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Benchmarking Health Care Waste Management and DRR Capacities in Five Asian Countries

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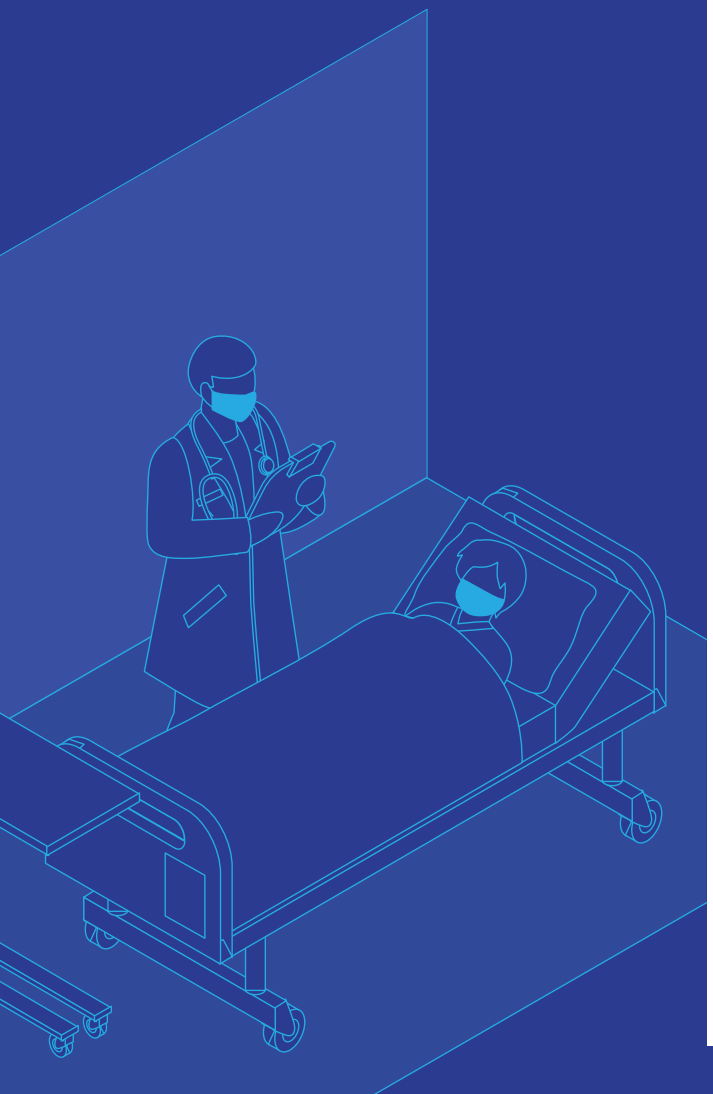
ACRONYMS AND ABBREVIATIONS

3R	reduce, reuse, recycle
ADB	Asian Development Bank
BAT	best available technology
BEP	best environmental practices
COVID-19	Coronavirus disease 19
DENR	Department of Environment and Natural Resources
DOH	Department of Health
DOH-HCWMM	Department of Health - Health Care Waste Management Manual
DRR	disaster risk reduction
DRT	Disaster Risk Reduction and Recovery for Building Resilience Team
Gavi	Global Alliance for Vaccines and Immunisation – GAVI The Vaccine Alliance
HCF	health care facility
HCWH	Health Care Without Harm
HCWM	health care waste management
HCWMM	Health Care Waste Management Manual
IEC	Information, education and communication
IGES	Institute for Global Environmental Strategies
IPC	infection prevention and control
KII	key informant interview
LGU	Local Government Unit
LMIC	low- and middle-income countries
M&E	monitoring and evaluation
MMCHD	Metro Manila Center for Health Development
MOH	Ministry of Health
MOHP	Ministry of Health and Population
MSWS	municipal solid waste services
POPs	persistent organic pollutants
PPE	personal protective equipment
SARS-CoV-2	severe acute respiratory syndrome – coronavirus 2
SOP	standard operating procedures
TSD	treatment, storage, and disposal
UNDP	United Nations Development Programme
UNDP BRH	UNDP Bangkok Regional Hub
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
WASH	water, sanitation and hygiene
WASH FIT	Water and Sanitation for Health Facility Improvement Tool
WHO	World Health Organization

EXECUTIVE SUMMARY



The COVID-19 pandemic made apparent the existing gaps and weaknesses in the health systems of developing countries in the Asia and the Pacific region, encompassing the aspects of policies, processes, infrastructure, and human resources. Moreover, the pandemic exposed the inequities in the development priorities within the health sector that could undermine countries' achievement of the Sustainable Development Goals, including disaster preparedness and resilience. One of the immediate and dire consequences of the pandemic was the increased volume of waste generated at health care facilities (HCFs), including hazardous waste, which raises the critical issue of safe health care waste management (HCWM) practices at all HCF levels.

UNDP, in partnership with the Government of China, implemented a regional project titled, "Learning from China's Experience to Improve the Ability of Response to COVID-19 in Asia and the Pacific Region", to support the strengthening of COVID-19 waste management in five countries: Cambodia, Lao PDR, Myanmar, Nepal, and the Philippines. Through this regional project, the DRT at the UNDP BRH, in collaboration with the UNDP Country Offices in the project countries, conducted comprehensive regional research on the HCWM practices and disaster risk reduction (DRR) capacities of HCFs in these countries.

This report documents the key findings and analysis from a benchmarking assessment of the HCWM capacities of the five countries, as well as from a benchmarking assessment of the incorporation of disaster risk reduction measures in health care facilities. The report includes recommendations for the five countries to improve their HCWM systems, as well as for regional-level actions for improved HCWM and related DRR measures.

BENCHMARKING HEALTH CARE WASTE MANAGEMENT CAPACITIES

The benchmarking aimed to dissect the main issues of each country in its HCWM system and implementation. The Gavi HCWM maturity model was adopted for this purpose.[1] The qualitative assessment considered six

1 Gavi, the Vaccine Alliance (May 2020). Health care waste management maturity model. Available at https://www.gavi.org/sites/default/files/programmes-impact/support/HCWM-Maturity-Model-May-2020.pdf

areas of waste management, namely: (1) awareness, training, and supportive supervision; (2) adherence and compliance; (3) national policy and strategic plans; (4) budget and planning, (5) practical guidance; and (6) technology and equipment availability and use. Reviews of relevant documents and reports, key informant interviews (KIIs), and surveys were utilized to form the basis of the qualitative assessment.

The results and findings from the assessment were validated by each country's stakeholders at national workshops that also aimed to identify and prioritize the practical measures to address the gaps in the country's HCWM system.

The review has shown that the HCWM policy and regulatory frameworks of most of the five countries are generally well established,[2] with policies and directives underpinned by the technical guidance and resources provided by the WHO and other international organizations. Common issues remain, however, with challenges to enforcement and resulting poor compliance among HCFs. In addition to the disproportionate burden on developing countries of the COVID-19 impacts, this underlying issue has made progressing towards safe and sustainable HCWM even more challenging for other low- and middle-income countries (LMICs) in the Asia-Pacific region.

The main challenges common among the five countries are summarised as follows:

- Insufficient resources allocated to enforcement of policies and regulations, resulting in only partial compliance.
- Uncoordinated HCWM processes and insufficient supervision and monitoring of HCWM practices among health workers, waste handlers and support staff.
- Lack of awareness and training on proper waste segregation, safe handling, treatment, and disposal of health care waste.
- Limited emphasis on public education for proper HCWM in households.
- Limited resources to institute and scale up HCWM best practices and install cost-effective waste treatment technologies.
- Lack of focus on waste minimization in HCFs.

Furthermore, data that track health care waste from each HCF are not well established in most cases. The lack of uniform definitions, indicators, and methodologies for data collection and analysis limits our understanding of the situation and issues, and by extension, hampers planning for effective solutions.

IMPACTS OF COVID-19 ON HEALTH CARE WASTE MANAGEMENT

Across all countries, the waste generated at HCFs increased with the COVID-19 pandemic. Poor segregation or in some cases deliberate non-segregation of waste have led to increased quantities of infectious waste as well as the subsequent cost for its treatment. International guidelines have promoted non-burn technologies for treatment of health care waste in support of the efforts to achieve sustainable low-carbon health systems.

With regards to managing vaccination waste, employing reverse logistics, early planning for waste management, and opting for best available technologies for treatment of waste are endorsed by the WHO and the UN Children's Fund (UNICEF) in their guidance.

2 Myanmar is an exception in that updated regulations and standard operating procedures have been drafted but not yet officially adopted.

BENCHMARKING DISASTER RISK REDUCTION CAPACITIES

Health care issues are closely linked with DRR. Both the COVID-19 pandemic, and disaster risks and climate change affect all sectors. Therefore, both DRR and addressing health care issues require multifaceted and systemic approaches. Several weaknesses in health care systems were exposed during this crisis. Addressing these issues can help strengthen the health sector's preparedness for emergencies and disasters, and by extension, aligns with the principles of DRR. It is crucial to connect health-sector issues with DRR to ensure actions are cohesive.

A HCF's capacity to manage disaster risks and cope with various health emergencies is crucial for the reliable delivery of essential health services. A system-wide approach to emergency preparedness should therefore include the capacity to safely manage health care waste during a crisis.

The benchmarking activity that was carried out as part of the research looked at the ways and means of HCFs to incorporate DRR in their plans and operations. The Gavi HCWM maturity model was adapted for this exercise and referred to the same six areas of assessment.

Based on the findings, the common challenge in institutionalizing DRR in HCFs is mainly due to gaps in polices and strategies. A key contributing factor to this is the limited resources put into improving HCWM and building DRR and emergency-response capacities. The analysis shows that most of these health systems are simply reactive to emergency situations. In addition, DRR concepts are still viewed as highly technical or are not well-known, and do not necessarily influence the HCWM practices of HCFs.

The main takeaway from the benchmarking exercise is that more efforts are needed to integrate disaster risk management in HCWM at the HCF level.

OPPORTUNITIES FOR REGIONAL COOPERATION

Consultations with regional experts were held based on the preliminary findings of the assessment, and the shared view of these experts was on the need of all five countries to ensure full compliance and proper enforcement of safe and environmentally sound HCWM practices.

Key recommendations grounded on the assessment findings include: firstly, the call for immediate actions to be directed at developing national DRR strategies and contingency plans for HCWM with consideration given to future disasters and emergencies; and, secondly, strengthening health authorities' capacities for planning, monitoring, and evaluating their HCWM systems including data collection and analysis. This part could be achieved with the adoption of uniform definitions, indicators, and methodology.

Another significant step for the global health care sector would be to take up decarbonization strategies in support of net zero emissions goals. The use of appropriate technologies, particularly non-burn technologies for health care waste treatment and disposal, should be promoted. Most developing countries could benefit from support in building their capacities to sustain these HCWM technologies through robust operations and maintenance practices.

Other recommendations from a regional perspective include:

- Strengthening collaboration among development partners focused on health, environment, DRR, urban and rural development in order to achieve synergies and to ensure consistency in policy advocacy.
- Promoting policies aimed at reducing volumes of health care waste.
- Supporting countries in the development of strategies and tools to educate health workers, waste handlers, and the public.
- Supporting countries in reviewing their national HCWM policy and regulatory frameworks with an emphasis on strengthening enforcement and compliance.

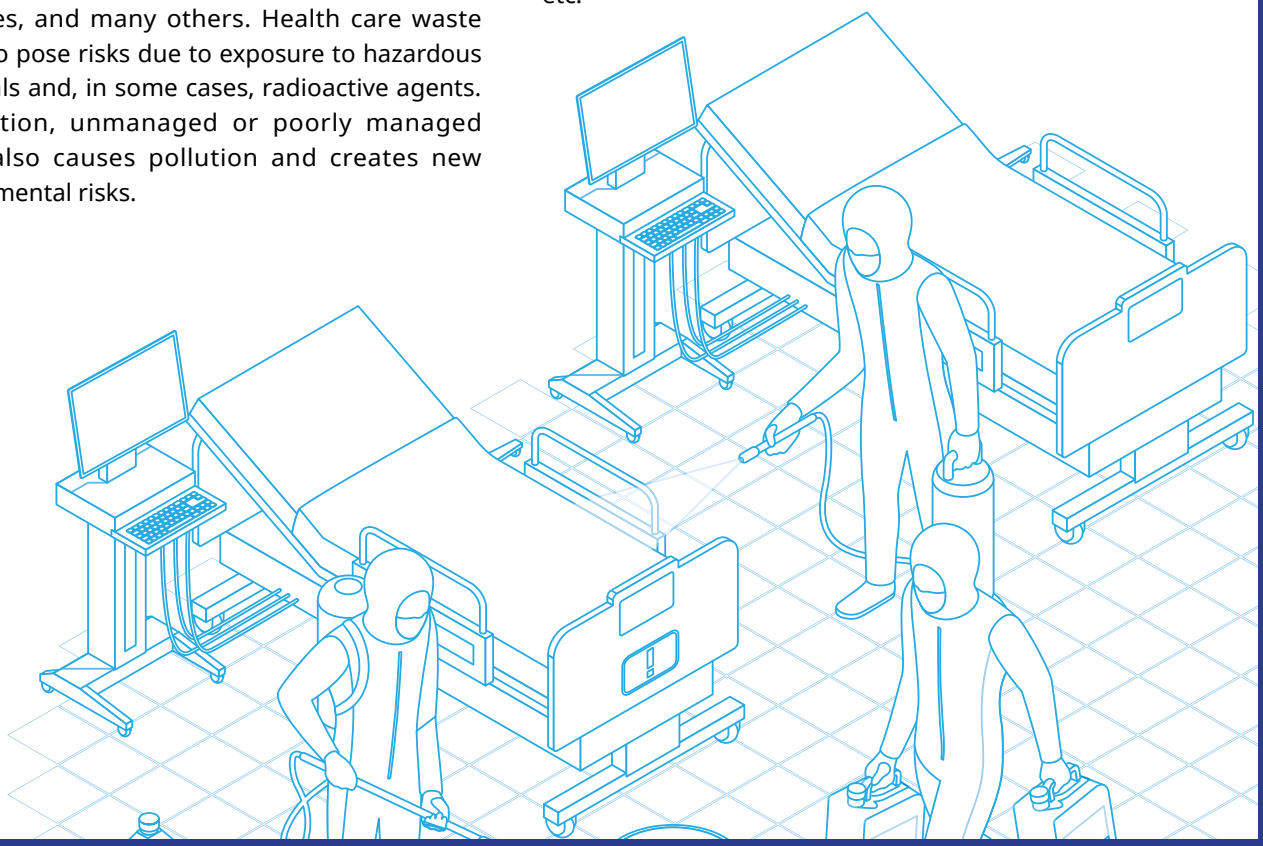
1. INTRODUCTION

1.1 BACKGROUND

COVID-19, with its highly contagious nature, has led to an unprecedented increase of health care waste generated in health care and quarantine facilities, medical laboratories, and bio-medical research facilities in many countries around the world. The increase in the amount of personal protective equipment (PPE) used during the COVID-19 pandemic within health care settings has further contributed towards the dramatic increase in health care waste.

If not properly treated and managed, health care waste poses serious risks of disease transmission to waste pickers, waste workers, health workers, patients, and the community in general through exposure to infectious agents such as the Human Immunodeficiency Virus (HIV), Hepatitis A, B, and C viruses, and many others. Health care waste may also pose risks due to exposure to hazardous chemicals and, in some cases, radioactive agents. In addition, unmanaged or poorly managed waste also causes pollution and creates new environmental risks.

COVID-19 has put a significant additional burden on all phases of HCWM systems, from segregation, collection, storage, transportation, treatment to final disposal. In light of this serious issue, international organizations such as the WHO and UNEP have developed a series of guidelines to support countries to manage health care waste in the context of the current pandemic. Many countries have also formulated policies, plans and standard operating procedures (SOPs) on COVID-19 waste management at national and local levels. However, institutional and capacity gaps persist, such as shortages of waste treatment equipment and facilities, lack of technologies for safe transportation and disposal, lack of professional workers and expertise for safe operations, and the need for awareness-raising and attitude changes towards better management of COVID-19 waste, etc.



The UNDP China Country Office, in close collaboration with the DRT at the UNDP BRH, leveraged resources from the Government of China through the Global Development and South-South Cooperation Fund to undertake a regional project titled, "Learning from China's Experience to Improve the Ability of Response to COVID-19 in Asia and the Pacific Region". This regional project supported and improved the response to COVID-19 in the Asia-Pacific region, particularly in Cambodia, Lao PDR, Myanmar, Nepal, and the Philippines.

Through this regional project, the DRT at the UNDP BRH, in collaboration with the UNDP Country Offices in the project countries, conducted research to better understand the most pressing issues related to HCWM in the five project countries through a situation analysis of HCWM practices and the DRR capacities of HCFs. The research took stock of the existing frameworks, capacities, and practices at various stages of the HCWM cycle in the five project countries, including emergency and disaster risk management capacities, and benchmarked them *vis-à-vis* the established or widely acknowledged international standards and norms. Based on the findings of the research, recommendations have been developed to inform future planning, policies, and actions of key stakeholders. The findings and recommendations from this study were verified by national authorities and relevant stakeholders in national workshops.

This study was conducted by a team consisting of one international consultant and five national consultants (one per country). The work was performed under the direct supervision of the DRT at the UNDP BRH, and in close coordination with UNDP Country Offices in the project countries.

1.2 ASSESSMENT FRAMEWORK

International Guidelines on Health Care Waste Management

International guidelines on the safe management of health care waste provide points of reference against which to assess waste management policies and practices. The WHO guidelines on HCWM are widely recognised as the most authoritative reference on this subject.[3] They serve as a point of reference for many national regulations and guidelines on HCWM, especially among LMICs, and for all other international guidelines on this subject. WHO guidelines on safe management of health care waste are summarised in Annex A.

Virtually all other internationally recognised guidelines on health care waste refer to WHO publications. Guidelines of several international organizations were reviewed and were found to be strongly aligned with the WHO technical guidance. These include the guidance notes issued by the United Nations Environment Programme (UNEP) and the Institute for Global Environmental Strategies (IGES) on health care waste and its impact on municipal solid waste services (MSWS),[4] the Asian Development Bank (ADB) guidance note on managing infectious COVID-19 waste,[5] and the Health Care Without Harm (HCWH) guidance note update on HCWM for COVID-19 waste (See Annex B). [6] The WHO guidelines for managing infectious waste and the preference for non-burn waste treatment technologies were also reflected in the guidelines of all other development partners.

Annex D presents a brief summary of international guidelines specifically on the management of waste generated through vaccination activities.

3 Prüss, Annette, Emmanuel, Jorge, Stringer, Ruth, Pieper, Ute, Townend, William. et al. (2014). Safe management of wastes from health-care activities / edited by A. Prüss ...[et al], 2nd ed.. World Health Organization. Available at https://apps.who.int/iris/handle/10665/85349

4 United Nations Environment Programme (UNEP) and Institute for Global Environmental Strategies (IGES) (2020). Waste management during the COVID-19 pandemic: from response to recovery. Available at https://www.unep.org/resources/report/waste-management-during-covid-19-pandemic-response-recovery

5 Asian Development Bank (ADB) (April 2020). Managing infectious medical waste during the COVID-19 pandemic. Available at https://www.adb.org/publications/managing-medical-waste-covid19

6 Health Care Without Harm (HCWH) (24 March 2020). Health care waste management: Coronavirus update. Available at https://noharm-global.org/documents/health-care-waste-management-coronavirus-update

A framework of assessment was developed to guide the analysis of collected information on HCWM *vis-à-vis* international guidelines and best practice.

ASSESSMENT FRAMEWORK PARAMETERS

- National policy and regulatory framework
- Breakdown of HCFs country-wide
- Waste generation rate
- Basic waste management practices
- Steps in the waste management chain
- Management of COVID-19 waste
- Case studies

1.3 METHODOLOGY

The research team collaborated in the collection and analysis of data and information, under the guidance and supervision of the DRT at the UNDP and in coordination with UNDP Country Offices.

Two approaches were utilized to collect data and information:

1. Literature search
2. Collection of supplementary data and information through surveys and KIIs.

The international consultant had the lead responsibility to identify and collect relevant background documents, for example international guidelines on safe HCWM and best practices, DRR measures and strategies for health services, and reports on HCWM from a regional (Asia-Pacific) perspective. National consultants identified and collected country-specific data and information such as: national legislation and/or regulations governing HCWM and DRR; technical guidelines that the government may have issued; information on the institutional or governance arrangements and key stakeholders; and relevant studies on HCWM practices and DRR efforts in the respective countries.

Gaps were identified where data and information were insufficient to complete the framework of assessment. Attempts were made to collect supplementary data and information to fill the gaps through surveys and questionnaires, and KIIs.

It was anticipated at the outset of the study that the available data and information would vary from country-to-country and, therefore, gaps in the framework of assessment would vary from country-to-country. The means of collecting supplementary data and information (whether by surveys or interviews) was decided on a country-by-country basis in consultation with the UNDP Country Offices.

The Gavi HCWM maturity model was used to benchmark the countries' HCWM systems against international best practice.[7] This is a qualitative method of assessment, which looks at broad areas of waste management including people, processes, and technology. Six areas of assessment (see Table 1) are assessed at levels 1 through 5, with 1 being the lowest level of assessment and 5 the highest. The study assessed each country's performance in each of the six areas of assessment based on the data and information collected through literature search and supplementary methods of collection. Results of the assessment were verified in national workshops.

7 Gavi, the Vaccine Alliance (May 2020). Health care waste management maturity model. Available at https://www.gavi.org/sites/default/files/programmes-impact/support/HCWM-Maturity-Model-May-2020.pdf

Table 1. Areas of assessment under the Gavi HCWM maturity model

People	**1. Awareness, training and supportive supervision:** Looks at the availability of training for health care workers and waste handlers on HCWM (both pre-service and in-service) and the level of integrated supervision that incorporates HCWM; and tracks comprehension of best practices in HCWM.
	2. Adherence and compliance: Assesses the level of adherence to best HCWM practices across the entire process, from point of generation to point of disposal. Monitoring and evaluation (M&E) frameworks and key performance indicators in place and supported through supervision.
Processes	**3. National policy and strategic plans:** Includes national policies and strategic plans for HCWM (including any immunization-specific policies or guidance); laws and regulations related to HCWM; and environmental impacts and policies on environmental sanitation and hygiene, to list a few.
	4. Budget and planning: Reflects the country having developed an appropriate budget that is fully funded and supports realistic needs. Budgets should be linked to resources and tools needed across all steps of HCWM, such as colour-coded bags at the facility level, transport for waste, treatment and disposal sites, and maintenance for HCWM equipment.
	5. Practical guidance: Looks at the hands-on tools such as SOPs, communication guidance, and job aids for health care workers and waste handlers directly involved in generating and managing waste.
Technology	**6. Technology and equipment availability and use:** Beyond equipment for treatment and disposal, this key area also incorporates all of the tools and supplies needed for HCWM. This begins with colour-coded collection technology at point of generation of waste, resources for occupational health and safety such as PPE, through the entire management process until disposal. This area should also consider maintenance for equipment to ensure functionality and overall sustainability.

A similar framework for the assessment of DRR capacities was adopted following the same assessment areas (see Table 2). Each indicator intends to determine the level of DRR capacities and emergency responsiveness of the health care system.

Table 2. Assessment areas for DRR capacities of HCFs

People	**1. Awareness, training and supportive supervision:** ▶ Awareness of the risk of disaster from all hazards (including natural disasters, man-made disasters, pandemics, epidemics, and disease outbreaks) for HCFs. ▶ Training given on DRR for HCFs. ▶ Supportive supervision for staff to improve their own work performance on DRR for HCFs.
	2. Adherence and compliance: The extent to which the HCFs act in accordance with the guidelines and training on DRR.
Processes	**3. National policy and strategic plans:** National policy and/or strategic plans regarding DRR for HCFs.
	4. Budget and planning: The existence of dedicated budget and plans for DRR for HCFs.
	5. Practical guidance: Guidelines or SOPs regarding DRR for HCFs that include HCWM, or HCWM guidelines, or SOPs that include a DRR portion.
Technology	**6. Technology and equipment availability and use:** The existence of and usage of best available technology (BAT) and equipment for DRR in HCWM.

