thick badin waste, sealed and containers resistive to heat and heat resistive other clinical waste under this method.

Decrease of volume of waste treated by pressure heater is not stronger than the decrese of volume in an incineration process. Therefore, there should be a safety disposal space with sufficient room for the disposal after treatment, Sterilization efficiently is median (70% - 80% that is even after this treatment, certain pathogenic can alive. (Source: Internet Access)

(b) Under the high heat process, clinical waste at a large range can be successfully treated by incineration. Clinical waste scientifically will completely become ash being combusted with oxygen under high heat. Under this, method the volume of waste is plentifully decreased (5%-10%) In keeping high heat all pathogenic and toxic waste is fully destroyed.

As a country that signs the “Stockholm” convention with an idea of removing or limiting survive carbonic pollutants, our country also needs to take action to discharge gases to the atmosphere after being purified in maintaining the combustion temperature at a high level. In the study conducted in respect of small scale incincrator, environmental criteria of “Stock holm” convention does not observe small scale incinerators/ burners, burners made up of bricks and drum type banners. The World Health Organization also has accepted that these are no more incinerators but clinical waste disposal units.

Furthermore, the policy statements of the World Health Organization 2014 state that instead of small scale incinerators, promotion of alternatives and modern technology is a short term strategy.

(c) In the final disposal of treated clinical waste viz; ash generates after being incinerated, hazardous clinical waste and the remaining waste after in between treatment methods, need to be deposited in a more safety and a secured earth filling, itentical therefor. These land fillings need to be created more environment friendly in a manner minimizing damages cause to under ground water, soil, weather, surface water sources and environment.

(Source: By internet access)

2.1.6. Methodolgy of disposing clinical waste in the past

As a methodology in disposing of clinical waste in the past waste was buried in the hospital premises it self. It was an easy task in the past, because the quantity of clinical waste accumulated in hospitals took a law value as compared with the current situation. Subsequantly, formal methodologies are invented for disposal of clinical waste and they are in operation in the hospitals of this country. Accordingly, the inceineration process in order to dispose of clinical waste accumulates daily in each hospital protectively and environment friendly has been introduced by utilizing financial assistance of other countries and the government of Sri Lanka, and it has been in operation successfully for a long duration.

In this regard the World Health Organization (WHO) has published the second edition of Technology guidelines on management of clinical waste protectively in the year 2014 named as “Blue Book”. The WHO has also recommended that the principles stated therein be used for formulation of policies on clinical waste management in other countries and used technologically.

2.1.7. Laws, Rules, Regulations, Policies and conventions relating to clinical waste disposal

Particulars appear below.

(a) Under section 23(a) and 23(b) of the National Environment Act No.47 of 1980 as amended by act No.56 of 1988 and Act No.53 of 2000, regulations made by the Minister read in conjunction with its sections by considering clinical waste as a special waste are as follows. According to the volume (a), sub-part 68 of the extra-ordinary gazette notification No.1533/16 of 25 January 2008 published by the Ministry of Mahaweli Development & Environment, an environmental protection licence needs to be obtained by Health Services Centres including medical laboratories and research centres which generate infected waste.

(b) In terms (28) of schedule viii of part II of the gazette extraordinary No.1534/18 dated 01 February 2008, except under the authority of a licence issued by the Authority and in accordance with such standards and other criteria as may be prescribed under the act, creation, collection, transport, storing, clearing, recycling or disposal or put up a place to dispose of garbage or any facility should not be done or supplied. This licence is denominated as schedule wate management licence.

According to this licence, every clinical premises is legally bound to dispose/ management of clinical waste which is a hazardous waste group, protectively and sicientifically. Protectively and scientisfically so disposal is a foremost factor in clinical functions.

(c) Sri Lanka National Health Policy (2016-2025) prolmulgated by the Ministry of Health, Nutrition and Indigenous Medicine and the Master Health Plan had been approved under the cabinet paper No.ඇමෙ/17/0366/718/084 on 18 June 2017. In this programme, under the strengthening of supply of services in order to achieve the preventive Health targets, 26 sectors have been designed and sector 26, paid attention of the following requirements.

It was expected that the establishment of methodologies to minimise environmental issues arise in providing health services (waste water and clinical waste emitted by hospitals) and the improvement of environment friendly methods (solar power systems and minimisation of gases and chemical substance and promotion of green zones)

(d) As a country that signs the basal convention in the year 1992, under the international conventions and guidelines, Sri Lanka also needs to establish hazardous waste management methodologies within its country and to make legal provisions for the proper management of such garbage.

(e) The World Health Organization (WHO) has promulgated the second edition of the technology guidelines on safety management of Clinical Waste names as “Blue Book” in the year 2014. The WHO has recommended that the principles stated therein need to be used for the formulation of policies and technologically on clinical waste management in other countries. Herein

* Recommended the promotion of Environmental policies in order to prevent risk and cashualties caused to the people and sanitary employees by clinical waste.

* Suggested to co-operate for issues stated in Stockholm and Basal conventions

* Recommended for the utilization sufficient financial and human resources for the Sustainable Management of Clinical Waste in the countries.

(f) According to the environmental ruling of the Stockholm convention signed in the year 2008, maintenance of the operation of incinerators for the purpose of removing or limiting carbonic pollutions servive in clinical waste, use of the best available technique and compliance with good environmental operations need to be performed.

2.2 Authority for Audit

This audit was carried out under my direction in pursuance of provisions in Article 154(1) of the Democratic Socialist Republic of Sri Lanka in conjunction with provisions of the National Audit Act No.19 of 2018.

2.3 Audit Objectives

Objectives include; evalute whether the waste generated by hospitals of Sri Lanka is disposed of systematically and protectively and the institutional functions related thereto in operating in accordance with laws, rules, regulations and conventions applicable in this connection and to draw attention of the related entities in respect of problems arise therefrom.

2.4 Basis for choosing the topic

Since the growth of population in Sri Lanka, services provide by free health service and private sector have been widened. In addition to the normal health services provided by hospitals staff of hospitals are also increased with the awareness of people in respect of expansion of non-communicable deceases and health care with the expansion of hospitals. It appears that waste generated from day today services provided by various units established in each hospital is severely increased. It is very essential that this waste needs to be disposed of safety and systematically. However, information is made available that within the institutional structure obliged to comply with regulations enacted by related laws, rules and various conventions, it is a common feauture that the relevant responsibility is not taken appropriately. Due to impact caused to Health and environment therefrom effect on the livelihood and the whose eco-system is an achievable challenge in the development process. Identification of problems in taking action to achieve those requirements and paying attention of parties those who are responsible thereon is the basis for choosing this topic.

2.5 Scope of Audit

I conducted my audit in accordance with the International Standards of Supreme Audit Institutions (ISSAI 5110-ISSAI 5140).

Due to limited staff, other resources and the time period allowed basically drawing more attention on hospitals situated in the following districts for this audit in respect of clinical waste management, functions of the Central Environmental Authority, Ministry of Health, Nutrition and Indigeneous Medicine and the 'SisiLi' Hanano Encare private entity and the issues how far those objectives are reached were examined. In choosing hospital for audit, 17 hospitals including general hospitals in 10 districts, covering 07 provinces have been choosen, as per details below.

