Baseline and Benchmarking Assessment for Health Care Waste Management in Bhutan

Project Report

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ACRONYNMS AND ABBREVIATIONS

3R	Reduce, Reuse, Recycle
ADB	Asian Development Bank
AHB	Annual Health Bulletin
BAT	Best Available Technology
DBE	Department of Bio-Medical Engineering
BHSQA	Bhutan Healthcare Standard for Quality Assurance
CRRH	Central Regional Referral Hospital
COVID-19	Coronavirus disease 19
DCS	Department of Clinical Services
DRA	Drug Regulatory Authority
EPI	Expanded Program on Immunization
FNPH	Faculty of Nursing and Public Health
GAVI	Global Alliance for Vaccines and Immunization
GNH	Gross National Happiness
HCW	Health Care Waste
HCWM	Health Care Waste Management
HIDD	Health Infrastructure Development Division
ICMWM	Infection Control and Medical Waste Management
IPC	Infection Prevention and Control
JDWNRH	Jigme Dorji Wangchuck National Referral Hospital
KGUMSB	Khesar Gyalpo University of Medical Sciences of Bhutan
KII	Key Informant Interview
MOH	Ministry of Health
MW	Medical Waste
DECC	Department of Environment and Climate Change
NMS	National Medical Services
NSB	National Statistics Bureau
ORC	Out Reach Clinic
РНС	Primary Healthcare Center
PPE	Personal Protective Equipment
QA	Quality Assurance
RGOB	Royal Government of Bhutan
SOP	Standard Operating Procedures
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Fund
UHC	Universal Health Coverage
WHO	World Health Organization

EXECTIVE SUMMARY

Innovations in health technology and infrastructure have significantly propelled the advancement in healthcare services. Complexities in the dynamics of health needs raced countries across the world to make varied healthcare services available, accessible and affordable to its populations. Logical expectations suggest that an increase in healthcare needs will lead to higher demand for healthcare services.

In context of Bhutan, with evolving health needs there has been an increase in introduction of advanced healthcare services, addition of further advanced and specialized healthcare services in future can be anticipated, and a notable expansion of the immunization program is witness with 6 vaccines in 1979 to 13 vaccines currently not forgetting the health infrastructures. Battling and controlling emergent infectious diseases such as COVID-19 is yet an another example of increase in healthcare services. However, the addition of services directly correlates with the increase in the amount of healthcare waste generation. Aligning with the Constitution of the Kingdom of Bhutan's mandate to maintain 60% of the country under forest cover indefinitely Bhutan find itself at the crossroads. Striking a balance between the developmental activities and the commitment to the world to remain carbon-neutrality Bhutan has been seeing many challenges, which are at times difficult to overcome because of constraints in financial resources, in particular. One particular activity that often threatens these commitments is the waste management which is in fact proliferating the environmental degradation not only in Bhutan but worldwide at an increasing pace. Although in 2019 Bhutan adopted the National Waste Management Strategy to achieve "Zero Waste Bhutan by 2030" many relentless efforts need to be dedicated to attain the target. Under the umbrella of waste management, Healthcare waste management strikes out to be an important issue considering the nature of waste that is produced as a result of healthcare activities. Every year the healthcare waste generated is on the rise which left unchecked can prove disastrous to both the environmental and human health.

In a pivotal stride to address the concerns of healthcare waste management in South-West Asia, the United Nations Development Program in collaboration with the Ministries of health of three country namely Bangladesh, Bhutan and the Maldives, embarks on an important journey towards making healthcare waste management efficient. Thus, this "Baseline and Benchmarking assessment on healthcare waste management in Bhutan" is an initiative under the multicounty project 'Improvement of Infectious Waste in South West Asia" led by regional Project Management Unit, Bangkok Regional Hub (BRH), United Nations Development Programme (UNDP), in close collaboration with the UNDP country office and National Medical Services, Ministry of Health, Bhutan. For Bhutan, this initiative underscores Bhutan's current status of the health care waste management in the country and its commitment to elevate healthcare waste management practices and responses for improvement. The current status on the assessment of baseline and benchmarking of the healthcare waste management system in Bhutan was possible by carrying out

a meticulous desk and literature review encompassing policies, Acts, Regulations, Standard Operating Procedures, reports and data on waste management, together with key informant interviews.

The GAVI-HCWM Maturity Model which was designed and published in 2020 by the GAVI, the vaccine Alliance initially was targeted to look into the effectiveness of the immunization waste management system. However, its structured framework approach served as a valuable tool for identifying the best practices, challenges, and explore opportunities for healthcare waste management within the broader scope of health care system and programs. Many countries across Asia has been able to categorize their HCWM system using this model. Experiences from countries such as Lao PDR, Myanmar, Nepal and People's Republic of China indicates that this model served as a catalyst to determine not only the efficiency of their HCWM system but also help them in strategizing plans for an improved system.

Using the GAVI-HCWM maturity model the current health care waste management system in Bhutan scores 2.5, placing Bhutan at Level of 2 of HCWM-model. Following the deductions made in all the key six areas defined by the model major weakness in HCWM in Bhutan is found to be in the area of all the three major categories. Firstly, "Training and awareness" on HCWM which of course are carried out for the healthcare providers, handlers and private stakeholders. However, the challenges that remains to be tackled are the irregularity in the trainings, which are often budget dependent and to manage and training of healthcare waste handlers, which often sees high turnover rate both in healthcare system and in other sectors. With the challenges in sensitization and awareness on HCWM, compliance to the whole process from segregation of waste at source till the end disposal stage remains shrouded due to the unavailability of the data. Yet from the Key Informant Interview and few available data from reports, "compliance and adherence" to the best practices remains a key area of concern. The compliance and adherence to environmental Acts and Regulations are yet another area wherein gaps are identified mainly in monitoring and ensuring the adherence both from the primary implementing agencies and agencies defining the Acts and Regulations. "Compliance and Adherence", the second key area of benchmarking thus seek critical attention to it and the urgent need to establish an evidence-based data on understanding the status. Despite having good practical guidance (third key area), lack of budget (Budget and Planning being the fourth key area), and the need to update and revise key documents (Policy and Strategic Plans: fifth key area) to standardize the practices contributed towards making the processes of HCWM to be prioritized. With Bhutan's commitment to remain carbon-neutral country having an operational incinerators and the practice of open-burning still pose a substantial risk for the environment. However, Bhutan's healthcare system has incorporated mitigation measures by ensuring that all the healthcare facilities are equipped with autoclaves, one of the "Best Available Technology" (being the sixth key area of benchmarking) and the adoption of "3Rs" for the HCWM. Definitely as promised and outlined in the "Environmental and Social Impact Assessment and Environmental and Social Management Plans -2023" Bhutan is on the road to

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address the challenges and issues in current HCWM-system. During the generation of this report data on the functionality of autoclaves in healthcare centers and how many healthcare facilities are implementing "3Rs" were not available. Nonetheless, despite notable strengths evident from this assessment of baseline and benchmarking of HCWM in Bhutan there are many opportunities that can be sought for to make the HCWM system one of the best in the region.

SECTION 1

Introduction

Bhutan, a small Himalayan Buddhist country, places great emphasis on its Happiness index, measured through the concept of Gross National Happiness (GNH). The country takes pride in its distinctive healthcare system, where services are provided for free as enshrined in its constitution. This not only contributes to the alleviation of high out-of-pocket expenditure on health but also reflects Bhutan's commitment to holistic well-being. With the increase in population, Bhutan has witnessed a corresponding rise in number of healthcare facilities, ensuring the availability and accessibility of the health care services to all. To offer alternative healthcare options, traditional healthcare services are integrated in hospitals, complementing the allopathic and modern health care services. As of 2022, the country has 53 hospitals, 186 primary health centers (PHC), and 51 sub-posts (an extended outreach clinic of primary healthcare centers) to meet the healthcare needs of 0.7 million population while concurrently striving to achieve the World Health Organization's Universal Health Coverage (UHC).

In tandem with its focus on healthcare accessibility and quality, Bhutan has also prioritized responsible and robust healthcare waste management practices to promote environmental sustainability and public health. The healthcare waste management program in Bhutan was initiated in the year 1994 under the funding of Danish International Development Agency (DANIDA) in response to detection of the first HIV case in the country. The healthcare waste management program evolved to be known as the "Infection Control and Medical Waste Management" program within the purview of Ministry of health, Bhutan.

Management of health care wastes generated from health care facilities falls under the purview of Ministry of Health, which is centrally monitored and regulated by the National Environmental Commission (NEC) which is presently named as "The Department of Environment and Climate Change (DECC). DECC which is the highest decision making and coordinating body across the sectors oversees all matters related to the protection, conservation and improvement of the natural environment. DECC formulates and develops policy documents including Acts, Regulations and guidelines that serves as the functional framework for agencies and sectors involved in waste generation and responsible management of the waste.

Background

Health care waste management poses a burgeoning challenge for Bhutan on its journey towards resilient and environmentally conscious healthcare system.

Healthcare waste management is a critical aspect of healthcare systems. Health care waste management focuses on safe and responsible disposal of waste generated from health facilities. Healthcare waste consists of wide range of materials, from infectious and hazardous waste to non-hazardous waste. The proper management of healthcare waste is essential to protect the well-being of healthcare workers, patients, and the environment from potential health risks. In Bhutan, while there is no specific clause on Healthcare Waste Management, the Waste Prevention and Management Act of 2009 emphasizes the need for safe waste management practices.

