



Status of health-care waste management in selected countries of the Western Pacific Region

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Foreword

The provision of health-care services results in the generation of solid and liquid wastes, some of which are hazardous. Individuals exposed to health-care waste (HCW), particularly hazardous HCW, are potentially at risk of being injured or infected. The World Health Organization has a leading role in the prevention and/or reduction of risks created by this type of waste and has issued several policy documents to support countries in the implementation of better health-care waste management (HCWM) systems.

This report presents the status of HCWM in selected countries in the Western Pacific Region. The compilation of the report was based on a survey conducted in selected countries in the Region. Additional information and data have been updated and incorporated in the report through a search and review of the literature. An assessment of results was made based on the survey and literature review. The assessment covers the management aspects of HCWM, which is comprised of current practices, including policies, regulations, training, awareness raising, technologies and financing in countries in the Western Pacific Region. The report also briefly presents definitions and classifications of HCW, as well as information about the generation of HCW. Likewise, the status of policies and regulatory frameworks is explained, taking into account international agreements and conventions to which countries are signatories. Selected countries discussed in this report include Australia, Brunei Darussalam, Cambodia, China, Fiji, Japan, Kiribati, the Lao People's Democratic Republic, Malaysia, the Marshall Islands, Micronesia (the Federated States of), Mongolia, Nauru, New Zealand, Palau, Papua New Guinea, the Philippines, the Republic of Korea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu and Viet Nam.

WHO guidance reflects the 2004 WHO policy paper, *Safe health-care waste management*, which recommends that countries conduct assessments before selecting appropriate HCWM methods. Along with WHO guidance, WHO also recommends the 2007 publication, *Core principles to ensure the achievement of safe and sustainable management of health-care waste*. This report on the status of HCWM in countries identifies gaps in order to inform future WHO and country support programmes in the Region.

Abbreviations

ADB	Asian Development Bank	NEPM	national environment protection measure
BAT	best available techniques	NHMRC	National Health and Medical Research Council
COAG	Council of Australian Governments	NIP	National Implementation Plan
CWMS	Clinical Waste Management Services	NMDP	national master development plan
DAO	DENR administrative order	NSC	national steering committee
DENR	Department of Environment and Natural Resources	NSWMP	national solid-waste management plan
DOE	Department of Environment	NZS	New Zealand Standard
EPA	Environmental Protection Agency	PacWaste	Pacific Hazardous Waste Management
EU	European Union	POPs	persistent organic pollutants
GEF	Global Environment Facility	PVC	polyvinyl chloride
HCW	health-care waste	RFID	radio frequency identification detection
HCWM	health-care waste management	SDP	strategic development plan
HSMP	health sector master plan	SEPA	State Environmental Protection Administration
IDP	infrastructure development plan	SPREP	Secretariat of the Pacific Regional Environment Programme
JICA	Japan International Cooperation Agency	UNDP	United Nations Development Programme
MAWC	Majuro Atoll Waste Company	UNEP	United Nations Environment Programme
MCC	Millennium Challenge Corporation	WAL	Waste Authority Limited
MEP	Ministry of Environmental Protection	WHO	World Health Organization
MOE	Ministry of Environment	WMWG	Waste Management Working Group
NAP	national action plan	WOSA	Waste Operations and Services Act
NEHP	National Environmental Health Programme		

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1. Introduction

The overall objective of this report is to describe the status of HCWM in selected countries of the Western Pacific Region for the period 2008–2013.

CHAPTER 1 presents the background and methodology of the health-care waste management (HCWM) survey conducted in 2013 in selected countries of the WHO Western Pacific Region.

CHAPTER 2 includes definitions and characterizations of health-care waste (HCW), with sections on definitions and characterizations and sources and risks of HCW, as well as information on HCW generation.

CHAPTER 3 presents the HCWM practices in selected countries in the Western Pacific Region, including Australia, Brunei Darussalam, Cambodia, China, Fiji, Japan, Kiribati, the Lao People's Democratic Republic, Malaysia, the Marshall Islands, Micronesia (the Federated States of), Mongolia, Nauru, New Zealand, Palau, Papua New Guinea, the Philippines, the Republic of Korea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu and Viet Nam. HCWM practices are explained by: i) international conventions and agreements; ii) policies and regulatory frameworks; iii) segregation, transportation, and treatment and disposal technologies; iv) training, education and public awareness; and v) financial resources and other project activities

CHAPTER 4 examines the status and issues of HCWM in selected countries in the Western Pacific Region. The chapter also includes a country-by-country analysis and concludes with a number of recommendations.

1.1 Background

The provision of health-care services results in the generation of solid and liquid wastes, such as sharps, blood, body parts, chemicals, pharmaceuticals, medical devices and radioactive materials. Poor management of HCW exposes health-care workers, waste handlers and the community to infections, toxic effects and injuries. Sound management of HCW is

thus a crucial component of environmental health protection. A number of countries in the Western Pacific Region have national policies, guidelines and action plans, as well as best practices on HCWM. However, the progress of HCWM in the Region may vary from country to country, as some are at a more advanced level of development than others.

Table 1 provides vital information about various factors such as population, life expectancy, infant mortality rate, hospital-bed density and gross domestic product (GDP) of each country. Relationships between these factors and the generation of HCW may exist and could help explain the variability of HCW planning, implementation and management in terms of development and implementation of regulatory frameworks, training, awareness raising, infrastructure and resources between countries. However, further research regarding the relationship between these factors and HCWM needs to be conducted.

There is a need to take account of the status of HCWM in countries in order that gaps may be identified and future support programmes may be informed. The following regulatory frameworks on HCWM include:

- *a.* Participation in international agreements and conventions: 1) Basel Convention on Hazardous Waste (UNEP); 2) Stockholm Convention on Persistent Organic Pollutants (POPs); and 3) Minamata Convention on Mercury.
- *b.* Law – Law or set of laws at the national level that address HCWM issues.
- *c.* Policy – Official document that states the goals to be achieved.
- *d.* Strategy – Official document that lists the steps that must be taken to achieve the objectives contained in the policy document.
- *e.* National action plan (NAP) – Document that can be seen as a time-driven scheme defining who does what, when, how and at what cost.
- *f.* Guide – Practical document(s) that lists responsibilities and duties of staff; segregation, handling, storage and transport procedures; colour coding, etc.
- *g.* National steering committee – Group of people that coordinate the implementation of the NAP according to the policy and strategy adopted.

This report discusses the status of HCWM in selected countries of the Western Pacific Region based on the survey conducted and the assessment of the results.

The survey was carried out on 25 September 2012 to identify the current status of HCWM in 24 of the 37 countries and areas in the Western Pacific Region. The survey included a literature search and a review of publications, newspaper articles and other sources of information. It also included an invitation for all countries to respond to an Internet-based questionnaire, with a total of 118 people from 20 countries participating in the online survey. Subsequently, additional information and data have been updated and incorporated in the existing content of the report through literature research and review.

As not all countries responded to the online survey, several gaps in information limited the scope of this report. In addition, information on HCWM for many countries was not readily available either via the Internet or in print, while in some cases the information was out of date.

Table 1: Key country data¹

COUNTRY	Total population [a]	Area (square km)	Life expectancy at birth m/f (years) [b]	Infant mortality rate (deaths per 1000 live births) [c]	Hospital bed density (beds per 1000 population) [d]	GDP per capita (PPP) in US\$ [e]
1. AUSTRALIA	22 268 000	7 741 220	80/84	4.55	3.82	41 954
2. BRUNEI DARUSSALAM	499 000	5 765	76/78	11.15	2.71	50 000
3. CAMBODIA	14 138 000	181 035	64/66	54.08	0.84	2 400
4. CHINA	1 348 932 000	9 596 961	74/77	15.62	4.20	9 233
5. FIJI	861 000	18 274	67/72	10.73	2.10	4 800
6. JAPAN	127 536 000	377 915	79/86	2.21	13.70	36 200
7. KIRIBATI	99 000	811	65/71	37.68	1.40	5 900
8. LAO PDR	6 201 000	236 800	66/69	57.77	0.70	3 000
9. MALAYSIA	28 401 000	329 847	72/76	14.57	1.80	16 900
10. MARSHALL ISLANDS	54 000	181	59/60	22.93	2.70	3 200
11. MICRONESIA (FED. STATES OF)	111 000	702	67/70	23.51	3.20	3 000
12. MONGOLIA	2 756 000	1 564 116	64/73	36	5.80	5 400
13. NAURU	10 000	21	68/76	8.51	N.A.	5 000
14. NEW ZEALAND	4 368 000	267 710	79/83	4.72	6.18	28 800
15. PALAU	20 000	459	68/77	12.10	4.90	10 500
16. PAPUA NEW GUINEA	6 858 000	462 840	61/65	42.05	N.A.	2 700
17. PHILIPPINES	93 261 000	300 000	66/73	18.75	0.50	4 300
18. REPUBLIC OF KOREA	48 184 000	99 720	77/84	4.08	10.30	32 400
19. SAMOA	183 000	2 831	70/76	21.85	0.97	6 200
20. SOLOMON ISLANDS	538 000	28 896	68/71	17.25	1.40	3 400
21. TONGA	104 000	747	73/70	13.21	2.60	7 500
22. TUVALU	10 000	26	65/64	33.55	5.56	3 300
23. VANUATU	240 000	12 189	71/74	17.90	1.69	4 900
24. VIET NAM	87 848 000	331 210	73/77	19.61	3.10	3 500

Note: [a, b, c, d, e: year published]:

1[abd:2009, c:2012]; 2[abd:2009, ce:2012]; 3[ab:2009, ce:2012, d:2010]; 4[abd:2009, c:2012]; 5[abd:2009, ce:2012]; 6[abd:2009, ce:2012]; 7[ab:2009, ce:2012, d:2010]; 8[ab:2009, ce:2012, d:2010]; 9[ab:2009, ce:2012, d:2010]; 10[ab:2009, c:2012, d:2010, e:2011]; 11[abd:2009, c:2012, e:2011]; 12[ab:2009, ce:2012, d:2010]; 13[ab:2009, c:2012, e:2005]; 14[ab:2009, ce:2012, d:2002]; 15[ab:2009, c:2012, d:2010, e:2011]; 16[ab:2009, ce:2012]; 17[abd:2009, ce:2012]; 18[abd:2009, ce:2012]; 19[ab:2009, ce:2012, d:2005]; 20[ab:2009, ce:2012, d:2005]; 21[ab:2009, ce:2012, d:2010]; 22[ab:2009, ce:2012, d:2001]; 23[ab:2009, ce:2012, d:2008]; 24[abd:2009, ce:2012].

1. Sources of most key country data were cited from CIA, The World Factbook, 2012 (<https://www.cia.gov/library/publications/the-world-factbook/index.html>) and other key data were cited from various reports and laws/regulations/guidelines in different countries.

1.2 Methodology

The survey was carried out using two approaches in parallel, namely:

- a literature search and review, and
- a survey questionnaire.²

The literature search and review was carried out through multiple means, including but not limited to Internet searches, telephone interviews and email correspondence.

Administration of the survey questionnaire (Annex 1) was conducted by use of a commercially available online survey tool (survey-monkey.com). The selected countries were informed about the survey and were requested to provide a list of potential participants who have the requisite knowledge of the status of HCWM in their respective countries. After receiving the contact details of the nominated participants, they were individually contacted and a country-specific network was provided. By registering the IP addresses of the partici-

pants, it was ensured that each participant could only fill out the questionnaire once. Three reminders were sent to the participants not responding to the survey.

Language problems in some countries, especially Cambodia and Mongolia, were resolved with the support of local WHO staff members who assisted in translating the questionnaire. The lack of Internet access in several countries was resolved by sending a scanned copy of the questionnaire to the consultant, who then entered the answers into the online survey tool.

Based on the findings of the online survey, the consultant carried out an assessment of the status in each country based on five main areas, namely: 1) management; 2) training; 3) policy and regulatory framework; 4) technologies implemented; and 5) financial resources. For each of these assessment areas, a score of 1 (insufficient) to 5 (excellent) was assigned, based on criteria as shown in [Table 2](#).

For the assessment of the legal and administrative framework, the following definitions are used in this report:

- Health-care waste law:** a law or set of laws at national level that addresses HCWM issues.
- Health-care waste policy:** an official document that states the goals to be achieved.
- Health-care waste strategy:** an official document that lists the steps that must be taken to achieve the objectives contained in the policy document.
- National action plan (NAP) on health-care waste:** a document that can be seen as a time-driven scheme defining who does what, when, how and at what cost.
- Health-care waste guide:** practical document that lists responsibilities and duties of staff; segregation, handling, storage and transport procedures; colour coding, etc.
- Health-care waste national steering committee (NSC):** a group of people that coordinate the implementation of the NAP according to the policy and strategy adopted.

2. The survey questionnaire was developed by WHO to analyse the implementation status of HCW in different regions of the world. It is planned that country information will be published on the website, <http://www.healthcare-waste.org/> to provide a global overview of the status of HCWM.

Table 2: Criteria for scoring of HCWM status in countries

Score	Criteria: MANAGEMENT	Score	Criteria: TRAINING
1	No specific waste management system exists.	1	No training is provided.
2	Some aspects of a waste management system exist with some segregation of the waste.	2	Basic HCWM training is provided but mainly by development organizations.
3	A waste management system has been introduced, waste is segregated in different waste streams and is safely collected.	3	Training is provided by the government or appointed contractors/consultants from time to time.
4	A comprehensive waste management system has been introduced that includes waste reduction and recycling aspects. Responsibilities are clear and the system is regularly monitored and supervised by the concerned authorities.	4	HCWM training is regularly offered – from basic to advanced levels.
5	The waste management system is fully integrated in the management system of the health-care facility and the concerned authorities, efforts to avoid waste generation are taken, and specific waste management plans and advanced monitoring and certification systems exist.	5	A mandatory training system on HCW exists for waste generators and handlers. The system supports lifelong learning.

Score	Criteria: POLICY & REGULATORY FRAMEWORK	Score	Criteria: TECHNOLOGIES IMPLEMENTED
1	A policy and regulatory framework does not exist.	1	No or only simple treatment and limited logistic equipment is available and used.
2	HCW is partly covered by other regulations and policies.	2	Basic treatment equipment is available but not always operational and does not fulfil international standards.
3	HCW is covered by other regulations and some legal documents specifically addressing HCW.	3	More advanced treatment equipment is available but does not fulfil international standards in all aspects.
4	A regulatory framework for HCW exists, but policies, strategies, or action plans are not available.	4	Advanced treatment equipment is available which follows international standards but does not fulfil all best available techniques (BAT) aspects.
5	A full policy and regulatory framework for HCW exists, including policy, law, guidelines, strategies and implementation plans.	5	BAT for logistic and treatment equipment is available, well maintained and regularly tested by independent institutions.

Score	Criteria: FINANCIAL RESOURCES
1	Nearly no financial resources exist.
2	Some financial resources exist for consumables, but mainly depending on donor organizations.
3	A budget for HCW exists, but mainly at central level.
4	Regular budget is available based on the “polluter-pays” principle.
5	Regular budget for HCW exists at facility level, based on a full cost analysis.

2. Definition, classification and categories of HCW

This section elucidates the definition and characterization of HCW and its sources and risks. It also presents the status of HCWM in selected countries in the Western Pacific Region in terms, definition and classification, as well as information on the generation of HCW from selected countries.