Table No – 01

Province	**District**		**Hospitals**
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Western	Colombo	i	NHSL (National Hospital)
		ii	Lady Ridgeway Hospital for Children
		iii	Castle street Hospital for Women
		iv	Prison's Hospital
	Gampaha	v	District Hospital, Gampaha
Central	Kandy	vi	Provincial General Hospital, Kandy
		vii	Peradeniya Teaching Hospital
	Nuwaraeliya	viii	District General Hospital, Nuwaraeliya
Southern	Matara	ix	District General Hospital, Matara
	Hambantota	x	Kataragama District Hospital
		xi	Thissamaharama Base Hospital
Eastern	Trincomalee	xii	Trincomalee District Hospital
		xiii	Kanthale Base Hospital
North Central	Polonnaruwa	xiv	Polonnaruwa District General Hospital
		xv	Medirigiriya Base Hospital
North Western	Kurunegala	xvi	Provincial General Hospital, Kurunegala
Uva	Badulla	xvii	Provincial General Hospital, Badulla

2.6 Audit Criteria

The following criteria are recognized.

i General circular No.01-12/2006 of 21 March 2006 of the Ministry of Healthcare and Nutrition on National Colour Code for the segregation of Hospital Waste (Annexe – 01)

ii SLCM National Guidelines/ Waste Management of the Sri Lanka College of Microbiology (Annexe- 02)

iii Circular No.PA/E&80H/11E/29/2013 dated 17 August 2013 of the Ministry of Health on Management of cytotoxic waste (Annexe – 03)

iv Circular No. PA/E&OH/11E/38/2012 dated 24 January 2013 of the Ministry of Health on Management of mercury in the Health Sector (Annexe – 04)

v. Circular No.01-27/2016 dated 31 May 2016 of the Health, Nutrition and Indigeneous medicine on minimisation of use of plastic and polythene in Health Institutions (Annexe – 05)

vi Sri Lanka National Health Policy 2016-2025 (Annexe – 06)

vii Gazette Extra ordinary No.1534/18 dated 01 February 2008 (Annexe – 07)

viii Hospital Infection Control Manual – SLCM/2005 (Annexe – 08)

ix extra-ordinary gazette notification No.1533/16 of 25 January 2008 (Annexe– 09)

3. Observations

3.1 Obtaining Environmental Protection Licence for Hospitals

3.1.1 Legal Requirement

In terms of Section 23(A) of the National Environmental Act No.47 of 1980 as amended by Act No.56 of 1988 and Act No.53 of 2000, no person shall discharge, deposit or emit waste into the environment which will cause pollution except, under the authority of a licence issued by the Authority and in accordance with such standards and other criteria may be prescribed under this Act, and a licence needs to be obtained therefor in terms of section 23(b)(i) of the Act. Industries so obtain such licenses have been promulagated in gazette extra-ordinary notification No.1533/16 of 25 January 2008 and health services institutions which generate Clinic Waste and Medical Laboratories and research centres are included under sub-part 68 of part 'a' of this gazette as well. A formal methodology has been determined for the management of clinical waste disposed of by Health Centres therefrom.

The Sisili Harano Encare (Pvt) Ltd. and the GFC (Pvt) Ltd.have been operated as licenced entities to facilitate the disposal of Clinical Waste and operations of the Cicili Harano Encare (Pvt) Ltd. has been stopped by a court order on 30 October 2018. The daily capacity of these facilitating companies is about 10-12 metic tons but it is insufficient to combust Clinical Waste of the whole country. According to the information available in the Central Environment Authority, the number of hospitals and other medical institutions within Sri Lanka as at 31 December 2018 amounted to 1,521.

3.1.2 Ascertainment of Environmental Protection Licence

Since this licence is obtained the advantages that a licence holder can have include, at least minimum contribution to environmental pollution and constant environmental protection, creation of a stakeholder who is interested in environmental issues and the holder of an environmental protection licence has a room for legal protection.

3.1.3 Progress of obtaining environmental protection licences

Details appear below.

(a) According to the information obtained from the Central Environment Authority on 31 August 2018, 328 institutions including public sector and private sector hospitals and other medical institutions had registered for obtaining environmental protection licenses out of which only 181 institutions have been qualified for obtaining the licence. When it considers as a percentage of total number of registered medical institutions of 1,521 it is about 12 per cent.

(b) Out of 47 base and Teaching Hospitals operate under the line ministry as at 31 December 2018, only 13 hospitals had obtained environmental protection licences and 10 hospitals had applied for the protection licenses. The number of hospitals obtained environmental protection licences represented only 28 per cent of the total number of base and Teaching Hospitals.

3.2 Scheduled waste management licence for hospitals

3.2.1 Legal Requirement

Details appear below.

(a) In terms of regualtions imposed under section 32 read in conjunction with sections 23 A and 23 B of the National Environmental Act, No.47 of 1980, particulars of scheduled waste under the issue of waste management licence are stated in part II of the gazette extra-ordinary No.1534/18 dated 01 February 2008. Accordingly, part II of schedule VIII of the above gazette notification identifies scheduled waste receives from special sources. Accordingly, bio-medical and Health Care waste from health care institutions, including medical laboratories and Research Centres is described under 5 main categories as 28th item of part II.

i	S-281	Infectious health care waste including laboratory cultures, waste from isolation words, tissues (swabs), materials or equipment that have been in contact with infected patients, human tissues or fluids.
ii	S-282	Sharps including needles and scalpels.
iii	S-283	Biological and anatomical waste including tissues, organs, body partes, human fetures and animal carcasess, blood and body fluids.
iv	S-284	Outdated and discharged drugs including cytotoxic drugs chemical regents.
v	S-285	Materials and containers contaminated with the above specified waste.

(b) Accordingly, no person shall generate, collect, transport, store, recover recycle or dispose or establishment of any site or facility for the disposal of waste of any waste except under the authority of a licence issued by the Central Environmental Authority and in accordance with such standards and criteria specified in schedule VII in respect of the specified institutions.

3.2.2 Progress of obtaining scheduled waste management licences

(a) According to the information obtained from the Central Environmental Authority on 31 August 2018, 328 government and private sector hospitals, including other medical institutes had been registered for obtaining scheduled waste management licence and only 50 had obtained licences thereof, representing only about 3 per cent of the total number registered medical institutions.

(b) Out of 47 Teaching Hospitals existed under the Line Ministry as at 31 December 2018, only 9 hospitals had obtained scheduled waste Management licence. Number of hospitals that obtained scheduled waste management licence represented only 19 per cent of the total number of base and teaching hospitals.

3.3 Segregation and collection of Clinical Waste

3.3.1 Segregation in generating Clinical Waste in terms of Colour Code

According to the General Circular No.01-12/2006 of 21 March 2006 of the Ministry of Healthcare and Nutrition and the National Guidelines/ Waste Management of Sri Lanka College of Microbiology, a National Colour Code for the segregation of hospital waste has been introduced. Accordingly, in generating Clinical waste, the national colour code identifies 7 specific categories, as shown below.

i.	Infectious Waste	-	Yellow
ii.	Sharp Waste	-	Yellow with red strip
iii.	General Waste	-	Black
iv.	Biode gradable Waste	-	Green
v.	Glass Waste	-	Red
vi.	Paper Waste	-	Blue
vii.	Plastic Waste	-	Orange

At the point of generation of waste itself, it should be segreagated in the above manner and put it in to the bags and bins of colours specified above.

Methodology of segregation of Clinical Waste in certain hospitals subjected to audit and observations thereon are as follows.

(a) Hospital waste in the Teaching Hospital of Peradenoiya is segregated at the point of being generated but not separated in accordance with the National Colour Code. As Hospital waste is not segregated in accordance with the National Colour Code it may cause environmental and Health risk by mixing general waste with sharp waste.

(b) Even though, waste is segregated in the Medirigiriya Hospital it has not been done in accordance with the specified National Colour Code. In the disposal of waste from wards, all waste is disposed of by black colour bags, resulting that it is mixed up with normal waste and as such there may be major health and environment risk.

Picture No - 01

Base Hospital, Medirigiriya

(c) Even though, waste in Kataragama base Hospital is segregated at the point of generation it had not been segregated in terms of the National Colour Code. Clinical waste had been segregated in terms of specific colour code and kept in specific bins but only black colour bags had been kept inside all colour bins. When clinical waste is removed, only this black colour bag is removed and as such there is a risk of mixing infected waste with general waste, was observed.

Picture No - 02

Base Hospita, Kataragama

(e) Even though, waste in Thissamaharama Hospital is segregated at the point of generating it has not been segregated in accordance with the National Colour Code. Only black colour polythine bags are used for the collection of all waste and as such it was observed that there may be a risk that general waste is mixed up with infected waste.

Picture No - 03

Thissamaharama Hospital

It was observed that all the hospitals stated above subjected to audit are not pursued the National Colour Code.

3.3.2 Polythene bags need to be used for the collection of Clinical Waste

According to the item 4.2 B(i) of the National Guidelines/ Waste Management of Sri Lanka College of Microbiology, yellow colour polythene bags with the minimum thickness of 300 µm need to be used for the collection of hazardous waste and the thickness of polythene bags in black colour use for the disposal of general waste needs to be a minimum of 200 µ.

The thickness of the yellow colour polythene bags used by a sample of selected hospitals for the disposal of hazardous waste had got tested by the Sri Lanka Standards Institution and the test result is as follows.

