
ENVIRONMENT DEPARTMENT
3.3 Management and Handling of Bio-Medical Waste
Highlights

Bio-medical waste is generated during the diagnosis, treatment or immunisation of human beings or animals or in research activities pertaining there to or in the production/testing of biologicals. The Bio-Medical Waste (Management and Handling) Rules 1998 (BMW Rules) framed by the Government of India as per the provisions of the Environment (Protection) Act 1986, came into effect on 20 July 1998. Rules require bio-medical waste generating institutions to ensure compliance of the provisions of the Rules within a prescribed time schedule. Kerala State Pollution Control Board (KSPCB) had not prepared a comprehensive list of bio-medical waste generating establishments, though the BMW Rules were notified in 1998. Most of the HCEs in the State were functioning without authorisation from KSPCB, in gross violation of rules. Implementation of BMW Rules in the State was very poor in view of the lack of interest shown by Government and Kerala State Pollution Control Board in enforcing compliance of the Rules. Some of the more important points are indicated below:

- **Delay of two years for commencement of the administration of Bio-medical Waste Rules in the State.**

(Paragraph 3.3.7)

- **There was no system of State level registration of Health Care Establishments (HCEs) and State level listing of HCEs.**

(Paragraph 3.3.8)

- **83 per cent of the identified institutions were functioning without authorization. Out of 1,278 HCEs under Government sector, only 179 (14 per cent) had obtained authorization as of March 2007.**

(Paragraph 3.3.9)

- **Non-issue/belated issue/non-renewal of authorization led to KSPCB foregoing a revenue of Rs 91 lakh.**

(Paragraph 3.3.9.2)

3.3.1 Introduction

Bio-medical waste is generated during the diagnosis, treatment or immunisation of human beings or animals or in research activities pertaining there to or in the production/testing of biologicals*. This waste is a reservoir

*Biologicals means any preparation made from organisms or micro organisms or product of metabolism and biochemical reactions intended for use in diagnosis/immunisation/treatment

of potentially harmful micro-organisms which can infect hospital patients, health care personnel and general public. Wastes and its by-products can also cause injuries, poisoning and pollution. Bio-medical waste management is an integral part of health care.

Government of India, Ministry of Environment and Forests notified (July 1998) the Bio-Medical Waste (Management and Handling) Rules 1998 under Environment (Protection) Act 1986, to streamline the procedure for handling, collection, transportation and disposal of bio-medical waste with the objective of avoiding any adverse effect on human health and environment. The bio-medical waste generating institutions were required to ensure compliance with the provisions of the Rules within a time schedule between 30 June 2000 and 31 December 2002 depending on the category of institution.

The State has a large number of Health Care Establishments and bio-medical waste generated in the State was 11,000 MT per annum approximately, according to a report published by Kerala State Council for Science, Technology and Environment.

Salient features of the Rules

- ◆ Every occupier/operator of bio-medical waste generating establishment shall have an authorisation to function
- ◆ The State Pollution Control Board is the Prescribed Authority to enforce the Rules
- ◆ The waste generated shall be segregated, packed and treated in compliance with standards prescribed in the Rules
- ◆ Common Bio-medical Waste Treatment and Disposal Facility may be established to treat waste generated in a cluster of hospitals
- ◆ The State Government shall constitute an Advisory Committee to advise Government and Prescribed Authority on matters related to the implementation of the Rules.

3.3.2 Organisational set up

Environment Department is the administrative department at Government level for matters relating to environment. Kerala State Pollution Control Board (KSPCB) is the Prescribed Authority in the State to enforce the provisions of the Rules. The KSPCB has its head office at Thiruvananthapuram, three regional offices and 14 district offices in the State. The occupier/operator of a bio-medical waste generating/handling institution is responsible for the establishment of proper waste treatment and disposal facilities.

