Training Component of the Project
"Environmentally Sound Management of Medical Wastes in India"
Endeavour of GEF, UNIDO, MoEFCC and State Governments of Gujarat
Karnataka, Maharashtra, Odisha and Punjab

TRAINER'S GUIDE FOR TRAINING ON BIOMEDICAL WASTE MANAGEMENT

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Trainers' Guide for Training on Biomedical Waste Management

Acknowledgement
This document has been prepared for the United Nations Industrial Development Organization (UNIDO) on behalf of the training component of the project "Environmentally Sound Management of Medical Wastes in India" by the Department of Community Medicine, M.S. Ramaiah Medical College, Bangalore. This document has been reviewed and approved by the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India.

Contributions were provided by Suman Gadicherla and reviewed by Lalitha Krishnappa and C. Shivaram, M.S. Ramaiah Medical College, Bangalore. Contributions and inputs were also provided by the Ministry of Environment, Forest and Climate Change, the Government of India; the Central Pollution Control Board; the State Pollution Control Boards, Health and Family Welfare Department and the participating health care facilities of the five project states – Gujarat, Karnataka, Maharashtra, Odisha and Punjab – to produce this document.

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सी.के.मिश्रा
C.K.Mishra

सचिव
भारत सरकार
पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय
SECRETARY
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FOREST & CLIMATE CHANGE

FOREWORD

Government of India, Ministry of Environment, Forest and Climate Change (MOEFCC) is the nodal agency for the India's environmental and forestry policies and programmes. Guided by the mandates of sustainable development inclusive of Industrial growth, Govt. of India, signed the Stockholm Convention on POPs in 2001 and ratified it in 2006. Post ratification of the Convention, as per Article 7 of the convention, National Implementation Plan (NIP) was formulated which identified " Environmentally Sound Management of Medical Wastes" as one of the priority areas.

In compliance to the obligations to be met under Stockholm Convention and ensuring sustainable and a pollution free environment, MoEFCC in collaboration with United Nations Industrial Development Organization (UNIDO) has been implementing a pilot project entitled "Environmentally Sound Management of Medical Waste in India" in the five states of India viz. Gujarat, Maharashtra, Karnataka, Odisha and Punjab.

Amongst many other, two of the major objectives of the project includes capacity building in terms of skilled and trained medical professionals with knowledge and sensitivity towards safe handling, treatment and disposal of medical waste in an environmentally sound manner and; establishment of BAT and BEP across the domain of medical fraternity including the waste handlers and the Medical Waste Treatment Facility operators.

To achieve the above objectives, extensive trainings are being conducted at all levels of medical personnel including administrators, Doctors, Nurses, Para-medical Staff, Waste handlers and CTF operators. Trainings manuals and SOPs developed in 7 languages with pictorial representations for ready understanding is anticipated to enable even the root level workers and feebly educated class to readily understand the medical waste management protocols and practices; thereby helping in percolation of the knowledge to the lowest stratum and upshot of effective implementation of New BMW Rules, 2016.

As a part of project sub-contract, the training documents and SOPs has been developed Dept. of Community Medicines, M. S. Ramaiah Medical College in consultation with the MoEFCC, UNIDO, Central Pollution Control Board (CPCB) and the experts from Technical Working Group and Steering Committee of the project appointed by MoEFCC. These documents are first of its kind and use of these documents are recommended for a more strengthened management of BMW with community of skilled manpower capable of replicating the knowledge further down the line.

The above objectives when accomplished will involuntarily help achieving the prime commitments of a) reduction and ultimate elimination of releases of Unintentionally Produced Persistent Organic Pollutants (UP-POPs) under Stockholm Convention and b) ground level implementation of the Biomedical Waste Management Rules, 2016.

I congratulate M. S. Ramaiah Medical College for their endeavour in developing the training documents and SOPs and recommend the use of these documents for ESM of BMW.

(C. K. Mishra)

Date: 25/10/2017
Place: Delhi

इंदिरा पर्यावरण भवन, जोर बाग रोड़, नई दिल्ली-110 003, फोन : (011) 24695262, 24695265 फैक्स : (011) 24695270
INDIRA PARYAVARAN BHAWAN, JOR BAGH ROAD, NEW DELHI-110 003, TEL. :(011) 24695262, 24695265 Fax :(011) 24695270,
E-mail : secy-moef@nic.in, Website : moef.gov.in

The United Nations Industrial Development Organization (UNIDO) is mandated to promote and facilitate industrial development for poverty reduction, inclusive globalization and environmental sustainability. This is embedded in the 2030 Agenda for Sustainable Development, the transformative agenda towards the future we want, unanimously agreed upon by the leaders of 193 Member States of the United Nations in 2015. In particular, its Sustainable Development Goal (SDG) 9, calls to "build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation".

Equally, the 2013 Agenda targets good health and well-being, under SDG3 "ensure healthy lives and promote well-being for all at all ages". Amongst others, this requires access to modern health services, provided in hospitals and other health care facilities, that as a consequence of their activities, produce a variety of wastes. These wastes need to be managed properly from source, through collection and transport to final treatment and disposal, to avoid posing threats to health and wellbeing, directly, due to infectious and/or toxic nature, or, indirectly, through the unintended creation of hazardous substances from incorrect treatment, particularly burning. The Stockholm Convention on Persistent Organic Pollutants and the Minamata Convention on Mercury, multilateral environmental agreements ratified by India, amongst others apply to the management of health care waste. UNIDO therefore implements a project with support from the Global Environment Facility (GEF) to develop scalable and replicable models for environmentally sound management of health care waste for different types of health care facilities, and demonstrate these in collaboration with hospitals across five States (Gujarat, Karnataka, Maharashtra, Odisha and Punjab).

Environmentally sound management of heath care waste starts with awareness of risks and adherence to standard operating practices by medical, nursing, administrative and general staff at all levels in the institutions. The M S Ramaiha Medical College and Hospitals in Bangalore therefore developed this set of training manuals and accompanying set of Standard Operating Practices. These are fully consistent with the National Bio-Medical Waste Management Rules of 2016. The Ministry of Environment, Forests and Climate Change (MoEFCC), Ministry of Health and Family Welfare (MoHFW), Central Pollution Control Board (CPCB) and other members of the Technical Advisory Committee all contributed to the review of these manuals.

I am pleased to recommend these manuals as the basis for practical and hands-on training for all involved in the health care waste management chain. Doing so will certainly contribute to protecting health and well-being of patients, staff, visitors and community at large, whilst also protecting the environment in a cost-effective manner.

René Van Berkel, PhD
UNIDO Representative
UNIDO Regional Office in India

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List of Abbreviations

BAT	–	Best Available Technology
BEP	–	Best Environmental Practices
BMW	–	Bio Medical Waste
CBWTF	–	Common Biomedical waste treatment facility
CPCB	–	Central Pollution Control Board
DLMC	–	District Level Monitoring Committee
ESM	–	Environmentally Sound Management
ESMMWI	–	Environmentally Sound Management of Medical Wastes in India
GEF	–	Global Environment Facility
GOI	–	Government of India
HCFs	–	Health Care Facilities
HCW	–	Healthcare Waste
HCWM	–	Healthcare Waste Management
Hg	–	Mercury
HICC	–	Hospital Infection Control Committee
HIV	–	Human Immunodeficiency Virus
HWTSDF	–	Hazardous Waste Treatment Storage & Disposal Facilities
IMA	–	Indian Medical Association
MoEFCC	–	Ministry of Environment, Forest and Climate Change
MOU	–	Memorandum of Understanding
MSRMC	–	M.S.Ramaiah Medical College
NACO	–	National AIDS Control Organisation
NGO	–	Non-Governmental Organisation
NSC	–	National Steering Committee
PCC	–	Pollution Control Committee
PCDD	–	Polychlorinated dibenzo dioxins (Dioxins)
PCDF	–	Polychlorinated dibenzofurans (Furans)
PEP	–	Post Exposure Prophylaxis
POPs	–	Persistent Organic Pollutants
PPE	–	Personal Protective Equipment
PPP	–	Public Private Partnership
SOP	–	Standard Operating Procedure
SNO	–	State Nodal Officer
SPCB	–	State Pollution Control Board
TNA	–	Training Need Assessment
ToTs	–	Training of Trainers
UNIDO	–	United Nations Industrial Development Organization
WHO	–	World Health Organization