Table No – 02

	Hospital	Thickness of a polythene bag (µ)
i	National Hospital	112
ii	District Hospital, Polonnaruwa	79
iii	District Hospital, Trincomalee	97
iv	Teaching Hospital, Peradeniya	81
v	Base Hospital, Kanthale	95
vi	District General Hospital, Gampaha	108

(a) According to the above figures it was observed that non of the 06 hospitals subjected to audit test check had used yellow colour polythene bags.

(b) It was observed that the disposal of hazardous waste by using bags without specific thickness as such, there may be a greatest risk by dropping out waste due to rip the bags, garbage collectors may touch waste, adding with general waste, adding to outdoors etc. and the environment will also be at risk.

3.3.3 Bins use for the disposal of sharp waste

In terms of item 4.2 (B) of the SLIM National Guidelines on waste management, sharps should be placed in specific cardboard or plastic boxes which are puncture proof and leak proof. Sharps boxes should be designed with a small opening so that items can be dropped in but no item can be removed. Boxes should be of yellow cover with red strips and have the bio hazard symbol on it. As these sharps are not properly managed and the health risk involves by disposing sharps with general waste, it was stated in the note issued by the World Health Organization in 1999 in respect of the management of clinical waste protectively that the risk involved in the infection of HIV, Hepatitis 'B' and hepatitis 'C' stated as 0.3%, 3.0% and 3.5% respectively. Observations on few hospitals subjected to test check are as follows.

(a) The cardboard bins used by the NHSL for dropping sharps were not safety bins having being properly covered and easy to be untied. Accordingly, it was observed at physical verification that the bin used for dropping sharps is unprotective and may cause casualties to patients and hospital staff by dropping needles and scalpels outside.

Picture No - 04

NHSL (National Hospial)

(b) The Medirigiriya base hospital had used substandard bins without the specific colour for dropping sharps. However, there was a risk of removing items with sharps outside though the small opening of the bin.

Picture No - 05

Base Hospital, Medirigiriya

(c) For dropping clinical sharps disposed of by the Base Hospital, Katharagama boxes devoiding specific standard and colour had been used. Even though, sharps should be dropped in to the boxes designed with specific standard and yellow colour with red stripe, no boxes so designed were available. It was observed that the boxes now designed to dispose of sharps are so large that they could not be put into the stove that uses for the combustion of this waste. As a result, when such waste is compusted, it had to be removed again from those boxes causing grave damage to Health and Environment in this process.

Picture No - 06

Base Hospital, Katharagama

(c) Boxes in the Tissamaharama Hospital for dropping sharps used were devoid of specific standards and colour. Even though, sharps are collected to the boxes they have not been made in accordance with the standard. It was observed that there is a possibility of opening the month of boxes and sharps come out being penetrated the boxes.

Picture No - 07

Tissamaharama Hospital

3.4 Transportation and store clinical waste

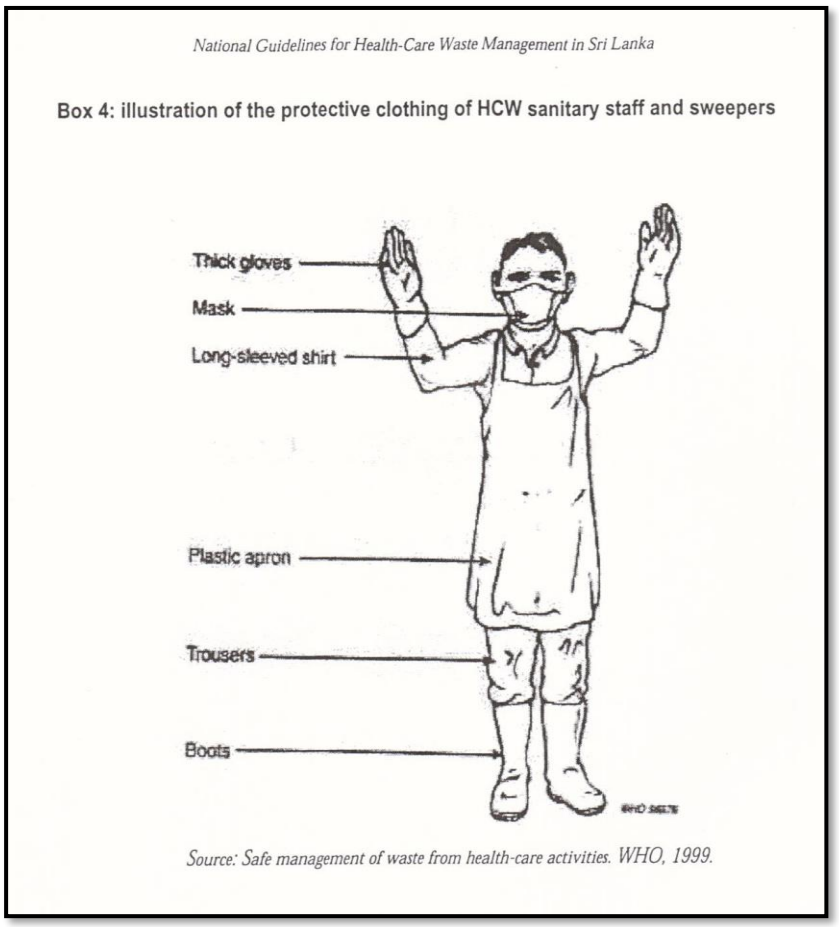
3.4.1 Onsite transporation of waste

In terms of item 4.2 B(ii) of the SLCM National Guidelines/ waste management, attention needs to be paid on the following matters in the waste collection and on site transporation.

i. Waste should be collected from each ward on a regular basis.

ii. When handling waste for transporation, sanitary staff should wear protective clothing at all times including face masks, aprons, boots and heavy duty gloves.

Picture No - 08



iii. All yellow bags should be sealed with appropriate adhesive tape and removed from the bins.

iv. The sharps boxes should be closed when ¾ full.

v. Waste should be collected in a trolley or cart which is easy to load and clean.

vi. The trolly use therefore should not be used for any other purpose.

vii. The collection route should be directed from the point of collection to the central waste storage facility.

Nevertheless, it was observed that the appropriate method is not followed by number of Hospitals subjected to observe. Particulars appear below.

(a) The manner how to manage sharp infection waste in Gampaha Hospital had been physically verified and observed that sharps had been fully stored in substandard boxes. It was also observed that a secured method had not been applied in the transporation of those boxes.

(b) The physical verification observed that the sanitary employees in the Trincomalee Hospital by whom infected waste is transported to the incinerator do not use secured methods such as wearning protective clothing, transport by trolley etc.

Picture No - 09

(c) Spot inspection observed that sanitary employees who transport clinical waste in the NHSL do not follow any health protective methods whatsoever. Even though, the Hospital Management explained that the employees were made aware and provided protective equipment, it was reported that they were not systematically used. Spot check observed that sanitary employees were packing sharps boxes and infection waste in the store devoid of gloves and boots and injuries were seen in their legs. There may be a possibility of becoming infected from such injouries**.**

Picture No - 10

(d) The boxes designed by the base hospital Katharagama for the disposal of sharps were not in conformity with specific standards and it was observed that such boxes had become full. It was observed that a sufficient protection was not made in on site transportation of waste.

3.4.2 Waste Storage

In terms of item 4.2.C of the SLCM National Guidelines/ waste Management, attention needs to be paid on the following matters in the storage of waste.

i. A separate central storage facility should be provided for storage.

ii. Non-hazardous waste which is to be taken away by local government authorities should be stored separately from hazardous waste.

iii. The central storage facility should be totally enclosed nad sealed from unauthorized access.

iv. It should be inacesible to animals, insects and birds.

v. It should be easy to clean and disinfect.

vi. It should have good water supply drainage and ventilation systems.

vii. Such waste should not be kept in the central storage that stores wasts for more than 48 hours.

Even though, the above requirements need to be followed, it was observed that several hospitals subjected to audit had not followed such methods. Particulars appear below.

(a) Clinical waste collected in the base hospital Kanthale is not burnt daily and the clinical waste collected during the period of 6-9 days is taken to the incinerator and combusted,

As the waste collecting centre was not appropriately covered, clinical waste had dropped out unprotectively. At the time of observation it was effused a bad smell in that place.