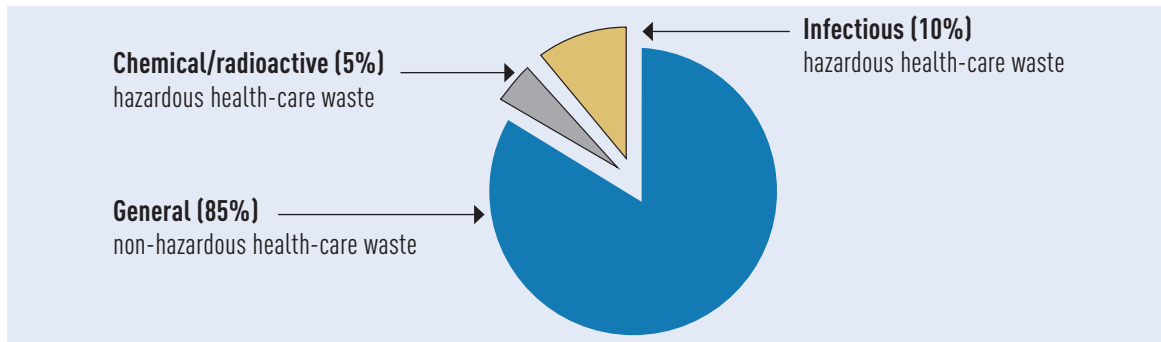
2.1 Definition and characterization

HCW is defined as the total waste stream from a health-care facility, which would include non-hazardous or general waste and hazardous HCW. In addition, it includes the same types of waste originating from minor and scattered sources, including those produced in the course of health care undertaken in the home (e.g. home dialysis, self-administration of insulin, recuperative care). Non-hazardous or general waste is defined as waste that does not pose any particular biological, chemical, radioactive or physical hazard. As the management of non-hazardous waste is, in the majority, part of the municipal waste management system, the focus of this survey is on the hazardous waste stream from the health-care sector.

Safe management of wastes from health-care activities – Second edition, commonly called the WHO Blue Book (2014), reported that between 75% and 90% of the waste produced by health-care providers is comparable to domestic waste and is usually called “non-hazardous” or “general health-care waste”. It comes mostly from the administrative, kitchen and house-keeping functions at health-care facilities, and may also include packaging waste and waste generated during maintenance of health-care facilities (Fig. 1). The remaining 10–25% of HCW is regarded as “hazardous” and may pose a variety of environmental and health risks.






A classification of the hazardous HCW stream is summarized in Table 3.

Figure 1: Typical waste compositions in health-care facilities



Source: Safe management of wastes from health-care activities – Second edition.

Table 3: Classification of hazardous HCW

Waste categories	Descriptions and examples
Sharps waste 	Used or unused sharps e.g. hypodermic, intravenous or other needles; auto-disable syringes; syringes with attached needles; infusion sets; scalpels; pipettes; knives; blades; broken glass.
Infectious waste 	Waste suspected to contain pathogens and pose 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
Pharmaceutical 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 content, e.g. batteries; broken thermometers and blood pressure gauges.
Radioactive waste 	Waste containing radioactive substances e.g. unused liquids from radiotherapy or laboratory research; contaminated glassware, packages, or absorbent paper; urine and excreta from patients treated or tested with unsealed radionuclides; sealed sources.

Note: Any general waste that is contaminated with hazardous HCW should be categorized as hazardous HCW.

During the preparation of this report it became obvious that in most countries covered by the associated survey, terms such as “hospital waste” or “medical waste” are used instead of the term “health-care waste” (HCW). The term medical waste is usually confined to infectious waste, pathological waste and sharps waste. However, in some countries it includes other hazardous waste categories, such as pharmaceutical waste, chemical waste and radioactive waste. For countries where a term other

than health-care waste is used or if the waste categories as listed above are not included in the definition, it is further explained in the sections on specific countries.

Different terms are used in various legislative instruments, policies and guidance documents to refer to hazardous HCW. Even where the same term may be used in different countries, they are defined differently. Examples of different terms and definitions used are listed in [Table 4](#).

Table 4: Definition and classification in selected countries in the Western Pacific Region

COUNTRY	Terms and definition used
AUSTRALIA	<p>Controlled waste – Defined by the National Environment Protection Measures (NEPM) and some state regulations as waste that can harm human health and the environment unless properly managed, and includes waste categories such as infectious waste, pharmaceutical waste and other waste categories that make up the hazardous HCW stream.</p> <p>Clinical waste – Defined in some states as any waste resulting from medical, nursing, dental, pharmaceutical, skin penetration or other related clinical activity. The waste has the potential to cause injury, infection or offence, and includes waste containing any of the following:</p> <ol style="list-style-type: none"> a. human tissue (other than hair, teeth and nails); b. bulk body fluids or blood; c. visibly blood-stained body fluids, materials or equipment; d. laboratory specimens or cultures; e. animal tissue, carcasses or other waste from animals used for medical research; and f. sharps (although not specified in all definitions). <p>Clinical and related waste – Defined in some states to include clinical waste as well as other hazardous waste categories such as pharmaceutical, chemical and radioactive waste.</p> <p>Clinical and related waste – Defined in the Industry Code of Practice for the Management of Clinical and Related Wastes. This type of waste is similar to the above but does not include radioactive waste. The term biohazardous waste has also been given the same meaning in this code to clinical and related waste and is intended to reflect other sources of waste other than the clinical setting.</p> <p>Medical waste – Defined in South Australia similarly to clinical waste but with an inclusive clause for other waste categories, i.e. “any article or matter that is discarded in the course of medical, dental, or veterinary practice or research and that poses a significant risk to the health of a person who comes into contact with it.”</p>

Table 4: Definition and classification in selected countries in the Western Pacific Region (continued)

COUNTRY	Terms and definition used
CAMBODIA	<p>Medical waste is defined in the <i>Prakas on Health-care Waste Management in Cambodia</i> as any waste which consists wholly or partly of human or animal tissue, blood or other body fluids, excretions, drugs, or other pharmaceutical products, swabs or dressings, syringes, needles or other sharp instruments. This type of waste, which unless rendered safe may prove hazardous or cause infection to any person coming into contact with it. The categories of medical waste included in this definition are: infectious waste, pathological waste, sharps waste, pharmaceutical waste, genotoxic waste, and chemical waste, waste with high heavy metal content, pressurised containers and radioactive waste.</p>
CHINA	<p>In China, the term “medical wastes” refers to directly or indirectly infectious, poisonous or otherwise harmful wastes generated by medical institutions in medical treatment, prevention, health care and other relevant activities (<i>Regulations on the Administration of Medical Wastes</i>, effective date: 16 June 2003), and is therefore comparable to the term “hazardous health-care waste”.</p> <p>The definition of HCW in China is the waste generated during medical treatment, disease prevention, health protection and other relevant activities in health-care institutions, which has direct or indirect infectiveness, toxicity and other harmfulness. In the Category Catalogue of Health-care Waste of China, HCW is divided into five categories: infectious waste, pathological waste, sharps, pharmaceutical waste and chemical waste.</p> <p>A general investigation of HCW generation in 23 provinces, organized by the State Environmental Protection Administration in 2004, showed that 75% of HCW was generated in hospitals. Although non-hospital health-care facilities represent 88% of the total number, they generated just 25% of all HCW. That indicates the major source is hospitals.</p> <p>A general investigation on the amount of HCW generation in 23 provinces, organized by the State Environmental Protection Administration in 2004, showed that 75% of HCW was generated in hospitals. Although non-hospital health-care facilities represent 88% of the total number, hospitals generated just 25% of all HCW. That indicated the major source and the management emphasis in China was hospitals.</p> <p>There were 3 351 000 beds in health institutions in 2005. In that year, the utilization rate of beds was 62.9%. According to these data, about 770 000 tons of HCW were generated in China in 2005.</p>
JAPAN	<p>In Japan, the term “infectious waste” refers to infectious waste, sharps and pathological waste but does not include other hazardous types of HCW, which are covered by other laws and regulations.</p>
LAO PEOPLE'S DEMOCRATIC REPUBLIC	<p>In accordance with the regulations, definitions for the different types of waste are as follows:</p> <ol style="list-style-type: none"> Medical waste refers to all or partial animal or human organs, blood or blood-containing liquid, digestive items, medicines or medicinal products, compresses, needle or sharp items that are hazardous to people once they are exposed to them. Normal waste refers to waste from paper, clothes, food and commodities, including the waste collected from streets and markets. Infectious waste refers to waste with a high risk of infection and outbreak. This waste comes from the patient service area, from items that have been in contact with infected patients or substances such as blood, tissue, pus, sputum, saliva, urine or stool, as well as different animal and human organs or animal carcasses from experiments. Pathological waste refers to muscles, organs or other parts of the body such as blood, tissue, organs or some lab animal carcasses, human liquid wastes from operations, autopsies, fetuses, etc.

Table 4: Definition and classification in selected countries in the Western Pacific Region (continued)

COUNTRY	Terms and definition used
<p>LAO PEOPLE'S DEMOCRATIC REPUBLIC (continued)</p>	<ul style="list-style-type: none"> e. Waste from sharp items refers to the waste which cause pricking, penetration or cause bruises, consists of two types: <ul style="list-style-type: none"> i) waste from infectious sharps items includes needle, scalpels, razor blades or any other infectious sharps items; and ii) waste from non-infectious sharps containers, broken glass or any other non-infectious vials. f. Pharmaceutical waste refers to wastes from drugs or expired, unused, contaminated pharmaceutical products, and vaccines. g. Genotoxic waste refers to the hazardous waste that is mutagenic, teratogenic or cancer-causing. These wastes include the cytotoxic drugs, and the human waste of patients treated with cytotoxins, chemicals and radioactive substances. h. Chemical waste refers to the chemical substances in the form of solids, liquids and gases that may be hazardous and has the following characteristics: toxic, corrosive (e.g. acid pH < 2 and base pH > 12), flammable, reactive, (explosive, reacts with water and cause explosion), or genotoxic. i. Waste with high heavy metal content refers to waste hazardous to health and the environment such as mercury from broken thermometers or manometers and cadmium from torch batteries. j. Waste from pressurized containers refers to emptied or unused gas containers or aerosol cans that could explode once incinerated or pricked. k. Radioactive waste refers to solids, liquids or gases contaminated with radionuclides used for identifying disease symptoms, therapy, and diagnosis.
<p>MALAYSIA</p>	<p>The term clinical waste is used in Malaysia to include infectious waste, sharps waste, pathological waste and pharmaceutical waste but does not include other hazardous components of HCW such as chemical waste. However other categories of HCW are defined in the <i>Environmental Quality (Scheduled Wastes) Regulations 2005</i>. The term health-care waste has recently been defined, as in this report, and includes clinical waste as one of the categories.</p>
<p>MONGOLIA</p>	<p>The terms and definitions used in Mongolia are as follows:</p> <ul style="list-style-type: none"> a. Waste from health-care facilities is divided into two groups: (1) non-hazardous; and (2) hazardous waste. <ul style="list-style-type: none"> i) The non-hazardous waste is comparable to waste generated by household. ii) The hazardous waste is further classified into highly infectious waste; infectious waste; sharps; pharmaceutical waste; chemical waste; cytotoxic waste; radioactive waste; pathological and anatomical waste; pressurized containers; and waste with high heavy metal content. These different categories of hazardous waste are described below. b. Highly infectious waste includes all viable biological and pathological agents artificially cultivated in cultures or stocks. It also includes items used for the transfer, inoculation, and mixing or cultures of infectious agents. c. Infectious waste consists of discarded materials that are contaminated with communicable pathogens that have the potential of transmitting infectious agents to humans. d. Sharps are all objects and materials that pose a potential risk of physical injury (stick, cuts, etc.). Typical items are needles, blades, broken glass and vials, infusion sets with butterflies, etc. e. Pharmaceutical waste includes expired, unused, unwanted, spilled and contaminated pharmaceutical products, drugs, and vaccines. It also includes all sera and bottles, boxes and vials used to contain pharmaceuticals, which are no longer required. It does not include packaging materials for

Table 4: Definition and classification in selected countries in the Western Pacific Region (continued)

COUNTRY	Terms and definition used																				
MONGOLIA (continued)	<p>pharmaceuticals that should be disposed of as non-medical waste and does not include either non-risk pharmaceuticals like vitamins, sugars, amino acid and certain salts.</p> <p>f. Chemical waste refers to discarded solid, liquid and gaseous chemicals, for example from diagnostic and experimental work, and cleaning, housekeeping and disinfecting procedures. There is a wide variety of dangers and different procedures within this group.</p> <p>g. Cytotoxic waste is a highly hazardous subgroup of pharmaceutical waste. Cytotoxics are pharmaceuticals used for cancer treatment and can be mutagenic, carcinogenic, and teratogenic. Cytotoxic waste – also known as genotoxic waste – is potentially highly hazardous if not carefully handled. For this reason it is considered as a separate waste category.</p> <p>h. Radioactive waste is generated during diagnostic, therapy and research processes. Radioactive waste has to be handled in accordance with national regulations.</p> <p>i. Pathological and anatomical waste includes all waste, recognizable as human body parts and placentas. Anatomical waste is not necessarily infectious but requires special handling for ethical and religious reasons.</p> <p>j. Pressurized container – Gases like compressed air, liquids or powdered materials are often stored in pressurized cylinders, cartridges, and aerosol cans.</p> <p>k. Waste with high heavy metal content is potentially highly toxic and represents a subcategory of hazardous chemical waste but needs special consideration during treatment. Cadmium is used in batteries and mercury in thermometers or manometers. Mercury is present also in small quantities in mercury vapour lamps. Lead is still used in radiation proofing of X-ray and diagnostic departments.</p>																				
REPUBLIC OF KOREA	<p>According to the Waste Control Act, the term “medical waste” in the Republic of Korea refers to the waste specifically enumerated by Presidential Decree as waste discharged from public health and medical institutions, veterinary clinics, testing and inspection institutions, and other similar institutions, which may cause harm to human bodies by infection or otherwise and for which it is deemed necessary to be put under special control for public health and environmental conservation. Examples of this include parts and extracts of human bodies and carcasses of laboratory animals. It does not include other types of hazardous HCW such as chemical or pharmaceutical waste that is covered by a different law.</p> <p>Classification of HCW</p> <table border="1" data-bbox="336 1385 1313 1847"> <thead> <tr> <th data-bbox="336 1385 480 1426">HCW</th> <th colspan="2" data-bbox="485 1385 1313 1426">Definition</th> </tr> </thead> <tbody> <tr> <td data-bbox="336 1426 480 1467">Isolated waste</td> <td colspan="2" data-bbox="485 1426 1313 1467">Wastes from the patients separated in order to protect people from infectious disease.</td> </tr> <tr> <td data-bbox="336 1467 480 1847" rowspan="5">Harmful waste</td> <td data-bbox="485 1467 708 1539">Organs</td> <td data-bbox="713 1467 1313 1539">Human or animal tissues, organs, parts of bodies, animal carcasses, blood, pus, materials from blood.</td> </tr> <tr> <td data-bbox="485 1539 708 1610">Pathological waste</td> <td data-bbox="713 1539 1313 1610">Culture fluids, culture fluid containers, waste test-tubes, slides, cover glass, etc. used for tests and experiments.</td> </tr> <tr> <td data-bbox="485 1610 708 1682">Sharps</td> <td data-bbox="713 1610 1313 1682">Syringe needles, blades for operation, needles for acupuncture, dental needles, broken glass test equipment.</td> </tr> <tr> <td data-bbox="485 1682 708 1753">Biological & chemical waste</td> <td data-bbox="713 1682 1313 1753">Waste vaccine, waste anti-cancer medicine, biological treating materials.</td> </tr> <tr> <td data-bbox="485 1753 708 1825">Blood-contaminated waste</td> <td data-bbox="713 1753 1313 1825">Waste blood bags, waste for blood dialysis, and other blood-containing wastes.</td> </tr> <tr> <td data-bbox="336 1825 480 1847">General waste</td> <td colspan="2" data-bbox="485 1825 1313 1847">Cottons, bandages, gauze, disposable diapers, sanitary towels, disposable syringes, etc.</td> </tr> </tbody> </table>	HCW	Definition		Isolated waste	Wastes from the patients separated in order to protect people from infectious disease.		Harmful waste	Organs	Human or animal tissues, organs, parts of bodies, animal carcasses, blood, pus, materials from blood.	Pathological waste	Culture fluids, culture fluid containers, waste test-tubes, slides, cover glass, etc. used for tests and experiments.	Sharps	Syringe needles, blades for operation, needles for acupuncture, dental needles, broken glass test equipment.	Biological & chemical waste	Waste vaccine, waste anti-cancer medicine, biological treating materials.	Blood-contaminated waste	Waste blood bags, waste for blood dialysis, and other blood-containing wastes.	General waste	Cottons, bandages, gauze, disposable diapers, sanitary towels, disposable syringes, etc.	
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Table 4: Definition and classification in selected countries in the Western Pacific Region (continued)

