MANAGING BIOMEDICAL WASTE IN INDIA

COVID-19 AND BEYOND

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Introduction

Biomedical waste management is a tricky business; it has become even more so in COVID-19 times. Not only has the quantity of biomedical waste produced at hospitals increased but, with people being quarantined at home, infectious waste needs to be collected and processed from residential setups as well. This briefing paper highlights the status of biomedical waste management in India, the steps being taken to improve it and the agenda for the future.

Biomedical Waste Management Rules, 2016 have set down the following procedure for management of this kind of waste:

1. The definition of the term **'healthcare facility'** has been deliberately kept broad so that all biomedical waste falls within the ambit of the Rules and its safe disposal is ensured:

'Healthcare 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.'

2. The Rules define an 'occupier' as:

'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, healthcare facility and clinical establishment, irrespective of their system of medicine and by whatever name they are called.'

They clearly set **out the duties of an 'occupier'**—to ensure that there is safe storage of segregated biomedical waste in coloured bags or containers; to pre-treat laboratory waste, microbiological waste, blood and blood samples through disinfection or sterilization; and to do everything in their power to make sure that the operations of the facility are safe and the people who are handling the waste are protected.

During COVID-19 times, the quanity of biomedical waste produced at healthcare facilities and residential setups has increased

3. The Rules promote centralized management of biomedical waste by stating that '*no occupier shall establish an on-site treatment and disposal facility, if a service of common biomedical waste treatment facility (CBWTF) is available within a distance of 75 km.*'

4. The Rules **also lay down the duties of the operator of a CBWTF.** An 'operator' of a CBWTF is:

'A person who owns or controls a CBWTF for the collection, reception, storage, transport, treatment, disposal or any other form of handling of biomedical waste.'

The operator requires an authorization for operation from the relevant state pollution control board (SPCB).

The operator of a CBWTF is paid for the collection, transportation and treatment of biomedical waste by a healthcare facility on the basis of the number of beds. If it is a non-bedded establishment, they are paid a pre-fixed charge. The rates are fixed by the health department. This system has been set up so that it does not create perverse incentives on either side—the healthcare facility or the operator.

State health departments fix the rate of collection, transportation and treatment of biomedical waste to make the system financially viable for operators. District health departments can increase (but not decrease) this rate as per ground conditions. Rates in Bihar, Delhi and Haryana are provided in *Table 1*.

Table 1: Collection and processing charges fixed for biomedical waste

State	Facility charges (maximum)
Bihar	1. In Nalanda, Buxar and Kaimur: Rs 5.75 per bed per day or Rs 20 per kg per day 2. In Ara and Rohtash: Rs 5.60 per bed per day or Rs 20 per kg per day
Delhi	1. Polyclinics, dispensaries, diagnostic and forensic laboratories other than government hospitals: Rs 27.87 per day (Rs 836 per month) 2. Bedded facility with one–seven beds: Rs 28.8 per day (Rs 864 per month) 3. Bedded facility with eight or more beds: Rs 3.85 per bed per day (Rs 115.50 per bed per month)
Haryana	1. Healthcare facilities without any beds or with up to five beds: Rs 1,000 per month 2. Healthcare facilities with six–ten beds, and standalone labs and diagnostic centres: Rs 1,850 per month 3. Healthcare facilities with 11–20 beds: Rs 2,250 per month 4. Healthcare facilities with 21–30 beds: Rs 4,000 per month 5. Healthcare facilities with 31–50 beds: Rs 5,500 per month 6. All healthcare facilities with more than 50 beds: Rs 8 per bed per day 7. Veterinary hospitals: Rs 1,100 per month 8. Primary health centres and community health centres that are outside municipal limits of the district headquarters: An additional fixed amount of Rs 5,000 per facility per month 9. Additional Rs 30 charged on healthcare facilities that have more than 50 beds and generate more than 325 g biomedical waste per day per bed

Source: CSE, 2020 (based on interaction with facility operators in these states)

