

Biomedical Waste Management(BMW) and it's Awareness in India

In accordance with BMW Rules, 2016



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- Biomedical waste management(BMW) Rules
- Importance of BMW management
- Sources of BMW
- Effects of BMW
- Present Scenario in India and Meghalaya
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- Transportation
- Conclusion
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What is Biomedical Waste (BMW)?

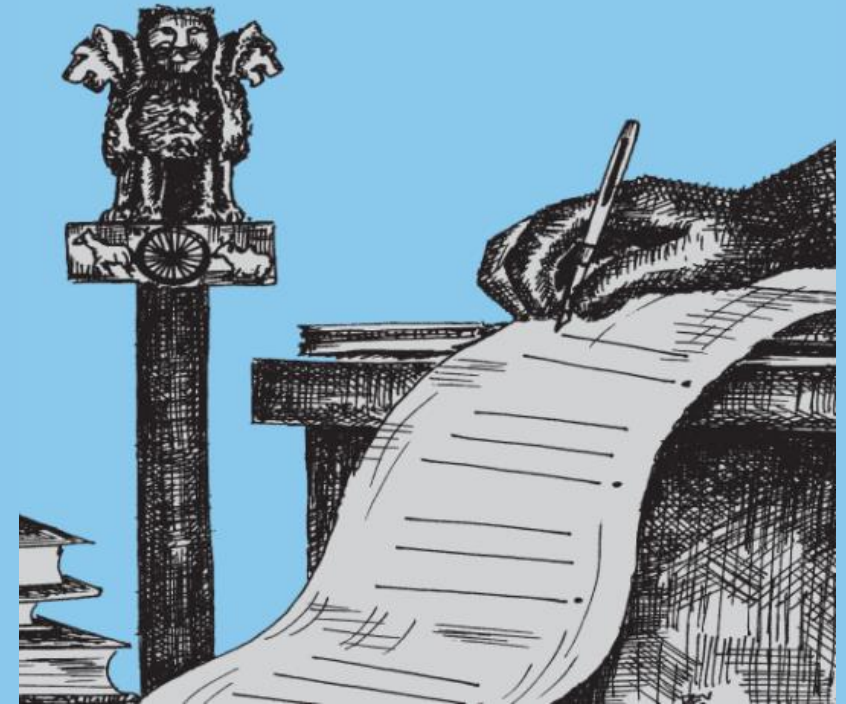
- BMW is the waste produced from medical activities
- Generated during
 - **diagnosis, treatment**
 - **immunization** of human beings or animals
 - **research activities**
 - production or testing of **biologicals**
 - **health camps** ... etc.,



Bio-medical Waste Management Rules

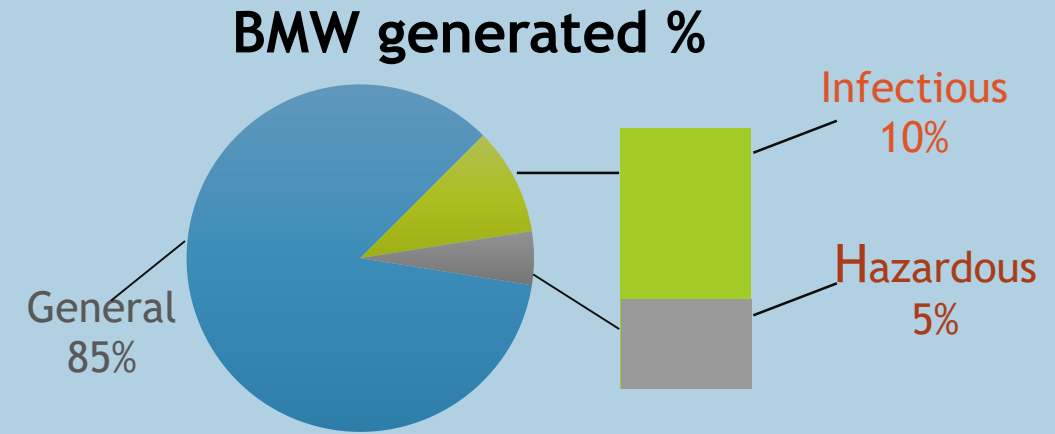
Framed by Ministry of Environment and Forest(MoEF), Govt. of India

- On **20th July 1998**, "Bio-medical waste (Management and Handling) Rules were framed.
- 1st Amendment on 06-03-2000.
- 2nd Amendment on 17-09-2003.
- On **28th March 2016**, Under **Environment (Protection) Act, 1986**, MoEF&CC notified the new BMW Rules, 2016 and replaced the earlier Rules(1988).