Introduction

About the ESMMWI project:

India being signatory to Stockholm convention in 2002, measures to reduce POPs need to be taken by the Government of India. One of the sources of unintentional production of POPs is biomedical waste and in this context, project "Environmentally Sound Management of Medical Wastes in India" (ESMMWI) was approved by Global Environment Facility (GEF) for which United Nations Industrial Development Organization (UNIDO) is the implementing agency; and Ministry of Environment Forest & Climate Change, Government of India is the national executing agency. This project aims at reducing POPs by instituting sound biomedical waste management.

This ESMMWI project will promote country-wide adoption of the best available technique (BAT)/ best environmental practices (BEP) in health care facilities of widely differing complexity and size, as well as in the evolving biomedical waste management infrastructure and industry in a manner that protects human health and reduce adverse environmental health impacts.

The overall project objective will be achieved by covering but not limited to the following approaches: [1]

- Segregation, decontamination and compaction of the medical wastes and thus reducing its volume to be disposed off by introducing alternative technologies
- Enhancing and optimizing incineration technologies
- Awareness generation and dissemination of know-how
- Incorporation of management systems
- Innovation and adoption of appropriate and affordable technologies and techniques
- Introduction of participatory funding systems and enhancement of relevant existing laws and regulations

The project will create a unique opportunity for the healthcare providers, hospitals, health departments, State Pollution Control Board (SPCB) and CBWTFs operators respectively to come together on a single platform to create an enabling health care environment.

The PPP model envisaged at the district level will involve all concerned stakeholders and inter-sectoral coordination where the community members, health care providers, state government departments, monitoring and evaluation entities will come together with well-defined roles and responsibilities for creation of a demonstration/model district of integrated biomedical waste

management model. There will be one such model district in each of the 5 participating states (Gujarat, Maharashtra, Karnataka, Odisha and Punjab), so as to achieve health and environmental benefits and replicate the outputs and lessons learned in these regions.

In these model districts, the project will identify possible options for sound management of biomedical waste by introducing non-burn alternative technologies or upgrading the existing incinerators so as to implement BAT/ BEP.

To familiarize health professionals with new and alternative technologies and to adopt changes in management, capacity building will be carried out for healthcare personnel. Awareness generation in the community, infrastructural and equipment support for HCFs and CBWTFs will be carried out.

About the training component of the ESMMWI Project:

The Training component of the project "Environmentally Sound Management of Medical Wastes in India" has been awarded to M.S.Ramaiah Medical College, Bangalore.

The aim of the training component of the project is:

- Enhance the existing institutional and technical capacity in identified 28 health-care facilities in each of the 5 selected states.
- Enhance the effectiveness and efficiency of segregation of biomedical wastes at source which reduces the volume of biomedical waste and hence, improves the management of waste at CBWTF.
- Develop standard protocols for biomedical waste movement in healthcare facilities from source to collection points established.
- Establish an integrated system for biomedical waste management and disposal.

The major components of the project is:

- Training Need Assessment
- Development of Training Documents, Guidance Manuals and Awareness Campaign Materials on Biomedical Waste Management
- Implementation of Training Programmes on Biomedical Waste Management

About the training Manuals and SOPs

The following documents have been developed to aid in the training process

i. Trainer's guide – provide guidelines for conducting one-day training on issues of environmentally sound management of Biomedical waste. It would help facilitators communicate the information present in the **Training Manual for Doctors, Nurses and Waste handlers on Biomedical Waste Management** using interactive training techniques.

ii. Information handbook on BMWM for Administrators- deals with the administrative aspects of biomedical waste management, for example: steps to set up a Biomedical waste management system in a HCF, policy issues, monitoring and issues regarding occupational safety, role and responsibilities of personnel involved in Biomedical waste management.

iii. Training Manual on BMWM for Doctors and Nurses deals with processes involved in waste management such as segregation, disinfection, transportation, documentation and methods of final disposal. It gives an overview of the processes involved in waste management in a health care setting.

iv. Training Manual for waste handlers deals with practical aspects and has pictorial representation of the processes. This would aid in the training of waste handlers who may have lower level of literacy

v. Standard Operating Procedures - Biomedical waste management has to be process dependent and not person dependent. The Standard Operating Procedure (SOP) will help in uniform implementation of the processes for Biomedical waste Management Rules, 2016. SOPs represent the action plan for achieving the policy.

Salient Features of BMWM Rules

1. Introduction:

Waste management rules in India are founded on the principles of "sustainable development", "precaution" and "polluter pays". Various rules were framed under the broader umbrella of "Environment Protection Act' by Ministry of Environment and Forests (MoEFCC) in 1986[2].

2. Key principles governing safe management of BMW: [3,4,5]

2a. "Sustainable development" is the organizing principle for sustaining finite resources necessary to provide for the needs of future generations of life on the planet

2b. The "Polluter Pays" Principle– Section 9 (3) of the Act embodies the "Polluter Pays Principle" which states that any expense which has been incurred to restore the environment to its natural state shall be paid by the person who is responsible for such degradation. "Polluter must bear the cost for damages and harm caused to environment by his own acts.

2c. The "Precautionary principle" – states that when the magnitude of a particular risk is uncertain, it should be assumed that this risk is significant and all measures should be taken to protect health and to avoid environmental degradation and hazards.

2d. The "**Duty of Care Principle**" refers that it is an obligation for any individual to follow utmost care while performing any tasks that could foreseeably harm others. It stipulates that any person handling or managing hazardous substances or related equipment is ethically responsible for using the utmost care in that task.

2e. The "**Proximity Principle**" recommends that treatment and disposal of hazardous waste take place at the closest possible location to its source in order to minimize the risks involved during its transportation

2f. The **"Prior Informed Consent Principle**" as embodied in various international treaties requires that affected communities and other stakeholders be apprised of the hazards and risks, and that their consent be obtained. In the context of BMW, the principle could apply to the transport of biomedical waste and the siting and operation of biomedical waste-treatment and disposal facilities.

3. Important Milestones

3a. International laws:

i. **Basel Convention**- Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989[6]
ii. **Stockholm Convention**- Stockholm Convention on Persistent Organic Pollutants Stockholm, 2001[7]
iii. **Minamata Convention**- on Mercury, Minamata 2013[8]

3b. Indian laws :

i. Environment (Protection) Act, 1986
ii. Batteries (Management and Handling) Rules, 2001
iii. Plastic Waste Management Rules, 2016
iv. E-waste (Management) Rules, 2016
v. Biomedical Waste Management Rules, 2016
vi. Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016
vii. Solid Waste Management Rules, 2016
viii. Bio-Medical Waste Management (Amendment) Rules, 2018

4. Biomedical Waste Management Rules, 2016 and BMWM (Amendment) Rules 2018[2]

4a. Introduction: Under the Environment (Protection) Act, 1986, Biomedical waste Management Rules, 2016 came into force from 28th March 2016 in superseding of the earlier Biomedical Waste (Management and Handling) Rules, 1998. Amendments to BMWM Rules 2016 was notified via Gazette notification on 16th March 2018 as Biomedical Waste Management (Amendments) Rules, 2018.

