

UNTYING A GORDIAN KNOT: PARADOX OF BIO-MEDICAL WASTE MANAGEMENT AND LEGAL COMPLIANCE IN INDIA

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Abstract

Every healthcare institution produces biomedical waste material while diagnosing and treating patients who are either humans or animals. This waste might be in a solid or liquid form such as microbiological and biological waste, abandoned medications and cytotoxic pharmaceuticals, soiled trash, solid waste, liquid waste produced from any infected regions, animal waste, human anatomical waste, incinerator ash, chemical waste, waste sharp etc. All such waste products are inherently harmful and needs proper management and disposal. Accordingly, the management of biomedical waste involves the four fundamental phases: i) generation of waste; ii) segregation; iii) collection & storage of waste; and iv) treatment & disposal. It has been the recommended practice that before disposing of the biomedical waste, the healthcare institutions must disinfect all the effluent as needed. The mismanagement of such waste has an immediate negative impact on the environment, humans & other species. On recurring basis, the medical clinics and healthcare facilities all across the world create a reasonably large amount of potentially toxic and enticing garbage. In this regard, majority of the developed nations have lately adopted the technologically advanced practice to neutralize the toxicity & dumping the waste in designated areas. Whereas, in underdeveloped nations such as India, bio-medical waste (BMW) is usually thrown in open areas, largely due to the lack of awareness, suitable infrastructure, funds and execution of national standards for waste disposal. This paper attempts to ponder on the nuances of biomedical waste management, its effects on an environment and legal infrastructure dealing with the concerns pertaining to disposal of biomedical waste, status of compliance of these provisions in some states and eventually recommending the innovative techniques and best practices which can be uniformly adopted by every state for increasing the efficacy of waste management.

Keywords: Biomedical Waste, Environmental Protection, Healthcare Management, Healthcare institutions

Introduction

Medical treatment is essential for sustaining life, but it also leads to production of lot of waste that is perilous to both the environment and living beings. Clinics and hospitals produce a variety of trash, including cotton, syringes, needles, gloves, liquid waste, expired medications, etc. Accordingly, bio-medical waste, often known as hospital waste, is the waste generated throughout the process of conducting tests; treating humans and animals; also, in research activities related to it. For the reason that it is contagious, biomedical waste seemingly is harmful to the people, other species and the environment. When compared to any other garbage, bio-medical waste is particularly more harmful in nature and differs from household or industrial waste. Hospitals, laboratories, clinics, dental clinics, laboratories, veterinary clinics, medical and bio research centres, etc. are the common producers of biological waste.¹ The "*Bio-medical Waste (Management and Handling) Rules, 1998*"—which were first declared on July 20, 1998—have been created by the federal government of India and have been revised in 2016 to reflect all the most recent modifications. This Rule establishes universal standards and a code of conduct for the whole country. It enlisted various kinds of bio-medical wastes² including human and animal anatomical waste, biotechnology and microbiology waste, waste sharps, including shattered glass, scalpels, syringes, and hypodermic needles, discarded medicines and Cyto-Toxic Drugs, solid waste, such as disposable goods like tubes, catheters, etc., excluding sharps, soiled waste, such as dressing, bandages, plaster casts, and material tainted with blood, etc.³ In reference to this, various scientists, researchers, NGOs, and environmental protection activists has pressed upon the legislators to implement adequate regulations for the treatment of bio-medical waste since they acknowledged through data & research that human actions and behaviours were seriously harming the environment and our sustainable development goals.⁴ While, the environmental concerns have existed for a very long time, but historical legal systems mandated that the environment be protected from danger wherever it was required. Earlier, there was no clear legislative directive to regulate bio-medical wastes. Whereas, in this technology advanced era, we have reached to the point where we cannot discard the implication of the hazardous waste generated by the healthcare

¹ Capoor, M., & Bhowmik, K. (2017). Implementation challenges in bio-medical waste management rules, 2016. *Indian Journal of Medical Microbiology*, 35(4).

² See The Bio-Medical Waste Management Rules, 2016, schedule I.

³ See, World Health Organization (WHO). (2013). Wastes from health-care activities. Factsheet No. 253, November 2011.

