

Managing Infectious Medical Waste during the COVID-19 Pandemic

During the COVID-19 outbreak in Hubei Province, People's Republic of China (PRC), infectious medical waste increased by 600% from 40 tons per day to 240 tons per day. This quickly overwhelmed existing medical transport and disposal infrastructure around hospitals.¹

Other countries will face similar challenges. It is critical that additional waste management systems are put in place to help reduce the further spread of COVID-19 and the emergence of other diseases.

To support its developing member countries, the Asian Development Bank (ADB) has compiled the following list of considerations and recommendations to enable governments to rapidly respond to these unprecedented challenges.

KNOW YOUR COUNTRY'S INFECTIOUS MEDICAL WASTE MANAGEMENT CAPACITY

GOVERNMENT CONSIDERATIONS

What is the current infectious medical waste management plan for my country?

Some governments have existing legislation and regulations in place for the disposal of infectious medical waste from hospitals and households. Continue to follow these and consider if additional capacity and resources are needed to maintain compliance. Others that need assistance in operationalizing international regulations may seek guidance from the [World Health Organization \(WHO\)](#),² the [Basel Convention](#),³ and the [United Nations Environment Programme](#).⁴

What existing medical waste disposal equipment does my country have?

Sanitary landfills, medical incinerators, and medical autoclaves are used to deal with pre-pandemic waste amounts. Other resources including mobile incinerators, industrial furnaces, and cement kilns could be assessed for use if existing systems are overloaded and capacity is limited. For more information read: [Technical Guidelines on the Environmentally Sound Co-Processing of Hazardous Wastes in Cement Kilns](#).⁵

What is the existing transport capacity for infectious medical waste in my country?

Safe transport requires vehicles that can be sterilized, trained drivers and waste collectors, dedicated routes, and vehicle and waste tracking systems. Training must be conducted for crews who will be exposed to household infectious medical waste.



For more information read: [Technical Guidelines on Transport of Infectious Clinical Waste UN3291](#).⁶

How much infectious medical waste should my country expect based on the PRC's experience?

The table below shows probable volumes based on the experience of the PRC.⁷ Few cities have the capacity to deal with the expected excessive amounts of waste. Governments should consider dealing with excess waste as soon as possible.

City	Population (World Population Review)	Additional Medical Waste	Total Possible Production Over 60 Days
Manila	14 million	280 t/d	16,800 tons
Jakarta	10.6 million	212 t/d	12,750 tons
Kuala Lumpur	7.7 million	154 t/d	9,240 tons
Bangkok	10.5 million	210 t/d	12,600 tons
Ha Noi	8 million	160 t/d	9,600 tons

Metric ton = 1000 kilograms t/d = metric tons per day
Source: Extracted from data cited in footnote 1.

What measures are needed to ensure compliance?

Ensure that transport and disposal systems implement duty of care, waste tracking and labelling, disposal unit licensing, record keeping, and emissions monitoring. Consider enhanced security measures.

How long will these emergency measures need to be in place?

The peak management and treatment campaign lasted over 60 days in Wuhan. Other countries will experience different emergency timelines, which are dependent on specific policies and predicted infection curves.

¹ J. Shi and W. Zheng. 2020. Coronavirus: China struggling to deal with mountains of medical waste created by epidemic. 5 March. <https://www.scmp.com/news/china/society/article/3065049/coronavirus-china-struggling-deal-mountain-medical-waste-created>.

² World Health Organization (WHO). *Rolling updates on coronavirus disease (COVID-19)*. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen>.

³ Secretariat of the Basel Convention. 2020. Waste management an essential public service in the fight to beat COVID-19. *Basel Convention*. 20 March. <http://www.basel.int/Implementation/PublicAwareness/PressReleases/WastemanagementandCOVID19/tabid/8376/Default.aspx>.

⁴ United Nations Environment Programme (UNEP). 2020. Waste Management and essential public service in the fight to beat COVID-19. *United Nations Environment Programme*. 24 March. <https://www.unenvironment.org/news-and-stories/press-release/waste-management-essential-public-service-fight-beat-covid-19>.

⁵ Basel Convention. 2011. *Technical Guidelines on the Environmentally Sound Co-processing of Hazardous Wastes in Cement Kilns*. Paper prepared for the tenth meeting of the Conference of the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. Cartagena, Colombia. 17-21 October. <http://www.basel.int/Portals/4/Basel%20Convention/docs/pub/techguid/cement/tg-cement-e.pdf>.