Limitations of the study

Due to the limited time-frame available for the study, data collection focused on hospitals and health centres, anticipating that: (a) the quantities of health care waste generated from scattered sources, while important, would be relatively minor compared with quantities generated from hospitals and health centres; and (b) little or no quantitative data would be available on quantities of health care waste from scattered sources. (See section 2.1 for more on scattered sources.)

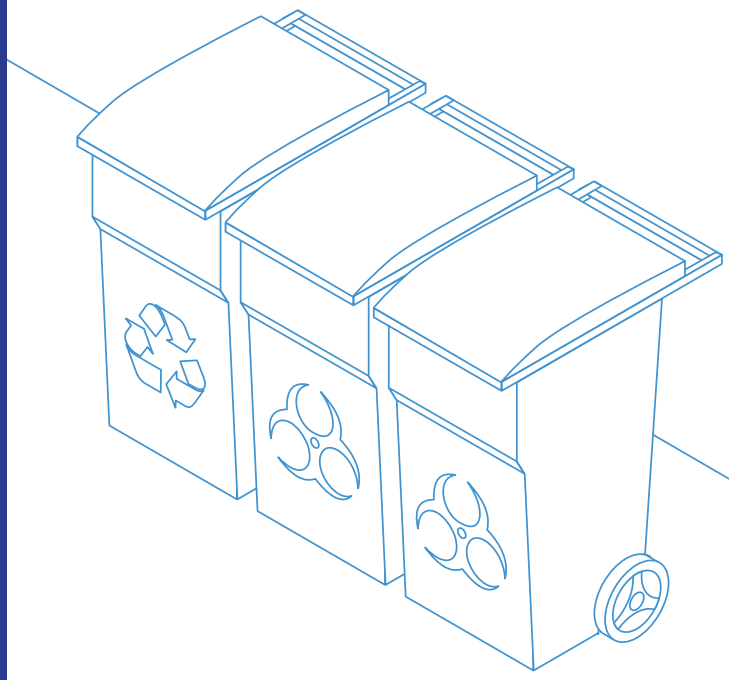
As anticipated, the available data and information varied from country to country, and gaps were identified in all of the project countries. Survey questionnaires administered in the countries to collect supplementary data and information had to be modest in nature and limited in distribution due to the short time-frame available for surveys. KIIs were kept to a minimum for the same reason.

In the case of Myanmar specifically, no contact with Myanmar authorities was possible due to UN principles of engagement, which severely constrained the ability to collect relevant data and information. The assessment of HCWM in Myanmar was therefore based on data gleaned from published papers, academic theses, several charity hospitals, and very limited KIIs.

2. HEALTH CARE WASTE GENERATION

2.1 DEFINITION AND CLASSIFICATION OF HEALTH CARE WASTE

The WHO considers health care waste to include all waste related to medical procedures generated within HCFs, which are primarily hospitals and health centres, but may also include research centres and laboratories. The term also refers to the same types of waste originating from small and scattered sources such as doctors' offices and pharmacies, and including waste produced for purposes of health care at the level of households.



Definitions of health care waste as used in the five countries under review somewhat complicate our understanding of the HCWM situations in the countries. See Table 3, below. Consider the following points:

- Only Cambodia uses the term "medical waste" and that term, as it is used in Cambodia, excludes non-hazardous waste generated in HCFs.
- Lao PDR and Myanmar have definitions of health care waste that closely match the WHO definition.
- Nepal's definition also closely matches the WHO definition except that it specifically includes waste generated during the diagnosis, treatment, or immunization of animals. Such waste categories are also included in the Philippines' definition of health care waste but are not included in the definitions used by Cambodia, Lao PDR, or Myanmar.
- Waste generated in the production or testing of biologicals is included in the definition of health care waste in Nepal and in the Philippines, but not in the other countries under review.

These points illustrate the lack of a uniform definition of the term "health care waste" and the lack of standardized waste categories, which make it difficult to compare waste-generation rates and waste-management practices among the five countries.

The present study was initially commissioned to study "medical waste management systems" in the five countries. In view of the definitions in use in the countries, the scope of study was widened to address the broader concept of health care waste. Failure to do so would have limited the study to Cambodia only since, considering the definitions found in the countries' relevant regulations, there is no waste defined as "medical waste" in Lao PDR, Myanmar, Nepal, or the Philippines. Furthermore, a study focused narrowly on medical waste in Cambodia would necessarily exclude very large volumes of non-hazardous material such as packaging material and food waste generated in HCFs.

The lack of uniformity among the countries' definitions also poses other complications. For example, whether data from veterinary hospitals or clinics should be considered in a given country if that country's definition of health care waste does not specifically include such waste.

Table 3. Definitions of health care waste adopted by each country

Lao PDR	The Decision on Waste Management in Health Care Facilities refers to health care waste as all waste generated within HCFs as well as all waste generated from health care activities undertaken in homes such as in-home dialysis, self- administration of insulin, other therapeutic injections, bandaging of cuts and wounds, etc. Health care waste is broadly defined in two categories: *hazardous health care waste* and *general waste*.
Myanmar	According to the Healthcare Waste Management Guideline, health care waste includes all the waste generated within HCFs, research centres and laboratories related to medical procedures. In addition, it includes the same types of waste originating from minor and scattered sources, including waste produced in the course of health care undertaken in the home e.g. home dialysis, self-administration of insulin, and recuperative care. Health care waste is broadly categorized into two groups: *hazardous health care waste* and *non-hazardous or general health care waste*.
Nepal	The Healthcare Waste Management Guideline defines health care waste as that generated by health care institutions, research facilities and laboratories, or generated during diagnosis, treatment, or immunization of human beings or animals or in research activities or in the production or testing of biologicals. Health care waste is broadly separated into three categories: *general*, *hazardous*, and *sharps*.
Philippines	The Health Care Waste Management Manual defines health care waste as any that includes all waste generated or produced as a result of any of the following activities: ▶ Diagnosis, treatment, or immunization of human beings or animals ▶ Research pertaining to the above activities ▶ Production or testing biologicals ▶ Waste originating from minor or scattered sources
Cambodia	The Regulation on Healthcare Waste defines health care waste as all categories of waste generated by a health care establishment. It is broadly categorized into two main groups: *general waste* and *medical waste*.

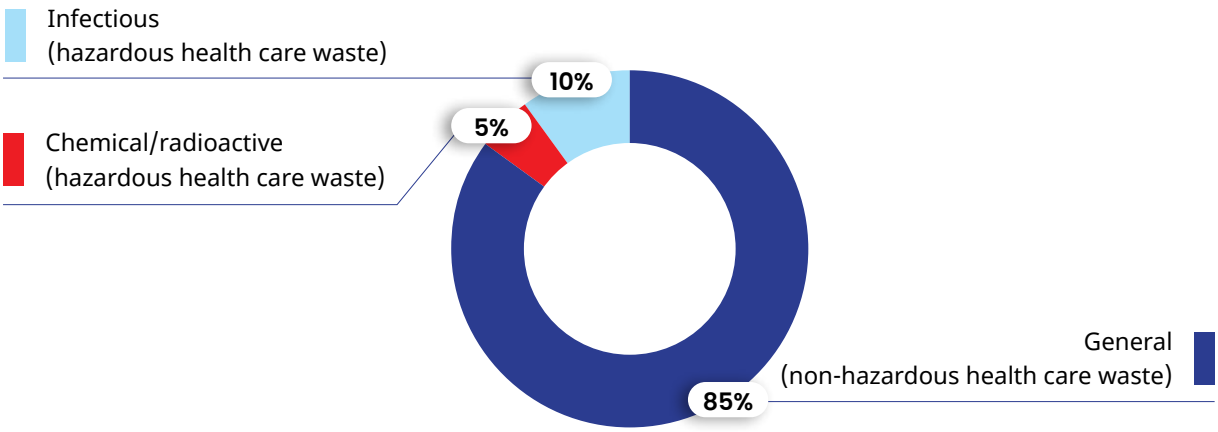
The categories of health care waste as defined by the WHO are: sharps waste, infectious waste, pathological waste, pharmaceutical waste, cytotoxic waste, chemical waste, radioactive waste, and general (i.e. non-hazardous) waste. The characteristics of the different waste categories are shown in Table 4.

Table 4. Categories of health care waste as defined by WHO

WASTE CATEGORY	DESCRIPTIONS AND EXAMPLES
Sharps waste	Used or unused sharps (e.g. hypodermic, intravenous or other needles; auto-disable syringes; syringes with attached needles; infusion sets; scalpels; pipettes; knives; blades; broken glass)
Infectious waste	Waste suspected to contain pathogens and that poses a risk of disease transmission (see section 2.1.2) (e.g. waste contaminated with blood and other body fluids; laboratory cultures and microbiological stocks; waste including excreta and other materials that have been in contact with patients infected with highly infectious diseases in isolation wards)
Pathological waste	Human tissues, organs, or fluids; body parts; foetuses; unused blood products
Pharmaceutical waste, cytotoxic waste	Pharmaceuticals that are expired or no longer needed; items contaminated by or containing pharmaceuticals Cytotoxic waste containing substances with genotoxic properties (e.g. waste containing cytostatic drugs, often used in cancer therapy; genotoxic chemicals)
Chemical waste	Waste containing chemical substances (e.g. laboratory reagents; film developer; disinfectants that are expired or no longer needed; solvents; waste with high content of heavy metals, e.g. batteries; broken thermometers and blood-pressure gauges)
Radioactive waste	Waste containing radioactive substances (e.g. unused liquids from radiotherapy or laboratory research; contaminated glassware, packages, or absorbent paper; urine and excreta from patients treated or tested with unsealed radionuclides; sealed sources)
Non-hazardous or general health care waste	Waste that does not pose any particular biological, chemical, radioactive, or physical hazard

Source: WHO, 2014

Figure 1. Typical waste composition in HCFs



Source: WHO, 2014

As shown in Figure 1, typically, 75 percent to 90 percent of waste produced by health care providers is non-hazardous at source and comparable to domestic waste. The non-hazardous portion of health care waste comes mostly from the administrative, kitchen, housekeeping, and maintenance functions at HCFs, and also includes packaging waste derived from deliveries of supplies and equipment. Hazardous categories of waste comprise the remaining 10 percent to 25 percent of health care waste. These categories may pose a variety of environmental and health risks if not safely managed. Consistent and effective segregation of hazardous and non-hazardous waste is necessary in order to maintain low percentages of hazardous waste. When hazardous waste is mixed with non-hazardous waste, the mixed waste must be managed as hazardous. This increases the overall quantity of hazardous waste and reduces the overall quantity of non-hazardous waste.

Cases wherein hazardous waste is over the estimated 10-to-25 percent share of total waste are presented in Box 1.

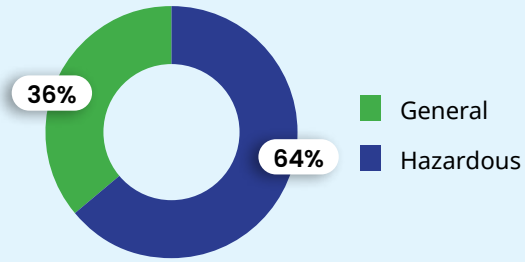
Box 1. Waste generation at Lao National Children's Hospital and Nepalgunj Sub-Metropolitan City

Hazardous waste generated from HCFs ranges from 10 percent to 25 percent of the total waste generated, according to the WHO. Field studies, however, suggest that ranges vary depending on (a) the specific services provided in the HCF, and (b) the degree to which waste segregation at source is practised. A detailed continuous seven-day study in Lao National Children's Hospital makes this case. Waste considered hazardous made up about 64 percent of the total waste generated before effective separation was implemented, as any waste containing some hazardous waste is considered hazardous in its entirety. After separation practices were improved, the quantity of waste considered hazardous was reduced to 29 percent of the total, only slightly higher than WHO global estimates. This was due to the poor segregation practices wherein hazardous wastes were mixed with general waste (Water and Environment International, 2015).

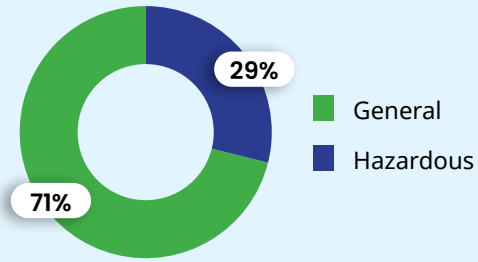
Continue on next page ▶

Box 1. (cont.)

Pre-separation waste scenario



Post-separation waste scenario



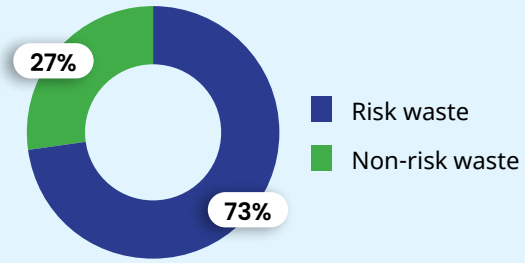
Source: Water and Environment International (2015). *Report on Assessment of the Health Care Waste Management System of Children's Hospital, Lao PDR*. Unpublished.

A similar study supported by the German Agency for International Cooperation (GIZ) Nepal in Nepalgunj Sub-Metropolitan City, Nepal found a similar issue on waste segregation practices. Overall, 73 percent of the waste generated at different levels of HCFs were considered high-risk waste (infectious and hazardous waste) prior to proper segregation. This was reduced to 32 percent with the implementation of a proper source separation programme; however, this is still higher than the WHO estimates.

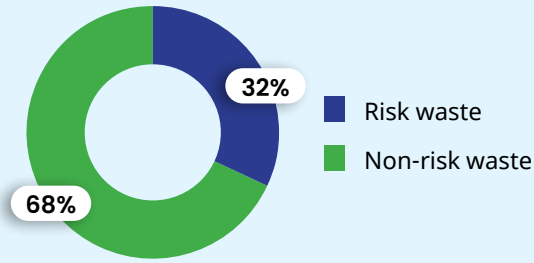
Most notably, a significant portion of waste generated at health posts was considered high-risk waste, about 79 percent prior to separation and 59 percent after separation of waste. This is mainly due to the generation of more pathological waste at health posts with birthing centres.

Current status and future perspective of risk waste in health care facilities of Nepalgunj Sub-Metropolitan City

Pre-separation (% of waste by weight)



Post-separation (% of waste by weight)



Source: Pathak, D.R., Nepal, S., Thapa, T, Dhakal, N., Tiwari, P., & Sinha, T.K. (2021). Capacity assessment and implementation analysis of common treatment facility for the management of infectious health care waste in rapidly urbanising city of Nepal. Waste Management & Research 39(1_suppl):64-75. doi: 10.1177/0734242X211013910.

The countries under review generally align with the WHO categorizations of health care waste, with some exceptions. Cambodia, Lao PDR, and the Philippines have added categories for pressurized containers and waste with high content of heavy metals. (Effectively, waste with a high content of heavy metals could be considered to be a sub-category of chemical waste.)

Nepal has only three categories of health care waste: general waste, sharps, and hazardous waste other than sharps. Hazardous waste other than sharps is then further categorized into infectious autoclavable and non-autoclavable (pathological and chemical waste). There is no specific category for pharmaceutical or genotoxic waste although these may be considered under the category of chemical waste. There is no category of radioactive waste in Nepal.

Table 5. Categories of health care waste adopted by each country

Lao PDR	Myanmar	Philippines
a. Hazardous health care waste ▸ Sharps waste ▸ Infectious waste ▸ Pathological waste ▸ Pharmaceutical waste ▸ Cytotoxic waste ▸ Chemical waste ▸ Waste with high content of heavy metals ▸ Pressurized containers ▸ Radioactive waste **b. General waste**	**a. Hazardous health care waste** ▸ Sharps waste ▸ Infectious waste ▸ Pathological waste ▸ Pharmaceutical waste including cytotoxic waste ▸ Chemical waste ▸ Radioactive waste **b. Non-hazardous or general health care waste**	**a. Sharps waste** **b. Infectious waste** **c. Pathological waste** **d. Pharmaceutical waste** **e. Genotoxic waste** **f. Chemical waste** **g. Waste with high content of heavy metals** **h. Pressurized containers** **i. Radioactive waste** **j. General waste**

Nepal	Cambodia
a. Hazardous waste **b. Sharps waste** **c. General waste** Note: Hazardous components of waste are further categorized into infectious autoclavable and non-autoclavable (pathological and chemical waste). Non-autoclavable waste can be incinerated or buried. If a combination of autoclaves, incineration and deep burial is used for waste treatment, then health care waste can be segregated into five categories, namely: general waste, sharps waste, autoclavable infectious waste, pathological or chemical waste for incineration, and waste for deep burial.	**a. Medical waste** ▸ Sharps waste ▸ Infectious waste ▸ Pathological waste ▸ Pharmaceutical waste ▸ Genotoxic waste ▸ Chemical waste ▸ Waste with high content of heavy metals ▸ Pressurized containers ▸ Radioactive waste **b. General waste**

2.2 HEALTH CARE WASTE GENERATION RATES

The data on health care waste generation rates for each country are presented in Table 6. The data are based on various relevant references and studies but are presented together to depict the health care waste situation in the country before and after the COVID-19 pandemic.

Table 6. Health care waste generation rates per country

	HEALTH CARE WASTE GENERATION RATES	REMARKS
Lao PDR	The average amount of health care waste generated in Vientiane at different facilities were: ▸ 0.84 kg/bed per day at national hospitals; ▸ 1.08 kg/bed per day at provincial hospitals; ▸ 0.47 kg/bed per day at district hospitals; and ▸ 0.08 kg/bed per day at health centres.[8]	▸ Data from pre-COVID-19 measurements. ▸ Among the provincial hospitals, district hospitals, health centres, pharmacies, private clinics within the area, the minimum quantity of solid waste was 0.02kg per day and a maximum of 700kg per day. About 27% was reported to be "medical waste" although the meaning of that term is unclear.
	It was estimated that about 556kg of waste per day was generated at one of the largest tertiary hospitals in Vientiane with a 450-bed capacity, at 58% capacity. The waste generation rate of the hospital is 2.2kg per patient per day. At another hospital with a 70-bed capacity, the generated waste was 90kg per day when the facility was at 77% occupancy. The waste generation rate of the hospital is 1.9kg per patient per day.	▸ More than half of the total waste generated was hazardous waste at each hospital.
	In 2021, three COVID-19 quarantine and isolation facilities in Vientiane were assessed for their waste generation rate: *a.* *Lanexay stadium*: 300-bed capacity with 18% occupancy rate generated 50kg of waste per day *b.* *Huayhong stadium*: 152-bed capacity with 65% occupancy rate generated 400kg of waste per day *c.* *KM27 isolation facility*: 500-bed capacity with 27% occupancy rate generated waste at 800kg per day.[9]	▸ About half of the waste generated at each facility was considered infectious waste.
Myanmar	Previous studies show that Yangon and Mandalay cities generate about 280t and 779t of medical waste per year, respectively.[10] The term "medical waste" is not precisely defined in the cited report but is said to consist of three categories of waste: (i) non-hazardous waste, (ii) pathological and infectious waste, and (iii) sharps, syringes, and pharmaceutical waste.	▸ Data from pre-COVID-19 measurements. ▸ More than 70% of this waste is reported to be infectious.

8 3R Knowledge Hub, Asian Institute of Technology (2008). Healthcare waste in Asia: Institutions and insights. Pathumthani, Thailand.

9 Lao PDR, Ministry of Health (2022). *Rapid assessment of health care waste management, wastewater treatment facility and sanitation of 12 target provincial hospitals.*

10 IGES (2016). Quick study on waste management in Myanmar: Current situation and key challenges. Available at https://www.iges.or.jp/en/publication_documents/pub/conferencepaper/en/5775/Myanmar_Baseline+Report+1st+Draft.pdf

	HEALTH CARE WASTE GENERATION RATES	REMARKS
Myanmar (cont.)	According to a 2017 WHO report:[11] ▸ Naypyitaw generated about 0.57t of medical waste per day (83% infectious waste, 1% sharps, 16% general waste) ▸ Yangon generated about 2.2t per day (71% infectious waste, 29% sharps) ▸ Mandalay generated about 1.2t per day (83% infectious waste, 1% sharps, 16% general waste)	▸ Data from pre-COVID-19 measurements.
	Waste generation at 68% of hospitals in Mon State generated an average of more than 100kg of waste per month, and the 32% generated between 11-100kg per month.[12]	▸ Data from pre-COVID-19 measurements. ▸ Data was collected from 93 primary health centres.
Nepal	The health care waste generation of Nepal is in a range of 0.99 to 1.8 kg per bed per day. Of this, hazardous waste is 0.33 to 0.59 kg per patient per day.	▸ Data from pre-COVID-19 measurements. ▸ The data are presented in range from a period of 2003 to 2020 through various assessments. [13,14,15]
	Based on 2015 national data, health care waste generation rate is approximately 1.35kg per patient per day. This assumes that with a total of 27,211 beds, the total quantity of hospital waste generated in the country is 36.7t per day.	▸ Data from pre-COVID-19 measurements. ▸ The actual amount would be more as non-hospital facilities still need to be accounted for. ▸ Assessment was conducted by the Ministry of Health and Population (MOHP) and the Department of Health Services at five regional hospitals, as reported in WHO 2017.
	In 2022, the waste generation rate for general waste is 1.1kg per bed per day, while both biodegradable and infectious waste are at 0.7kg per bed per day.[16]	▸ The data is based on a 2022 survey by the MOHP of 40 hospitals. No increase in the waste generation rate is seen from the 2015 data.

11 WHO (2017). Report on health-care waste management status in Countries of the South-East Asia Region. Available at https://apps.who.int/iris/handle/10665/258761

12 Ei Mon Win and others, "Healthcare waste management at primary health centres in Mon State, Myanmar: the comparisons between hospital and non-hospital type primary health centres", Nagoya Journal of Medical Science, vol 81. No.1. (February 2019), pp.81-91.

13 Nepal, Ministry of Health and Population (2014), National Health Care Waste Management Guideline, Nepal. https://climate.mohp.gov.np/downloads/Health_Care_Waste_Management_Guideline_2071.pdf

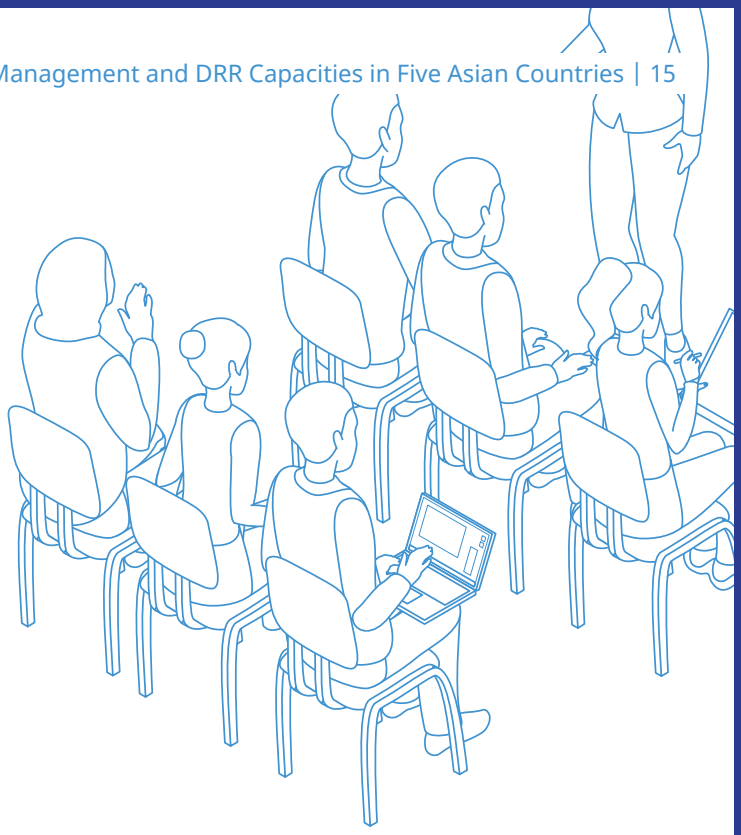
14 Nepal, Ministry of Health and Population (2020), National Health care waste management guideline: standards and operating procedures 2020, Nepal. https://climate.mohp.gov.np/downloads/National%20Health%20Care%20Waste%20Standard%20Operating%20Procedure-2020.pdf

15 Pathak.D, Dhakal.N, et al; "Capacity assessment and implementation analysis of common treatment facility for the management of infectious health care waste in rapidly urbanising city of Nepal", *Waste Management and Research*, Special Issue-Health care waste and Covid 19, Volume 31, Issue 1, 2021.