With increase in demand for both quality and quantity of health services, Bhutanese health care system is embarking on journey to cater to the need of its people and save country of the escalating out of country referrals costs with the introduction of specialized services at the tertiary level (few examples are: catheterization laboratory in Jigme Dorji Wangchuck National Referral Hospital (JDWNRH), Dialysis facilities in other regional and cluster hospitals) and scaling up of the comprehensive health care service package at the Primary health care centers. With increase in services the health care waste generation is forecasted to increase. As per UNDP-Bhutan reported that in the year 2021 the health care facilities around the country generated over 490 metric tons of HCW, which was one of the highest in the recent years. The culminating effect of COVID-19 pandemic cannot be disregarded for the mounting HCW generation and the issue is more worrisome with increase in infectious waste production.

UNDP-Bhutan in collaboration with Ministry of health carried out a small-scale baseline and benchmarking assessment using the GAVI-HCWM-maturity model in the year 2022. This assessment provides a great insight into current HCWM practices. Many processes are in practice and risk mitigation measures implemented guided by the National Guideline on Infection Control and Medical Waste Management-MoH (2014) and Waste Prevention and Management (Amendment) Regulation (2016).

However, it was also observed that many challenges and barriers remain a threat to the robust HCWM for Bhutan. Few highlights from the assessment concludes that there still remains capacity-building gap for the care waste handlers starting at the point of waste-generation and the concerning knowledge-practice gap and subtle existence of gender disparity. Low compliance to the guidelines were observed while in some lack of Standard Operating Procedures can be attributed to improper HCWM. Commendable initiatives such as arrangements of the transportation, installment of the incinerators, treatment facilities (e.g Autoclaves), even the use of GPS for tracking (e.g K-tracker for municipal trucks), reporting system to the Ministry of Health and to the DECC are in place, yet there remains a lot of opportunity for improvement.



Bhutan must take advantage of this chance for developing focused initiatives to overcome the challenges and barriers. By prioritizing healthcare waste management, the well-being of the healthcare workers, patients, and the environment can be safeguarded. Resilient strategies to ensure the long-term viability of healthcare system and foster environmental consciousness by proper HCWM can be guided by having a baseline and benchmarking assessment for the country.

Objective of the project

The primary aim of this project was to assist UNDP country office to conduct baseline and benchmarking assessment of health care waste management in Bhutan which will aid the Ministry of Health in Bhutan, health agencies, and pertinent stakeholders engaged in Health Care Waste Management (HCWM) to implement healthcare waste management practices and technologies that are suitable for the local context, addressing both infectious and non-infectious healthcare waste.

Methodology

For the baseline and benchmarking assessment, the methodology used were

1. Desk and literature review

To understand the current stand and status of the health care waste management in Bhutan for the baseline and benchmarking assessment the national legislations and polices were reviewed. Technical guidelines and standards relevant to HCWM were also looked into to get more insight into the current status of HCWM in Bhutan. An extensive literature review of standards and guidelines issued by World Health Organization, research work carried out on Bhutanese context which are published in peer review journals and technical working report on HCWM in the country were reviewed.

2. Stakeholders meeting

Stakeholders for the HCWM were identified and meeting carried out twice for the purpose of feedback on the baseline and benchmarking assessment method initially and agree and provide feedback on the current level of HCWM and the country report. The local stakeholders aimed at were representatives from healthcare professionals, waste handlers, environmental experts, policymakers and international developmental partner (UNDP) who had been actively involved in HCWM in Bhutan.

Baseline and benchmarking assessment framework

For the country's health care waste management baseline and benchmarking assessment framework the GAVI-Health care waste management maturity model-2020 which is developed by GAVI is used as depicted in Table 1. Although this GAVI-HCWM Maturity Model is designed

for the assessment of HCWM-systems in the context of immunization programs, it serves as a useful tool for overall HCWM from the experiences of many developing nations. The findings from this assessment exercise can be used as a starting point to understand the broader spectrum of HCWM in country and thereby address the challenges, leverage on the strengths and seek out the opportunity for a robust HCWM for safe and clean world. This framework takes into consideration the six key areas of HCWM as shown in the following table.

Table 1: Six key areas for assessing the maturity of HCWM system (Gavi the Vaccine Alliance, 2020)

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

SECTION 2: OVERALL WASTE MANAGEMENT IN BHUTAN

Health care system of Bhutan

The health care system is based on the primary healthcare approach after becoming a signatory to the Alma-Ata Declaration in 1978. The health care services are made available through a threetier structure: at primary level is the basic health care units (BHUs) which now is renamed as Primary Health care centers (PHCs), sub-posts and outreach clinics (ORCs) which are under the PHCs, at secondary level is the district or general hospitals and at the tertiary level is the regional and national referral hospitals. Traditional and allopathic medical services are completely integrated and provided within the framework of the Ministry of Health in Bhutan. To cater to the need of the citizens few diagnostic centers are allowed to be operated which are mandated to meet the requirement of the MoH and abide the regulations of Medical and Health Professionals Council (MHPC). Royal Center for Disease Control (RCDC) and Vector-borne Disease Control Program (VDCP) are public health monitoring and surveillance centers for disease control under the MoH. Table 2 sums up the total number of healthcare facilities (includes allopathic, traditional, private diagnostic centers and disease-control centers) in Bhutan, while Figure 1 shows the distribution of healthcare facilities district-wise. These health care facilities across the country are the main source of healthcare waste generation.

District	Tertiary Level	Tertiary Level Secondary Level		Primary Level		
District	Referral	District	РНС	Sub post	ORC	
Bumthang		1	5	0	11	
Chhukha		5	13	2	41	
Dagana		3	7	0	34	
Gasa		1	3	0	5	
Наа		1	4	2	17	
Lhuentse		1	14	0	32	
Monggar	1	1	22	5	58	
Paro		1	3	2	21	
Pemagatshel		2	11	7	36	
Punakha		1	7	1	10	
Samdrup Jongkhar		5	7	3	30	
Samtse		4	12	5	50	
Sarpang	1	2	11	1	13	
Thimphu	1	3	12	0	16	
TrashiYangtse		2	7	2	26	
Trashigang		7	14	4	54	

Table 2: Health	care facilitie	es of Bhutan
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Trongsa		2	5	4	6	
Tsirang		2	7	0	20	
Wangdue		2	12	8	27	
Zhemgang		4	10	5	34	
Total	3	50	186	51	541	
Approved Private diag	gnostic centers	tic centers Total existing private diagnostic centers 13				
Royal Center for Dise	ase Control (RCDC	Control (RCDC) 1(located in Thimphu). This center carries out				
		testing of the samples				
Traditional medicine	unit 80 in total wh	80 in total which are integrated with the health centers facility.				
(TMU)	NTMH which	NTMH which is the sole traditional hospital located in Thimphu is				
	accounted for	accounted for under the secondary level of service.				

(Source: MoH-website and Annual Health Bulletin, 2023)

Figure 1: Distribution of Health facilities (Hospitals and PHCs) by District (AHB-2023)



(map credit: AHB,2023)

For the total population of 770,276 spanning over total area of 38,394 sq.km Bhutan has been successful in reaching the unreached in-terms of Universal Health Coverage. With increase in health care facilities an increase in health service utilization is evident from the total caseload reported over the past 5 years (2018-2022) by MoH (Ministry of Health, 2023).

Health care waste management in Bhutan

The Ministry of Health oversees the management of medical waste from healthcare facilities nationwide. With the increase in healthcare facilities and health care services, and with an increase in health service utilization waste generation each year is in the rise. The health care waste management throughout the country is guided by the National Guideline on infection control and medical waste management (ICMWM-2018) and Guideline for disposal of pharmaceutical waste (Drug Regulatory Authority, 2014). The management of the wastes produced by healthcare facilities in Bhutan is addressed through infection prevention and control (IPC), and waste management activities.

Medical waste refers to all categories of waste generated from health facilities, clinics, animal husbandries, veterinary hospitals and other clinical laboratories, and home-based treatment of patients (Ministry of Health, 2018; NEC, 2012). Health care waste is categorized as hazardous and non-hazardous as shown in the figure 2. Non-hazardous wastes constitute about 75%-90% which doesn't require any special treatment. About 10%-25% is considered as hazardous waste, thus requiring special treatment and management to reduce the transmission of infection, cause injury and environmental pollution.





Sources of Health Care Waste

These sources of healthcare waste encompass healthcare facilities, such as hospitals and clinics, where medical activities generate substantial amounts of waste. Additionally, private diagnostic facilities, private pharmacy and home-based treatment contribute to the overall generation of

healthcare waste. The waste generated in healthcare facilities, research centers, and laboratories during medical procedures is classified differently by the World Health Organization (WHO) and the Waste Prevention Management Regulation-2012 of Bhutan. WHO terms it as health-care waste, while Bhutan's regulation defines it as Medical Waste. The classification outlined in Table 3 adheres to the Waste Prevention Management Regulation-2012 and includes categories such as General waste, Pathological waste, Infectious waste, Sharps, Pharmaceutical waste, Chemical waste, Radioactive waste, and Pressurized containers.