⁶ Wash in Health Care Facilities. 2013. *Technical Guidelines of Transport of Infectious Clinical Waste (UN3291)*. <https://www.washinhc.org/wp-content/uploads/2019/03/Guidelines-Transport-of-infectious-waste-UN3291.pdf>.

⁷ Extracted from data cited in footnote 1.

ACT NOW

WASTE MANAGEMENT RECOMMENDATIONS

General Municipal Solid Waste Management Services

- Reschedule municipal solid waste collection frequency according to reduced workforce availability and reallocate available assets for infectious medical waste management.
- Recycling activities should be avoided to prevent human contact with any potentially infectious domestic and medical waste. All municipal waste should be treated as non-recyclable and disposed of through incineration or sanitary landfill. Landfill sites with informal waste picking will need increased management and security.

For more information on what other cities are doing, consult the [Association of Cities and Regions for sustainable Resource Management](#).⁸

Household Infectious Medical Waste Management

- Swan neck tie**
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- Households containing a person under investigation (PUI) or person under monitoring (PUM) should be encouraged to segregate all medical waste (face masks, wipes, tissues).
 - Where possible the monitoring agency responsible for PUI/PUM management should provide yellow medical bags and collection services for PUI/PUM related waste.
 - All PUI/PUM related waste should be double bagged, “swan neck” tied and the outside sprayed with a 0.5% chlorine disinfectant solution (1% household bleach solution).
 - If dedicated medical waste collection is available, then the double-bagged waste should be disposed of immediately.
- If no dedicated medical waste collection is available, then the double-bagged waste should be stored for 72 hours before being disposed with the general household waste.

For more information see footnote 8.

Infectious Medical Waste in Hospitals, Medical Centers, and Emergency Medical Facilities

Local governments can estimate the potential increase in tonnage over time:

$$\text{Estimated Infected Persons} \times 3.4 \text{ kilograms} = \text{Increase in Infectious Medical Waste per Day of Outbreak}^a$$

^a Equation compiled from data cited in footnote 7.

All medical waste should continue to be handled in line with your existing national legislation. However, experience from Hubei Province, PRC, has shown that **transport** and **disposal** elements of the system will be the first to be overwhelmed (footnote 1).

⁸ Association of Cities and Regions for Sustainable Resource Management (ACR+). 2020. Municipal Waste Management and COVID 19. <https://www.acrplus.org/en/municipal-waste-management-covid-19>.

⁹ Y. Chartier et al, ed. 2014. Safe management of wastes from health-care activities. Geneva, Switzerland: WHO. https://www.who.int/water_sanitation_health/publications/wastemanag/en/.

TRANSPORT



Additional vehicles should have a non-absorbent, sealed load area capable of being locked, disinfected, and separate from the driver’s cabin. Their vehicle identification numbers (VIN) or chassis numbers should be recorded to allow future control. For more information see footnote 6.

DISPOSAL



Infectious medical waste is typically segregated by hospital staff at the time of packing. The double-bagged items are sprayed with 0.5% chlorine solution before onsite temporary storage.⁹ The method of disposal then varies between hospitals:

- Sterilization through steam (autoclave) or irradiation prior to disposal in a licensed landfill
- Disposal through incineration on-site or at a remote specialist facility

If these resources begin to be overwhelmed, alternatives are available for temporary capacity increase:

- Mobile incineration or autoclave units may be used to support the existing infectious medical waste infrastructure

Some cement kilns and industrial furnaces may be used as temporary disposal facilities. The Government of the PRC has successfully made use of cement kilns for this purpose ($>1s$ Residence Time $>1100^{\circ}\text{C}$). For more information see footnote 5.

- As a temporary measure, secure facilities can be used as temporary storage in anticipation of additional emergency resources becoming available in the medium term.

Special Provisions with Countries with Large Informal Waste Management Sectors

Intermediate sorting of waste will result in higher infection rates and dispersal of infected waste. The risk of infected waste being handled multiple times needs to be avoided. This risk is particularly high with informal sector workers.

For more information:

Additional information is available through the links in this document, the ADB Data Room, and from the World Health Organization, the Basel Convention, and the United Nations Environment Programme.

ADB may be able to provide assistance to our developing member countries in emergency planning, emergency assistance, and remote training of operators. Please contact [ADB resident missions and offices](#) to request assistance.

Photo: Medical waste management in the People’s Republic of China. Properly managing infectious medical waste is essential for preventing further spread of COVID-19 and other diseases (photo by Lu Guang).

Note: ADB recognizes “China” as the People’s Republic of China.



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