COUNTRY	Terms and definition used
VIET NAM	<p>In Viet Nam, five main waste categories exist:</p> <p>a. Infectious waste:</p> <ul style="list-style-type: none"> i) sharp waste (group A) is waste that can cut or puncture including needles, syringe, scalpels, knives, nails, bladders, broken glass and other sharp objects used in health activities; ii) infectious non-sharp waste (group B) is waste in contact with blood, humour and waste generated from sterile rooms; iii) highly infectious waste (group C) is generated from laboratories such as autopsies and tools in contact with autopsies; iv) anatomical waste (group D) includes parts of human body, tissues, placentae, fetuses and animal carcasses. <p>b. Chemical waste:</p> <ul style="list-style-type: none"> i) pharmaceuticals that are expired, low grade or no longer needed; ii) harmful chemical substances in health care activities (Appendix 1 is issued in accordance with this Regulation); iii) cytotoxic drugs, including medicine bottles, empty bottles, tools involved in cytotoxic drug and excreta of patients treated with chemotherapy (Appendix 2 is issued in accordance with this Regulation); and iv) waste that contains heavy metals: mercury (thermometer, broken mercury sphygmomanometer, waste from odontological activities, cadmium (from batteries), lead (lead-coating boards and materials used for preventing X-ray in image and X-ray diagnosis). <p>c. Radioactive waste</p> <p>Radioactive waste includes solid waste, liquid waste and gaseous waste generated from activities of diagnosis, treatment and research. The list of radioactive substances and marked compounds used in diagnosis and treatment is issued in accordance with Decision No. 23/2006/QDD- BYT dated 24 December 2009.</p> <p>d. Pressurized containers</p> <p>Pressurized containers include oxygen containers, gas containers and aerosol containers. These containers are explosive and flammable during incineration.</p> <p>e. General waste</p> <p>General waste that does not contain infectious agents, harmful chemicals, radioactive substances, explosive and flammable factors includes:</p> <ul style="list-style-type: none"> i) waste generated from patients' rooms (except for sterile rooms); ii) waste generated from health care activities: glass bottles and jars, serum bottles, plastic materials, and plaster for bone fracture. This waste does not involve blood, biological liquids or harmful chemicals; iii) waste generated from administrative affairs: papers, newspapers, documents, covers, carton boxes, plastic bags and X-ray film-containing bags; and iv) out-house waste, such as leaves or other waste from natural environment.

2.2 HCW generation

Identifying the types and quantities of waste produced in a health-care facility as early as in the planning stage is a crucial first step in safe waste disposal. Waste-generation data are used to estimate the required capacities for containers, storage areas, and transportation and treatment technologies, as well as to establish baseline data on rates of production in different medical areas and for procurement specifications, planning, budgeting, calculating revenues from recycling, optimization of waste-management systems and environmental impact assessments.

CAMBODIA

The city of Phnom Penh in Cambodia generates large volumes of medical waste compared to the other cities and provinces. Phnom Penh generated 342.54 kg/day of HCW from 3114 beds from hospitals, polyclinics, clinics, and health-care centres, according to a 2003 Cambodia Environment Association survey supported by the Japan International Cooperation Agency.

CHINA

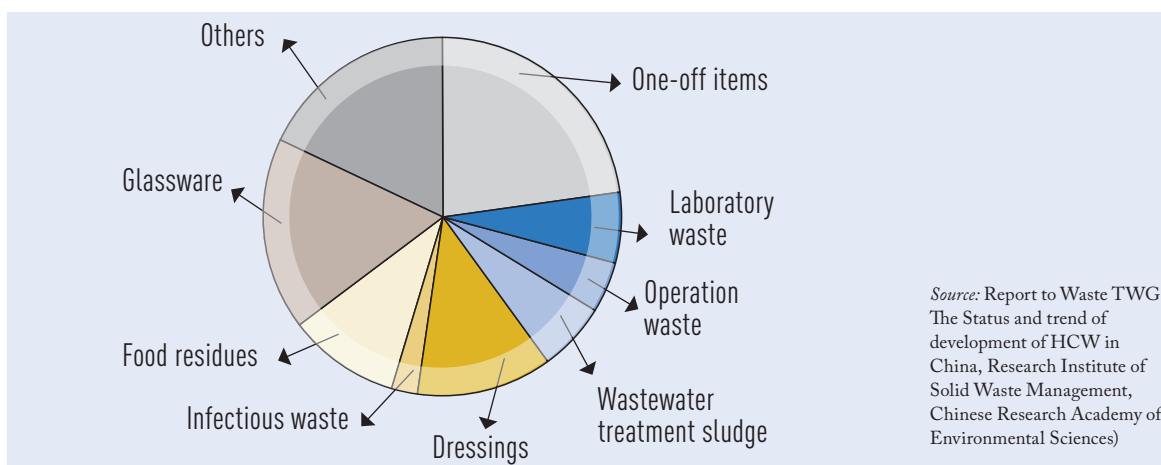
A clear definition and categories of HCW in China have been established, however, its main

composition varied in different regions. As an example, [Figure 2](#) shows the composition of HCW of Dongguan City, China.

JAPAN

In Japan, infectious wastes generated from the following facilities are regulated by law: hospitals (20 or more beds), clinics (19 or fewer beds), clinic laboratories, nursing homes, midwifery homes, veterinarians and laboratories (medical, dental, pharmacology, and veterinary). In 2003, HCW generation amounted to 285 000 tons for infectious waste and 945 000 tons for non-infectious waste.

Figure 2: Composition of HCW in Dongguan City, China (2008)



MONGOLIA

In 2005, a total of 2324 facilities provided health-care services in Mongolia of which 24.5% were primary health-care facilities, 1.5% secondary-level health-care facilities, 0.9% tertiary-level health-care facilities, and 29.4% were out-patient and in-patient private hospitals.

In the health-care facilities in Ulaanbaatar, the percentage of medical waste in the total waste stream was comparatively high (ranging between 12.5% and 69.3%) depending on the type of health-care facility, which indicated poor waste segregation and minimization practices. The health-care facilities in Ulaanbaatar produce about

781 kg of medical wastes and 1874 kg of general wastes, for a total generation rate of 2655 kg per day.

REPUBLIC OF KOREA

The Republic of Korea generated 82 633 tons of HCW from some 57 837 generators in 2007, and since then the amount per year has been increasing. The Waste Management Act specifies 16 HCW generators, the main sources being hospitals and clinics. As of December 2007, there were 316 general hospitals and 50 123 clinics. Other generators of HCW include public health-care centres (2962), veterinary clinics (2757), and medical or pharmaceutical research institutes (1679).

2.3 Sources and risks of HCW

2.3.1 Sources of HCW

The WHO Blue Book (2014) lists the different types of health-care facilities that can be viewed as major or minor sources of HCW, according to the quantities produced. [Table 5](#) illustrates the major and minor sources of HCW.

2.3.2 Risks associated with HCW

The largest component of non-hazardous HCW is similar to municipal waste and should not pose any higher risk than waste produced in households. It is the smaller hazardous HCW

component that needs to be properly managed in order that the health risks from exposure to known hazards be minimized. Protection of the health of staff, patients and the general public is the fundamental reason for implementing a system of HCWM.

The hazardous nature of HCW is due to one or more of the following characteristics: presence of infectious agents, a genotoxic or cytotoxic chemical composition, presence of toxic or hazardous chemicals or biologically aggressive pharmaceuticals, presence of radioactivity, and presence of used sharps.

All individuals coming into close proximity with hazardous HCW are potentially at risk from exposure to a hazard, including those working within health-care facilities (e.g. medical doctors, nurses, hospital maintenance

personnel, patients, among others) that generate hazardous waste, and those individuals who either handle such waste or are exposed to it as a consequence of careless actions.

Table 5: Major and minor sources of HCW

MAJOR SOURCES OF HCW	
Institutions / Establishments	Type
Hospitals	University hospital, general hospital, district hospital
Other health-care facilities	Emergency medical care services, health-care centres and dispensaries, obstetric and maternity clinics, outpatient clinics, dialysis centres, long-term health-care establishments and hospices, transfusion centres, military medical services prison hospitals or clinics
Related laboratories and research centres	Medical and biomedical laboratories, biotechnology laboratories and institutions, medical research centres
Mortuary and autopsy centres	
Animal research and testing	
Blood banks and blood collection services	
Nursing homes for the elderly	

MINOR SOURCES OF HCW	
Institutions / Establishments	Type
Small health-care establishments	First-aid posts and sick bays, physicians' offices, dental clinics, acupuncturists and chiropractors
Specialized health-care establishments and institutions with low waste generation	Convalescent nursing homes, psychiatric hospitals, institutions for disabled people
Activities involving intravenous or subcutaneous interventions	Cosmetic ear-piercing and tattoo parlours, illicit drug users and needle exchanges
Mortuary and autopsy centres	
Animal research and testing	
Blood banks and blood collection services	
Nursing homes for the elderly	

3. Practices of HCWM in countries of the Western Pacific Region

This chapter highlights international conventions and agreements; policy and regulatory frameworks of HCWM; segregation, transportation, treatment and disposal and technologies; training, education and public awareness; financial resources; and other project activities.

Current practices on HCWM in selected countries in the Western Pacific Region discussed in this chapter include Australia, Brunei Darussalam, Cambodia, China, Fiji, Japan, Kiribati, the Lao People's Democratic Republic, Malaysia, the Marshall Islands, Micronesia (Federated States of), Mongolia, Nauru, New Zealand, Palau, Papua New Guinea, the Philippines, the Republic of Korea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu and Viet Nam.

3.1 International conventions and agreements

International agreements and conventions include:

- Basel Convention on Hazardous Waste
- Stockholm Convention on Persistent Organic Pollutants
- Minamata Convention on Mercury

The aforementioned international agreements and conventions are particularly relevant to the management of wastes from health-care facilities, the protection of the environment and sustainable development, and they should be taken into account when preparing waste-management policy and legislation.

3.1.1 Basel Convention on Hazardous Waste

The Basel Convention on the Control of Trans-Boundary Movements of Hazardous Wastes and their Disposal (the Basel Convention) is the most comprehensive global environmental treaty on hazardous and other wastes.

It has 170 member countries (parties) and aims to protect human health and the environment against the adverse effects resulting from the generation, management, trans-boundary movements and disposal of hazardous and other wastes. The Basel Convention specifically refers to clinical wastes from health care in hospitals, health centres and clinics; as well as waste pharmaceuticals, drugs and medicines.

3.1.2 Stockholm Convention on Persistent Organic Pollutants

The Stockholm Convention on Persistent Organic Pollutants (the Stockholm Convention) is a global treaty to protect human health and the environment from persistent organic pollutants (POPs). POPs are chemicals that remain intact in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of living organisms and are toxic to humans and wildlife. POPs circulate globally and can cause damage wherever they travel. Under Article 5 and Annex C, governments that are party to the convention are required to reduce or eliminate releases from unintentional production of POPs (dioxins and furans). These chemicals are formed and released to the environment by medical waste incinerators and other combustion processes. Governments must require the

use of best available techniques and promote best environmental practices for new incinerators within four years of the convention coming into force for the country.

3.1.3 Minamata Convention on Mercury

The Minamata Convention for Mercury is a global treaty to protect human health and the environment from the adverse effects of mercury. The major highlights of the Minamata Convention on Mercury include a ban on new mercury mines, the phase-out of existing ones, control measures on air emissions, and the international regulation of the informal sector for artisanal and small-scale gold mining. The first new global convention on environment and health for nearly a decade was formally adopted at an international meeting in Japan on 10 October 2014. More than 90 nations plus the European Union signed the treaty. The treaty requires ratification by at least 50 of the nations that sign on before becoming legally binding for those countries and could accomplish its aim of curbing harmful emissions of mercury anywhere from about 2025 to 2050. This treaty includes the phasing out of certain medical equipment in health-care services, including mercury-containing medical items such as thermometers and blood pressure devices.

[Table 6](#) outlines the conventions and agreements to which selected Western Pacific Region countries are signatories. Most of the countries have signed and ratified, while some countries are not a party to the mentioned conventions.

Table 6: Status of conventions and agreements in selected countries of the Western Pacific Region

COUNTRIES	BASEL CONVENTION	STOCKHOLM CONVENTION	MINAMATA CONVENTION
AUSTRALIA	5 February 1992	23 May 2001 / 20 May 2004	10 October 2013
BRUNEI DARUSSALAM	16 December 2002	21 May 2002	
CAMBODIA	2 March 2001	23 May 2001 / 25 August 2006	10 October 2013
CHINA	22 March 1990 / 17 December 1991	23 May 2001 / 13 August 2004	10 October 2013
FIJI		14 June 2001 / 20 June 2001	
JAPAN	17 September 1993	30 August 2002	10 October 2013
KIRIBATI	7 September 2000	4 April 2002 / 7 September 2004	
LAO PDR	21 September 2010	5 March 2002 / 28 June 2006	
MALAYSIA	8 October 1993	16 May 2002	
MARSHALL ISLANDS	27 January 2003	27 January 2003	
MICRONESIA (FED. STATES OF)	6 September 1995	31 July 2001 / 15 July 2005	
MONGOLIA	15 April 1997	17 May 2002 / 30 April 2004	10 October 2013
NAURU	12 November 2001	9 May 2002	
NEW ZEALAND	18 March 1989 / 20 December 1994	23 May 2001 / 24 September 2004	10 October 2013
PALAU	8 September 2011	28 March 2002 / 8 September 2011	
PAPUA NEW GUINEA	1 September 1995	23 April 2001 / 7 October 2003	
PHILIPPINES	22 March 1989 / 21 October 1993	23 May 2001 / 27 February 2004	10 October 2013
REPUBLIC OF KOREA	28 February 1994	4 October 2001 / 25 January 2007	
SAMOA	22 March 2002	23 May 2001 / 4 February 2002	10 October 2013
SOLOMON ISLANDS		28 July 2004	
TONGA	26 March 2010	21 May 2002 / 23 October 2009	
TUVALU		19 January 2004	
VANUATU		2005	
VIET NAM	13 March 1995	23 May 2001 / 22 July 2002	

3.2 Policy and regulatory frameworks

This section provides the significant points of the national laws/regulations, policies, strategies, national action plans and technical guidelines that govern HCWM in selected Western Pacific Region countries.

Policies and regulatory frameworks exist in most of the countries of the Western Pacific Region. These frameworks, explicit or implicit at the national level, along with strategies and action plans as well as guidelines on HCWM are summarized in [Table 7](#).

AUSTRALIA

There is no national law or regulation on HCW. The only national law is the National Environment Protection Measure (NEPM) for Movement of Controlled Waste 1998 (currently being revised) that is aimed at minimizing the potential for harm to human health and the environment from the transport of controlled waste around Australia. Each state/territory has in place its own acts and regulations that deal with the management of waste. The policies available at the national and state and territory levels are:

- a) *At the national level*, the National Waste Policy: Less Waste, More Resources outlines general principles and strategies on waste, one of which is to collaborate with relevant jurisdictions to create a national definition and classification system for wastes (including hazardous and clinical wastes) that aligns with international conventions.
- b) *At state and territory levels*, some policies are:
 - i. Specific to HCW, e.g. the Clinical and Related Waste Management Policy in Western Australia. This policy addresses both the hazardous and non-hazardous waste streams of HCW.
 - ii. General, for example, the Environment Protection (Waste to Resources) Policy in South Australia. This policy addresses all

categories of waste with the exception of radioactive waste, which is regulated under the Radiation Protection and Control Act 1982.