4b. Application: The rules apply to all persons who generate, collect, receive, store, transport, treat, dispose or handle biomedical waste in any form including

• Hospitals • Nursing homes • Clinics • Dispensaries • AYUSH Hospitals • Veterinary institutions/ Hospitals • Animal houses	• Pathological laboratories • Blood banks • Clinical establishment research or educational institutions • Forensic laboratories • Research labs	• Health camps • Medical/surgical/OBG camps • Vaccination camps • Blood donation camps • First aid rooms of schools

4c. BMWM Rules, 2016 shall not apply to [2]

Sl. No.	Type of waste	Covered under
i.	Radioactive waste	**Atomic Energy At, 1962 (33 of 1962)**
ii.	Hazardous Chemicals	**Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989**
iii.	Solid Wastes	**Solid waste Management Rules, 2016**
iv.	The Lead Acid Batteries	**Batteries (Management and Handling) Rules, 2001**
v.	Hazardous Wastes	**Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2016**
vi.	E- Waste	**E- Waste (Management and Handling Rules, 2016** made under the act
vii.	Hazardous Microorganisms Genetically Engineered Microorganisms and Cells	**Manufacture, Use, Import, Export and Storage of Hazardous Microorganism, Genetically Engineered Microorganisms or Cells Rules, 1989**

5. Important definitions[2]:

5a. "**act**" means the Environment (Protection) Act, 1986 (29 of 1986)

5b. "**animal house**" means a place where animals are reared or kept for the purpose of experiments or testing; "**authorization**" means permission granted by the prescribed authority for the generation, collection, reception, storage, transportation, treatment, processing, disposal or any other form of handling of Biomedical waste in accordance with these rules and guidelines issued by the Central Government or CPCB as the case may be;

5c. "**authorized person**" means an occupier or operator authorized by the prescribed authority to generate, collect, receive, store, transport, treat, process, dispose or handle Biomedical waste in accordance with these rules and the guidelines issued by the Central Government or the Central Pollution Control Board, as the case may be

5d. "**biological**" means any preparation made from organisms or micro-organisms or product of metabolism and biochemical reactions intended for use in the diagnosis, immunization or the treatment of human beings or animals or in research activities pertaining thereto;

5e. "**Biomedical waste**" means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or research activities pertaining thereto or in the production or testing of biological or in health camps, including the categories mentioned in Schedule I appended to the rules

5f. "**Biomedical waste treatment and disposal facility**" means any facility wherein treatment, disposal of Biomedical waste or processes incidental to such treatment and disposal is carried out, and includes common Biomedical waste treatment facilities

5g. "**Form**" means the Form appended to these rules

5h. "**handling**" in relation to Biomedical waste includes the generation, sorting, segregation, collection, use, storage, packaging, loading, transportation, unloading, processing, treatment, destruction, conversion, or offering for sale, transfer, disposal of such waste

5i. "**health care facility**" means a place where diagnosis, treatment or immunization of human beings or animals is provided irrespective of type and size of health treatment system, and research activity pertaining thereto;

5j. "**major accident**" means accident occurring while handling of Biomedical waste having potential to affect large masses of public and includes toppling of the truck carrying Biomedical waste, accidental release of Biomedical waste in any water body but exclude accidents like needle prick injuries, mercury spills

5k. "**management**" includes all steps required to ensure that bio- medical waste is managed in such a manner as to protect health and environment against any adverse effects due to handling of such waste;

5l. "**occupier**" means a person having administrative control over the institution and the premises generating biomedical waste, which includes a hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank, health care facility and clinical establishment, irrespective of their system of medicine and by whatever name they are called

5m. "**operator of a common Biomedical waste treatment facility**" means a person who owns or controls a Common Biomedical Waste Treatment Facility (CBMWTF) for the collection, reception, storage, transport, treatment, disposal or any other form of handling of Biomedical waste

5n. "**prescribed authority**" means the State Pollution Control Board in respect of a State and Pollution Control Committees in respect of an Union territory;

5o. "**Schedule**" means the Schedule appended to these rules.

6. **Duties of the Occupier:** [2] It shall be the duty of every occupier to-

a. take all necessary steps **to ensure that Biomedical waste is handled without any adverse effect to human health and the environment** and in accordance with these rules;

b. make a provision within the **premises for a safe, ventilated and secured location for storage of segregated biomedical waste i**n colored bags or containers in the manner as specified in Schedule I

c. **pre-treat the laboratory waste, microbiological waste, blood samples and blood bags** through disinfection or sterilization on-site in the manner as prescribed by the WHO guidelines on Safe management of wastes from health care activities and WHO Blue Book, 2014 and then sent to the Common bio-medical waste treatment facility for final disposal;

d. **phase out use of chlorinated plastic bags (excluding blood bags) and gloves** within **two years** by **27th Match 2019**;

e. **dispose of solid waste** other than Biomedical waste in accordance with the provisions of respective waste management rules made under the relevant laws and amended from time to time;

f. not to give treated Biomedical waste with municipal solid waste;

g. provide **training to all its health care workers** and others, involved in handling of bio medical waste at the time of induction and thereafter at least once every year and the details of training programmes conducted, number of personnel trained and number of personnel not undergone any training shall be provided in the Annual Report;

h. **immunize all its health care workers** and others, involved in handling of Biomedical waste for protection against diseases including Hepatitis B and Tetanus that are likely to be transmitted by handling of Biomedical waste, in the manner as prescribed in the National Immunization Policy or the guidelines of the Ministry of Health and Family Welfare issued from time to time;

i. **establish a Bar- Code System** for bags or containers containing Biomedical waste to be sent out of the premises or for the further treatment and disposal in accordance with the guidelines issued by the Central Pollution Control Board by 27th March, 2019;

j. ensure **segregation of liquid chemical waste at source** and ensure pre-treatment or neutralization prior to mixing with other effluent generated from health care facilities;

k. ensure **treatment and disposal of liquid waste** in accordance with the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974);

l. ensure **occupational safety of all its health care workers** and others involved in handling of Biomedical waste by providing appropriate and adequate personal protective equipment;

m. **conduct health check up at the time of induction and at least once** in a year for all its health care workers and others involved in handling of bio- medical waste and maintain the records for the same;

n. maintain and update on day to day basis the Biomedical waste management register and display the monthly record on its website according to the Biomedical waste generated in terms of category and color coding as specified in Schedule I;

o. **report major accidents** including accidents caused by fire hazards, blasts during handling of Biomedical waste and the remedial action taken and the records relevant thereto, (including nil report) in Form I to the prescribed authority and also along with the annual report;

p. all the health care facilities (any number of beds) shall make available the annual report on its web-site within a period of two years from the date of publication of Bio-Medical Waste Management (Amendment) Rules, 2018;

q. inform the prescribed authority immediately in case the operator of a facility does not collect the Biomedical waste within the intended time or as per the agreed time;

r. establish a system to review and monitor the activities related to Biomedical waste management, either through an existing committee or by forming a new committee and the Committee shall meet once in every six months with documentation of the minutes of meeting. HCFS with less than 30 bedded hospitals to designate a person to monitor and review the activities of BMWM and submit an annual report.