16 Nepal, Ministry of Health and Population (2022). Assessment of HCWM in COVID-19 Designated Hospitals of Nepal.

	HEALTH CARE WASTE GENERATION RATES	REMARKS
Philippines	The most recent survey that compares the 2019 and 2020 data of 51 hospitals shows that general non-infectious waste has decreased by 12.86% (271t) while infectious waste has increased by 25.22% (341t).[17]	▸ The increase in waste generation is due to efforts to control possible exposure to and transmission of COVID-19. There has been increased utilization of single-use plastics such as PPE, food utensils, and waste containers. Most waste generated in HCFs are categorized as infectious waste, which necessitated suspension of recycling activities.
	The additional infectious waste that Manila was projected to generate due to COVID-19 was around 280t per day.[18]	▸ The estimate is based on the experience from Hubei Province's infectious medical waste generation rate.
Cambodia	The city of Phnom Penh generated 343 kg/day of health care waste from 3,114 beds from hospitals, polyclinics, clinics, and health care centres.[19]	▸ Data from pre-COVID-19 measurements. ▸ Based on a 2003 Cambodia Environmental Association survey.
	In 2021, an increase of roughly 40t per month, or about 1.33t per day, of health care waste was generated from eight national hospitals, 24 provincial referral hospitals, 64 district referral hospitals and 1,097 health centres.[20]	▸ The noted increase is due to the expansion of medical services of national hospitals in Phnom Penh, and the most common types of health care waste generated are infectious waste which includes COVID-19 related waste, pathological, sharps, and pharmaceutical waste. ▸ The 2021 HCWM assessment found that the volume of waste has increased tenfold from 2t per day to 20t per day over the course of the COVID-19 pandemic.[21] About 70% of the collected waste is COVID-19-related waste, this translates to about 3kg per capita per day at HCFs, with 1kg considered to be hazardous waste.

17 Blas, Wenceslao, "Challenges in Medical Waste Management in the Philippines in Response to Covid-19", presentation, 17 May 2022.
18 ADB (April 2020). Managing infectious medical waste during the COVID-19 pandemic. Available at https://www.adb.org/publications/managing-medical-waste-covid19
19 WHO (2015). Status of health-care waste management in selected countries of the Western Pacific Region. Available at https://apps.who.int/iris/handle/10665/208230
20 Cambodia, Ministry of Health, "Health statistics update", 31 December 2021.
21 Gerald Flynn and Phoung Vantha, "The sprawling mess of Cambodia's medical waste mismanagement", *Cambodianess,* 1 October 2021.



3. NATIONAL POLICIES AND PRACTICES

3.1 LAO PDR

Health care waste, as defined in the Ministerial Decision on Health Care Waste Management (2017), conforms with the WHO definition. The regulation provides general guidance on safe practices at each step of the waste management chain and calls for all HCFs at every level to consider HCWM as an integral part of health services delivery.

Most central and provincial hospitals contract private waste haulers to collect health care waste and transport it to provincial landfills. At the district level, health care waste may be transported to local landfills either by private waste haulers or in hospital vehicles. For the Vientiane capital area, the operations of commercial waste haulers are regulated by the Vientiane City Office for Management and Service, and the Ministry of Public Work and Transport regulates the operations of waste landfills. The operations of commercial waste haulers in other provinces are regulated by the Organization of Urban Development or Provincial Administration Office, and report directly to the provincial governors.

POLICY AND REGULATORY FRAMEWORK	
Ministerial Decision on Healthcare Waste Management (2017)	This determines the measures required by all HCFs to safely manage and dispose of health care waste, and applies to all types of HCFs as defined by the Law on Health Care (Amended) 2014, whether public or private. [22] It also expressly prohibits the incineration of health care waste, except as an option for pathological waste where placenta pits are not available and controlled burial is not practical. Under this regulation, all HCFs must develop and implement HCWM plans and provide adequate budget and staff training for implementation of the plans. Environmental health management committees are to be established at central, provincial, and district levels to review and approve HCWM plans and to monitor and support their implementation.

22 including hospitals, health centers, and medical clinics whether public or private, and all medical and bio-medical laboratories, biotechnology laboratories and institutions, medical research centers, animal research institutions and laboratories, blood banks, home nursing services, morgues and mortuaries, dental clinics, mental health clinics, registered and non-registered pharmacies (drug stores), crematories, physical therapy clinics and institutions, and other places that generate waste from health-care activities

POLICY AND REGULATORY FRAMEWORK	
MOH's Standard Operating Procedures	These SOPs provide more explicit guidance to waste handlers. An SOP for the operation of autoclaves is available and is now being expanded to include the care and maintenance of autoclaves. SOPs are also being developed, in line with WHO guidelines, to cover waste segregation, collection, transport, storage, treatment and disposal at three levels of health service: central and provincial hospitals, district hospitals, and health centres and vaccination teams.
Law on Immunization (2018)	This law conflicts with the Ministerial Decision 2017 in that it permits the controlled burning of impotent vaccines and used vaccine vials and ampoules and the incineration at high temperature (over 800°C) of immunization equipment such as used needles and syringes.[23]

In 2022 the MOH with support from the WHO undertook a survey of 12 HCFs, namely 12 provincial hospitals and their subsidiary temporary quarantine centres.[24] Key findings of the survey are as follows:

HEALTH CARE WASTE MANAGEMENT PRACTICES	
Waste classification and segregation	The survey found that nearly 60% of facilities performed waste segregation well while partial segregation was found in 11% and no segregation in 2% of the facilities surveyed (no data was collected from the remaining 27%). This indicates that the segregation of waste in provincial hospitals is at a moderate level.
Waste collection	Waste collection practices were reported to perform well in 70% of the facilities surveyed, reported as being only partial in 8%, and as non-performing in 13%. Overall, this indicates that the waste collection system practice is at a good level.
Waste transport	Almost all the facilities contracted sanitation firms for waste transportation to the hospital waste collection area, and waste transportation from hospital to landfill. Except for the Saravan provincial hospital, the transportation of waste to collection area was carried out by administrative, nursing, and sanitation staff. This is because the urban development and administration board is not in place and there is no private sanitation company. The frequency of the transportation of waste from the hospital to the landfill varies depending on the contract between the hospital and the sanitation companies, from one to three times per week. At the time of the survey during the outbreak of COVID-19, the number of trips to landfills has increased from two to three times per week and in some provinces, this is carried out every day.
Waste storage	Only 44% of the facilities surveyed performed well; 4% partially well; and nearly 19% poorly or not at all. This indicates that the current waste storage practices remain a challenge. No data was collected from 33% of the facilities surveyed.

23 Lao PDR, Law on Immunization, art. 30 (2018).
24 Lao PDR, Ministry of Health, *Rapid Assessment of Health Care Waste Management, Wastewater Treatment Facility and Sanitation of 12 Target Provincial Hospitals* (2022).

HEALTH CARE WASTE MANAGEMENT PRACTICES	
Waste treatment and disposal	***Infectious waste:*** All provinces followed the guidelines and standards of HCWM operations guidelines. Infectious waste is treated on-site by autoclave sterilization or incineration. Only 29% of facilities were found to perform well, 5% partially well, and 16% were non-performing. No data was collected from 50% of the facilities surveyed. This indicates that the current infectious waste management for all provincial hospitals remains a challenge. ***Sharps waste:*** All provincial hospitals dispose of sharps waste by incineration, except in the Provinces of Savannakhet, Sekong, and Attapeu, where sharps waste is buried. ***Anatomical waste:*** Most of the anatomical waste consists of placenta from maternity wards and anatomical parts from surgery. Disposal of placentas is generally done by family members. Anatomical parts are generally incinerated or buried. ***Pharmaceutical waste:*** Only three provinces have data (Oudomxay, Luangprabang, and Khammouane). Most of this waste is expired drugs, and disposed of by incinerator.
Wastewater treatment and disposal	The operation of the wastewater treatment system in each province was found to be problematic due to the years of use of wastewater treatment equipment, insufficient maintenance budget, and lack of specialized staff.

While the above-mentioned survey focused on provincial hospitals and quarantine centres, a separate nationwide survey of HCFs expanded the coverage to include most district hospitals and health centres.[25] The survey was conducted by the MOH, with WHO support, in 2021 and covered 1,073 health centres, 135 district hospitals, and 15 provincial hospitals. The survey found that, overall, only 19 percent of HCFs have basic waste management services, meaning that waste is segregated into at least three bins and sharps and infectious waste are treated and disposed of safely. Limited waste management services were found in 77 percent of HCFs, meaning that there is limited segregation and/or limited treatment and disposal of sharps and infectious waste, but not all requirements for basic services are met. The most common factors limiting HCWM services in the survey were, firstly, open burning of waste and, secondly, overfilling of waste bins or mixing of different categories of waste in bins. These limitations were found in most health centres and in about half of all district hospitals but only a few provincial hospitals. See Figure 2 for more details on the findings.

Figure 2. Results of survey of 1,225 HCFs in Lao PDR

Waste management key figures

19%

of facilities have basic waste services - meaning that waste is safely segregated into at least three bins and sharps and infectious waste are treated and disposed of safely.

77%

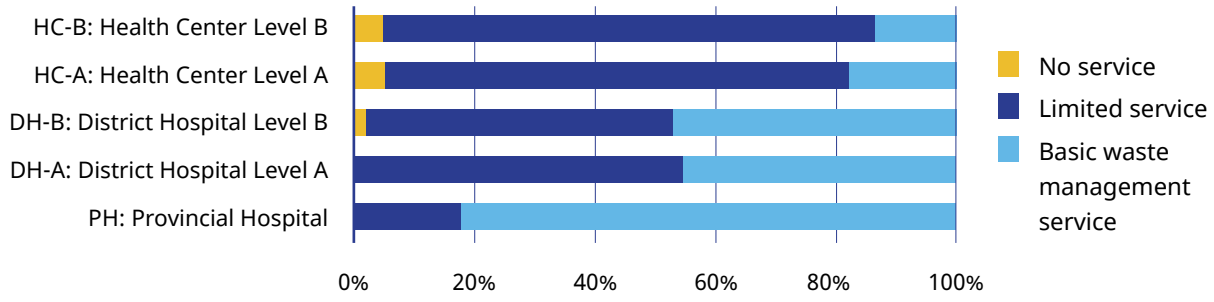
of HCFs have limited waste management services - meaning that there is limited separation and/or treatment and disposal of sharp and infectious waste but not all requirements for basic services are met.

4%

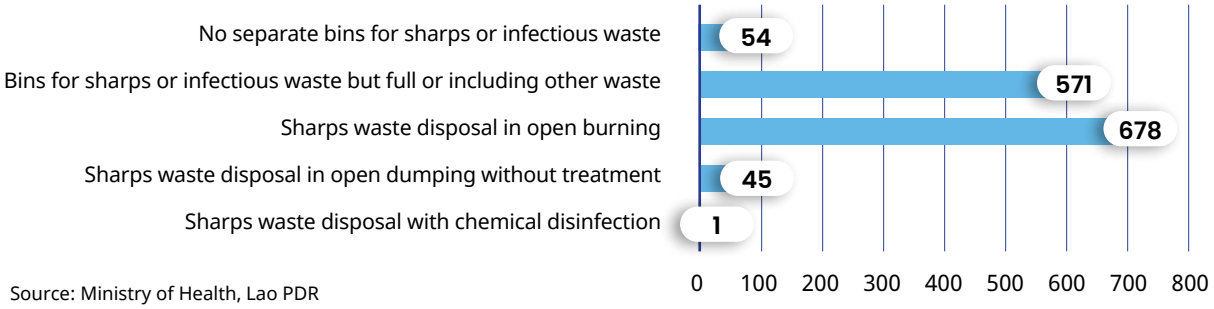
of HCFs have no waste management system - meaning there are no separate bins for sharps or infectious waste, and sharps and/or infectious waste are not treated/disposed of.

25 Lkhasuren, O., "WASH in Health Care Facilities Lao PDR: A review of the baseline assessment results", presented at the Informal Health Development Partners' Meeting, February 2022.

Waste management service ladder by health facility type



Key factors limiting the hospital waste management by number of facilities affected



Source: Ministry of Health, Lao PDR

In summary, the results of the survey show generally poor compliance with the Minister's Decision regarding waste management practices, especially among health centres and district hospitals. Regarding treatment and disposal practices, the results of the survey show that open burning and incineration of waste are still widely practised in contravention of the Minister's Decision and that wastewater treatment and disposal practices are widely problematic.

COVID-19 RESPONSE	
Policies and guidelines	In response to the COVID-19 pandemic, the government established the Central Task Force for COVID-19, which has focused its efforts on testing, quarantine, and treatment and planning for roll-out of vaccines. Guidelines for safe management of COVID-19 vaccination waste were issued in the National Deployment and Vaccination Plan for COVID-19. The MOH, with support from WHO Lao PDR, developed a guidance with SOPs for safe HCWM at HCFs in May 2021 that outlined the general steps for COVID-19 waste management to be taken up at HCFs, community quarantine and isolation facilities, and temporary field hospitals or monitoring facilities. The guidance note provides a set of procedures for handling (1) infectious and sharps waste management, and (2) external transport from HCF to landfill.[26]

26 WHO Representative Office in Lao PDR (2021). *Guidance with SOPs for safe health care waste management in quarantine and isolation facility and temporary field hospital/HCF*, personal communication, 14 December 2022.

COVID-19 RESPONSE (cont.)	
Implementation	Many HCFs handling COVID-19 patients adopted a policy of non-segregation of hazardous and non-hazardous waste, and treatment by autoclave or incineration of all waste generated in the facilities. Such practice directly contravenes the WHO guidance, which advises that health care waste from COVID-19 facilities is no different than that generated in other HCFs and that no special measures are needed beyond the WHO standard recommendations for safe management of health care waste. In practice, the quantities of health care waste that have resulted from the policy of non-segregation have overwhelmed many HCFs' capacities for waste treatment and disposal. Many HCFs are now faced with significant backlogs of mixed waste. For COVID-19 vaccination waste, half of the surveyed HCFs disposed of sharps by incineration and disposed of other waste, infectious and non-infectious, by burning on-site. About one-quarter of the facilities observed these practices partially and one-quarter reported no data. These practices do not conform with the Minister's Decision and are inconsistent with international best practice.

CHALLENGES AND MOST PRESSING ISSUES

- **Limited technical capacity on HCWM at provincial hospitals.** The committee does not have an annual work plan for HCWM in provincial hospitals. There is also no regular assessment of HCWM. The IPC committee does not have a HCWM function. Many of the committee members in the provincial hospitals have not been trained in HCWM and on the Water and Sanitation for Health Facility Improvement Tool (WASH FIT). In some provinces, the IPC structure and committee members have not been updated.
- **Insufficient guidelines and SOPs on HCWM.** Only a few of the provincial hospitals have guidelines and SOPs on HCWM. Many provincial hospitals did not have openly displayed waste management and disposal guidelines e.g. posters where the bins or waste container packaging are located.
- **Insufficient waste separation, collection, and storage facilities at provincial hospitals.** Notable observations include the following:
  - Waste containers (bins/bags) used do not adhere to the colour-coding scheme prescribed in the guidelines and SOP.
  - Only some health care wards of the provincial hospitals used plastic bins or plastic bags for infectious waste collection.
  - Safe packaging and adequate labelling of waste were not being practised and a lot of bins and other waste containers did not have complete covers.
  - There is no weighing scale to weigh each type of waste prior to transporting to a storage facility.
  - Trolleys for transporting waste from each health care ward to the waste storage facility are not colour-coded. Therefore, separation of general and infectious waste is insufficient.
  - Some have small waste storage facilities that cannot accommodate large amounts of waste.
- **Lack of waste management and disposal records.**
  - There is no recording of the weight or volume of each type of waste before transporting it to the waste storage site. Many provincial hospitals do not record the daily amount of waste that is sterilized by autoclave.
  - There is also no regular supervision and monitoring for the implementation of HCWM at provincial hospitals.
- **Limited capacity for waste disposal and treatment,** including the following:
  - Treatment for infectious waste, sharps waste, pathological waste, and chemical waste is limited.
  - The staff in charge of the autoclaves are not trained on its use, and there is no designated technical staff responsible for operating the incinerator.
  - There is insufficient budget for HCWM in all provincial hospitals and COVID-19 treatment centres, and PPE is limited in some provincial hospitals.

CHALLENGES AND MOST PRESSING ISSUES (cont.)

- **Limited capacity for waste management at COVID-19 treatment and quarantine centres,** including the following:
  - There is insufficient staff at COVID-19 facilities to handle waste management.
  - There is a lack of waste management planning and regular training on waste management and disposal.
  - In some provinces, large amounts of waste were not disposed of daily.
- **Limited capacity for waste management at COVID-19 vaccination facilities.**
  - Used syringe and needles are secured in safety boxes and are sent to the provincial maternal and child health units for disinfection and disposal by incinerator, although incineration was not carried out daily.
  - Used vaccine vials were not sprayed with 0.5% chlorine solution before being buried.

The Ministerial Decision on Health Care Waste Management and the SOPs that have been developed by the MOH provide a strong foundation for Lao PDR's national HCWM system, especially when coupled with government's regulatory framework for waste haulers and landfills. However, provisions in law that allow open burning and incineration of vaccination waste run contrary to current trends towards decarbonization of the health sector and mitigation of climate change. They are out of sync with international best practices.

3.2 MYANMAR

The national legislation on the management of hazardous waste, including other categories of hazardous waste such as pesticides and certain industrial waste, is not clearly developed, and a comprehensive national policy for the management of hazardous waste, including health care waste, is currently lacking. The existing guidelines that are in place will need to be reformulated in accordance with international guidelines and best practices. In general, any regulatory, policy and administrative guidelines for HCWM only exist as a part of a broader hospital policy.[27]

POLICY AND REGULATORY FRAMEWORK	
National Health Policy (1993)	The National Health Policy was developed with the initiation and guidance of the National Health Committee in 1993. The National Health Policy has placed the "Health for All" goal as a prime objective using the Primary Health Care approach.[28]
National Environmental Policy (2019)	One of the principles of the policy is environmental service provisioning, which includes waste management and wastewater treatment. The policy also encourages enterprises including HCFs to adopt clean production principles and best practices i.e. using resource-efficient and zero-waste approaches for infrastructure planning and development for urban and human settlement areas.[29] For sustainable economic and social development, pollution and waste is to be avoided and minimized at source, which is more cost-effective than remediation.

27 Myanmar, Ministry of Health, *Myanmar Essential Health Services Access Project Environmental Management Plan* (2014).
28 Myanmar, Ministry of Health, *Health in Myanmar* (2014).
29 Myanmar, Ministry of Natural Resources and Environmental Conservation, *National Environmental Policy of Myanmar* (2019).

POLICY AND REGULATORY FRAMEWORK	
National Waste Management Strategy and Master Plan for Myanmar (2018-2030)	The current plan published by the Ministry of the Natural Resources and Environmental Conservation constitute the country's first waste-management guidelines that seek to address the issue in a more holistic and integrated manner. It outlines strategic policy directions, programmes, and actions of the ministry for environmentally sustainable waste management, with the intent to promote socially acceptable and economically feasible practices that limit the environmental impacts of the waste management system. To some degree, health care waste is covered under this plan as one of its goals is to "extend sustainable and environmentally sound management of industrial and other hazardous wastes". This would require the separate collection and sound treatment of hazardous waste, including infectious medical waste, from non-hazardous waste within the medium- to long-term implementation of the plan.[30]
Hospital Management Manual (2011) **Hospital Infection Control guidelines (2016)** **Standard Operating Procedures of Health-care Waste Management of Health-care Facilities (2019)**	Tertiary hospitals, specialist hospitals and private hospitals will still have to follow the Hospital Management Manual and Hospital Infection Control Guidelines. Nevertheless, all these guidelines are made accessible to all levels of health workers at both public and private health facilities. The latest SOP is developed under Essential Health Services Access Project implemented by the MOH and financed by a loan from the World Bank's International Development Association. This SOP is intended for township hospitals, station hospitals, urban health centres, rural health centres, sub-rural health centres, and immunization posts.

General waste management is a principal function of City Development Committees and Town Development Committees designated within Myanmar cities and townships. Each committee maintains a Pollution Control and Cleansing Department that is responsible for managing household solid waste, as well as the management of industrial, medical, and hazardous waste, including collection from health facilities.

More targeted strategies for health care waste, meanwhile, are under the responsibility of the MOH. Under the Department of Public Health, the Occupational and Environmental Health Division is responsible for setting up guidelines and SOPs for HCWM. The Department of Medical Care Service is responsible for the monitoring and supervision of both public and private health facilities in following the guidelines and requirements of proper HCWM practices.

With respect to the actual implementation of HCWM, the situation analysis corroborates the findings of several studies on the HCWM practices of primary health centres, and both public and private hospitals across the country.

30 Myanmar, Ministry of Natural Resources and Environmental Conservation, *National Waste Management Strategy and Master Plan for Myanmar 2018-2030* (2018).

HEALTH CARE WASTE MANAGEMENT PRACTICES	
Waste classification and segregation	Although the guidelines on classification and segregation have been made available, this is still not generally practised. While most HCFs provide different containers for different types of waste, general waste is often mixed with infectious waste. This may be due to lack of knowledge on classifying the waste. Proper labelling of containers is also necessary for the segregation of waste.
Waste collection	Waste collection is done by general workers in hospitals. They are not often vaccinated against infectious diseases such as hepatitis B. There is also a lack of PPE supply for waste handlers, most notably during the COVID-19 pandemic. In cities and some townships, the health care waste is collected by dedicated waste-collection vehicles.
Waste transport	Carts and old wheelchairs are often used for on-site waste transportation in hospitals, but there is difficulty in transporting waste in multi-storied hospitals without an escalator or with only a single escalator that is dedicated for hospital staff and patient use.
Waste storage	There are no on-site waste storage facilities in most hospitals. Old store buildings or garages are used as waste storage areas, which are often close to residential buildings.
Waste treatment and disposal	The study on HCWM practices within Mon State found that most primary health centres did not have supporting facilities such as temporary storage areas for health care waste, or on-site treatment facilities. The KIIs conducted similarly found that lower-tier health facilities such as township hospitals and health centres do not have proper supporting equipment, such as containers for segregation and equipment for accidental spillage of health care waste, to the same level as tertiary hospitals. The use of autoclaves for treatment is very low and most HCFs make use of burning in pits to dispose of infectious waste, sharps waste, and pathological waste. There are some on-site disposal facilities for health care waste but most of them are not of an acceptable standard, working poorly and at low temperatures, which may lead to improper emission control and severe environmental pollution.[31] Untreated waste is typically transferred to municipal landfills, and in small townships the landfill area is accessible to waste collectors and recyclers.
Wastewater treatment and disposal	Wastewater is often discharged without treatment and ends up in streams and rivers. Although there is an established standard for effluent discharge from HCFs, there are no wastewater treatment recommendations in the waste management guidelines.
Vaccination waste	Proper practices for the disposal of vaccination waste are not always observed, which, together with unsafe practices such as scavenging in waste disposal sites, can lead to accidents and health hazards. Needle cutters are used by rural health centres and urban health centres to dispose of sharps waste. In the case of vaccinations carried out in remote villages far from health centres, waste is often left behind in the villages. It was also reported that health care workers in hospitals put whole syringes and needles into safety boxes without recapping.