Why BMW is Important?

- Due to increase in population the amount of BMW generated is increasing.
- Amount of infectious waste is around 15%.
- Amount of non- infectious wastes constitutes nearly 85%.



- In absence of proper segregation, the non-infectious waste becomes infectious and poses environmental threat to the society
- An inappropriate treatment and disposal can help spread infectious diseases in society.

What is Biomedical Waste (BMW)?



Hospitals and other health facilities

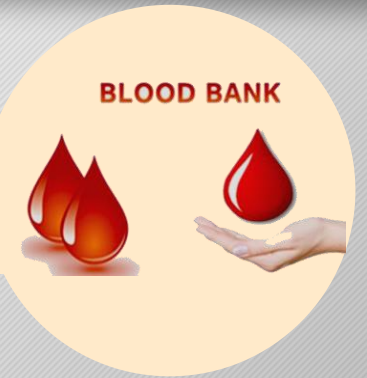


Laboratories and research centres

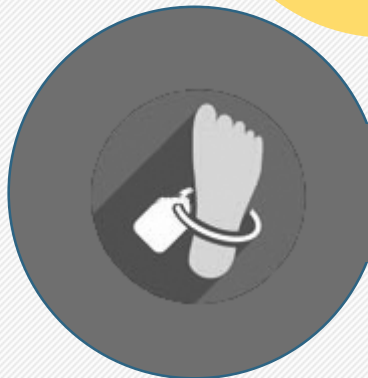


Nursing homes

Blood banks and collection services



Animal research and testing laboratories



Mortuary and autopsy centres

BMW generated at home



Effects of BMW

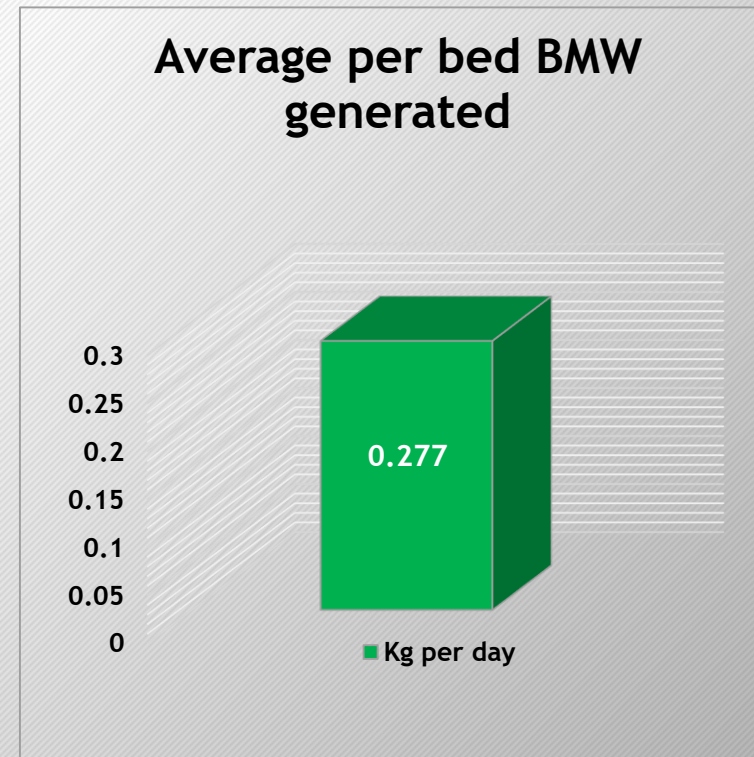
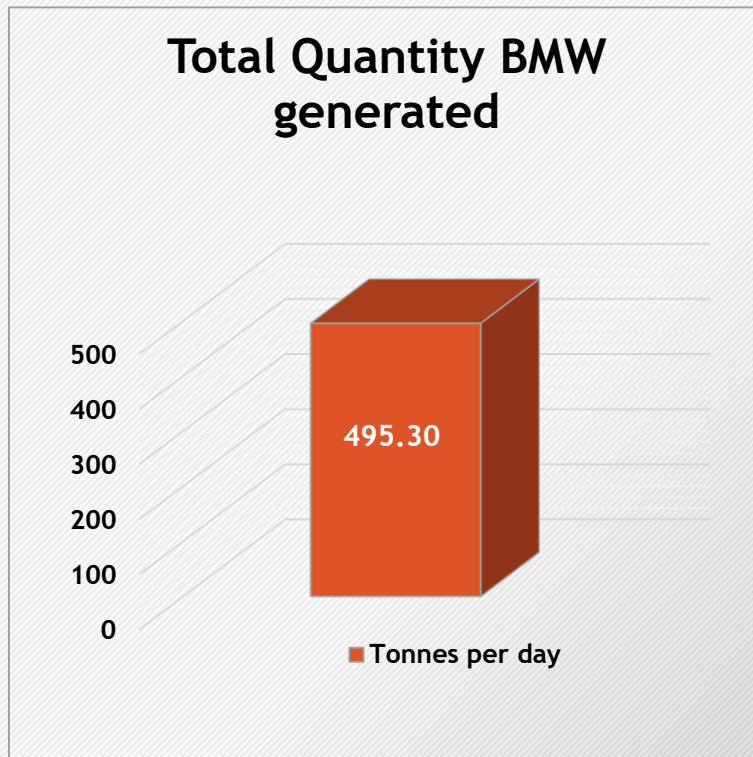
The improper management of BMW causes serious environmental problems in terms of:

- Air Pollution
- Water Pollution
- Land Pollution
- Soil Pollution



Present Scenario In India (According to WHO Report, 2017)

- Total quantity of BMW generated in India is 495.30 tonnes/day (495300 kg/day)
- Average per bed per day Biomedical waste generation is 0.277 kg/day (495300/1786108 : waste generated per day/ number of beds).



According to the WHO's "Report on health-care waste management status in countries of the South-East Asia Region(April 2017)", India was surveyed with the details below.

Figure 1: Segregation Status of Hospitals -India

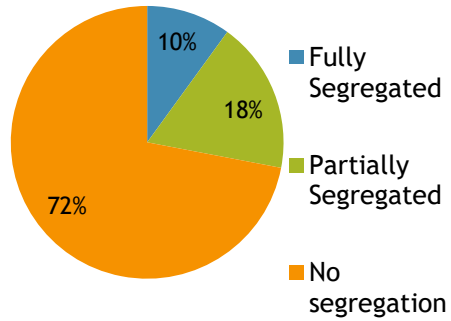


Figure 2: Connectivity with CBWTF

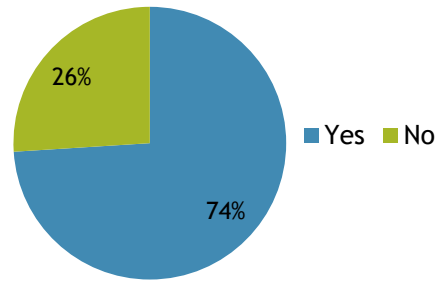


Figure 3: Frequency of waste collection by CBWTF Vehicle

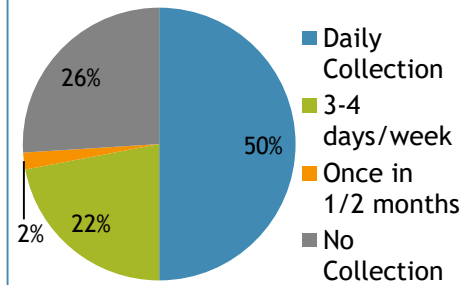


Figure 4: Nature of waste Dumping

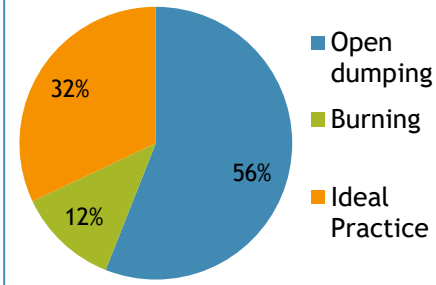


Figure 5: Interim Storage Facility (%)