7. Salient features of BMW Management Rules, 2016 and amendments of 2018 include the following[9]:

a. The **ambit of the rules** has been expanded to include camps such as vaccination camps, blood donation camps, surgical camps or any other healthcare activity

b. **Phase out use of chlorinated plastic bags** (excluding blood bags) and gloves within two years by **27th Match 2019**

c. **Pre-treat the laboratory waste, microbiological waste, blood samples and blood bags** through disinfection or sterilization on-site in the manner as prescribed by the WHO guidelines on Safe management of wastes from health care activities and WHO Blue

Book, 2014 and then sent to the Common bio-medical waste treatment facility for final disposal

d. Provide **training** to all its health care workers and **immunize** all health workers regularly

e. **Establish a Bar- Code System** for bags or containers containing Biomedical waste to be sent out of the premises or for the further treatment and disposal in accordance with the guidelines issued by the Central Pollution Control Board by 27th March, 2019

f. Report major accidents

g. The new rules prescribe **more stringent standards in existing incinerators for incinerator to reduce the emission of pollutants** in environment

h. **Inclusion of emissions limits for Dioxin and furans**

i. **Achieve the standards for retention time in secondary chamber and Dioxin and Furans within two years**

j. Biomedical waste has been classified in to **4 categories instead 10** to improve the segregation of waste at source

k. **Procedure to get authorization simplified**. Automatic authorization for bedded hospitals. The validity of authorization synchronized with validity of consent orders for bedded HCFs. **One time authorization for non-bedded HCFs**

l. State Government to provide land for setting up common Biomedical waste treatment and disposal facility

m. **No occupier shall establish on-site treatment and disposal facility**, if a service of `common biomedical waste treatment facility is available at a **distance of seventy-five kilometer**.

n. Operator of a common biomedical waste treatment and disposal facility to ensure the timely collection of biomedical waste from the HCFs and assist the HCFs in conduct of training.

8. Major provisions in the Bio- Medical Waste Management Rules, 2016 and its likely implication [10]

BMW (Management and Handling) Rules, 1998 & revised in 2011	Bio- Medical Waste Management Rules, 2016 and Amendments, 2018	Reasons and likely implications
Title		
Bio- Medical Waste (Management and Handling) Rules, 2011	Bio- Medical Waste Management Rules, 2016. Biomedical Waste Management (Amendment) Rules 2018	The word 'Management' includes Handling.
Application		
These rules apply to all persons who generate, collect, receive, store, transport, treat, dispose, or handle biomedical waste in any form.	These rules shall apply to all persons who generate, collect, receive, store, transport, treat, dispose, or handle bio-medical waste in any form and **shall not apply to:** - Radioactive waste - Municipal solid waste - Lead acid batteries - Hazardous waste - E-waste - Hazardous microorganisms	Modified to bring more clarity in the application. Clarified that vaccination camps, blood donation camps, surgical camps or any other healthcare activity undertaken outside the healthcare facility, will be covered.
Duties of the Health care facilities including CBWTF		
Every occupier of an institution generating bio-medical waste which includes a hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank to take all steps to ensure that	**Additions**: Health care facilities (HCF) shall make a provision within the premises for a safe, ventilated and secured location for storage of segregated biomedical waste	To ensure that there shall be no secondary handling, pilferage of recyclables or inadvertent scattering or spillage by animals and the BMW from such place or premises can be directly transported in to the CBWTF

BMW (Management and Handling) Rules, 1998 & revised in 2011	Bio- Medical Waste Management Rules, 2016 and Amendments, 2018	Reasons and likely implications
such waste is handled without any adverse effect to human health and the environment.	Pre-treat the laboratory waste, microbiological waste, blood samples and blood bags through disinfection or sterilization on-site in the manner as prescribed by the WHO guidelines on Safe management of wastes from health care activities and WHO Blue Book, 2014 and then sent to the Common bio-medical waste treatment facility for final disposal;	This is to prevent the possible microbial contamination.
	Phase out use of chlorinated plastic bags (excluding blood bags) and gloves within two years by 27th Match 2019	Will eliminate the emission of dioxin and furans from burning of such wastes.
	Provide training to all its health care workers and others involved in handling of BMW at the time of induction and thereafter at least once every year	Will improve the management of BMW including collection, segregation.
	Immunise all its health care workers and others involved in handling of BMW for protection against diseases including Hepatitis B and Tetanus	To protect the health of workers
	Establish a Bar- Code System for bags or containers containing Biomedical waste to be sent out of the premises or for the further treatment and disposal in accordance with the guidelines issued by the Central Pollution Control	Will improve the segregation, transportation and disposal system. Also will eliminate pilferage on the way of BMW to disposal facility.

BMW (Management and Handling) Rules, 1998 & revised in 2011	Bio- Medical Waste Management Rules, 2016 and Amendments, 2018	Reasons and likely implications
	Board by 27th March, 2019	
	Report all major accidents including accidents caused by fire hazards, blasts during handling of BMW and the remedial action taken to SPCB	Help to monitor and improve the management
	Existing incinerators shall achieve the standards for retention time in secondary chamber and Dioxin and Furans within two years from the date of this notification	Will improve the environment in the vicinity of treatment facility.
Duties of the operator of a CBWTF		
Nil	Same as the duties of HCFs and additionally they shall ensure timely collection of bio-medical waste from the HCFs, assist the HCFs in conduct of training	Specific responsibility on the operator of a common bio-medical waste treatment and disposal facility will be make them clear to their duties
Treatment and disposal		
Every HCFs, where required, shall set requisite bio-medical waste treatment facilities like incinerator, autoclave, microwave system for the treatment of waste, or, ensure requisite	No occupier shall establish on-site treatment and disposal facility, if a service of CBWTF is available within a distance of **seventy-five kilometer**.	This is to make the installation and operation of CBWTF a viable one.
Segregation		
Bio-medical waste classified in to 10 categories based on treatment options.	Bio-medical waste classified in to 4 categories based on treatment options.	Will improve the segregation of waste at source channelize proper treatment and disposal
Storage		
No untreated bio-medical waste shall be kept stored	Untreated human anatomical waste, animal anatomical	Will eliminate obtaining permission within 48 hours

BMW (Management and Handling) Rules, 1998 & revised in 2011	Bio- Medical Waste Management Rules, 2016 and Amendments, 2018	Reasons and likely implications
beyond a period of 48 hours. Provided that if for any reason it becomes necessary to store the waste beyond such period, the authorised person must take permission of the prescribed authority and take measures to ensure that the waste does not adversely affect human health and the environment.	waste, soiled waste and, biotechnology waste shall not be stored beyond a period of 48 hours. In case for any reason it becomes necessary to store such waste beyond such a period, the occupier shall take appropriate measures to ensure that the waste does not adversely affect human health and the environment and inform the SPCB along with the reasons.	which is not practically feasible.
Authorisation		
Hospitals treating 1000 or more patients per month to obtain authorization from SPCBs/PCCs	One time Authorisation for Non-bedded HCFs. The validity of authorization shall be synchronised with validity of consent orders for Bedded HCFs	HCFs can make application along with consent and hence getting authorisation will not be additional burden for HCFs. and operator of treatment facility. It will also help to SPCB in making single inspection / monitoring to consider both the consent and authorisation.
Advisory committee		
The Government of every State/Union Territory shall constitute an advisory committee with the experts in the field of medical and health, animal husbandry and veterinary sciences, environmental management, municipal administration, and any other related department or organisation including non-	No change in the concept except additional members. Shall meet once in six months.	Advisory Committee has strengthened suitably with additional members.