There is no guideline on HCW issued by the national government. The *National Guidelines for Waste Management in the Health-care Industry*, published by the National Health and Medical Research Council (NHMRC) have been rescinded. Different guidance materials exist at the state and territory level. To harmonize and to promote safe and cost-effective practices in transportation, treatment and disposal, the waste industry has developed the Industry Code of Practice for the Management of Clinical and Related Wastes. Australia has no specific HCWM strategy, but the strategies incorporated in the national policy are applicable to HCW. Similarly, there is no specific national action plan for HCWM, however, as part of the National Policy, there is a National Waste Policy Implementation Plan. Other action plans also exist, such as for the reduction of dioxin.

Neither does Australia have a specific national steering committee on HCWM, but the Council of Australian Governments (COAG) Standing Council on Environment and Water, which was established in 2010 incorporates the

National Environment Protection Council, which in turn has a standing committee on the implementation of the National Waste Policy.

There are differences in jurisdictional approaches, policy, waste classifications and definitions across the states and territories of Australia. This causes problems particularly when services are provided across state boundaries, as this would require different waste management strategies, training and quality-assurance programmes.

To achieve greater consistency in industry practice, the Biohazard Waste Industry Group of Australia and New Zealand developed the 6th Edition of the Code of Practice. Although this code was prepared in consultation with several government departments of environment and health and other national associations and has been adopted by the Environmental Protection Agencies (EPA) of Victoria, Western Australia and South Australia, it remains outside the legal framework.

The need for a consistent definition has also been recognized in the National Waste Policy, but this standard definition has yet to be developed. Apart from a technical specification for a national standard for dioxin discharge developed for the Ministry of Environment, there are no national emission standards for waste treatment facilities. There is also no uniform, national policy concerning installation of dental amalgam separators to ensure that mercury may be recycled as required.

BRUNEI DARUSSALAM

In Brunei Darussalam, generally, a weak environmental framework exists, although it is expected that three new regulations – the Environment Pollution Control Order, the

Environmental Impact Assessment Order, and the Hazardous Waste (Control of Export, Import and Transit) Order – will be issued soon. There is no specific law on HCW. The only law addressing HCWM issues is the Infectious Disease Order. There is no specific policy on HCWM but policies for handling hazardous infectious waste have been developed and covered under the Infection Control Programme.

There are no existing guidelines, strategies or national action plans on HCWM. The Department of Pharmaceutical Services has developed a draft guideline on HCWM only for units operating under its administration. The Guidelines for Health and Safety of Health-care Workers also partly address HCW.

There is no national steering committee for HCWM. However, members of the National Infection Control Committee are also responsible for HCWM.

CAMBODIA

In Cambodia, laws and regulations include the Law on Natural Resources Management and Environmental Protection (1996) and the Sub-Decree on Solid Waste & Hazardous Substance Management (1999). Regarding HCWM regulation, the Prakas on Health-care Waste Management in Cambodia was issued by the Ministry of Health. A “prakas” is comparable to a proclamation or declaration that is a ministerial or inter-ministerial decision signed by the relevant minister(s). The declaration provides definitions of all categories of HCW; the requirements for the identification, labelling and classifications of HCW; and technical requirements for segregation, collection, storage, handling, transportation, treatment, and disposal of all

categories of wastes generated from health-care establishments in Cambodia. A National Policy on Health-care Waste Management in the Kingdom of Cambodia is available.

A Technical Guideline on Health-care Waste Management was developed in 2011 that provides guidance on the management of HCW as well as guidance and specifications on treatment options. The Infection Prevention and Control Guidelines for Health-care Facilities also partly address HCW.

There is no HCWM strategy. The National Plan for the Management of Health-care Wastes in Cambodia (developed in 2008) is still a draft. However, the National Strategic Plan for Infection Control in Health-care Facilities 2011–2015 has been issued and this addresses HCWM. A National Implementation Plan on dioxin has also been developed. A National Steering Committee for HCWM has been established.

CHINA

The regulatory agency for HCW in China was the Ministry of Health – now the National Health and Family Planning Commission (NHFPC) – before the SARS crisis in 2002–2003. The management of HCW was one of the factors of the classification and assessment of health-care institutions. For example, in the Classification Standard of General Hospitals promulgated by Ministry of Health, one factor considered was whether the contaminated matter was treated according to the standards of health-care and environmental protection.

The limitations were revealed during the SARS outbreak in 2003, as it was difficult for the Ministry of Health and health-care institutions to manage HCW throughout the

process of collection, storage, transportation and disposal.

The lack of facilities for centralized disposal was the cause of improper treatment of a lot of them. The HCW disposal facilities could not ensure the safety of people's health and the environment as there were almost no technical guidelines and standards for the treatment of HCW.

The Regulations on the Management of Health-care Waste were instituted as an intervention to address the HCWM problems and ensure the the protection of health and the environment. The promulgation of the regulations heralded the beginning of a legal HCWM system in China.

The laws and regulations include:

1. Environmental Protection Law of China issued by a Standing Committee of the National People's Congress in December 1989.
2. Regulations on Management of Medical Waste issued by State Council in 2003.
3. Measures on HCWM were also established:
 - a. Measures for Manifest Management on Transfer of Hazardous Wastes;
 - b. Catalogue of Classified Medical Waste;
 - c. Measures for Management on Medical Waste of Medical and Health-care Institutions; and
 - d. Measures for Administrative Penalty on Medical Waste Management.

The main law for solid waste is the Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste. Based on this law, the State Council promulgated the Regulation on the Control of Medical Waste (Order No.380) as China's first legislation to address HCWM. The State Environmental Protection Administration – now the Ministry of Environmental

Protection (MEP) – has issued several notices and circulars specifically for HCW.

In China, there is no policy on HCWM, however, different guides and standards on the management of HCW from generation to packing, transport and treatment have been issued by the Ministry of Health and MEP.

In China, standards and technical guidelines exist, these include:

1. Pollution Control Standard for Hazardous Wastes Incineration (GB18484-2001).
2. Technical Standard for Medical Waste Transport Vehicle (GB 19217-2003).
3. Technical Standard for Medical Care Incinerator (GB 19218-2003).
4. Technical Specification for Centralized Disposal of Medical Waste (Trail).

There is no national HCWM strategy and national action plan for HCWM. However, a National Plan for Construction of Hazardous and Health-care Waste Treatment Facilities exists.

The NIP on POPs includes measures in regard to the reduction of dioxin from HCW incineration.

A national steering committee does not exist, but various working groups on HCW have been formed.

FIJI

There is no specific law on HCW in Fiji. Since 2011, HCW has been partly covered by the Environment Management (Waste Disposal and Recycling) Acts and Regulations. The Environment Management Act 2005, Act No.1 of 2005, concerns the protection of the natural resources and the control and management of developments, waste management and pollution control, and calls for the establishment of a national environment council.

A Policy for Health-care Waste Management was developed and adopted by the Ministry of Health in 2002, and it was revised in 2010. This revision is still a draft.

In Fiji, there is no specific guideline on HCWM. In 2011, the National Solid Waste Management Strategy: 2011–2014 was launched which also includes some aspects on HCWM.

There is no national action plan for HCWM. However, Fiji is a member of the Secretariat of the Pacific Regional Environment Programme (SPREP), which is currently developing the Pacific Health-care Waste: Development of a Regional Strategy and Action Plan 2013–2015.

As signatory to the Stockholm Convention, an NIP on POPs was developed which also includes some aspects on HCW incineration.

There is no national steering committee on HCWM.

JAPAN

In Japan, the Waste Management and Public Cleansing Law (hereafter, Waste Management Law) prescribes the necessary management structure to control waste environmentally. To provide detailed information, a Manual on Sound Management of Infectious Wastes was developed by the Ministry of the Environment and widely used among stakeholders.

The national government is responsible for policy and legislation, collecting information, promoting technical development and assisting local governments, as needed, technically and financially.

Local governments are responsible for implementing the regulation for disposers and generators of waste, including issuing business licenses and facility licenses, on-site inspec-

tion, administrative enforcement and communicating with waste companies, local residents and other related stakeholders.

Waste generators (hospitals and clinics) are responsible for disposal of their HCW in accordance with the regulations. If they do not dispose of waste by themselves, they need to outsource it to a licensed waste management company and take necessary measures for sound management throughout the sequence of waste management.

In managing waste, they need to observe related regulations. Medical associations are expected to disseminate information to their members to promote the sound management of HCW from hospitals.

Infectious waste was first regulated in 1992. Revised criteria for infectious waste management were promulgated by the Ministry of Environment in 2004.

Japan has no policy on HCWM, but practical guidelines for infectious waste have been developed, including guidelines for home-based HCW (2008) and for the manual handling of HCW (2012). Strategies for different kinds of HCW have been developed, although Japan does not have an existing national action plan on HCWM.

Various national steering committees for different aspects of HCW exist, such as for the setting up of new guidelines for infectious waste receptacles.

KIRIBATI

Kiribati has no specific law on HCW, though the Environment Act of 1999, which was amended in 2007, also addresses HCWM. Similarly, Kiribati has no existing policy, HCW strategy or guidelines on HCWM. In 2011,

the Environment Policy and Strategic Plan for Kiribati was drafted.

There is no national action plan on HCWM. The Environment and Conservation Division has developed a draft National Waste Management Strategy that covers the treatment of HCW.

A Health-care Waste Management Committee made up of the Ministry of Health and Ministry of Environment exists but is not operational.

The Environment Act of 1999 (and amended in 2007) lays the framework for environmental protection in Kiribati.

LAO PEOPLE'S DEMOCRATIC REPUBLIC

Some existing rules and regulations for HCWM in the Lao People's Democratic Republic include:

1. Law on hygiene, preventive pathology and health promotion;
2. Guidelines for hospital waste management;
3. 1997 ministerial decree on solid waste management in the health-care service areas; and
4. Regulation on Waste Management in the Health-care Service Institute (2004).

The environmental legal framework is generally weak in the Lao People's Democratic Republic. Several laws, policies and regulations are drafted but are not issued. The Infection Control Regulation remains a draft.

A National Health-care Waste Policy (2011) exists, but is not widely implemented. A policy on environmental health standards in health centres in the Lao People's Democratic Republic was drafted in 2010.

The Guideline on Infection Control, as with the regulation, remains a draft. Guides and

waste management plans for HCW have been developed and are available in major hospitals.

The Lao People's Democratic Republic has a draft National Strategy on Health-care Waste and a draft National Health-care Waste Action Plan (2010–2015), but these have not yet been implemented.

A National Health-care Waste Committee exists but does not regularly convene.

MALAYSIA

In Malaysia, HCW is included in the Environmental Quality (Scheduled Wastes) Regulations 2005 which is part of the Environmental Quality Act of 1984. The Private Health-care Facilities and Services Act also requires that waste is managed in accordance with all regulatory requirements.

There are also other regulations, such as Environmental Quality (Clean Air) Regulations 1978 and Environmental Quality (Dioxin and Furan) Regulations 2004, which set limits on emissions from incinerators.

A separate policy on HCW does not exist, but waste management is included in different policies, e.g. in the Policies and Procedures on Infection Control of the Ministry of Health, and in the environment policy of the Department of Environment, Ministry of Environment and Natural Resources. In the past, the main policy was the Policy on the Protection of Public Health and Environment (1996).

There was a guideline and plan of action developed by the Ministry of Health in 1993 on clinical and related wastes. A new set of guidelines on HCWM was also developed in 2012 for its hospitals.

Guidelines on various categories of HCW have also been developed by the Department of Environment, such as the Technical Guidelines for Environmentally Sound Management under the Basel Convention, the Guidelines on Handling and Management of Clinical Wastes in Malaysia, and the Guidelines for the Classification of Used Electrical and Electronic Equipment in Malaysia, all of which are available on the Department of Environment website.

The national HCW strategy was developed in the 1990s. The strategy called for the privatization of hospital support services for Ministry of Health hospitals, including clinical waste management services. This strategy resulted in the development of the infrastructure for the management of clinical waste. Although health care is identified by the Government as one of the 12 National Key Economic Areas in the 10th Malaysian Plan (2011–2015), specific actions on HCW are not included. However, the national HCW strategy developed in the 1990s included an action plan.

There is no national steering committee for HCW, but there are various bodies such as a committee to monitor privatized hospital support services, including the Clinical Waste Management Services.

MARSHALL ISLANDS

There is no specific law or regulation on HCWM in the Marshall Islands. But the National Environmental Protection Act of 1984 and the Solid Waste Regulations of 1989 address several aspects of HCWM.

The Marshall Islands does not have any national policy, guidelines, strategy or national action plan on HCWM. HCW is addressed to a

certain extent in the National implementation plan for the Stockholm Convention on POPs.

The Cabinet has established a National Strategic Committee to develop a National Solid Waste Strategic Plan, but there is no national steering committee specifically for HCWM.

MICRONESIA (FEDERATED STATES OF)

The Federated States of Micronesia is an independent sovereign island-nation consisting of four states (Yap, Chuuk, Pohnpei and Kosrae), with each state having its own legislation. The legal basis and law for HCWM is the Federated States of Micronesia Public Law 15-09, supplemented by Presidential Order No. 1, which also established the Office of Environment and Emergency Management, and which now bears responsibility for implementing the Federated States of Micronesia Environmental Protection Act at the national level.

There are no policy and guidelines on HCWM in the Federated States of Micronesia.

The Strategic Development Plan 2004–2023 highlights the need for better management of waste and pollution control, but there is no specific mention of HCW.

The Federated States of Micronesia Infrastructure Development Plan serves as a comprehensive strategic plan to guide infrastructure development in the country. Based on this, a national solid-waste management strategy was developed which also covers HCW from hospitals and dispensaries. An action plan on waste management is included in the strategy and partly addresses HCW issues.

There is no national steering committee for HCW.

MONGOLIA

In Mongolia, several laws and orders on the management of HCW have been issued, including:

1. Ministerial order No.93 (2011) regarding the calculation and financing of the HCW system.
2. Ministerial order No.158 (2011/05/03) regarding the approval of guidelines to classify, collect, store, transport, disinfect, and dispose of waste from health-care organizations.
3. Ministerial order No.179 (2011/05/31) regarding the approval of waste facility and equipment guidelines of health-care organizations.
4. Joint order of the Minister of Health and Minister of Environment and Tourism No. A-320/305 (2011) regarding temporary rules to classify, segregate, collect, store, transport, disinfect and dispose of health care waste.
5. Ministerial order No. 380 (2011) regarding approval of guidelines for waste facilities of health-care facilities.
6. Joint order of the Minister of Health and DG of the national Emergency Management agency No. 07/27 (2011) regarding ban of the procurement of mercury-containing equipment.

In addition to the above national laws and orders, there are various guidelines and training manuals for implementing HCW in the country.

The national action plan on the Improvement of Solid-waste Management (2002), the Law on Municipal and Industrial Waste (2004), and the Regulations on Removal and Disposal of Hazardous Waste (2002) were approved by the

Government of Mongolia and are being implemented. The Regulation for Improvement of Health-care Waste Management and the regulation for Chemical Waste Management (2003) were approved by a joint order issued by the Ministry of Health and the Ministry of Nature and Environment. Technical support was provided by WHO for the development of the National Action Plan on the Improvement of Solid Waste Management and the Regulations for Improvement of Health-care Waste Management.

Inconsistencies are found in the management options for medical/infectious wastes in Mongolia. The regulations are interim and suggest a broad range of options for the treatment of medical waste, including combustion, and do not comprehensively address clear requirements for disposal/combustion facilities nor the need for licensed or special collection services and disposal facilities. National guidelines and plans specific to HCWM have not, as yet, been developed in Mongolia.

Hence, existing regulations should be reviewed and modified as needed. In addition, comprehensive implementation guidelines, standards and detailed practical manuals should be developed. One of the most important issues for adequate implementation of the regulations and standards is the establishment of proper technological and financial mechanisms to address the management of the wastes generated at the different types of health-care facilities.