Most hospitals have a HCWM committee that is responsible for the monitoring and supervision of HCWM as well as training and capacity building of hospital staff on occupational health and safety. In tertiary hospitals, the committee consists of the hospital administrator, pathologist, microbiologist, pharmacist, radiologist, engineer, and head nurses of patient wards, as well as the focal persons for infection

31 As stated in the Environmental and Social Management Framework of the Myanmar COVID19 Emergency Response Project (31 July 2020).

control and waste management. In public health facilities, however, there is no dedicated personnel for waste collection and handling. This task is carried out by general workers who are also responsible for cleaning wards, carrying oxygen tanks and medical equipment, and other things. In sub-rural health centres, the midwife and public health supervisor must handle health care waste by themselves.

There is no guideline for the public concerning the segregation and disposal of health care waste generated in households, and health care waste is usually disposed of along with general household waste. The public generally learn about the hazards of medical waste only from health practitioners and in instances where there is immediate concern i.e. when there is a sick member of the household.

COVID-19 RESPONSE	
Targeted policies and guidelines	The MOH issued the Guidelines for Healthcare Waste Management during COVID-19 Pandemic in April 2020. The guideline addresses COVID-19 waste as highly infectious waste. The steps prescribed for waste management are segregation, labelling, storage, and transport.
Implementation	For final disposal, the guideline recommends using standard incinerators for non-reusable infectious waste. If a standard incinerator is not available, the waste can be disposed of by pit burning, but this is only for emergencies. For reusables such as boots, face shields and goggles, the guideline recommends using either alcohol or chlorine solution to disinfect. The guideline recommends a storage area for temporary storage of waste before disposal. For transport of waste, the waste handler should wear full protective equipment, and transport waste using a wheeled cart, through pre-planned routes. The pressing issues with the guideline in terms of deviations from the WHO guideline is that there are no recommendations for the use of autoclaves for waste treatment before disposal. Additionally, the guideline does not clearly define its scope as it only addresses the waste from health care services and does not include a discussion of which types of HCFs should follow the guideline.

CHALLENGES AND MOST PRESSING ISSUES

- **Lack of well-defined and integrated coordination and supervision of HCWM at all levels of HCFs in the country.** There is no coordination mechanism and insufficient legal and administrative frameworks of HCWM to allow proper coordination of HCWM policies and implementation among the different stakeholders involved.
- **Lack of dedicated budget for HCWM in public health facilities.** A specific budget for HCWM is not planned. The resources and tools needed for HCWM in public health facilities come from the general administrative budget or are acquired through donor support.
- **Inadequate and outdated physical and institutional infrastructure and equipment.** While there is a general awareness of the recommended BAT and best environmental practices (BEP) for waste treatment and disposal, outdated equipment is still being used especially in rural areas.
- **Lack of monitoring and supervision of HCWM systems and poor compliance with national guidelines.** M&E frameworks and key performance indicators are in place; but less than half of facilities adhere and comply.
- **Lack of a standard job description for HCWM staff.** There are SOPs available at the HCF level, but there is no clear outline for the work of waste handlers, and there are no regular trainings for waste handlers being provided.

3.3 NEPAL

Nepal's policy documents define all aspects of HCWM in line with WHO guidelines except for some minor exceptions. The Ministry of Health and Population (MOHP) plans to develop a detailed process of HCWM in line with SOP 2020, which will bring Nepal's policy and regulatory framework into fuller compliance with WHO guidelines.

POLICY AND REGULATORY FRAMEWORK	
Solid Waste Management Act (2011 and 2017)	Assigns the responsibility for management of hazardous and health care waste to institutions that generate such waste.
Public Health Service Act (2018, and its ensuing regulations promulgated in 2020)	Under this act, the provincial and local governments are responsible for the proper management, regulation and monitoring of health care waste produced by hospitals, health centres and laboratories. The regulation also made the MOHP responsible for developing standards for effective collection, reuse, treatment, and disposal of health care waste; and setting operating standards for the various services. The MOHP formulated the Minimum Service Standards for primary hospitals, and established such standards for different levels of hospital including a section for hospital waste management.
Health Care Waste Management Guideline (2014)	This technical guideline outlines the process of safe management of health care waste including waste minimization, segregation, collection and storage, transportation, treatment, and disposal. The guideline also recommends HCWM methods for the different levels of HCF.
HCWM Standard Operating Procedures (2020)	This was formulated by the MOHP based on the HCWM Guideline and the WHO international guideline. This document explains the steps for safe HCWM including minimization, segregation, collection, transportation, storage, treatment, and disposal and monitoring, in line with the national guidelines. It may be noted that the National Standard for Water, Sanitation and Hygiene (WASH) in Health Care Facilities incorporates the SOP 2020 for HCWM.
Three-year Action Plan for HCWM (2022–2025)	This plan was developed with the aim of: (i) creating an enabling environment through diagnostic studies, research, and development of a roadmap; (ii) strengthening HCWM infrastructure and services through procurement of supplies and equipment based on needs assessments; (iii) planning and procurement to build the capacity of local government bodies to safely manage COVID-19 vaccination waste; and (iv) strengthening the HCWM capacity of health authorities (national, provincial and local levels) and HCFs through development of IEC materials, training and installation of equipment.

The MOHP with support from sector agencies conducted a cross-sectional assessment of the HCWM system, selecting 55 hospitals including federal, provincial, academic hospitals, and local hospitals that were designated for COVID-19. The assessment area covered six provinces out of Nepal's seven. In the remaining one province a study of 12 hospitals had already been carried out by the German Agency for International Cooperation (GIZ) in Nepalgunj Sub-metropolitan City. Data from the two studies show similar trends with respect to the major issues. The MOHP assessment covered HCWM practices in line with the Ministry's SOP 2020.

The MOHP assessment data covers only hospitals, while the Nepalgunj assessment focused on different levels of HCF (hospitals, health posts, urban health clinics and pharmacies). Some findings that emerged from the MOHP study and the Nepalgunj city-wide study are as follows:[32]

HEALTH CARE WASTE MANAGEMENT PRACTICES	
Organization	Only half of the hospitals surveyed have waste management committees with designated focal persons. Of this half, only 80% conduct committee meetings. None of the smaller HCFs (health posts and clinics) have management committees or designated focal points for HCWM.
Training	Only 43% of hospitals reported that HCWM staff are trained. About half of the hospitals have IPC training for their health workers and support staff. Only about a third of doctors, a third of nurses, and a third of HCWM dedicated staff are trained in IPC. Almost 75% of the support staff responsible for waste management have not received any trainings on safe HCWM.
Waste collection	Only 19 to 24% of the waste bins at smaller HCFs were found to be labelled. Almost two-thirds of the hospitals survey reported deficiencies in waste segregation. Only one-third reported that waste is segregated at all generation points. Recapping of syringes is performed systematically in less than half of the hospitals, and in none of the smaller HCFs. Poor compliance regarding use of sharps containers and needle cutters was also found in more than half of the hospitals.
Waste transport	Separate trolleys for waste collection are present in just slightly more than half of the hospitals but only one-third have designated waste transport routes.
Waste storage	Only about 30% of the hospitals store infectious waste according the MOHP guidelines. About 40% do not have an area for waste storage before treatment at all. Other hospitals reported having a protected area for waste disposal, although not fully in compliance with regulations. None of the smaller HCFs have waste storage areas.
Waste treatment	About only 40% of the hospitals surveyed treat infectious waste before disposal, and the most common method is an open burn bit. About 51% do not have space to establish a treatment area on-site. Only 56% of the hospitals have functional autoclaves or alternative treatment technologies with sufficient capacity. None of the smaller HCFs were found to be practising waste treatment.
Waste disposal	About 45% of the hospitals surveyed dispose of infectious waste with municipal waste after treatment, 15% dispose of infectious waste along with municipal waste but without treatment. About 30% burn their waste in pits.
Wastewater treatment and disposal	Hospitals dispose of wastewater either through a soak pit (26%), municipal drainage without treatment (35%), septic tank (35%) or on land (11%).
Vaccine waste	According to the results of the survey, only about one-quarter of the hospitals treat all vaccination waste with autoclaves or microwaves. Only slightly more than half destroy syringes using needle cutters. Safety boxes are adequately available in about three out of every four hospitals.

32 Pathak.D, Dhakal.N, et al. (2021). Capacity assessment and implementation analysis of common treatment facility for the management of infectious health care waste in rapidly urbanising city of Nepal, *Waste Management and Research*, Special Issue-Health care waste and Covid 19.

COVID-19 RESPONSE	
Policies and guidelines	The MOHP developed and issued guidelines entitled HCWM in the Context of COVID-19 Emergency (Interim Guidance). These guidelines pertain to "waste generated in connection with all suspected and confirmed COVID-19 cases, both symptomatic and asymptomatic in different levels of HCFs, isolation centers, quarantine centers including hotels, home quarantine and holding areas like port of entry from other countries." The guidelines consider all such waste as potentially infectious, including waste that would normally be categorized as non-hazardous general waste, and recommends that all such waste be managed as infectious waste. Special measures are recommended for waste minimization, segregation, collection, storage, treatment and disposal; although the guidelines specifically recognize that these measures may be feasible only in circumstances where the quantities of COVID-19 related waste are quite low and where treatment capacity is sufficient to process the entire waste stream. This is a significant deviation from the WHO guidance, which advises the health care waste from COVID-19 facilities is no different than that generated in other HCFs and that no special measures are needed beyond the WHO standard recommendations for safe management of health care waste.
Implementation	COVID-19 waste management policies at the household, HCF, and local government levels are in line with the principles of infectious waste management – with the notable exception mentioned above, that the MOHP's COVID-19 emergency guidelines considers all COVID-19-related waste as potentially infectious. More than 50 hospitals across the country were designated as COVID-19 hospitals. Research indicated that 52% (at the time of study in 2021) of hospitals provided COVID-19 vaccines and 90% collected and segregated COVID-19-related waste in accord with MOHP guidelines. The 16 hub hospitals for COVID-19 have developed safe HCWM systems with the use of non-burn technology thorough the support of the MOHP, as well as the German Agency for International Cooperation (GIZ) and UNDP. Similarly, 417 smaller health facilities (health posts) were provided with the required technical assistance and equipment through the support of MOHP and the programme Strengthening Systems for Better Health in Nepal, supported by the United States Agency for International Development (USAID).

CHALLENGES AND MOST PRESSING ISSUES

- **Deviation of existing HCWM guidance documents from international guidelines.** The assessment indicated that there are some gaps in the existing guidance documents for HCWM when compared to international guidelines. An update of the HCWM guideline should address this gap. A simplified standard process of HCWM needs to be formulated for health centres at the village level, meeting minimum standards and conducting a baseline survey for the situation assessment. There is a need to develop standards and indicators in terms of service levels and waste treatment levels, and the MOHP needs to enforce them.
- **Lack of oversight committees and human resources for HCWM at hospitals.** The assessment indicated that those hospitals having an HCWM committee with dedicated management staff and systematic HCWM tend to be better-performing than others. The MOHP needs to support hospitals in establishing a HCWM system with minimum facilities in coordination with government at all levels. Every hospital needs to have dedicated waste management and trained HCWM staff. The MOHP needs to support capacity development and provide training.
- **Lack of resources.** The assessment indicated that there was no required infrastructure (e.g. buildings and electricity) to set up waste management systems in most of the HCFs. Despite support for the procurement of equipment, the lack of resources has caused issues in the regular operation of this equipment.
- **Need to conduct research on HCWM systems.** There is insufficient evidence on the existing HCWM systems. Operational research and case studies can help identify what should be adopted and improved.
- **A nationwide awareness and education programme is needed, at both the HCF and community levels.**

3.4 PHILIPPINES

The enacted policies and guidelines in the Philippines are both comprehensive and in line with the international standards. The Department of Health (DOH) Health Care Waste Management Manual (HCWMM) in particular offers flexibility to HCFs on practices and processes, while providing guidance on assessment, planning and implementation for their respective institutions.

POLICY AND REGULATORY FRAMEWORK	
Department of Environment and Natural Resources (DENR) and the DOH Joint Administrative Order No. 2, Series of 2005	Under this joint order, the DOH is mandated to design and develop policies and procedures to be undertaken within the HCFs, while the DENR is decreed to craft procedures and standards for transportation, treatment, and disposal of health care waste. The DENR also has jurisdiction over transport, treatment, storage, and disposal (TSD) service providers.
Revised Healthcare Waste Management Manual (DOH-HCWMM) (2020)	The manual discusses in detail different aspects of managing health care waste from waste characterization, minimization, transport, to treatment and disposal. The DOH-HCWMM adopts the WHO guidance on safe management of health care waste and is applied to all levels of HCF as well as other entities involved in the waste management system.
Hospital Licensure Act (1965) **Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990** **Philippine Clean Air Act of 1999** **Ecological Solid Waste Management Act of 2000** **Philippine Clean Water Act of 2004**	These related national laws directly or indirectly address waste management, including health care waste.
Presidential Decree No. 3931 series of 1964 as amended by Presidential Decree No. 984 series of 1976	This act created the National Water and Air Pollution Control Commissions.

With the assistance of DOH, a baseline survey instrument was disseminated to HCFs as part of the present study. The aim of the survey was to measure the compliance of HCFs with set guidelines. The survey was participated in by 36 HCFs from public and government-owned facilities. HCFs in this survey have varied service capabilities, namely: Level-1 hospitals (8); Level-2 hospitals (2); Level-3 hospitals (24); a dispensary (1); and a custodial psychiatric care facility (1).

The majority of the surveyed HCFs considered that they are implementing basic HCWM (21). On the other hand, 14 HCFs implement higher-level HCWM, and only one identifies with limited HCWM. Other findings of the survey are identified below:

HEALTH CARE WASTE MANAGEMENT PRACTICES	
Organization	Only three out of 36 HCFs do not have waste management committees with identified members from different departments. One of those three HCFs is currently in the process of developing a waste management committee
Training	All HCFs conduct training at least once a year. Ten HCFs said that they implement six or more trainings and orientations annually. Trainings and orientations are also provided to newly employed workers. Several HCFs said that, with the onset of the COVID-19 pandemic, trainings and orientations were put on hold or decreased in number.
Waste collection	More than 90% of the HCFs responded that they segregate waste at source from coloured and labelled containers. These are collected two or more times a day in 32 HCFs, while only one answered that they were collecting the waste less frequently than once a day. Syringes are placed in sharps- puncture-proof containers in 34. However, 19 HCFs mentioned recapping syringes, and 22 responded that needle destroyers are not sufficient in number.
Waste transport	All HCFs have trolleys for collecting waste while 29 HCFs have separate trolleys for infectious waste. The majority of the HCFs (34) have specified routes for the trolleys.
Waste storage	Thirty-four of the HCFs have a dedicated storage area following the regulations and guidelines of the government. At the same time, 31 HCFs noted that their storage area needed to be expanded or upgraded.
Waste treatment	Thirty out of the 36 HCFs are treating infectious waste prior to disposal. Sixteen HCFs do all their infectious waste treatment off-site while 12 HCFs treat it on-site. The remaining HCFs do both on-site and off-site treatment (8).
Waste disposal	As per the DOH guideline, infectious waste needs to be removed from the facility within 24 hours. However, less than 50% (17) confirmed that this is done in their facility. A quarter of the surveyed HCFs (9) rarely remove infectious waste from the facility within 24 hours. Mostly, general waste is disposed of through municipal waste with treatment (17) or without treatment (18). Five HCFs identified open dumping as part of their method of disposal.
Wastewater treatment and disposal	A number of HCFs have installed a wastewater treatment facility on site (29), but 9 HCFs said that these are either only partially functional or the capacity is insufficient to treat their wastewater. Twenty-four HCFs dispose of wastewater to the public sewer while eight discharge their wastewater into septic tanks. Seven HCFs discharge wastewater after treatment to water bodies such as lakes and rivers.
Vaccine waste	Sharps from vaccinations are placed in puncture-proof containers. These are mainly treated off-site (23 HCFs) while autoclave treatment and disposal in septic vaults are each applied in eight HCFs.

COVID-19 RESPONSE	
Policies and guidelines	The DOH COVID-19 Waste Management Sourcebook was developed in 2021 as a supplementary guideline to the existing DOH-HCWMM. The guidance outlined in the Sourcebook is consistent with those mentioned in the DOH-HCWMM but with an emphasis on managing infectious waste from all COVID-19-related activities. It also applies to all levels of HCFs including the temporary treatment and monitoring facilities, as well as other non-HCF entities such as laboratories involved in COVID-19 testing and vaccination sites outside of HCFs. Complementing this guidance, the DOH issued two important memos, namely: (1) DM 2020-0170: Interim Guidelines on Management of Healthcare Waste in Health Facilities, Communities, Quarantine Units, and Temporary Treatment and Monitoring Facilities with Cases of Coronavirus Disease COVID-19; and (2) DM 2021-0031: Interim Guideline on the Management of Healthcare Waste Generated from COVID-19 Vaccination.
Implementation	For the COVID-19 vaccination programme, a reverse logistics model for its waste management procedure was adopted, which required the strict accounting for and documentation of all vaccine vials and immunization waste at all points of the process. The waste is then sent to the designated temporary regional storage facility prior to being collected, treated, and disposed of by the approved service provider, along with processing of the proper documentation. Compounding difficulties, the health care workforce saw a drop in numbers during the pandemic. For example, the Private Hospital Association of the Philippines estimated that from 2020-2021, 40% of the private-hospital nurses resigned. The remaining, limited workforce on occasion prioritized patient care over HCWM. Metro Manila Center for Health Development (MMCHD) reported lacking the necessary supplies to manage health care waste. HCFs had a shortage of yellow bags and sharps containers. To replace official sharps container, HCFs have used thick cartons and thick plastic containers.

Waste treatment is also being carried out in 27 of the hospitals, mostly through the use of autoclaves, while others use chemical disinfection, sterilization, waste microwaves, hydroclaves, or pyroclaves.

CHALLENGES AND MOST PRESSING ISSUES

- **Inadequate number of members and/or trained individuals implementing and monitoring HCWM at various levels.** In hospitals, the resignation of 40% of nurses in private institutions during the pandemic may have affected HCWM due to possible unfamiliarity with the processes among their replacements or other staff.[33] In the National Capital Region, only three out of 17 cities have trained Pollution Control Officers, as reported by MMCHD.[34]
- **Limited access to funds and complex procurement processes.** Individual HCFs, even private hospitals, lack necessary initial funds to purchase efficient and effective waste treatment equipment. The revised HCWM manual, apart from identifying various treatment options, offered insights on ways to finance these large procurements. Purchasing and installing this equipment also requires permits and licences. The government follows a rigorous procurement process, which has resulted in delay and/or non-procurement of this equipment for DOH hospitals.

33 Reuters, "Overwhelmed Philippines hospitals hit by staff resignations", 17 August 2021.
34 Blas, Wenceslao, "Challenges in Medical Waste Management in the Philippines in Response to Covid-19", Presentation, 17 May 2022.

CHALLENGES AND MOST PRESSING ISSUES (cont.)
▸ **Lack of integration and harmonization of national policies.** HCWM iterations and guidance are found in several national policies that also address waste management of other sectors. There is no single law dedicated to HCWM. At least three government agencies regulate HCFs, and each have their own monitoring forms and processes. Harmonization of these monitored indicators, and a repository database accessible to agencies, will maximize the efforts placed into monitoring and evaluating HCFs' compliance.
▸ **Lack of localized policies and plans.** Local government units (LGUs) lack the expertise and capacity to localize and develop supportive policies and plans for implementation. MMCHD has said that in 2021 the majority of the LGUs had no HCWM plans, either as part of their solid waste management strategy or as a separate plan.[35]
▸ **Limited access to waste transport and TSD facilities.** TSD facilities are not equally distributed geographically. Out of the 48 registered TSD facilities, 40 are situated in Luzon while Visayas and Mindanao only have four each.[36]

3.5 CAMBODIA

Cambodia has developed and endorsed the relevant regulations and guidelines for managing medical waste generated from HCFs, with the foremost being those issued by the Ministry of Health (MOH), and are aligned with international guidelines. In particular, the Regulation on Healthcare Waste Management of 2008 provides the adopted definitions and categories of medical waste, as well as the technical requirements for segregation, collection, storage, handling, transportation, treatment, and disposal of all types of medical waste.

POLICY AND REGULATORY FRAMEWORK	
Regulations (Prakas) on Healthcare Waste Management (July 2008)	Provides the technical guidance and specifications for some components of HCWM. During its preparation, consideration was given to the MOH's policy on HCWM as well as the Ministry of Environment's Law on Environmental Protection and Natural Resource Management and its Sub-Decree on Solid Waste Management, which lacked a focus on HCWM.
National Guideline on Healthcare Waste Management (June 2012)	The national guideline helps the MOH to develop SOPs for effective collection, reuse, treatment, and disposal of health care waste. It also helps the MOH in setting SOPs within the various health care services, both public and private, including procedures for designing and locating medical waste management system. In 2021, UNDP provided support to operationalize the national guideline through the development of a guidebook titled, "Medical Waste Management: A Practical Guide for Healthcare Facilities in Cambodia"[37]
The National Guidelines for Infection Prevention and Control (IPC)	This guideline aims at prevention and control of health care-associated and antimicrobial-resistant organism infections using surveillance methods, evidence-based prevention, and control strategies, including health care workers' health and safety through the collaboration of both public and private HCFs at all levels. The guideline supports the individual HCFs at the national, provincial and district levels to establish IPC committees to monitor and control the performance of health care workers regarding compliance of IPC practices including HCWM.

35 Ibid.
36 Department of Environment and Natural Resources-Environmental Management Bureau (2022, May 20). List of Registered TSD Facilities. Philippines. https://emb.gov.ph/wp-content/uploads/2020/02/List-of-TSD-Facilities-January-2020-for-posting.pdf
37 UNDP Cambodia (2021). Medical Waste Management: A Practical Guide for Healthcare Facilities in Cambodia.

POLICY AND REGULATORY FRAMEWORK	
National Strategic Plan (NSP) for IPC (2021–2025)	The NSP for IPC aims at promoting the prevention and control of health care-associated and antimicrobial-resistant organism infections using surveillance methods, evidence-based prevention, and control strategies, including health care workers' health and safety through the collaboration of public and private HCFs. According to this, each HCF is required to establish an IPC committee to be responsible for the proper management and monitoring the performance of health care workers regarding compliance of IPC practices including management of health care waste, and to ensure workers' health and safety. The NSP for IPC is to respond effectively to prevent and control health care-associated infections outbreaks, including needlestick and sharps injuries among HCFs. The NSP for IPC helps the MOH to develop and set up SOPs within the various health care services including public and private. This includes the preparation of policy and procedures for designing and locating wastewater and medical waste management systems.
HEALTH CARE WASTE MANAGEMENT PRACTICES	
Waste classification and segregation	The online survey conducted among 50 target HCFs by the national consultant indicates that 30% of HCFs (15) always or almost always segregate medical waste, while 66% (33) sometimes practice waste segregation at the source. In addition 24% of HCFs (12) always use colour-coded containers with labels for different types of medical waste, while 48% (24) sometimes use labelled, colour-coded containers. In addition, 22% of HCFs (11) reported having enough colour-coded and labelled buckets or containers for waste segregation, while 44% (22) do not have enough.
Waste collection	Regarding waste collection, 94% of HCFs (47) regularly collect medical waste from the point of generation every day (once or more) while 6% (3) collect it less frequently than once per day. In addition, 66% of HCFs (33) always or sometimes practice re-capping syringe needles after use, while 34% (17) never practice this because they follow the new guideline of the MOH to not re-cap syringe needles after use.
Waste transport	Only 16% of HCFs (8) regularly use separate trolleys for transporting infectious waste and general waste, while 44% (22) sometimes do so. Only 20% of HCFs (10) clean the trolleys on a daily basis, while 70% (35) clean the trolleys only sometimes. Only 30% of HCFs (15) have designated routes for transport of health care waste. The majority of HCFs do not regularly or never comply with these basic practices.
Waste storage	According to the findings of the consultant's survey, nearly all HCFs (94%) have dedicated waste storage areas, but only about half have protected waste storage areas. Only about one out of every four HCFs remove infectious waste from storage areas on a daily basis. In addition, 88% of the HCFs surveyed reported a need to expand waste storage areas.