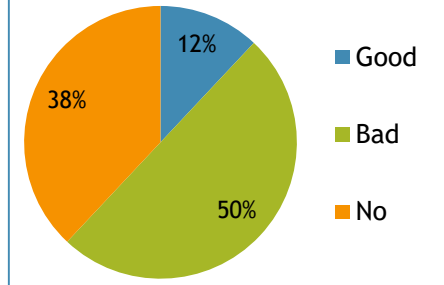


Figure 6: PPE Availability

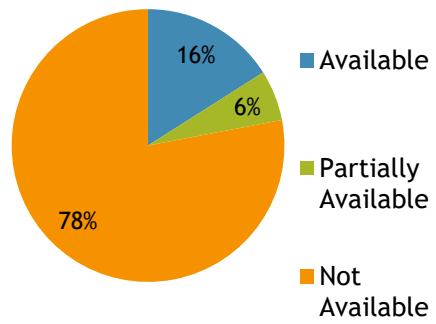


Figure 7: Needle-stick injury reporting

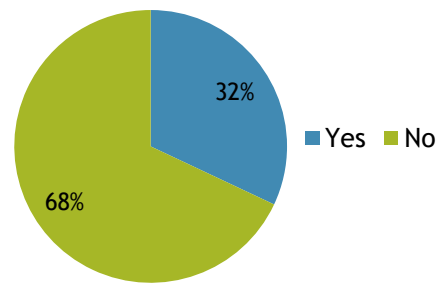


Figure 8: Availability of funds

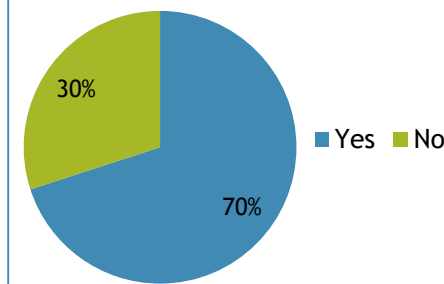


Figure 9: Staff awareness level

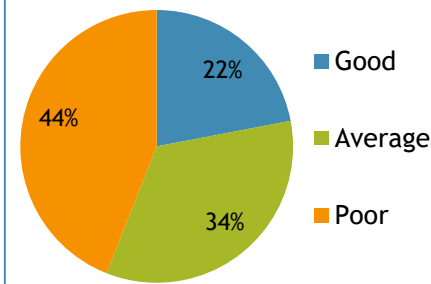
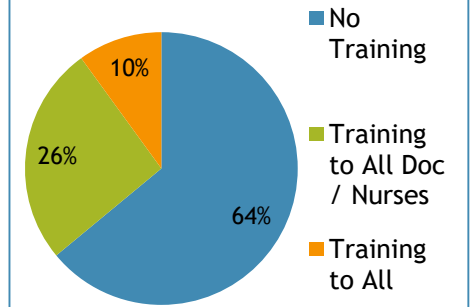