3.3.3 Audit objectives

The main objectives of the performance audit were to examine whether

- Action was taken to identify all the waste generating units and issue authorisation

- Adequate funds were provided to Government institutions for waste disposal and utilised effectively
- Bio-medical waste handling and disposal procedures followed were according to prescribed Rules
- Functioning of common bio-medical waste treatment facility was effective
- Monitoring and evaluation mechanisms were effective

3.3.4 Audit criteria

- Provisions under Bio-Medical Waste (Management and Handling) Rules 1998.
- Assessed requirement of funds for waste disposal.
- Central Pollution Control Board (CPCB) guidelines on bio-medical waste handling and disposal.
- Guidelines for installation of Common Bio-medical Waste Treatment Facility issued by CPCB.
- Monitoring standards prescribed.

3.3.5 Audit coverage

Comments on the implementation of the Bio-Medical Waste (Management and Handling) Rules were included in the Review on 'Implementation of Environmental Acts and Rules in regard to Air Pollution and Waste Management' (para 3.1.9(ii)(a) and (b)) of the Report of the Comptroller and Auditor General of India for the year ended 31 March 2001(Civil), Government of Kerala. The Report was discussed by the Committee on Public Accounts in January 2006 and recommendations are awaited (May 2007). The present Review covering the period 2002-03 to 2006-07 was conducted during February-May 2007. The audit coverage was confined to establishments practising allopathic system of medicine since the bio-medical wastes generated in other systems of medicine were not significant.

3.3.6 Audit methodology

An entry conference was held with the Secretary, Environment Department in March 2007. Audit scrutinised records relating to the Health and Family Welfare Department of Secretariat, Head office, Regional office Thiruvananthapuram and four district offices (Thiruvananthapuram, Alappuzha, Thrissur and Palakkad) of the KSPCB, Directorate of Health Services and Directorate of Medical Education. In addition 10 Health Care Establishments (HCEs) under Government/private sector in each of the selected district and the Common Bio-Medical Waste Treatment Facility at Palakkad in the private sector were inspected. The private institutions were inspected in the presence of KSPCB officials. The districts and units were selected by simple random sampling.

Audit findings

3.3.7 Delay in implementation of Bio-Medical Waste Rules

Delay of two years for commencement of the administration of Bio-medical Waste Rules in the State

The Bio-Medical Waste (Management and Handling) Rules 1998 (BMW Rules) framed by the Government of India as per the provisions of the Environment (Protection) Act 1986, came into effect on 20 July 1998. Though the notifications specifying the KSPCB as the Prescribed Authority was issued in October 1999, the order prescribing the authorisation fee for application, under the BMW Rules was issued only in June 2000. This resulted in delay of two years for commencement of the administration of Rules in the State.

The last date for the establishment of treatment and disposal facilities ranged from 30 June 2000 to 31 December 2002 depending on the bed strength of the Institutions.

3.3.8 Identification of Health Care Establishments

There was no system of State level registration of HCEs and State level listing of HCEs

It was mandatory that every occupier/operator of an institution generating, collecting, receiving, storing, disposing and/or handling bio-medical waste except those providing treatment/service to less than 1,000 persons per month to have an authorisation issued by the KSPCB to function. There was no system of state level registration of HCEs and a state level list of HCEs was not available. Though private HCEs were to be registered with Local Self Government Institutions (LSGIs), there existed no procedure of getting clearance from KSPCB prior to such registration/intimating the Board of newly registered HCEs. Based on the details collected from the Director of Health Services, Directorate of Medical Education, Indian Medical Association (Kerala Branch) etc., KSPCB had identified about 2,600 institutions initially. As of March 2007, the number of institutions identified was 5,200. Veterinary hospitals in the State did not meet the criteria prescribed in the Rules and hence were not brought under the provisions of BMW Rules. Shortage of manpower was cited as the reason for not preparing a comprehensive inventory of HCEs in the State. Audit scrutiny revealed that no additional staff were sanctioned for implementation of BMW Rules and the available manpower against the sanctioned strength declined gradually since 2000. Thus even nine years after the Rules were notified, KSPCB did not have the necessary data essential for enforcement of Rules.

Government stated (August 2007) that no separate manpower has been sanctioned for the implementation of the BMW Rules.