HEALTH CARE WASTE MANAGEMENT PRACTICES	
Waste treatment and disposal	Hospitals use different methods of treatment and disposal as follows: **Using microwave technology with Sterilwave 100 (bio-medical waste treatment equipment)** 43% of Referral Hospitals (50 of 116)[38] use bio-medical waste treatment equipment (Sterilwave 100) that has the capacity to treat mixed medical solid waste, including PPE, needles, and ampoules and flacons, as well as COVID-19 waste.[39] The hospitals reported that operating the Sterilwave (steam equipment) requires huge daily consumption of electrical power distribution and high cost of maintenance, for a limited capacity of waste treatment. However, the MOH has considered that this equipment meets its definition of an Integrated Bio-Medical Waste Treatment Machine that is very convenient and safer with reduced impacts on human health, animal health, and the environment. **Using incinerator** Around 35% of HCFs use two-chamber incinerators to conduct on-site treatment of medical waste, including pathological waste, sharps waste, pharmaceutical waste, and PPE. **Using off-site HCWM treatment[40]** In total, 68% of interviewed HCFs (34) use off-site HCWM treatment. In Phnom Penh city alone, there are 1,978 waste collection points, from which medical waste collection services collect and transport waste to the Dangkor landfill for incineration. Elsewhere, HCFs that lack equipment cannot do on-site treatment of health care waste, or even transport health care waste to the nearest referral hospitals (at the district or provincial level) for incineration. Non-hazardous health care waste is collected and transported to landfills by the private service providers and treated alongside general municipal waste. **On-site open pit** Just 4% (2) sometimes use on-site open pits, especially during the rainy season and overload periods, as well as in 2021 due to the COVID-19 peak outbreak. Those open pits were filled with soil after the rainy season.
Wastewater treatment and disposal	None of the public or private HCFs have a functioning wastewater treatment plant, with the exception of the Royal Phnom Penh Hospital. Wastewater from HCFs is normally discharged without treatment into public sewers (84% or 42) or directly into natural water bodies (6% or 3), or on land (10% or 5).
Vaccine waste	Almost every HCF surveyed administers vaccines, including COVID-19 vaccines, but approximately three out of every four fail to practise effective segregation. Only half of the HCFs surveyed have adequate supplies of safety boxes, and less than half, about 40%, actually use safety boxes for the collection of sharps. Nearly all vaccination waste is treated by incinerators, either on-site or off-site, with only a few HCFs using on-site burial or open pits.
Financing	All HCFs use internal funding sourced from user fees to pay for on- and off-site medical waste treatments (each HCF spends USD 111.59 per month on average).[41]

38 ADB (2022). Cambodia Rapid Immunization Support Project under the Asia Pacific Vaccine Access Facility: Due Diligence of Cambodia's Healthcare Waste Management System. Available at https://www.adb.org/sites/default/files/linked-documents/55104-001-ld-09.pdf. In addition, some National Hospitals also have Sterilwaves but these were not included in this dataset.

39 The Sterilwave 100 is able treats mixed waste (PPE + syringe + needles + ampule/flacon), it Is noted that when it treats PPE alone (too much plastic) then the Sterilwave 100 often gets stuck or error.

40 In the Asia-Pacific region, where HCFs lack on-site treatment units, waste tends to be transported by commercial waste haulers under contractual agreements for off-site treatment and/or final disposal. In some cases, the HCF itself may have a waste transport vehicle for this purpose. Exploring this part of the HCWM practices in the five project countries in greater depth was outside the scope of this research, but would be a valuable area for future study.

41 JICA survey in March 2022 (preliminary findings)

COVID-19 RESPONSE	
Policies and guidelines	The Policy on HCWM was updated in September 2009, and the Guidelines for the Management and Treatment of COVID-19 in the Kingdom of Cambodia was endorsed in August 2021.[42, 43] The guidance is in accordance with the condition of resources found in HCFs in Cambodia and is meant for staff at all levels of HCFs. It serves as a tool for planning and monitoring the implementation of waste management. The draft guideline has been useful for supporting HCWM training during the COVID-19 pandemic, with at least 60% of the facilities surveyed having conducted specialized training within the past two years.

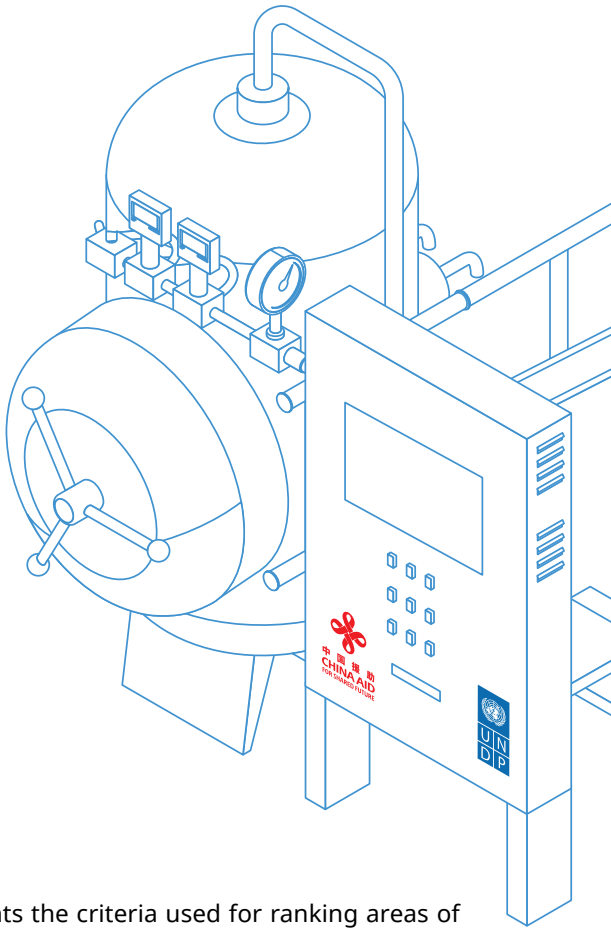
CHALLENGES AND MOST PRESSING ISSUES

- **Lack of awareness among health workers and the public on HCWM.** Only 60% of HCWM staff received proper training. However, there is a high turnover rate leading to staff shortages, and generally HCWM staff receive very low incentives for the work.
- **Lack of resource and equipment for proper treatment of health care waste.** About 68% of HCFs use off-site city waste management services to treat infectious waste due to the lack of equipment. There is only one private health care waste treatment service provider in Phnom Penh that caters to public and private HCFs. Transportation of health care waste is often delayed (every two days) due to lack of trucks, especially during the rainy season.
- **None of the public and private HCFs in Cambodia (except the Royal Phnom Penh Hospital) have wastewater treatment facilities in place.** Wastewater is normally discharged into sewers without treatment (84%) or discharged into rivers, lakes, and streams without treatment (78%), with many hospitals doing both.

42 Cambodia, Ministry of Health, *Policy on Health Care Waste Management* (2009). https://moh-dhs.com/docs/163_doc.pdf
43 Cambodia, Ministry of Health, *Guidelines for the Management and Treatment of COVID-19 in the Kingdom of Cambodia* (2021). https://moh-dhs.com/download_en.php?id=161

4.

BENCHMARKING NATIONAL HEALTH CARE WASTE MANAGEMENT SYSTEMS



The five countries' HCWM systems were benchmarked using the Gavi HCWM maturity model.

Table 7 presents the criteria used for ranking areas of assessment from Level 1 (lowest, or least developed) through Level 5 (highest, or most developed).

Table 7. Levels of assessment as per the Gavi HCWM maturity model

AREA		LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
People	**Awareness, training and supportive supervision**	Low level of awareness of risk associated with HCW (less than 40%).	Moderate awareness of risk associated with HCW; curriculum developed but not fully rolled out (implemented in 41%–50% of facilities).	A significant proportion of health workers and waste handlers (51%–75%) are trained on the risks associated with HCW and clear guidance on HCWM is available at most facilities.	High level of awareness of HCW risk. 76%–85% health care workers and waste handlers have undergone training and have access to on-going training.	More than 85% of health workers and waste handlers are trained and are aware of risks associated with HCW and demonstrate BEP. HCWM is included in supportive supervision activities.
	Adherence and compliance	Little insight into adherence of best practices for HCWM.	Have insight and best practice of HCWM available (SOPs and job aids) but not practiced (less than 50% of facilities adhere and comply).	Best practices of HCWM being adhered to in at least half of the facilities; minimal M&E in place.	Significant compliance to the best HCWM practices. M&E framework in place with some tracking of adherence.	Country fully adheres to the best practices; M&E framework tracks adherence to policies and guidance.

AREA		LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
Processes	National policy/ strategic plans	Policy is needed or currently being developed. No recent HCWM assessment carried out (within the last 5 years).	Policy developed and/or reviewed within the last 5 years. HCWM assessment carried out within the last 5 years.	Policies and guidelines are disseminated and partially adopted.	Country can show that the policies and guidelines are fully implemented at all levels of the system.	Policies widely adopted across the country. Evidence that WM performance gaps are addressed in strategic planning and financing mechanisms at national and sub-national levels.
	Budget and planning	HCWM is not planned and budgeted.	Budgeted but not directly linked to realistic needs or assessment findings.	At least half of facilities develop a HCWM budget and implement specific plans.	Budgets are available, funded and tracked at 75% of system levels.	HCWM is 100% budgeted at national and sub-national levels.
Technology	Practical guidance	Need, or currently being developed.	Guidance developed but not fully in use (used in less than 50% of the facilities).	Guidance is developed and in use in 50%–65% of the facilities within the country.	Guidance is available and being implemented at most (65%–85%) system levels.	Guidance is available and in use at more than 85% of facilities within the country.
	Technology and equipment availability and use	Not aware of BAT and BEP. Out-of-date, inefficient, non-environmentally friendly options for treatment and disposal.	Awareness of the recommended BAT and BEP options but still using out-of-date equipment and technology.	Some BAT equipment available at 50% of facilities (or 50% accessing services) and/ or at least 50% of the waste being generated is treated and disposed using globally accepted technologies.	Globally accepted equipment is widely (more than 51%) available; most facilities are clustered and mapped to an acceptable treatment technology.	Only efficient and BAT used to manage HCW. Environmental monitoring of waste treatment and disposal done in compliance with national and/or global standards.

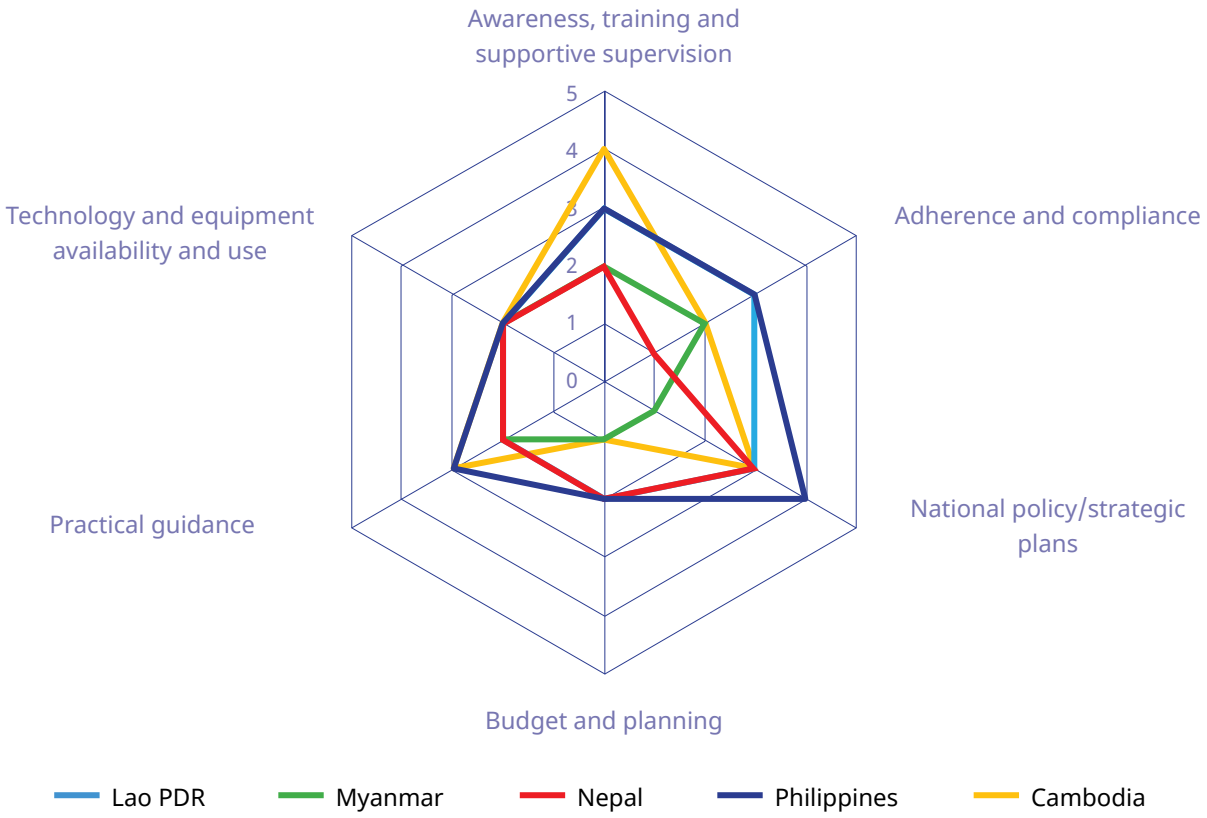
Source: Gavi, 2020

The results of this benchmarking exercise are summarized in Table 8 below.

Table 8. Results of HCWM systems benchmarking exercise

AREA		LEVEL				
		Lao PDR	Myanmar	Nepal	Philippines	Cambodia
People	Awareness, training and supportive supervision	3	2	2	3	4
	Adherence and compliance	3	2	1	3	2
Processes	National policy/ strategic plans	3	1	3	4	3
	Budget and planning	2	1	2	2	1
	Practical guidance	2	2	2	3	3
Technology	Technology and equipment availability and use	2	2	2	2	2
Total		15	10	12	17	15
Overall Mean Score		**2.5**	**1.7**	**2**	**2.8**	**2.5**

Figure 3. HCWM systems benchmark scores of each country



4.1 LAO PDR

The findings show moderate awareness of risks associated with health care waste. Lao PDR has followed the WHO guidance on WASH and waste management for COVID-19. HCWM has been integrated in the WASH FIT framework, which was developed into a national training programme in 2015. However, there is limited financial capacity to roll out the training nationwide. In general, waste segregation of infectious, sharps, and common waste is poorly performed, which increases the amount of waste categorized as infectious. This puts a strain on the treatment operations, which can lead to infectious waste being left untreated before transporting to the municipal landfill. The guidelines and SOPs of the IPC are in place but less than 50 percent of HCFs performed well on compliance. The MOH, with the support of the WHO, has developed HCWM policies and plans and has been rolling out an IPC programme with finance from the World Bank. The programme also provides support for COVID-19 waste management. However, HCWM receives the lowest priority in the budgeting process. The findings indicate insufficient budget for HCWM in the surveyed HCFs. Most provincial hospitals have contracted private companies to provide sanitation and cleaning services. The services cover cleaning of health screening and treatment services units at all HCF buildings, including waste transport to the hospital waste collection area, and waste transportation from hospital to landfill. The guidelines for IPC specifies that waste from COVID-19 treatment centres are considered infectious waste, and all types of waste from such centres are incinerated or sterilized by autoclave, and then transported to the provincial management units and eventually to landfills.

4.2 MYANMAR

There is moderate awareness of risk associated with health care waste; HCWM and infection control practices are included in the curriculum for health care workers but there is little training available for waste handlers. SOPs are available but there is no job description for health care waste handlers. M&E frameworks and key performance indicators are in place but less than half of facilities comply. HCWM policy and regulation is lacking and no assessment of HCWM has been carried out for more than five years. Budgeting for HCWM at facility level is generally lacking. Expenditures are met from general administrative budgets or covered by donor funds. Guidelines for safe HCWM have been developed recently but are in use in less than half of the HCFs. Despite growing awareness about non-burn treatment technologies, other methods such as incineration, open burning, on-site burial, and indiscriminate dumping are still widely practised.

4.3 NEPAL

Around half of the larger HCFs and almost none of the smaller HCFs have a dedicated management committee or designated focal person for HCWM, while about 43 percent of health care workers and supporting staff are trained on safe HCWM. However, adherence to their training is poor and less than 40 percent of HCFs comply with standards and guidelines on a regular basis. In the case of smaller HCFs, almost 75 percent of the support staff have not received any trainings on HCWM. Nepal does enjoy well developed HCWM policies and guidelines, which have been widely disseminated but are not yet fully implemented at all levels of health services. Only 40 percent of HCFs have guidelines and SOPs in place. Although the majority of HCFs have budgets for HCWM, most facilities lack facility-level plans to guide expenditures. Only 30 percent of HCFs use non-burn treatment technologies. Incineration, open burning, on-site burial, and indiscriminate dumping are widely practised. Though most of the HCFs have received waste treatment equipment, due to lack of proper infrastructure and human resources the safe waste treatment and disposal process have not been fully implemented.

4.4 PHILIPPINES

The Philippines has long enjoyed a well-developed policy and regulatory framework and technical guidelines that reflect international best practice. The Philippines has been a leader in the region on banning incineration of waste. The national guidelines on HCWM have been supplemented with interim guidelines on HCWM in facilities having COVID-19 patients, and with interim guidelines to address vaccination waste. Survey results indicate that most HCFs receive relevant training at least once a year and training has been intensified during the pandemic through online platforms and dissemination of learning materials. Enforcement of regulations is practised through an accreditation process that is required for licensing HCFs' operation of HCWM systems. However, results from the present study and previous audits raise questions about the effectiveness of the accreditation procedures. Incidents of poor waste segregation and indiscriminate dumping of waste have been documented among facilities despite accreditation and wide dissemination of guidance and learning materials. Budget limitations and manpower shortages have been identified as factors that pose challenges to compliance. These factors have been exacerbated in the context of the ongoing pandemic.

4.5 CAMBODIA

Awareness is high, with 85 percent of health workers and waste handlers having received training during the pandemic and, in urban areas, nearly 80 percent reporting increased awareness. National guidelines were reviewed and updated in 2021 in response to the COVID-19 pandemic. However, while guidance materials and SOPs have been widely distributed to HCFs, only 30 percent adhere to guidelines on waste segregation. This is due, at least in part, to a shortage of collection bins in many HCFs. Most HCFs finance waste disposal and improvement of waste management practices within HCFs from their internal resources. Regarding treatment of health care waste, access to treatment facilities has greatly expanded during the pandemic.

5.

BENCHMARKING DISASTER RISK REDUCTION IN HEALTH CARE WASTE MANAGEMENT

The study team developed a methodology to benchmark countries' DRR measures for health care waste against international best practice. The methodology is similar to, but distinct from, the Gavi HCWM Maturity Model.[44]

Table 9 presents the criteria used for ranking areas of assessment from Level 1 (lowest, or least developed) through Level 5 (highest, or most developed).

Table 9. Assessment of DRR measures for HCFs

AREA		LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
People	**Awareness, training and supportive supervision**	Low level of awareness of disaster risks associated with HCFs & reduction measures (<40%).	Moderate awareness of disaster risks associated with HCFs & reduction measures. Curriculum developed but not fully rolled out. (Implemented in 41-50%).	A significant number of health workers & waste handlers (51-75%) are trained on DRR for HCFs and clear guidance on DRR is available at most facilities.	High level of awareness on DRR for HCFs. 75-85% of health workers and waste handlers have undergone training and have access to on-going training.	More than 85% of health workers and waste handlers are aware of DRR for HCFs and demonstrate best practices. DRR is included in supportive supervision activities.
	Adherence and compliance	Little insight into adherence of best practices for DRR for HCFs.	Have insight and best practice of DRR for HCFs is available (SOPs & job aids) but not practised (<50% of facilities adhere and comply).	Best practices of DRR for HCFs are adhered to in at least half of the facilities. Minimal M&E in place.	Significant compliance to the best practices for DRR in HCFs. M&E framework in place with some tracking of adherence.	Country fully adheres to best practices for DRR in HCFs. M&E framework tracks adherence to policies and guidance.

44 The assessment areas and the use of five levels were brought forward from the Gavi HCWM Maturity Model, but the criteria used in the indicators were adapted to benchmark countries' DRR measures for health care waste against international best practice.

AREA		LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
Processes	**National policy/ strategic plans**	Policy is needed or currently being developed. No recent assessment of DRR for HCFs carried out (within the last 5 years).	Policy developed and/or reviewed with the last 5 years. Assessment of DRR for HCFs carried out within the last 5 years.	Policies and guidelines are disseminated and partially adopted.	Country can show that the policies and guidelines are fully implemented at all levels of the system.	Policies widely adopted across the country. Evidence that gaps in DRR for HCFs are addressed in strategic planning and financing mechanisms at national and subnational levels.
	Budget and planning	DRR for HCFs is not planned and budgeted.	DRR for HCFs is budgeted but budget is not linked to realistic needs or assessment findings.	At least half of facilities develop a budget for DRR for HCFs and implement specific plans.	Budgets are available, funded and tracked at 75% of system levels.	DRR for HCFs is 100% budgeted at national and subnational levels.
	Practical guidance	Needed or currently being developed.	Guidance developed but not fully in use (used in <50% of facilities).	Guidance is developed and in use in 50-65% of the facilities within the country.	Guidance is available and being implemented at most (65-85%) systems levels.	Guidance is available and in use at more than 85% of facilities within the country.
Technology	**Technology and equipment availability and use**	Not aware of best practices for DRR for HCFs. Technologies & equipment for DRR in HCFs are out-of-date, inefficient etc.	Awareness of best practices for DRR for HCFs exists, but technologies & equipment for DRR are still out-of-date, inefficient etc.	Some BAT & equipment for DRR in HCFs is available in 50%.	Globally accepted equipment is widely available (more than 51% of facilities).	Only efficient and BAT for DRR in HCFs is in use.