Figure 10: Training mechanism



* CBWTF – Common Biomedical Waste Treatment Facility

* PPE – Personal Protective Equipment

Annual Report Information on BMW Management

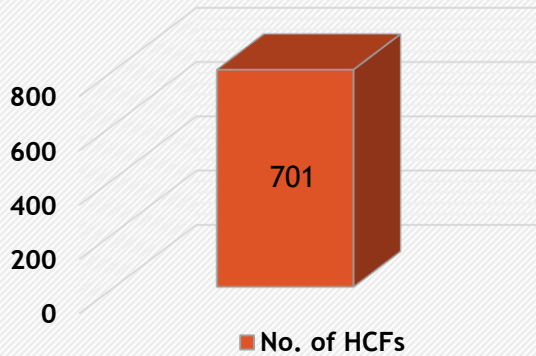
CPCB Report,
2015-2016

Name of the State	Total no. of HCFs	Total no. of Beds (approx)	No. of Operational CBWTFs	No. of CBWTFs under construction	Total Quantity of BMW generated (kg/day) approx.	Total Quantity of BMW treated (kg/day) approx.
Assam	955	22739	01	01	6885.25	6869.25
Delhi	4197	48046	02	00	14644.71	14644.71
Karnataka	26724	171610	25	05	51560	51560
Maharashtra	62833	278867	37	03	62470	62204
Mizoram	104	2284	00	00	5378.58	5377.65
Punjab	5863	59055	04	00	13148.1	13148.1
Rajasthan	5384	94961	10	07	19480.13	18917
Uttar Pradesh	8366	16489	16	00	37498	35816
West Bengal	6879	103378	06	03	32823	23555.6

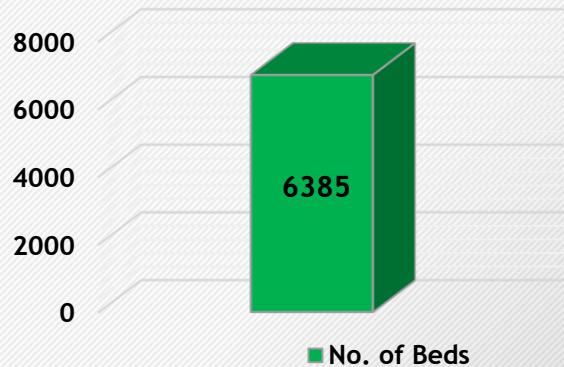
Present Scenario In Meghalaya (According to Meghalaya State Pollution Control Board(MSPCB))

- 701 Health Care Facilities (HCFs).
- 6385 numbers (approx.) of beds in the hospitals
- BMW generated per day is reported and treated as 1157.54 Kgs.