Waste cate	gories	Description
Non- Hazardous	General waste	Waste free of pathogenic micro-organisms or hazardous substances. Therefore, harmless and does not need special handling or treatment.
	Infectious waste Sharp wastes	Comprises organisms that may harbor pathogens capable of causing infections. It includes laboratory culture stocks, live or attenuated vaccines, human and animal cell cultures, infectious agents obtained from research laboratories, biological toxins, utensils and instruments used for transferring cultures, as well as used syringes and contaminated materials. Suture needles, scalpel blades, lancets, broken vials / ampoules/
	Pathological waste	pipettes/glasses, knives and infusion sets. Body parts and tissues, body fluids, dead fetuses, placenta, blood and blood products.
	Pharmaceutical waste	Unused, contaminated expired drugs, vaccines, serum and recalled (quality failed) medicinal products, medicine returned by patients.
Hazardous waste	Genotoxic waste	Cytotoxic drugs, highly toxic and may contain mutagenic, teratogenic or carcinogenic properties.
	Chemical waste	Laboratory reagents, X-ray film developer, disinfectants and others like Deltamethrin etc.
	Radioactive waste	Radioactive substances used for diagnostic or therapeutic purposes. Blood, urine and faeces of patients on treatment or tested with radionuclides.
	Pressurized containers	Gas cylinders (anesthetic gas, oxygen, compressed air in health facilities) stored in pressurized cylinders, cartridges, aerosols and cans.
	Heavy metals	Mercury from broken thermometers and mercury sphygmomanometer, dental amalgam, cadmium from batteries, tube lights and bulbs.
	<i>E-wastes</i>	Printer cartridges, computers etc

Table 3: Health care waste description as per ICMWM-2018

Despite the varying terminology, these classifications essentially denote the same types of waste originating from healthcare settings. Although, tailoring the terminologies to our country context allows for better alignment with our local needs and circumstances, establishing common terminology can enhance clarity, consistency, avoid confusion and effective communication in the management of healthcare-related waste and facilitate international cooperation.

Health Care Waste generation rates

According to the Bhutan Waste Accounts report, health centers generate a combined annual waste volume of 1,086 tons. Of this total, 363.5 tons, representing 33.48%, was classified as medical waste, requiring specific treatments such as incineration and autoclaving. The remaining 722.5 tons per year, constituted non-hazardous general waste (NSB & Escap, 2021).

In 2020, the Ministry of Health documented a total waste generation of 622.05 tons from all the 20 districts, of which general waste amounted to 46% of the total waste while the remaining 54% was specifically categorized as infectious waste. Infectious waste takes into account pathological. Infectious, pharmaceutical, sharps, chemical, pressurized and radio-active wastes generated from the healthcare facility whereas the general waste constitutes of food waste and non-clinical wastes. While the Bhutan State of Environment Report-2022 reported that the annual health care waste generation in 2021was around 690 tons of which 268.21 tons (39%) constituted general waste and 421.57 tons (61%) made up infectious waste (ADB, 2022; NEC, 2022). In 2022, Infection Control Program, MoH, recorded 52% of general waste and 48% infectious/hazardous waste. From these reports it can be deduced that the HCW-generation is on the rise and all the more it is concerning that infectious waste are generated more than the general waste. Based on the data from varied sources (HCWM-report and record maintained by MoH and from NEC-report), trend in HCW generation is illustrated in figure 3.





While there had been a decline in infectious waste in 2022 fair assumption can be made that during the rise in infectious wastes could be associated with the surge in COVID-19 waste. During the pandemic all COVID-19 related waste were treated and managed as infectious/hazardous waste. From the table 4 it can be deduced that Thimphu, the capital city of Bhutan and houses the national referral hospital produces the highest healthcare waste. However, an interesting observation can be made in the context of Chukha which produced 38.2% of HCW in 2020 which reduced to 6.5% in 2022. Some of the assumptions such as COVID-19 pandemic, waste reporting system or data error can be made. This assumption positively suggests the need for the evidence-based primary data if we have to move towards robust HCWM system in country. This need for the primary data is resonated in the HCW reporting by facility level presented in table 5.

	Total healthcare waste in 2020 was 622050.50 kgs	Total healthcare waste in 2022 was 700148.86 kgs
Dzongkhags	Percentage of waste produced district wise in 2020 (100%)	Percentage of waste produced district wise in 2022 (100%)
Bumthang	0.7	0.6
Chukha	38.2	6.5
Dagana	0.9	1.0
Gasa	0.1	0.0
Haa	0.4	0.6
Lhuntse	0.3	0.3
Mongar	3.6	4.9
Paro	2.4	2.6
Pemagatshel	0.7	0.8
Punakha	2.6	3.9
S/Jongkhar	1.4	2.1
Samtse	1.6	2.3
Sarpang	6.6	7.7
Thimphu	32.4	50.2
Tashigang	2.5	3.1
Trashi Yangtse	0.9	0.9
Trongsa	0.7	0.4
Tsirang	0.6	2.9
Wangdue	2.7	8.5
Zhemgang	0.6	0.6

Table 4: Percentages of waste production district-wise in the year 2020 and 2022

Table 5 data suggests most importantly that the waste generation as per WHO categorization of non-hazardous and hazardous health care waste (80:20) doesn't add up. Plus, Primary health care level produces more hazardous healthcare waste than non-hazardous waste which suggest the need to understand the factors contributing to current scenario.



HCF level	Total health facility	Non-infectious (tons)	Infectious (tons)
Tertiary level HCF	3+1*	210.75	193.46
Secondary level HCF	53	138.75	127.45
Primary health care	228	13.26	16.47
Total	280	362.77	337.37

Table 5: HCW generated as per the level of HCF in 2022

*3 referral hospital and 1 RCDC

According to the Ministry of Health's report on the nation's health, the total caseload (total hospital visitors) in health facilities for the year 2022 amounted to 2,109,458 (Ministry of Health, 2023). Given this population seeking healthcare services in the year 2022, the waste generation rate per person in kilograms, calculated from a total of 700148.864 kg using WGR formula is:

WGR per person= $\frac{Total Waste Generated in 2022}{Total Caseload in 2022}$ Total waste generated in 2022= 700148.864 kgs

Total Caseload in 2022= 2,109,458 persons

WGR = 0.33 kg/person

Following the same formula the hazardous waste per hospital bed per day can be calculated. The total number of inpatient (IPD) beds (per 10,000 population) was increased to 1650 in 2022 from 1640 in 2020. The infectious/hazardous waste generated in 2022 amounts to approximately 0.56kg per hospital bed per day, exceeding the World Health Organization (WHO) estimate of 0.2kg of hazardous waste per hospital bed per day for low-income countries. The utilization of the Waste Generation Rate (WGR) requires careful consideration, as not all healthcare facilities generate equivalent amounts of waste. Disparities could be due to factors such as the facility's size, bed count, occupancy rates, the nature of services provided and the total population within their catchment area. Therefore, caution should be exercised when relying on WGR as a measure, taking into account the diverse characteristics of healthcare facilities that influence waste production. Nevertheless, analyzing the reasons behind this increase could provide valuable insights for waste reduction strategies or improved waste management practices in the future.

Immunization-related waste generation

The Expanded Program on Immunization was inaugurated in the country on November 15, 1979, during the International Year of the Child. Its primary objective was to diminish morbidity and mortality related to seven vaccine-preventable diseases: Tuberculosis (TB), Diphtheria, Pertussis, Tetanus, Polio, Measles, and Hepatitis B. Tetanus Toxoid (TT) immunization for pregnant mothers was introduced in 1983 (Ministry of Health, 2011). Subsequently, in 1987, the National Plan of

Action for accelerating the Expanded Program on Immunization (EPI) was formulated. Due to robust government commitment and community mobilization, the Universal Child Immunization (UCI) milestone was achieved in 1991. Table 6 gives an overview of current routine immunization schedule in Bhutan which also depicts how important it is to account for immunization waste separately.

Vaccines	No. of doses	Age of administration
BCG (Bacille Calmette Guerin)	1	At birth or first contact
Hepatitis B	1	At birth (within 24hrs as zero dose)
DTP-Hep B-Hib (Pentavalent)	3	1-at 6 weeks, 2-at 10 weeks, 3-at 14 weeks
Oral Polio Vaccine (OPV)	4	0-at birth (within 0-14 days), 1-at 6 weeks, 2-at 10 weeks, 3-at 14 weeks
Inactivated Polio Vaccine (IPV)	2	1-at14 weeks, 2-at 8 months
Pneumococcal Vaccine (PCV)	3	1-at 6 weeks, 2-at 10 weeks, 3-at 9 months
Measles Mumps and Rubella (MMR)	2	1-at 9 months, 2-at 24 months
Diphtheria, Tetanus and Pertussis (DTP)	1	Booster at 24 months
Totomus direkthoria (Td)	2	School going boys &girls (class PP & 7)
Tetanus diphtheria (10)	2	Out of school boys and girls (at 6 yrs & 13 yrs)
	2	HPV1 &HPV2 for boys and girls of class six
Human Papilloma Virus (HPV)	2	For out of school girls &boys at the age of 12 yrs
	3	For girls and boys 15 years and above
	1	Pregnant women, Health workers, Chronic medical conditions and Elderly population 65 years and above
Seasonai influenza vaccine	2	Children 6 to <24 months Children with chronic medical conditions for 2-8 years

Table 6: Routine immunization schedule in Bhutan

(Source: MoH, 2024)

National immunization, a substantial healthcare activity, significantly contributes to healthcare waste (HCW); however, it is not individually inventoried. As per the annual health bulletin, the Crude childhood immunization coverage in 2022 was 96.69 % (Ministry of Health, 2023) while in 2021 it was 94.1% (Ministry of Health, 2022).

Immunization is provided by all the healthcare facilities in Bhutan from ORC-without shed to National Referral Hospital. When it comes to management of immunization waste, the ICHWM-2018 and pharmaceutical waste management by DRA is followed. The waste generated from immunization activities are not accounted for separately. However, Vaccine Preventable Disease Program, Ministry of Health does keep track of the vaccine wastage rate. Due to unavailability of the data and lack of formal information the perspective could not be incorporated in this report. However, the waste produced within the healthcare sector should be handled in a manner that

ensures safety for both human health and the environment, avoiding any negative consequences (NEC, 2012, 2016).

During COVID-19 the scenario however was different. For a small landlocked country with a population of around 760,000, the year 2020-2022 tested our collective strength in confronting the highly feared and widely discussed pandemic. On a positive note, COVID-19 has played a role in significantly enhancing Bhutan's capability for quality storage of routine and COVID-19 vaccines. The storage capacity has seen a threefold increase, expanding from 95,000 liters to 372,638 liters, covering a diverse range of temperatures (UNICEF-Bhutan, 2022). However, it's essential to acknowledge that the surge in COVID-19 tests and the extensive vaccination efforts has substantially contributed to the generation of healthcare waste (HCW) in the country. The waste related to COVID-19 vaccination is discussed under the heading COVID-19 waste management.