The Health Sector Master Plan for developing the sector and improving the health of the people of Mongolia was approved by Government Resolution No. 72 on 13 April 2005. Following the development of the Health Sector Master Plan (2006–2015), it became clear that an intermediate step was necessary if the implementers were to be able to use

the Health Sector Master Plan strategies and strategic actions in the development of their operational plans. It also became evident that much more focus would be needed to move from the broad strategies listed in the Health Sector Master Plan to their actual implementation. Hence, the development of an Implementation Framework became inevitable.

The National Strategy on the Improvement of Health-care Waste Management and Action Plan for 2009–2013 was developed and approved by Order 293 of the Minister of Health in 2009. One of the actions taken was to ensure that every single health-care facility has a full-time staff member in charge of HCWM.

There is a national steering committee on HCW, which meets from time to time.

Improvement of HCWM and proper disposal of expired drugs are included in the strategic actions of Health Sector Master Plan and identified as a high-priority issue for resource allocation and international support. The Implementation Framework of the Health Sector Master Plan identified strategic actions to improve the management of medical waste and disposal of expired drugs.

The Mongolian National Environmental Health Action Plan (NEHAP) was endorsed by the Government Order No. 245 in December 2005. The implementation of NEHAP was divided into two phases and endorsed by the Minister of Health to ensure successful implementation: 2006–2010 and 2011–2015.

NAURU

In Nauru, the law in the area of waste is inadequate and mainly consists of the Litter Prohibition Act of 1983 and the draft Environment Management Bill of 2006.

The country does not have an existing policy, strategy, guideline or national action plan for HCWM. However, HCW is partly covered by the NIP and the draft National Solid Waste Management Strategy. There is no national steering committee on HCWM.

NEW ZEALAND

New Zealand has no specific law on HCW

The Policy Framework to Reduce and Safely Manage Hazardous Wastes in New Zealand clarifies that the New Zealand Standard on Management of Health-care Waste (NZS 4304:2002) has the function of a policy.

Several guidelines have been issued on the management and handling of HCW, such as the Guidelines for the Safe Handling of Cytotoxic Drugs and Related Waste.

There is no specific HCWM strategy or national action plan on HCWM, but important aspects such as the onsite incineration ban are covered in the NIP and other strategic waste documents. HCW is part of the general waste strategy in New Zealand.

There is no national steering committee for HCWM.

PALAU

There is no national law or regulation on HCW in Palau.

In Palau, waste management is the responsibility of each state government, with the exception of Koror. In Koror State, the state government handles waste collection. The national government, through the Solid Waste Management Office in the Bureau of Public

Works, manages and operates the national M-Dock Landfill.

The Environmental Quality Protection Act of 1981 has a specific regulation concerning solid waste management, which became effective 26 May 1996. A recycling act was enacted in 2006.

There is no policy, strategy, national action plan or guideline for HCWM in Palau.

The National Master Development Plan was established in 1996. The plan envisaged development of Palau on a long-term basis up to the year 2020, and also partly covered the waste management sector. The National Solid Waste Management Plan was completed in 2008, but is pending review and approval.

There is no national steering committee for HCWM.

PAPUA NEW GUINEA

The Environment Act (2000) is the major regulation for environment issues in Papua New Guinea. The Public Health Act of 1973 and the Public Health (General and Sanitation) Regulation of 1973 address management of HCW produced by hospitals and clinics.

There is no policy and strategy for HCWM, however, the publication: *National Health Service's Infection Prevention Policy Guidelines for Health Facilities* (second edition, 2009), in chapter 13, addresses some aspects of HCW.

In addition to the infection prevention guideline, draft Guidelines for Health-care Waste Management in Papua New Guinea have been developed. There is no specific national action plan or national steering committee on HCWM.

PHILIPPINES

In the Philippines, health-care facilities, as generators of HCW, are responsible for the collection, handling, segregation, transport, treatment and disposal of the waste. It is crucial that these generators are aware of existing international conventions and agreements, as well as national laws, policies and specific administrative requirements related to HCWM so that they can utilize them in developing their own HCWM programmes.

The Philippines has a comparatively long history in hazardous waste management and several acts are relevant to HCWM:

1. Republic Act No.4226, also known as the Hospital Licensure Act (1965). It requires the registration and licensure of all hospitals in the country and mandates the Department of Health to provide guidelines for hospital technical standards as to personnel, equipment and physical facilities.
2. Republic Act No.8749 or the Philippine Clean Air Act of 1999. It prohibits the incineration of biomedical wastes effective 17 July 2003. The act promotes the use of state-of-the-art, environmentally sound and safe non-burn technologies for the handling, treatment, thermal destruction, utilization and disposal of sorted, non-recycled biomedical and hazardous wastes.
3. Republic Act No.9003 or the Ecological Solid Waste Management Act. It mandates the segregation of solid wastes at the source, including households and institutions like hospitals by using a separate container for each type of waste from all sources.
4. Republic Act No.6969 or the Toxic Substances and Hazardous and Nuclear Waste Control Act 1990.
5. DENR Administrative Order (DAO) No.36, Series of 2004 on Revising DAO No.29, Series 1992, to Further Strengthen the Implementation of Republic Act 6969 and Prescribing the Use of the Procedural Manual.
6. Department of Health–Department of Environment and Natural Resources (DENR) Joint Administrative Order No.02 Series of 2005 dated 24 August 2005 entitled Policies and Guidelines on Effective and Proper Handling, Collection, Transport, Treatment, Storage and Disposal of Health-care Waste.
7. Department of Health Administrative Order 2007-0014, Guidelines on the Issuance of Certificate of Product Registration for Equipment or Devices Used for Treating Sharps, Pathological and Infectious Waste.
8. Presidential Degree 856, the Code on Sanitation of the Philippines – on Sewage Collection and Excreta Disposal. From the health-care regulator side, the Code of Sanitation of the Philippines was developed which includes HCW.
9. Department of Health Administrative Order No.2008-0021 dated 30 July 2008 on the Gradual Phase out of Mercury in all Philippine Health-care Facilities and Institutions.
10. *Health-care Waste Management Manual*. In addition to the Joint Administrative Order, the Department of Health established a manual on hospital waste management in 1997, the *Health-care Waste Management Manual* (second edition, 2004) and a *Health-care Waste Management Manual*, (third edition, 2011).

Currently, the Philippines does not have any existing national strategy or national action plan on HCWM. There is no national steering committee, however a thematic working group on HCWM does exist.

REPUBLIC OF KOREA

In the Republic of Korea, HCW is categorized under specified waste – similar to hazardous waste in other countries. The Waste Management Act includes seven types of HCW, which are classified according to the degree of hazard. Non-infectious wastes generated from HCW facilities are defined as industrial wastes, but can be disposed of as municipal wastes if the municipality allows. Since 1981, the task of administering HCW was covered by Ministry of Health, but in 2001 it was transferred to Ministry of Environment. The Waste Management Act deals with HCW in the Republic of Korea. The act describes the types of HCW and generators, and standards for proper disposal. Detailed guidelines on the regulations are provided by the Ministry of Environment. In the Republic of Korea, medical waste is a subset of hazardous wastes. The country has no specific policy on HCWM, however it is covered in the Second National Comprehensive Plan for Waste Management (2002–2011). Other guidelines for HCWM are available, e.g. the Guideline for Health-care Waste Management (2004).

A strategy document that lists the steps that must be taken to achieve the objectives contained in the policy document is available. There is no national action plan on HCWM, but HCW is addressed in the Second National Comprehensive Plan for Waste Management (2002–2011).

There is no national steering committee for HCWM.

SAMOA

Samoa has no specific law on HCW, however the Lands, Surveys and Environment Act of 1989 does govern the management of solid waste. The act provides mechanisms to develop an environmental management plan that can be used to set performance criteria for the treatment and disposal of hazardous HCW. Supplementary legislation associated with the 1989 act includes Health Ordinance 1959, covering the health and safety of health-care professionals and workers when handling hazardous HCW. The Labor and Employment Act of 1972 needs to be revised to bring it in line with current best practices. The Poison Act does not have any controls pertaining to the transportation and handling of hazardous HCW.

A policy on HCW was developed, but it needs revision.

The Health-care Waste Management Plan (2011) could be considered a guideline. A national strategy on HCWM is included in the Health-care Waste Management Plan. Nevertheless, the national plan does not include an action plan.

A national steering committee has been set up with a national HCW officer as a focal point for all HCW issues.

SOLOMON ISLANDS

The legal framework for the environment in Solomon Islands is limited and consists mainly of the Environment Act of 1998 and the Environment Regulation of 2008.

In 2009, Solomon Islands launched a national HCWM policy. However, the country has no detailed guidelines on HCWM. A draft strategy has been developed but has not been approved. A national action plan for HCW, which was drafted for the years of 2008–2009 also exists but has not been implemented. HCW is not part of the general waste management plan.

A national steering committee was set up but is no longer active.

TONGA

The legislation on waste management in Tonga includes:

1. Hazardous Wastes and Chemicals Act No.28 of 2010, which provides for the regulation and proper management of hazardous wastes and chemicals in accordance with accepted international practices and the international conventions applying to the use, trans-boundary movement and disposal of hazardous substances, and for related purposes.
2. Waste Management Act 11 of 2005, which provides for the collection and disposal of solid wastes and the management of all waste in the country.
3. Public Health Act No.29 of 1992, which deals with public health services in Tonga. Part VI addresses Waste Disposal: Collection and Disposal of Toxic or Hazardous Waste.
4. Environment Management Act No.27 2010, which established the Ministry of Environment and Climate Change to ensure the protection and proper management of the environment and the promotion of sustainable development.

The Waste Management Act of 2005 and the Public Health Act of 1992 each include a chapter on waste disposal. In 2010, the Hazardous Wastes and Chemicals Act was passed.

The Ministry of Health in Tonga does not have regulations or guidelines on HCWM, but the issue is partly addressed by an infection control guide.

There is no strategy, national action plan or national steering committee on HCWM.

TUVALU

Tuvalu is one of the most environmentally fragile states in the Pacific due to its low relief and small land area. Two key risks confronting it are rising population density in Funafuti and poor waste management and pollution control. Climate change and the prospect of rising sea levels are also major risks, if not a paramount threat. Poor collection and improper disposal of waste have direct implications for human and ecosystem health across Tuvalu's nine atolls and reef islands. Polluted lagoons, groundwater that is not potable and greater waste accumulation are latent sources of disease, and threaten public health and sanitation. The biggest threats lie within or near each island's population centre, especially Funafuti, with 50% of the population and where the volume of waste is growing rapidly. On outer islands with potable groundwater, contamination is a growing danger.

In Tuvalu the main laws for waste management are the Waste Operations and Services Act of 2009 and the Environment Protection Act of 2007.

The Waste Operations and Services Act of 2009 defines the roles and responsibilities for waste management in Tuvalu and provides for the collection and disposal of solid wastes and other wastes and related operations and services in designated areas of Tuvalu.

There is no specific law on HCW and no policy, national action plan or guidelines on HCWM.

There is no specific national steering committee for HCW, but a Waste Management Working Group was established in July 2008.

VANUATU

Vanuatu has no existing legislation regulating waste management. Instead, the Public Health Act No.22 of 1994 provides the basic requirements for sanitary systems for all dwellings in rural and urban areas. A National Waste Minimization and Management Project set about raising general awareness on the need for waste management. Despite these efforts, no national policy has been endorsed by the Council of Ministers. Vanuatu needs effective legislation to address waste management on land and at sea.

The Public Health Act No.22 of 1994 was brought into force in stages. By Public Health (Commencement) Order No.10 of 1995, Parts 1, 2, 9, 12, 15 and 16 and sections 104(c) and (d) and 109(1) became law on 24 April 1995. In 2002, the Minister of Health had a Notice of Commencement of certain provisions of the Public Health Act No.22 of 1994 published in the Official Gazette. This brought in the remainder of the parts of the 1994 act into force. Thus, the provisions in relation to nuisance, protection of water supply, sanitation and waste disposal commenced as law in 2002.

The Public Health Act No.22 of 1994 provides the basic requirements for sanitary systems for all dwellings in rural and urban areas.

The Environment Management and Conservation Act No.12 of 2002 provides for the conservation, sustainable development and management of the environment of Vanuatu. There is no specific law on HCW.

The National Waste Policy was endorsed in March 2001 by the Council of Ministers, with the Environment Unit as the National Waste Coordinating Agency. The policy calls for the development of a National Waste Management Strategy and a Hazardous Waste Management Strategy. However, the policy was never operationalized, and many of the recommendations were not realized. Hence, the country has no specific policy or guidelines on HCWM.

A draft National Waste Management Strategy and Action Plan (2012–2015) was developed but not implemented. There is no national action plan and no national steering committee for HCWM.

The Environmental Code of Practice and Report grants the environment minister powers to make regulations to conserve and prevent the waste of natural resources.

The existing domestic law in relation to POPs, a section of the Environmental Conservation, and Management Act No.12 of 2002 provide the minister with the power to regulate the environmental effects of importation and transportation of hazardous substances, pests and weeds, waste management, and air and water pollution. These powers provide opportunities to strengthen the Environment Department's capacity to monitor the environment for industrial waste, pollution and other chemicals or biological agents in relation to management of pests and weeds.

VIET NAM

Decision No. 43/2007/QĐ-BYT of the Ministry of Health, dated 30 November 2007, promulgates the Regulation on Health-care Waste Management, which is the main law on HCW in Viet Nam. A planned HCW project will include a review of this law.

There is no specific HCWM policy, but development of one is planned.

Circular No. 18/2009/TT-BYT on the Guidelines on the Implementation of Infection Control in Health-care Facilities, dated 14 October 2009, provides guidance on the implementation of infection control in health-care facilities and requires implementation of

good waste management. Various guidelines on HCWM have been developed, but harmonization of these guidelines is required.

Various HCW strategies have been developed by different governmental organizations and need to be harmonized.

On 25 May 2011, the Prime Minister's Decision No. 798/QĐ-TTg approved a solid waste treatment investment programme for 2011–2020. This action plan also includes HCW treatment. A specific action plan for HCW has also been drafted but has yet to be approved.

A national steering committee has been set up for the implementation of the new HCW project.