3.3.9 Issue of authorisation

Only a small percentage of bio-medical waste generators were given authorisation within the statutory time limit

All the bio-medical waste generating/operating establishments were required to obtain authorisation within a time schedule between 30 June 2000 and 31 December 2002. The KSPCB started issuing authorisation from January 2001 and the total number of authorisations issued till December 2002 was 436 only against 2,600 identified initially. Thus only a small percentage of bio-medical waste generators were given authorisation within the statutory time limit. The Head Office of the KSPCB issued/renewed authorisation to all

BMW generating establishments till June 2005, thereafter the power was delegated to Regional/District office based on the bed strength of establishments.

83 per cent of the identified institutions were functioning without authorisation

Audit scrutiny revealed that majority of the identified 5,200 HCEs had not applied for authorisation. Applications were received from 1,308 HCEs only and 895 authorisations were issued till March 2007. As a result 83 per cent of the identified institutions were functioning without authorisation in gross violation of the Rules. The year-wise details of issue of authorisation were as follows:

Year	Number of hospitals Identified as on 1 st April	Hospitals applied for authorisation during the year	Number of authorisations issued during the year
Upto 2002-03	2,981	1,180	546
2003-04	2,126	85	235
2004-05	93	31	98
2005-06	Nil	12	10
2006-07	Nil	(*)	6
Total	5,200	1,308	895

(*) not available

Government stated (August 2007) that of the 895 HCEs only 328 held valid authorisation as of August 2007.

No new institutions were identified after 2004-05. The number of applicants also declined sharply since 2003-04. This indicated that after an initial effort no effective steps were taken by KSPCB to ensure compliance with the Rules by the bio-medical waste generators.

It was seen in audit that

- Out of the identified HCEs there were 31 hospitals with bed strength 500 or more and 95 hospitals with bed strength between 200 and 500 in the State which had the potential of generating substantial quantities of bio-medical waste. Of these five hospitals with bed strength 500 or more and 24 hospitals with bed strength between 200 and 500 had not been issued authorisation till date (May 2007).
- Out of 1,278 HCEs under Government sector only 179 (14 per cent) had obtained authorisation as of March 2007, indicating failure of Government to ensure that its own institutions were implementing the provisions of the Rules.
- Out of 40 establishments visited by audit in four selected districts 26 had applied for authorisation and 22 obtained authorisation. Ten HCEs had not applied for authorisation so far (May 2007). The remaining four had no in-patient facility/treated less than 1,000 out-patients per month.

Out of 1,278 HCEs under Government sector, only 179 (14 per cent) had obtained authorization as of March 2007

- One HCE^f which was issued authorisation for three years lacked bio-medical waste segregation, treatment and disposal facilities as of March 2007 indicating improper inspection by KSPCB.
- None of the three Government Medical Colleges[∞] test checked had valid authorisation as of March 2007 though Medical College, Alappuzha had provisional authorisation in October 2004. It is to be noted that Medical Colleges are premier health care institutions in the State treating large number of patients and consequently generating large quantities of bio-medical waste.
- Though application for authorisation was to be disposed of by the prescribed authority within a period of 90 days from the date of receipt of application, delay of one to forty five months was noticed in 102 cases out of 162 checked.

The KSPCB attributed inadequate infrastructure facilities to handle bio-medical waste, incomplete applications and non-remittance of required fees as the reasons for the non-issue of authorisations. But the lack of effort on the part of KSPCB to address these issues and take corrective action indicates the low priority assigned to this vital issue.

3.3.9.1 Renewal of authorisation

An authorisation was granted for a period of three years including an initial trial period of one year from the date of issue. All subsequent renewals were to be for a period of three years. A provisional authorisation was granted for the trial period to enable the occupier/operator to demonstrate the capacity of the facility.

Test check of the files relating to the issue of authorisations in 162 out of 362 cases at the Head office and four district offices revealed that

- All authorisations issued were provisional and in three cases the period was beyond 12 months.
- Validity of authorisation (first issued/renewed) except in 15 out of the 162 cases expired as of March 2007.
- The KSPCB had inspected only six of them within the validity period to ascertain the capacity of the facility to regularise or cancel the provisional authorisation. Consequently the provisional authorisations could not be regularised/cancelled and hence lapsed.
- Applications for renewal were received from only 60 establishments and only 14 were renewed by issuing subsequent provisional authorisation indicating non-acquisition of facilities.