⁴ Parida, A., Capoor, M. R., & Bhowmik, K. T. (2019). Knowledge, attitude, and practices of Bio-medical Waste Management rules, 2016; Bio-medical Waste Management (amendment) rules, 2018; and Solid Waste Rules, 2016, among health-care workers in a tertiary care setup. *Journal of laboratory physicians*, 11(04), 292-296.

institutions. Scientists and researchers are now attempting to find safe disposal and management solutions for the numerous issues related to bio-medical waste that have repeatedly arisen. It is evident that the relationship between the environment and people varies across time and geographically. This conjecture is justified & applicable to the guiding philosophy of environmental conservation India as well, the Indian Constitution was not ecologically conscious until 1976, and environmental protection in India did not begin until 1972, the year following the Stockholm Conference.

Historical References on Environmental Protection in India

India's ancient history has a tight and immediate connection to the environment. Gautam Buddha, an environmentalist, and humanitarian attained enlightenment by squatting down beneath a Bodhi tree & pronounced the core tenets of human values are nonviolence and simplicity. Thereby, the principles of simplicity teach us that we shouldn't trample on the environment which in essence solidifies the doctrine for encouraging the respect for the environment. The inferences of Buddhism consider people, trees, and forests to be inextricably linked while only the tree may be used to obtain food and shelter. In addition to this, Jainism forbids the animal sacrifice during festivals. It precludes confinement, abuse, overcrowding, and denying animals sufficient access to food and water. Jainism also promotes environmental harmony and aids in protecting and maintaining nature from harm. The person tends to neglect their own unique presence, according to Lord Mahavira Swami, if they dismiss or deny the existence and presence of the earth, fire, air, water, and plants.⁵

Whereas the Kautilya's Arthashastra also stipulated the below-mentioned penalties for citizens who disregarded hygienic standards: 1/8th of a pana (the silver punch-marked currency introduced by the Mauryan Dynasty, which included the pana) will be fined for dumping dirt on the pavement, and one quarter of a pana will be fined for obstruction with mud or water. (2.36.26). If dirt is dumped on a royal highway street, the fee is doubled. (2.36.27). If someone is caught exploiting a reservoir as a urinal, they will be fined 1 pana, as a latrine, 2 panas; if they are caught urinating at a temple, they will be fined one and one half pana, as a latrine, 3 panas; and if they are caught urinating at a royal building, they will be fined 2 pana, as a latrine, 4 panas. (2.36.28). The fine for throwing dead animals inside the city limits, such as cows, dogs, and cats, is 3 panas; for other animals, such as donkeys, camels, mules, horses, or cattle,

⁵ Francis, E. (2012). King, Governance, and Law in Ancient India: Kauṭilya's Arthaśāstra, A New Annotated Translation.

the fine is 6 panas; and for human corpses, the fine is 50 panas. (2.36.30) It was declared a crime since it unquestionably harms society's ecosystems and habitats.⁶

Inferences from Modern History

During the colonisation period, Britishers left their mark on the legal and administrative system of India. While, during their power stint in India, numerous destructions of natural resources were initiated as they had little sympathy for the need to preserve the forests. However, to control pollution of the water, air, and wildlife in India, the British government passed a number of different legislations. One of the earliest laws pertaining to water pollution was the *Shore Nuisance (Bombay & Kolaba) Act, 1853 (Act No. 11 of 1853)* among them. Act 5 of 1857, the *Oriental Gas Company Act*, was passed to control the pollution emitted by Oriental Gas Company. The Indian Penal Code, 1860 was the second law to be passed (Act No. 45 of 1860). As stated in *Section 268 of the Indian Penal Code, 1860*, "if any act which causes any common injury, danger, or annoyance to the public or to the people in general then the act may be treated as public nuisance then the offender shall be punishable under Secs. 290 or 291 of the Indian Penal Code," there shall be punishment for environmental polluters. Similarly, "if a person conducts any work unlawfully or carelessly that he knows or has cause to think would likely spread infection of any disease harmful to life, may be penalised under Sec. 269 of the Indian Penal Code."

Additionally, there are also criminal penalties under circumstances that result in the loss of value or usability of any property, as stated in several Sections of the Indian Penal Code, 1860, such as Sections 426, 430, 431, and 432.⁷ This suggests that anybody in violation of the

⁶ Kangle, R. P. (1986). *The kautiliya arthasastra* (No. 1-3). Motilal Banarsidass Publ..

⁷ Indian Penal Code, 1860 (Act 45 of 1860) ss. 426, 430, 431, 432

“Section 426. Punishment for mischief.—Whoever commits mischief shall be punished with imprisonment of either description for a term which may extend to three months, or with fine, or with both.