COVID-19 Waste management

Bhutan, like many nations worldwide, faced the challenges posed by the COVID-19 pandemic. The first case was reported in March 2020, leading to a series of measures implemented to curb the spread of the virus. With the formation of National COVID-19 Task force, robust standard operating protocols ranging from identification of a quarantine facilities, contact-tracing, waste management, travel restrictions, testing and diagnosis were developed and made available to all health care facilities and administrative agencies. The SoP on waste management was derived from ICMWM-2018 (Ministry of Health, 2020). As of May 8, 2022, the country recorded a total of 59,497 confirmed cases and 21 associated deaths. The impact extended beyond public health, significantly affecting Bhutan's economy. The country experienced an estimated 3.4% contraction in its gross domestic product in 2021 compared to the pre-COVID growth of 4.3% in 2019. The enduring effects underscore the multifaceted challenges posed by the pandemic on both health and economic fronts in Bhutan. Bhutan with support from donors was able to vaccinate 90% of the its eligible population against COVID-19.

Due to the paucity of the data on COVID-19 waste generated and shortage of accessible published documents related to the management of COVID-19 waste it is challenging to draw definitive conclusions about COVID-19 waste management. Nonetheless, there are few available reports on COVID-19 waste from which can draw fair conclusions. UNDP-Bhutan, for instance reported that Thimphu alone generated on an average 350kgs of waste every day from 57 facilities identified and designated out of 54 flu clinics and 302 quarantine facilities in the country. NEC reported that a combined quantity of 26 tons of infectious waste, including materials related to COVID-19, produced by Jigme Dorji Wangchuck National Referral Hospital (JDWNRH), was disposed of through incineration at Memeylakha (the biggest and the only landfill in Thimphu) (NEC, 2022). During the pandemic UNDP- Bhutan facilitated the procurement of 175,000 medical masks, 9,990 face shields, 7,000 gowns, 500 thermometers, and 200 body bags (UNICEF-Bhutan, 2022). Establishing an aggregate for COVID-19 waste is challenging. However, a study by Yangdon et

al. (2023) underscores the significant impact of facemask waste alone during the COVID-19 period. The facemask waste alone highlights the concern of surge in plastic waste and negligence of the of the accountable agencies exposing not only the fragility of the waste management system but also the inefficiencies and inadequacies in both social and technical aspects of the HCWM in the country. COVID-19 waste takes into account the COVID-19 vaccination wastes too. All COVID-19 waste were treated as infectious wastes and its management were guided by ICMWM-2018 and WHO (2020).

COVID-19 Vaccination waste

Table 7 and 8 enumerates vital information on COVID-19 vaccination in Bhutan. The information in the tables is based on the report published by Ministry of Health & World Health Organization (2022).

Year	Doses	Туре	Country	Used for
Jan 2021	150,000	Covishield	India	Nationwide campaign of
March 2021	400,000	Covishield	India	First dose
July 2021	500,000	Moderna	USA	Nationwide campaign of
				second doses.
2021	250,000	AstraZeneca	Denmark	
2021	82,500	AstraZeneca	Croatia and Bulgaria	Nationwide campaign
2021	5,850	Pfizer	COVAX: USA	begins for booster doses of
2021	50,000	Sinopharm	People's Republic of China	vaccine.
September	200,000	Purchased by	MoH, Royal Government of	
2021		Bhutan		

Table 7: Types and doses of COVID-19 Vaccine received by Bhutan

Activity	Outcome
First Nationwide vaccination campaign:	• 472,139 eligible adults > 18 years vaccinated (total
AstraZeneca	eligible adults 533,500)
	• 94% of eligible population vaccinated
Second Nationwide vaccination	Second dose for adults
campaign: Moderna, Pfizer-BioNTech,	• First does for Children aged 12-17 (78.6%)
Sinopharm	• 94 % of eligible population vaccinated
Nationwide campaign begins for booster	• 93.5% age 12 and above got second jab
doses of vaccine.	
Booster dose to 228,000 people in	• 99.6 % vaccinated
priority groups	

Nationwide campaign begins for	٠	Close to 130,000 children below 12 years, data on
vaccination of children aged 5-11.		how many were vaccinated could not be traced.

- By mid-April 2022, 91 percent of the entire Bhutanese population had received two standard doses of vaccine and a booster shot
- 169,148 tests were reported to be carried out during the initial phase of the pandemic.

The COVID-19 Vaccination dashboard for the WHO South-East Asia Region (2024) indicates that, as of October 30, 2022, Bhutan has administered a total of 2,011,426 doses of the COVID-19 vaccines. The waste generated from vaccination used and unused vials (expired or spoiled), sharps, and non-sharps waste which needs to be managed as per the WHO guideline (WHO, 2022). Determining the waste generated from the COVID-19 vaccine could not be carried out, primarily because there is a lack of available waste generation rate or wastage factor per dose specific to our country's context, as well as the absence of such data from neighboring regions, which otherwise could be used for estimation.

However, a rough estimation of syringes and sharps waste can be made by taking into consideration that a unit of full packet of syringe and sharps (syringe, needle, needle cap, packaging material) weighs 4.4557gm from a study carried out by Rayhan et al. (2022) in Bangladesh. In Bhutan, the total dose of COVID-19 vaccine administered was 2,011,426. Thus, the total waste of syringe, sharps and packaging generated will be (assumption made here is that one does will use one unit of the syringe and needle set). Total waste = 4.4557 gms X 2,011,426= 8962310.828gms which translates to 8962.31 kg. From March 2021-30th October, 2022 (Roughly over 1 year 8 months) the from just administering the vaccine amounted to 8962.31 kg or 8.96 tons. Other waste such as PPE, gloves, swabs, card-boxes etc are not accounted in this estimation due to unavailability of the data. In contrast, the Asian Development Bank on the other hand provided an estimate indicating that the waste generated solely from COVID-19 vaccine in 2022 was approximately 3.07 tons (ADB, 2022) which is around 3,070kg. However, the waste generation rate or estimation methods may differ between the sources, leading to discrepancies in the reported figures. Additionally, this highlights the importance of standardizing waste estimation practices to ensure accurate and consistent reporting across different entities or sources. And more importantly it can also be deduced the importance of providing the estimation of each category of waste and call action to revisit the current reporting system.

Health Care Waste Management

The medical wastes generated by the health care centers across the country are managed as per the ICMWM-2018 by the respective healthcare centers which is concurrent with National Environmental Acts and Regulations. Table 9, 10 and 11 outlines the medical waste management guidance to be adhered by all the health care facilities in Bhutan.

Table 9: Management of Medical Waste Management

1. Non-mazardous waste						
General waste	Type of bin/ color-code	Disposal				
Biodegradable waste/food	30L, Blue plastic bin with wheels and lid	Compost pit				
waste						
Non-biodegradable waste	50L, Green plastic bin with wheels and lid	Segregate/ recycle/ reuse/landfill				

1. Non-Hazardous waste

2. Hazardous waste

The waste generated is required to be segregated at the point of generation in the designated waste containers.

Hazardous	PPE	Color-	Bin description	Symbols
waste		code		
Solid	Utility gloves,	Red	30L, strong leak-proof plastic	
infectious	plastic apron,		bin with swing/pedal operated	SZ.
waste	gumboot, mask		lid and wheels	BIOHAZARD
Sharps	Utility gloves, gumboot	Yellow or white	Puncture proof sharps container/ boxes with bio- hazard symbol labeled as 'SHARPS'	
Cytotoxic waste	Mask, goggle, Utility gloves, boot, plastic apron &face shield	Purple	Container or plastic bag with its symbol	CYTOTOXIC WASTE
Chemical & Pharmaceutical waste	Utility gloves, plastic apron & mask, goggles, face shield	Brown	Container or plastic bag	Ċ
Radioactive waste	Lead apron		Lead container with radioactive symbol, labeled as "BIOHAZARD"	

(source: ICMWM, 2018)

Activities	Guidelines
Location of the	Infectious waste and non-infectious waste bins should be located in the area accessible to
waste bins	authorized personnel ONLY
Waste level	Waste should not be filled up to the brim of the bin. Only 3/4 of the bin should be filled and
	the waste bag should be tightly closed or sealed.
Waste storage	Waste storage place should be designated within the facility in a separate area or room. Details
	of storage facility.
	The storage duration of infectious medical waste should not exceed the following:
	• Summer: 24-48 hours
	• Winter: 24- 72 hours
Storage of	Cytotoxic waste must be stored separately from other medical waste in a secure and
cytotoxic waste	designated area and should be under lock and key.
Storage of	Radioactive wastes should be stored in lead containers. During radioactive decay, it should
radioactive	be labeled with the type of radionuclide, dated and taken back by the concerned dealers.
waste	
Storage	• Away from the kitchen, common passage and the main entrance.
facilities for	• Have a cement or impermeable floor.
hazardous	• Have access to water supply for cleaning purposes.
medical waste	Have proper drainage system.
	• Have easy access to staff handling the waste and waste collecting vehicles.
	• The area must be always kept locked when not in use.
	• Inaccessible to animals, birds, insects, rodents and non-authorized personnel.
	• The area should be well lit and ventilated.
	• Supply of cleaning items (broom, mops, detergents/ disinfectants, PPE (utility gloves,
	face-shield, plastic apron, gumboots) should be placed close to the storage place.
Sharp wastes	This includes objects, devices or instruments that are used to puncture, cut or scrape body
	parts. These include the following:
	1. Needles used during injections, biopsies, venipuncture or for suturing
	2. Blades including razors, surgical blades, scissors and stitch cutters
	3. Glass including broken ampoules, vials, glass and suction bottles
	4. Other sharps can include trocars, lancets, surgical instruments such as dissecting forceps
	and drill bits
Handling &	As these instruments are contaminated with body fluids and can cut or puncture, they should
Disposal of	be placed in a container which is: Puncture resistant, does not leak, can be sealed, labeled as
sharps	"biohazard" or Sharps
Prevention of	When sharps containers are full (3/4 of total capacity), it should be sealed and should not be
access to used	re-opened.
needles	• Sharps containers should not be shaken.
	• Sealed containers should be put away at a safe, designated place.