Table 2: Methods of disposal of biomedical waste as laid down in the 2016 Rules

Category	Type	Method of disposal
Yellow category	Highly infectious waste: Human, animal, anatomical, soiled, etc.	Incineration, plasma pyrolysis or deep burial
Red category	Contaminated waste (recyclable): Waste generated from disposable items like tubing, bottles tubes, syringes (without needles)	Autoclaving, microwaving or hydroclaving followed by shredding or mutilation. Treated waste to be sent to registered or authorized recyclers, or for energy or plastics recovery, or for diesel or road making. It should not be sent to landfill sites.
White category	Waste sharps, including metals—needles, syringes with fixed needles, etc.	Autoclaving or dry heat stabilization, followed by shredding or mutilation and encapsulation in metal or cement containers to be sent for final disposal to iron foundries, or sanitary landfills or designated concrete waste sharp pits.
Blue category	Glassware: Broken or discarded and contaminated glassware, including medicine vials, etc.	Disinfection (by soaking and cleaning with detergent and sodium hypochlorite or through autoclaving or microwaving or hydroclaving. Then it should be sent for recycling.

Source: Biomedical Waste Management Rules, 2016

5. The Rules set down **methods of treatment and disposal** of biomedical waste based on the type of waste. They provide for incineration and recycling after treatment depending on the infectious nature of the waste (see *Table 2*).

The Rules provide that **red and blue category waste** must be properly treated, disinfected and mutilated before being sold to a recycling unit. Under the Rules, recyclers need to have valid authorization or registration from the prescribed authority (SPCB). Furthermore, the occupier or operator of the CBWTF is required to maintain a record of recyclables and these details must be submitted to the prescribed authority annually.

6. The Rules provide for **barcoding to track the collection, disposal and recycling of biomedical waste**. They also provide that the occupier (hospital or healthcare facility) must establish a barcode system for bags or containers containing biomedical waste to be sent out of the premises; and the operator of a CBWTF has to establish barcoding and global positioning system (GPS) tracking for biomedical waste. This was to be done within one year of the notification of the Rules.

7. Healthcare facilities are required to **phase out all mercury-based medical instruments** and ensure mercury waste management as per Central Pollution Control Board (CPCB) guidelines.

NGT directions on biomedical waste

On 12 March 2019, National Green Tribunal (NGT) directed CPCB to prepare a scale of compensation to be recovered from violators of provisions of Biomedical Waste Management Rules, 2016 within one month. It directed all SPCBs to recover compensation from polluters by laying down their own scale, which should not be less than the scale fixed by CPCB.

Accordingly, CPCB prepared guidelines for imposition of an environmental compensation charge(ECC) on deviant healthcare facilities and CBWTFs, which has been accepted by NGT.

For healthcare facilities: The list of non-compliance for levy of the ECC includes lack of authorization under the Rules and absence of an arrangement with a CBWTF for disposal. The minimum ECC levied on a healthcare facility is Rs 1,200 per day.

For CBWTFs: The list of non-compliance for levy of the ECC includes incinerator emissions exceeding the set limit.The minimum ECC levied on a CBWTF is Rs 3,000 per day.

In January 2020, Delhi Pollution Control Committee informed the NGT that 48 healthcare facilities in the national capital were found to be non-compliant with the provisions of the 2016 Rules and a penalty of Rs 1.34 crore had been levied on them.

On 23 April 2020, NGT directed CPCB to take essential steps to ensure compliance with Biomedical Waste Management Rules, 2016. The need for further revision of the Rules to cover all aspects of policy dealing not only with institutions but also with individual households was underlined. Situations where scientific disposal facilities like incinerators are not available and unmindful deep burial without adequate safeguards can adversely affect groundwater table and pose a danger to the health and safety of people were also highlighted.

On 18 May 2020, NGTdirected the West Bengal government and the SPCB to separately file reports by 8 July on the implementation of the CPCB guidelines on handling, treatment and disposal of biomedical waste of COVID-19 patients with specific reference to waste of people who are under home quarantine.

The Tribunal has directed the Centre to constitute a high-level task team, comprised of members of the Ministry of Environment, Forest and Climate Change, Ministry of Health, Ministry of Urban Development, Ministry of Jal Shakti, Ministry of Defence and the CPCB, to supervise the handling and scientific disposal of COVID-19 waste in accordance with the guidelines.

The Tribunal has also directed state departments of environment and SPCBs to ensure compliance with Biomedical Waste Management Rules, 2016 and furnish reports on action taken to CPCB. It has directed CPCB to take further steps and furnish a consolidated report to the tribunal about the steps taken in this regard and the ground status as on 31 May 2020.

NGT has also directed that the chief secretaries of states and UTs must closely monitor the scientific storage, transportation, handling, management and disposal of COVID-19 waste.