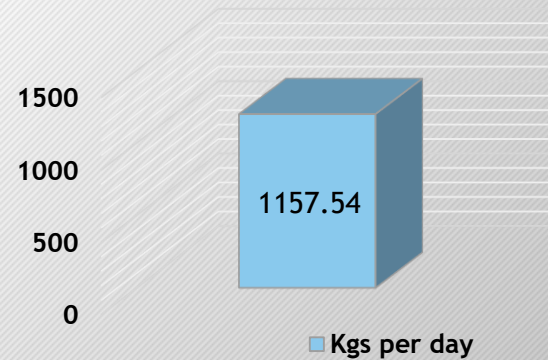
Total Number of HCFs



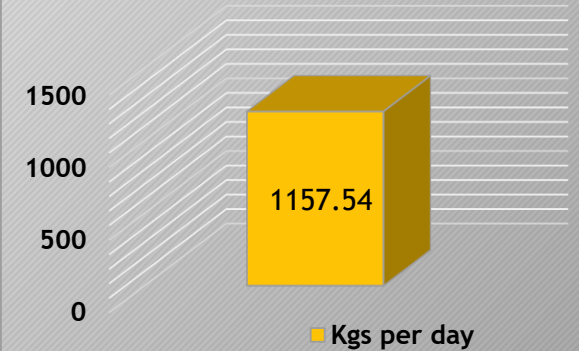
Number of beds in hospitals



BMW generated per day



BMW treated per day



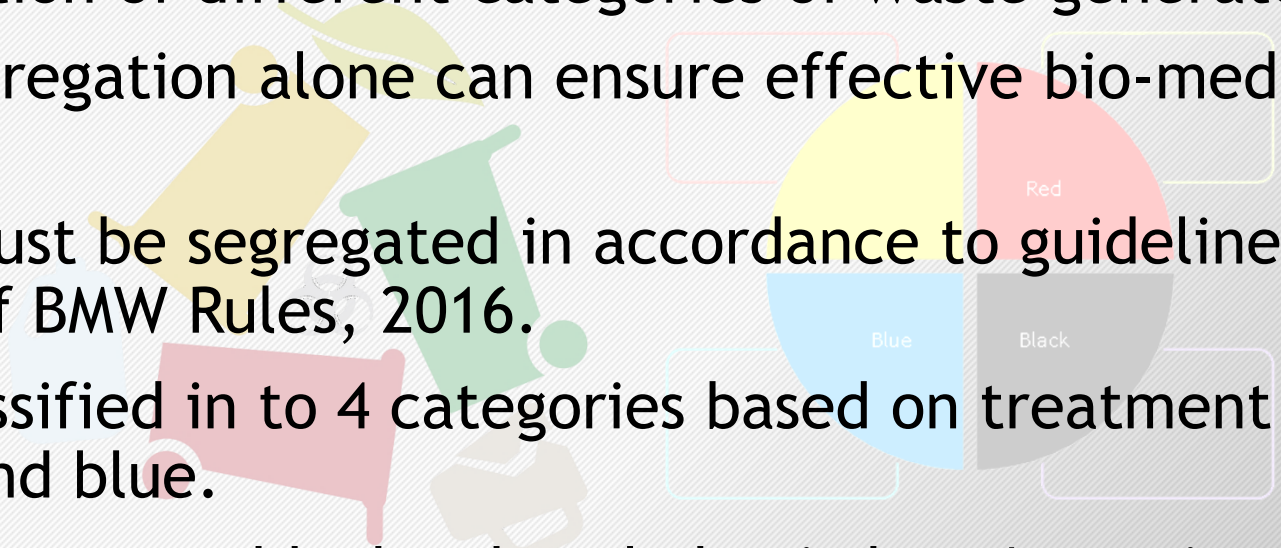
Necessary compliance by BMW generators

- Vaccinated against Hepatitis B to Hospital Staff
- Use of Heavy Duty Protective gears
- Annual BMW Management training to health care workers
- Report accidents caused during waste handling
- Maintain monthly records of day to day waste management
- Produce annual reports in Form-IV to the prescribed authority
- Every occupier or operator handling BMW, irrespective of the quantity shall make an application in Form II for authorization.
- All necessary compliance in accordance with BMW (Management) Rules 2016 to avoid unwanted occurrence

Segregation

BMW Rule
2016

- Basic separation of different categories of waste generated at source
- Effective segregation alone can ensure effective bio-medical waste management
- The BMWs must be segregated in accordance to guidelines laid down under schedule 1 of BMW Rules, 2016.
- BMW are classified in to 4 categories based on treatment options; yellow, red, white and blue.
- For General waste, a black colored plastic bag /container is used.



Segregation of BMW in Color Coded Bags

BMW Rule
2016

Yellow

Human Anatomical Waste, Animal Anatomical Waste, Soiled Waste, Expired or Discarded Medicines, Chemical Waste, Microbiology, Biotechnology and other clinical laboratory waste



Red

Plastic Waste such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles and fixed needle syringes) and vacutainers (with their needles cut) and gloves



White

Sharp Waste including metals like Needles, Syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades, etc.



Blue

Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes and metallic body implants .



Yellow Non-chlorinated Bag/Bin

BMW Rule
2016



Human Anatomical Waste, Animal Anatomical Waste, Soiled Waste, Expired or Discarded Medicines including antibiotics.

Treatment and Disposal options:

- i. Incineration or Plasma Pyrolysis* or deep burial
- ii. All other discarded medicines shall be either sent back to manufacturer or disposed by incineration.

* Plasma pyrolysis : disintegration of organic compounds into gases and non-leachable solid residues in an oxygen-starved environment

Yellow Non-chlorinated Bag/Bin

BMW Rule
2016



(i) Chemical Solid Waste (ii) Discarded Linen, mattresses contaminated with blood/body fluid (iii) Microbiology, Bio-technology and other clinical Lab waste

Treatment and Disposal options:

- i. Disposed of by incineration or Plasma Pyrolysis or Encapsulation
- ii. Non-chlorinated chemical disinfection followed by incineration or Plasma Pyrolysis shredding or mutilation or combination of sterilization and shredding
- iii. Pre-treat to sterilize with non-chlorinated chemicals on-site as per National AIDS Control Organisation or WHO guidelines thereafter for Incineration.