Table 10: Guidelines for Hazardous Medical Waste Management

Transportation	1. A pathway must be identified to transport Infectious/hazardous medical waste to the site			
of infectious/	of treatment and disposal.			
hazardous	2. If there is no separate pathway, wastes should be transported after the busy hours of the			
medical waste	facility.			
	3. Waste should	be secured to prev	ent leakage during transportation.	
	4. Specified haz	ardous waste trolle	ys or carts must NOT be used for any	other purpose other
	than to transp	ort waste.		
	5. Waste trolley	s or carts must be th	noroughly washed after disinfection	at the waste disposal
	site.			
Hazardous	Collection	Transportation	Treatment Method	Disposal
waste				
Solid Infectious	When the bin is	Only on	Autoclaving, Chemical	Municipal Bin
waste	³∕₄ full	specified waste	disinfection, incineration	Deep burial pit
		trolley or cart		
Pathological	When the bin is ³ /	4 full	Dispose of in deep burial pit	Deep burial pit
waste				
Liquid	Procedure specifi	c collecting	Decontaminate with 0.5%	Sewage system
infectious waste	container		bleaching solution in equal	with plenty of
			proportions (1:1) for 10 minutes	water
Sharps	When the box is ³	4 full	Autoclaving & shredding or	Deep burial pit or
			Incineration	recycle
Chemical &	Collected and sen	t to pharmacy for	Encapsulation	Landfill
Pharmaceutical	final disposal			
Waste				
Cytotoxic waste	Collect in leak-pr	oof container and	Encapsulation, Incineration,	Landfill and deep
	store in designate	d area	Chemical disinfection	burial pit
Radioactive	Collect in lead co	ntainer	Decay by storage	
waste				

(source: ICMWM-2018)

The primary method for disposing of healthcare wastes nationwide is deep pit burial and disposal at the identified landfill. Sharps are either autoclaved and buried in a deep burial pit, or needles are destroyed in needles destroyer and disposed in deep burial pit and in health facilities where there is no deep burial pit the sharps are destroyed or decontaminated with 0.5% chlorine and buried. Health facilities that have access to incinerator sharps are incinerated. Remaining medical wastes are separated, treated with bleaching powder, and then deposited into deep pit burials (NEC, 2022). This method of treatment and disposal were also reported by the HCF during their annual waste reporting to MoH.

The Primary Health Care centers (PHCs) which forms the backbone of Bhutanese health care system operates the Outreach clinics (ORC) and sub-posts. The waste generated at the ORCs and Sub-posts are collected by the respective PHCs, treated as per the ICMWM-2018 and undergoes

autoclave and burial pit disposal. In some districts, the district hospital van/ vehicle collects HCW from the PHCs nearby and are disposed-off to the designated landfill/burial pits. At the referral level, the referral hospitals collect HCW from the nearby PHCs and district hospitals falling under their respective Dzongkhags, and are either incinerated or disposed-off in the designated landfill following the ICMWM-2018 in compliance with Waste Prevention and Management Regulation (NEC-2012 & 2016). For example, for the HCW generated in Thimphu (the capital), the Thimphu thromde (municipality) is actively involved. Thimphu thromde collects general waste from Jigme Dorji National Referral Hospital (JDWNRH) twice a day and are disposed-off to the municipal landfill (Thimphu Thromde Office, 2019) while the chemotherapy waste from JDWNRH used to be taken for incineration at Gedu/Gomtu once a month in past. However, the incinerator at Gedu is no longer functional while the one in Gomtu is primarily installed for the cement factory is rarely used by health agencies. The healthcare waste generated by all the healthcare facilities follow the pathways as shown in figure 4 for its final disposal.



Figure 4: Overall healthcare waste disposal pathways

As of January 2024, Bhutan possesses three operational incinerators dedicated to the treatment of healthcare waste although initially amid the COVID-19 pandemic there were total of 4 incinerators. These incinerators were acquired and set up in 2020, during the COVID-19 pandemic. The installation of these incinerators was expedited with approval obtained from the National Environment Commission (NEC) due to the substantial volume of healthcare waste generated during the pandemic. Waste generated during the COVID-19 were treated as hazardous/ infectious wastes. However, there are very limited official record and documentation of the amount of 19

COVID-19 related wastes generated by the health care facilities or quarantine facilities. COVID-19 paved in the opportunity for the incinerators to be bought and brought into the country, although NEC till that date ensured that no services leading to environmental pollution is refrained from getting into the country. Table 11 provides information about operational incinerators installed specifically for waste management.

Incinerator	Place of installment	Status	Ownership
capacity			
300kg	Memeylakha, Thimphu	Non-	Installed in 2021. NEC initially operated but since
		Functional	2022 the operation has been halted due to lack of
			budget, human resource.
100 kg	Memeylakha, Thimphu	Functional	Operated by designated and trained person under
			the control of Ministry of Health
300kg	Konbar, Mongar	Functional	Installed in 2021. Operated by Mongar
	landfill		Municipality.
300 kg	Toribari, Phuentsholing	Non-	Installed in 2021. Operated by Phuentsholing
		Functional	Municipality.

Table 11: Sta	tus of Incinerators
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(Source: KII, ICP)



(source: UNDP-Bhutan website)

In picture: A 300-kg capacity incinerator procured with support from UNDP

All the incinerators were acquired through financial assistance provided by the donor and country development partners in the year 2021-2022. In addition to the existing incinerators, there are two 30kg and one 100kg incinerator which are yet to be installed. However, the installation is delayed due to several reasons such as prioritizing the health facility, taking up of ownership of the running and operational costs by the MoH and municipality, and the most important and pertinent being refusal of environmental clearance by NEC. As of now, neither the Ministry of Health (MoH) nor the DECC has a definitive plan to adopt alternative, pollution-free solutions in lieu of incinerators. Additionally, there is no existing plan to discontinue the current usage of incinerators. Nonetheless, many strategies are already making its way into better HCWM, for instance some of the healthcare facilities are implementing 3Rs- Reduce, Reuse, Recycle. According to the Environmental



Clearance Regulation (2016), the validity of environmental clearance for any project is five years. Before renewal, the NEC/DECC Secretariat or the competent authority conducts compliance monitoring. Failure to comply with the regulations or not meeting the standards as specified by NEC/DECC may result in offence (as per Chapter VIII (Offence and Penalty)) and imposition fine as per the Annexure VII of the Waste prevention and management regulation (2012).

Despite the World Health Organization's (WHO) discouragement of open burning and incineration of healthcare wastes in Bhutan, open burning is still prevalent in many Primary Health Centers (PHCs), and incinerators continue to be in use. This indicates a potential gap between recommended waste management practices and the current practices on the ground. Thus, raising concerns about the effectiveness and compliance to HCWM, and compliance to Acts, Regulations and guidelines on Waste management and in particular HCWM by both the implementing agencies (low adherence) and regulatory agencies (low/lack of monitoring).

Pharmaceutical waste management

Pharmaceutical waste comprises expired or partially used medicines, damaged or spilled biological products such as blood and serum, as well as rejected or recalled medicinal products (Drug Regulatory Authority, 2014). For the management of pharmaceutical waste, the guideline for disposal of pharmaceutical waste (1st Ed, 2014) developed by the Drug Regulatory Authority (DRA) is followed. The process of encapsulation has been discontinued and the most common method of disposal are dilution with water (1:3) and release in flowing water, or into the sewerage system. Some health facilities disposed-off in deep burial pit and some facilities take it to the landfill.

The pharmaceutical waste at PHC-levels is disposed-off in a burial pit while at district or referral level it is handed over to pharmacy and Medical Store Department for proper and appropriate disposal in line with the DRA guideline. The guideline for the pharmaceutical waste management is illustrated in the figure 5 process flow chart.



(source: DRA, 2014)

Figure 5: Process flowchart for pharmaceutical waste management

Legal framework of the waste management

The National Environment Commission (NEC) of Bhutan plays a crucial role in environmental governance and sustainable development in Bhutan. One of the important mandates of the NEC is to ensure the conservation of Bhutan's environment and sustainable use of its natural resources. NEC formulates and recommends the policies and regulations pertained to environmental conservation. Few examples of legislations on waste management are and is outline in table 12.