Government stated (August 2007) that inadequate facilities for bio-medical waste management and insufficient manpower were the major reasons for non-renewal of authorisations.

^f Taluk Headquarters Hospital, Neyyattinkara

[∞] Thiruvananthapuram, Alappuzha, Thrissur

3.3.9.2 Potential loss of revenue due to non-issue of authorisation

Non-issue/belated issue/non-renewal of authorization resulted in potential revenue loss of Rs 91 lakh to KSPCB

From January 2003 all bio-medical waste generators were to function only with authorisation issued by KSPCB. An authorisation once issued was to be renewed after three years. The applicants are required to remit fees ranging from Rs 500 to Rs 10,000 depending on the bed strength/number of out-patients till June 2006. An integrated clearance system was adopted from July 2006 for the clearance under Water Act, Air Act and Bio-Medical Waste Rules in the case of HCEs and the fees collected based on capital investment. The application fees received by KSPCB up to 2006-07 were from 1,308 institutions only and amounted Rs 59.55 lakh. Had all the identified institutions (5,200) been issued authorisation and it was renewed as required under the Rules, the KSPCB would have received fee of Rs 1.51 crore approximately. Thus, due to non-issue/renewal of authorisation to all the identified institutions as required under the Rules, KSPCB suffered a potential loss of Rs 91 lakh.

3.3.9.3 Penalty

According to the provisions in the Environment (Protection) Act 1986, violation/non-compliance of Rules shall attract a penalty up to Rupees One lakh and/or imprisonment up to five years. However, the KSPCB had not used the statutory powers available to enforce implementation of Rules by invoking the penal provisions in the Act. According to Government (August 2007), invoking penal provisions was not productive and persuasion/issue of closure notice was more beneficial.

3.3.10 Funding to Government Institutions

3.3.10.1 Allotment and utilisation of funds

Regular funds were not provided in the State annual budget for bio-medical waste treatment and disposal activities. However, funds were provided in the budget for establishment of infrastructure facilities and activities like installation of incinerator, water treatment plant, management, training to the health and non health workers in Government hospitals under the control of Director of Medical Education (DME) and Director of Health Services (DHS) from 2003-04 onwards. The budget provision and expenditure during the period 2003-04 to 2006-07 were as follows:

(Rupees in lakh)

Year	Budget provision			Expenditure		
	DHS	DME	Total	DHS	DME	Total
2003-04	Nil	10.00	10.00	Nil	9.01	9.01
2004-05	25.00	Nil	25.00	11.36	Nil	11.36
2005-06	50.00	106.00	156.00	0.00	80.00	80.00
2006-07	20.00	50.00	70.00	7.00	40.00	47.00
Total	95.00	166.00	261.00	18.36	129.01	147.37

Audit scrutiny revealed that

- Rupees Eighty lakh was deposited by DME with Public Works Department (PWD) in March 2006 for establishment of incinerator,

water treatment plant and related civil works at Medical College, Kozhikode in 2005-06. However, in June 2006 it was decided to entrust the work to Kerala Water Authority (KWA) and sanction of Government for re-transfer of the amount deposited is awaited (May 2007). This resulted in idling of Rs 80 lakh deposited in March 2006 for establishment of infrastructure facilities.

Only 19 per cent of the budget allocation was utilized by DHS during the period from 2003-04 to 2006-07

- Only 18 lakh (19 per cent) of Rs 95 lakh allocated to DHS for the period 2003-04 to 2006-07 was utilised by the department. Out of the balance Rs 74 lakh was surrendered due to non-establishment of infrastructure facilities and Rupees three lakh lapsed.

Despite the absence of facilities for disposal of Bio-Medical Waste, the Departments did not take effective action to utilise the funds provided in the budget, specifically for erecting waste treatment and disposal facilities.