Table 7: Policies and regulatory frameworks in selected countries of the Western Pacific Region

COUNTRY	LAW	POLICY	STRATEGY	NATIONAL ACTION PLAN	HCW GUIDE	NATIONAL STEERING COMMITTEE
AUSTRALIA	National Environment Protection Measure (NEPM) for Movement of Controlled Waste 1998	National Waste Policy: Less Waste, More Resources e.g., Specific to health-care waste, the Clinical and Related Waste Management Policy in Western Australia	Partly (included in national policy on waste)	National Waste Policy Implementation Plan	National Guidelines for Waste Management in the Health-care Industry	Industry Code of Practice for the Management of Clinical and Related Wastes
BRUNEI DARUSSALAM	Infectious Disease Order Environment Pollution Control Order, Environmental Impact Assessment Order and Hazardous Waste (Control of Export, Import and Transit) Order	Partly (included in the infection control policy)			Guidelines for Health and Safety of Health-care Workers Partly (only for selected facilities)	
CAMBODIA	Prakas on Health-care Waste Management in Cambodia	National Policy on Health-care Waste Management 2009		National Plan for the Management of Health-care Wastes in Cambodia 2011–2015 (developed 2008)	Technical Guideline on Health-care Waste Management Infection Prevention and Control Guideline for Health-care Facilities	
CHINA	Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste 2005 Regulations on Management of Health-care Waste issued by State Council on 2003 (Order No. 380)			National Plan for Construction of Hazardous and Health-care Waste Treatment Facilities	Pollution Control Standard for Hazardous Wastes Incineration (GB18484-2001) Technical Standard for Medical Waste Transport Vehicle (GB 19217-2003) Technical Standard for Medical Care Incinerator (GB 19218-2003) Technical Specification for Centralized Disposal of Medical Waste (Trail)	

Table 7: Policies and regulatory frameworks in selected countries of the Western Pacific Region (continued)

COUNTRY	LAW	POLICY	STRATEGY	NATIONAL ACTION PLAN	HCW GUIDE	NATIONAL STEERING COMMITTEE
CHINA (CONTINUED)	Regulations on Management of Health-care Waste issued by State Council on 2003 (Order No. 380)				Technical Standard for Medical Care Incinerator (GB 19218-2003) Technical Specification for Centralized Disposal of Medical Waste (Trail)	
FIJI	Environment Management (Waste Disposal and Recycling) Regulations	Policy for Health-care Waste Management 2002	National Solid Waste Management Strategy: 2011-2014			
JAPAN	Waste Management Law (Wastes Management and Public Cleansing Law) Waste Disposal Law of 1970		Different strategies for different kinds of health-care waste		Manual on Sound Management of Infectious Wastes, May 2012 Home based health-care waste (2008) and for the manual handling of health-care waste (2012)	
KIRIBATI	Environment Act 1999					
LAO PDR	1997 Ministerial decree on solid waste management in the health-care service areas Regulation on Waste Management in the Health-care Service Institute (2004)	National Health-care Waste Policy (2011)				
MALAYSIA	Environmental Quality (Scheduled Wastes) Regulations 2005 Environmental Quality Act 1984 Private Health-care Facilities and Services Act	Policies and Procedures on Infection Control of the Ministry of Health Environment Policy of the Department of Environment Policy on the Protection of Public Health and Environment (1996)	National Health-care Waste Strategy and Action Plan	National Health-care Waste Strategy and Action Plan	Technical Guidelines for Environmentally Sound Management under Basel Convention, Guidelines on Handling and Management of Clinical Wastes in Malaysia	

Table 7: Policies and regulatory frameworks in selected countries of the Western Pacific Region (continued)

COUNTRY	LAW	POLICY	STRATEGY	NATIONAL ACTION PLAN	HCW GUIDE	NATIONAL STEERING COMMITTEE
MARSHALL ISLANDS	National Environmental Protection Act, 1984 and the Solid Waste Regulations 1989					
MICRONESIA (FEDERATED STATES OF)	Federated States of Micronesia Public Law 15-09 Presidential Order No. 1	Strategic Development Plan 2004–2023	Federated States of Micronesia Infrastructure Development Plan	Federated States of Micronesia Infrastructure Development Plan		
MONGOLIA	Law on Air, 2010 Law on air pollutants charge, 2010 Law on waste, 2012 Law on EIA, 2012 Law on Environmental Protection, 1995	Ministerial order No. 93 (2011) Ministerial order No. 158 Ministerial order No. 179 Joint order of the Ministers of Health and Environment and Tourism No. A-320/305 (2011) Ministerial order No. 380 (2011) Joint order of the Minister of Health and DG of the national Emergency Management agency No. 07/27 (2011)	National strategy on the improvement of health care management and action plan for 2009–2013	National Action Plan on Improvement of Solid Waste Management Regulation for Improvement of Health-care Waste Management (HCWM) Health Sector Master Plan (HSMP) 2006–2015 Health Sector Strategic Master Plan Implementation Framework Health care management and action plan for 2009–2013 NEHAP, for 2011–2015	Guideline on basic training for HCWM, 2010 Guideline on implementation of HCWM, 2010 Guideline on mercury-containing equipment in health-care facilities	Multisectoral technical working group for HCWM was established in 2011; it was revised in April, 2014
NAURU	Litter Prohibition Act 1983					
NEW ZEALAND		Policy Framework to Reduce and Safely Manage Hazardous Wastes in New Zealand New Zealand Standards on Management of Health-care Waste (NZS 4304:2002)			Guidelines for the Safe Handling of Cytotoxic Drugs and Related Waste	

Table 7: Policies and regulatory frameworks in selected countries of the Western Pacific Region (continued)

COUNTRY	LAW	POLICY	STRATEGY	NATIONAL ACTION PLAN	HCW GUIDE	NATIONAL STEERING COMMITTEE
PALAU	Environmental Quality Protection Act 1981			National Master Development Plan (NMDP)		
PAPUA NEW GUINEA	Environment Act (2000) Public Health Act 1973 Public Health (Sanitation and General) Regulation 1973	National Health Service Standards for Papua New Guinea 2011–2020			Chapter 13 Infection Prevention Policy Guidelines for Health Facilities (2nd Edition, 2009)	
PHILIPPINES	Republic Act No. 4226 Hospital Licensure Act (1965) Republic Act No. 8749 or the Philippine Clean Air Act of 1999 Republic Act No. 9003 or the Ecological Solid Waste Management Act of the Philippines Republic Act No. 6969 or An Act to Control Toxic Substances and Hazardous and Nuclear Waste Control Act 1990 DOH Administrative Order No. 2008-0021 dated 30 July 2008 on Gradual Phase-out of Mercury in all Philippine Health-care Facilities and Institutions				Health-care Waste Management Manual	Presidential Degree 856, Code on Sanitation of the Philippines
REPUBLIC OF KOREA	Policy on the Protection of Public Health and Environment (1996)	National Health-care Waste Strategy and Action Plan				

Table 7: Policies and regulatory frameworks in selected countries of the Western Pacific Region (continued)

COUNTRY	LAW	POLICY	STRATEGY	NATIONAL ACTION PLAN	HCW GUIDE	NATIONAL STEERING COMMITTEE
SAMOA	Lands, Surveys and Environment Act 1989	Health-care Waste Management Plan (National Strategy)			Health-care Waste Management Plan (2011)	
SOLOMON ISLANDS	Environment Act 1998 Environment Regulation 2008	National Health-care Waste Management Policy 2009				
TONGA	Waste Management Act, 2005 Public Health Act, 1992 Hazardous Wastes and Chemicals Act 2010					
TUVALU	Waste Operations and Services Act, 2009 Environment Protection Act, 2007					
VANUATU	Public Health Act No.22 of 1994 Environment Management and Conservation Act No.12 of 2002					
VIET NAM	Decision No. 43/2007/QĐ-BYT dated 30 November 2007 of the Ministry of Health promulgating Regulation on Health-care Waste Management			Prime Minister Decision No. 798/QĐ-TTg on the approval of the solid waste treatment investment program for the period 2011 to 2020	Circular No. 18 /2009/TT-BYT dated 14 October 2009 on the Guideline on the Implementation of Infection Control in Health-care Facilities	The Prime Minister decision No. 798/QĐ-TTg also established the National Steering Committee to HCW projects

3.3 Segregation, transportation, treatment and disposal, and technologies

AUSTRALIA

To ensure that controlled wastes transported between Australian states and territories are properly identified, transported and handled in an environmentally safe manner, the National Environmental Protection Measure on Movement of Controlled Waste was formulated.³ Nevertheless, the way in which the NEPM is implemented is still decided individually by each jurisdiction. Additionally, when new disposal service contracts are established, generators are sometimes not informed of the different technologies used by the service provider that may require different segregation practices, such as steam sterilization versus incineration.

Notwithstanding the issues highlighted above, regulations, guidelines and definitions have been developed by each state and territory on waste management, and waste is segregated at the point of generation, it is contained in appropriate receptacles (identified by colour and label) and is disposed of in licensed waste-treatment facilities. Contractors providing disposal services and suppliers of tools and equipment for segregation of waste are also easily found on the Internet. The polluter-pays principle is applied whereby health-care facilities pay for HCWM services and a manifest system for tracking the movement of HCW is in place. Various strategies are being developed via the National Waste Policy, involving the Australian Government, the National Environment Protection Council and individual state governments, and it is expected that HCWM will improve as these are implemented.

3. As the country did not participate in the survey, the information is based on the result of a literature search and review by the consultant.

BRUNEI DARUSSALAM

In Brunei Darussalam appropriate facilities and sufficiently skilled human resources are not available for environmentally sound treatment of hazardous waste.⁴ The main treatment and disposal method for HCW is uncontrolled incineration and burying. Illegal dumping of hazardous HCW has been reported. Monitoring the disposal of domestic and clinical waste is the task of the Temburong Health Service Department. HCW treatment services and consumables required for HCWM are regularly tendered.

Ongoing activities include supply and delivery of waste disposable items for all health centres of Health Service Department, Ministry of Health, for a period three years, as well as supply and delivery of waste disposable items for the infection control unit for a period of three years.

CAMBODIA

While HCWM received little attention in Cambodia in the past, efforts have been made over the last 10 years to improve the legal framework. HCWM improved in some secondary- and tertiary-level hospitals in Phnom Penh with hazardous HCW disposed of in basic incinerators. However, these were normally without emission control systems. Outside of Phnom Penh, only a few provincial towns have received some support, and most HCW are still simply dumped on vacant land

4. As the country did not participate in the survey, the information is based on the result of a literature search and review by the consultant.

outside of towns. These dumpsites usually lack control, are poorly managed and may pose a significant risk to the environment and possibly to public health. Controlled dumpsites can only be found in the capital and in the main cities.

The mismanagement of HCW poses severe risks to people, especially waste handlers and waste pickers, locally called *stung mean chey*. These waste pickers can be injured by direct contact with contaminated sharps. A risk of blood-borne infections, including hepatitis B and C and HIV, exist.

Within the hospitals that received support, basic segregation has been introduced but without standard operating procedures or regular training provided. However, in the majority of health-care facilities the internal waste logistics are considered as unsafe.

Technology includes the provision of sustainable treatment, including autoclave and shredders for HCW, as well as a national incinerator based in Phnom Penh to treat wastes that are potentially hazardous in nature.

CHINA

The health system in China recognized the need for improved HCWM during the SARS crisis, and in 2003 a law on HCW was approved.

During the past 10 years, an ambitious programme has set up several hundred centralized hazardous HCW treatment facilities in China. Although these centralized treatment facilities were built, not all fulfil today's existing emission parameters. Programmes to improve HCWM also took place in hospitals. A financing system for the treatment of HCW was also introduced.

Today nearly all hospitals have at least a basic HCWM programme, with waste being segregated and contracts established with local

waste-treatment companies. Personal protection equipment and consumables for waste management (e.g. sharps boxes) are widely available and HCW training is provided by the Government. However, more advanced HCWM systems exist in the eastern provinces of China and in the urban areas than in the western provinces.

FIJI

The HCW system in most of the hospitals in Fiji has to be considered weak, especially in the smaller and more remote health-care facilities. While a basic segregation into infectious waste (yellow bags), sharps (sharps containers) and general waste (black bags) is carried out in larger hospitals, this segregation is not implemented in smaller hospitals. Some health-care workers have received training on HCW and were provided with personal protective equipment. The HCW collection system is weak and most of the existing incinerators have operational problems.

JAPAN

In Japan, waste management is carried out in accordance with the Waste Disposal Law of 1970. Japan's first specific rule for infectious waste management was set up in 1992.⁵ The regulation was revised by the Ministry of Environment in 2004. The law requires that infectious waste be treated in incineration or melting facilities.

The HCWM system itself is of a high standard and includes one of the world's most advanced electronic waste manifest systems. HCW is segregated in health-care facilities and after-

5. As the country did not participate in the survey, the information is based on the result of a literature search and review by the consultant.

wards collected and transported in approved containers. The collection and treatment are monitored by an electronic waste manifest to avoid illegal disposal. About 98% of hospitals outsource the disposal of their HCW to waste-treatment companies, while less than 0.8% of hospitals dispose of waste by themselves. More than 90% of hospitals and other facilities incinerate their infectious waste, either by themselves or by outsourcing the task.

Japan has 296 infectious waste treatment companies, with about 90% of them using incineration and 5% melting waste, as of March 2006.

In the hospitals, waste generators are regularly trained on HCWM and receive necessary personal protection equipment. Ongoing and other planned activities include improvement of the collection of home-based HCW.

KIRIBATI

In Kiribati, the waste management in health-care facilities is basic, i.e. segregation of waste is not universally carried out, problems exist in the logistics chain (from waste generation until final disposal) and the knowledge of the health-care workers in regard to waste management is low.

Generally the HCWM needs to be reviewed and revamped.

MALAYSIA

In 1997, the Ministry of Health privatized the clinical waste management service for its hospitals and health-care facilities. The privatized service is comprehensive and includes the entire logistics chain from segregation to

disposal, as well as the provision of training and the development, operation and regular upgrading of a management information system for monitoring. Three companies awarded the contract are bound by the requirements of a concession agreement and guidelines, which specify that procedures and standards for the service and the system in place is well developed and monitored by both Ministry of Health and the Department of Environment (DOE). More recently, management of other categories of HCW in Ministry of Health hospitals has been incorporated into the new privatization agreement.

The strategy of privatization was for the three concession companies to develop the infrastructure for clinical waste management, not only for Ministry of Health hospitals but also to make this available to other governmental health-care facilities, private health-care facilities and medical laboratories. Compliance by these facilities is monitored by DOE. For the other HCW categories, various other treatment facilities have been set up and licensed by DOE and are listed on DOE's website. One of the conditions of licences issued to all treatment facilities is the requirement to attend training conducted by DOE. The movement of waste is tracked via an electronic consignment note system, as well as via GPS on licensed vehicles.

Management of HCW in small private clinics is less established as not all engage the services from the above-mentioned companies on a regular basis. Some shortcomings in segregation and in the logistics system have been reported in publications for these health-care facilities.

Increase in capacities and upgrading of existing waste treatment facilities to comply with more stringent requirements, such as continuous

emission monitoring. New treatment facilities for clinical waste are being planned or installed. The concession agreement has been revised to incorporate comprehensive HCWM.

MARSHALL ISLANDS

The waste management system of the Marshall Islands has to be considered weak. The main waste management activities are organized by the Majuro Atoll Waste Company.

Majuro Atoll Waste Company work is based on a draft Environmental Management Plan that is used as the operational plan for the management of solid waste. However, this plan does not seem to be implemented as waste is currently burnt openly. An incinerator that was previously available is no longer functioning.

In health-care facilities, only a very basic waste management system is implemented. Guidelines and regulations are not available.

FEDERATED STATES OF MICRONESIA

The HCWM system in all four states is weak. HCW on Pohnpei is generated from the main Pohnpei State Hospital as well as 10 dispensaries – five located on the main island and five on outer islands. At the main hospital, HCW is disposed of in a wood-fired, single-chamber incinerator donated by the Government of Japan in 2009. This incinerator is operated by hospital staff, once or twice per week on a two-hour cycle. The resulting ash is then taken to the Dekehtik dumpsite. Prior to the installation of this incinerator, HCW was often burnt at the dumpsite under controlled conditions. The situation varies in the other states. In Yap, the Department of Health Services

treats medical waste by incineration, while in Chuuk, HCW is disposed of at the dumpsite. The HCWM system needs to be reviewed and revamped across all states.

MONGOLIA

Waste in most of the health-care facilities is segregated. In the three major cities, centralized treatment facilities are operational and are collecting and treating HCW.

There are fundamental problems with respect to waste management, such as a lack of a comprehensive action plan and financing plan, inadequate infrastructure for collection, transport and disposal of HCW, insufficient knowledge and skills of personnel in the health sector, and poor occupational and environmental health practices. These problems may lead to further deterioration of the situation in Mongolia if not addressed adequately.

The Government needs to make a critical decision on how to organize waste disposal facilities in the country, whether to set up central treatment and disposal facilities in the major urban areas and *aimag* centres and/or require individual treatment and disposal facilities at *soum* and bag levels.

It is essential to introduce environmentally-sound technological measures to improve HCWM in Mongolia, including non-incineration technologies and technologies for segregation, collection transportation and final disposal. Preparation of a well-estimated investment plan for HCWM is crucial for the implementation of an action plan. The use of environmentally-sound non-combustion technology is the best option. However, if incineration is considered as an interim solution for the treatment of medical wastes,

existing low-temperature incinerators should be banned, and replaced with modern incinerators equipped with proper air pollution control units. Thus, issues such as rigorous segregation, emission standards, vigilant monitoring, regular maintenance, proper disposal of ash and enforceable sanctions for non-performance need to be addressed.