It was further observed that clinical waste first entered into the collection centre is not removed first (using FIFO method) resulting waste being remained for a long period in the retaining bin, effusing a bad smell.

The manner how clinical waste is collected in Kanthale Hospital

Picture No - 11

The manner how clinical waste is collected in Kanthale Hospital

(b) In the examination of clinical waste storage process in the NHSL the following matters were observed.

i. About 1200 kg of clinical waste is collected daily and there were no sufficient storage facilities to store them. According to the itme C and D vi of the SLCM Guidelines/ waste management, infections waste should be stored in a lead shielded storage room with concrete walls but stores had not been designed in accordance with such standard. As insufficient space in the area waste bags were stacked outside the storage room.

ii. As this store has only one door when taking away, waste was disposed by using last in first out basis (LIFO method). Therefore it was observed that old waste had remained undelivered.

iii. In terms of item C of the SLCM Guidelines/ waste Management on waste management, the Central storage facility should be totally enclosed and sealed from unauthorized access and should be desiged in such away that it should be inaccessible to animals, insects and birds. Nevertheless, it was observed that it had not been so done.

Picture No - 12

The manner how clinical waste was stored in the NHSL

(c) An agreement had been entered into with a private company for the disposal of clinical waste in the Lady Ridgeway Hospital. As a large quantity of waste was not removed by 03 January 2019, it was accumulated within the hospital premises. It was observed that the storage facility to store general waste and sharps was insufficient.

Picture No - 13

3.5 Treatment for Clinical Waste

3.5.1 Necessity to treat miscellaneous waste

In terms of item 4.2 D of the National Guidelines/ Management of the Sri Lanka College of Micro-biology different types of hazardous waste (HW) should be treated appropriately. Accordingly, it is clearly stated waste treated methods need to be followed in the disposal of pharmaceuticals chemical waste effluents, placentas and anatomical waste, blood and infections waste. In the test examination of waste treatment process in hospitals subjected to sample check observed the following matters.

(a) Gampaha Hospital

i. The temperature of the second chamber of incinerator should be 1200 C^o, in order to minimise hazardous substance emits to the at mosphere being destructed hazardous waste contains in infected substance harmful to environment and organism. However, at the 2 occasions observed the temperature of the incinerator in Gampaha Hospital had low temperature then that of the temperature needs to be existed as detailed below.

Table No – 03

Opportunity	Date of observation and time	Temperature existed at the time of observation
1	11.00 am – 12.11.2018	468 c^0 – 572 c^0
2	11.45 am - 12.11.2018	610c^0

Under the above temperature condition, it was observed that air emission hazards is not fully destroyed by the incineration process.

ii. Cytotoxic empty bottles used for the patients in the cancer treatment unit and syringe used for dispensing had been stored in an unprotective place and those cytotoxic empty bottles and the used syringes were scattered around the collection centre. Similarly, it appeared that the place had become wet due to rain water and as such it was observed that there is a risk of adding substance to common water system in this place by mixing rain water.

(b) District Hospital, Trincomalee

The Hospital has facilities for 525 inwards patients and is a hospital which treats about 600 out patients daily. Particulars of clinical waste and sharps generated by the operations of the hospital from January to August 2018 appear below.

Table No – 04

Month	Clinical Waste	Sharps
January	1,460	265
February	2,975	400
March	3,035	452
April	2,440	329
May	3,010	305
June	2,840	390
July	1,330	200
August	990	230
Total	18,080	2,571

It was observed that for the discharge of clinical waste of the Trincomalee Hospital, 2 methods viz, incineration and autoclaving are used, as detailed below.

i. An incinerator of "Lakmini" type had been purchased on 28 October 2017 by the Hospital at a cost of Rs.9,200,000 for the combustion of clinical waste. This machine can combust 65-70 kg of solid waste per hour within the periods of 20 to 25 minutes. And also this machine is used for burring injection needles and sharps use for minor operations.

ii. At the time of going to audit physical verification, blood was scattered near the incinerator and it was observed that it had happened while the persons operate this machine were putting the bags with waste into this machine unprotectively.

iii. It came to know from the operator of the incinerator that there was a lack of stores facilities to store boxes with sharp equipment.

iv. Even though the temperature of the incinerator for discharging cytotoxic waste protectively needs to be more than 1200 C^0, it was observed that this incinerator did not have so much temperature. It was observed that waste had been unprotectively stored within the premises where the incinerator of the Trincomalee Hospital is installed and it had become a major environmental issues.

v. While being combusted clinical waste, it was observed that a black colour smoke was emitted to the atmosphere and also observed that an emission test was not carried out by the hospital in respect of gases discharged to atmosphere.

vi. It was observed that remaining ash in the process of incineration was discharged unprotectively to the land nearby.

Picture No - 14

Incinerator at Trincomalee Hospital

Picture No – 15

The manner how ash was disposed of by Trincomalee Hospital

vii. The 'metamisor' which can metamize about 400 kg of clinical waste daily had been supplied to the Trincomalee Hospital on 15 May 2018. When treating by this machine, 90 per cent of the quantity of input is emitted again as sludge. The physical verification observed that an environmental friendly method has not been followed for the disposal of this sludge.

(c) Polonnaruwa Hospital

This hospital situated in a land, about 24 acres in extent comprises 916 patients beds and 4 operation theatres. Two methods viz, incineration and metamizeration are used for clinical waste treatments. The incinerator had been supplied since April 2017 under a project of the Ministry of Health and Nutrition. In operating 12 hour period daily, 500 kg of waste is combusted and the discard quantity of waste is averaged at 90-120 cubic meters. Temperature of the first and the second chambers of the incinerator is about $750c^0$ – $850\ c^0$ and $1000c^0$-$1150c^0$.

i. The height of the chimney of the incinerator situated in the hospital premises that removes clinical waste and the height of the 3 storied building being constructed is similar as observed by naked eye. It is therefore observed that inhalation of smoke by the staff and patients engage in their works nearby while in the process of clinical waste incineration may cause health hazard.

Picture No – 16

New building being built – Polonnaruwa Hospital

ii. Before being installed the incinerator for clinical waste combustion such waste had been buried within the premises of the Hospital itself. As a result, it was observed by the time of audit examination on 29 October 2018 that such waste had come out to the surface of the premises.

Picture No – 17

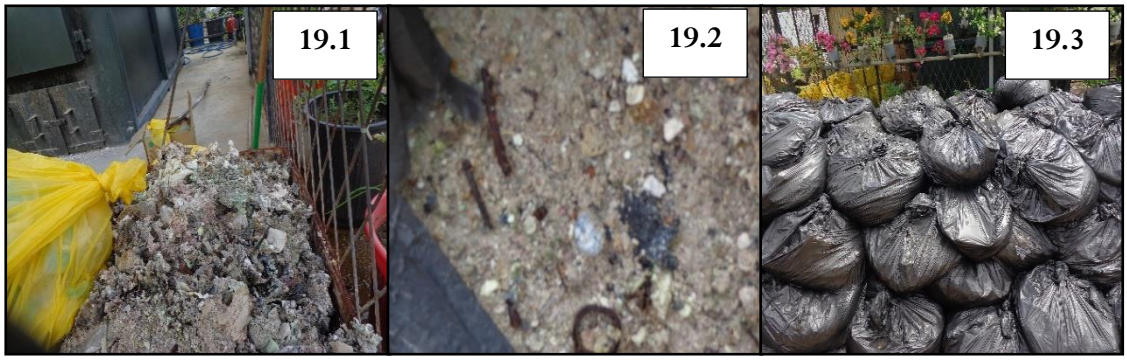
The manner that clinical waste buried in the Hospital premises came out to the surface.

iii. Even by the date of audit on 29 October 2018, the metamizer provided to the hospital for clinical waste management has been serviced by a private entity but the ownership of it had not been vested in the hospital. This machine treats the quantity of 15-20 kg per hour. Even though it would take about an hour for the metamizeration of the stock of waste entered first once the machine is started it was stated that it would take time period of 20-30 minutes for the metamizaration of a subsequent stock of waste. Residues after the metamizerisation by this machine do not fully reduce to ashes but broken into small pieces and remained as sludge. In the physical verification of these residues it was observed that there were needles and scalpels use for patients and small pieces of sharps use in medical operations. Further the physical verification observed that residues of sludge in the metamizer puts into the incinerator again and combusted.