Section 430. Mischief by injury to works of irrigation or by wrongfully diverting water.—Whoever commits mischief by doing any act which causes, or which he knows to be likely to cause, a diminution of the supply of water for agricultural purposes, or for food or drink for human beings or for animals which are property, or for cleanliness or for carrying on any manufacture, shall be punished with imprisonment of either description for a term which may extend to five years, or with fine, or with both.

Section 431. Mischief by injury to public road, bridge, river or channel.—Whoever commits mischief by doing any act which renders or which he knows to be likely to render any public road, bridge, navigable river or navigable channel, natural or artificial, impassable or less safe for travelling or conveying property, shall be punished with imprisonment of either description for a term which may extend to five years, or with fine, or with both.

Section 432. Mischief by causing inundation or obstruction to public drainage attended with damage.— Whoever commits mischief by doing any act which causes or which he knows to be likely to cause an inundation or an obstruction to any public drainage attended with injury or damage,

aforementioned requirements if they produce, collect, receive, store, transport, treat, dispose of, or handle bio-medical waste in any way. Additionally, this Penal Code lays out penalties for certain forms of pollution that do not already have a deterrent impact on society. Whereas the Police Act of 1861 (Act 05 of 1861) also prohibits and regulates the slaughter of animals, the washing of carcasses, and the dumping of filth in public places and it also specifies penalties as the form of retribution for violators. Further, the Indian Easement Act of 1882 provided protection for riparian landowners from undue upstream user pollution. The Indian Fisheries Act of 1897 also lists the penalties for violators who pollute the water to kill fish. Besides this, the Bengal Smoke Nuisance Act of 1905 and the Bombay Smoke Nuisance Act of 1912 were two highly dated laws passed during the British era to prevent air pollution.

While taking cognizance of provisions under aforementioned legislations, it was pellucid that there were no explicit environmental restrictions when the British ruled India. Thenceforward, environmental protection was embraced under Article 21 of the Indian Constitution & it was impacted when the Constitution entered into force in 1950 and the judiciary developed the idea of Fundamental Rights. Following that, the Government of India created legislation to safeguard the environment in accordance with societal demands. The Factories Act of 1948 (Act No. 63 of 1948) also outlines the best practises for waste disposal and enlists the State to develop regulations to carry out these directives. The state is also responsible for preventing water contamination under the River Boards Act, 1956(Act No. 49 of 1956) for the maintenance and management of Inter-State Rivers and waterway valleys.⁸ A few important rights, relevant for our subject, are mandated by the Indian Constitution, and they are stated in Part III. Among these rights, Art. 21 gives everyone the right to life. The right to life finds its place in ecological justice's expansion and accessibility. M C Mehta, a dissident lawyer played a major role in expanding the skyline of Art. 21's soul. According to Article 47, of the constitution, improvement of the infrastructure encompassing public health is one of the State's primary duties. Moreover, Article 48A illustrates that the State shall make an effort to protect and develop the environment, and Article 51A (g) makes it a fundamental duty of every citizen of India to protect and enhance the environment.

shall be punished with imprisonment of either description for a term which may extend to five years, or with fine, or with both."

⁸ Divan, S., & Rosencranz, A. (2022). *Environmental Law and Policy in India: Cases and Materials*. Oxford University Press. 579-601

International Conventions

There are three international accords i.e., *The Basel Convention on Hazardous Waste*, the *Stockholm Convention on Persistent Organic Pollutants (POPs)*, and the *Minamata Convention on Mercury* are particularly relevant in setting up the guidelines for the management of bio-medical wastes, environment protection, and sustainable development. are examples of these conventions.⁹ The most comprehensive environmental convention on hazardous and other wastes is the Basel Convention on Hazardous Waste. It aims to protect human health and the environment from the harmful effects of hazardous waste development, management, and disposal, including clinical wastes produced by healthcare facilities, and has 170 member states. Additionally, the *Stockholm Convention on Persistent Organic Pollutants* (also known as the Stockholm Convention) is also a treaty which was designed to safeguard health of the humans and the adjoining environment against persistently released organic pollutants (POPs)¹⁰. POPs are considered as the dangerous compounds that if present in the bodies of living creatures' and can cause immense harm. The mechanism of medical waste disposal including incinerators and few other such processes which produce these compounds.¹¹ In the year 2006, preliminary recommendations on best environmental practises (BEF) were issued. ¹²It provides best guidelines to be followed for waste reduction, segregation, recycling, recovery, education, and appropriate collection and transportation.¹³ In 2013, an agreement called the Minamata Convention on Mercury was made to safeguard both environment and human life & health against the harmful effects of mercury. This Convention calls attention to a material that is used widely in daily items, is naturally occurring, and is emitted into the atmosphere, land, and water from a number of sources.¹⁴

⁹ Technical Guidelines on Environmentally Sound Management of Wastes Consisting of Elemental Mercury and Wastes Containing or Contaminated with Mercury 31 October 2011. Geneva: Basel Convention and United Nations Environment Programme; 2011.