Status of nationwide implementation

The Biomedical Waste Management Rules, 2016 direct SPCBs to submit annual reports on the implementation status to CPCB. A 2018 amendment to the Rules provided a format for submission of these reports. CPCB published an *Annual Report on Biomedical Waste Management* for 2018 based on data compiled and reported by all SPCBs. It also filed a status report in May 2019 on the performance of the implementation to NGT, in compliance with an order dated 12 March 2019.

Table 3: Status of management of biomedical waste in India

Parameter	Statistics
Number of healthcare facilities	270,416
Number of bedded healthcare facilities	97,382
Number of beds	2,206,362
Number of non-bedded healthcare facilities	173,831
Healthcare facilities that have applied for authorization	111,122 (41 per cent)
Healthcare facilities granted authorization	110,356 (40 per cent)
Number of CBWTFs	200 + 28 (under construction)
Number of authorized captive biomedical waste treatment facilities and incinerators operated by healthcare facilities	12,326
Number of captive incinerators operated by healthcare facilities	120
Total generation of biomedical waste	614 tonnes per day
Biomedical waste treated by CBWTFs	534 tonnes per day (87 per cent)
Biomedical waste treated by captive treatment facilities or disposed of at deep burial sites	80 tonnes per day
Number of healthcare facilities violating the 2016 Rules	27,301
Number of showcause notices or directions issued	16,956
Number of CBWTFs that have installed CEMS	172

Note: 2018 figures

Source: https://cpcb.nic.in/uploads/Projects/Bio-Medical-Waste/AR_BMWM_2018.pdf

Issues in biomedical waste management

Key issues that need further examination and discussion are as follows:

1. **Pending authorization:** Why is the rate of grant of authorization by SPCBs so low? What causes the delay in granting authorization? Can the process be improved?

2. **Inventory of biomedical waste:** Is the inventorization of biomedical waste linked with the grant of authorization? How can inventorization be improved?

3. How do SPCBs track the quantity of biomedical waste of different categories—red, blue, white, etc.—collected and processed?

4. Who manages captive incinerators and deep burial sites and are they adequately tracked?

5. How many incinerators in CBWTFs have been upgraded as per CPCB directions? What are the timelines for upgrading incinerators?

6. What is the status of GPS tracking and barcoding of biomedical waste?

7. Information regarding biomedical recycling. Who are the authorized recyclers? What measures are being taken to track and quantify biomedical waste that has been processed for recycling?

Authorization and inventorization

Under the Rules, healthcare facilities are required to obtain authorization from SPCBs. The authorization process is critical as it allows an SPCB to track the status of compliance in the state. An authorization is granted once a healthcare facility has signed a contract with a CBWTF for biomedical waste management. Data from SPCBs shows that about 41 per cent healthcare facilities have been granted authorization. However, a large number of healthcare facilities (about 40 per cent) have still not applied for grant of authorization.

According to officials of SPCBs, the bottleneck in the grant of authorization is the attainment of consent to operate (CTO), which is a time-consuming process in itself as it requires clearances from many agencies.

Inventorization of biomedical waste could well result in an underestimate. The quantity of biomedical waste generated is computed by SPCBs on the basis of information furnished by healthcare facilities seeking authorization. However, since a large number of healthcare facilities have yet to seek authorization, SPCBs lack data to properly estimate the quantity of biomedical waste produced.

Incineration, recycling and deep burial—closing the disposal cycle

Management (safe treatment and disposal) of biomedical waste has two critical components:

1. Safe and well-managed incineration to ensure that waste is fully burnt and there are no toxic emissions from CBWTFs: During incineration, a CBWTF has to ensure that the temperature in the primary chamber is around 800ºC and the temperature in the secondary chamber is around 1,050ºC. The gas residence time in the secondary chamber must be at least 2 seconds. The incinerator must have an efficiency of at least 99 per cent.