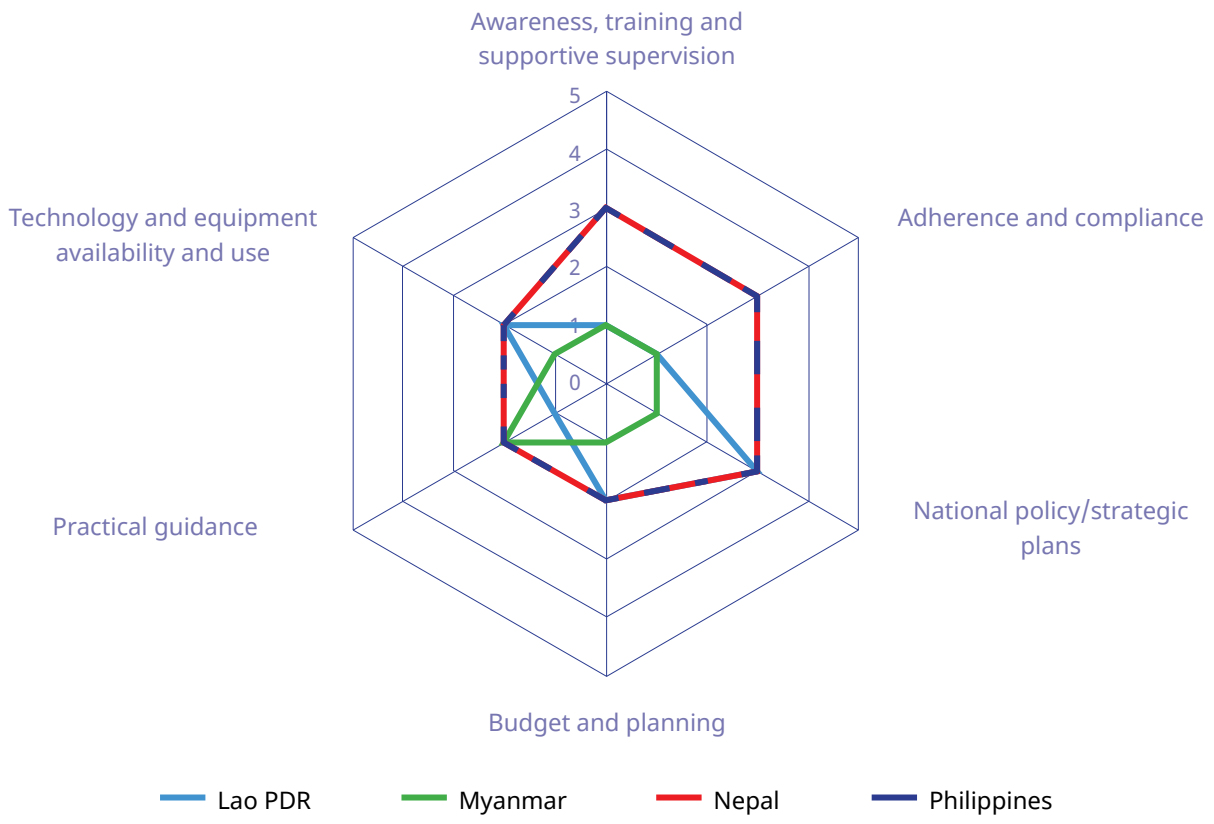
The results of this benchmarking exercise are presented in Table 10. The results were validated in national workshops.[45] In Lao PDR, Nepal, and the Philippines, the results were verified in consultation with relevant national authorities, representatives from hospitals, and representatives from UN agencies, international organizations, and non-governmental organizations. In Myanmar, the regional research team did not consult with Myanmar authorities, but instead the results were verified in consultation with representatives from private hospitals, representatives from UN agencies, and experts on HCWM and DRR who were not affiliated with Myanmar authorities.

Table 10. Results of DRR capacity benchmarking exercise

AREA		LEVEL			
		Lao PDR	Myanmar	Nepal	Philippines
People	Awareness, training and supportive supervision	1	1	3	3
	Adherence and compliance	1	1	3	3
Processes	National policy/strategic plans	3	1	3	3
	Budget and planning	2	1	2	2
	Practical guidance	1	2	2	2
Technology	Technology and equipment availability and use	2	1	2	2
Total		10	7	15	15
Overall Mean Score		**1.7**	**1.2**	**2.5**	**2.5**

45 The benchmarking scores were assigned by the regional research team based on reviews of national policies and findings from consultations with relevant experts and stakeholders. The scores proposed by the regional research team were then validated in national workshops.

Figure 4. DRR capacity benchmark scores of each country



5.1 LAO PDR

The results of the KIIs, opinion survey, and validation workshop confirmed that "awareness, training, and supportive supervision" was low and scored with a 1, and that there is low awareness among health staff and the public even when best practices are available. The lack of budget and enforcement of regulations, including the low awareness, led to low "adherence and compliance", and is therefore scored as 1.

The area of "national policy and strategic plans" is scored with a 3, due to the significant support from donors and development partners in this regard, however the main challenge is on financing these plans. In line with this, "budget and planning" is seen as insufficient and is usually only required as per the procurement policy of donors and thus scored with a 2. The low level of social spending has led to the limited budget for HCWM, particularly DRR.

"Practical guidelines", given a score of 1, have been developed but are not comprehensive. There is still a need to review and revise these to be consistent with international and regional standards. The area of "technology and equipment availability and use" is scored with a 2 because some up-to-date technologies are used, but are not sufficient or maintained.

5.2 MYANMAR

Myanmar's exposure to a range of natural hazards, including cyclone Nargis in 2008, has driven many changes in the DRR development plans and programmes of the country. Among such plans is the Myanmar Action Plan on Disaster Risk Reduction, which was published in 2012 and focuses on disaster preparedness and mitigation. Generally, there is a low level of awareness of disaster risks in health care and of DRR measures in the country, and a low level of adherence to

DRR guidelines. The areas of "awareness, training, and supportive supervision" and "adherence and compliance" therefore, were scored with 1 in the benchmarking exercise.

The National Disaster Management Committee is the leading body for disaster risk management in Myanmar. The Department of Disaster Management was established to support DRR efforts by providing precautionary steps to minimize loss of lives and property. A key document was developed in 2020 by the Ministry of Social Welfare, Relief and Resettlement and the MOH, the Guidance on Mainstreaming Disaster Risk Reduction in the Health Sector,[46] which identifies approaches for incorporating DRR measures in the health sector development plan. Thus, the area on "practical guidance" received a relatively higher score of 2 to recognise the existence of this guidance document. However, a policy for DRR in HCFs is still needed, including the necessary budget and planning, which have yet to be defined. The technology and equipment for DRR in HCFs are also out of date and inefficient. This is mainly due to the limited budget as well as inadequate understanding of environmental and disaster risks, and of the best practices for DRR in HCFs.

5.3 NEPAL

Many HCFs have their disaster preparedness and response plans in place. A significant number of health workers and waste handlers (51-75 percent) have been trained in DRR, and clear guidance on DRR is available at most HCFs, though the level of awareness is still inadequate. Many waste handlers have not accessed relevant training and hence do not engage in good practices. Upon consultation, majority of the stakeholders agreed to give "awareness, training, and supportive supervision" a score of 3. Good practices have been adopted in the acquisition and construction of health facilities. However, there is no national system for M&E, which makes monitoring of adherence and compliance difficult. In this area, a score of 3 was agreed upon. National policies, guidelines, and strategic plans have been developed, disseminated, and partially adopted, but they are not fully implemented at all government levels or in all HCFs. Therefore "national policy and strategic plans" was scored with 3. There are some gaps in DRR at some HCFs, especially in terms of strategic planning and financing mechanisms at the national and subnational levels.

The budget allocation and plans are not sufficient for nationwide coverage. DRR for HCFs does receive a budget but it is not based on either realistic needs or assessment findings. As a result, specific plans are not implemented. A score of 2 was decided for "budget and planning". Practical guidance has been developed but is not fully in use. In fact, it is used in less than half of all HCFs. It was decided that "practical guidance" would be given a score of 2. Some technologies and equipment are available, but they are not used properly. While awareness of good practices for DRR for HCFs exists, technologies and equipment for DRR are still out of date and inefficient. Globally accepted technologies and equipment are not widely available. The area on "technology and equipment availability and use" was given a score of 2. The overall score for the DRR assessment was 2.5, a score less than "fair." The areas of budget and planning, practical guidance, and technology and equipment availability and use only scored 2 and require measures to increase progress. Careful allocation of financial resources based on quick assessment, dissemination, and orientation on existing policy provisions, and management of trained human resources with robust knowledge of technical know-how would help to improve progress in these three areas.

46 Myanmar, Ministry of Social Welfare, Relief and Resettlement, *Guidance on Mainstreaming Disaster Risk Reduction in the Health Sector, Myanmar-Rural Settings* (2020). https://themimu.info/sites/themimu.info/files/documents/Guidelines_MainstreamingDRRinHealth%20in%20Myanmar_MoH-RRD.pdf

5.4 PHILIPPINES

The existing national policies on DRR in relation to health care provide guidance on the institutionalization of measures for mitigation, risk reduction, adaptation, and response. Additionally, the provided guidance covers both structural and non-structural components. Health-related structural guidance highlights the efficient use of energy and other resources to decrease carbon emissions, and measures to increase the resilience of facilities to hazards. Non-structural guidance focuses more on increasing capacity and capability of communities and health workers to lessen vulnerability to threats. With this, "national policy and strategic plans" is given a score of 3, while "practical guidance" and "technology and equipment availability and use" are each given a score of 2.

"Adherence and compliance", as demonstrated by the DOH mandate on institutionalizing DRR in HCFs and the efforts on HCWM as part of national- and subnational-level DRR measures during emergencies, is given a score of 3. In the interviews conducted, to manage surge in waste volume HCFs either expanded their storage or identified additional storage. The HCFs closely coordinated with health care waste treatment facilities for alternative measures to store the waste on-site longer or facilitate collection, treatment, and disposal.

A score of 2 was given for "budget and planning" as funding is extended to HCFs through the DOH, although additional funding to increase DRR capacity and a more thorough review of capacity needs, governance and monitoring of funding utilization is needed.

Efforts by the government and civil society organizations to mainstream and promote DRR within HCWM exist but are still limited, and not all HCFs have received such support. The necessary guidance on practical and pragmatic approaches to DRR in HCFs still need to be defined. The area of "awareness, training, and supportive supervision" is given a score of 3.

6. CONCLUSIONS AND RECOMMENDATIONS

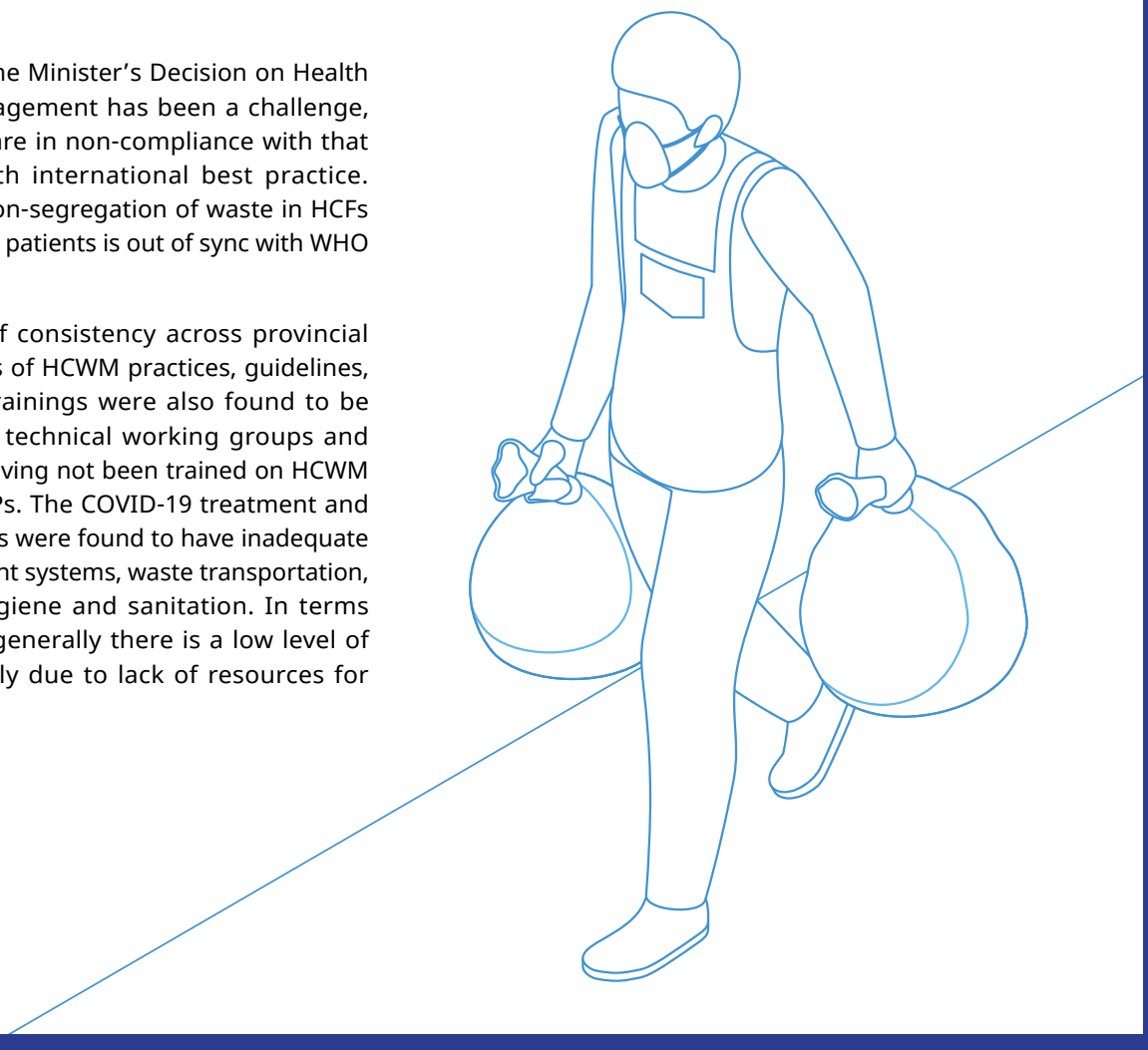
Important conclusions can be drawn from the findings of this study with regard to HCWM policies and practices in the five countries. Country-specific recommendations were developed through the national workshops and integrated in this report. Recommendations for regional cooperation are addressed in section 6.3 below.

6.1 CONCLUSIONS

6.1.1 Lao PDR

Enforcement of the Minister's Decision on Health Care Waste Management has been a challenge, and many HCFs are in non-compliance with that Decision and with international best practice. The practice of non-segregation of waste in HCFs treating COVID-19 patients is out of sync with WHO guidance.

There is a lack of consistency across provincial hospitals in terms of HCWM practices, guidelines, and SOPs. The trainings were also found to be insufficient, with technical working groups and health workers having not been trained on HCWM guidelines or SOPs. The COVID-19 treatment and quarantine centres were found to have inadequate waste management systems, waste transportation, disposal, and hygiene and sanitation. In terms of DRR in HCFs, generally there is a low level of awareness, mainly due to lack of resources for DRR measures. The phasing-out of incinerators also remains a significant challenge due to limited financial and human resource capacities. These conclusions, however, are founded on a limited evidence base. Further study is needed to understand the status of HCWM practices in the public and private hospitals that were not covered by the survey and in the many non-hospital facilities (i.e. health centres, health posts etc.).



6.1.2 Myanmar

National health and environment policies provide a potential framework for HCWM in Myanmar, but national policy and legislation that would specifically guide HCWM planning, and practices remain a challenge. Roles and responsibilities of the various stakeholders are generally understood but coordination mechanisms have not yet been established. HCWM plans generally exist only at the level of some HCFs, and budgetary support for capital and operating expenditures is often lacking. The MOH has developed technical guidelines and SOPs. However, their dissemination has been uneven, and application of the guidelines is challenged by insufficient numbers of trained staff and insufficient training opportunities. While data on waste management practices within HCFs is sparse, the available data shows generally poor compliance with best practices in terms of waste segregation, collection, transport and storage. Equipment for treatment of health care waste is often lacking and, where available, tends towards incineration technologies. Elsewhere, open burning or landfill disposal without treatment is common.

6.1.3 Nepal

Nepal has addressed HCWM very well in its public health policy, acts, regulations, and guidelines, including the MOHP minimum standards and SOPs for HCFs. The MOHP has also conducted a nationwide cross-sectional assessment of the current situation in hospitals. Despite Nepal's strong policy and regulatory framework, the MOHP assessment indicates that more than half of all public hospitals need to improve their HCWM practices in order to meet these standards. Additionally, while most of the district level hospitals have received equipment for treatment of the health care waste, the lack of proper infrastructure and human resources impede the full operation of the HCWM system.

This conclusion, however, is founded on a limited evidence base. Further study is needed to understand the status of HCWM practices in the 58 public hospitals that were not covered by recent studies, as well as in Nepal's 4,634 non-hospital facilities (i.e. health centres, health posts etc.) and in the country's 2,277 private HCFs.

6.1.4 Philippines

The Philippines has ratified several legislations and national policies that provide guidance on managing health care waste from health care institutions, while the national policies on DRR in relation to health care provide guidance on the institutionalization of measures for mitigation, risk reduction, adaptation, and response. Overall, policies and its implementation are geared more towards providing downstream interventions such as waste treatment and disposal, capacity building of health care workers, and adaptation initiatives. Upstream solutions such as green procurement and mitigation initiatives are less mainstreamed. Initial financial requirements and procurement processes are part of the identified barriers.

In managing health care waste, the number and capacity of TSD facilities is insufficient for the amount of generated waste, and their geographical distribution among the Philippines' three main islands is uneven. Sanitary landfill in the country is also scarce, leading to difficult and possibly improper disposal of health care waste. The final disposal methods for health care waste are usually selected based on the land area each facility can allocate for waste disposal. This limitation also applies in the case of engineered sanitary landfills.

Direct efforts addressing DRR and HCWM are not evident, based on the review of policies and measures. The DRR measures being implemented were mainly response actions to the pandemic or natural disasters. Treatment and disposal of waste through health care waste treatment facilities is the primary intervention utilized to manage waste during disasters. Additional funding to increase DRR capacity of HCFs has been provided. However, a more thorough review of capacity needs, governance and monitoring of funding utilization is needed.

Communication of guidelines and other information from the DOH central office is usually disseminated through regional DOH offices. Training and orientations are conducted as deemed needed, when requested, and when there are new issuances of guidelines. All IEC materials are made accessible through an online cloud and the DOH website.

6.1.5 Cambodia

Policy, regulations, and technical guidelines for HCWM have been in place in Cambodia since 2008. Yet, less than half of HCFs observe even basic HCWM practices on a regular basis, indicating that challenges exist to the enforcement of regulations.

With the support of external development partners, the Royal Government of Cambodia has taken strong action to improve HCWM in the context of the COVID-19 pandemic. Based on findings from surveys, technical guidance has been updated and training of health care workers has been intensified. Despite these efforts, however, strong needs persist to improve HCWM practices, especially with regard to segregating waste at source, the transport of waste within HCFs, and internal waste storage.

The near absence of any treatment of wastewater from HCFs is also a long-standing and pressing issue.

6.2 RECOMMENDATIONS FOR COUNTRIES

Based on the research findings and discussions from the national validation workshops, the following are the recommendations to address the main challenges and issues in the HCWM system and DRR capacity gaps of HCFs. The recommendations were identified and endorsed by key stakeholders of each country during the national validation workshops. Note that the recommendations for Myanmar are not targeted towards Myanmar authorities, but instead towards stakeholders working on HCWM and DRR in the country, including stakeholders from private hospitals and representatives from UN agencies.

6.2.1 Lao PDR

Recommendations for HCWM	
People	▸ Provide training on proper waste management procedures to the IPC, health staff, and cleaners in all HCFs. ▸ Develop a facility specific annual plan for HCWM including M&E system.
Processes	▸ Develop and update guidelines, SOPs, and communication materials of HCWM, covering the whole process of HCWM.
Technology	▸ Provide autoclaves to all HCFs that do not have one yet and train staff on the proper procedure for use and maintenance. ▸ Help build a wastewater treatment model that can be scaled up.
Recommendations for DRR	
People	▸ Develop and deliver DRR awareness raising trainings to public health staff and public.
Processes	▸ Review and harmonize procurement policy for HCWM system with international and regional standards.
Technology	▸ Carry out a need assessment for environmentally friendly equipment in HCWM.

6.2.2 Myanmar

Recommendations for HCWM	
People	▸ Conduct regular trainings for HCWM, especially for waste handlers. ▸ Develop a supervision and monitoring system for health care waste. ▸ Explore interventions to increase compliance, including checklists for waste handlers and awareness raising and education on HCWM of personnel at private hospitals, and awareness raising for the public.
Processes	▸ Establish a national-level HCWM coordination mechanism. ▸ Provide dedicated funding for HCWM to HCFs in accordance with the quantity of waste generated. ▸ Provide IEC materials and job aids for waste handlers and health care workers. ▸ As final disposal of waste is done by municipal departments for most HCFs, develop standardized guidelines and procedures for handling and disposing health care waste for use of all municipal departments.
Technology	▸ Improve equipment for treatment of health care waste and replaced where possible with non-burn technologies. ▸ Provide regular maintenance of equipment and facilities. ▸ Support private waste collection and disposal services to address the gaps in the disposal and recycling processes.
Recommendations for DRR	
People	▸ Provide regular training and drills to staff from subnational-level health facilities.
Processes	▸ Provide dedicated funding for environmental and DRR issues. ▸ Conduct a national level study on assessment of DRR in health care.
Technology	▸ Complete a site assessment before construction of health facilities.

6.2.3 Nepal

Recommendations for HCWM	
People	▸ Conduct training needs assessments and develop learning resource packages and reference materials on health, safety, and environmental issues relating to health care waste. Develop a separate module with easily understandable reference materials on integrated HCWM for waste handlers, managers, and decision-makers. ▸ Organize training of trainers and develop a pool of trainers qualified to teach HCWM, and roll out training at the subnational level in coordination with provincial health training centres and provincial health directorates. Use the cascade model to roll out an integrated package on HCWM to build up human resource capacity. ▸ Systematize the mechanism for nominating trainees and make it transparent and strategic to allow for the target participants to receive appropriate training and ensure learnings are put into practice. Establish a reward system for people who practice excellent HCWM even during emergencies. ▸ Develop materials for IEC and behaviour change communication, to increase awareness of issues around health care waste among community and staff at HCFs. Update those materials periodically based on learnings acquired in the field.

Recommendations for HCWM	
People (cont.)	▶ Build the capacities of technical staff to carry out M&E with the use of SMART indicators (specific, measurable, achievable, relevant and time-bound) to assess performance of integrated waste management. Periodically organize workshops to share good practices and lessons learned to cross-fertilize knowledge. Build the capacity of the technical working group to generate and properly analyse good practices before scaling up those practices to the HCF level. ▶ Build the capacities of provincial health clusters and institutionalize local-level clusters to operationalize federal-level policies and execute the HCWM in an integrated manner through a series of capacity-building initiatives. Provision adequate resources in terms of human resource, logistics and finance in operationalizing integrated waste management into practice.
Processes	▶ Develop practical guidance for the formulation and operationalization of HCWM plans with the involvement of relevant stakeholders. Review and update plans regularly and include reference to good practices and learning gathered from the HCF level. ▶ Develop a self-reliant and sustainable health financing mechanism, i.e. Public Private Partnership (PPP) model, and ensure that environmental safeguards along with disaster and climate risks are in place. ▶ Formulate local-level integrated HCWM strategic plans along with disaster preparedness and response plans, and allocate adequate budget to operationalize such plans.
Technology	▶ Support the installation of autoclaves or other similar technologies in all provinces and all hub hospitals for the proper management of health care waste. Make sure that there are sufficient trained human resources for the regular operation and maintenance of these technologies. Support the introduction of technologies that are easy to operate and that require minimal financial resources for operation and maintenance. ▶ Select environment-friendly technologies to foster environmental protection, and prioritize non-burning technologies. Pre-test all treatment technologies before their operation to ensure that the treatment of pathogens and other hazards is efficient and to control any adverse effects on human health.
Recommendations for DRR	
People	▶ Mainstream disaster and climate issues in HCWM training curricula and session plans. Include drills in the training and provide for refresher trainings. Involve experts and trained human resources from the Management Division of the MOHP and NHTC as resource persons in such trainings. ▶ Conduct education sessions on how to best perform HCWM during emergencies and communicate the potential risks associated with waste handling and the need to follow the government-mandated procedures and requirements to reduce disaster and climate risks in HCFs. ▶ Conduct a series of discussions, review-and-reflection sessions, and orientations to staff at different government levels as well as HCF staff to clarify their roles and responsibilities with respect to integrated waste management with a risk-reduction approach. Also share the key policy provisions and guidelines for compliance. ▶ In provincial and local health systems, establish a separate institutional arrangement to deal with disaster and climate risks as part of HCWM. Institutionalize health emergency operation centres and hub-and-satellite hospital networks for effective coordination, information management, and resource mobilization. ▶ Assign a dedicated DRR focal point at each HCF to ensure that the HCF complies with HCWM-related policy provisions in a safe and risk-free environment. Train each DRR focal person to ensure that issues related to disaster and climate risk reduction are well reflected in each training and orientation session and every review-and-reflection meeting. Make DRR focal points responsible for the proper execution of disaster preparedness and response plans in coordination with relevant stakeholders.