3.3.10.2 Short utilisation of Government of India grant

Short-utilisation of GOI grant to the extent of Rs 81 lakh provided for establishment of infrastructure facilities

Government of India provided Rs 85 lakh in March 2005 to Medical College, Thiruvananthapuram for establishment of infrastructure facilities like incinerator, autoclave, shredder, training to staff, etc., for bio-medical waste management and disposal. Out of this Rs 3.97 lakh was expended in June 2006 for training, purchase of plastic bags and wheel barrows. The balance amount remained unutilised as of March 2007.

3.3.10.3 Sanction to meet expenditure from HDS/HDC funds

Absence of regular financial support resulted in non-implementation of bio-medical waste treatment and disposal as stipulated in the Rules

Funds collected by the Hospital Development Committee/Society are authorised to be used for the purchase of medicines, bandages, establishment charges etc. In addition, Government in March 2004 granted one time special sanction to Government hospitals to utilise not more than 10 per cent of their collection in the Hospital Development Society (HDS)/Hospital Development Committee (HDC)* for putting in place a bio-medical waste segregation and disposal mechanism. However, no expenses were incurred in the test checked HCEs for this purpose.

In June 2005 sanction was accorded by Government to hospitals with bed strength of 100 or more to engage Indian Medical Association Goes Eco-friendly (IMAGE), a body of Indian Medical Association (IMA), Kerala Branch for the transportation and disposal of waste in their plant at Palakkad at the rate of Rs 2.75 per bed per day, utilising funds from HDC/HDS. The number of beds for payment was reckoned as 80 per cent of the sanctioned bed strength of HCE. Government extended this sanction to all HCEs from December 2006. Utilisation from the fund could not be considered as regular financial support since HDS/HDC fund represent the fee receivable from parking of vehicles, charges of passes issued to visitors, service charges etc., and vary from time to time and from institution to institution. Absence of regular financial support resulted in non-implementation of bio-medical waste treatment and disposal as stipulated in the Rules.

* HDS constituted in Medical Colleges/District level hospitals and HDC in other hospitals

3.3.11 Segregation and storage of bio-medical waste

Segregation is the most important step in the entire process of Bio-medical waste management. Improper segregation of waste results in mixing of general waste with bio-medical waste rendering the general waste also toxic and hazardous. As only about 15 *per cent* of hospital waste is hazardous proper segregation could considerably reduce the quantity of waste as well as cost of treatment and disposal. The BMW Rules provide that the waste shall be segregated at the point of generation and collected into appropriate colour coded bags at the point of generation as indicated in the table below:

Colour code	Type of waste
1. Yellow	Potentially infectious non-plastic waste
2. Red	Potentially infectious plastic waste
3. Blue/white	Waste sharps
4. Black	Discarded medicines, chemical waste, incineration ash

Test check of the records relating to bio-medical waste in the 40 HCEs in the selected districts revealed that the segregation of waste as stipulated was not carried out in 18 HCEs till date. In three Medical Colleges and one General Hospital with bed strength ranging between 747 to 1,600 and generating substantial quantities of waste, segregation was started between February 2004 and November 2005 only against the prescribed date of June 2000.

State Government have no mechanism to monitor proper segregation of waste generated by the units

In the absence of State level inventory of HCEs and non-possession of authorisation by 83 *per cent* of the identified HCEs, the prescribed authority/State Government have no mechanism to monitor the proper segregation of waste generated.

3.3.12 Treatment and disposal

Bio-medical waste is categorised into ten types according to the nature of waste. The treatment/disposal options are incinerator/deep burial, autoclaving, shredding, etc., depending on the type of waste.

The position of treatment and disposal facilities in the 40 test checked hospitals are detailed in the succeeding paragraphs.

3.3.12.1 Incineration

Human anatomical waste, animal waste and soiled waste are incinerated. Incineration system uses high temperature combustion under controlled conditions to convert wastes containing infectious and pathological material into mineral residue and gases. As per the guidelines issued by the Central Pollution Control Board, the incinerator should be double chambered with burners for each chamber so that the temperature of the primary and secondary chambers should be $800\pm 50^{\circ}\text{C}$ and $1050\pm 50^{\circ}\text{C}$ respectively. The incinerator shall be equipped with high pressure Venturi Scrubber System Air Pollution Control Device so that the temperature of the flue gas at the venturi scrubber outlet shall be approximately $70\text{-}80^{\circ}\text{C}$ to ensure saturation of the flue gas. The waste shall be charged into the primary chamber in bags through an automatic

feeding device at recommended intervals ensuring no direct exposure of furnace atmosphere to the operator.