Table 4: Authorized recyclers of disinfected, autoclaved and shredded recyclables in select cities

State	Recycling facility
Gurugram	Goyal Glass Ware Pvt Ltd (glass) at Firozabad, U.P.
Delhi	Delhi Scrap Management (plastics) at Bawana Industrial Area Duggar Fibre Pvt Ltd (metal) at Jahangir Puri, Delhi
Kolkata	Shadab Plastic Jas Plastic Bengal Polychem Industries Smak Film
Siliguri	Saroda Plastic Industries Shiv Poly Udyog Kundu Poly Udyog Utpal Pipe Manufacturing Ganapati Polymers Radha Swami Plastic K.D. Plastic Industries
Sangrur	Shiv Shankar Plastics
Patiala	Ganesh Plastic, Patiala P.D. Industries Shri Radhe Krishan Plastic Industry Manmeet Industries Grace Plastic Industries Remal Dass Ram Lal, Rajpura Nabha Trading Co. Shakuntla Industries
Ludhiana	B.K. Engineering Works Rajiv Plastic Industries Shree Durga Plastic
Bokaro	Trident Metal Energy Pvt Ltd, Kandra
Deoghar	Anmol Agriform Input Pvt Ltd, Jasidih
Ranchi	Mangalam Lubricants Pvt Ltd, Herdag Tirupati Chemicals & Industries, Mahilong Poddar Agrotech, Tupudana Industrial Area, Hatia
Saraikela–Kharsawan	Jamshedpur Lubricants, AIA Bolbum Petroleum, AIA Jamujara Lubricants, AIA

Source: CSE 2020 (based on interaction with facility operators)

Improper and unauthorized deep burial of biomedical waste is a serious danger

The Rules have also set down emissions standards and stack height. Particulate matter emissions concentration has to be less than 50 mg/ Nm^3 and NO_x emissions concentration less than 400 mg/ Nm^3. Mandated minimum stack height is 30 metres. Incinerators are required to install continuous emission monitoring systems (CEMS) that must be linked to the websites of the concerned SPCB and CPCB.

Ash from incineration of biomedical waste has to be disposed of at a CBWTF. However, if the concentration of toxic metals in the ash is within the limits set by Hazardous and Other Waste (Management and Transboundary Movement) Rules 2016, it may be disposed of at a municipal landfill.

2. Red, white and blue category wastes must be properly treated, disinfected and mutilated before being sold to a recycling unit: Under the 2016 Rules, recyclers need valid authorization and registration from SPCBs to operate.

Furthermore, the occupier or operator of a CBWTF is required to maintain a record of the recyclables and these details must be submitted to the prescribed authority annually.

This link between the CBWTF and the recyclers needs to be tracked properly so that biomedical waste is safely handled and disposed of. Recyclers pay for treated waste; therefore, they have a motive to ensure it is recyclable. However, given the nature of biomedical waste, it is critical that the system is further improved through the use of barcoding. Barcoding will make tracking the source of the waste possible, and act as a deterrent against sale of recyclable waste that has not been treated and disinfected properly by CBWTFs to recyclers.

Besides these two critical elements, the 2016 Rules clearly state that **deep burial** is only permitted in rural or remote areas where there is no access to CBWTFs. This can be done after express approval from the concerned SPCB as per standards specified in schedule III of the Rules, as updated by CPCB from time to time. At present, schedule III states that the pit must be 2 metres deep; covered with lime and then soil; and at least 6 metres away from the groundwater table. How is this ensured? How many hospitals have been given permission for deep burial?

Barcoding—tracking the collection, treatment, disposal and recycling of biomedical waste

The 2016 Rules provide for barcoding of bags and containers carrying biomedical waste sent out of healthcare facilities. These bags and containers are required to be tracked through GPS. This was to be done within a year of the notification of the Rules. However, it remains a work in progress. For example, in Delhi–NCR, Environment Pollution (Prevention and Control) Authority (EPCA) discovered that many healthcare facilities have not put barcoding and GPS tracking systems in place. The main reason for this is suspicion that the common facility operator setting up this system is overcharging for the service. It is also not clear who is required to set up this system—individual healthcare units, the operator or the relevant SPCB.

Under the present arrangement, there is no link with recyclers. Waste sent to recycling units from common waste facilities should also be scientifically quantified and barcoded so that control is possible. If untreated waste has been sent to recyclers, it needs to be tracked back to the common facility so that the people responsible can be held accountable.

General waste management: How it is done

Hospitals generate general waste as well—from places like canteens and through people like the staff.

According to the 2016 Biomedical Waste Management Rules, healthcare facilities are required to dispose of solid waste other than biomedical waste separately. There are separate rules for it.

The Solid Waste Management Rules, 2016 categorize all facilities that, on an average, generate 100 kg of solid waste per day as 'bulk waste generators'. Such generators are required to segregate waste and ensure that it is processed internally or through authorized waste recyclers or agencies. Most municipal corporations have appointed agencies for collection and processing of waste from bulk waste generators. However, this system is inadequate and could lead to dumping of solid waste in the vicinity of a hospital or in green and vacant areas.