Recommendations for DRR	
Processes	▸ In all HCFs, develop disaster preparedness and response plans based on the concept of integrated HCWM and ensure that these plans draw upon the learning of the past. Make sure these plans are updated, tested, and revised based on the newest learning available. ▸ Conduct analysis, and amend existing policies if improvements are needed. Mainstream disaster and climate risks into HCWM policies and ensure these are readily implementable. Craft an HCWM and DRR harmonization policy to mainstream issues and concerns of each sector and to operationalize HCWM through a risk-reduction lens. ▸ Facilitate the development of provincial- and local-level HCWM policies, strategic plans, directories, guidelines, and other necessary documents with the risk-reduction components required for compliance with federal-level policies through the mobilization of senior officials at the MOHP. ▸ Strengthen provincial-level health clusters and roll out health-related disaster management activities at the local level for a more strategic coordination of disaster and emergency response. ▸ Develop a guideline or SOP for regularizing the cluster coordination mechanism for all phases of disasters (preparedness, response, rehabilitation, mitigation, and recovery). ▸ Ensure adequate operational budget for mainstreaming disaster and climate-change issues in disaster preparedness and response plans at each HCF. Allocate budget to an HCF based on its performance and remoteness, and the availability of technical expertise, in order to achieve value for money. Craft guidelines for local and provincial governments for the allocation and mobilization of emergency funding for HCWM during emergencies. ▸ Develop disaster preparedness and emergency response plans that provide specific practical guidance, including disaster-preparedness and emergency-response planning templates, and capacity-building initiatives.

6.2.4 Philippines

Recommendations for HCWM	
People	▸ Support information dissemination and the health care sector workforce ▪ Develop a series of videos, led by government agencies in collaboration with the private sector, to educate health care workers on important guidelines. ▪ Conduct orientation regularly and in a timely manner in HCFs. Ensure that new employees are briefed on HCWM policies and required practices. ▪ Implement policies and plans in LGUs and increase awareness on proper waste disposal and segregation at the community-level. ▪ Reinforce proper information dissemination on proper waste management at source especially to staff and patients. ▪ Allocate sufficient funds to address HCWM and incentivize employees, from both the government and private institutions.

Recommendations for HCWM	
Processes	▶ Strengthen policies and strategies ▪ Review all current enacted national policies. Identify gaps to develop an integrated, innovative, and responsive waste management policy specific to HCFs. ▪ Review and update the strategic plan for waste management that was developed for 2012-2016 to include resilience and emergency planning to accommodate and respond to emerging situations (e.g. pandemics, climate change). ▪ Prioritize preparedness, planning, monitoring and lessons to further improve waste-management initiatives. ▪ Strictly implement policies in HCFs, such as the minimization of waste (directive to all not to allow single-use plastics or Styrofoam), or proper placement of bins. ▪ Gather representatives of both private and public HCFs to collect and share insights, and identify solutions to identified gaps. ▶ Review licensing, monitoring, and assessment ▪ Conduct waste characterization and audit in representative sample of HCFs across the region while thoroughly reviewing HCWM practices implemented in HCFs. ▪ Harmonize the administration requirements of different regulating agencies (DOH, DENR, the Philippine Health Insurance Corporation Philhealth). ▪ Budget permitting, create a system that will centrally house the collected data. ▪ Issue an order and compulsory compliance by LGUs on the strict monitoring of developed applications in tracking the status of actions related to waste. ▪ Review the existing rules and regulations and update those that are outdated, streamline procurement processes, and increase budgets for HCWM. ▪ Establish a centralized collector of PPEs and vaccination waste under the DOH, especially at the height of a pandemic when more waste is generated.
Technology	▶ Strengthen policies and strategies ▪ Bring the private sector on board with regards to HCWM technology, particularly the suppliers of health care items. They potentially have the financial capacity and capability to conduct research and development to produce more sustainable and reusable products. ▪ Minimize generated waste through giving priority to utilizing products that promote sustainability, reusability, and the circular economy. Mainstream green procurement practices. ▪ Reconsider categorizing all health care waste as infectious. ▶ Improve treatment, transport, storage, and disposal ▪ Streamline processes for acquisition and installation of treatment technologies in HCFs or groups of HCFs to address the number of treatment facilities. ▪ Promote technologies that are compliant with national policies, and that can sanitize and/or reduce volume of waste to respond to limited space for disposal (e.g. sanitary landfill). ▪ In the interim, increase the number of TSD facilities and ensure more even distribution across regions. ▪ Improve the technologies being utilized in the hospital for processing the waste, to limit the travel distance of infectious waste. ▪ Coordinate with the TSD provider to make necessary adjustments or alternative steps on how to accommodate a surge in waste generation in HCFs.

Recommendations for DRR	
People	▶ Strengthen institutional collaboration ▪ Reinforce the different services and roles of each bureau and departments of each national government agency. ▪ Ensure commitment and involvement of all stakeholders at all levels. ▶ Develop trainings and capacity building ▪ Conduct various drills, trainings, and workshops (table-top exercises) in the facility and in the community to test the DRR strategic plans and identify gaps for improvement. ▪ Explore standardization of trainings for contact tracers to improve vigilant monitoring as first line of defence against local transmission. ▶ Support the health care workforce ▪ Ensure the needs of attending health care staff and employees are addressed in times of responding to disasters and pandemic (e.g. lodging and food). ▪ Monitor all personnel's daily health status and compliance with protocols to avoid risk of increased COVID-19 cases among hospital staff in the facility.
Processes	▶ National government ▪ Integrate DRR in the HWMM. ▪ Review the strategic plans and prioritize the activities on DRR that are deemed to be most needed by the institution and the community. ▪ Prioritize building the capacities and resilience of communities, health services, and infrastructure (resilient and green health facilities). ▶ Local government ▪ Coordinate closely with LGUs and health care waste treatment facilities to manage treatment and disposal of both regular and health care waste. ▪ Strengthen LGUs' capacity to carry out directives in providing resources, resolving cultural and political differences, and implementation. ▶ Institutional ▪ Map out vulnerabilities of communities neighbouring the HCF. Consider the vulnerabilities of both the community and the HCF in planning for emergencies. ▪ Conduct routine inspections of all units and departments in the facility to check for possible hazards (damaged flooring, exposed wirings etc.). ▪ Develop disaster risk reduction and management plans with regards to identified vulnerabilities, to maintain operational capacity at the onset of emergencies and disasters. ▪ Institutionalize the Guidelines on Integration of the Local Health Systems into Province-Wide and City-Wide Health Systems in HCFs, using the operational framework of disaster risk reduction and management, to guarantee uninterrupted delivery of essential health services during emergencies and disasters. ▪ Increase collaboration between sectors during the recovery phase for better rehabilitation and reconstruction. ▶ Infrastructure ▪ Improve storage facilities of the infectious waste in the hospital to allow for a potential surge in waste volume and/or a delay in collections. ▪ Build in-house wastewater treatment facilities.

Recommendations for DRR	
Processes (cont.)	▸ Disaster risk reduction ▪ Consider investing in research endeavours to develop testing kits and vaccines. ▪ Install early-warning devices. ▪ Retrofit and strengthen buildings that still have a strong foundation. ▪ Improve epidemiologic surveillance to capture the status of infection for a more informed response. ▪ Increase the number of hospitals and hospital beds, and the capacities of intensive care units. ▪ Enhance health-related disaster response, including the establishment of indicators on gender-responsive facilities during disasters (e.g. accessibility of sanitation sites for women, girls, and boys, in safe locations). ▪ Ensure hospitals have back-up supplies (fuel, generator, water supply, food) for three to seven days during disasters and other emergencies. ▪ Explore teleconsultations (over the phone) to minimize the exposure of health care workers.

6.2.5 Cambodia

Recommendations for HCWM	
People	▸ Review and update curriculum, training materials, and other IEC materials and tools to educate health workers, waste handlers, and the public. ▸ Raise awareness on risks posed by health care waste to public health and the environment. ▸ Promote safe HCWM practices in HCFs. ▸ Enrich the function of the IPC committee to support effective segregation of waste at source in all HCFs.
Processes	▸ Review and update existing HCWM policies, technical guidelines, and regulatory frameworks and strengthen national capacities to ensure compliance and promote good practices of waste management chain from segregation at source, to waste collection, waste transport, internal storage, treatment, external storage, and disposal. ▸ Promote the adoption of policies aimed at reducing volumes of health care waste e.g. promote segregation practices with sufficient resources. ▸ Decentralize HCWM e.g. by region or quarter (commune) based on density of population or numbers of HCFs that have sufficient budget allocation.
Technology	▸ Phase out the use of incinerators in all HCFs. ▸ Provide equipment for handling and additional collecting trucks to transport health care waste from rural and remote health centres to their central referral hospitals for treatment of waste. This will help limit the need for additional incinerators.

6.3 RECOMMENDATIONS FOR THE ASIA-PACIFIC REGION

Regional experts interviewed for the present report were presented with the main preliminary findings that had emerged from the study up until the time of the interviews.[47] The interviews were semi-structured and conducted according to guidelines that appear in Annex D. In general, there was wide agreement among the regional experts that HCWM systems in the five countries started from disadvantaged positions when confronted by greatly increased quantities of waste occasioned by the COVID-19 pandemic. Many HCFs were overwhelmed despite most of the countries having relatively well-developed policy and regulatory frameworks because enforcement was generally weak, and compliance was often poor. However, several regional experts expressed the view that many urban hospitals in the Philippines would be exceptions to this finding.

The regional experts also agreed that there was wide variation between the five countries in the availability of data on indicators such as waste generation rates and waste management practices. There was also wide agreement that survey data cannot be easily compared between the five countries due to differences in definitions, indicators, and survey methodologies, and that this was also an issue in other LMICs of the region. Some sentiment was expressed that HCWM systems may not be taking full advantage of data held by academia and by health services. This underscores the general challenge of collecting and analysing relevant data to enable better planning and management efforts.

In addition to the findings on poor enforcement and compliance, and findings on data management, regional experts also generally agreed that other pressing issues were common not only among the five countries but among other LMICs in the region. These include: little emphasis on waste minimization; unsafe waste handling practices; waste treatment equipment frequently lacking or malfunctioning; poor waste disposal practices such as open burning and indiscriminate dumping; insufficient financial support; insufficient numbers of skilled and knowledgeable workers; and little or no effective public education programmes. These issues were seen by the regional experts to be more prevalent in small hospitals and rural health centres and less prevalent in medium and large hospitals in towns and cities.

The following recommendations for regional cooperation are made:

1. Promote regional cooperation to advocate for the adoption of uniform definitions of health care waste among countries of the region. Uniform definitions would facilitate research aimed at better understanding the main HCWM issues in countries of the region.
2. Support countries in developing DRR strategies and in preparing contingency plans to maintain effective HCWM systems in the event of future pandemics or disaster-driven emergencies.
3. Strengthen collaboration on HCWM among countries and regional partners, focused on health, environment, DRR, and urban and rural development, including intergovernmental organizations, non-governmental organizations, green hospital networks[48], universities and research institutes, for the purpose of sharing knowledge, information, experiences and tools; to develop and optimize synergies in their support to countries of the region; and to ensure consistency in technical guidance and policy advice.
4. Support LMICs in strengthening capacities for planning, monitoring, and evaluating HCWM systems, including data collection and analysis. The Microsoft Excel-based health care waste trackers developed by HCWH are recommended for this purpose.[49]
5. Promote the adoption of policies aimed at reducing volumes of health care waste, such as green trade and procurement policies and circularity in the health sector.

47 Experts interviewed included representatives of the Asian Institute of Technology, Health Care Without Harm, UN Environment Programme, WHO South-East Asia Regional Office, and WHO Western Pacific Regional Office.
48 For example, the Global Green Hospital Network and Practice Greenhealth.
49 https://noharm-global.org/waste-trackers

6. Promote research and innovation in the development of medical textiles, for example to make reusable PPE more attractive in terms of safety and comfort, and to reduce the use of disposable PPE.
7. Support countries in the development of strategies and tools to educate health workers, waste handlers, and the public to raise awareness on risks posed to public health and the environment by health care waste and to promote safe HCWM practices in HCFs, in homes, and in the wider community.
8. Support countries in reviewing their national HCWM policy and regulatory frameworks, aligning them with international guidelines, and strengthening national capacities to mobilize resources and particularly to enforce compliance.
9. Promote the use of appropriate technologies for health care waste treatment and disposal, particularly the use of non-burn technologies, and support countries in strengthening their capacities to sustain HCWM technologies through adherence to SOPs and effective maintenance practices. In particular, increase coordination between development partners and donors to ensure that resources are used effectively and the procurement of non-burn technologies is prioritized.

REFERENCES

3R Knowledge Hub, Asian Institute of Technology. 2008. "Healthcare waste in Asia: Institutions and insights". Pathumthani, Thailand.

Asian Development Bank. 2020. "Managing infectious medical waste during the COVID-19 pandemic". Available at https://www.adb.org/publications/managing-medical-waste-covid19

Asian Development Bank. 2022. "Cambodia Rapid Immunization Support Project under the Asia Pacific Vaccine Access Facility: Due Diligence of Cambodia's Healthcare Waste Management System". Available at https://www.adb.org/sites/default/files/linked-documents/55104-001-ld-09.pdf.

Blas, Wenceslao, "Challenges in Medical Waste Management in the Philippines in Response to Covid-19", presentation, 17 May 2022.

Cambodia, Ministry of Health. 2009. "Policy on Health Care Waste Management". Available at https://moh-dhs.com/docs/163_doc.pdf

Cambodia, Ministry of Health. 2021. "Guidelines for the Management and Treatment of COVID-19 in the Kingdom of Cambodia". Available at https://moh-dhs.com/download_en.php?id=161

Cambodia, Ministry of Health. 2021. "Health statistics update (31 December 2021)".

Ei Mon Win and others. 2019. "Healthcare waste management at primary health centres in Mon State, Myanmar: the comparisons between hospital and non-hospital type primary health centres". Nagoya Journal of Medical Science, vol 81. No.1., pp.81-91.

Gavi, the Vaccine Alliance. 2020. "Health care waste management maturity model". Available at https://www.gavi.org/sites/default/files/programmes-impact/support/HCWM-Maturity-Model-May-2020.pdf

Gerald Flynn and Phoung Vantha, "The sprawling mess of Cambodia's medical waste mismanagement", Cambodianess, 1 October 2021. Available at https://cambodianess.com/article/the-sprawling-mess-of-cambodias-medical-waste-mismanagement

Global Environment Facility, United Nations Development Programme, World Health Organization, and Health Care Without Harm. 2010. Decision Tree for the treatment of COVID-19 waste. Available at http://greenhealth carewaste.org/wp-content/uploads/2020/12/Decision-Tree-for-the-treatment-of-COVID-19-Healthcare-Waste.pdf.

Global Platform for Sustainable Cities/World Bank. 2021. "COVID-19 Vaccination and municipal waste management: technical brief". Available at https://www.thegpsc.org/knowledge-products/solid-waste-management/covid-19-vaccination-and-municipal-waste-management

Health Care Without Harm. "Health care waste trackers". Available at https://noharm-global.org/waste-trackers

Health Care Without Harm. 2020. "Health care waste management: Coronavirus update (24 March 2020)". Available at https://noharm-global.org/documents/health-care-waste-management-coronavirus-update

Institute for Global Environmental Strategies. 2016. "Quick study on waste management in Myanmar: Current situation and key challenges". Available at https://www.iges.or.jp/en/publication_documents/pub/conferencepaper/en/5775/Myanmar_Baseline+Report+1st+Draft.pdf

JICA survey in March 2022 (preliminary findings)

Lao PDR, Law on Immunization, art. 30 (2018).

Lao PDR, Ministry of Health. 2022. "Rapid assessment of health care waste management, wastewater treatment facility and sanitation of 12 target provincial hospitals".

Lkhasuren, O., "WASH in Health Care Facilities Lao PDR: A review of the baseline assessment results", presented at the Informal Health Development Partners' Meeting, February 2022.

Myanmar, Ministry of Health. 2014. "Health in Myanmar".

Myanmar, Ministry of Health. 2014. "Myanmar Essential Health Services Access Project Environmental Management Plan".

Myanmar, Ministry of Natural Resources and Environmental Conservation. 2018. "National Waste Management Strategy and Master Plan for Myanmar 2018-2030".

Myanmar, Ministry of Natural Resources and Environmental Conservation. 2019. "National Environmental Policy of Myanmar".

Myanmar, Ministry of Social Welfare, Relief and Resettlement. 2020. "Guidance on Mainstreaming Disaster Risk Reduction in the Health Sector, Myanmar-Rural Settings". Available at https://themimu.info/sites/themimu.info/files/documents/Guidelines_MainstreamingDRRinHealth%20in%20Myanmar_MoH-RRD.pdf

Nepal, Ministry of Health and Population. 2014. "National Health Care Waste Management Guideline". Available at https://climate.mohp.gov.np/downloads/Health_Care_Waste_Management_Guideline_2071.pdf

Nepal, Ministry of Health and Population. 2020. "National Health care waste management guideline: standards and operating procedures 2020". Available at https://climate.mohp.gov.np/downloads/National%20Health%20Care%20Waste%20Standard%20Operating%20Procedure-2020.pdf

Nepal, Ministry of Health and Population. 2022. "Assessment of HCWM in COVID-19 Designated Hospitals of Nepal".

Pathak, D.R., Nepal, S., Thapa, T, Dhakal, N., Tiwari, P., & Sinha, T.K. (2021). Capacity assessment and implementation analysis of common treatment facility for the management of infectious health care waste in rapidly urbanising city of Nepal. Waste Management & Research 39(1_suppl):64-75. doi: 10.1177/0734242X211013910.

Philippines, Department of Environment and Natural Resources-Environmental Management Bureau. 2020. "List of Registered TSD Facilities". Available at https://emb.gov.ph/wp-content/uploads/2020/02/List-of-TSD-Facilities-January-2020-for-posting.pdf

Prüss, Annette, Emmanuel, Jorge, Stringer, Ruth, Pieper, Ute, Townend, William. et al. (2014). Safe management of wastes from health-care activities / edited by A. Prüss ...[et al]; 2nd ed.. World Health Organization. Available at https://apps.who.int/iris/handle/10665/85349

Reuters, "Overwhelmed Philippines hospitals hit by staff resignations", 17 August 2021. Available at https://www.reuters.com/world/asia-pacific/overwhelmed-philippines-hospitals-hit-by-staff-resignations-2021-08-16/

United Nations Development Programme. 2021. "Medical Waste Management: A Practical Guide for Healthcare Facilities in Cambodia".

United Nations Environment Programme and Institute for Global Environmental Strategies. 2020. "Waste management during the COVID-19 pandemic: from response to recovery". Available at https://www.unep.org/resources/report/waste-management-during-covid-19-pandemic-response-recovery

United Nations Environment Programme. 2020. "COVID-19 Waste management factsheets" (19 June 2020). Available at https://www.unep.org/resources/factsheet/covid-19-waste-management-factsheets

Water and Environment International (2015). Report on Assessment of the Health Care Waste Management System of Children's Hospital, Lao PDR. Unpublished.

World Health Organization and United Nations Children's Fund (2021). "Guidance on developing a national deployment and vaccination plan for COVID-19 vaccines: interim guidance, 1 June 2021". Available at https://apps.who.int/iris/handle/10665/341564

World Health Organization Representative Office in Lao PDR (2021). "Guidance with SOPs for safe health care waste management in quarantine and isolation facility and temporary field hospital/HCF", personal communication, 14 December 2022.

World Health Organization. 2006. "Management of waste from injection activities at the district level: guidelines for district health managers". Available at https://apps.who.int/iris/handle/10665/43476

World Health Organization. 2014. "Safe management of wastes from health-care activities, 2nd ed". Available at https://www.euro.who.int/__data/assets/pdf_file/0012/268779/Safe-management-of-wastes-from-health-care-activities-Eng.pdf

World Health Organization. 2015. "Immunization in practice: a practical guide for health staff". Available at https://apps.who.int/iris/handle/10665/193412

World Health Organization. 2015. "Status of health-care waste management in selected countries of the Western Pacific Region". Available at https://apps.who.int/iris/handle/10665/208230

World Health Organization. 2017. "Report on health-care waste management status in Countries of the South-East Asia Region". Available at https://apps.who.int/iris/handle/10665/258761

World Health Organization. 2020. "Water, sanitation, hygiene, and waste management for the COVID-19 virus: interim guidance, 19 March 2020". Available at https://apps.who.int/iris/handle/10665/331499

ANNEX A

WHO GUIDELINES ON HEALTH CARE WASTE MANAGEMENT

CATEGORIES AND DEFINITIONS OF HEALTH CARE WASTE

The WHO considers health care waste to include all waste generated within HCFs, which are primarily hospitals and health centres, but may also include research centres and laboratories related to medical procedures. The term also refers to the same types of waste originating from small and scattered sources, including waste produced for purposes of health care at the level of households.

There are eight specific categories of health care waste as defined by the WHO. These include: general (i.e. non-hazardous) waste, sharps, infectious waste, pathological waste, pharmaceutical waste, genotoxic waste, chemical waste, and radioactive waste. The characteristics of the different waste categories are discussed in Section 3.

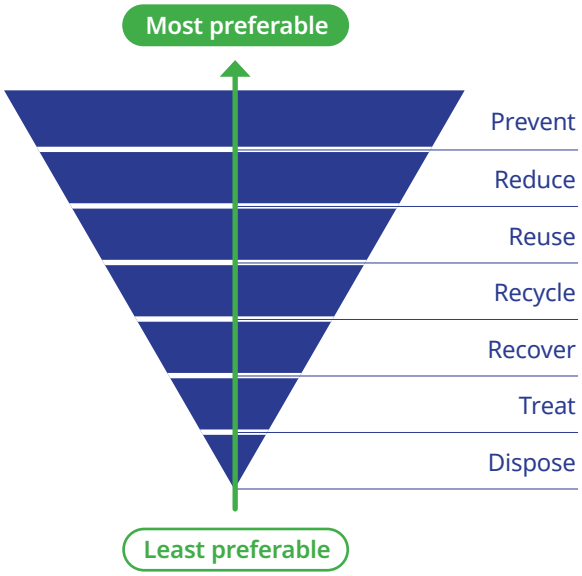
NATIONAL POLICY AND REGULATORY FRAMEWORK

The WHO guidelines emphasize the importance of establishing national policy on HCWM. National policy can serve as a blueprint that drives decision making at a political level and mobilizes government resources and action to improve HCWM practices on the ground. The policy should address the country's own particular needs and problems while also taking into account the relevant international agreements and conventions regarding health care waste. Following on from national policy, legislation and regulations should be developed that describe requirements for safe management of health care waste, including classification and segregation of waste, waste collection and handling procedures, procedures for waste transportation and storage, and methods for treatment and disposal of waste. The legal framework should establish methods for enforcement of relevant laws and regulations. Both solid waste and wastewater generated through health care activities should be covered. Practical guidelines or manuals, SOPs, codes of practice, and the like may be issued by government agencies or by others such as professional bodies or concerned non-governmental organizations in order to supplement national regulations and to support their implementation.

