

A review of health-care waste management policies in the Western Pacific Region

Key findings from selected countries and areas



World Health
Organization

Western Pacific Region

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Abbreviations

BAT	best available technology
BEP	best environmental practice
COVID-19	coronavirus disease
JMP	Joint Monitoring Programme for Water Supply, Sanitation and Hygiene
POP	persistent organic pollutant
SDG	Strategic Development Goal
UNICEF	United Nations Children's Fund
WASH	water, sanitation and hygiene
WHO	World Health Organization

Executive summary

Health-care waste management is a critical aspect of health-care systems that has a significant impact on public health primarily due to the ensuant risk of infections. Health-care waste is also a recognized environmental health concern because of its detrimental effects on ecosystems, water and air quality, and overall environmental sustainability: this is the principle that underpins related environmental regulations. Its multifaceted significance underlines the need for global health-care waste management, which offers public health protection through infection prevention and control, but also includes issues of resource efficiency and long-term sustainability.

Health-care waste management may be neglected, particularly in health-care facilities with limited resources, owing to the competing priority of maintaining routine operational health-care service functions, especially during emergencies. In view of this situation, the World Health Organization (WHO) provides practical guidance in the form of a handbook on safe, efficient and environmentally sound methods for handling and disposing of health-care waste in normal situations and emergencies. The practices outlined in this handbook are universally applicable and provide benchmarks that authorities and health-care facilities can adopt to ensure compliance with local and international regulations.

A review was carried out on health-care waste management policies in the Western Pacific Region, encompassing 16 countries and areas with diverse systems and resources.¹ This report presents key findings on policy comprehensiveness in relation to WHO guidance. The review process included examining essential components of the legal framework for health-care waste management in each country. It also sought to identify best practices in disaster and emergency preparedness and to determine whether advanced, environmentally friendly technologies, including low-carbon alternatives, had been adopted as recommended in national policies. Based on the findings, recommendations were made with the aim of enhancing health-care waste management policies, with a specific focus on addressing technical gaps.

Policy framework for health-care waste management

Most of the 16 countries and areas have policies and regulatory frameworks that govern health-care waste management with clearly defined waste categories. The following capacities and gaps in health-care waste governance were identified in these countries and areas:

- 19% have no specific requirements for the safe management of waste generators, and 25% do not have established procedures for permits related to treatment and handling;
- 63% have inspection and audit systems to ensure compliance and impose penalties for non-compliance, but designated authorities for conflict resolution are unclear in most cases;
- 75% have training requirements for health-care workers and staff handling waste;
- 75% lack evidence of a dedicated budget for central-level health-care waste management;

¹ The 16 countries and areas were Australia, Brunei Darussalam, Cambodia, China, Hong Kong SAR (China), Japan, the Lao People's Democratic Republic, Malaysia, Mongolia, New Zealand, Papua New Guinea, the Philippines, the Republic of Korea, Samoa, Singapore and Viet Nam.

- 81% have regulations on record-keeping and reporting, but only 44% indicate that a national-level health-care waste monitoring system is in place, although routine waste generation rate monitoring remains unreported; and
- most lack dedicated national policies for health-care waste management and generally delegate to regional or subregional health-care waste management plans and procedures.

Technical guidelines for health-care waste management

In most of the countries and areas reviewed, comprehensive guidance exists for each stage of waste handling. Some countries, including China, have separate policy documents for specific aspects of waste transport, treatment and disposal. Other countries, such as Cambodia, Malaysia, Mongolia, Samoa and Viet Nam, provide broader descriptions since these processes are managed by regulated service providers. Despite variations, there is a collective effort to offer clear guidelines for health-care waste handling and disposal.

- Infectious waste is a vital component in health-care waste management guidelines. It is frequently singled out when categorizing hazardous medical waste. Guidelines typically detail precise containment and packaging rules for infectious waste, including the use of leak-proof and puncture-resistant containers to ensure safety and prevent contamination. Japan's approach to health-care waste classification differs, with a primary emphasis on the characteristics of infectious material, leading to distinct handling and disposal processes.
- Sharps waste is a constant feature in these countries' health-care waste management guidelines because of the substantial and immediate dangers of mishandling and improper disposal. Guidelines typically offer precise directions on using puncture-resistant containers, safe disposal practices, and the need for thorough training of health-care personnel to ensure proper sharps waste management.
- Pathological waste is well addressed in the technical guidelines. Some countries consider sociocultural factors when handling specific pathological waste or anatomical remains. They may advocate alternative disposal methods, such as special burial sites or cremation, to uphold cultural and religious customs. For instance, New Zealand's policy adopts a clear disposal process based on existing legislation for body part disposal.
- Pharmaceutical waste receives thorough attention in health-care waste management policies because of its crucial role in safeguarding patient and environmental safety. Some policies detail measures like take-back programmes for the safe return and disposal of unused or expired medications.
- Many countries have regulations for chemical waste management that apply to all sectors, including health care. Health-care waste policies may cite these regulations to avoid redundancy. The quantity and types of chemical waste in health-care facilities vary widely based on facility size, services offered and the complexity of medical procedures undertaken, and it may be impractical to address all potential chemicals in a specific health-care waste policy. For instance, Samoa stores chemical waste (primarily from laboratories) in various locations before exporting it for treatment and disposal and is considering take-back arrangements with suppliers in future contracts.
- In some countries, radioactive waste is not completely integrated into the health-care waste management guidelines because this type of waste falls under the responsibility of the relevant authorities for nuclear and radiation safety.

- General waste from health-care facilities may not be part of health-care waste management policies since it falls under separate waste regulations that apply to various waste sources outside the health-care sector. These regulations usually exist at the municipal or national level. Nevertheless, health-care policies encourage waste reduction and proper segregation of hazardous and non-hazardous waste. Most of the 16 countries and areas reviewed include general waste in their policies or guidelines, except for China, Hong Kong SAR (China), Japan, Malaysia, the Republic of Korea and Singapore.

Supportive strategies for sustainable health-care waste management

Most countries and areas examined in the review prioritize environmentally sustainable health-care waste management policies, which is a positive approach to reducing the environmental impact of health-care waste. However, only a few of these countries and areas explicitly mandate the use of low-carbon technologies within their policies.

In many cases, incineration remains the predominant method for treating health-care waste. However, even when incineration is used, some countries have introduced stringent requirements, such as best environmental practices (BEPs) or best available technologies (BATs), to ensure that incineration is conducted in an environmentally responsible manner and with minimal emissions.

On the other hand, a subset of countries, including the Lao People's Democratic Republic, Mongolia, the Philippines and Singapore, is actively seeking to eliminate incineration or adopt cleaner and more environmentally friendly technologies. This shift aligns with the global trend toward reducing carbon emissions and environmental pollution associated with traditional incineration methods.

In essence, while many countries prioritize sustainability in health-care waste management, their approaches diverge. Some continue to use incineration but with stricter environmental controls, while others are actively pursuing alternative, low-carbon technologies to minimize the environmental footprint of health-care waste treatment. This divergence reflects ongoing changes in policies and practices in this critical area of waste management.

In terms of disaster preparedness, less than half of the countries and areas reviewed include related procedures in their health-care waste management policies or regulations. Potential hazards during disasters can present a considerable challenge for health services, including the proper handling, storage, transportation and disposal of health-care waste. Risks can include infrastructure damage and disruptions to regular waste management, leading to contamination and disease spread, environmental harm and increased waste generation, as was seen during the coronavirus disease (COVID-19) pandemic.

Establishing a robust waste management system with disaster preparedness measures is prudent. This policy review revealed that most countries and areas lack disaster preparedness protocols except for Australia, Mongolia, the Philippines and Singapore. Brunei Darussalam, New Zealand and Samoa acknowledge to some extent that emergency plans are essential in health-care waste management.

The generation of waste materials associated with animal health care was also examined in this review. It is considered good practice to include veterinary sources of waste in overall health-care

waste management policies. Veterinary health-care waste was found to be fully integrated into the waste management policies in nine of the 16 countries and areas reviewed, partially integrated in three and not at all integrated in four.

Key recommendations

This review has provided valuable insights into the existing health-care waste management frameworks of countries and areas across the Western Pacific Region, highlighting both strengths and drawing attention to areas in need of improvement. The summary recommendations listed below suggest measures to enhance the effectiveness and sustainability of future health-care waste management policies in the Region.

Addressing legal and budgetary shortcomings:

1. Define the legal obligations for health-care waste generators, establish licensing and inspection systems, and designate and empower the authority responsible for enforcing regulations in order to strengthen the regulatory framework.
2. Perform needs assessments for health-care waste management at all levels (central, provincial, district and facility) and allocate budgets accordingly. Develop waste management plans at each level and provide sufficient resources for effective implementation.

Addressing technical limitations:

1. Develop practical and easy-to-follow policy or guidelines for safe health-care waste management, with due consideration of management capacities and resources of health-care waste generators.
2. Systematize reporting and collecting of health-care waste generation data in order to establish a structured and logical system of organizing data and information.
3. Foster collaboration and dialogue between development partners, agencies, regional partnerships and national governments.

In addition, consider further studies to evaluate policy implementation, regulatory compliance and appropriateness of guidance materials to demonstrate the practical effectiveness of existing health-care waste management policies and provide a better evidence base for policy refinement. A focus on cross-sectoral instruments, particularly from the environmental and agricultural sectors, could also be envisaged.