Incinerators were used for short periods or as a place for burning the waste

Incinerators (two donated and four costing Rs 41 lakh) were installed between November 1999 and August 2005 in six out of 25 Government HCEs test checked. But none of the installed incinerators satisfied the norms prescribed in the Rules and were either used for short periods only or used as a place for burning the waste, resulting in unproductive expenditure of Rs 41 lakh. Inadequate incineration can result in release of toxic pollutants into the air. It was also found that the operators engaged were not qualified technicians.

Government stated (August 2007) that CPCB had instructed to discourage installation of individual incinerators and hence individual HCEs were not being asked to install incinerators.

3.3.12.2 Deep burial

Burial pits in the institutions test checked were not authorized by KSPCB

Deep burial of category one and two^φ waste is also an option in towns with population less than five lakh and in rural areas. Under the Rules the location of the deep burial site shall be authorised by the prescribed authority and the area should be relatively impermeable and should not be prone to flooding or erosion. None of the burial pits in the test checked institutions were authorised by the State Pollution Control Board. General Hospital, Thiruvananthapuram located in the city, deep buried the waste when the incinerator was not working though deep burial was not permissible as the population of the city was more than five lakh. Medical College Hospital and Women & Children Hospital in Alappuzha which have no incinerator resorted to deep burial. As most areas in Alappuzha district are water logged and flood prone, deep burial was liable to cause contamination to the surrounding areas.

The practice of deep burial adopted by the HCEs were without the prescribed safeguards and was therefore fraught with the risk of causing contamination of soil and underground water sources.

3.3.12.3 Autoclaving

Autoclaving is prescribed for disinfecting and treating Micro-biology and Bio-technology waste, waste sharps and soiled waste. Autoclaving (steam sterilisation) is a low heat thermal process and is designed to bring steam into direct contact with the waste in a controlled manner and for sufficient duration to disinfect the waste. Autoclave for bio-medical waste disposal was not installed in any of the test checked hospitals except in the pre-clinical and para-clinical departments of Medical College, Thrissur.

3.3.12.4 Shredding

From amongst all categories of wastes the 'sharps' which include syringes, needles, guide wires, scalpel, blades, broken glasswares pose high risk of

^φ Human anatomical waste and animal waste

injury and direct transmission potential due to the puncture or cut injury. So its management and disposal require utmost care.

Shredding/mutilation other disinfection was the procedure prescribed in the rules for waste sharps. Audit scrutiny revealed that shredding was done for syringes and needles alone by using needle cutters/burners in the test checked hospitals. Non-shredding of other items was fraught with the risk of reuse of the materials and injury to general public.

3.3.13 Treatment of liquid waste

For liquid waste generated in the HCEs disinfection by chemical treatment was mandatory before discharge to public drain. However the liquid waste generated in 15 out of 40 inspected HCEs was discharged without proper disinfection. This can lead to pollution of surrounding water bodies.

3.3.14 Lifting of waste by Municipal Bodies

The Municipal bodies shall pick up the segregated non-bio-medical solid waste generated as well as the duly treated bio-medical waste for disposal at the Municipal dumpsite. However, out of the 40 test checked HCEs, the Municipal bodies lifted the waste only in 10 HCEs. As a result the other HCEs deep buried/burned the general waste also.

Director of Health Services allotted (between June 2002 to June 2006) Carcass carriers (each costing Rs 13.23 lakh) to four municipal bodies through the HDCs of hospitals at Neyyattinkara, Nedumangad, Cherthala and Kayamkulam for lifting waste from these hospitals and dead bodies of animals from the concerned municipal areas. However, Kayamkulam Municipality alone lifted the waste from the hospital premises. As a result the expenditure of Rs 39.69 lakh (cost of three vehicles) failed to serve the intended purpose and the three hospitals continued to dispose of general waste by burning/burial.