1. Regulation for Environmental Clearance of Projects 2016

2. The Water Regulations of Bhutan 2014

3. Waste Prevention and Management Regulation 2016

- 4. The Water Act of Bhutan 2011
- 5. National Environment Protection Act of Bhutan 2007
- 6. Environmental Assessment Act 2000

Regulations	Year	Summary of the document
Regulation for Environmental	2016	It highlights the objectives and regulatory framework (Procedures, monitoring, enforcement and
Clearance of Projects		reporting) with legal obligations for project proponents seeking environmental assessment and
		clearance such as Environmental Assessment Act and The Water Act of Bhutan.
The Water Regulations of	2014	This regulation ensures the enforcement, implementation, and effective execution of the Water Act
Bhutan		by Competent Authorities. It underscores the commitment to regulating and managing water
		resources in Bhutan in accordance with established legal frameworks. Under this regulation MoH's
		mandate encompasses planning, quality assurance, and the promotion of sustainable practices to
		ensure the accessibility and quality of water resources in rural communities.
Waste Prevention and	2016	The Waste Prevention and Management Regulation is a comprehensive framework dedicated to
Management Regulation-		effective waste management, emphasizing handling, reduction, recycling, and responsible disposal
amended		practices. It specifies that all institutions must submit their waste management compliance and
		monitoring status to their respective District heads, while healthcare facilities report to the District
		Health Supervisory Officer, who updates the Ministry of Health annually. District heads and the
		Ministry of Health are further obligated to report to the National Environment Commission (NEC)

Table 12: Annotation of the documents reviewed



		towards the end of the calendar year. This regulation applies to all the ministries. In Health sector
		to wards the end of the earlier grant and regulation applies to an the ministres. In reduct sector
		nearth care facilities including private, military, and regulatory authorities, are to implement and
		adhere to comprehensive waste management regulations. For the health care waste management
		institutions are required to handle the sharps properly, have appropriate disposal methods for
		infectious materials, strict compliance with national guidelines for hazardous chemical wastes,
		secure funds for effective waste management systems, and maintain detailed records of waste-related
		activities and incidents.
The Water Act of Bhutan	2011	The purpose of this Act is to protect, conserve, and manage water resources in an economically
		efficient, socially equitable, and environmentally sustainable manner. The act mandates that the
		Ministry of Health monitor the quality of drinking water in both urban and rural areas which includes
		refraining from water pollution from health care waste disposal.
National Environment	2007	It is a legislative framework designed to safeguard the environment by establishing guidelines and
Protection Act of Bhutan		regulations for sustainable and responsible environmental management in Bhutan. This act stipulates
		that institutions must ensure proper waste disposal, must be responsible and accountable for their
		own waste management and must have comprehensive waste management plans.
Environmental Assessment	2000	This act outlines a systematic approach to environmental assessment, emphasizing the importance
Act		of considering environmental factors in decision-making processes related to development and
		planning, establishment or carrying out of a project. Any establishment of project must go through
		the screening process outlined in EAA and obtain environmental clearance before its operation.
Waste Prevention and	2009	This Act safeguard and promote human health by ensuring environmental protection through
Management Act of Bhutan		measures such as minimizing waste generation, encouraging the segregation, reuse, and recycling of
		waste, environmentally responsible waste disposal, and fostering efficient collaboration among
		implementing agencies. This act mandates that lead implementing agencies shall be responsible for
		the wastes generated from the institutions and agencies under it.

SECTION 3: AWARENESS, TRAINING AND SUPPORTIVE SUPERVISION

For proper Health care waste management all the personnel involved in health care service delivery must be aware, trained in segregation, management and proper disposal. Healthcare Waste management of everyone's business. Although there is no written and documented frequency and commitment to conduct awareness and training on HCWM, regular activities are carried out which often are dependent on the availability of the fund. However, the infection control program under Ministry of Health (previously, which currently is under the organogram of National Medical Services following the health ministry transformation) ensures that training on Infection Control (IC) and waste management (WM) is carried out once a year.

To sustain the HCWM initiatives and carry out HCWM activities at the facility level, Infection control (IC) focal person is identified from each unit of the healthcare facility, for example in the hospital one health care personnel, usually a nurse is identified to carry out the infection control related activities. Whereas at the level of PHC, the infection control and waste management are carried out by the Health Assistants (HA). All the health care facilities have at least one IC-focal. The designated trained IC- focal are responsible to carry out

- 1. regular review meeting for IC/WM
- 2. regular monitoring and supervision of IC activities
- 3. continue medical education (CME)
- 4. orientation of the staff
- 5. incident recording and documentation

The designated trained IC focal at the hospital level and HA at the PHC level ensures that waste is segregated at the source and treated as mandated. The ward-boys/girls (Ward assistants) and cleaners in the health care facility carries out ICMWM activities. They are involved in segregation at the source, collection, and transportation of the HCW to the disposal site/center collection site/area. For example, the Cleaners/ward-boy/girl collects the HCW from their respective wards/units and transports to the central collection area/ waste storage house, in the hospital from where the waste either is collected by the municipal for the final disposal or by the designated person (Waste storage house in-charge) who reports waste collected, incinerates and disposed-off. While at the PHC level the support staff (cleaner/ward boy/caretaker) collects the HCW which are then autoclaved (as per the protocol) and disposed-off (methods include: Deep burial pit, or openburning).

Since 2012, as per KII (who had worked as a program manager for infection control at MoH, since 2012), MoH has been providing trainings to at least one IC-focal (also known as IPC focal) from all the hospitals in the country once a year. From the year 2020 onwards, training of the trainer (ToT) on infection control and health care waste management (ICHCWM) was carried out so that other health care staff in their health care facility or in their Dzongkhag (district) can be trained



and sensitized on ICHCWM. As per the record maintained by MoH, since 2023 March till Jan 2024, a total of 321 people were trained on HCWM-with more focus on infection control. The support staffs who were trained were from hospitals, thromdes (municipality), private sectors and private diagnostics. Private pharmacy shop vendors were also trained on HCWM. Table 13 indicates the training components as per the following categories of healthcare providers.

Table 13: IC-HCWM training component for healthcare providers and waste handlers

For Waste Handlers (MoH, Thromdes/privates)

- Introduction to the Healthcare Waste Project and Training Program
- Introduction to Improvement of Infectious Waste Management Project
- Medical waste management: Current Practice
- Chain of Infection and Modes of Transmission
- Hand Hygiene
 - Importance of HH, Proper handwashing techniques and use of hand sanitizers
- Personal Protective Equipment (PPE)
 - Types, Donning and Doffing Procedure
- Accidental Occupational Exposure
 - Introduction to revised form, Immediate actions to take in case of accidental exposure
- Practical Demonstration: Hand Hygiene and PPE
- Introduction to Medical Waste Management
 - o Types and categories of medical waste, Risk associated with improper handling
- Legal and Regulatory Framework
 - Overview of relevant local and national regulations
- Segregation and Collection of Medical Waste
 - Proper techniques for segregation at the source. Different colour bags and wastebins for different waste types. Safe collection and storage practices
- Handling and Transportation
 - Safe handling and transportation of medical waste. Packaging and labelling requirements
- Treatment and Disposal Methods
 - o Explanation of various treatment methods
- Infection Control and Safety Measures
 - Importance of hand hygiene and PPE. Preventing cross-contamination and the spread of infections
- Recording and Reporting of Medical Waste
- Basic Gender concepts, gender issues and gender mainstreaming in health care waste project.



For IPC Focal

- Hand Hygiene
 - Importance of HH. Proper handwashing techniques and use of hand sanitizers
- Personal Protective Equipment (PPE)
 - Types. Donning and Doffing Procedure
- Preparation of Bleach solution
 - Proper preparation and dilution of bleach for disinfection. When and how to use bleach for cleaning and decontamination
- Accidental Occupational Exposure
 - Introduction to revised form. Immediate actions to take in case of accidental exposure
- Segregation and Collection of Medical Waste
 - Proper techniques for segregation at the source. Different colour bags and wastebins for different waste types. Safe collection and storage practices
- Handling and Transportation
 - Safe handling and transportation of medical waste. Packaging and labelling requirements
- Treatment and Disposal Methods
 - o Explanation of various treatment methods
- Recording and Reporting of Medical Waste
- Basic Gender concepts, gender issues and gender mainstreaming in health care waste project.

(Source: KII, MoH, UNDP-Bhutan)

Autoclave treatment is typically operated by specifically trained personnel, commonly the waste house in-charge, who undergo informal training for the task as per KII and a field report on HCWM carried out by Bhutan country office UNDP (2022).

Infection control and waste management are integrated into the pre-service curriculum for Nurse (Diploma and BSc in Nursing and Midwifery) (FNPH, 2016), and like-wise in the curriculum for Health Assistants (Diploma in community Health), Technicians (Allied health sciences) and short courses (6 months-certificate course). However, HCWM is not explicitly mentioned in the inservice curriculum for In-service BScNM and Bachelors in Public Health (BPH) except for the 6-months certificate course on nursing-specialty. These are the courses by Faculty of Nursing and Public Health (FNPH), one of the oldest health institutes for nurses and allied health care professional in Bhutan, under Khesar Gyalpo University of Medical Sciences of Bhutan (KGUMSB). All the private nursing colleges/ institutes in the courty follows the curriculum designed by FNPH, KGUMSB. Table 14 presents an excerpt from pre-service curriculums on the



integration of IC-HCWM. In-terms of the training on HCWM, it can be fairly assumed that 100% of the health care facilities has at least one healthcare professional trained. However, the exact number of people trained in HCWM could not be ascertained.

BScNM	DCH and Allied health		
Infection Control	Solid waste		
• Types of infection, Chain of infection transmission	Hazardous waste		
• Defenses against infection: natural and acquired	• Waste management		
Concept of asepsis: medical and surgical asepsis	strategies		
• Standard safety precaution (Universal precaution)			
• Isolation techniques and precautions (Barrier nursing)			
Hand washing, Personal protective equipments			
• Decontamination of equipments and units. Needle prick injury			
Post exposure prophylaxis (PEP)			
Biomedical Waste management			
• Types of hospital waste. Waste segregation Waste management			

Table 14: Excerpt from the in-service training curriculum

Monitoring and evaluation as per the KII are carried out depending on the availability of the fund by the MoH and District Health Officer (DHO) or Chief Medical officer or IPC-focal at the district level for the district hospitals and PHCs. However, within the facility level the IPC-focal/ Quality Assurance (QA) focal ensures constant monitoring and supervision of the activities.