Picture No – 18

Incinerator

Picture No – 19



Ashes emit from incinerator

iv. It came to know from the staff assigned to the process of clinical waste combustion that there is no methodology to dispose of ash remains at the end of the combustion process and observed that such ash has been put into black colour bags and deposited within the hospital premises.

v. Those polythene bags were teared by animals and observed that they were scattered on the ground of that place being kept open the bags with ash.

Picture No – 20

Ash removed from metamizer

vi. It was observed that the remaining sludge in the metamizer at the end of the metamizeration process, included needles and scalpels and other sharps used in medical operations. As this sludge had been stacked in an unsecured manner in the open yard, there may be a risk that germs can cause infection to staff employed for the disposal of chemical waste and the people come to the hospital in a manner by trampling or any other means.

vii. Expenditure on clinical waste management

Particulars of expenditure incurred by the Polonnaruwa Hospital for waste management during the past 3 years are as follows.

Table No – 05

Year	Expenditure
	Rs.
2016	7,747,897
2017	7,590,080
2018	5,368,640

	20,706,617
	=========

Even though the total expenditure incurred for waste management for the last 3 years amounted to Rs.20,706,617 it was observed that the wast management is not carried out eco-friendly.

(d) Thissamaharama Hospital

Thissamaharama Hospital consists of facilities for 186 inward patients and it is a 'B' grade base Hospital according to the Health Ministry's grading. The quantity of clinical waste daily generated by this hospital is about 260 kg approximately.

As the chimney of the incinerator now in operation in the Hospital is broken and the roof was removed, the machine is not operated in rainy days. Further, the temperature in operating the machine is not indicated and as such, it could not be checked whether waste is combusted by the specific temperature. The following types of waste is subjected to burn by the incinerator.

- Sharps
- Infectionable Waste
- Pathological Waste
- TB Samples (about 6 per day)
- VDRL, HIV, TT1 (hepatitis B and C)
- Unbleached cloths made by the theatre for maternity wards.

The following observations are made in this regard.

i. About 220 litres of water (32x5+20x3) used for washing x rays had been collected to cans and stacked in that room but not removed.

ii. Blood discarded after laboratory tests is added to the gullies were overflown and stepped out of the hospital premises. It was seen that waste water was mixed up with blood.

iii. Before, being introduced autoclave in the blood bank to the burner, it is not sterilized. It was revealed that bags with blood are put into the incinerator and allowed to combust.

iv. A large quantity of out-dated drugs had been stacked insecurely in the room of the sanitary labourers. Therefore, it is very easy for them to remove such drugs out of the hospital and as such the health hazard caused thereby may be very serious.

v. A large quantity of vials use for patients were collected and stacked in a room.

vi. Ash remains after being combusted waste had left on the flow nearby and sample tube not fully burnt could be seen there. As there was no thermometer in this burner temperature was not indicated and therefore it could not be established whether hazardous damage of remaining ash after being combusted is completely left out.'

Picture No – 21

Thissamaharama District Hospital

(e) Peradeniya Technical Hospital

This hospital operates as a teaching Hospital in the Central Province can facilitate 928 inwards patients. Audit examination carried out in respect of the generation of clinical waste in the out patients division and the inward patients division revealed the following matters.

Table No – 06

Period ---------- Dates	Quantity of clinical waste generated ---------- Kg
i. January 2018 04 - 31	9,414
ii. February 2018 03 -23	6,373
iii. March 2018 01 - 29	9,520
iv. April 2018 02 - 26	8,375
v. May 2018 01 - 30	10,488
vi. June 2018 02 - 20	6,450
vii. July 2018 19 - 31	4,258
viii. August 2018 04 - 25	8,802
ix. September 2018 05 - 30	14,380
	---------- 78,060 ======

Accordingly, 78,060 kg of clinical waste was generated up to September 2018. Observations in this regard appear below.

i. It was observed that there is insufficient stores facilities to store clinical waste of Peradeniya Teaching Hospital at present. It was further observed that such waste had been improperly disposed in the Hospital premises and in certain instances, waste was burnt in the open premises.

ii. In terms of circular No.01-27/2016 of 31 May 2016 of the Ministry of Health, Nutrition and Indigeneous Medicine, it was stated that by inheling dioxide gas emits in burning chlorinated plastic and polythene, it may cause problems related to cancer, genetic mutation, inmun deficiencies and endocrine system and may make impact on growth and reproduction. However, it was observed that chemical waste and polythene of this hospital was burnt in the open premises at the time of audit verification.

iii. It is observed that sanitary labourers do not follow a secured method in collecting clinical waste and the risk involves in them causing infected position. It was also observed that clinical waste so collected has not been taken by the Cicil Hanaro Private Ltd. until 22 October 2018.

Picture No – 22

Teaching Hospital, Peradeniya

(f) Katharagama Hospital

Even though, it was observed that this hospital has 85 beds for inwards patients and about 100 outpatients come for treatments, data on the quantity of general waste and sharp waste generates daily are not maintained. The following observations are made in this connection.

i. The burner utilises for the combustion of sharps at present belongs to the MOH Office and was observed that it is substandard and not suitable to combust clinical waste. There was no place to dispose of ash remained after being burnt waste by the burner belongs to the Hospital.

Picture No – 23

Burner by which sharps are combusted

ii. Too much of waste generated by the Hospital and polythene are burnt in an open premises and as a result, it was observed that bad impact may cause to pre-school situated nearby and other school children by inhaling toxic smoke emitted therefrom.

Picture No – 24

iii. Placenta is berried in an extremely insecured place and lots of vials were accumulated and stacked in a room.

iv. District Hospital, Katharagama is situated in the Katharagama tourist zone and it was observed that pre – schools and other schools are also situated near the Hospital. Therefore, it is observed that under these circumstances it will cause social and environmental issues, due to disposal of waste not in an environmental friendly manner.

v. In the examination of Hospital premises, very informal disposal of waste was observed and it was also revealed that hospital employees had suffered from dengue during the month of August 2018.

(g) Castle Street Hospital for Women

Castle Street Women's Hospital consists of 459 beds. In the audit of clinical waste management of the Hospital carried out on 09 January 2019 observed the following matters.

Before 09 March 2018 about 60 kg of clinical waste in the Hospital had been handed over to the Colombo Municipal Council after being sterilized for a period of about 40 minutes by the hydro clave with the temperature of $122c^0$ – $135c^0$. Similarly, sharps broken into small pieces by the shedder and handed over to the Colombo Municipality. However, after 09 March 2018, disposal of clinical waste of the castle street hospital has been suspended by the Colombo Municipality. Observations in this connection are as follows.

i. The area in which this machine is installed is submerged by water during rainy days. As a new building complex is constructed near the hospital, a wall of the building in which waste burning machines are installed had cracked and as such that building is at risk.

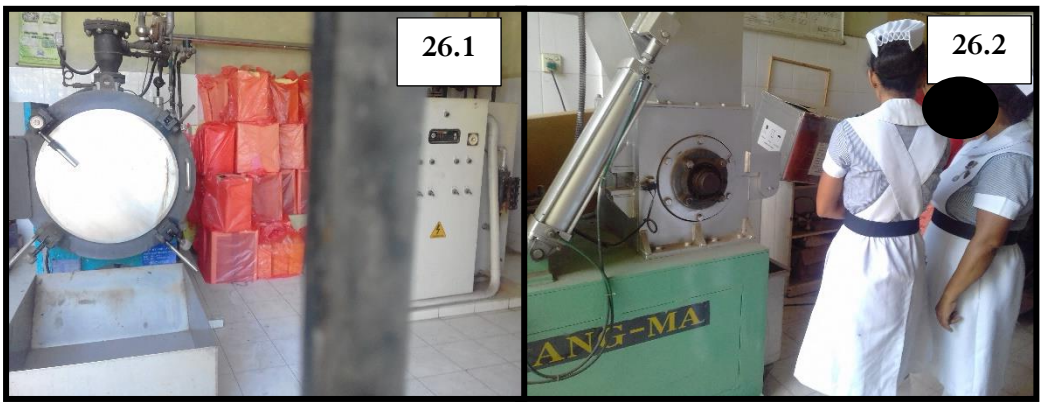
Picture No – 25

The cracked wall

ii. By 09 January 2019, clinical waste is burnt by an incinerator owns by a private entity established in the Hospital premises of Sri Jayawardhapura.

iii. The hydroclave and the sheder exist in the hospital had been serviced and maintained in the year 2017 as well and it was observed that even currently those 2 machines are in operational condition. Even though, an officer has been given foreign training to operate these machines without being utilized them, clinical waste is given to the private entity which combusts clinical waste of Sri Jayawardenapura Hospital.