WASTE MINIMIZATION

The WHO promotes a waste management hierarchy that incorporates the concept of the "3R's" (reduce, reuse, recycle) as illustrated in the figure below. In this concept, best practice means avoiding or recovering as much health care waste as possible in a facility's operation. The most preferred option is to avoid generating waste through green procurement practices, effective management of stocks to avoid damaged and expired products, and by minimizing waste-generating medical procedures such as unnecessary injections and pharmaceutical prescriptions. The WHO guidelines also provide guidance on safe procedures for reuse, recycling and recovering of certain products and materials. Single-use devices such as disposable face masks and gloves should never be reused because they cannot be cleaned or disinfected thoroughly and therefore pose a risk of infection to secondary users. Similarly, devices such as syringes, needles, other sharps and catheters should not be reused due to the risk of spreading infectious diseases.

Figure 5. Waste management hierarchy



Source: WHO, 2014

WASTE MANAGEMENT PRACTICES

The WHO guidelines describe in detail the recommended procedures for safe management of health care waste from the points where waste are generated through the various steps until their final disposal. The general principles guiding the segregation, storage and transport of health care waste are as follows:

- Health care waste should be segregated into different fractions, based on their potential hazard and disposal route, by the person who produces each waste item.
- Separate containers should be available wherever waste is generated for each segregated waste fraction.
- Waste containers when filled should be labelled to help managers control waste production.
- Closed local storage may be needed if waste is not collected frequently.
- Hazardous and non-hazardous waste should not be mixed during collection, transport, or storage.
- Collected waste is often taken to central storage sites before on-site or off-site treatment and disposal.
- Staff should understand the risks and safety procedures for the waste they are handling.

WASTE TREATMENT AND DISPOSAL

Waste treatment technologies suitable for processing health care waste are reviewed in the WHO guidelines, including: thermal processes such as incineration and dry heat technologies; chemical processes such as chemical disinfectants and alkaline hydrolysis; biological processes including composting and vermiculture; microwave treatment technologies; mechanical treatment processes such as shredding, encapsulation, and inertization; and others. Guidance is given on the selection of treatment technologies for specific categories of health care waste, which involves consideration of factors such as waste characteristics, technology capabilities and requirements, environmental and safety factors, and costs, as well as consideration of site-specific issues such as space limitations, availability of supporting infrastructure (for example, electricity and water), and operations and maintenance requirements. Guidance is also given on procedures for safely managing radioactive, pharmaceutical, cytotoxic and other chemical waste, which includes waste minimization and protocols for return to suppliers.

The WHO guidelines also address the land-based disposal of health care waste, including the disposal of placentas and other anatomical waste in placenta pits or approved burial grounds, disposal of infectious waste and sharps in on-site secure burial pits, and landfilling of health care waste in external disposal sites including those operated by local government bodies.

HEALTH CARE WASTE MANAGEMENT IN THE CONTEXT OF COVID-19

The WHO interim guidance note dated 29 July 2020 supplements the Organization's IPC documents by summarizing the WHO guidance on water, sanitation, hygiene and waste management relevant to viruses.[50] Of particular note is the following excerpt:

50 WHO (2020). Water, sanitation, hygiene, and waste management for the COVID-19 virus: interim guidance, 19 March 2020. Available at https://apps.who.int/iris/handle/10665/331499

> *"Best practices for safely managing health-care waste should be followed, including assigning responsibility and sufficient human and material resources to segregate, recycle and dispose of waste safely. There is no evidence that direct, unprotected human contact during the handling of health-care waste has resulted in the transmission of the COVID-19 virus. Health care waste generated from facilities treating COVID-19 patients is no different than waste coming from facilities without COVID-19 patients. Additional treatment or disinfection beyond existing safe waste management recommendations are not needed." (Underscore added for emphasis.)*

The practical implication of this guidance is that the COVID-19 pandemic does not imply any need for HCFs to manage health care waste in any manner that exceeds the WHO document (WHO, 2014).

With regard to health care waste generated at the household level, the WHO guidance note states as follows:

> *"Waste generated at home during quarantine, while caring for a sick family member or during the recovery period should be packed in strong bags and closed completely before disposal and eventual collection by municipal waste services."*

If such services are not available, the WHO guidance allows that safely burying or controlled burning may be done as an interim measure.

DECISION TREE FOR THE TREATMENT OF COVID-19 WASTE

UNDP together with the Global Environment Facility, the WHO, and HCWH developed a decision tree to guide authorities in determining best options for treatment of COVID-19 waste in different situations.

The underlying principle is that waste generated from the care of COVID-19 patients should be managed the same as any other health care waste. This is in line with the WHO interim guidance note, which states that, "Health care waste generated from facilities treating COVID-19 patients is no different than waste coming from facilities without COVID-19 patients."

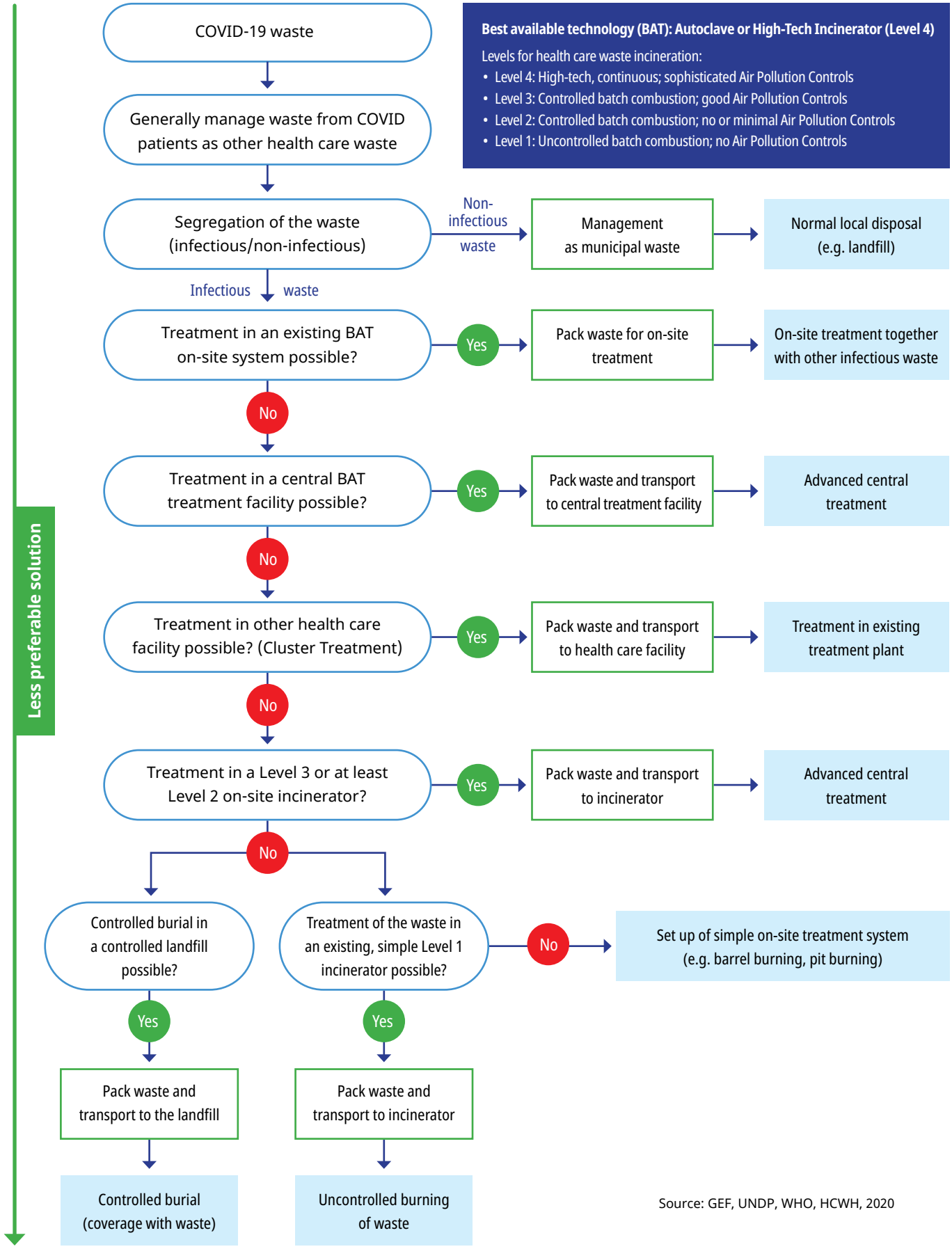
Consistent with the WHO guidance, the decision tree indicates that the first step in managing waste from the care of COVID-19 patients is to segregate non-infectious waste from infectious waste, and to manage the non-infectious waste stream as municipal waste. Secondly, infectious waste from the care of COVID-19 patients should be combined with other infectious waste generated in the HCF and treated on-site using BAT. BAT in this context is defined as autoclaves or high-temperature incinerators operated continuously with sophisticated air-pollution control equipment. The decision tree provides for alternative methods for treating infectious waste in descending order of preference in situations where on-site treatment with BAT is not possible. In such situations, the next option would be treatment in a centralized BAT facility or transfer to another HCF where BAT is available.

In descending order of preference, the next option where no BAT is available is to incinerate infectious waste on-site in a level-3 incinerator (controlled batch operation with good air-pollution control) or level-2 incinerator (controlled batch operation with no or minimal air-pollution control).

Options which should be considered only as short-term interim measures, where none of the more preferred options are feasible, include controlled burial in a controlled landfill or burning in a level-1 incinerator (uncontrolled batch operation with no air-pollution control).

The final and least preferable option, to be implemented only as an emergency measure, is setting up a simple on-site treatment system such as barrel burning or pit burning.

Figure 6. Decision tree for the treatment of COVID-19 waste



Source: GEF, UNDP, WHO, HCWH, 2020

ANNEX B

INTERNATIONAL GUIDELINES ON HEALTH CARE WASTE MANAGEMENT

1. UN ENVIRONMENT PROGRAMME

UNEP and the IGES, during an early stage of the COVID-19 pandemic, issued a guidance document addressing health care waste and its impact on municipal solid waste services (MSWS).[51] The publication summarizes national HCWM and MSWM policies and practices based a literature review of official publications and a rapid survey of HCWM and MSWS in 15 countries, including 10 in Asia. The report also summarizes key points on best practice based on international guidelines. Finally, and perhaps of greatest value, the report provides forward-looking guidance for building sustainable HCWM systems and MSWS during the recovery phase. Some of the key recommendations for recovery concern the interface between health care waste and MSWS, the need for guidelines at the local level on the management of health care waste generated in scattered sources, including households and public places, and the need to strengthen preparedness for future emergencies as well as the need for build-back-better policies.

UNEP has also issued a series of fact sheets on COVID-19 waste management on the following topics:[52]

1. Introduction to COVID-19 waste management
2. National medical waste capacity assessment
3. How to choose your waste management technology to treat COVID-19 waste
4. Policy and legislation linked to COVID-19 and pandemics
5. Links to circularity – Non-health care waste
6. Linkages of air quality and COVID-19
7. Household medical waste management strategies
8. Disaster- or conflict-affected states and vulnerable humanitarian operations
9. COVID-19, sanitation and wastewater

These well-illustrated guidelines provide practical advice on mitigating adverse environmental impacts of the pandemic, ranging from the safe management of waste produced in response to the crisis, to the control of releases of harmful chemicals to the air, water and land.

UNEP's factsheets urge compliance with WHO guidelines on safe management of health care waste and with the requirements of international conventions. Among the problems that countries might face, as highlighted in the factsheets, are: the lack of sufficient data to enable strategic planning and decision making; a lack of knowledge and capacity among health workers; and challenging situations that prevail in disaster- or conflict-affected states and in vulnerable humanitarian operations.

UNEP's guidance on waste management technology focuses mainly on waste treatment technologies and promotes the use of BAT and BEP. Non-burn technologies, particularly autoclaves and microwave sterilization, are identified as the preferred choice for treating infectious waste. Secondary preferred technologies are high-temperature twin-chamber incinerators (>850° C) preferably with air-pollution control equipment. The De-Montfort high-temperature incinerator and barrel incinerators with air induction are considered only as temporary stop-gap solutions, and the use of on-site burial pits

51 United Nations Environment Programme (UNEP) and Institute for Global Environmental Strategies (IGES) (2020). Waste management during the COVID-19 pandemic: from response to recovery. Available at https://www.unep.org/resources/report/waste-management-during-covid-19-pandemic-response-recovery

52 UNEP (19 June 2020). COVID-19 Waste management factsheets. Available at https://www.unep.org/resources/factsheet/covid-19-waste-management-factsheets

is described as a short-term emergency solution only. The factsheets emphasize that there should be no uncontrolled dumping and no open burning of health care waste. This guidance is in accord with WHO guidance.

With respect to health care waste at the household level, UNEP's guidance is again in accord with WHO. Health care waste at household level includes PPE, expired and discarded medicines, injection needles and other sharps, and other health care related waste. UNEP emphasizes the importance of segregating health care waste at household level from other non-hazardous household waste in order to minimize the volume of waste that must be treated as hazardous. This is especially important in households where there are confirmed or suspected COVID-19 cases or where people are in quarantine. Health care waste at household level should be segregated and stored, temporarily, in sealed waste containers and collected at the first opportunity in order to prevent the risk of spread of disease. Waste should be handed over for collection in a strong, tightly sealed bag. The need for public awareness and education, and for training of waste handlers, is also emphasized in the fact sheets.

2. ASIAN DEVELOPMENT BANK

ADB in April 2020 issued a short guidance note on managing infectious COVID-19 waste.[53] The note recommends, firstly, that national governments assess their existing medical waste management plans and capacity for implementation and, secondly, that they take steps to strengthen the capacity of municipal waste management services in anticipation of increased volumes of medical waste feeding into municipal waste streams.

ADB recommends that medical waste generated from HCFs be managed in line with existing national legislation although preparations should be made to handle increased tonnage resulting from the pandemic. ADB's note makes the assumption that "infectious waste is typically segregated by hospital staff at the time of packing" which, in reality, is only possible when infectious waste is first reliably segregated from non-infectious waste at the point of generation. ADB notes that intermediate handling of waste should be avoided as this increases the risk of spreading infection.

The guidance note states that national authorities may consider, for treatment of infectious waste, non-burn technologies such sterilization through steam (autoclaves) or irradiation, or on-site or off-site incineration. Where waste management infrastructure is overwhelmed by increased waste volumes, ADB recommends that mobile equipment (such as mobile autoclaves and incinerators) be considered for temporary relief. It also notes that cement kilns and industrial furnaces may be used as temporary measures along with secure storage facilities for medium-term storage. It is recommended that treated waste be disposed of in licensed landfills.

For the management of COVID-19 waste at household level, ADB recommends that face masks, wipes and tissues be segregated from all other household waste, double bagged (preferably in yellow bags), and the bags then tied at the neck and sprayed outside with chlorine solution disinfectant.

3. HEALTH CARE WITHOUT HARM

In March 2020, HCWH issued a guidance note endorsing the WHO guidelines on the subject of HCWM during the pandemic.[54] The following excerpt is relevant:

> *"The WHO advises that any system exercising best practice for infectious waste will also be able to manage waste potentially infected with SARS-CoV-2. Segregation systems should remain the same. There is no need to treat coronavirus waste with disinfectant. To be plain, waste associated with COVID-19 is managed no differently than other infectious waste." (Underscore added for emphasis.)*

HCWH also notes that both the WHO and UNEP have endorsed steam-based or other non-incineration methods of treatment as opposed to incineration because of costs and also because of persistent organic pollutants produced by incineration.

53 Asian Development Bank (ADB) (April 2020). Managing infectious medical waste during the COVID-19 pandemic. Available at https://www.adb.org/publications/managing-medical-waste-covid19

54 Health Care Without Harm (HCWH) (24 March 2020). Health care waste management: Coronavirus update. Available at https://noharm-global.org/documents/health-care-waste-management-coronavirus-update

ANNEX C

INTERNATIONAL GUIDELINES ON MANAGEMENT OF VACCINATION WASTE

The WHO has, over the years, issued several publications that provide broad guidance on vaccination practices including, among other things, management of vaccination waste. The most recent of these guidance documents is entitled Immunization in Practice – a practical guide for health staff (2015 update).[55] Its guidance on vaccination waste is basically unchanged from earlier WHO guidance documents, including the WHO 2006 publication titled Management of waste from injection activities at the district level: guidelines for district health managers"[56] The WHO guidance emphasizes the use of safety boxes for disposal of sharps waste and presents options for disposal of filled safety boxes, including incineration, steam treatment (autoclaves), encapsulation, and secure burial. Barrel burning and open burning are considered as last resorts only if no other options are possible. Management of other waste generated through vaccination programmes, which may include items such as empty or discarded vials, cotton pads, dressing materials, intravenous bags or tubes, latex gloves, and other plastic materials and waste products, can be guided by WHO guidelines on HCWM as described in section 2.1, above.

More recently, the WHO, acting jointly with UNICEF, prepared an interim guidance document on deployment of COVID-19 vaccines.[57] This guidance document emphasizes the importance of ensuring that infrastructure and procedures for safe management of vaccination waste are in place prior to the start of vaccination activities. The waste management system should include on-site waste segregation, and collection, transport, storage, treatment and disposal of vaccination waste in accord with WHO guidelines mentioned above and preferably employing BAT. Where equipment and facilities for safe treatment and disposal of vaccination waste are not available, reverse logistics should be employed to safely return such waste to a health centre, hospital, or other location where suitable equipment and facilities are found. Districts or regions may also cluster vaccination sites around sites where appropriate treatment and disposal facilities are available. It is of critical importance that all vaccine vials and packaging cartons are duly accounted for in all vaccine stores and service points in order to prevent their possible use in the illegal production, distribution and sale of counterfeit vaccines. As stated in the WHO/UNICEF guidance document, "There are anecdotal reports about criminal activity involving collection and refilling of used vaccine vials and cartons and of selling the falsified vaccines online."

Considering the effect of the roll-out of COVID-19 vaccines on municipal waste operations, the World Bank published a technical brief in September 2021.[58] The brief emphasizes the importance of waste minimization and the importance of waste segregation. The table below, adapted from the World Bank brief, presents the broad range of types of waste generated by vaccination activities and their classifications as hazardous or non-hazardous waste. It can be seen that, apart from needles, syringes and vaccine vials, vaccination activities generate a number of non-hazardous waste types that can be managed as municipal waste, including large quantities of packaging materials, refrigerant packs, wipes, and other non-hazardous disinfectants. The brief makes references to the WHO guidance on the management of sharps and infectious waste. It notes that by

55 WHO (2015). Immunization in practice: a practical guide for health staff. Available at https://apps.who.int/iris/handle/10665/193412

56 WHO (2006). Management of waste from injection activities at the district level: guidelines for district health managers. Available at https://apps.who.int/iris/handle/10665/43476

57 WHO and United Nations Children's Fund (UNICEF) (2021). Guidance on developing a national deployment and vaccination plan for COVID-19 vaccines: interim guidance, 1 June 2021. Available at https://apps.who.int/iris/handle/10665/341564

58 Global Platform for Sustainable Cities (GPSC)/World Bank (2021). COVID-19 Vaccination and municipal waste management: technical brief. Available at https://www.thegpsc.org/knowledge-products/solid-waste-management/covid-19-vaccination-and-municipal-waste-management

employing needle cutters or destroyers in vaccination programmes, the volume of sharps containers may be reduced very significantly.

Types of waste generated by immunization campaigns and classifications

TYPE OF WASTE	CLASSIFICATION/HAZARD LEVEL
Sharps	Hazardous: Presents high risk for vaccination workers.
Vials and residual vaccine	Hazardous: Broken glass is classified as sharps. Vials may be classified as confidential waste because of counterfeiting concerns.
Syringes	Sharps, infectious: Usually classified as infectious (removing needles from syringes can reduce volume of sharps waste).
Shipping boxes, vaccine packaging	General waste (municipal solid waste): Includes polystyrene, non-recyclable plastics. Vaccine packaging may be classified as confidential waste because of counterfeiting concerns.
Refrigeration packs	General waste (municipal solid waste): Contents of cold packs are non-toxic.
Dry ice	Hazardous: Risk of burns and suffocation.
Other packaging	General waste (municipal solid waste).
Face masks, gloves, other PPE	Infectious: Additional concerns over PPE include the risk of illicit resale. Other ongoing wok investigates the possibility of leaching of pollutants, and hazards to wildlife.
Disinfectants	General waste (municipal solid waste): These include non-recyclable packaging and wipes.

Source: GPSC/World Bank, 2021

ANNEX D

INTERVIEW QUESTIONS FOR THE ASSESSMENT OF HEALTH CARE WASTE MANAGEMENT IN ASIA

The below interview questions were prepared by Terrence Thompson[59] to support the regional research for this benchmarking assessment of health care waste management in Asia. The text and questions provided to the respondents are included below for your reference.

UNDP, in partnership with the Government of China, is undertaking a regional project titled, "Learning from China's Experience to Improve the Ability of Response to COVID-19 in Asia and the Pacific Region", to strengthen COVID-19 medical waste management capacities in five countries: Cambodia, Lao PDR, Myanmar, Nepal, and the Philippines. Through this regional project, the DRT at the UNDP BRH is conducting research to better understand the most pressing issues concerning HCWM in the five countries.

I am currently supporting the research, leading a team of national consultants in the five project countries (one consultant in each of the five countries) to assess the HCWM policies and practices. To complement the ongoing activities of data collection, analysis, and dialogue with governments and stakeholders at the national level, I would like to ask you to kindly share with us your views as a regional body in order to help us gain a regional perspective on the issue of HCWM in LMICs in the region.

The findings of the study and its recommendations will be shared with the respective governments and relevant stakeholders in order to inform the future development of policies, programmes, and projects in this area.

Please kindly answer the following questions and return to me. Thank you.

1. My impression based on information that I am seeing from the five countries is that most countries had well developed policies, legal regulations, and technical guidelines developed even prior to the COVID-19 pandemic. However, practically speaking, enforcement was weak and compliance was often poor. The countries therefore started from a disadvantaged position and were overwhelmed when confronted by greatly increased quantities of health-care waste occasioned by the pandemic.

   Question: To what extent, if any, do you share this impression (a) specifically with respect to the five project countries, and (b) generally with respect to low- and middle-income Asian countries?

2. Among the five project countries, we have found very wide variation in the availability of data on indicators such as waste generation rates and waste management practices. Survey data are not very extensive in most countries and survey data among the various countries cannot be easily compared due to differences in survey methodologies. The lack of data presents challenges for understanding problems affecting health-care waste management in the countries and therefore also presents challenges for formulating solutions.

59 International consultant - Baseline and Benchmarking Assessment on COVID-19 Medical Waste Management

Question: To what extent, if any, is this finding credible (a) specifically with respect to the five project countries, and (b) generally with respeact to low- and middle-income Asian countries?

3. Notwithstanding the lack of data found in some of the participating countries, the impression that is emerging from the study is that some of the most pressing issues concerning health-care waste management include:

   - Poor enforcement of regulations and poor compliance.
   - Lack of supervision, monitoring, record-keeping, and data analysis.
   - Little emphasis on waste minimization techniques and practices.
   - Unsafe waste handling practices at facilities level (i.e. poor waste segregation, transport, and storage).
   - Waste treatment equipment frequently absent or malfunctioning.
   - Poor waste disposal practices (e.g. open burning or incomplete incineration, indiscriminate dumping or dumping in uncontrolled landfills/dumpsites).
   - Insufficient financial support for health-care waste management activities.
   - Insufficient numbers of health care workers having adequate knowledge and skills for safe health-care waste management, and lack of training opportunities.
   - Little or no effective public education programmes, neither at the level of facilities nor the community level, and poor health-care waste management practices among visitors and at the household level.

Question: To what extent, if any, do you share this impression (a) specifically with respect to the five project countries, and (b) generally with respect to low- and middle-income Asian countries?

4. The ongoing study will result in country-specific recommendations for improving health-care waste management in the five project countries. Recommendations made from the perspective of regional bodies could complement the country-specific recommendations.

Question: What recommendations can you share with us, particularly: (a) recommendations that may be relevant to multiple low- and middle-income countries in Asia, and (b) recommendations for action by regional bodies?

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