Municipal bodies lifted the waste only in 10 HCEs out of 40 HCEs test checked

3.3.15 Maintenance of Records

Every occupier of a BMW generating establishment is required to maintain records related to the generation, collection, reception, storage, transportation, treatment and disposal of waste. This is necessary for periodical inspection and verification by the Prescribed Authority and for submitting annual reports. It was found in audit that only two out of the 40 test checked institution maintained such records. As a result the hospitals could not quantify the waste generated.

3.3.16 Common Bio-medical Waste Treatment and disposal Facility (CBWTF)

A Common Bio-medical Waste Treatment and disposal Facility(CBWTF) is a set up that can be used to treat the bio-medical waste generated in a number of health care facilities. BMW Rules stipulate that the Municipal Corporations, Municipal Bodies or Urban Local Bodies, as the case may be, shall be

responsible for providing suitable common disposal/incineration sites for the bio-medical wastes generated in the areas under their jurisdiction. In areas outside the jurisdiction of any municipal body, it shall be the responsibility of the occupier generating bio-medical waste/operator of a bio-medical waste treatment facility to arrange for suitable sites individually or in association, so as to comply with the provisions of these Rules. A CBWTF shall be allowed to cater upto 10,000 beds situated within a radius of 150 Km. However, in an area where 10,000 beds were not available within a radius of 150 Km, another CBWTF may be allowed to cater the HCEs situated outside the said 150 Km. The system shall have the treatment facilities like incinerator, autoclave/microwave/hydroclave/shredder.

Government stated (August 2007) that common facility for 10,000 beds and for 150 Km are general guidelines and are not mandatory.

3.3.16.1 CBWTF in Government sector

CBWTF yet to be established in Government Sector

Majority of HCEs in the State failed to provide adequate facilities for the disposal of bio-medical waste. Government in February 2004 approved the establishment of three common bio-medical treatment and disposal facilities in Kannur, Thrissur and Alappuzha districts. The facilities are to be established at the identified centres on Built-Operate-Transfer (BOT) basis. However, these facilities are yet to be established (May 2007).

3.3.16.2 CBWTF in private sector

Indian Medical Association Goes Eco-friendly (IMAGE), erected a CBWTF at Kanjikode in Palakkad District. This Facility with a waste treatment capacity of three MT per day was established in December 2003 at a cost of Rs 1.50 crore, on the land owned by IMA. The results of a visit to the Facility are detailed in the succeeding paragraphs.

3.3.16.3 Operational Capacity

The capacity of CBWTF is fixed on the basis of number of beds catered and collection area. As per the guidelines of CPCB 10,000 beds is the maximum operational capacity within a radius of 150 Km. However, the Facility was collecting (March 2007) bio-medical waste from 27,893 beds of 841 HCEs covering all the 14 districts. This was 279 per cent above the recommended capacity. The increase in the number of beds increased the quantity of waste collected. The waste collected in March 2007 averaged four MT per day which exceeded the capacity of three MT resulting in overloading. The operator tried to establish two more Facilities in Kollam district and Idukki district. But the Facilities could not be established due to political and public issues. As a result the whole waste is treated and disposed of in one centre.

3.3.16.4 Incinerator

There is no automatic feeding device in the facility and the bags were fed manually, the quantity fed depended on the quantity of waste collected per day. As per the computer controlled temperature data sheet for March 2007

primary chamber attained temperature up to 1,225°C and secondary chamber attained temperature up to 1,415°C. Loading of excess waste is the reason for the increase in temperature though the burner was programmed for automatic cut off at 900°C in the primary chamber and 1,100°C in the secondary chamber. The scrubber of outlet temperature never attained the recommended level of 70-80°C and the maximum temperature attained was 37°C. The high temperature of primary chamber may result in excessive stack emission and lower scrubber outlet temperature indicates unsaturated flue gas. Non-compliance of the operational standards prescribed in the BMW Rules may adversely affect human health and environment.