Yellow Category: Chemical Liquid Waste

BMW Rule
2016

Chemical Liquid Waste: discarded Formalin, liquid from laboratories and floor washings, cleaning, etc.



Separate Collection system leading to Effluent Treatment System



Treatment and Disposal options:
Pre-treat to sterilize with non-chlorinated chemicals on-site

Red Non-chlorinated Bag/Bin

BMW Rule
2016



Contaminated Waste (Recyclable) Wastes generated from disposable items.

Treatment and Disposal options:

Autoclaving or micro-waving/ hydroclaving followed by shredding or mutilation or combination of sterilization and shredding.

White Category: Sharp Containers

BMW Rule
2016



Waste sharps Including
Metals



Sharps must always be kept in puncture-proof containers to avoid injuries and infection to the workers handling them.

Treatment and Disposal options: Autoclaving or Dry Heat Sterilization followed by shredding or mutilation or encapsulation in metal container or cement concrete(Sharp Pit); combination of shredding cum autoclaving.



Blue Category: Cardboard Box

BMW Rule
2016



Glassware & Metallic Body Implants



Treatment and Disposal options: Disinfection (by soaking the washed glass waste after cleaning with detergent and Sodium Hypochlorite treatment) or through autoclaving or microwaving or hydroclaving and then sent for recycling.

Storage

- Once collection occurs then biomedical waste is stored in a proper place
- Segregated wastes of different categories needs to be collected in identifiable containers
- The duration of storage should not exceed for 8-10 hrs in big hospitals (more than 250 bedded) and 24 hrs in nursing homes.



Transportation

BMW Rule
2016

- The waste should be transported for treatment either in trolleys or in covered wheel-barrow.
- The bags / Containers containing BMWs should be tied/ lidded before transportation.
- Before transporting the bag containing BMWs should be accompanied with a signed document by Nurse/ Doctor mentioning date, shift, quantity and destination.
- Final Transport of BMW must be to CBMWTSDF only in authorized vehicle with appropriate documentation for further record.



Conclusion

- Although the country has 191 operational offsite treatment facilities, they are **not sufficient** to treat the large quantum of waste being produced
- Although India's policy framework is well drafted, the country has fallen **weak** on its implementation strategy
- The monitoring bodies, viz. State Pollution Control Boards (SPCBs) and Central Pollution Control Boards (CPCBs), should make a **strict timeline** and visit the health-care facilities and Central Bio-medical Waste Treatment Facility (CBWTF) regularly and update their data on time.

Awareness Programme at Children's Hospital, Shillong



ENVIS Team with Hospital Staffs



Coloured-bins at Nursing Station



Needle Cutter/Destroyer



Effluent Treatment Plant



Concrete Sharp Pit



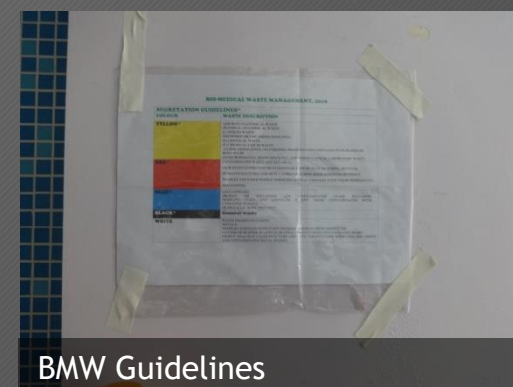
Sewage Treatment Plant



Main Waste Storage Area



10% Bleach



BMW Guidelines

Awareness Programme at Nazareth Hospital, Shillong



ENVIS Team with Hospital Staffs



Coloured-bins at Emergency Room



Coloured-bins at Nursing Station



Protective Gloves



BMW Guidelines



Main Waste Storage Area



Segregation of waste in Main Waste Storage Area



Sharp Disposal



Effluent Treatment Plant

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Thank You

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