Picture No – 26



Hydroclave and the shedder machine

(h) Badulla General Hospital

Badulla Hospital consisting of 1513 beds for inwards patients is the General Hospital in Badulla District. The quantity of waste consists of approximately 320 kg of infection waste and 41 kg of hazardous waste is daily generated. The matters observed in respect of waste management in this Hospital are as follows.

i. The old incinerator existed for incineration consisted of 2 chimneies but it was observed that there was no system of measuring temperature while be incinerated.

ii. Quality of gases emitted in the combustion process was not checked by the Hospital.

iii. Even though the incinerator the work of which commenced since 18 July 2018 consisted of 2 chambers, temperature of those 2 chambers was not exceeded $800c^0$ as stated by the Letter No.BD/GH/AC/22/2018 dated 20 December 2018 of the Director of Provincial General Hospital, Badulla.

iv. At the physical verification carried out on 15 January 2019 temperature of the incinerator could not be observed as the stock of diesel required for the operation of the incinerator was exhausted. Therefore, the old incinerator had been used for burning clinical waste on that date.

v. At the time of physical verification, the hight of the new chimney of incinerator was about 6.5 meters. Near the place where this incinerator was installed in the Badulla General Hospital, Children's wards and thalaseemia patients wards were situated and those wards had been located in the 3rd and 4th floors of the 5 storied building. The hight of this building is about 20 feet and it was observed that the hight of the chimney of incinerator was less than that of the hight of the building.

vi. Accordingly, it was observed in the examination of Chief nursing officer's reports of ward 30, 23 and 24 that smoke emits from this incinerator is spread surrounding the wards, causing severe health effect on children.

vii. Test erports on smoke emits from this incinerator had not been maintained by the Hospital and as such observations on the quality of smoke emits from this incinerator could not be given.

viii. Officials informed that the incinerator is operated only on working days and clinical waste had been clustered unsecurely for 2 days by 14 January 2019, the date of audit. It was observed that at the time of audit verification, all such clinical waste had mixed up with rain water as it was raining at that time and flown on the surface of the earth.

ix. Ash emits from the incinerator was cluttered unprotectively in a land nearby.

x. In addition, to the combustion chamber received under the Australian Aid Project executed under the Ministry of Health & Nutrition, a metamizer bearing type No.240SSS (metamizeration plant) had been used since 18 July 2018 for the disposal of clinical waste.

xi. An estimated amount of Rs.3,437,517 had been allocated in the year 2017 under the World Bank Aids requires for the construction work of clinical waste storage and the financial records observed that the full amount had been utilized by 31 December 2017. Nevertheless, clinical waste had been stored in an unprotective manner in an open premises at the time of audit and as such the effectiveness of this contruction work could not be satisfied in audit.

xii. In the examination of records daily maintain about the operation of this metamizer noticed the following information.

Table No – 07

Month	**Operation efficiency**	**Active Position**
	Days	
July 2018	25 -31	Inoperative
August 2018	01-03	
August 2018	14-31	
September 2018	01-29	
October 2018	01-31	
November 2018	01-05	
	23-30	
Deecmber 2018	01-27	

xiii. Accordingly, out of the total number of 184 days available from the date of handing over this metamizer to the hospital up to the end of the year, it could not be utilized for 128 days.

Picture No – 27

Provincial Hospital, Badulla

xiv According to the Letter No.PA/E&OH/OE/29/2013 dated 17 August 2013 of the Ministry of Health on management of cytotoxic waste, instructions for the disposal of hazardous cytotoxic waste have been issued. Accordingly, cytotoxic waste needs to be stored in a suitable tight containers in a secured place, until disposal is done. However, waste was stored unprotectively rearest to the patients wards.

xv. By 15 January 2019, the date of audit, this store was overflown due to storing discarded cytotoxic waste and parts thereof had dropped in to the adjoining store.

xvi. According to the Letter No.BD/PGH.OUP/RQ/2011/25 dated 03 August 2018 of the Director of Provincial General Hospital, it was stated that the quantity of cytotoxic waste accumulated as at that date amounted to 10000 kg.

xvii. Even though, it was expected to discharge this cytotoxic waste in an environmental friendly manner by utilising the incinerator newly installed in the Badulla General Hospital, the temperature of 800 c^0 had existed in the incinerator where as the temperature of 1,200 c^0 should have been required.

Picture No – 28

The manner how cytotoxic waste is stored in Badulla General Hospital.

(i) Kurunegala Provincial General Hospital

The Teaching Hospital of Kurunegala is the 3rd largest Hospital in Sri Lanka and extents in an area of 35 acres, consisting of 1991 beds. This Hospital provides services to approximately one millions patients annually. It is reported that patients of North Central Province, North Western Province, Central Province and Eastern Province come to this hospital for treatments.

About 2,500 kg of clinical waste is collected daily by the Hospital and the waste is treated by incineration and metamizaration. The existing incinerator uses for treatment in the Hospital presently is about 15 years old. It was observed in audit that this machine frequently becomes inoperative, waste is not properly combusted and not operated at the maximum capacity, resulting that waste is being accumulated. Observations in this regard are as follows.

i. As the highest of the maternity ward complex now being constructed goes over the height of the chimney of the incinerator, entering the smoke emits from the chimney to these wards is inevitable. Thalaseemia patients ward and the children ward are situated near the incinerator and as such it was observed that such patients frequently in hell the smoke.

ii. Audit observed that in the process of chemical waste incineration, solid black smoke is emitted. Letter of 14 December 2017 addressed to the Hospital Director by the Microbiologist it was stated that smoke is so emitted as waste is not combusted as specified and such smoke contents hazardous substances harmful to health such as toxic chemicals carcinogen, heavy metal, polyvinyl chloride (PVC), Polycyclic, aromatic, hydrocarbons (PAHS) furans etc.

iii. As the thermometer of this incinerator does not indicate digits, it cannot be accepted that clinical waste is cobusted under the standard temperature.

iv. At the time of physical verification, bags with clinical waste were stacked in the open premises.

v. The metamizer is used for the clinical waste treatment of the Hospital and it was under the control of a private entity. At the time of physical verification, the machine was not in operation and the clinical waste bags had been collected near the room that put up for the machine. It was revealed that remaining ash accumulated at the end of the operation process was taken by the Urban Council and such bags with ash had been kept in an insecured open place at the time of audit verification.

Picture No – 29

Provincial Hospital, Kurunegala

(j) Base Hospital, Kanthale

An incinerator had been purchased in the year 2016 at a cost of Rs.4,347,826 for the combustion of clinical waste in the base Hospital, Kanthale. This incinerator can combust the capacity of about 40-45 kg of clinical waste daily and the height of its chimney was about 60 feet. Ash, remains after burning waste remains in the incinerator is discharged to a sump in the hospital premises.

Picture No – 30

Incinerator at Kanthale Hospital

(k) Matara Hospital

Observations appear below.

i. In the examination of waste treatment at Matara Hospital, observed that a large quantity of indisposed clinical waste had been stacked unprotectively in the hospital premises (near the waste water sterilization system) A large number of waste bags, heaped in this place had been opened by animals and scattered solid waste around the area.

ii. It was observed in audit that there may be a great risk that pathogenic contains in this solid waste will add to the Niwala Revere nearby and the surrounding environment with the rain.

Picture No – 31

The manner how clinical waste is collected.

(l) Prison's Hospital

At the time of audit on 15 November 2018 the following matters were observed in respect of the disposal of clinical waste in the prison's Hospital.

i. Observations made on that date in respect of improper treatment are shown in the following table.