NAURU

HCW is not well managed in Nauru. Waste is treated using an old incinerator, which was installed in the main hospital when the hospital was built. Although this incinerator was overhauled in 2003, it does not always work. Waste pharmaceuticals are being dumped mainly at a landfill. Proper treatment options and infrastructure for medical and quarantine waste management are recognized needs. Indeed, a focus of the health development plan is to maintain and strengthen pollution-control measures, especially sewage and medical waste management.

NEW ZEALAND

Over the last 20 years, an advanced HCWM system has been set up in New Zealand.⁶ Staff members are trained in HCWM, and budgets are available for treatment and disposal services. Treatment plants are or will be upgraded. Possible shortcomings can be found in the field of mercury management, HCW management at minor waste generator sites and home-based health-care activities.

According to the NIP, health-care institutions are expected to incorporate new technologies, such as steam sterilization and autoclaving,

as part of an integrated waste management approach to treat medical wastes.

PALAU

The four main waste generators are the Belau National Hospital and three other private medical clinics in Palau.⁷ Waste from these clinics is transported to the national hospital and burnt in simple incinerators. Within the health-care facilities, HCW is segregated and collected in specific receptacles. The knowledge of the staff is limited and regular monitoring is not carried out.

PAPUA NEW GUINEA

Until 2006, segregation of HCW occurred at the source, with general non-risk waste collected as part of the municipal waste collection system and potentially hazardous HCW burnt in specially designed incinerators that were generally managed by the health authorities. The residual waste from the incineration process was either taken to a central disposal facility or buried onsite.

Since 2006, the designated incinerators have not been functioning. Thus, HCW is disposed of in areas allocated specifically for it within the Baruni Dump. Dump operators, nearby residents and inhabitants of the Baruni Dump are exposed to high health risks, specifically the community who live adjacent to the HCW disposal site. Other hospitals reported indiscriminate dumping of HCW and the practice of burying it in shallow pits, partially burning it with kerosene and partly covering it with soil.

6. As the country did not participate in the survey, the information is based on the result of a literature search and review by the consultant.

7. As the country did not participate in the survey, the information is based on the result of a literature search and review by the consultant.

PHILIPPINES

The Philippines has a comparatively comprehensive legal framework and a well-established HCWM system, but is lacking in implementation and enforcement. In the larger hospitals, HCW is segregated in hospitals and a management and administrative system exists. In urban areas, licensed waste disposal companies are available that are collecting, treating and disposing of HCW.

SAMOA

In Samoa, HCW was a major problem in terms of public health as a result of inadequate collection and treatment of discarded sharps and contaminated surgical dressings and bandages at the national and district hospitals.⁸ The situation improved after 2005 as a designated HCW officer was appointed and a new incinerator was donated by the Japan International Cooperation Agency. Following training sessions, segregation of waste improved and a system was put in place to properly collect different types of waste from the wards. However, there are still weak points in regard to management, treatment and safety of the waste logistics.

Since 2010, there has not been much progress and it is hoped that with the final implementation of the waste management plan in 2011 the system will continue to improve.

The methods of segregation, collection, treatment and disposal of HCW at various health-care facilities throughout Samoa have been implemented under the HCWM component of the Samoa Health Sector Management Project. Procurement of resources

(i.e. yellow and green waste bins), sharps containers, the installation of new incinerator at Tafaigata, and the provision of two waste trucks each for Upolu and Savaii contributed to the improvement of the existing system.

Hazardous waste minimization can only be achieved if waste is properly segregated at the point of generation, minimizing the amount of hazardous waste that requires costly specialized treatment and disposal, and maximizing the proportion of non-hazardous waste that can be safely and cheaply disposed of to landfill.

SOLOMON ISLANDS

In Solomon Islands, HCW only received attention in the middle of the last decade. Previously, waste was disposed of without treatment in the backyards of health-care facilities or in the sea.

Amid growing public sensitivity about the issue, a policy on HCW was launched and major health-care facilities started to introduce basic waste management systems, such as segregation of HCW. Some training sessions were carried out, but not all relevant people participated. Available technologies for the treatment of hazardous waste are outdated and only partially function. A specific budget for HCWM is also not available.

TONGA

In 2007, a new solid waste collection system was implemented on Tongatapu, and the Waste Authority Limited was established to take control of solid waste collection and disposal.⁹

The waste disposal services provided by Waste Authority Limited are poor and are planned to

8. As the country did not participate in the survey, the information is based on the result of a literature search and review by the consultant.

9. As the country did not participate in the survey, the information is based on the result of a literature search and review by the consultant.

be improved via a project funded by the Asian Development Bank. On most other islands, formal arrangements for solid-waste collection are not in place.

HCWM is still a critical issue, but only a very basic HCWM system has been implemented so far. Based on an infection control guide, basic segregation (general waste, infectious waste, sharps, etc.) using a colour-coded system is carried out. Only limited training is provided and financing of the system is an ongoing problem, which has at times resulted in incorrect treatment of infectious waste.

TUVALU

In health-care facilities in Tuvalu, there is a basic system of HCWM that currently includes mainly the segregation of the waste streams and transport of waste for treatment and disposal. Through a project funded by the European Union (EU), a system of safe collection and treatment of hazardous waste, including HCW, is being planned for both the Princess Margaret Hospital in Funafuti and medical clinics in the outer islands.

A specific training system does not exist. Infectious waste is currently treated using a simple incinerator, situated near the Princess Margaret Hospital. A separate budget for HCW does not exist.

The 10th European Development Fund Tuvalu Waste, Water and Sanitation Project will drive a strong Tuvalu-EU partnership to establish sustainable waste operations, providing low-technology solutions and an appropriate plant and equipment, with Tuvalu providing all service/operational funding. Cabinet has approved in principle funding waste services

by imposing a levy on imports. An administrative framework and other details are under investigation. If endorsed, a waste levy could provide sustainable funding for future waste services in support of this project.

The 10th European Development Fund Technical Cooperation Facility has funded new waste management legislation. The Waste Operations and Services Act of 2009 was enacted at the June 2009 Parliament session. The Waste Operations and Services Act augments the Environment Protection Act of 2007 and provides the legal framework for the waste component of the EU project.

VANUATU

Basic HCWM has been introduced with the segregation of hazardous and non-hazardous waste at source and the treatment of the hazardous wastes – mainly infectious waste, sharps and pathological waste – at one of the two incinerators located on the hospital grounds of the Port Vila Central Hospital.¹⁰

The residual ash from the incinerator is taken to the Bouffa landfill site for disposal.

It is reported that the incinerators have operational problems and sometimes do not function. When the incinerators are not functioning, the hazardous HCW is taken to the landfill where it is burnt in an open pit. Similarly, in hospitals where there is no incinerator or where the incinerator is not functional, hazardous HCW is openly burnt and buried.

10. As the country did not participate in the survey, the information is based on the result of a literature search and review by the consultant.

VIET NAM

Over the last five years, the HCW situation in Viet Nam has changed. Currently, HCW is one of the priorities of the Government, and a major project with a budget of US\$ 150 million has commenced that will further improve the situation.

Currently, a basic HCWM system is being implemented in hospitals. Several training

sessions on HCW have been provided by different organizations and various guidelines have been developed, which needs to be harmonized. A regulatory framework exists, but needs to be reviewed. The logistics and treatment equipment currently in use are not state of the art and need to be upgraded. Financing for the recurrent cost of HCWM is still a challenge as the sector is underfunded.

3.4 Training, education and public awareness

This section presents past, ongoing and planned activities for training, education and public awareness on HCWM in selected countries of the Western Pacific Region.

Only six countries are described in this section due to data and information availability.

CAMBODIA

HCWM activities include awareness campaigns where the design of pictograms and a specific sample of containers in the national language for medical waste have been disseminated to hospitals. Capacity-building activities include workshops, training, and the distribution of posters, stickers, sample bins and sharps containers to promote HCWM. But Cambodia has limited resources for HCW infrastructure.

FIJI

Some health-care workers received training on HCW and were provided with personal protection equipment.

JAPAN

HCW practitioners received training and conducted an awareness campaign on HCWM at the local and national level.

MONGOLIA

While HCWM received little attention in the past, this has changed during the past few years. Awareness-raising activities among stakeholders on the risks of HCW resulted in a willingness to start changing processes. The importance of these activities was underlined by a WHO study in 2011 that showed very high prevalence of hepatitis B and C among health workers in Mongolia – above 50% in some surgical departments – pointing to a breach in HCWM.

PHILIPPINES

Some health-care workers have received training in HCWM, but many other still lack knowledge. Financing of HCWM is a problem in the Philippines.

REPUBLIC OF KOREA

The Resource Recirculation Center, National Institute of Environmental Research is supporting the Ministry of Environment by conducting the required research on HCW. In the private sector, three HCW-related associations keep their members updated on regulation and policy developments.

3.5 Financial resources and other project activities

This section illuminates the financial resources for HCWM in aspects such as infrastructure, capacity-building and funding.

This section does not include Australia, Brunei Darussalam, Cambodia and the Lao People's Democratic Republic due to the unavailability of data and information.

CAMBODIA

A specific budget for the financing of HCWM activities does not exist, either at the central level or within health-care facilities.

JAPAN

A financing system is in place to cover the cost of HCWM and is based on the polluter-pays principle.

CHINA

The Global Environment Facility (GEF) is funding a project in China on Environmentally Sustainable Management of Medical Wastes. The 11th and 12th Five-Year Plan activities include the construction of hazardous and medical waste treatment facilities.

MALAYSIA

Malaysia's financing system, including the privatization model of the Ministry of Health, is based on the polluter-pays principle.

MONGOLIA

Mongolia is being supported by WHO and the Millennium Challenge Corporation (MCC) on the improvement of its HCW system. The Asian

Development Bank is also funding a project on the improvement of the HCW system as part of the Fifth Health Sector Improvement Project.

PACIFIC ISLANDS

Pacific island countries and areas, including Fiji, Kiribati, the Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu, engaged in the development of a Regional Strategy and Action Plan 2013–2015 through SPREP and an EU-funded Pacific Hazardous Waste Management (PacWaste) project, which includes a HCW component.

Through PacWaste, these countries as well as the Federated States of Micronesia will receive assistance and equipment to set up improved HCWM.

The financing system for the management and treatment of HCW in most Pacific island countries is not fully developed.

PHILIPPINES

The Philippines has a HCWM project supported by GEF and the United Nations Development Programme (UNDP). Various training programmes exist, such as the programme for the Calabarzon Region (2012) financed by Japan.

REPUBLIC OF KOREA

A financing system is in place to cover the cost of HCWM and is based on the polluter-pays principle.

VIET NAM

HCW is one of the priorities of the Government, and a major project with a budget of US\$ 150 million has commenced, helping further improve the situation. However, the financing for the recurrent cost of HCWM still remains a challenge as the sector is underfunded. A UNDP-GEF global HCW project will demonstrate and promote best techniques and practices for reducing HCW to avoid environmental release of dioxin and mercury. Various projects financed by bilateral donors such as Belgium and Germany include a HCW component.

4. Status of HCWM in selected Western Pacific countries

The potential risks created by the unsafe management and disposal of HCW have long been recognized in the Western Pacific Region, and efforts have been undertaken to raise awareness of the problem.

Some countries in the Region have had the financial resources to take countermeasures and have introduced more advanced HCWM systems to address the risks. But other countries faced financial constraints that limited their response. Hence, only limited measures have been undertaken, which often were dependent on donor support.

In the last decade, several countries in the Region have begun to improve HCWM. For example, the Lao People's Democratic Republic, Mongolia and Viet Nam have already invested or will invest strongly in the improvement of HCW infrastructure. Several countries, including Cambodia and the Philippines, have improved HCW legislation. New strategies, such as the centralization and privatization of HCW disposal services, have been implemented in Malaysia. Pacific island countries and areas are working towards the development of HCWM plans. The status and issues of HCWM in selected countries in the Western Pacific Region are shown in a summary assessment in [Table 8](#).

The five HCW aspects listed in Table 8 include: HCWM (management); HCW training (training); HCW policies and regulatory frameworks (regulation); HCW technologies (technology); and HCW financial resources (financing). In addition to rating the information base of each country, the implementation level in five HCW aspects is listed in Table 8. A score of 1 is “insufficient” and 5 is “excellent”.

Table 8: Summary assessment on HCWM in selected countries of the Western Pacific Region

COUNTRY	INFORMATION BASE	MANAGEMENT	TRAINING	REGULATION	TECHNOLOGY	FINANCING
AUSTRALIA		-	-	-	-	-
BRUNEI DARUSSALAM	Poor	-	-	-	-	-
CAMBODIA	Good	2	2	4	2	2
CHINA	Fair	3	3	4	3	3
FIJI	Poor	2	2	2	2	1
JAPAN	Good	-	-	-	-	-
KIRIBATI	Poor	2	2	1	2	1
LAO PDR	Fair	2	3	3	3	2
MALAYSIA	Good	3	3	4	4	4
MARSHALL ISLANDS	Poor	2	2	1	1	2
MICRONESIA (FEDERATED STATES OF)	Poor	1	1	2	1	1
MONGOLIA	Good	3	4	4	3	4
NAURU	Poor	1	1	2	1	1
NEW ZEALAND	Fair	-	-	-	-	-
PALAU	Fair	-	-	-	-	-
PAPUA NEW GUINEA	Poor	-	-	-	-	-
PHILIPPINES	Good	3	3	4	3	2
REPUBLIC OF KOREA	Good	4	4	4	5	4
SAMOA	Fair	-	-	-	-	-
SOLOMON ISLANDS	Fair	2	2	2	1	1
TONGA	Fair	-	-	-	-	-
TUVALU	Poor	2	2	1	2	1
VANUATU	Poor	-	-	-	-	-
VIET NAM	Fair	3	3	3	2	2

Note: Rating scheme ranges from 1 = insufficient to 5 = excellent; “-” refers to no data/information

4.1 Status of HCWM based on survey results

4.1.1 Health-care waste management

The Federated States of Micronesia and Nauru have no specific HCWM system. Some aspects of a waste management system exist in Cambodia, Fiji, Kiribati, the Lao People's Democratic Republic, the Marshall Islands, Solomon Islands and Tuvalu. Waste management systems have been introduced in China, Malaysia, Mongolia, the Philippines and Viet Nam. The Republic of Korea has a comprehensive HCWM system.

4.1.2 Health-care waste management training

The Federated States of Micronesia and Nauru provide no training on HCWM. Cambodia, Fiji, Kiribati, the Marshall Islands, Solomon Islands and Tuvalu provide basic HCWM training but mainly through the support of development organizations. In China, the Lao People's Democratic Republic, Malaysia, the Philippines and Viet Nam training is provided by the government or appointed contractors or consultants. Mongolia and the Republic of Korea are at the forefront, regularly offering training from basic level to advanced.

4.1.3 Policies and regulatory framework

A regulatory framework on waste management does not exist in Kiribati, the Marshall Islands and Tuvalu. HCW is partly covered

by other regulations in countries such as Fiji, the Federated States of Micronesia, Nauru and Solomon Islands. In the Lao People's Democratic Republic and Viet Nam HCW is covered by other regulations, and some legal documents specifically address HCW. In Cambodia, China, Japan, Malaysia, Mongolia, the Philippines and the Republic of Korea a regulatory framework for HCW does exist, but certain documents are missing.

4.1.4 Technologies

Pacific island countries, such as the Marshall Islands, the Federated States of Micronesia, Nauru and Solomon Islands, have little or no treatment equipment and limited logistics available for HCW use. Basic treatment equipment for general waste is available, but it is not always operational and does not fulfil international standards for HCW. In China, the Lao People's Democratic Republic, Mongolia and the Philippines more advanced treatment equipment is available but does not fulfil all international standards. In Malaysia, sophisticated treatment equipment that meets international standards is available, however it does not fulfil all best available techniques (BAT) standards. BAT for logistics and treatment equipment is available, well maintained and regularly tested by independent institutions in Japan and the Republic of Korea.