¹⁰ Revised Draft Guidelines on Best Available Techniques and Provisional Guidance on Best Environmental Practices of the Stockholm Convention on Persistent Organic Pollutants. Geneva: Secretariat of the Stockholm Convention; 2006.

¹¹ Also see, Fiedler, H. (2007). National PCDD/PCDF release inventories under the Stockholm convention on persistent organic pollutants. *Chemosphere*, 67(9), S96-S108.

¹² World Health Organization, & WHO. (2004). *Review of Health Impacts from Microbiological Hazards in Health-Care Wastes*. world health organization.

¹³ See, World Health Organization, & WHO. (2004). *Guidelines for drinking-water quality* (Vol. 1). world health organization.

¹⁴ United Nations Environment Program. (2013). *Minamata Convention on Mercury*. united nations environment program. see also, Kessler, R. (2013). The Minamata Convention on Mercury: a first step toward protecting future generations.

Judicial Response towards Bio-Medical Waste Management

There are numerous judgements pronounced by the Apex Court of the country and various High Courts of states which apparently emphasized on the aspects of Bio-Medical Waste Management and largely emphasised on the protection of environment. In the year 1990-91, a Public Interest Litigation was instituted in *Subhash Kumar v. State of Bihar* asking the Supreme Court to direct the Director of Collieries to prevent the river Bokaro from receiving sludge from its washeries. Slurry storage on agricultural land is rumoured to have an impact on its fruitfulness. Furthermore, the flowing slurry pollutes the river, rendering it unsuitable for use in the water supply. The arena of discussion pertaining to this case was to determine whether the right to have a healthy environment was included in the broader aspect of right to life. In final judgement pronounced by Justice Singh, “*the right to life is a basic right protected by Article 21 of the Constitution and it includes the freedom to enjoy clean water and air*”.¹⁵ Prior to this, in mid-1980’s, a writ was filed in *Kinkri Devi v. State of Himachal Pradesh* under Art. 226, 51A (g), and 48A at the Himachal Pradesh High Court with the intention of securing and protecting the Shivalik Hills. As a consequence of this petition, a rent for the exhumation of limestone had to be wiped off. Thereafter, the Court kept an eye on concerns related to the environment and how things naturally change. Further, In the year 1993, in the case of *K.C. Malhotra v. State of Madhya Pradesh*, an expert filed a PIL in relation to the pandemic cholera outbreak (which resulted in the deaths of 12 children) as a result of open waste, soiled water, dirt storage, defiled water, and garbage. This situation was clearly brought about by the negligence of many State entities and professionals.¹⁶ According to the court, the right to life also included the fundamental necessities of life, such as the access to adequate nutrition, clothing, protection, and facilities for reading and writing. Upon the further interpretation, the citizens of that state have a direct responsibility under Art. 21 to ensure that the government works to improve general wellbeing as this is one of its fundamental duties. Finally, the Court gave an order to preserve the vigour of the local tenants and their general health. In the case of *Vellore Citizens Welfare Forum vs. Union of India*¹⁷, the Supreme Court declared, the principle of ‘Sustainable Development’ and ‘Polluter Pays Principle’ to be integral part of environment protection law of the country.