Table No – 08

Nature of Waste	Daily quantity of waste (kg)	Method of disposal
Infection waste	4.5	Burning
Sharp waste	2.5	Burning
Pathological waste	1	Burning
Chemical waste	200 ml	Burning
Pharmaceutical waste	0.5	Burning
General waste	0.1	Given for pigs food/ bury

ii. The environmental protection licence and the scheduled waste management licence relating to the disposal of clinical waste had not been obtained even by 16 January 2019.

iii. Letter No.බන්ධ/රෝ/වැලි/ප්‍ර.වෛ/01/19 dated 16 January 2019 of the Chief Medical Officer observed that all clinical waste generates in the Prison's Hospital is burnt open in a common land.

(m) District Hospital, Nuwaraeliya

District General Hospital of Nuwaraeliya facilitates 425 inwards patients and consists of 15 wards 2 laboratories one mortuary, a kitchen and an operation theatre. The matters observed in respect of recycling of waste in this hospital appear below.

i. Even though request had been made for the environment protection licence on 06 November 2017, that licence and the scheduled waste management licence had not been obtained even by 28 January 2018, the date of audit.

ii. It was observed that infection waste is daily carried by the Urban Council of Nuwaraeliya and disposed to Sandathenna area belongs to the Nuwaraeliya Pradeshiya Sabha and this waste was not subjected to any basic treatment whatsoever.

iii. Even though the principle private entity engaged in hazardous waste in this Hospital had obtained waste up to September 2018 and since October 2018 waste had not been taken by that entity. Such sharps had stored unprotectively in a store room and an open place in the Hospital premises.

iv. Cytotoxic waste had been collected in an insecured open place near the cancer clinic and cytotoxic waste had also been stored unprotectively in a small room without proper standard near the highway outside the hospital. As people come to the hospital are loitering nearby, storing cytotoxic waste as such is a major risk.

v. Even though, a provision of Rs.1.5 million had been made in the year 2018 for the provision of facilities to store clinical waste , that requirement was not fulfilled even up to 28 January 2019 the date of audit.

vi. It was observed that an incinerator is being put up in the new hospital complex by a Netherland Project and the smoke emits from the chimney of that incinerator can spread into the buildings situated over the chimney. Despite, room and facilities are available to put up the incinerator in a suitable place they had been established in a lower land.

vii. Among the matters observed in the process of incineration and metamizerisation of clinical waste in the hospitals subjected to audit , commonly identified risky area is the height of the chimney of the incinerator is not up to the standard and as a result patients may be again infected by inhaling gases emitted to the environment, therefrom.

viii. Disposal of ash remains after being incierated and sludge remains after being metamizerd insecurely and non-environment friendly manner.

3.6 Various programmes executed in respect of waste treatment

3.6.1 Tripartite agreements and observations on waste treatment

Details appear below.

(a) With the intention of the disposal of clinical waste generated by government and private hospitals in Sri Lanka in an environment friendly manner, the contractual project had been commenced on 02 January 2014 under 3 major parties. The first the second and the 3rd parties of this agreement consisted of the Ministry of Health, Central Environmental Authority and the private entity respectively and the period of provision of services under this agreement as a pilot project was 5 years. Under this agreement, clinical waste generated in all government hospitals connected with the line ministry, Provincial Hospitals and hospitals cover under the local authorities had been directed for treatments.

(b) Clinical waste was classified under 4 main categories therein but radioactive waste was not covered by this. The first part of the agreement explained the responsibilities and duties of the Ministry of Health and the second part had explaned responsibilities and duties of the Central Enviornment Authority as the enforcement of government envirionmental laws. The third part and the 4th part had explained duties and responsibilities as the service provider and general responsibilities respectively.

(c) Infrstructure facilities requires for the provision of services had been located in the Mulleriyawa Hospital premises in the Grama Niladhari Division 502/C of Rajasinghegama belongs to Colombo District. The premises expected to implement the project consisted of 60 purchase in extent and the capacity of the incinerator installed therein was approximately 6 metric tons per day.

(d) The environment licences in terms of Sections of the National Environmental Act No.47 of 1980 had been obtained and it had been classified as an industry under the 68th sub item of part A of the Gazette Notification No.1533/16 of 25 January 2008. The annual Environmental Protection Licence and the schedule waste management licence had been obtained since 2014. Furthermore, the environmental protection licence bearing No.07604 (R4) valid for the period from 18 March 2018 to 17 March 2019 and the schedule waste management

licence bearing No.097/HWM/2018/R4 valid for the period from 03 March 2018 to 02 March 2019 had been obtained.

(e) According to the letter dated 06 March 2014 of the Secretary to the Ministry of Health, Clinical waste disposal facility had been given to 24 hospitals under this project. In terms of the letter of 06 October 2015 of the Chief Executive Officer of the said private company, during the period of 18 months, since the commencement of the project, services had been provided to 33 government hospitals by this project and also stated that they have reached up to the maximum capacity limit of the project.

(f) In terms of the letter dated 05 July 2016 of the Secretary to the Prime Minister, recommendations had been made to improve the capacity of this Clinical Waste processing and disposal project and to consider for the next 10 year period. The approval of the Cabinet of Ministers had been given to extent this project by the letter dated 03 August 2016. According to the cabinet memorandum No.2017/CP/16 of 07 March 2017, it was proposed to lease a plot of land at Muthurajawela, 2 acres, 1 rood and 23.99 purchas in extent to this company to commence the project and the approval of the Cabinet of Ministers had been granted therefore on 29 March 2017.

(g) According to a complain made by residents inhabited near the Mulleriyawa Colombo East Base Hospital to the judiciary, the functions of the company had been stopped since 30 October 2018 by a court order.

(h) By the date of audit on 05 October 2018, the quantity of Clinical Waste collected from the Hospitals by this company but not treated amounted to 8 metric tons approximately.

(i) The quantities of clinical waste collected by this company but not treated and stored in the following hospitals are as follows.

Table No – 09

Hospital	Number of Kg	Number of containers approximately
IDH	157,236	13
Karapitiya	52,025	05
Kaluthara	13,695	01
Peradeniya	29,808	02
	---------- 252,764 ========	------- 21 =====

(k) It was planned to begin the operations of the company again in Muthurajawela and it is expected that it would take at least a period of 4 months. Accordingly, the quantity of Clinical Waste probably be collected can be forcasted as follows. (2019 April 30)

Table No – 10

	Kg
Daily Collection	8000
Per month (8000x30)	240,000
May be collected during 4 months (800x30)	960,000
(240,000x4)	
Quantity already collected	252,764
Total Quantity	---------- 1,212,764 =======

It is observed that being stored untreated clinical waste in large quantities may arise economic, social and environmental issues.

3.6.2 Australian Aids Projects

Particulars are as follows.

(a) An agreement had been entered into between the Australian Export Finance and Insurance Corporation (EFIC) and the government of Sri Lanka on 07 December 2015 for granting a loan of US$ 13.76 million for the hospital waste treatment. Under this, 20 hospitals from selected 6 provinces in Sri Lanka have been classified and identified and planned to supply incinerators for 5 hospitals and metamizers for the selected 20 hospitals. The total cost thereof was US$ 15,023,157.7. Details appear in Schedule 02.

(b) Incinerators and metamizers given under this project had been physically verified in selected hospitals and observed that those machines were not in operation in an efficient and effective capacity as intended.

(c) It was also observed that while being treated by these machines, hazardous substance contains in clinical waste is not removed as anticipated and the remaining sludge is not used for earth filling protectively.

(d) Finally it was observed that as compared with the cost incurred thereon, the intended purpose of disposing clinical waste in an eco-friendly manner could not be efficiently and effectively achieved by this project.

3.6.3 The second Health Sector Development Programme

Details are as follows.

(a) A project to obtain the environmental protection licence and the schedule waste management licence for base hospitals and hospitals above that by the second Health Sector Development Programme had been commenced in the year 2013. According to this project, the objective of this project was to obtain environmental protection licences and the schedule waste management licence for base hospitals and 69 hospitals above that.

(b) As observed in the examination of performance of the ascertainment of environmental licences and schedule waste management licences from 2014 to 2017 under this project, it was targeted to obtain environmental protection licences and schedule waste management licences for 69 hospitals. However, the above licences had been obtained only by 12 hospitals at the end of the project period. It represented only 17 per cents as a percentage of performance. Details appear in schedule 03.

(c) Even though, the environmental protection licence and the schedule waste management licence should have been obtained for all base hospitals and the above by 2017 under this project, according to the performance reports. actually reached to the relevant objective was only 17 per cent.