1 Background

It is imperative that safe and sustainable water, sanitation and hygiene (WASH) and health-care waste management are implemented by all levels of health-care facilities to ensure the provision of quality care. From a global perspective, however, safe waste management services for health-care waste are lacking, especially in less developed countries. One in three health-care facilities does not safely manage health-care waste, according to a World Health Organization (WHO) global analysis of health-care waste based on 2019 data (1). The latest data from the Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP) in 2021 show that only 34% of health-care facilities have basic waste services. The same report also found that 80% of the 79 participating countries have developed health-care waste standards, and that these are often distinct from WASH standards (2).

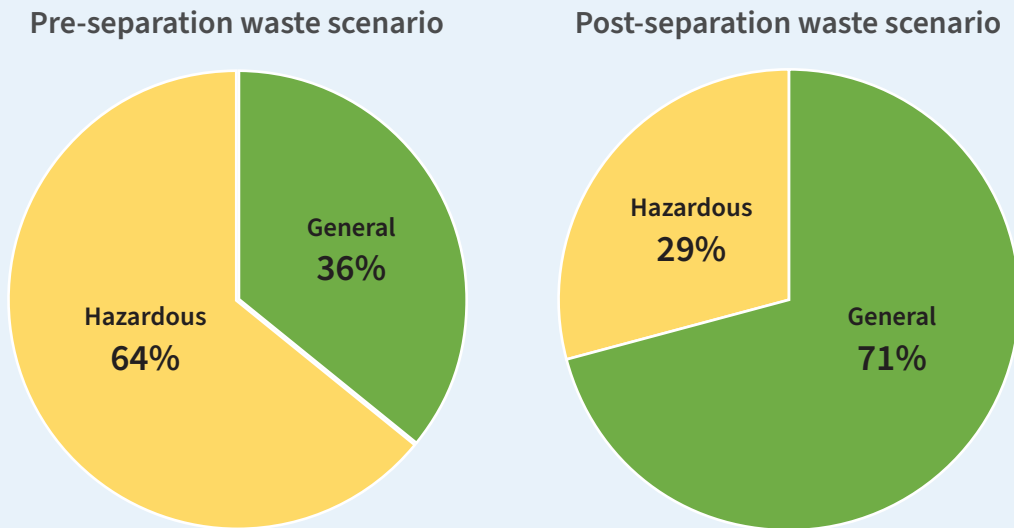
Health-care waste is mainly produced by health-care facilities, research centres and laboratories that carry out related medical procedures but may also originate from a variety of less important sources and include waste produced by health-care procedures undertaken in the domestic setting (for example, home dialysis, self-administration of insulin and recuperative care). Between 75% and



90% of the waste produced by health-care providers is comparable to domestic waste and is usually termed “non-hazardous” or “general health-care waste”. The remaining 10–25% of health-care waste is regarded as “hazardous” and may pose a variety of environmental and health risks (3). However, poor waste segregation practices often result in the non-hazardous component being rendered hazardous, thereby unnecessarily overburdening the waste management infrastructure (Box 1).

Box 1. Health-care waste composition at the Lao National Children’s Hospital

The type of services provided in the health-care facility and the degree to which waste segregation at the source is practised can affect the composition of the total waste generated. A measurement of the health-care waste generated at the Lao National Children’s Hospital showed that the overall share of designated hazardous waste was 64% when hazardous waste was not separated from general health-care waste. This share was reduced to 29%, however, when proper segregation was carried out.



Source: Water and Environment International, unpublished report on an assessment of the health-care waste management system of the Lao National Children’s Hospital, 2015.

WHO guidelines for safe health-care waste management

The main purpose for categorizing health-care waste is to ensure proper management and disposal based on the potential risks associated with different types of waste. Generally, health-care waste is designated into hazardous and non-hazardous types. Table 1 shows the categories defined by the WHO handbook *Safe Management of Wastes from Health-care Activities*.

Table 1. Categories of health-care waste

Waste category	Description and examples
Hazardous health-care waste	
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 (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; fetuses; unused blood products. Recognizable human or animal body parts are sometimes termed “anatomical waste”.
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 heavy metal contents such as 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, including recyclables, non-recyclables and compostables.

Source: World Health Organization (3).

WHO recommends that waste segregation systems be standardized nationwide and draw on national guidelines or regulations for health-care waste management. This usually entails a uniform colour-coding system to provide a visual indication of the potential risk posed by waste in a given container, to facilitate disposal of waste items in the appropriate containers and to maintain segregation during transport, storage, treatment and disposal (4). In countries where health-care waste regulations are issued at state and territory levels, segregation systems should be implemented in accordance with the appurtenant regulations.

An overview of safe health-care waste management collection, storage, transport, treatment and disposal methods according to WHO recommendations is presented in the Annex.

Climate-responsive strategies in health care

In addition to the existing gaps in health-care waste management, the threat of climate disasters adds to the risks that confront developing countries, which are often the least equipped to manage and respond to catastrophic events. Extreme weather events such as hurricanes, floods and wildfires

can disrupt waste management systems and infrastructure, resulting in the unintended release of hazardous materials and contaminants with potential health and environmental consequences. These events also contribute to long-term pollution and degradation of ecosystems.

The health sector's contribution to global greenhouse gas emissions mainly comes from energy use, transport and products manufactured, used and discarded (5); global model estimates found that it was responsible for about 5% of total emissions in 2017 (6). This indicates that decarbonization measures can potentially have a bearing in this sector. High-impact actions to move towards zero emissions are outlined in the global road map for health-care decarbonization; they address electricity, buildings and infrastructure, travel and transport, food, pharmaceuticals, circular health and improved system effectiveness and were drawn from existing resources (7).

To support the health sector's responsiveness to climate and environmental goals, WHO recommends that Member States establish sustainable health-care waste management systems that follow international conventions, such as the Basel Convention on the Trans-Boundary Movements of Hazardous Wastes and their Disposal (8), the Stockholm Convention on Persistent Organic Pollutants (POPs) (9), and the Minamata Convention on Mercury (10), and apply the "polluter pays principle" to minimize environmental risks. Instituting a durable approach to ensure environmentally sustainable health-care waste management by all WHO Western Pacific Region Member States aligns with WHO's global policy recommendations and will support Member States' efforts to achieve the Sustainable Development Goals (SDGs) for health (SDG3), water and sanitation (SDG6) and climate change (SDG13), as well as the Paris Agreement targets.

Purpose of this report

Related assessments focus on existing practices in the management of health-care waste or offer a limited national perspective on disaster and emergency preparedness in health-care waste management (11–13). A comparative review of health-care waste management policies implemented by countries in the Western Pacific Region is needed to develop upstream interventions in accordance with environmentally accepted models for health-care waste management, including clean technologies and disaster and emergency preparedness and response.

The objective of this review was to evaluate national health-care waste management policies and identify gaps and shortcomings. Part of the review process was to analyse the essential components of the legal framework governing health-care waste management in each country, such as the scope of applicable national policies or guidelines or regional-level strategies on health-care waste or hazardous waste management. The review also aimed to identify the best disaster and emergency preparedness practices and best available technology, including low-carbon options set out in current national policies. Recommendations to further develop these health-care waste management policies, specifically addressing technical gaps, were developed based on the findings of the review.

This report is primarily intended for use by policy-makers and regulatory authorities, international organizations and development partners working on projects in the health and environment sectors. It aims to provide valuable information for collaborating and coordinating efforts among key stakeholders working to enhance health-care waste management policies.

2 Review methodology

The WHO handbook *Safe Management of Wastes from Health-care Activities* (2014) provides a comprehensive blueprint for proper waste characterization, handling, treatment and disposal methods. This document has been widely adopted and is often cited by countries and organizations as a reference, setting out the minimum safety standards for different health-care waste management processes. It therefore served as the framework for the analysis and subsequent recommendations presented in this report, with the goal of identifying the most straightforward – and prioritizing the most urgent – actions to adopt in national policies.

A desk review was conducted on existing national policies and guidelines on clinical or hazardous health-care waste management published by the health or environment ministries. More specifically, the review examined these key points:

- essential components of the legal framework on health-care waste management, and
- the scope and provisions of health-care waste management guidelines.

Limitations of the review

The review was limited to examining health sector policies exclusively; any other supporting policies, such as those from the environment ministries, were excluded from its scope. The documents reviewed were obtained from WHO country offices or health ministries by request or through desktop research. While the review sought to refer to current health-care waste management policy and guideline documents or the latest publicly available regulation, unpublished documents may inadvertently have been excluded from the review process.

Initially, the intention of this review was to encompass the entire WHO Western Pacific Region and to assess health-care waste management policies across the Region. Research revealed, however, that the availability of policy documents was limited. As a result, the scope of the review narrowed to focus on a subset of countries for which policy documents were accessible (Table 2).

The limited availability of national policy documents on health-care waste management for most of the Pacific island countries and areas presented a significant challenge because it precluded a detailed analysis of individual national policies. A regional perspective on health-care waste management strategy has therefore been adopted for discussion.