¹⁵ *Subhash Kumar v. State of Bihar*. AIR 1991 SC 420

¹⁶ *K.C. Malhotra v. State of M.P.* AIR 1994 MP 48

¹⁷ 1996 (5) SCC 647

The supreme court's real intervention for hazardous waste disposal came in *Research Foundation For Science, Technology National Resource Policy v. Union Of India*¹⁸ wherein a Committee on Management of Hazardous Wastes was constituted and directed to recommend measures for hazardous waste material disposal. Whereas, In the case of *Environment Monitoring Forum and Anr. Vs. Union of India (UOI) and Ors*¹⁹, court held that all such institutions which are generating bio-medical waste have to handle such waste in a prescribed manner which do not cause environmental damage. Further, Odisha High Court in *Maitree Sansad vs. The state of Orissa and Ors* case passed observations on inappropriate measures of dumping biomedical waste in municipal dustbins and open spaces and held that it leads to spreading of diseases. Also, *National Green Tribunal, in Haat Supreme Wastech Pvt. Ltd. Ors vs State Of Haryana Ors*²⁰ held that any plant involved in bio-medical waste disposal will require Environmental Clearance (EC). It also said that environmental damage may be prevented by enforcing such rules. However, Supreme Court, in *D Swamy vs. Karnataka State Pollution Control Board*²¹, decided on 22nd September 2022, held that if the unit has other requisite consent to operate and confirms required pollution norms, ex post facto EC can be granted in exceptional circumstances and wouldn't be closed only because it does not have the environmental clearance papers. The court decided it in the interest of preventing environmental pollution.

Contemporary Legal Provisions

Biomedical waste is defined as "any solid, fluid, or liquid waste, including container and any intermediate product, which is generated during diagnosis, treatment, or immunisation of humans or animals, in research activities, or in the production or testing of biological products" under the *Biomedical Waste (Management and Handling) Rules 1998*, which were enacted by the Indian parliament. Infectious, chemical, heavy metal, ordinary municipal garbage, and a variety of other unclean goods are all included in the hospital waste. Needles, scalpels, anatomical human organs, blood samples, microbiological cultures, and other biomedical wastes are also included, as are infectious wastes like clothing and other things contaminated with bodily fluids and discharges. Biomedical waste released by hospitals might be dangerous since it could include infectious disease. Some pathogenic organisms pose a threat due to their high pathogenicity and potential drug resistance. Poor waste management will lead to natural

¹⁸ (2005) 10 SCC 510

¹⁹ MANU/KE/0894/2003

²⁰ MANU/GT/0089/2015

²¹ 2022 SCC OnLine SC 1278

contamination, offensive odours, the development and spread of insects, rats, and worms, as well as the possibility for the transmission of illnesses including typhoid, cholera, hepatitis, and AIDS through wounds from syringes and needles tainted with human blood.

The new *Biomedical Waste Management Rules 2016* were announced by the MoEFCC, Government of India, in early 2016, while exercising of the powers conferred by sections 6, 8 and 25 of the *Environment (Protection) Act, 1986 (29 of 1986)*. These rules shall be utilized to regulate the management of biomedical waste and have a significant impact on the clean-India initiative.²² Accordingly, all the authorized health care institutions in the country are required to separate bio-medical waste and classify it into yellow, red, blue/white, and dark coloured bags or dustbins.²³ These wastes can be kept for up to 48 hours before being safely disposed of or collected by a professional from a common bio medical waste treatment facility (CBMWF). The CMBWF then handles the trash in accordance with the bag's colour. The varied colours necessitate distinct methods of disposal, including cremation, deep entombment, autoclaving, destruction, concoction treatment, transfer to a landfill, etc. Health Care Facilities are currently responsible for pre-treating research facility and micro biological waste, blood tests, and blood sacks through local sanitization and cleaning in the manner advised by the World Health Organization (WHO) or National Aids Control Organization, regardless of whether final treatment and transfer take place nearby or at a typical biomedical waste treatment facility (NACO).²⁴ To stop the release of dioxins and furans from burning such waste, health care facilities must stop using chlorinated plastic bags, gloves, and blood packs within two years. According to a study by the Government of India, a total of 484 tonnes of biological waste are created daily in India by 1,68,869 healthcare facilities. Only 447 tonnes per day of material are processed before disposal. There are several problems with informal waste disposal. 15% of the trash from health care facilities is dangerous or toxic, whereas 85% is not. Risky consequences are mixed with sullyng, which makes the entire waste harmful.²⁵ As a result, it is necessary to isolate and treat. Inadequate disposal increases the risk of contamination,

²² Bio-Medical Waste Management Rules. 2016 Published in the Gazette of India, Extraordinary, Part II, Section 3, Sub-Section (i), Government of India Ministry of Environment, Forest and Climate Change.

²³ See also, Pandey, A., Ahuja, S., Madan, M., & Asthana, A. K. (2016). Bio-medical waste management in a tertiary care hospital: an overview. *Journal of clinical and diagnostic research: JCDR*, 10(11), DC01.

²⁴ Sheikh N. A. (2012). Hospital Waste Management: Indian Perspective. *Indian Journal of Forensic Medicine & Toxicology*. 6(2):127-9. See also, Nanda, H., & Pati, J. (2017). Legal Regime of Bio Medical Waste and Environmental Protection. *EXECUTIVE EDITOR*, 8(2), 167.