BMW (Management and Handling) Rules, 1998 & revised in 2011	Bio- Medical Waste Management Rules, 2016 and Amendments, 2018	Reasons and likely implications
governmental organisations. Ministry of Defence shall constitute, an Advisory Committee under Additional Director General of Armed Forces Medical Services with representative of Ministry of Defence, MoEFCC, for HCFs under Armed forces under the Ministry of Defence.		
Standards for emission from incinerators		
SPM in the Incinerator's emission- 150 mg/Nm3	50 mg/Nm3	The proposed stringent standards for emission from Incinerator (reduction of permissible limit for particulate matter, introduction of standards for Dioxin and Furans and increasing the residence time in the Incinerator Chambers) will improve the operation of incinerator and reduce the emission of pollutants in environment.
Residence Time in Secondary chamber of incinerators is 1 second	2 seconds	
Nil - Standards for Dioxin and furans	Standards for Dioxin and furans prescribed.	
Site for Common bio-medical waste treatment and disposal facility		
--Nil..	The department dealing the allocation of land shall be responsible for providing suitable site for setting up of CBWTF in the State Government	Getting suitable land is the problem in many States for establishment of CBWTF. Making the responsibility of state Government to provide land would eliminate the issue of getting land for the CBWTF.
Monitoring of implementation		
..Nil..	MOEFCC shall review the implementation of the rules in the country once in a year	The monitoring of the implementation was earlier only with SPCBs and review of

BMW (Management and Handling) Rules, 1998 & revised in 2011	Bio- Medical Waste Management Rules, 2016 and Amendments, 2018	Reasons and likely implications
	through the State Health Secretaries and CPCB,SPCBs State Government shall constitute District Level Monitoring Committee (DLMC) under the chairmanship of District Collector or District Magistrate or Deputy Commissioner or Additional District Magistrate to monitor the compliance of the provisions of these rules in the HCF. DLMC shall submit its report once in six months to the State Advisory Committee, SPCB for taking further necessary action. DLMC shall comprise of District Medical Officer or District Health Officer, representatives from SPCB, Public Health Engineering Department, local bodies or municipal corporation, IMA, CBWTF, registered NGO working in the field of BMW management. District Medical Officer shall be the Member Secretary of this Committee.	implementation through the District Committee is likely to improve the implementations.

Source: Major changes in BMWM rules 2016. Available at http://pibphoto.nic.in/documents/rlink/2016/mar/p201632701.pdf accessed on 25th Dec 2017

9. Schedule [2]

Schedule	Details
Schedule I	Biomedical waste categories and their segregation, collection, treatment, processing and disposal options
Schedule II	1. Standards for incinerators a. Operating standards b. Emission standards c. Stack Height
	2. Operating and Emission standards for disposal by Plasma pyrolysis or Gasification: a. Operating standards b. Air emission standards and air pollution control measures c. Disposal of ash vitrified materials
	3. Standards for autoclaving of biomedical waste
	4. Standards for Microwaving
	5. Standards for Deep Burial
	6. Standards for efficacy of Chemical Disinfection
	7. Standards for dry heat sterilization
	8. Standards for Liquid waste
Schedule III	List of Prescribed Authorities and the corresponding duties
Schedule IV Part A	Label for biomedical waste containers or bags
Schedule IV Part B	Label for transporting biomedical waste bags or containers

According to BMWM Rules 2016, under the duty of occupier rule 4(g), report of training of all the personnel involved in bio medical waste management is necessary. The details of the personnel trained has to be reported to the respective Pollution Control Boards.

Objectives of Training

The main objective of training is to strengthen the knowledge, attitude and skill of the personnel handling Biomedical waste management (BMWM) in various capacities as administrators, doctors, nurses & waste handlers in health care facilities across the five identified states (Gujarat, Karnataka, Maharashtra, Odisha and Punjab) of the country.

The following objectives should be kept in mind for training of various personnel involved in BMW management:

1. **Administrators, waste mangers and CBWTF managers**
    - Understand the importance of Environmentally Sound Management of BMW
    - Have an overview of the BMWM Rules, 2016
    - Comprehend processes involved in BMWM
    - Identify gaps in BMWM in their respective health care facilities
    - Prepare implementation plans for improvising the system of BMWM in their respective HCFs and develop as a model HCF
    - Prepare plans for conduct of training in their respective health care facilities of all the personnel involved in management of bio medical waste.
    - Set up/ improvise BMWM systems in their respective HCF
    - Identify and delineate role of each of the personnel involved in BMWM
    - Develop monitoring plans in their respective health care facilities

2. **Health Care professionals**
    - Understand the importance of Sound management of Biomedical Waste.
    - Have an overview of the BMWM Rules, 2016
    - Prepare plans for conduct of training in their respective health care facilities of all the personnel involved in management of bio medical waste.
    - Train personnel in their respective health care facilities.
    - Set up/ improvise biomedical waste management systems in their respective HCFs
    - Develop monitoring plans in their respective HCFs

3. **Waste handlers**
    - Understand the importance of using PPE and immunization to protect themselves.
    - Know about segregation, storage and transportation.
    - Comprehend the processes involved in BMWM

Overview of Training

Duration of training	One day
Number of participants	30 – 35 maximum of 40 participants
Background of the trainers/ facilitators	Preferably Doctors / Nurses/ waste management officer who have undergone training in Bio medical waste management
Facilitators	Two locally identified facilitators, one from MSRMC, Assistant State project officer and one from state pollution control board.
Venue	At health care facility

One day Training Schedule (Sample Schedule)

One day training schedule in selected Health care facility

Time	Duration	Session	Method
9.00 am – 9.30 am	30 minutes	Registration	
9.30 am – 10.00 am	30 minutes	Inauguration	
10. 00 am– 10.30 am	30 minutes	Pre-test About the project, Objectives and expected outcomes	Presentation
10.30 am – 10.45 am	15 minutes	Ice breaking session, participants view and expectations	Brainstorming, discussion
10.45 am -11.00am	**15 minutes**	**Tea break**	
11.00 am – 11.15 am	15 minutes	Situation analysis of BMW in the HCF	Presentation
11.15 am – 11.45 pm	30 minutes	Introduction to HCWM – importance, definition, types of waste, life cycle approach	Discussion, brainstorming
11.45 am – 12.15 pm	30 minutes	BMWM Rules, 2016	Discussion
12.15pm – 1.00pm	45 minutes	Segregation of waste and containment	Segregation , discussion
		Exercise on segregation	Demonstration & Exercise
01.00 -2.00 pm	**60 minutes**	**Lunch**	
02.00- 2.30 pm	30 minutes	Pre-treatment by autoclaving/microwaving or chemical disinfection & chemical liquid waste management	Demonstration & video, Interactive discussion

02.30 pm – 03.00 pm	30 minutes	• Spill management
		  • Blood &Body fluid
		  • Mercury
		  • Chemical
		  • Cytotoxic
			Interactive Discussion
			Video film

03.00 pm – 03.30 pm	30 minutes	Final treatment options	Interactive session
03.30 pm – 03.45 pm	15 minutes	Tea Break	
03.45 pm – 04.15 pm	30 minutes	• Occupational safety	Demonstration & Discussion
04.15 pm – 04.45 pm	30 minutes	• Monitoring & Evaluation; Documentation • Action plan *	Group discussion
4.45- 5 PM	15 minutes	Valedictory & Certificate distribution	

Note: Any additional issues can be discussed and incorporated based on the need
**Action plan can be discussed based on need of the Health care facility*

Training of Trainers (TOT) Schedule

Training of Trainers (TOT) workshop (Two days)