Some of the challenges with regard to people is the gap in training and sensitization. This could be largely influenced by a high turnover rate among staff (resulting from exits from the profession, transfers, or new recruitments). Additionally, these challenges may stem from attitudes towards Healthcare Waste Management (HCWM) practices and insufficient monitoring, as noted by Laabar et al. (2012) and Letho et al. (2021).

SECTION 4: ADHERENCE AND COMPLIANCE

Adherence and compliance at healthcare facility level

Gaps in adherence and compliance of the practices to the ICMWM-2018 by the implementers (Doctors, nurses, allied health care professionals and support staff) at the facility level (Laabar et al., 2012; Letho et al., 2021; UNDP, 2022; Wangmo, 2013). Many of the health care facilities has SoPs on infection control and waste management developed tailored to their practice with guidance of ICMWM-2018. Color-coded bags and dustbins are supplied to all the health care facilities by Ministry of health. However, from the reports and studies non-compliance with the segregation of waste at the source is evident (UNDP & Cheizom, 2023). Infectious and Hazardous wastes are



collected in color coded (red) plastic bags while the General waste is collected in green colorcoded plastic bags in dustbins. The wastes from healthcare units are transported in trolly to the waste storage house/area in the premises or to a disposal site. The process of HCWM in JDWNRH and the waste transportation pathways in Central Regional referral hospital (CRRH) is illustrated in figure 6.





While the adaption of ICMWM-2018 into SOPs by the healthcare centers provides a positive insight into the adherence and compliance in general for the HCWM, it can also be a learning for the need to standardize the SOPs across the diversity of the healthcare facilities. All infectious waste undergoes autoclaving and is then disposed of at the designated landfill sites by the respective Thromde and Municipal offices. The visited landfill sites are specifically identified and located away from residential communities and are identified as per the NEC Acts and regulations.

Non-compliance was also observed in donning of Protective personnel equipment (PPE) like gloves, boots & apron, and failure to use a separate trolly for transportation of different categories of wastes as stipulated by WHO putting the health care personnel at risk. The assessment

conducted by UNDP in 2022 identified instances of non-compliance with the appropriate use of burial pits in a few healthcare centers. An example of the inappropriate use of burial pit can be seen in figure 7. Although, open burning of the waste is discouraged, PHCs often resort to this method due to unavailability of the pick-up facilities for transportation to the landfill. It's important to note that this observation was limited to the four healthcare facilities visited in the report, and therefore, it's not conclusive for the entire country.

However, a pessimistic assumption could be made that similar practices might be prevalent in other healthcare facilities.



Figure 7: Poor compliance to the guidelines

(source: MoH-UNDP-joint Field Mission report on HCWM-2022)

A checklist on supportive supervision and monitoring of infection control and medical waste management is annexed in ICMWM-2018 to maintain the uniformity of the practice. All healthcare facilities in the country are mandated to report their annual medical waste generation in the standard reporting form issued by MoH. It is also required of the healthcare facilities to maintain and report accidental injury related to HCWM. The health care service quality assurance and improvement are guided by the health care service standards: Bhutan Healthcare Standard for Quality Assurance (BHSQA), which also lays down the Key Performance Indicators (KPI) for the healthcare centers and a whole chapter which emphasizes on hospital infection control (HIC) and medical waste management standards(Bhutan Standards Bureau, 2018). However, the achievement of the KPIs related to HCWM cannot be ascertained as the healthcare facilities are in the process of implementation of BHSQA.

Adherence and compliance at operational and policy level

The National Environment Commission (NEC) oversees the adherence and compliance with national Acts and regulations related to environmental clearance. Each dzongkhag is assigned a certified environment officer who is responsible for conducting site visits and evaluating the environmental impact before the commencement of a proposed project or when a project seeks the

renewal of environmental clearance every 5 years. These officers are also tasked with ongoing monitoring to ensure that agencies comply with regulations, with the authority to impose fines if any violations are identified. However, challenges such as limited manpower, budget constraints, and other contributing factors have resulted in minimal monitoring and supervision of sites by the NEC. While there is a framework in place for environmental oversight and regulation, there are challenges that need to be addressed, including resource constraints and potential limitations in the monitoring process.

SECTION 5: NATIONAL POLICY AND STRATEGIC PLANNING

This section provides an overview of the national policies and strategic plans, and laws and regulations concerning HCWM in the country. In Bhutan, legislative changes or policy decisions made at the central level have a nationwide application. Legislation concerning general waste management serves as the basis for enhancing infectious waste management, providing the Ministry of Health with the authority to implement safe healthcare waste (HCW) management practices across all health facilities. The effectiveness of the healthcare waste management system depends on the structure of legislation and regulations. The national policies, regulations, acts, standards, and guidelines related to Healthcare Waste Management (HCWM) are outlined in table 15.

Document Name	Description and scope for MoH						
Legislation documents							
Regulations for	This regulation outlines responsibilities and procedures for implementing the						
Environmental	Environmental Assessment Act, 2000. It focuses on ensuring public review						
Clearance-2016	of environmental impacts, aligning projects with sustainable development						
	policies, considering foreseeable environmental effects before commitments,						
&	exploring alternatives, implementing measures to avoid or mitigate damage,						
	promoting renewable resources and clean technologies, and contributing to						
Environmental	a comprehensive database on environmental and cultural conditions in						
Assessment Act	Bhutan. This regulation also clearly lays down the penalties for violations.						
2000	EEA-2000 stipulates the procedures for the assessment of potential effect of						
	strategic plans, policies, programs and projects on the environment. Thus,						
	any establishment that MoH may carry out, for example site identification						
	for incinerators, Landfill or large burial pits must get clearance from						
	NEC/DECC.						
The Water	This regulation applies to all the issues related to water resources and their						
Regulations of	management under the Water Act. MoH under this regulation is required to						
Bhutan-2014	carry out overall planning, implementation and management of drinking						
&	water supply and sewage for the rural areas for better sanitation and safe						

Table 15: Policy and Legal framework for HCW management



The Water Act of Bhutan-2011	drinking water. The Water Act stipulates that MoH monitor the quality of drinking water both in urban and rural areas. The Chapter 8 of the Act which discusses on Prevention and control of water pollution clearly states that
	chemical, radiological, radioactive, medical or any other hazardous waste into water bodies."
Waste Prevention	2012 regulation is designed to facilitate the implementation of the Waste
and Management	Prevention and Management Act, 2009, by establishing procedural
(Amendment)	guidelines. It enforces responsible waste management practices and ensure
Regulation, 2016	environmental protection with emphasis on efficient practices at all
&	organizational levels, covering the collection, segregation, treatment,
Waste Prevention	storage, transportation, reduction, reuse, recycling, and safe disposal of solid,
and Management	liquid, and gaseous wastes. It also outlines penalties and prohibits illegal
Regulation, 2012	dumping or unauthorized release of waste into the environment. While
	regulation, 2016 amends the definition of waste-related terms and identifies
	a clear role of implementing agencies.
Strategy, plan and	guideline
National Waste	The strategy aims to proactively prevent and decrease waste generation at its
Management	source, encouraging the diversion of materials for refuse, reuse, recovery,
Strategy, 2019	and recycling and aim for "Zero Waste Bhutan by 2030". This strategy aims
	to reduce the volume of waste sent to landfills, optimize resource utilization
	and lessen the environmental impact of waste management processes. The
	strategy emphasizes on sustainable financing, technology, capacity
	development and inclusiveness.
	Ministry of health, as of now doesn't have any healthcare waste management
	strategy/ies.
Thimphu Waste	This Waste management plan for Thimphu outlines the current waste
Management	management system and its challenges. It also lays down the management of
Plan, 2019	waste, both municipal and health care waste within Thimphu.
	Ministry of health, as of now doesn't have any formal published healthcare
	waste management plan/s.

However, a way forward was for the future infection control and waste management by the infection control program was outlined in the report on healthcare waste management. The way forward are:

- 1. Incorporate Private Diagnostic Centers into the Medical Waste Management framework.
- 2. Implement waste management mapping to optimize transportation logistics, especially in Primary Health Centers (PHCs) and hospitals.

- 3. Certify Infection Prevention and Control Focal Persons, equipping them with the necessary technical expertise in medical waste management.
- 4. Develop standardized architectural designs for Waste Storage facilities in Primary Health Care Centers and oversee their construction.
- 5. Foster collaborative partnerships among doctors, local government entities, and relevant agencies such as Thromde Municipality and the National Environment Commission to promote effective medical waste management.
- 6. Provide capacity-building training sessions for primary waste handlers, including support staff and caretakers.
- 7. Integrate the concept of liquid waste management into the planning and construction of new hospitals.
- 8. Establish a robust mechanism to address occupational hazards associated with medical waste management.
- 9. Procure equipment necessary for effective medical waste management.
- 10. Explore the possibility of digitizing medical waste management and create a tracking system if feasible.
- 11. Secure funding resources for the implementation of medical waste management initiatives.

SECTION 6: BUDGETING AND PLANNING

Healthcare is primarily funded and administered by the State, following a three-tiered network of health facilities throughout the country, aligned with specified service standards and care levels. This approach adheres to the constitutional mandate outlined in Article 9, Section 21, which emphasizes the State's commitment to offering free access to basic public health services encompassing both modern and traditional medicines. Currently, there is no dedicated budget specifically allocated for Healthcare Waste Management (HCWM). Infection control and waste management activities are proposed yearly to Ministry of Finance for securing fund. In view of other competing activities often the budget allocation for HCWM is very minimal thus leading to dependence on funding sources from Development Partners.

The majority of the funding for activities associated with Healthcare Waste Management (HCWM), including the procurement of waste shredders, weighing scales, autoclaves, and the construction of waste storage and deep burial pits, has been sourced from aid provided by organizations such as the World Health Organization, Asian Development Bank, Global Fund, and UNDP. Figure 8 illustrates the flow of national health budget from Ministry of Finance (MOF).