(Source: Performance report of the second Health Sector Development Project)

(d) In considering the estimated provisions and the actual expenditure for the improvement of clinical waste management process (in 25 Health Services Institutions) financial performance in the years 2015, 2016 and 2017 had been 61 per cent, 50 per cent and 88 per cent respectively and the performance up to August 2018 was only 20 per cent as per details below.

Table No – 11

Year	Estimated provisions	Actual Expenditure	Expenditure as a percentage of the estimate
	Rs.Mn	Rs.Mn	
2015	150	92	61
2016	250	127	50
2017	4.3	3.8	88
up to August 2018	20	4.2	20

Accordingly, it was observed that the allocated money for the clinical waste management process had not been utilized in a maximum efficiency.

3.7 Supervision and Monitoring

Due to insufficient place given for the disposal process of Clinical Waste generated by Hospitals and medical institutions in Sri Lanka and the weaknesses in the internal control and monitoring systems of this process, it was reported in the newspapers in the year 2019 that there were occations that unidentified individuals had disposed of clinical waste to various places in Sri Lanka illicity. (E.g.Divayina Newspaper on 28.09.2019)

4. Recommendations

(a) Obtain the Environmental Protection licence for all government and private hospitals and other medical institutions.

(b) Obtain the schedule waste management licence for all government and private hospitals and other medical institutions.

(c) Be obligatory to segregate in generating and disposing hospital waste in accordance with the National Colour Code and facilitate therefore.

(d) Be obligatory to maintain the minimum guage in polythene bags use for the discharge of clinical waste.

(e) Establish a methodology to supply bags with similar standard to all hospitals.

(f) Be obligatory to maintain the standard of use for the disposal of sharp waste bins and dispose protectively.

(g) Use warning symbols in sharp waste disposal bins.

(h) Establish a methodology to provide sharp waste disposal bins with the similar standard.

(i) Be given instructions that when 3/4 rd of the capacity of sharp waste bin is filled it should be removed and facilitate therefore.

(j) Be obligatory to follow security methods for on site transporation of waste.

(k) Give instructions to sanitary employees about the importance of performing the duties in the disposal of clinical waste in an protective manner and be obligatory to follow security methods.

(l) Provide sufficient infrastructure facilities required to store clinical waste securly.

(m) Direct to methodologies of quick disposal of waste without being stored for a long period.

(n) Discharge outdated drugs in accordance with the Health Ministry’s circulars for the removal of risk involves in improper storage of outdated drugs.

(o) Establish an appropriate methodology in order to prevent adverse effects due store waste improperly as a result of insufficient storage facilities since the collection of clinical waste is gradually increased.

(p) Maintain temperature needs to be existed in the combustion of clinical waste for eco friendly disposal.

(q) Instructions be given and provide facilities to follow the circular instructions issued in respect of the disposal of cytotoxic emply bottles and syring use for pharmaceutical of such drugs.

(r) Act in accordance with the Circular No.PA/E&OH/11E/29/2013 of 17 August 2013 in storing cytotoxic waste.

(s) Make arrangement to use ash generates after incineration process for a secured earth filling without causing any damage to the surface, interior water sources, earth and air.

(t) Maintain air emission eco-friendly and obtain periodic reports in respect of smoke emits from waste combustion machines and incinerators.

(u) Establish a methodology to dispose waste uses for washing copies with x-rays without being collected and kept for a long period.

(v) Prohibit burning of infection waste and polythene in an open premises.

(w) Find the possibility to reuse existing hydroclaves and sheders inoperative at present in the hospitals and take necessary action.

(x) Establish a clinical waste management methodology paralleled to the hospital development programmes.

(y) Provide incineration facilities in one common place instead of providing individual incinerators for each hospital (Combination of several provinces). This may be able to minimize bad environmental effect arises due to negligence or ignorance in the implementation independently by each hospital.

(z) Minimise malign environmental impact which may cause in the operation of incinerators put up by the Australian Project.

(aa) Obtain performance reports of the Australian Project and review and take corrective action.

(ab) Formulate a national policy for the disposal of hospital waste in an environment friendly manner.

(ac) Take action by the Ministry of Health to Strengthen the management process of clinical waste in an environment friendly manner by utilizing funds with maximum efficiently and effectively.

(ad) Expedite to obtain the schedule waste management licence and the environment protection licence for required hospitals, as expected by the Second Health Services Development Project.

(ae) Use of financial and human resources require for the eco-friendly management of Clinical Waste in compliance with National and International laws, Rules and Regulations.

(af) In awarding contract for the disposal of clinical waste to the private sector, monitor and follow up the place of discharge if waste is removed from the hospital premises.

5. Conclusion

Hospital or Clinical Waste needs to be systematically disposed of in accordance with the segregation of waste made in terms of the nature of waste generates at domestic and institutional levels. It needs to be carried out in accordance with the regulations imposed by the Central Environmental Authority that functions its monitoring part and the Central Environmental Authority needs to a continuous supervision to ensure the manner how those regulations are followed. In addition, the Ministry of Health Monitors every hospital by way of regulations other instructions imposed under that, guidelines and directives by a separate unit established for that purpose. Certain regualtions thereof are internationally recognized and all hospitals need to adhere to all these legal requirements. Nevertheless, the Clinical Waste Management Process had not been satisfactorily carried out by all hospitals subjected to audit test check and the supervision and monitoring part carried out in that regard by the Central Environmental Authority, Hospitals Managements and the relevant units in the Ministry of Health were not at a satisfactory level. It is therefor concluded that there is a great risk in arising severe environmental and Health problems by Hospital Waste. The resultant out turn may be very serious if these issues further exist.

Schedule No.01

Hazardouse waste contains in Hospital Waste

i.	Infectious Waste	Waste that is suspected to contain pathogens (Eg: samples that have been contact with blood or other body fluids, dressings, gres, cotton, bandage etc.	
ii.	Sharp Waste	Syringes with needles, scalpel blades, razors, infusion sets, contaminated broken glasses etc.	
iii	Pathological waste/ anatomical waste	Human body parts, fetuses, placenlae etc.	
iv	Pharmaceutical waste	Outdated drugs	
v	Cytotoxic waste	Genotoxic chemicals use for cancer treatments.	
vi	Chemical waste	Laboratory treatments, waste contents with heavy metal (Batteries themometers content with mercury discarded blood pressure monitors, fluorescent lamps, antibiotic.	
vii.	Radio active waste	Waste contents with radioactive substance waste emits from radiotherapy, faeces and urine waste discharge by patients taken radiotherapy treatments.	
		Source:	Health care waste management guidelines of the Sri Lanka College of Microbiology.

Schedule No.02

Province	Hospitals	Incinerator	Metamizer
Northern	Base Hospital, Thelippalai	✓	✓
	Primary Security Unit, Omanthai	✓	✓
Eastern	Teaching Hospital, Batticaloa	✓	✓
	District General Hospital, Ampara	-	✓
	District General Hospital, Trincomalee	-	✓
	Kalmune North	-	✓
	Ashreoff Memorial Hospital, Kalmune	-	✓
	Base Hospital, Akkrepattu	-	✓
North Central	District General Hospital, Polonnaruwa	✓	✓
	Teaching Hospital, Anuradhapura	-	✓
Uva	Provincial General Hospital, Badulla	✓	✓
	District General Hospital, Monaragala	-	✓
Wayamba	District General Hospital, Chillaw	-	✓
	Teaching Hospital, Kurunegala	-	✓
	Base Hospital, Kuliyapitiya	-	✓
	Base Hospital, Marawila	-	✓
Sabaragamuwa	Provincial General Hospital, Ratnapura	-	✓
	Base Hospital, Embilipitiya	-	✓
	District General Hospital, Kegalle	-	✓
	Base Hospital, Karawanella	-	✓
		---- 05 ===	---- 20 ===

Schedule No.03

Provincial/ Line Ministry	Number of Hospitals expect to obtain Environmental Protection licence and schedule waste management licence during the project period	Number of Hospitals obtained environmental protection licence and schedule waste management licence
Line Ministry	41	10
Western	7	2
Southern	3	-
Central	6	-
Wayamba	2	-
Uva	2	-
Sabaragamuwa	1	-
North Central	-	-
Northern	7	-
	69	**12**