4.1.5 Financial resources

Pacific island countries including the Federated States of Micronesia, Fiji, Kiribati, Nauru, Solomon Islands and Tuvalu have almost

no financial resources for HCWM. Several countries have resources to handle consumables, but mainly depend on donor organizations. In China, a budget for HCW exists, but mainly at central level. In Japan, Malaysia, Mongolia and the Republic of Korea a regular budget based on the polluter-pays principle has been established. Despite the improvements in many countries, HCWM is still far from ideal. Further support for the development of HCWM systems in countries is required to ensure that within the next decade safe HCWM systems are implemented.

4.1.6 Country-by-country needs assessment

Based on the survey findings and the literature search and review, the following HCWM needs have been identified for each country.

AUSTRALIA

- Improve consistency in HCW definitions in various jurisdictions.
- Develop national HCW guidelines.
- Harmonize and streamline accepted technologies for the treatment of HCW at the national level.
- Create a harmonized system for the supervision and monitoring of HCWM.
- Further improve the management of mercury, in particular from dental sources (amalgam).

BRUNEI DARUSSALAM

- Review existing policy or set up a specific policy for HCW.
- Set up a national action plan for HCW.
- Develop an appropriate regulatory system for HCW.

- Develop a guideline on HCWM.
- Improve the monitoring system for HCWM.
- Standardize the training system for HCWM.

CAMBODIA

- Implement the already developed guidelines and provision of training for health-care workers on waste management.
- Provision of small-scale equipment (bins, bags, personal protection equipment) to improve segregation and HCW logistics.
- Monitor and supervise the application of the *prakas* on HCW.
- Improve the HCW infrastructure.

CHINA

- Strengthen the implementation of HCWM, especially in western and rural areas.
- Ensure stricter monitoring and enforcement of the existing regulations and technical standards
- Better control emissions from HCW incineration.
- Set up a national training system for HCWM.

FIJI

- Set up of a legal framework for HCWM.
- Develop specific guidelines for HCWM.
- Set up a training system for HCWM to ensure all relevant personnel are trained.
- Develop a monitoring and supervision system for HCWM.
- Clarify the future financing of HCWM activities.
- Improve the HCWM infrastructure.

JAPAN

- Develop a comprehensive guideline covering all types of HCW generated by the health-care or related sectors.
- Improve the management of waste from home-care activities.
- Continue the improvement of the safe treatment of chemical and HCW, e.g. collection of mercury waste from minor generators.

KIRIBATI

- Set up a HCWM plan.
- Ensure ownership of the problem by the Ministries of Health and of Environment.
- Set up a training programme for waste generators, hospital orderlies and incinerator operators.
- Ensure a financing scheme for the HCWM system and ensure maintenance of the high-temperature incinerators installed in 2011.

LAO PEOPLE'S DEMOCRATIC REPUBLIC

- Develop a financing scheme to ensure sustainable financing of the HCWM system.
- Further strengthen the legal framework on HCWM.
- Implement a monitoring system for environmental health for health-care facilities.
- Roll out environmental health training to all health-care facilities.
- Ensure maintenance of existing treatment systems.

MALAYSIA

- Continue the expansion of existing plants and set up of additional HCW treatment plants, especially in the eastern region.

- Better control and management of HCW, especially in smaller health-care facilities operated by the private sector.
- Further strengthen the training system for HCWM disposal.
- Further strengthen HCW disposal from minor generators and home-based HCW disposal.
- Further reduce unintentionally produced POPs from the health-care sector, if required after ratifying the Stockholm Convention and the development of the NIP.

MARSHALL ISLANDS

- Clarify responsibilities with regard to HCWM and disposal.
- Identify possibilities for funding HCWM.
- Set up a legal framework for HCWM, including an HCW policy.
- Develop a national strategy, action plan and guidelines for HCWM.
- Set up a training system for HCWM, following development of the legal framework and guidelines.
- Install necessary treatment plants for HCW.
- Ensure monitoring and financing of the newly established system.

MICRONESIA (FEDERATED STATES OF)

- Clarify responsibilities on HCWM and identify possibilities for funding for HCWM.
- Implement the national solid waste management strategy and develop a HCWM plan.
- Develop a practical guideline on HCWM.
- Train staff on HCWM and set up a financing scheme.
- Set up the infrastructure for HCWM and develop monitoring.

MONGOLIA

- Review and update the national action plan and set up of a HCW policy.
- Upgrade the centralized treatment facility of Ulaanbaatar to meet international standards and review the facilities in two other cities.
- Improve the monitoring and inspection capacity for HCW.
- Improve the liquid hazardous HCW system and implement systems to recycle certain chemicals.
- Continue to improve the HCWM infrastructure at the *aimag* level.

NAURU

- Develop the legal framework for HCWM, including a HCWM policy, strategy, action plan and guidance.
- Train staff on HCWM.
- Ensure financing of HCWM systems and set up a monitoring system for HCW.
- Develop the necessary infrastructure for HCWM.

NEW ZEALAND

- Continue the replacement of on-site incinerators with alternative technology or centralized waste services.
- Improve the management of mercury.
- Strengthen the monitoring and inspection system to reach the goals of waste minimization.
- Improve HCWM by minor generators.

PALAU

- Develop a legal framework for HCWM and clarify responsibilities.

- Develop a guideline on HCW.
- Improve the current waste treatment options (incinerators) and other infrastructure.
- Set up a monitoring and inspection system, including a financing scheme for HCW.
- Improve HCWM and train waste generators and operators.

PAPUA NEW GUINEA

- Develop an appropriate legal framework for HCWM.
- Reintroduce basic waste management in health-care facilities.
- Set up a training, monitoring and inspection system on HCW and ensure sustainable financing of the system.
- Improve HCWM infrastructure.

PHILIPPINES

- Set up a national HCWM strategy and action plan.
- Improve the monitoring and inspection system to enable the enforcement of the legal framework.
- Clarify responsibilities and development of a polluter-pays financing system for HCW.
- Further strengthen the training system on HCW.
- Improve HCWM, especially in smaller and more remotely located health-care facilities.

REPUBLIC OF KOREA

- Set up collection system for home-based HCW.
- Increase use of less-polluting treatment technologies (Fig. 3).
- Improve storage and spillage management.

SAMOA

- Improve consistency of HCW definitions in different jurisdictions.
- Develop a national guideline on HCWM.
- Harmonize and streamline accepted technologies for the treatment of HCW at the national level.
- Create a harmonized system for the supervision and monitoring of HCWM.
- Further improve the management of mercury in particular from dental sources (amalgam).

SOLOMON ISLANDS

- Improve the regulatory framework, including development of a guideline on HCWM.
- Improve the available HCW infrastructure and equipment.
- Set up a monitoring and inspection system and a sustainable financing system for HCWM.
- Train all relevant staff in HCWM.

TONGA

- Develop a legal and administrative framework for HCWM.
- Provide equipment and infrastructure for HCWM.
- Set up a monitoring, inspection and financing system for HCWM.
- Train staff on improved HCWM.

TUVALU

- Set up a legal framework for HCWM.
- Improve the administrative management plan for HCW and develop a strategy and an action plan for HCWM.

- Improve the available HCW infrastructure and equipment.
- Improve monitoring, inspection and financial planning for HCWM.
- Train key staff in HCWM.

VANUATU

- Set up a legal framework for HCWM.
- Improve the administrative management and develop a strategy and an action plan.
- Improve monitoring, inspection and financial planning for HCWM.
- Train key staff in HCWM.
- Improve the available HCW infrastructure and equipment.

VIET NAM

- Ensure the careful and sustainable implementation of the new Hospital Waste Management Support Project financed by a World Bank loan.
- Review and harmonize the legal and administrative framework.
- Implement a national strategy on HCWM training.
- Strengthen the financing system for HCWM.
- Review the current HCW monitoring and inspection system.

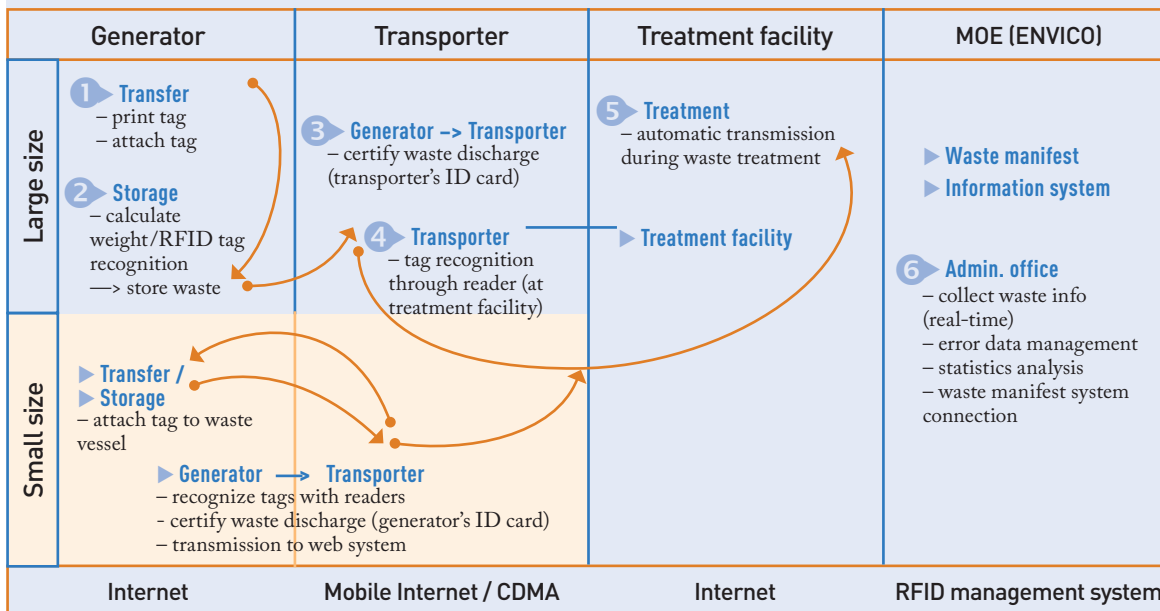
Figure 3: The work process of a Radio Frequency Identification Detection (RFID) manifest system in the Republic of Korea

In August 2008, the Republic of Korea started a new manifest system using RFID technology to monitor the carriage and treatment of HCW.

Under the new system, the generator puts an electronic tag bearing information such as the type of HCW, generator and weight on the container.

The transporter and disposers detect the information using an RFID reader during carriage and treatment and send it on a real-time basis to the Korea Environment & Resources Corporation (ENVICO), an affiliate of the Ministry of Environment responsible for running the waste manifest system.

The RFID-based manifest system has many advantages over the previous paper-based manifest system. For example, it can prevent illegal dumping during transportation through the real-time monitoring. And it also frees the generator, transporter and disposer from paperwork normally required for reporting the disposal of HCW.



Source: after David Chung (2010). Report for Waste TWG. Resource Circulation Division, National Institute of Environmental Research (NIER), Environmental Research Complex, Republic of Korea.

5. Recommendations

Twenty-four of the 37 countries and areas of the Western Pacific Region were covered by this research.

These 24 countries are: Australia, Brunei Darussalam, Cambodia, China, Fiji, Japan, Kiribati, the Lao People's Democratic Republic, Malaysia, the Marshall Islands, the Federated States of Micronesia, Mongolia, Nauru, New Zealand, Palau, Papua New Guinea, the Philippines, the Republic of Korea, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu and Viet Nam. It is recommended that the 13 countries not covered in this report be included in the future to ensure a clear and full picture of the HCW situation in the Western Pacific Region.

5.1 Strategic directions in countries

The following recommendations provide strategic direction, possible actions and tools that can promote HCWM in countries of the Western Pacific Region. Governments, international organizations and other stakeholders can synergize their respective knowledge and expertise in the implementation of these strategies and actions.

5.1.1 Policy and regulatory frameworks

- Develop HCW policies and regulatory frameworks taking into account international conventions and agreements, as well as the practices of other countries. Tailor them to local needs with clear roles and responsibilities, thereby creating dedicated units for monitoring implementation and enforcement of HCWM.

5.1.2 HCWM (separation, transportation, treatment and disposal) and technologies

- Encourage integrated treatment facilities under build-operate-and-transfer or build-own-operate-and-transfer schemes.
- Select a low-cost HCWM plan adaptable to developing countries and implement it.

5.1.3 Training, education and awareness raising

- Synergize capacity-building and technical support activities to enhance partnerships among HCW sector and other stakeholders.
- Establish a network for capacity-building through periodic training and workshops that explicitly address HCWM and waste minimization. Conduct HCWM research and development covering best practices, lessons learnt, indicators, etc.

- Carry out information, education and communication campaigns on HCWM to raise awareness of decision-makers and health-care facility staff in handling, safety and exposure to HCW.
- Develop training tools, modules and packages focusing on best practices on HCWM.

5.1.4 Financial resources

- Establish a waste minimization system and apply the savings to fund the overall HCWM system.

5.2 Western Pacific Region strategic directions

Possible strategies for the improvement of HCWM in the Western Pacific Region include the following.

5.2.1 Improvement of a regional dialogue

Given the various states of development of national HCWM systems in the Western Pacific Region, three regional development clusters are proposed as follows:

- **North-South cluster:** Australia, China, Hong Kong SAR (China), Japan, Macao SAR (China), Mongolia, New Zealand and the Republic of Korea.
- **South-East cluster:** Brunei Darussalam, Cambodia, the Lao People's Democratic Republic, Malaysia, the Philippines and Viet Nam.

- **South Pacific cluster:** Countries in the South Pacific, excluding Australia and New Zealand.

For each of the three regions, a HCW working group should be established to share experiences on the practical management of HCW and to update each other on lessons learnt. Additionally, a vertical experience exchange among these clusters should take place regularly.

The exchange of lessons learnt between systems in transition and advanced systems, and/or systems in transition and underdeveloped systems, could benefit less-developed countries and help ensure better utilization of funds planned for the improvement of the systems.

5.2.2 Regional improvements in the South Pacific cluster

It is recommended that WHO in cooperation with SPREP consider an application for an HCW project to be funded by GEF to reduce the unintentional production of POPs in South Pacific health-care facilities.

5.2.3 Improved database on regional HCW documents and tools

The analysis of available documents shows that a wide variety of potentially useful action plans, guidelines, policies, regulations, etc. are available but often difficult to find. It is recommended that these documents be made available on the WHO website or another platform for HCWM in the Region.

5.2.4 Standardization of the legal and administrative framework

The study shows that a regulatory framework for HCWM does not exist in the South Pacific region. Responsibilities for monitoring and supervision of HCW activities are not clearly defined and the monitoring capacities of enforcement authorities can be regarded as weak. As an immediate intervention, HCW policies and guidelines should be introduced to support subsequent implementation of national HCW strategies and plans. To ease implementation, templates for the development of policies, strategies and guidelines should be made available.

5.2.5 Regionalization of the training system

In an effort to standardize and harmonize training systems, it is recommended regional curriculums or training materials for HCW training be issued, as they are by WHO Regional Office for Europe, so they can be easily adapted and used by countries. This will also enable the training of participants from several countries to be conducted at the same time or in parallel and will avoid the unnecessary duplication of activities. Additionally, standardized training for treatment facility operators and inspectors should be developed.

5.2.6 Coverage of all hazardous HCW categories during strategy and action plan development

HCW is defined as the total waste stream from a health-care facility, including all hazardous and non-hazardous waste streams. Within the Western Pacific Region, management of hazardous HCW tends to focus on so-called “medical waste”, which in most countries is defined as a waste stream that includes infectious waste, sharps and pathological waste but does not normally include chemical, pharmaceutical or radioactive wastes. It is strongly recommended that countries include these other categories of waste when developing HCW strategies, policies and actions plans. Considering that governments have adopted a global, legally binding treaty to realize mercury-free health care by 2020, it will be important that countries be ready to address the disposal of mercury when they begin substituting mercury-based medical devices with alternatives.

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