²⁵ Sarkodie, S. A., & Owusu, P. A. (2021). Impact of COVID-19 pandemic on waste management. *Environment, development and sustainability*, 23(5), 7951-7960.

encourages the reuse of organised drugs and prohibited disposables, and produces safe microorganisms.

Status of Compliance by States

Pursuant to the Rule 13 of *Bio-Medical Waste Management Rule of 2016*, the State's Pollution Control Board are required to submit an annual report before July 31st of every year. The report shall embrace the data and nuances such as collection, treatment and disposal of biomedical waste in their respective state to Ministry of Environment Forests & Climate Change. In theyear 2021, the SPCB of all the states have submitted their annual report barring Nagaland. Thereafter, the concerned Ministry has inspected few discrepancies and non-compliances such as absence of liquid waste pre-treatment facilities, non-disclosures related to availability of deep-burial pits and lastly,²⁶ With reference to the unauthorized healthcare facilities, it was discovered that out of 3,25,014 operational HCFs in India, 14% of the HCFs are unauthorised and thereby, the states were recommended to serve the show-cause notice to these HCFs.²⁷

The collective reports revealed that the cumulative amount of biological waste produced in the country per day was estimated to be 774 tonnes, of which 656 tonnes per day were non-COVID biomedical waste and 118 tonnes per day were COVID biomedical waste. Further, as reflected in Fig #1, it was revealed that out of 3,52,014 healthcare facilities in the country only 4% of the have their own facilities for managing the disposal of biomedical waste.²⁸

²⁶ Central Pollution Control Board (MoEF&CC). (2020). *Annual Report on Biomedical Waste Generation*. central pollution control board.

²⁷ See, Ramteke, S., & Sahu, B. L. (2020). Novel coronavirus disease 2019 (COVID-19) pandemic: considerations for the biomedical waste sector in India. *Case Studies in Chemical and Environmental Engineering*, 2, 100029.

²⁸ Central Pollution Control Board (MoEF&CC). (2020). *Annual Report on Biomedical Waste Generation*. central pollution control board.

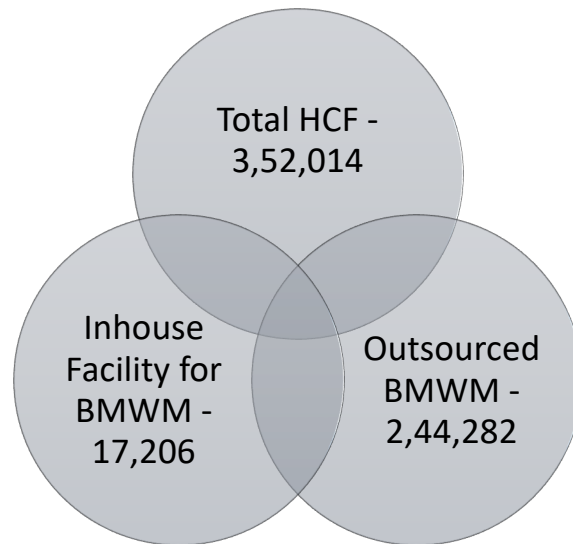


Figure 1

Further, it has been noted that there is a lag among the production of biomedical waste and its effective treatment. The CPCB has detected this oversight and informed the appropriate State Board to close the gap and guarantee that biomedical waste is disposed of in accordance with the 2016 BMWM Rules.

Report of Compliance by the States²⁹

S.No.	Name (State/Union Territory)	Cumulated Quantity of BMW generated	Cumulated Quantity of BMW Treated and Disposed	Gaps in treatment and disposal of bio-medical waste (kilogram per day)
1	Andaman Nicobar	536.36	536.36	0
2	Andhra Pradesh	25029.3	25029.3	0
3	Arunachal Pradesh	353.63	353.63	0
4	Assam	8235.97	5314.22	2921.75

²⁹ Central Pollution Control Board (MoEF&CC). (2020). *Annual Report on Biomedical Waste Generation*. central pollution control board.