3.3.16.5 Autoclave

Bio-medical waste other than that sent for incineration is autoclaved for disinfection before disposal. The vaccum autoclave at the facility shall be operated at one of the following conditions:

Alternative	Minimum Temperature °C	Minimum pressure Kg/cm ²	Minimum residence time minute
1	121	1.1	45
2	135	2.2	30

The computer data sheet of the autoclave showed a residence time of 12 minutes only against 45 minutes required, at temperature 121°C. As the operating parameter was not met, the sterilisation carried out was not proper. No spores testing of the autoclaved waste was conducted to ensure complete killing of Bacillus Stearothermophilus spores.

3.3.17 Monitoring and Evaluation

The State Government has to constitute an Advisory Committee to advise the Government and the Prescribed Authority about matters relating to the implementation of the Rules. An advisory committee with Chairman, KSPCB as Chairman was constituted in July 1999. As of March 2007 only two meetings were conducted (1999, 2002). Though it was decided in the second meeting to convene the meeting once in three months, it was not convened thereafter.

The KSPCB had not fixed any specific norms for inspecting HCEs.

The HCEs were to constitute Waste Management Committees to monitor, review and analyse the waste management practices. However, only nine out of the 40 checked HCEs constituted such committees.

3.3.18 Annual reporting

Every occupier/operator shall submit an annual report indicating the categories and quantities of bio-medical waste handled during the previous year, to the Prescribed Authority by 31 January every year. The Prescribed Authority shall forward a consolidated report to the Central Pollution Control Board by 31 March every year.

Advisory Committee convened only two meetings since its constitution in July 1999

HCEs did not forward annual reports to KSPCB and KSPCB did not report to CPCB

The prescribed authority had forwarded two annual reports for 2001 and 2005 in October 2002 and August 2006 respectively. Annual report for 2006 is being compiled (May 2007).

The poor performance of the HCEs in submission of annual report is the reason for the delay in forwarding the annual report to CPCB. None of the 40 test checked establishments' forwarded annual report regularly to the KSPCB.

3.3.19 Conclusion

Though KSPCB was notified as statutory authority responsible to enforce the implementation of the BMW Rules, it did not prepare a comprehensive list of bio-medical waste generating institutions and take effective steps to enforce BMW Rules in all the identified HCEs. As of March 2007, only 17 *per cent* of the identified institutions were brought under the purview of the Rules. Even for HCEs which had been issued authorisation, timely renewal had not been made. KSPCB also did not take follow-up action after issue of provisional authorisation in most of the cases. As a result most of the HCEs were functioning without authorisation, in gross violation of the Rules. Only 14 *per cent* of Government HCEs had obtained authorisation as of March 2007 and regular funds were not allotted to these HCEs for proper management of bio-medical waste. It was found that even the funds allotted for creating infrastructure facilities for waste disposal were not utilised. Audit test check revealed that waste treatment and disposal facilities were either non-existent or inadequate in most of the HCEs.

Only one Common Bio-medical Waste Treatment Facility existed against the four required and it was handling waste in excess of its stated capacity leading to improper disposal of waste. Proper monitoring and evaluation mechanism did not exist at Government/Prescribed Authority/Operator level. Thus the implementation of BMW Rules in the State was very poor, as a result of the low priority assigned by Government/KSPCB in enforcing compliance with the Rules. As most of the 11,000 MTs of bio-medical waste estimated to be generated in the State annually is being disposed without proper segregation and treatment there could be disastrous consequences to the health of the people due to possible contamination of the environment by toxic and infectious waste.

3.3.20 Recommendations

- KSPCB should take urgent action to prepare an inventory of all bio-medical waste generating institutions and bring them under the purview of the Rules.
- Introducing a system of production of authorisation of KSPCB under BMW Rules by HCEs while applying for registration/renewal of registration with LSGIs should be considered by Government so as to bring all private HCEs under the Rules.

- Government should ensure availability of funds for infrastructure facility and recurring expenditure in Government sector.
- KSPCB should invoke penal provisions under Environment (Protection) Act, 1986 to ensure compliance of Rules by bio-medical waste generators.
- Sufficient number of CBWTF should be established in accordance with the guidelines issued by Central Pollution Control Board.
- Norms for inspection should be fixed to ensure regular compliance of Rules by the bio-medical waste generators.