CPCB guidelines on biomedical waste of COVID-19 patients

CPCB has issued new guidelines, first in March 2020, subsequently revised and updated twice in April 2020 and on 10 June 2020, on COVID-19.

For COVID-19 isolation wards: To store COVID-19 biomedical waste separately and clearly label it. It should be lifted directly from the ward into the CBWTF collection van. This kind of waste falls into two categories—yellow and red. Masks, headcaps and covers, shoe covers, disposable linen gowns, etc. have been categorized as 'yellow' and marked for incineration.

For sample collection centres and laboratories for COVID-19 patients: Biomedical Waste Management Rules, 2016 to be followed strictly.

For quarantine camps and homes, and home-care facilities: Segregation is a must:
1. General solid waste should be collected by municipal authorities.
2. Waste contaminated with blood or body fluids of COVID-19 patients to be collected in yellow bags, placed separately and collected for biomedical waste collection by local bodies and sent to CBWTFs for incineration.

The problems

1. The quantity of biomedical waste produced has increased dramatically due to COVID-19. State CBWTF facilities are working at capacity to incinerate this waste.

2. Hospitals and healthcare facilities are formal medical institutions where segregation is better understood and practiced. These institutions also have agreements with biomedical waste collectors. But informal quarantine centres may not necessarily have the staff and the wherewithal to deal with biomedical waste properly. This is even more true in case of home quarantine. It can lead to yellow waste being mixed with general municipal solid waste, putting municipal workers in danger and increasing the risk of spread of infection. On the other hand, municipal solid waste might be wrongly labelled yellow, increasing the burden on already strained incinerators.

c. The use of plastics and disposable masks has also increased manifold, putting an additional burden on the collection and processing systems.

COVID-19 has brought the need for extremely careful handling of biomedical waste into renewed focus

Agenda for biomedical waste management

1. There is a process to identify healthcare facilities and to grant them authorization. This system is working reasonably well and SPCBs are also working to improve it and streamline clearances. The delay in authorization needs to be looked into and dealt with. **Data management systems for tracking and inventorization of biomedical waste need to be improved.**

2. A system is in place for collection of biomedical waste, which is segregated by healthcare facilities and then taken to CBWTFs run by private agencies. However, the **incinerators at CBWTFs are not properly regulated**. They need to run at the right temperature so that toxic emissions are eliminated.

3. **CEMS** have been installed at some CBWTFs, but they are not working satisfactorily—they are either not connected to the websites of relevant SPCB or CBCB, or the data is insufficient. These issues needs to be tackled.

4. Tracking of biomedical waste generated, collected, processed and recycled needs to be improved urgently. The barcoding system, as specified in the 2016 Rules, has yet to be implemented completely. **It is critical for tracking biomedical waste—both the quantity and collection—and needs to be implemented through CPCB.** Doing so will provide a national system of biomedical waste tracking and ensure compliance with the Rules.

5. Biomedical waste sent to authorized recyclers after treatment needs to be tracked. At present, there is no tracking system for recyclable waste. This is also the case with ash produced during incineration. Recyclable waste has good market value and so the possibility of it being discarded or dumped is small. However, it is important to ensure that recyclable waste is handled only by authorized dealers. **The barcoding system should be extended to waste recyclers as well.** This will be relatively easy to do and it will allow CPCB and SPCBs to keep track of the waste being sent for recycling from all CBWTFs and fix responsibility if treatment and handling guidelines for biomedical waste have been violated.

6. General waste (non-biomedical waste generated by healthcare facilities) is governed by Solid Waste Management Rules, 2016. The **Rules have provisions about 'bulk generators'**. These can be made more specific with regard to healthcare facilities.

Supreme Court directions on biomedical waste

In July 2020, Supreme Court directed the Environment Pollution (Control and Prevention) Authority (EPCA) to file a report on biomedical waste, particularly in terms of the infectious waste generated because of COVID-19.