5	Bihar	27846.15	10201.3	17644.85
6	Chandigarh	5729	5729	0
7	Chhattisgarh	7234.31	7234.31	0
8	Daman &Diu and Dadra & Nagar Haveli	450	450	0
9	Delhi	23200.09	23200.09	0
10	Goa	1272.68	1272.68	0
11	Gujarat	49492	49492	0
12	Haryana	19217	19217	0
13	Himachal Pradesh	3545.78	3545.78	0
14	Jharkhand	8406.7317	8406.7317	0
15	J & K	5941.81	5941.81	0
16	Karnataka	82604	38951	43653
17	Kerala	40408	40207	201
18	Ladakh	43.35	43.35	0
19	Lakshadweep	1137	1137	0
20	Madhya Pradesh	20008.91	19003.55	1005.36
21	Maharashtra	82146.35	82111.82	34.53
22	Manipur	921.9	888.5	33.4
23	Meghalaya	1556.95	1556.95	0
24	Mizoram	863.13	863.13	0
25	Nagaland	891.8	652.5	239.3
26	Odisha	15303.76	15303.76	0
27	Puducherry	4360	4360	0
28	Punjab	16998.16	16998.16	0

29	Rajasthan	18911.56	18911.56	0
30	Sikkim	477.56	477.56	0
31	Tamil Nadu	35269.74	35269.74	0
32	Telengana	23810	23810	0
33	Tripura	3852.58	3852.58	0
34	Uttarakhand	7616.57	7616.57	0
35	Uttar Pradesh	64038	64038	0
36	West Bengal	43513.39	43513.39	0
37	DGAFMs	5450.99	5450.99	0
Total		656674.5117	590941.327	65733.19

In order to address such gaps in earlier years and to lessen negative effects on human life and environment, a Common Bio-medical Waste Treatment and Disposal Facility (CBWTF) is established. Here, the member healthcare facilities treat the biological waste they produce properly. Recyclable materials can either be recycled or disposed of in a secure landfill after treatment. Occupiers are prohibited by BMW Rules from establishing an on-site or captive bio-medical waste treatment and disposal facility if a public facility is reachable within a 75-kilometer radius. According to SPCBs/PCCs' 2020's annual report, apparently there are presently 208 CBWTFs operating in the nation, and 33 more are being built. There are no CBWTFs for the treatment and disposal of biomedical waste in the following states: Andaman & Nicobar, Arunachal Pradesh, Goa, Ladakh, Mizoram, Nagaland, Sikkim, and Tripura. Additionally, In accordance with the 2016 BMW Rules, each owner or operator of a facility for the treatment of common biomedical waste is required to install an Online Continuous Emission Monitoring System (OCEMS) for the parameters authorised by the State Pollution Control Board or Pollution Control Committees and to transmit the real-time data to the servers at the State Pollution Control Board or Pollution Control Committees and Central Pollution Control Board. The numbers given indicate that 195 out of 208 CBWTFs have OCEMS installed in their incineration stacks.

In addition to this, according to the report of the Oversight Committee instituted by National Green Tribunal, Lucknow, there were total 23,882 health care facilities (including Government & Private) in the state out of which only 20,927 health care facilities were authorised. Whereas the remaining 2955 were still in the process of obtaining the authorization from State. Out of these only 5239 healthcare facilities have actually submitted the annual report on BMW Management in the year 2019 and out of these, only 1048 facilities have registered on the real-time interface established by the state titled *BMWIS*.³⁰ Accordingly, it is estimated that all the healthcare facilities in the state generate almost 52.5 Mega Tonnes of Bio-Medical Waste per day (including incinerable & non-incinerable waste). While only 3620 healthcare facilities have initiated the deep-burial facility out of which only 21% is operation & remaining is in the process of construction. Furthermore, as per this report, few surveys reflect the veracious status of awareness regarding disposal of BMW among the direct stakeholders such as healthcare workers in various districts. The lack of awareness pertaining to segregation and hazards related to BMW among varied classes i.e., Nurses, Pharmacists, Technicians, Dental Practitioners & Paramedics ranges from 50% to 75%.³¹ As a consequence of this report, the State Government has imposed a cumulative penalty of INR. 8.0 Crores as ‘Environment Compensation’ on almost 140 defaulters. Besides, the notices related to incomplete authorization were issued to 5806 healthcare facilities excluding few show cause notices issued for contravening the provision of BMW Rules 2016.³²

Interpretation of gaps through Sustainable Development Goals

Sustainable Development Goals (SDG) have been adopted by United Nations in the year 2015 as an action plan for development and better standard of living of humanity. Appropriate healthcare waste management will ensure realising some of the SDG goals including a) good health and well-being (SDG 3); and b) clean water and sanitation (SDG 6)

Good health and well-being are fundamental aspect of right to life. As mentioned earlier, even the Apex Court has ruled in a number of cases that the right to health is a component of Article 21 of the Indian Constitution, which also protects the right to life. The gap between the biomedical waste generated and disposed of, as noted in the previous section, will endanger the health and well-being of the people. As noted by World Health Organisation, at least fifteen

³⁰BMWIS available at <http://BMWis.uphsspmis.org> (accessed on Oct 10, 2022)

³¹ NGT Lucknow, Uttar Pradesh. (2019). *Report of the Oversight Committee 2019*. ngt lucknow, uttar Pradesh.