Table 2. Countries and areas in the Western Pacific Region with policy documents available for review

Australia	Mongolia
Brunei Darussalam	New Zealand
Cambodia	Papua New Guinea
China ^a	Philippines
China, Hong Kong (SAR)	Republic of Korea
Japan	Samoa
Lao People's Democratic Republic	Singapore
Malaysia	Viet Nam

^a The officially published document exclusively addressed the classification scheme for medical wastes, thereby limiting analysis of findings and discussion to this specific stage of the health-care waste management process.

Furthermore, some documents were published in local languages and translated into English using online translation resources. Cross-checks were carried out to corroborate the correctness of the translation using available reference documents online, such as published research papers and presentations, or by WHO staff who were native speakers of local languages.

3 Health-care waste management situation in the Western Pacific Region: Key results and findings

3.1 Health-care waste generation data

Data on health-care waste generation can indicate the extent of a waste management issue, and in turn be used as a credible tool to increase the urgency for health-care sector policies.

The review was able to identify health-care waste generation data for 11 out of 16 countries and areas (Table 3), although 13 require record-keeping and reporting in health-care facilities (see Table 5). However, in most cases, the data were linked to one-off studies, not routine monitoring programmes. Some countries (Cambodia, the Lao People’s Democratic Republic, Mongolia, Singapore and the Philippines) had recent waste generation estimates that compared data before and during the COVID-19 pandemic, while others provided ad hoc studies assessing the health-care waste output due to the pandemic.

Table 3. Health-care waste generation data availability

Country or area	Health-care waste generation data
Australia	✓
Brunei Darussalam	○
Cambodia	✓
China	○
China, Hong Kong SAR	○
Japan	○
Lao People’s Democratic Republic	✓
Malaysia	✓
Mongolia	✓
New Zealand	✓
Papua New Guinea	○
Philippines	✓
Republic of Korea	✓
Samoa	✓
Singapore	✓
Viet Nam	✓

✓ Health-care waste generation data presented in technical documents or reports.

○ No data found.

For most of the countries and areas reviewed in this report, health-care waste generation rates are not well documented and audit procedures are limited. Where data are available, they are based on ad hoc sampling for related studies or policy development. This underscores the urgent need to improve monitoring systems and policies to address waste management challenges in the health-care sector.

3.2 Policy framework for managing health-care waste

3.2.1 International agreements and conventions

Health-care waste management is not explicitly covered by a specific global treaty, but several international agreements and conventions address aspects of it. The three main conventions that are relevant to the policy framework for managing health-care waste are outlined below.

a. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal

The Basel Convention is a global environmental treaty designed to control the transboundary movement and disposal of hazardous wastes, including health-care waste. Health-care waste under the Convention specifically refers to clinical wastes from medical care in hospitals, medical centres and clinics (Y1) and waste pharmaceuticals, drugs and medicines (Y3). The Convention also identifies “infectious” as a hazard characteristic (H6.2, described in Annex III of the Convention), which is defined as “substances or wastes containing viable micro-organisms or their toxins which are known or suspected to cause disease in animals or humans”.

Countries that are party to the Basel Convention are required to ensure that health-care waste is properly classified, handled, packaged, labelled and transported in accordance with the Convention’s provisions. The document *Technical Guidelines on the Environmentally Sound Management of Biomedical and Healthcare Wastes (14)*, developed under the Convention, outlines the strategies for managing biomedical and health-care wastes.²

b. The Stockholm Convention on Persistent Organic Pollutants (2001)

The Stockholm Convention on Persistent Organic Pollutants (POPs) focuses on the regulation of a group of highly toxic chemical substances that persist in the environment, bioaccumulate in living organisms and present a range of adverse effects for both human health and the environment. The Stockholm Convention is relevant in this context as medical waste incinerators are major sources of dioxins and furans, toxic chemical compounds that belong to the group of POPs.

Under the Stockholm Convention, parties are required to adopt measures that limit or eliminate the release of POPs. One of its relevant resources, *Guidelines on Best Available Techniques and Provisional Guidance on Best Environmental Practices (15)*, includes a section that deals specifically with health-care waste (Section V.A.ii). It lists various best environmental practices (BEPs), which

² Under the Technical Guidelines, biomedical and health-care waste is defined as the solid or liquid waste produced by health care (including collected gaseous waste).

include source reduction, segregation, resource recovery and recycling, training, and proper collection and transport. The guidelines also describe alternative technologies to incineration, such as steam sterilization, advanced steam sterilization, microwave treatment, dry-heat sterilization, alkaline hydrolysis and biological treatment.

c. The Minamata Convention on Mercury (2013)

The most recent global environmental treaty, the Minamata Convention on Mercury, addresses the various anthropogenic activities that contribute to widespread mercury pollution. Under this Convention, provisions on reducing and eliminating mercury releases include phasing out mercury-containing medical devices and phasing down the use of mercury in dental amalgam. The Convention also calls for the promotion of environmentally sound management of mercury wastes; in the health-care setting, this involves proper segregation, handling, treatment and disposal of mercury-containing waste.

Table 4 shows the countries and areas in the Western Pacific Region that, to date, are parties to the abovementioned conventions.

Table 4. Countries and areas in the Western Pacific Region that are parties to the conventions (as of 1 June 2023)

Country or area	Basel Convention	Stockholm Convention	Minamata Convention
1. American Samoa			✓ ¹
2. Australia	✓	✓	✓
3. Brunei Darussalam	✓	✓	
4. Cambodia	✓	✓	✓
5. China	✓	✓	✓
6. China, Hong Kong SAR	✓ ¹	✓ ¹	✓ ¹
7. China, Macao SAR	✓ ¹	✓ ¹	✓ ¹
8. Cook Islands	✓	✓	
9. Fiji		✓	
10. French Polynesia	✓ ¹	✓ ¹	✓ ¹
11. Guam			✓ ¹
12. Japan	✓	✓	✓
13. Kiribati	✓	✓	
14. Lao People's Democratic Republic	✓	✓	✓
15. Malaysia	✓	✓	✓
16. Marshall Islands	✓	✓	✓
17. Micronesia, Federated States of	✓	✓	
18. Mongolia	✓	✓	✓

Country or area	Basel Convention	Stockholm Convention	Minamata Convention
19. Nauru	✓	✓	
20. New Caledonia	✓ ¹	✓ ¹	✓ ¹
21. New Zealand	✓	✓	✓
22. Niue		✓	
23. Northern Mariana Islands, Commonwealth of the			✓ ¹
24. Palau	✓	✓	✓
25. Papua New Guinea	✓	✓	
26. Philippines	✓	✓	✓
27. Pitcairn Islands	✓ ¹	✓ ¹	✓ ¹
28. Republic of Korea	✓	✓	✓
29. Samoa	✓	✓	✓
30. Singapore	✓	✓	✓
31. Solomon Islands	✓	✓	
32. Tokelau			
33. Tonga	✓	✓	✓
34. Tuvalu	✓	✓	✓
35. Vanuatu	✓	✓	✓
36. Viet Nam	✓	✓	✓
37. Wallis and Futuna	✓ ¹	✓ ¹	✓ ¹
TOTAL	31	33	27

✓ – Ratification, acceptance, approval or accession; ✓¹ – Party through its metropolitan country.

As of 1 June 2023, of the 37 countries and areas concerned, 31 (84%) are parties to the Basel Convention, 33 (89%) are parties to the Stockholm Convention, and 27 (73%) are parties to the Minamata Convention. Overall, Member States of the WHO Western Pacific Region are well represented as parties to the relevant conventions, all of which contribute to the broader framework of managing hazardous waste, including waste from health-care facilities.

A significant proportion of the 37 countries and areas in the Western Pacific Region are parties to the Basel Convention (84%), the Stockholm Convention (84%) and the Minamata Convention (73%). Member States are actively participating in these conventions, which indicates that substantial efforts are ongoing to manage hazardous waste, including waste produced by health-care facilities.

3.2.2 National policies for safe health-care waste management

Since the objective of this review was to evaluate the current state of national health-care waste management policies, part of the review process entailed analysis of the essential components of the legal framework governing health-care waste management in each country.

A basic legal framework, as outlined in the WHO handbook (2014), would typically include the following:

- a clear definition of hazardous health-care waste and its various categories;
- a precise indication of the legal obligations of the health-care waste producer regarding safe handling and disposal;
- specifications for record-keeping and reporting;
- establishment of permit or licensing procedures for treatment and waste-handling systems;
- specifications for an inspection system and regular audit procedures to ensure application of the law and impose penalties for contraventions; and
- designation of courts responsible for handling disputes arising from application of the law or non-compliance with its measures.

The review found that almost all countries for which information was available have a policy and/or regulatory framework governing health-care waste management. Table 5 outlines specific legal, regulatory and policy framework measures benchmarked against WHO guidelines. It may be noted that Papua New Guinea does not currently have a specific health-care waste management policy dedicated solely to health-care waste. However, the country does have other existing regulations and policies that could serve as valuable resources and guidance, such as the National Guidelines on Infection Prevention and Control for COVID-19 (16).

It emerged that all countries reviewed have clear definitions of health-care waste and its various categories, but 19% still lack precise indications concerning the legal obligations incumbent on waste generators for the safe management of such waste. Meanwhile, 25% did not indicate in their policy documents whether they had any permit or licensing procedures covering the treatment and handling of health-care waste.

Many countries (63%) have included specifications for inspection systems and auditing procedures in their guidelines to ensure compliance with regulations and policies and to impose penalties for non-compliance.