Key issues

Subsequently, in its report to the Supreme Court (no. 112), EPCA listed the following key issues:

1. CPCB has been proactive in issuing directives and guidelines regarding the management of COVID-19 biomedical and plastic waste. These guidelines have been informed by the situation evolving since 19 March, when the issue was primarily regarding isolation wards in hospitals. On 25 March, the issue of quarantine centers was added; In April, the management of wastewater from treatment facilities was emphasized. The 6 June guidelines focused on the growing problem of waste handlers and the need for protective gear for sanitary workers and others involved in the waste system. In the latest review and guidelines (4th review), CPCB has stressed on the issue of segregation of household waste from infectious waste so that it does not overload the treatment system.

2. The guidelines include the management of biomedical waste in homes, where there are patients under self-quarantine, and in isolation wards in railway carriages and other such institutional facilities in the private and public sectors.

3. Based on the directions of the NGT, CPCB has also launched an app to track biomedical waste (COVID-19 BWM). The app allows **generators of waste** (urban local bodies in the case of homecare, hospitals and laboratories), **picker of waste** (transport of the ULB or waste treatment facility) and the **waste treatment operator** to feed in data so that COVID-19 biomedical waste can be tracked and monitored.

4. With the increase in the number of COVID-19 positive cases, there is a huge increase in the quantum of biomedical waste generated. Based on data provided by CPCB, the quantum of biomedical waste generated has increased from 94 tonnes in May 2020 in Delhi, Haryana, Rajasthan and U.P. to 761 tonnes in July (till 24 July 2020). This data may be on the lower side as a number of generators have not yet registered on the app or are not using it.

Table 5: Biomedical waste generated in Delhi, Haryana, Rajasthan and U.P.

	May	June	July
Biomedical waste generated (metric tonnes per month)	94	665	761

Source: EPCA

5. However, according to CPCB and SPCBs, the huge increase in the quantum of biomedical waste in June was also because biomedical waste from households and quarantine centers was not being segregated and general waste was being

mixed with biomedical waste. This put pressure on the central facilities for biomedical waste disposal. Therefore, now there is an emphasis on the need to segregate biomedical waste from general waste, even in households where there are COVID-19 patients. According to the guidelines, only the infected waste (PPE suits, gloves, masks and swabs) should be put in the 'yellow' bags meant for incineration, while all the food and other waste should be collected as general waste.

6. CPCB's assessment is that at the current rate of biomedical waste generation, and if there is adequate segregation, existing CBWTF in the region are enough to deal with it. The data shows that the states and the region have adequate capacity for treatment of biomedical waste—Delhi can treat 2,220 tonnes per month; Haryana 288 tonnes per month; Rajasthan 72 tonnes per month; and U.P. 1,656 tonnes per month. This will obviously need to be carefully monitored and tracked—if the generation load increases because of an increase in the number of patients, then other facilities like hazardous waste incinerators will have to be used for biomedical waste.

7. While the system for collection of biomedical waste from healthcare facilities and registered laboratories is well established, in the case of COVID-19, **biomedical waste is generated** in homes and quarantine centers. This is where the key complication arises, as urban local bodies (and increasingly village panchayats, as positive cases increase in rural areas) have to track patients on a real-time basis and then set up systems for collection of biomedical waste from individual households located in different parts under their jurisdiction. The list of households is also dynamic—new infections mean new households being added and as people get better, the houeholds need to be taken off the list.

8. The municipal corporations—North, East, and South Delhi; New Delhi; Faridabad; Ghaziabad; and Gurgaon—explained that they had set up systems to collect the waste from individual households and from quarantine centers and to send it to CBWTFs. However, South and North Delhi Municipal Corporations said that they were sending the waste to waste-to-energy plants and not to biomedical waste treatment facilities for incineration.

9. The municipal corporations said that they were providing 'yellow bags' and also educating households on the need to segregate biomedical waste from general waste. Biomedical waste in Faridabad and Gurgaon is being collected separately and this also improves the segregation and sorting at the household level.

10. There is growing concern over the increase in plastic waste because

of COVID-19, which is adding to the problems of general solid waste management in cities. The collection of this waste—which is not from infected households or quarantine centers—is a huge challenge as it increases the need for segregation at the household level so that general waste can be recycled and not sent to landfills.

EPCA recommendations

Based on the aforementioned findings, EPCA made the following recommendations for the consideration of the Supreme Court:

1. It is important to track biomedical waste on a daily basis and to ensure that it is collected, transported and sent to a registered CBWTF. **All municipal corporations and SPCBs may be directed to use the COVID-19 BWM app. This may be made mandatory, so that CPCB can track all biomedical waste and ensure that it is being sent for treatment.**

2. **The South and North (Delhi) Municipal Corporations may be directed to send biomedical waste to a CBWTF and not to waste-to-energy (WTE) plants.** This is because WTE plants are not designed to incinerate biomedical waste, which needs a double-incineration chamber and protocols for storage and emissions control.