Day 1

Time	Duration	Session	Method
9.00 – 9.30 am	30 minutes	Registration	
9.30- 10.00 am	30 minutes	Inauguration	
10.00 – 10.30 am	30 minutes	Pre-test , About the project, Objectives and expected outcomes	Presentation
10.30 am – 10.45 am	15 minutes	Ice breaking session, participants view and expectations	Brainstorming, discussion
10.45 am -11.00am	**15 minutes**	**Tea break**	
11.00 am – 11.15 am	15 minutes	Situation analysis of BMW in the HCF	Presentation
11.15 am – 11.45 pm	30 minutes	Introduction to HCWM – importance, definition, types of waste, life cycle approach	Discussion, brainstorming
11.45 am – 12.15 pm	30 minutes	BMWM Rules, 2016	Discussion
12.15pm – 1.00pm	45 minutes	Segregation of waste and containment	Segregation , discussion
		Exercise on segregation	Demonstration & Exercise
01.00 -2.00 pm	**60 minutes**	**LUNCH**	
02.00- 2.30 pm	30 minutes	Pre-treatment by autoclaving/microwaving or chemical disinfection & chemical liquid waste management	Demonstration & video, Interactive discussion

02.30 pm – 03.00 pm	30 minutes	• Spill management
		  • Blood &Body fluid
		  • Mercury
		  • Chemical
		  • Cytotoxic
			Interactive Discussion
			Video film

03.00 pm – 03.30 pm	30 minutes	Final treatment options	Interactive session
03.30 pm – 03.45 pm	15 minutes	Tea Break	
03.45 pm – 04.15 pm	30 minutes	• Occupational safety	Demonstration & Discussion
04.15 pm – 04.45 pm	30 minutes	• Preparation for the field visit and evaluation of the day	Discussion

Day 2

Time	Duration	Session	Method
08.30 am – 01.00 pm	4 hours and 30 minutes	Visit to model facility- HCF and CBWTF	Demonstration, Discussion
01.00 -2.00 pm	**LUNCH**		
02.00- 2.30 pm	30 minutes	Debriefing, monitoring and evaluation	Group discussion
02.30 pm – 03.00 pm	30 minutes	Action plan discussion	Group work
03.00 pm – 03.15 pm	**Tea break**		
03.15 pm – 03.45 pm	30 minutes	Presentation of action plan, training logistics	Group work presentation
03.45 pm – 04.00 pm	15 minutes	Post-test, Participants feedback	Brainstorming
04.00 pm – 04.30 pm	30 minutes	Valedictory (Certificate distribution, any 2 participants speak) in additional to other plans.	Distribution of certificates and conclusion

Training of Waste Handlers

Points to consider when imparting training to waste handlers:

- Training, preferably conducted in the local vernacular language
- Less of didactic and more of interaction and demonstration
- More of AV aids to be used . Ex Video film, flip charts, posters and demonstrations
- Importance of PPE has to be emphasized
- Adult learning principles need to be applied when conducting training
- It is suggested that duration of training for waste handlers be restricted to half a day session
- Waste handlers need to be trained, on issues of segregation, disinfection, transportation and use of PPE
- Doctors/ nurses/ waste management officer can train the waste handlers in the local vernacular language
- Training and retraining of waste handlers is necessary as the turnover rate of waste handlers is high
- For further details refer Waste Handlers Manual

Roles and Responsibilities of a Facilitator

Guidance [11,12]

- State the training objectives of each session in order to initiate discussion
- Sessions to be made as interactive as possible
- Clarify any doubts
- Be available and ready to help
- Provide examples from own experience
- Possess good communication skills speak clearly and modulate voice
- Ask a participant to summarize at the end of each session, fill in the gaps if need be.
- Use different methodology of facilitation depending on audience (Example more pictorial and participatory for waste handlers, interactive sessions for doctors and nurses etc.)

Motivation [11,12]

- Compliment the participants for their active involvement
- Ensure participation of each of the participants in the training
- Keep the group on track
- Offer constructive criticism
- Ensure an atmosphere that is conducive for learning , open and non-judgmental
- Encourage suggestions from participants
- Obtain feedback from participants so that further session can be improved upon
- Ask one of the participant to recapitulate the learnings at the end of the sessions.

Organizational [11,12]

- Ensure that venue is comfortable and quiet
- Ensure an atmosphere that is conducive for learning , open and non-judgmental
- Ensure that all participants have access to all materials
- Record conclusions and agreements
- Set goals that are achievable

Preparation for Training

ASPO will coordinate with the HCF for the finalization of date, venue and other logistics arrangements. Preferably a meeting should be conducted prior to the training to delineate and discuss content of presentation with the facilitators. Training programme would be smooth and uneventful if the confirmations regarding date, participants, facilitators, venue, and other logistics are sought few days prior to the programme. The below given checklist would aid in the preparation for the training programme.

Checklist for state– UNIDO Training at respective HCF

Sl. No.	Checklist	Remarks
1.	Confirm date, Time and Venue	
2.	List of invitees	
3.	List of chief guests and their biodata	
4.	Registration forms–Print	
5.	Lighting lamp or other activity signifying inauguration	
6.	Bouquets/ Mementoes	
7.	Banners– Print	
8.	AV Aids- (Laptop, LCD projector with white screen)	
9.	Files, note pads, pens, Sketch pens, Marker Pens	
10.	Attendance form– print	
11.	Resource persons- List, Invitation, TA/DA	
12.	Invite HCFs/ CBWTF	
13.	Identify HCF for demonstration	
14.	Identify CBWTF (model district) for visit	
15.	List of Participants and invitation	
16.	Food and refreshments	
17.	Certificates for participants & resource persons	
18.	Rapporteur	
19.	Pre & post- test forms printouts	
20.	Reporting formats	
21.	HONOs – Stay and transportation	
22.	Vouchers and bills	
23.	Demonstration at venue- Colour coded bins & Demo kits for segregation exercise	

Micro plan for each session of training programme

Planning for each of the sessions: (Time may be modified according to the need of the resource person)

Time	Activity/ Topic	Methodology and steps	Materials
30 min	Registration	• Participants to fill the registration format • Distribute any material / handout • Make note of nominated participants who have not attended	Registration format
30 min	Inauguration	• Ensure the dignitaries are on time prepare a schedule for inauguration	Mementoes, Bouquets, may be Culture specific based on the state

Time	Activity/ Topic	Objective	Methodology	Materials
20min	Pretest	To test the knowledge of the participants before the training	• Distribute questionnaire to participants • Plot percentage of correct answers • Identify weak areas with questions with < 50 % correct answers	Pre test forms
15 min	Ice breaking session	To get to know the participants better	Introduction of all the participants and facilitators.	
10 min	About the project, its objectives and expected outcomes	To appraise the participants • Regarding expected outcomes of the training programme • Regarding objectives of the project	• Brief presentation of objectives and activities under the project • Power point presentation for the same to be ready	PPT for the same
15 min	Situation analysis of BMW in the selected HCFs of the state	To appraise the participants of the present practices of health care waste management in their respective hospitals	• A presentation of the situation analysis of the selected HCF to be made by the master trainer/ administrator of the hospital. • The presentation preferably must highlight	PPT presentation

Time	Activity/ Topic	Objective	Methodology	Materials
			the current practices of segregation, disinfection, management of sharps and any other best practices that are being followed in any of the 28 HCFs of the respective states. The final disposal mechanism also can be highlighted. Special mention of HCFs where CBWTF are not available.	
15 min	**Tea Break**			
5 min	Introduction to Bio Medical Waste management	To create awareness regarding advantages of sound management of Bio Medical waste	Impact on health and environment due to improper waste management.	By interaction with the participants
5min	Definition	To discuss definitions of commonly used terms	By interaction with participants, discuss definitions of commonly used terms such as Definitions of: Waste, bio medical waste, occupier, HCF, autoclave, microwave, disinfection, segregation, CBWTF etc.	Presentation PPT
10 min	Life cycle approach	To appraise participants regarding the life cycle approach of BMWM	Discuss Life cycle approach with examples	Presentation
30 min	BMWM Rules, 2016	Objective of the session: At the end of the session it is expected that participants would be aware of the new rules	• Interactive discussion on changes suggested in the new rules	PPT
10 min	Segregation and containment of waste	To discuss the importance of segregation and containment practices as per BMWM Rules, 2016	• Discuss the importance of segregation, prerequisites for segregation and containment • Discuss color coding	Interactive discussion with the help of PPT
15min	Exercise on Segregation	To demonstrate segregation in accordance with	Divide participants into 3- 4 groups **Each participant is given one**	Segregation sets and color coded bins