Review findings would suggest that most policy documents do not clearly identify the designated authority for conflict resolution if issues arise regarding the enforcement of the health-care waste management regulations. Nearly 75% have yet to designate courts of law with jurisdiction over their health-care waste legislation.

Table 5. Overview of the existing legal frameworks for health-care waste management in selected countries and areas

Legal framework for health-care waste management	Number of countries and areas	Percentage of total
1. National legislation or policy on managing hazardous waste from health-care activities		
Yes	15	94%
Partial	1	6%
No	–	
2. A clear definition of hazardous health-care waste and its various categories		
Yes	16	100%
Partial	–	–
No	–	–
3. A precise indication of the legal obligations of the producer of health-care waste regarding safe handling and disposal		
Yes	13	81%
Partial	–	–
No	3	19%
4. Establishment of permit or licensing procedures for systems of treatment and waste handling		
Yes	12	75%
Partial	–	–
No	4	25%
5. Specifications for record-keeping and reporting		
Yes	13	81%
Partial	–	–
No	3	19%
6. Specifications for an inspection system and regular audit procedures to ensure enforcement of the law and impose penalties for contraventions		
Yes	10	63%
Partial	–	–
No	6	38%
7. Designation of courts responsible for handling disputes arising from the application of the law or non-compliance with its measures		
Yes	3	19%
Partial	1	6%
No	12	75%

Legal framework for health-care waste management	Number of countries and areas	Percentage of total
8. National legislation or policy on hospital hygiene and infection control		
Yes	15	94%
Partial	–	–
No	1	6%
9. National-level steering committee on health-care waste management		
Yes	5	31%
Partial	–	–
No	11	69%
10. National-level monitoring system for health-care waste		
Yes	7	44%
Partial	–	–
No	9	56%
11. Pre-service training requirement for waste management personnel		
Yes	12	75%
Partial	–	–
No	4	25%
12. Budget for health-care waste management		
Yes	4	25%
Partial	–	–
No	12	75%

At the national level, nearly all the countries reviewed were found to have national legislation or policy on hospital hygiene and infection prevention and control, to which health-care waste management is closely linked. These policies share a core objective, emphasizing the importance of proper waste segregation and safe disposal of infectious waste.

In 75% of the countries reviewed, there was a provision for pre-service training of responsible personnel and frontline staff on handling health-care waste.

On the other hand, 75% of these countries had no evidence of budget allocation for central-level health-care waste management.

As stated above, although record-keeping and reporting were mandated in 81% of the countries reviewed, only 44% appeared to have a national-level health-care waste monitoring system. Data on the routine monitoring of health-care waste generation rates were not found in any country reviewed.

- Almost all countries reviewed have established policies and regulatory frameworks for health-care waste management, with clear definitions of waste categories. However, 19% lack precise obligations for safe management of waste by generators, and 25% lack permit procedures for treatment and handling.
- Of the countries reviewed, 63% have inspection and audit systems to ensure compliance and impose penalties for non-compliance, but designated authorities for conflict resolution are unclear in most cases.
- Hospital hygiene and infection control policies are prevalent in almost all countries reviewed which emphasize proper waste segregation and disposal of infectious waste.
- Of the countries reviewed, 75% have pre-service training requirements for health-care workers and waste-handling personnel.
- Of the countries reviewed, 75% lack evidence of a dedicated budget for central-level health-care waste management.
- While 81% of countries reviewed require record-keeping and reporting, only 44% possess national-level health-care waste monitoring systems, and routine waste generation rate monitoring remains unreported.

3.2.3 Regional strategies on health-care waste management for Pacific island countries and areas

There is a lack of individual national policies dedicated solely to health-care waste management in Pacific island countries and areas. Some countries have integrated health-care waste management within their broader environmental or health policies, but the absence of specific and comprehensive guidelines poses challenges to effective and uniform health-care waste management across the Pacific region.

In lieu of this, Pacific island countries and areas have set up an integrated framework to assess, collect and dispose of hazardous health-care waste. *Pacific Health Care Waste: A Regional Strategy and Action Plan 2013–2015* was adopted by the 23rd Secretariat of the Pacific Regional Environmental Programme (SPREP) Meeting in 2013. This strategy document makes it clear that Pacific island countries and areas have common issues with regards to managing health-care waste, such as insufficient information on the extent of the problem, lack of treatment and disposal facilities, limited resources and capacities to safely manage health-care waste, as well as a lack of appropriate standards on equipment importation.

No subsequent action plan has been presented. However, a comprehensive long-term strategy for integrated and sustainable waste management and pollution prevention and control in the Pacific region (2016–2025) makes health-care waste a priority issue. Stocktaking of the various existing policies and legislation in the region, as summarized in the strategy document, revealed that the adoption and implementation of policies, strategies and plans remain a significant challenge for many.

According to the 2016–2025 regional strategy, several countries and areas have health-care waste strategies integrated into a broader waste management policy, strategy or plan. These include Cook Islands, Kiribati, the Marshall Islands, the Federated States of Micronesia, Niue, Palau, Solomon Islands, Tokelau and Vanuatu. The corresponding policy documents of each country or area were not identified, however, and no further analysis on the comprehensiveness of the policy documents was provided.

- Most Pacific island countries lack dedicated national policies for health-care waste management and generally refer to regional/subregional health-care waste management plans and procedures.
- Key issues highlighted in the *Pacific Health Care Waste: A Regional Strategy and Action Plan 2013–2015* are common to the countries and include:
 - insufficient information on the extent of the problem;
 - lack of treatment and disposal facilities;
 - limited resources and capacities to safely manage health-care waste; and
 - lack of appropriate standards on equipment importation.
- Technology options for the safe destruction of health-care waste in Pacific island countries and areas are provided in a report published under the PacWastePlus programme. It presents a comparative evaluation of the feasible technology options for each type of waste analysed against technological, legal, economic and environmental considerations. The full report is published by SPREP and is available online at <https://library.sprep.org/content/technology-options-safe-destruction-healthcare-waste-other-traditional-high-temperature>.

3.2.4 Scope of health-care waste management technical guidelines

Even without a dedicated national policy, technical guidelines or standards for health-care waste management could be developed by encouraging collaboration between stakeholders at different levels: international organizations, national governments, health authorities, relevant experts and professional associations.³ The purpose of technical guidelines on health-care waste management is to provide a comprehensive and standardized framework for the safe and proper handling, segregation, treatment and disposal of health-care waste. Increasingly, these should address aspects of climate resilience and sustainability owing to the growing threat of climate change.

In general, these guidelines should take up critical aspects to ensure safe and proper health-care waste management by outlining best practices and procedures (Table 6). This review examined their comprehensiveness of content and alignment with WHO recommendations and sought to identify potential gaps and areas for improvement in health-care waste management at both national and facility levels. Table 7 presents a summary of its findings.

³ Health-care waste standards are one of the eight practical steps outlined by WHO/UNICEF as the means for achieving progress at country level (2).

Table 6. Basic principles of general, infectious and sharps waste management

Process	Best practices
Minimization	<ul style="list-style-type: none"> All health-care facilities need to minimize generating all types of waste, e.g. by procuring products with less packaging or PVC-free plastics.
Segregation	<ul style="list-style-type: none"> Correct segregation of health-care waste is the responsibility of all health-care providers. Every health-care facility should have waste containers displaying a uniform colour-coding system. All waste should be clearly labelled with information on contents, date, time of closure and person responsible.
Storage	<ul style="list-style-type: none"> Infectious and sharps waste storage should be separate from general non-hazardous waste, clearly labelled, and kept in a room with sealed or tiled floors and walls to allow easy cleaning. Similar conditions should be in place for other types of hazardous waste.
Collection	<ul style="list-style-type: none"> Infectious and sharps waste should be collected within two to four days, depending on climate and storage conditions.
Internal transport	<ul style="list-style-type: none"> Infectious waste should be transported in a trolley or a cart that is easy to load and unload, with surfaces that are easy to clean and without sharp edges that could damage waste bags or containers.
External transport	<ul style="list-style-type: none"> Transport vehicles should be labelled according to the type of waste being transported, i.e. with relevant hazard symbols. All vehicles should carry a consignment note from the point of collection to the treatment facility. Vehicles used to collect hazardous/infectious health-care waste should not be used for any other purpose. Vehicles should be free of sharp edges, easy to load and unload by hand, easy to clean or disinfect, and sealed or hermetic to prevent any spillage on hospital premises or during road transportation.
Treatment	<ul style="list-style-type: none"> All hazardous waste should be treated prior to disposal or disposed of in a landfill solely for hazardous waste. Waste should be treated with technologies that minimize the formation and release of chemicals or hazardous emissions. Infectious and sharps waste should be treated by steam (e.g. autoclaving) or other non-burn technology.
Disposal	<ul style="list-style-type: none"> Non-hazardous waste should be collected or transported regularly to well managed public disposal sites.

In 69% of the countries reviewed, there was adequate identification of sources or activities that produce health-care waste. Most of these guidelines, about 75%, clearly define the responsibilities incumbent on the relevant authorities with respect to health-care waste management.

Technical guidelines from all countries reviewed provide guidance on treatment and disposal methods for the various categories of health-care waste, although in one country, guidance is only partial (China). In general, guidelines concentrate on aspects related to waste management procedures, waste classification, storage requirements, transportation and treatment options. Only half of the countries reviewed provide guidance on waste minimization, and in a few cases, guidance is only partial.