In the management of biomedical waste, the working of common facilities is critical. It is important that there is full monitoring of their functioning. The temperature data—provided through sensors installed in the plants—helps determine the functioning of the plant and needs to be monitored and enforcement regarding it stepped up.

3. **All SPCBs and pollution committees may be directed to ensure that all common facilities have installed online continuous emissions monitoring systems (OCEMS) and data from them is transmitted to both SPCB as well as CPCB websites.**

4. **CPCB may be directed to ensure that data from real-time OCEMS is monitored on a daily basis and information shared with SPCBs so that action can be taken, where necessary.**

5. Experience with air quality data has shown that when data is made publicly available, it leads to better scrutiny and effective monitoring.

CPCB may be directed to make real-time OCEMS data available publicly

on its website, particularly of temperature, so that working of the common facilities can be scrutinized by the general public.

6. Segregation of COVID-19 waste at the household or quarantine centre needs to be done with utmost care so that infected biomedical waste is sent for incineration and is not mixed with general solid waste.

Municipal corporations may be directed to ensure that they educate households about segregation and also send biomedical waste for treatment to common facilities only.

7. The management of biomedical waste requires tracking, not just of COVID-19 waste but also of all hospital waste across the country. Already, EPCA, in its *Report 110*, has pointed out the importance of bar-coding. The practice will allow SPCBs and CPCB to track all waste generated and its management. Supreme Court, in its direction of 21 July 2020, has taken note of the issue of bar-coding and its importance. Bar-coding is best done through SPCBs or through CPCB so that it can be regulated across the country. It should not be left to CBWTF operators as this will not allow for good management. **Supreme Court may direct MOEF&CC or CPCB to work out a national bar-coding system or portal for tracking biomedical waste.**

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Based on this report, the Supreme Court, on 30 July 2020, issued directions (see *Box: SC order dated 30 July 2020*), which will greatly advance the agenda to track and improve management of biomedical waste. CPCB has been directed to monitor the real-time OCEMS from CBWTFs and to make this data available to the public. This is the first time Supreme Court has stepped in and directed that data from emissions monitoring be made available to all, as it will increase transparency and credibility of the data. CPCB has also been directed to work on a national bar-coding system so that biomedical waste is tracked in each state—from generation to processing to incineration and also recycling.

Clearly, management of biomedical waste during a pandemic will require greater-than-usual scrutiny.

SC order dated 30 July 2020

Report nos. 110 and 112 submitted by EPCA
(regarding hospital waste management in compliance of directions dated 06 March 2020 and report on hospital waste management for COVID-19 in compliance of directions dated 21 July 2020)

Considered the reports of EPCA with respect to management of biomedical waste, particularly during COVID-19 and recommendations made in *Report 112*.

Considering the aforesaid recommendations, we issue the following directions:

1. All municipal corporations and SPCBs are directed to use the COVID-19 BWM app. This has been made mandatory and CPCB will track all biomedical waste and ensure that it is being sent for treatment.

2. The South and North (Delhi) Municipal Corporations are directed to send biomedical waste to CBWTFs and not to WTE plants.

3. All SPCB and pollution committees are directed to ensure that all common facilities have installed OCEMS in the plants and that the data from this is transmitted to both the state board website and CPCB.

4. CPCB is directed to ensure that data from real-time OCEMS is monitored on a daily basis and information shared with state boards so that action can be taken, where necessary.

5. CPCB is directed to make real-time OCEMS data available publicly on its website, particularly for temperature so that working of the common facilities is known.

6. Municipal corporations are directed to ensure that they educate households about segregation and also send biomedical waste for treatment to common facilities only.

7. We direct MOEF&CC and CPCB to work out a national bar-coding system or portal for tracking biomedical waste.

Let the directions be carried out punctually and compliance ensured. Let CPCB issue requisite directions to all SPCBs.

Four years after Biomedical Waste Management Rules were notified in India, implementation has improved in certain areas but continues to remain iffy on key parameters. COVID-19 has brought the need for extremely careful handling of biomedical waste into renewed focus.

In this background paper, we identify the drivers of biomedical waste management, the big wins, possible lacunae, and set an agenda for the future.

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