Time	Activity/ Topic	Objective	Methodology	Materials
		BMWM Rules,2016	**item to be put in the correct bin. Should be done without discussion.** **Discussion on segregation to be done after every 6 items are segregated**	
10 min	Disinfection	To discuss role of pre-treatment by autoclaving/microwaving and chemical disinfection. in Bio Medical waste management	By interaction with the participants, • Discuss the importance of pre-treatment by autoclaving/microwaving and chemical disinfection, • Difference between disinfection and sterilization, principles of chemical disinfection • As per rules, the category of waste that requires pretreatment by autoclaving/ microwaving and chemical disinfection • As per BMWM Rules, 2016 the prescribed chemical disinfection agents and their strength.	PPT and interactive session
10 min	Chemical liquid waste management	To understand procedures to be undertaken for safe disposal of chemical liquid waste	By interaction with participants discuss the importance of safe disposal of chemical liquid waste and different methods for disposal of liquid chemical waste	PPT and interactive session
8 min	Spill management:	- To discuss the steps to be taken for management of spill. - Contents of a spill kit - To demonstrate the management of spill of blood or body fluid	• Demonstrate the contents of a spill kit. • Demonstrate the steps of spill management using the spill kit.	Contents of a spill Kit - Disinfection agents, Piece of cloth, Yellow liner Gloves, mask, goggles , apron , caution board
5 min	Mercury waste management:	To highlight the importance of mercury contamination in health care facility and	• By interaction, elicit the hazards of mercury • Elicit the current practices in management of Mercury	PPT / Video film, Mercury spill kit,

Time	Activity/ Topic	Objective	Methodology	Materials
		measures to phase out mercury in health care settings	in the hospitals • Demonstrate mercury spill management	Two exposed x-ray films or Plastic film, Plastic or glass bottle with water, 20 ml syringe without needle, Nitrile glove
5min	Video film on mercury spill management	To demonstrate right practice of managing mercury spill	To play video film and summarize key points	Video film
2 min	Summary	To summarize the important points	Recap of important points	PPT
30 min	Final treatment options	Objective of the session is: To discuss various technologies available for final disposal.	Interactive discussion • Discuss in brief the advantages and disadvantages of each of the technologies. • Discuss the importance of segregation in final disposal mechanisms. • Discuss specifically each person's role in the chain of events.	PPT
6 min	Occupational safety	To highlight importance of occupational safety in a health care setting	Discuss importance of occupational safety By interaction, elicit the various occupational hazards in a hospital	PPT
6 min	PPE	To demonstrate use of personal protective equipment	By interaction, elicit importance and list various activities in the hospital that require personal protective equipment	Demonstrate the various PPE
6 min	Needle stick injury	To discuss importance of needle stick injury and management reporting	Discuss the consequences of needle stick injury and its prevention	PPT
6min	Immunization	To discuss importance of immunization among health care workers	Discuss the various mandatory immunizations in a health care sector	PPT
6 min	Periodic	To discuss importance	Discuss the importance of	PPT

Time	Activity/ Topic	Objective	Methodology	Materials
	health examination	of periodic health examination as a part of occupational safety	periodic health examination	
30 min	Debriefing, monitoring and evaluation	To discuss importance of monitoring of the health care waste management.	Discussion with participants regarding the visit. Discussion on best practices and how it can be adapted to their facility	Flip chart to note down the points for implementation
15 min	Posttest, participants feedback	- To test knowledge of the participants after the training and - To evaluate training programme	Administration of Post-test to the participants Plot a graph similar to Pre test Compare the two Check if any of the questions have less than 50% correct answers. Check if the issue has been clarified. Feedback form to be filled by the participants	Post-test forms, Session feedback forms
15 min	Valedictory		Certificate distribution and feedback from the participants.	Certificates Feedback forms

Reporting of the training programme

Every training activity conducted needs to be reported using the reporting format.

The following aspects need to be taken into account for reporting

1. Executive summary
2. Introduction
3. Venue, date & timing of the training
4. Training team
5. Profile of trainees and number of trainers.
6. Inauguration details
7. Training sessions and discussion
8. Stakeholder Discussions (if any)
9. Conclusion/ way forward
10. Take home messages from training
11. Evaluation
12. Acknowledgement
13. Annexures (if any):

Tips for Training

"What I hear, I forget;

What I see, I remember;

What I do, I understand."– Confucius 451 BC

Adult learning Principles [11,12]

- Adult learners are motivated and self-directed
- Adult learners bring life experience and knowledge
- Adult learners are goal oriented
- Adult learners are relevancy oriented
- Adult learners are practical
- Adult learners like to be respected

The teaching methodology should align with principles of adult learning

- Adults will learn only when they are motivated to do so
- They learn by doing and focus more on problem solving.
- Any training programme focused on adults need to be flexible and must cater to their needs. It should be less directive and more of responsive
- Adult learners draw heavily on their experience and relate present learning to previous learning. Hence, training needs to be more hands on, interactive and activity oriented.
- Adults need to be respected and the environment of learning needs to be open and non-judgmental.
- Adult learners need to be facilitated to learn and not directed to do.
- Immediate feedback would help them learn better.

Tips on conducting a training session

- Start each session with an introduction to evoke interest in the topic of discussion
- Maintain eye contact and establish rapport with the participants
- Relate to the previous topics discussed
- Provide learners with as many real life experiences as possible and examples
- At the end of session, summarize the main points of learning

Interactive training session

Advantages of interactive sessions:

- It helps maintaining the learner's interest and avoids monotony
- As adult learners they think
- The learners get involved in their learning.
- The point of view of the learners gets a hearing and at the same time if any misconceptions can be corrected.
- Any doubts can be cleared

Disadvantages of interactive sessions:

- Effectiveness of interactive session depends on the moderator's capacity of handling the interaction
- Some participants dominate the interaction and some may not participate in the discussion
- The discussion can go tangentially in a different direction; the main objective would get sidelined.

Demonstration / activity

Tips for Demonstration / activity:

- State the objective of demonstration
- Demonstrate the steps in the correct sequence with appropriate materials and equipment
- Make sure that the demonstration is visible to all
- Never demonstrate the skill or activity incorrectly
- Explain each step so that it is understood by all
- Encourage questions and suggestions

Advantages of Demonstration:

- Demonstration helps in observation of skill
- It reinforces the correct method of preparation

Disadvantages of demonstration:

- It is time consuming
- Difficult for a large gathering

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Annexure-1 Pre-test and Post-test Questionnaire

Training component of the project
"Environmentally Sound Management of Medical Wastes in India"
GEF / UNIDO / MoEFCC/ MSRMC Endeavor

Pre-test / post-test questionnaire

1. Name: ……
2. Name of Health Care Facility/ CBWTF: ……
3. Designation: ……
4. No. of years employed in the current facility: ……
5. Type of HCF: - 1) small :< 100 beds 2) medium: 101-500beds 3) large :> 500beds

EVALUATION FORMAT

Pre Test: ☐ **Post Test:** ☐

Dear Friend,
The following questions help each one of us to do the self-evaluation. It is hoped that at the end of all the sessions we will be able to know what we really learned. Kindly fill them with in next 20 minutes, and kindly answer all the questions. **Enter appropriate code in the last column given.**

Question	Response
1. **Hazards of improper waste management is / are** a. Risk of infections and injuries b. Air pollution c. Water pollution d. All of the above	
2. **The most CRITICAL component for Safe Management of Biomedical Waste is** a. Segregation at Point of Generation b. Disinfection c. Proper disposal of Infectious waste d. Use of personal protective devices	
3. **The following personal protective equipment must be used while cleaning contaminated instruments** a. Mask b. Gloves c. Apron d. Goggles	

4. **Disease that has the predominant potential for transmission through infectious waste is**
   a. Tuberculosis
   b. Malaria
   c. Hepatitis B
   d. None of the above

5. **According to Biomedical waste management (BMWM) Rules 2016, how many categories of biomedical waste are generated**
   a. 4
   b. 5
   c. 6
   d. 10

6. **Segregation is best achieved at**
   a. Point of generation
   b. Intermediate storage
   c. Final storage
   d. Final disposal

7. **Which of the following is the Biohazard symbol?**
   a. 
   b. 
   c. 
   d. 