Notably, guidance on the treatment and disposal of wastewater generated by health-care activities is significantly lacking. About half of the countries reviewed lack adequate guidance on wastewater treatment and disposal. An even greater portion, almost 63%, do not impose any limits on emissions of atmospheric pollutants, for example, from waste incineration. In 25% of the countries reviewed, the technical guidelines lack adequate guidance on occupational health and safety procedures to safeguard health-care workers and waste handlers.

Setting emission limits for waste treatment processes and occupational safety measures to protect health-care workers and waste handlers during waste management activities are, however, complex and multifaceted issues. They may involve specific regulatory requirements, detailed technical specifications and environmental impact assessments, which extend beyond the scope of general health-care waste management guidelines. It should be noted that technical guidelines on health-care waste management are typically drafted with a specific end in mind: to provide clear and comprehensive instructions on proper health-care waste management while giving due consideration to the practicality of implementing such measures.

Table 7. Overview of the existing technical guidelines in selected countries and areas

Scope of existing technical guidelines on health-care waste management	Number of countries and areas	Percentage
1. Identified sources or activities that produce health-care waste		
Yes	11	69%
Partial	–	–
No	5	31%
2. Clear definition of responsibilities incumbent on authorities		
Yes	12	75%
Partial	–	–
No	4	25%
3. Safe practices for waste minimization		
Yes	8	50%
Partial	3	19%
No	5	31%
4. Separation, handling, storage and transport methods for each category of health-care waste		
Yes	15	94%
Partial	1	6%
No	–	–

Scope of existing technical guidelines on health-care waste management	Number of countries and areas	Percentage
5. Treatment and disposal methods for each category of health-care waste		
Yes	13	81%
Partial	3	19%
No	–	–
6. Treatment and disposal methods for wastewater		
Yes	6	38%
Partial	2	13%
No	8	50%
7. Emission limits for atmospheric pollutants		
Yes	6	38%
Partial	–	–
No	10	63%
8. Occupational health and safety procedures		
Yes	12	75%
Partial	–	–
No	4	25%
9. Health-care facility monitoring tool		
Yes	9	56%
Partial	–	–
No	7	44%

- Based on the review, technical guidelines adequately identify sources of health-care waste in 69% of cases, with 75% defining responsibilities incumbent on the relevant authorities.
- Only half of the countries reviewed address waste minimization, and few provide guidance on wastewater treatment and atmospheric pollutant emissions. Occupational health and safety procedures are insufficiently addressed in 25% of cases. These aspects may involve specific regulatory requirements, detailed technical specifications and environmental impact assessments that extend beyond the scope of general health-care waste management guidelines.

3.2.5 Analysing country policies: Alignment with the WHO guidelines for safe health-care waste management

The WHO guidelines serve as a comprehensive framework to ensure proper handling, segregation and disposal of health-care waste, and this analysis examined country policies concerning their application. Table 8 shows the different processes included in each country's technical guidelines document.

In general, there is comprehensive guidance available for each stage of waste handling in most countries. However, some countries, like China, have separate policy documents that address specific aspects of the transport, treatment and disposal steps. On the other hand, countries such as Cambodia, Malaysia, Mongolia, Samoa and Viet Nam offer broader descriptions of the treatment and disposal steps because these processes are managed by regulated transport service providers and treatment and disposal facilities. The approach to waste management may therefore vary across Member States, but, overall, there is an effort to provide clear guidelines for proper handling and disposal of health-care waste.

Table 8. Waste management process described in the technical guidelines reviewed

Country or area	Segregation	Collection	Storage	Transport	Treatment	Disposal
Australia^a	✓	✓	✓	✓	✓	✓
Brunei Darussalam	✓	✓	✓	✓	✓	✓
Cambodia	✓	✓	✓	✓	✓	○
China	✓	✓				
China, Hong Kong SAR	✓	✓	✓	✓	○	○
Japan	✓	✓	✓	✓	✓	✓
Lao People's Democratic Republic	✓	✓	✓	✓	✓	✓
Malaysia	✓	✓	✓	✓	✓	○
Mongolia	✓	✓	✓	✓	○	○
New Zealand	✓	✓	✓	✓	✓	✓
Papua New Guinea	✓	✓	✓	✓	✓	✓
Philippines	✓	✓	✓	✓	✓	✓
Republic of Korea	✓	✓	✓	✓	✓	✓
Samoa	✓	✓	✓	✓	○	○
Singapore	✓	✓		✓	✓	✓
Viet Nam	✓	✓	✓	○	○	○

✓ Included in the technical guidelines.

○ Limited description or guidance provided in the technical guidelines.

^a Refers to Australian Standard 3816:2018 on the management of clinical and related wastes. Regulations may vary across states and territories.

Taking a more detailed approach, the following tables (Table 9–14) provide a comprehensive overview of guidance on managing each type of health-care waste.

Infectious waste is a key component of technical guidelines for health-care waste management and is often given special attention when classifying hazardous medical waste (Table 9). Guidelines often outline specific containment and packaging requirements for infectious waste, such as the use of leak-proof and puncture-resistant containers to prevent exposure and contamination. Japan’s policy on health-care waste classification demonstrates a different approach, with a primary focus on infectiousness: special processes for handling and disposal are based on the infectious nature of the waste.

Table 9. Guidance for managing infectious waste

Country or area	Characterization	Segregation	Collection	Storage	Treatment	Transport	Disposal
Australia ^a	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Brunei Darussalam	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Cambodia	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part
China	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance
China, Hong Kong SAR	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part
Japan ^b	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Lao People’s Democratic Republic	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Malaysia	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Mongolia	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part
New Zealand	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Papua New Guinea	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Philippines	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Republic of Korea ^c	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Not covered under the technical guidance	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Samoa	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part
Singapore	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Not covered under the technical guidance	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Viet Nam	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part

■ Conforms to the WHO handbook recommendations in general

■ Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part

■ Not covered under the technical guidance

^a Refers to Australian Standard 3816:2018 on the management of clinical and related wastes. Regulations may vary across states and territories.

^b Waste generated at health-care facilities is subjected to a three-step identification process based on shape, place of generation or type of infectious diseases to be classified as infectious waste.

^c Unofficial translation of the Medical Waste Separation and Disposal Guidelines, 2019.

Sharps waste is consistently included in technical guidelines for health-care waste management due to the significant and immediate risks associated with its improper handling and disposal (Table 10). Technical guidelines often provide detailed instructions on the use of puncture-resistant sharps containers, safe disposal methods and the importance of proper training for health-care staff to ensure correct handling of sharps waste.

Table 10. Guidance for managing sharps waste

Country or area	Characterization	Segregation	Collection	Storage	Treatment	Transport	Disposal
Australia ^a	Green	Green	Green	Green	Green	Green	Green
Brunei Darussalam	Green	Green	Green	Green	Green	Green	Green
Cambodia	Green	Green	Green	Green	Green	Green	Yellow
China	Green	Green	Green	Grey	Grey	Grey	Grey
China, Hong Kong SAR	Green	Green	Green	Green	Yellow	Green	Yellow
Japan ^b	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Lao People's Democratic Republic	Green	Green	Green	Green	Green	Green	Green
Malaysia	Green	Yellow	Green	Yellow	Green	Green	Yellow
Mongolia	Green	Green	Green	Yellow	Green	Green	Yellow
New Zealand	Green	Green	Green	Green	Green	Green	Green
Papua New Guinea	Green	Green	Green	Green	Green	Green	Green
Philippines	Green	Green	Green	Green	Green	Green	Green
Republic of Korea ^c	Green	Green	Green	Green	Grey	Green	Green
Samoa	Green	Green	Green	Green	Yellow	Green	Yellow
Singapore	Green	Green	Green	Grey	Green	Green	Green
Viet Nam	Green	Green	Yellow	Yellow	Yellow	Yellow	Green
■ Conforms to the WHO handbook recommendations in general ■ Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part ■ Not covered under the technical guidance							

^a Refers to Australian Standard 3816:2018 on the management of clinical and related wastes. Regulations may vary across states and territories.

^b Waste generated at health-care facilities is subjected to a three-step identification process based on shape, place of generation or type of infectious diseases to be classified as infectious waste.

^c Unofficial translation of the Medical Waste Separation and Disposal Guidelines, 2019.

Guidance for managing pathological waste is generally well covered in the technical guidelines (Table 11). Some country policies include sociocultural considerations in the handling of certain pathological wastes or anatomical remains and specify alternative disposal methods such as special

burial sites or cremation in accordance with cultural and religious customs. As exemplified by New Zealand’s policy, a special management process based on relevant legislation clearly identifies which disposal controls should be implemented for disposal of body parts.