³² Central Pollution Control Board (MoEF&CC). (2020). *Annual Report on Biomedical Waste Generation*. central pollution control board.

percent of bio medical waste is dangerous and expose citizens to health and environment related risks³³, safe handling of bio medical waste fundamental to ensuring healthy life of people. If this hazardous waste is not insulated and treated properly and thrown in open areas, it poses a severe risk to sanitation of health care workers and people handling waste materials. If such wastes can find its way in water bodies, it will contaminate the water bodies and also be threat marine species and access to clean water of people.³⁴

Limitations of Legal Regulations

It's quite apparent that there is a certain level of improvement & enhancements in our procedures for managing biomedical waste in India, there are still a number of issues that prevent us from declaring a complete success. The regulation has granted the local self-government, the state, and the national pollution control board full authority. A harsh action should be taken against any hospital found to be in violation of the bio-medical regulations in their hospital, which may result in the facility's immediate closure. It is the obligation and authority of the states PCBs (Pollution Control Boards) to periodically check the hospitals without prior warning. Even if the regulations include a variety of treatments for bio-medical waste, it can be challenging to adhere to disposal procedures in city hospitals, which may have an impact on the nearby residential areas and residents. The cost for tiny clinics increases as a result of the hospital's dependence on a private contractor to transport and dispose of the biomedical waste produced at the facility. In many countries, the unlawful dumping of biomedical waste has grown extremely prevalent. The law might not have total control on the rule-follower. Because they mix biomedical waste with regular trash and dump it in the neighbourhood dustbins, unauthorised disposers are difficult to spot. One of the key problems that the government cannot readily resolve is this one. In addition, influence and bribery lead to the protection of defaulters.³⁵

³³ World Health Organization. (2017). *Safe management of wastes from health-care activities: a summary* (No. WHO/FWC/WSH/17.05). World Health Organization. available at: <https://apps.who.int/iris/bitstream/handle/10665/259491/WHO-FWC-WSH-17.05-eng.pdf> (accessed on 26th Oct. 2022)

³⁴ Nalini Ravichandran, Used plastic masks and gloves are making their way into water bodies across India. *Scroll.in* Nov 02, 2020. Available at: <https://scroll.in/article/977217/used-plastic-masks-and-gloves-are-making-their-way-into-water-bodies-across-india> see also, Kothari, R., Sahab, S., Singh, H. M., Singh, R. P., Singh, B., Pathania, D., ... & Tyagi, V. V. (2021). COVID-19 and waste management in Indian scenario: Challenges and possible solutions. *Environmental Science and Pollution Research*, 28(38), 52702-52723.

³⁵ World Health Organization. (2011). *Aide-mémoire: developing a national blood system* (No. WHO/EHT/11.01). World Health Organization.

Conclusion

Stringent laws, committed assistance of government and authorities and effective BMW practises followed by both healthcare professionals and HCFs, and regular monitoring of BMW practises should all go into the management of biomedical waste. There is no doubt that the lawmakers have created tough regulations for the safe and effective management of biomedical waste for healthcare facilities, yet they should be closely followed by the various state agencies to prevent biohazards from entering the environment. The new BMW 2016 recommendations, which aim to reduce environmental pollution and ensure the safety of staff, patients, and the general public, are an improvement over prior norms in terms of better segregation, transportation, and disposal processes. In light of this, it is advised that medical wastes be grouped in a similar manner according to their origin, typology, and risk considerations related to their management, capacity, and extreme disposal. The main step is isolating waste at the source, and reduction, reuse, and repurposing should be taken into account from genuine viewpoints. We must think of radical and innovative solutions to address the troubling situation of municipal disregard for healthcare facilities and lax government adherence to the bare minimal of regulations as generation of waste, particularly biomedical waste, places increasing immediate and abnormal costs on society. In this way, our ability to logically monitor growing quantities of biological waste that exceed practises will be put to the test. If all the direct and indirect stakeholders aim to protect our precious environment and the wholesome wellness of our community, then they should focus on this crucial problem out of both a reasonable concern for healthcare providers and a legitimate concern for the fellow citizens.