8. **The Stockholm convention is a global treaty to protect human health from**
   a. Greenhouse gases
   b. Persistent Organic Pollutants
   c. Hospital acquired Infections
   d. Waste sharps

9. **Of the total waste generated from a health care facility, the proportion of infectious and hazardous waste is**
   a. 10 – 20%
   b. 30 – 40%
   c. 50 – 60%
   d. 80 – 90%

10. **According to BMWM Rules 2016, infectious waste shall not be stored beyond**
    a. 24 hours
    b. 48 hours
    c. 72 hours
    d. 96 hours

11. **All the following steps should be followed after needle stick injury <u>EXCEPT</u>**
    a. Exposed parts to be washed with soap and water
    b. Pricked finger should be kept in antiseptic lotion
    c. Pricked finger should not be squeezed
    d. Report all needle stick injury even if it doesn't bleed

12. **Post exposure prophylaxis is of no use if started later than** a. 36 hours b. 48 hours c. 60 hours d. 72 hours	
13. **Recommended disinfectant by BMWM Rules 2016 used for handling spills would be** a. 1% Sodium hypochlorite b. 10% Sodium hypochlorite c. 1% Bleach Solution d. 10% Bleach Solution	
14. **Recommendations for storage facilities for health care waste include all <u>EXCEPT</u>** a. Should be impermeable floor b. Inaccessible for animals and birds c. Afford easy access for all health care personnel d. Easy access for waste –collection vehicle	
15. **Mercury spill is dangerous since its vapours primarily affect** a. Nervous System b. Blood c. Pancreas d. Heart	
16. **Which of the following should not be incinerated:** a. Used IV Bottles b. Plaster of Paris Cast c. Expired drugs d. Placenta	
17. **According to BMWM rules 2016, which of the following waste should be pre-treated at Health care facility level before putting into yellow bin** a. Expired drugs b. Blood bags c. Chemical waste d. Placenta	
18. **For sharps waste, which type of container should be used** a. Puncture proof and leak proof white container b. Puncture Proof, leak proof and tamper proof white container c. Puncture proof and leak proof white translucent container d. Puncture Proof, leak proof and tamper proof white translucent container	
19. **Which of the following accidents needs to be reported immediately in form I to SPCB?** a. Needle stick injury b. Mercury spills c. Blasts during handling of biomedical waste d. Exposure of eyes to body fluids	
20. **As per BMWM rules 2016, the quality of bags used for waste collection should be** a. Non chlorinated plastic bags of more than or equal to 20 microns thickness b. Non chlorinated plastic bags of more than or equal to 30 microns thickness c. Non chlorinated plastic bags of more than or equal to 40 microns thickness d. Non chlorinated plastic bags of more than or equal to 50 microns thickness	

21. **Match the following waste types with respective colour codes for segregation**

Type of waste	Enter the Color code option		Color code options
a. Body parts			1. Red
b. Catheter tubing			2. White
c. Discarded linen			3. Yellow
d. Expired drugs			4. Blue
e. Broken ampoule			5. Black
f. Blood bags			6. Green
g. Used Needles			
h. Placenta			
i. Dressings			
j. Syringes with intact needles			
k. Gloves			

22. **Score according to your opinion for the statements given below**

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
5	4	3	2	1

Sl. No	Statement	Score
a.	Managing biomedical waste is predominantly a job of waste handlers	
b.	Biomedical waste management is an environment issue	
c.	Improper management of biomedical waste does not affect me directly	
d.	Segregation will help reduce the cost of managing biomedical waste	
e.	Needle stick injuries without bleeding need not be reported	
f.	Biomedical waste management is everyone's responsibility	
g.	Biomedical waste management is an occupational safety issue	
h.	Periodic training of health care workers on BMWM is essential	
i.	Recapping of needle prevents needle stick injury	
j.	Knowledge on final disposal will help us practice segregation better	

Annexure-2 Keys for the pre and post test

Question	Correct key		Question	Correct key
1.	D		**11**	B
2.	A		12	D
3.	B		13	A
4.	C		14	C
5.	A		15	A
6.	A		16	A
7.	C		17	B
8.	B		18	D
9.	A		19	C
10.	B		20	D

Keys for the question no. 21

Type of waste	Enter the Color code option		Color code options
a. Body parts	3		1. Red
b. Catheter tubing	1		2. White
c. Discarded linen	3		3. Yellow
d. Expired drugs	3		4. Blue
e. Broken ampoule	4		5. Black
f. Blood bags	3		6. Green
g. Used Needles	2		
h. Placenta	3		
i. Dressings	3		
j. Syringes with intact needles	2		
k. Gloves	1		

Annexure-3 Waste Handler's Evaluation Tool

Training component of the project
"Environmentally Sound Management of Medical Wastes in India"
GEF / UNIDO / MoEFCC/ MSRMC Endeavor

GENERAL INFORMATION

1. Name: ……

2. Name of Health Care Facility/ CBWTF: ……

3. No. of years employed in the current facility: ……

EVALUATION FORMAT

Pre Test: ☐ **Post Test:** ☐

Question	Answer
1. Segregation is best achieved at a. Final disposal b. Point of generation c. Intermediate storage d. Final storage	**B**
2. **Personnel who work for collection & storage need to** a. Wear hard heavy duty rubber gloves, mask, apron, boots b. Wash hands thoroughly after handling the waste c. Be immunized against Tetanus, Hepatitis B d. All of the above	**D**
3. What should you not do in an event of a needle stick injury? a. Immediately wash the wound with antiseptic b. Report the injury as soon as possible to the nursing staff of that ward/OPD c. Details of injury should be entered in the injury register d. Post exposure Prophylaxis (PEP) should be started at least within 72 hours	**A**

4. Match the following waste types with respective colour codes for segregation

Type of waste	Enter the Color (Yellow/ Red/ Blue/ White puncture proof container)
a. Used dressing material	Yellow
b. Plastic catheter tube	Red
c. Discarded linen	Yellow
d. Needles	White
e. Broken ampoule	Blue

5. Which of the following is false? **C**

a. Collection of waste in a closed trolley

b. Use of PPE (gowns, masks, aprons, boots) at all times

c. Same lifts and ramps for waste trolleys and patients

d. Hand wash after waste handling

6. When should we wash our hands?

a)	After contact with body fluids or excretions, wound dressing	**True**/ False
b)	Moving from contaminated body site to another body part/ patient	**True**/ False
c)	After contact with soiled equipment like bed pan, lab equipment with specimen	**True**/ False
d)	After handling any waste	**True**/ False

7. State whether true or false.

a. Needles should be recapped after use. True/ **False**

b. Plastic waste from the hospitals can be sold to any plastic recycler True/ **False**

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