Table 11. Guidance for managing pathological waste

Country or area	Characterization	Segregation	Collection	Storage	Treatment	Transport	Disposal
Australia ^a	Green	Green	Green	Green	Green	Green	Green
Brunei Darussalam	Green	Green	Green	Green	Green	Green	Green
Cambodia	Green	Green	Green	Green	Green	Green	Yellow
China	Green	Green	Green	Grey	Grey	Grey	Grey
China, Hong Kong SAR	Green	Green	Green	Green	Yellow	Green	Yellow
Japan ^b	Grey	Grey	Grey	Grey	Grey	Grey	Grey
Lao People’s Democratic Republic	Green	Green	Green	Green	Green	Green	Green
Malaysia	Green	Yellow	Green	Yellow	Green	Green	Green
Mongolia	Green	Green	Green	Yellow	Green	Green	Green
New Zealand	Green	Green	Green	Green	Green	Green	Green
Papua New Guinea	Green	Green	Green	Green	Green	Green	Green
Philippines	Green	Green	Green	Green	Green	Green	Green
Republic of Korea ^c	Green	Green	Green	Green	Grey	Green	Green
Samoa	Green	Green	Green	Green	Yellow	Green	Yellow
Singapore	Green	Green	Green	Grey	Green	Green	Green
Viet Nam	Green	Green	Green	Green	Yellow	Yellow	Yellow
■ Conforms to the WHO handbook recommendations in general ■ Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part ■ Not covered under the technical guidance							

a Refers to Australian Standard 3816:2018 on the management of clinical and related wastes. Regulations may vary across states and territories.

b Waste generated at health-care facilities is subjected to a three-step identification process based on shape, place of generation or type of infectious diseases to be classified as infectious waste.

c Unofficial translation of the Medical Waste Separation and Disposal Guidelines, 2019.

Pharmaceutical waste is generally well covered in health-care waste management policies due to its critical importance in ensuring patient and environmental safety (Table 12). Certain measures such as take-back programmes to ensure the safe return and disposal of unused or expired medications are specified in some policies.

Table 12. Guidance for managing pharmaceutical and cytotoxic waste

Country or area	Characterization	Segregation	Collection	Storage	Treatment	Transport	Disposal
Australia ^a	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Brunei Darussalam	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Cambodia	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part
China	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance
China, Hong Kong SAR	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance
Japan ^b	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance
Lao People's Democratic Republic	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Malaysia	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Mongolia	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part
New Zealand	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Papua New Guinea	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Philippines	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Republic of Korea ^c	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Not covered under the technical guidance	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Samoa	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part
Singapore	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Viet Nam	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part

a Refers to Australian Standard 3816:2018 on the management of clinical and related wastes. Regulations may vary across states and territories.

b Waste generated at health-care facilities is subjected to a three-step identification process based on shape, place of generation or type of infectious diseases to be classified as infectious waste.

c Unofficial translation of the Medical Waste Separation and Disposal Guidelines, 2019.

Many countries have existing regulations and guidelines for the management of chemical waste that apply to all industries, including health care. Health-care waste policies may refer to these general regulations rather than duplicating them in their specific guidelines (Table 13).

In other instances, the amount and types of chemical waste generated in health-care facilities can vary significantly based on the size of the facility, range of services provided and complexity of medical procedures. Addressing all potential chemicals in a specific health-care waste policy may be impractical due to these variations, as was the case for Samoa, where chemical waste (mostly laboratory) is stored in an ad hoc manner in several locations prior to exporting for treatment and disposal, while take-back arrangements with suppliers are being considered for inclusion in future contractual arrangements.

Table 13. Guidance for managing chemical waste

Country or area	Characterization	Segregation	Collection	Storage	Treatment	Transport	Disposal
Australia ^a	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Brunei Darussalam	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Cambodia	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part
China	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance
China, Hong Kong SAR	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance
Japan ^b	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance
Lao People's Democratic Republic	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Malaysia	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance
Mongolia	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part
New Zealand	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Papua New Guinea	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Philippines	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general
Republic of Korea ^c	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance
Samoa	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part
Singapore	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance	Not covered under the technical guidance
Viet Nam	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Conforms to the WHO handbook recommendations in general	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part	Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part

■ Conforms to the WHO handbook recommendations in general
■ Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part
■ Not covered under the technical guidance

^a Refers to Australian Standard 3816:2018 on the management of clinical and related wastes. Regulations may vary across states and territories.

^b Waste generated at health-care facilities is subjected to a three-step identification process based on shape, place of generation or type of infectious diseases to be classified as infectious waste.

^c Unofficial translation of the Medical Waste Separation and Disposal Guidelines, 2019.

In some countries, radioactive waste is not completely integrated in the health-care waste management guidelines because management of this type of waste falls under the responsibility of the applicable authorities for nuclear and radiation safety (Table 14).

Table 14. Guidance for managing radioactive waste

Country or area	Characterization	Segregation	Collection	Storage	Treatment	Transport	Disposal
Australia ^a	■	■	■	■	■	■	■
Brunei Darussalam	■	■	■	■	■	■	■
Cambodia	■	■	■	■	■	■	■
China	■	■	■	■	■	■	■
China, Hong Kong SAR	■	■	■	■	■	■	■
Japan ^b	■	■	■	■	■	■	■
Lao People's Democratic Republic	■	■	■	■	■	■	■
Malaysia	■	■	■	■	■	■	■
Mongolia	■	■	■	■	■	■	■
New Zealand	■	■	■	■	■	■	■
Papua New Guinea	■	■	■	■	■	■	■
Philippines	■	■	■	■	■	■	■
Republic of Korea ^c	■	■	■	■	■	■	■
Samoa	■	■	■	■	■	■	■
Singapore	■	■	■	■	■	■	■
Viet Nam	■	■	■	■	■	■	■
■ Conforms to the WHO handbook recommendations in general							
■ Limited description provided in the technical guidance; conforms to the WHO handbook recommendations in part							
■ Not covered under the technical guidance							

^a Refers to Australian Standard 3816:2018 on the management of clinical and related wastes. Regulations may vary across states and territories.

^b Waste generated at health-care facilities is subjected to a three-step identification process based on shape, place of generation or type of infectious diseases to be classified as infectious waste.

^c Unofficial translation of the Medical Waste Separation and Disposal Guidelines, 2019.

The management of general waste from health-care facilities may not always be included in health-care waste management policies because non-hazardous waste is often subject to separate waste management regulations that apply to all types of waste produced by various sources, not just health-care facilities. These general waste management regulations are typically implemented at a broader level, for example, in municipal or national waste management policies. Nonetheless, it is important that health sector policies promote minimization of both hazardous and non-hazardous wastes and their effective segregation throughout the waste management chain.

Of the 16 countries and areas reviewed, most have included general waste in their policies or technical guidelines, except for China, Hong Kong SAR (China), Japan, Malaysia, the Republic of Korea and Singapore.

4 Best practices in health-care waste management

Given that health-care waste management is critical to ensuring public health and environmental protection, it is considered best practice to adopt sustainable measures in line with global sustainability goals. This section focuses on the incorporation of essential best practices within national policies, encompassing environmentally sustainable measures, low-carbon technologies, disaster preparedness and specialized veterinary waste management.

4.1 Sustainable health-care waste management

Policies on health-care waste management in the jurisdictions of the countries reviewed include a range of environmentally sustainable measures to minimize the impact of waste on the environment. Apart from proper waste segregation, common measures such as recycling and reuse are promoted to support waste reduction (including hazardous waste) in health-care facilities.



These measures often align with the accepted environmentally sustainable practices outlined in the WHO guidelines. As seen in Table 15, most countries reviewed were found to incorporate one or more environmentally sustainable measures in their health-care waste management policies and regulations.

Table 15. Environmentally sustainable measures or strategies identified in policy documents

Country or area	Environmentally sustainable measures endorsed in policy
Brunei Darussalam	<ul style="list-style-type: none"> • Waste minimization • Safe reuse, recycling, recovery
Cambodia	<ul style="list-style-type: none"> • Waste minimization • Employing a national 3R strategy
Lao People's Democratic Republic	<ul style="list-style-type: none"> • Waste reduction and recycling • Waste minimization (for chemical waste) • Composting • Non-burn technologies for routine treatment (except for pathological waste during emergencies)
Malaysia	<ul style="list-style-type: none"> • Waste minimization • Recycling
Mongolia	<ul style="list-style-type: none"> • Prohibition of on-site burning or burying of domestic waste (except for infectious waste but only during emergencies)
New Zealand	<ul style="list-style-type: none"> • Recycling
Philippines	<ul style="list-style-type: none"> • Green procurement • Waste minimization • Safe reuse, recycling, recovery programme • Composting • Non-burn technologies for routine treatment (except during emergencies)
Republic of Korea	<ul style="list-style-type: none"> • Green procurement • Waste minimization • Safe reuse, recycling, recovery programme
Samoa	<ul style="list-style-type: none"> • Waste minimization
Singapore	<ul style="list-style-type: none"> • Waste minimization • Safe reuse and recycling • Promotion of clean technology for waste treatment
Viet Nam	<ul style="list-style-type: none"> • Waste minimization • Recycling

Shift to low-carbon technologies

While most countries and areas reviewed were found to promote environmentally sustainable health-care waste management policies, only a few promoted the use of low-carbon technologies (Table 16). The review found that incineration is still the most viable treatment option in most countries and areas, although regulations require the application of BEPs or BATs. A few

countries actively recommended eliminating incineration or shifting to cleaner technologies: Lao People’s Democratic Republic, Mongolia, the Philippines and Singapore.

Table 16. Policies that prescribe low-carbon or cleaner technologies

Promotion of low-carbon or non-burn technologies as a treatment option	Number of countries and areas	Percentage of total
Yes	4	25%
Partial	–	–
No	12	75%



In the Lao People’s Democratic Republic, for instance, the 2022 revision to the Ministerial Decision on Health-care Waste Management stipulates that waste incinerator planning and procurement is no longer allowed and that only non-burn technologies are permitted for routine treatment. This requirement may be suspended as an interim measure during disasters or health emergencies, but for one year only.

In its health-care waste management manual, the Philippines has moved towards prioritizing pollution prevention over pollution control as part of its response options to environmental issues, as well as regulatory changes following its commitment to the Stockholm Convention to reduce the use and release of POPs. The practical guidance on operating small-scale incineration highlighted in the manual recommends its use during critical circumstances only. However, it also emphasizes the importance of implementing best practices to minimize its environmental impact during operation.

4.2 Disaster risks in health-care waste management

Less than half of the countries and areas reviewed were found to include disaster risk reduction or adaptation measures in their national health-care waste management policies or regulations. The potential hazards that can arise during disasters or emergency situations can pose significant challenges to the provision of health services including the proper handling, storage, transportation

and disposal of health-care waste. Some of the disaster risks in health-care waste management include damage to infrastructure, disruptions to regular waste management practices leading to possible contamination, spread of infectious diseases and environmental pollution, as well as increased waste generation overwhelming the existing waste management system and resources: this was observed during the COVID-19 pandemic.

It would be judicious to have in place a robust waste management system that incorporates disaster preparedness measures. This review of current country policies indicates that there is a general lack of disaster preparedness protocols in more than half of the countries except for Australia, Mongolia, the Philippines and Singapore, while Brunei Darussalam, New Zealand and Samoa acknowledge that emergency plans are a necessary component of health-care waste management (Table 17).

Table 17. Policies that include disaster or emergency protocols or plans

Disaster risk reduction, adaptation or emergency measures in the policies of the country or area	Number N = 16	Percentage
Yes	4	25%
Partial	3	19%
No	9	56%

4.3 Inclusion of veterinary health-care waste

WHO guidelines for safe health-care waste management, which date from 2014, focus exclusively on waste generated by health-care activities involving human subjects. The COVID-19 pandemic underlined the validity of the One Health concept in understanding and confronting global health risks. This review of health-care waste management policies in the Western Pacific Region therefore considered the inclusion or absence of veterinary health-care waste in health-care waste management policies or regulations in the countries reviewed. Waste materials generated by veterinary procedures pose similar waste management challenges and considerations as health-care waste generated by human health-care facilities. The review therefore considered it good practice to include these sources of waste in health-care waste management policies.

Veterinary health-care waste proved to be well integrated in nine of the 16 countries and areas reviewed, while in three countries, integration was only partial. No integration of veterinary health-care waste was found in the policies of four countries (Table 18).

Table 18. Policies that cover veterinary health-care waste

Integrated veterinary health-care waste in policy	Number of countries and areas	Percentage of total
Yes	9	56%
Partial	3	19%
No	4	25%

Box 2. Examples of waste minimization solutions as described in the country policy**Waste minimization**

As suggested in the WHO guidelines, the preferred management solution to health-care waste is not to produce the waste or to reduce it as much as possible (minimization). Minimization is applied at the point of its generation and can include various strategies such as efficient stock management.

Brunei Darussalam:

Significant reduction of health-care waste may be encouraged through **source reduction, good management and control practices, stock management of chemical and pharmaceutical products, and waste segregation.**

Cambodia:

Each health-care establishment should develop its own health-care waste management policy including minimization. Other related policies should also incorporate elements that support the minimization strategy, i.e. purchasing and stock management policies.

Lao People's Democratic Republic:

Quantities of chemical waste should be minimized by substituting highly toxic and environmentally persistent cleaners and solvents with less toxic and environmentally friendly chemicals, using minimum concentrations where possible, and ensuring good inventory control.

Philippines:

Source reduction measures include:

- **product change**, including **product substitution, change in composition, change in concentration;**
- **process change**, including **change in input material, better process control, technology change or modification, change in operation;** and
- **good practices, including improved segregation, procedural measures, loss prevention, better management practices and material handling improvement.**

Samoa:

As a minimum standard for waste minimization, each health-care facility's waste management plan should feature strategies broadly aimed at shifting practices away from disposal towards source reduction, safe reuse and recycling, where possible.

Singapore:

Waste minimization activities in industrial processes that are promoted include waste exchange, use of clean technology, reuse and recycling, and waste audit.

Viet Nam:

Health-care facilities should apply these waste minimization methods:

- buy, install and use necessary supplies and equipment, devices, medicines, chemicals and materials suitable for use;
- upgrade equipment and update professional procedures and other methods to minimize health-care waste;
- adopt measures and a road map to limit the use of disposable plastic products and non-biodegradable plastic bags in order to reduce the generation of plastic waste; and
- segregate plastic wastes for recycling or treatment in accordance with the law.

Box 3. Examples of recycling solutions as described in the country policy**Recycling and recovery**

Recycling non-hazardous waste from health-care facilities can help reduce outlay through reduced disposal costs or payments received from recycling companies for the recovered materials.

Brunei Darussalam:

Reuse of certain types of containers provided they are properly washed and disinfected. Recovery of certain chemicals containing heavy metals, i.e. silver and lead foils.

Cambodia:

Segregation of recyclable materials from general waste is encouraged, i.e. plastics, papers and e-waste.

Lao People's Democratic Republic:

Health-care facilities should segregate recyclable materials, i.e. paper, plastic, glass and metal (iron, copper, aluminium, stainless steel), from non-recyclable materials in general waste. Recyclable materials may be sold by health-care facilities to commercial enterprises duly authorized by the competent authorities to purchase and handle such materials.

New Zealand:

Recyclables to be identified in consultation with the recycling receiving agent or local authority as appropriate. Recyclables include paper, cardboard, glass, plastics, metal or composting waste.

Philippines:

On-site or off-site recovery, reuse and recycling measures include:

- recovery and return to the original process;
- recovery and use as a raw material for another process;
- processing for resource recovery; and
- processing to create useful by-products.

Singapore:

Large amounts of industrial waste generated and collected in Singapore by licensed collectors are either recycled, reused or have valuable components extracted and recovered before disposal: these include spent solvents, spent etchants and photographic wastes.

Viet Nam:

Health-care facilities should collect recyclable ordinary solid waste. These include uncontaminated paper, plastic, metal (cans) and glass (identified in Appendix 1 of the policy document). Treated infectious waste that meets national technical regulations on the environment to be managed as recyclable ordinary solid waste.

5 Conclusions

Review of the policy documents highlighted several important observations.

- Most policies in the countries and areas reviewed closely adhere to the guidelines set out by WHO on safe health-care waste management. Alignment with WHO recommendations indicates that countries have demonstrated their commitment to abide by international best practices and standards to safeguard public health and the environment. However, some guidelines gave rise to overly broad discussions on procedures that may not be relevant to specific user groups, and which may potentially lead to confusion and inefficiencies.
- Most policies in the countries and areas reviewed have specific provisions on health-care waste data collection and recording, but there was no evidence of how health-care waste data were used to develop policies and guidelines, which raises concerns about whether some decisions and procedures were fully evidence-based.
- Some guidelines lacked essential details on the treatment and disposal of health-care wastewater, leaving room for ambiguity and inadequate handling of potentially hazardous wastewater.
- Some progress has been made in recognizing the importance of sustainable health-care waste management practices, but there is still limited emphasis on shifting to sustainable treatment options, such as promoting low-carbon and non-burn technologies. Future updates and improvements to country policies should address this gap.
- Country policies were in place long before the advent of significant events such as the COVID-19 pandemic, which revealed the need for strengthened management systems to address surges in health-care waste. However, there is still a general lack of emphasis on disaster preparedness or emergency measures during catastrophic events (including pandemics) in most health-care waste management policies. The absence of clear guidelines in this regard poses potential challenges for handling increased waste volumes and ensuring their safe disposal during such crises.



6 Recommendations

It is recommended that health authorities in the countries and areas in the WHO Western Pacific Region take steps to address the principal policy gaps identified in this review. These include shortcomings in the legal and budgetary framework as well as many limitations in technical policies and guidance.

Addressing legal and budgetary shortcomings

- 4. Clearly define the legal obligations incumbent on generators of health-care waste, develop and implement a system of licensing and inspection, and designate and empower the legal authority to enforce health-care waste management regulations.** A robust regulatory framework backed with enforcement capability will promote safe management practices.
- 5. Conduct needs assessments for health-care waste management at different levels (central, provincial, district and facility) and allocate appropriate budgets based on needs.** Health-care waste management plans should be developed at every level and supported with adequate resources for implementation.

Addressing technical limitations

- 1. Develop practical and easy-to-follow policy or guidelines for safe health-care waste management.** Guidance should be developed in line with desired results and outcomes while considering the management capacities and resources of the health-care waste generator.

Specific recommendations include:

- a. Conduct waste audits at the health-care facility level to develop sustainable waste management policies.**

A comprehensive waste audit helps understand the types and quantities of health-care waste generated at the health-care facility level in order to develop appropriate waste management strategies, including environmentally sustainable practices. Some relevant resources for this purpose are free and available online (19).

- b. Incorporate or strengthen existing provisions on health-care waste minimization in a sustainable waste management strategy.**

When developing and updating policy or technical guidelines, include provisions for waste reduction by adopting a green procurement process and promote reusable alternatives as

appropriate. Set up waste recycling programmes involving waste management companies to ensure full-scale implementation, from segregation by waste generators to treatment and disposal by waste management facilities.

c. Promote waste incineration phase-out or, where incineration is permitted on an interim or emergency basis, impose limitations on emissions and disposal of ash residue.

Governments and regulatory bodies should prioritize the development and implementation of alternative waste management strategies. Collaboration between government agencies, waste management companies, environmental organizations and communities is necessary to transition successfully from waste incineration to more sustainable options.

d. Develop or include policies and technical guidance on health-care wastewater treatment and disposal.

Safe and adequate treatment and disposal of health-care wastewater is essential to protect human health and the environment from infectious and other hazardous materials present in discharges.

2. **Systematize reporting and collection of data on health-care waste generation.** A structured and logical system of organizing data and information requires the adoption of specific methodologies and tools by the regulatory authorities and all facilities generating, handling, transporting, treating and disposing of health-care waste.

Specific recommendations include:

a. Develop standardized data collection methods.

Develop nationally standardized data collection methods, forms and templates that are easy to use and understand. This ensures that data being collected across different health-care facilities or departments are consistent. Key monitoring indicators for health-care waste management can be adopted from the WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (JMP) for tracking SDG achievements (see section 3.4 Core health-care waste management questions) (20).

b. Use digital data collection tools.

Consider using digital collection tools such as electronic forms or online platforms to streamline the data collection process to help ensure its accuracy and enable real-time reporting and monitoring.

c. Establish a data review and validation process.

Set up a data review and validation process to ensure the accuracy and integrity of the collected data: the aim is to improve the decision-making process based on reliable data. Indicators on health-care waste management can be included in the national health monitoring information system (21).

3. **Foster collaboration and dialogue between development partners, agencies, regional partnerships and national governments.** External stakeholders may provide valuable support to developing countries in the effort to improve their health-care waste management, although disparities in priorities and recommendations may hamper progress towards the successful introduction of sustainable health-care waste management practices. Collaborative efforts must be responsive to the unique challenges, local needs and existing capacities of the developing country.

The JMP report also recommended improving cross-sectoral coordination and integrating WASH into the health systems monitoring, finance and coordination mechanism for actors in the health, WASH, climate and energy domains.

Specific recommendations include:

- a. **Adopting the best available technologies and best environmental practices already in use in some countries of the Western Pacific Region by other health authorities in the Region.**

These measures include green procurement and other strategies for waste minimization; recycling and recovery of waste materials; use of low-carbon and non-burn technologies such as autoclaves and microwave treatment units; disaster risk and recovery practices in health-care waste management, including readiness for waste management under pandemic conditions; and safe veterinary health-care waste management as an integral part of national health-care waste management policies, regulations and guidance.

- b. **Establishing platforms for engagement and cooperation among stakeholders.**

Regular meetings, workshops and conferences can facilitate the exchange of ideas, foster partnerships and strengthen the commitment of all stakeholders. Ideally, knowledge and information exchange, as well as any lessons learnt from the implementation of best practices, ought to lead to innovation and improved waste management practices.

Recommendations for further study

The present study reviewed relevant policies, regulations and guidance materials on health-care waste management in the Western Pacific Region. It is recommended that future studies assess the implementation of those policies, compliance with regulations and suitability of guidance materials.

The present study was limited to health sector policies, regulations and guidance materials bearing on health-care waste management. It is recommended that future studies review intersectoral instruments with a bearing on this subject, especially those in the environment and agriculture sectors.

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Annex

Overview of the WHO-recommended health-care waste management handling, treatment and disposal process

	Sharps	Highly infectious waste	Other infectious pathological, and anatomical waste	Chemical and pharmaceutical, cytotoxic waste	Radioactive waste	General health-care waste
SEGREGATION	<p><i>Container type:</i> Puncture-proof container</p> <p><i>Container colour:</i> Yellow</p> <p><i>Container markings:</i> Labelled as "SHARPS" with biohazard symbol</p>	<p><i>Container type:</i> Strong leak-proof plastic bag, or container capable of being autoclaved</p> <p><i>Container colour:</i> Yellow</p> <p><i>Container markings:</i> Labelled as "HIGHLY INFECTIOUS" with biohazard symbol</p>	<p><i>Container type:</i> Leak-proof plastic bag or container</p> <p><i>Container colour:</i> Yellow</p> <p><i>Container markings:</i> Marked with biohazard symbol</p>	<p><i>Container type:</i> Plastic bag or rigid container</p> <p><i>Container colour:</i> Brown</p> <p><i>Container markings:</i> Labelled with the type of waste, name of major chemicals, and with the necessary hazard symbol for corrosive, flammable, explosive or toxic chemicals.</p>	<p><i>Container type:</i> Lead box</p> <p><i>Container colour:</i> N/A</p> <p><i>Container markings:</i> Labelled with radiation symbol</p>	<p><i>Container type:</i> Plastic bag</p> <p><i>Container colour:</i> Black</p> <p><i>Container markings:</i> Maybe further segregated into:</p> <ul style="list-style-type: none"> Recyclables Biodegradable Non-recyclable
COLLECTION	<p>Collect when container is $\frac{3}{4}$ full.</p> <p>Can be collected together with other infectious waste in yellow trolleys.</p>	<p>Collect when container is $\frac{3}{4}$ full or at least once a day.</p> <p>Collect separately from other types of infectious waste.</p>	<p>Collect when container is $\frac{3}{4}$ full.</p> <p>Transported in trolleys painted in the appropriate colour code for infectious waste (yellow).</p>	<p>Collect on demand.</p> <p>Should be transported separately in boxes to central storage sites.</p>	<p>Collect on demand.</p>	<p>Collect when container is $\frac{3}{4}$ full or at least once a day.</p> <p>Collected separately from infectious wastes and in black trolleys labelled as "General waste" or "Non-hazardous waste".</p>

	Sharps	Highly infectious waste	Other infectious pathological, and anatomical waste	Chemical and pharmaceutical, cytotoxic waste	Radioactive waste	General health-care waste
STORAGE	Store in designated infectious and sharps waste storage area.	Store in designated hazardous waste storage area.	<p>Store in infectious waste storage area with biohazard symbol.</p> <p>Storage time should not exceed the following periods:</p> <ul style="list-style-type: none"> • Temperate climate - 72hrs in winter or 48hrs in summer • Warm climate 48hrs during cool season or 24hrs during hot season <p>Storage time can be more than a week if storage room is refrigerated (no higher than 3°C to 8°C)</p>	<p>Store in designated chemical and hazardous pharmaceutical waste storage area.</p> <p>Non-hazardous pharmaceutical waste can be stored in a non-hazardous storage area.</p>	<p>Store in waste storage containers that prevent dispersion of radiation and in areas equipped with sufficient shielding material i.e., lead shielding.</p> <p>Note: Radioactive waste should be stored in compliance with national regulations and in consultation with the radiation officer.</p>	Store in designated general waste storage facility.
TRANSPORT	<p>The transport vehicle should be labelled according to the type of waste being transported and be provided with transport documentation or consignment note.</p> <p>No specific vehicle labelling is required if less than 333 kg (i.e. the “gross dangerous goods charge”) of infectious waste is transported – although labelling is recommended. Vehicles transporting more than 333 kg gross weight must be provided with warning plates.</p>					

	Sharps	Highly infectious waste	Other infectious pathological, and anatomical waste	Chemical and pharmaceutical, cytotoxic waste	Radioactive waste	General health-care waste
TREATMENT	<ul style="list-style-type: none"> Autoclave Microwave Chemical disinfection Encapsulation 	<ul style="list-style-type: none"> Autoclave Microwave Chemical disinfection Dual-chamber starved-air incinerators Ash pit (for hazardous fly and bottom ash from incineration) 	<ul style="list-style-type: none"> Autoclave Microwave Alkaline hydrolysis or alkaline digestion (for anatomical parts) Multiple chamber incinerator (for pathological waste) Chemical disinfection 	<ul style="list-style-type: none"> Encapsulation Inertization Multiple chamber incinerator (for genotoxic substances and heat-resistant chemicals) Chemical degradation in accordance with manufacturers' instructions (for cytotoxic waste) Recovery of silver from photoprocessing wastewater 	<ul style="list-style-type: none"> Decay in storage 	<ul style="list-style-type: none"> Composting and vermiculture (for biodegradables) Incineration (as transitional treatment only, excluding PVC plastics and other chlorinated waste)
DISPOSAL	<ul style="list-style-type: none"> Secured burial pit/sharps pit 	<ul style="list-style-type: none"> Burial pit (for small or rural health-care facilities) Treated waste can be disposed of with regular municipal solid waste 	<ul style="list-style-type: none"> Burial or cremation (for anatomical waste particularly recognizable body parts or fetal material) Treated waste can be disposed of with regular municipal solid waste 	<ul style="list-style-type: none"> Treated waste can be disposed of with regular municipal solid waste Transfer to waste-disposal facility for hazardous chemicals Return to manufacturer for unused pharmaceuticals Dilution and sewer discharge for relatively harmless and small quantities of pharmaceuticals 	<ul style="list-style-type: none"> Return to supplier Long-term storage at an authorized radioactive waste disposal site 	<ul style="list-style-type: none"> Controlled and safe land disposal Interim disposal on-site Recycling