Flow of Fund

Source: (MoH, 2021)

back the user fees to MOF.



SECTION 7: PRACTICAL GUIDANCE

The National Guideline on Infection Control and Medical Waste Management (ICMWM)-2018 is the principal document intended for use by all healthcare facilities across the country. This guideline provides a standard infection control and medical waste management for the health care facilities throughout the country. The guideline is intended to be a valuable tool for healthcare providers, training institutions, Private Diagnostic Centers, Military Hospitals, and other stakeholders involved in designing, implementing, monitoring, and evaluating infection control practices in Bhutan.

Many healthcare facilities have developed their own Standard Operating Procedure for infection control and waste management adapted from ICMWM-2018, however, the exact number of healthcare facilities with Sops could not be ascertained due to paucity of data and records maintained. Bhutan Healthcare Standard for Quality Assurance-2018 also serves as a guidance to maintain the standard of care at the facility level with KPIs to be achieved.

SECTION 8: TECHNOLOGY AND EQUIPMENT AVAILABILITY AND USE

Administratively Bhutan is divided into 20 dzongkhags (districts) and total of 205 gewogs (block) which are under the dzongkhags. With support from UNDP, 112 fully automated autoclaves and Personal Protective Equipment (PPE) gears (180) were distributed to 112 health centers across 15 districts and five cities in the country. With support from ADB construction of waste storage, deep burial pits and procurement of autoclaves in 8 Dzongkhags was done while with support from Global fund waste autoclaves, shredders and weighing scales were distributed in 12 dzongkhags. The deep burial pits in all the health care facilities under the 8 Dzongkhags are confirmed to have built in compliance with the standard drawing and requirement of the Health Infrastructure Development Division (HIDD) of Ministry of Health. In absence of the published and accessible inventory of the HCWM equipment in all 54 hospitals and 186 PHCs fair assumption based on the procurement made through donor aids and a recent inventory by BMED and KII following can be concluded, as depicted in table 16.

Equipment and facility	Hospitals	РНС	Sub-post	
Autoclaves	All Hospitals and PHCs (functional)			
Waste Autoclave, 70 ltrs*	6	2	0	
Waste Autoclave, 40 ltrs*	1	17	1	
Steam Sterilizer, Vertical, Waste, 70 ltrs*	3	0	0	
Steam Sterilizer, Vertical, Waste, 40 ltrs*	0	24	0	
Biomedical Waste Shredder	19	0	0	
Weighing scales	All Ho	spitals and PHC	s (functional)	
Deep burial pit	All Hospitals and most of the PHCs			

Table 16: Availability equipment and facility for HCWM



300kg- Konbar, Mongar landfill (1) and	Functional
Thimphu (1)	
	*Installed in 2021

DHIS-2 platform is robustly used for reporting on health care waste management by all the health care facilities. In one of the districts K-tracker (GPS tracking) is used by the municipality to track the municipal trucks as shown in the figure 10, all in an effort to make the service delivery efficient.

Figure 9: Use of GPS for tracking the Municipal trucks



SECTION 9: BENCHMARKING

The GAVI-HCWM-Maturity Model was used for the benchmarking and table provides the benchmarking exercise. Table 17: Results of Benchmarking using the GAVI maturity model

Area		Level	Basis for ranking
People	Awareness, Training and Supportive Supervision	3	 MoH provides training to all the stakeholders involved in HCWM, including the private sectors and municipality Trainings are done at least one a year by MoH, while the IPC-focal carries out sensitization and awareness at the facility level at least twice a year. However, post-covid and high turn-over rate of the health care staff (Nurses and Support staff) the trainings and awareness program have slowed down owing to the shortage of budget and human resource at the program level. Infection control and Waste Management components are incorporated in pre-service curriculum minimally.
	Adherence and compliance	2	• More than 50% of healthcare facilities adhere to best practices of HCWM, however, there is minimal monitoring carried out by MoH, DECC, or the Health officials at the district health. However the monitoring at the health care facility level is often done by the IPC-focal and QA-focal, however, compliance data is not available.
Processes	National Policy and Strategic Plans	2	 A high level of implementation could be deduced from the existing Governing Laws (Act), by-laws (Rules and Regulations), Policies and guidelines related to waste management. Nonetheless, the review and revision are still due, for instance, the ICMWM-2018 (3rd ed), Waste Prevention and Management Regulation-2012 & 2016 are due for revision.
	Budget and Planning	2	 HCWM activities are minimally budgeted by Ministry of Finance (MoF). All the planned activities are proposed to MoF which then undergoes rigorous scrutiny and budget allotted accordingly. Since procurement of the technology and equipment are centrally procured often leading to long lead time or not at all get purchased because of lack of budget thus, maximum activities and procurements are donor aided. Yet having a program dedicated to infection control and medical

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				waste management under MoH indicates the importance of the HCWM and annual activities
		are drawn up and implemented, as per the availability of the budget.		
			•	Guidance is available and more than 85% of the health care facilities in the country use the
Practical Guidance	2		guidance and many of the health facilities, especially the hospitals have developed SOPs	
	Tractical Guidance	5		tailored to their facility. However, at the system level there are issues at PHC level, and
				municipality involvement.
			•	Some BAT equipment is available at 50% of facilities (or 50% accessing services) and/or at
	Technology and Equipment Availability and Use	3		least 50% of the waste being generated is treated and disposed of using globally accepted
				technologies, like autoclaves and shedders. However, many PHCs still practice open burning
			1	and then either bury in available empty space within the facility or in deep burial pit (if
Technology				available). Al though many health care facilities does report having deep burial pit the question
				remains on the meeting of the HIDD standards.
			•	WHO though discourages the use of incinerators yet overwhelming waste generated during
				COVID-19 pandemic forced the country to adopt the best alternative available technology to
				safe the country and its population.
	Total Score	15		
	No. of Areas	6		
	Overall Score	2.5		



Figure 10: Spider Chart of GAVI-HCWM-Maturity Model Score

The current scoring of 2.5 suggests that Bhutan has a moderate level of HCWM system. This scoring process initiates a recurring assessment process to be undertaken periodically as the HCWM system progresses towards maturity. From the model, opportunities for strengthening the HCWM system can be identified for instance, "Adherence and compliance", "Policy and Strategic Plans" and "Budget and Planning" areas can be prioritized to strategically enhance and fortify the overall effectiveness of the HCWM system in Bhutan.

SECTION 10: RECOMMENDATIONS

Area		Recommendations
	Awareness, Training and Supportive Supervision	 Advocate for more funds to address budget and human resource shortages, allowing for regular training sessions and awareness programs. Implement targeted training for new healthcare staff to integrate infection control and waste management practices effectively. Collaborate with educational institutions and relevant organizations to strengthen the inclusion of infection control and waste management components in pre-service healthcare education for sustainability Implement a robust monitoring and evaluation system to continually improve training programs and awareness initiatives.
People	Adherence and compliance	 Strengthen monitoring efforts by MoH, NEC and District level health officer to ensure consistent adherence to HCWM best practices. Leverage on IPC-focal and QA-focal for monitoring, emphasizing compliance data documentation at the facility by making the task attractive. Facilitate regular compliance reporting by healthcare facilities using standardized templates. Establish a feedback mechanism to communicate monitoring results, fostering continuous improvement. Regular co-ordination meeting among the stakeholder, particularly, NEC, MoH, Municipality and local government to streamline healthcare waste management processes, and contribute to more effective and sustainable initiatives. Ownership and accountability for HCWM within the facility and out of facility (especially the transportation to the landfill, releasing to the sewage system, incineration) must be made clear and should be clearly defined.
Processes	National Policy and Strategic Plans	 Prioritize timely review and revision of key documents Urgently develop a strategic plan for healthcare waste management (HCWM) within the Ministry of Health. A strategic plan provides a roadmap for effective, long-term management and improvement of HCWM practices.

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		•	Year-marking budget for priority activities and equipping healthcare facilities with infrastructure and
	Budget and		technology to effectively manage the HCW.
	Planning	•	Strengthen 3Rs in Health facilities through capacity building, infrastructure and technology assistance.
		٠	Fund allocation for research for which aid in planning and implementation.
		•	Standardization of Standard Operating Procedure across healthcare facilities
		•	Develop and implement performance metrics for HCWM: such as waste segregation rate, Proper Disposal
Practical			rate, training and Compliance rate, waste reduction and recycling rate at the facility level
	Guidance	Guidance •	Integrating the waste generation from Healthcare facilities to National Waste Inventory- an initiative by
			NEC so that data standardization is facilitated which can be a vital source for policy and regulation
			formulation or amendment.
	Taabnalagy and	•	Prioritize the implementation of Best Available Technologies (BAT) equipment in Primary Healthcare
Technology	Equipment Availability and Use		Centers (PHCs) to replace environmentally harmful practices like open burning and improper disposal
			methods.
		•	Advocate and encourage for non-burning technologies, especially 3Rs and explore for low-emission
			alternatives.

LIMITATION

This assessment's limitation lies in its reliance on a limited number of peer-reviewed journal articles, reports from HCWM-involved agencies, particularly UNDP, and existing national policies and government documents for findings and data. The project's short duration precluded the collection of primary data.

REFERENCES

- ADB. (2022). Responsive COVID-19 Vaccines for Recovery Project under the Asia Pacific Vaccine Access Facility: Due Diligence Report for COVID-19 Vaccination Waste Management. 2022. https://www.adb.org/projects/documents/bhu-55083-001-rrp
- Bhutan Standards Bureau. (2018). Bhutan Healthcare Standard for Quality Assurance.
- Drug Regulatory Authority, B. (2014). Guideline for Disposal of Pharmaceutical waste.
- FNPH. (2016). Curriculum for Bachelor of Science in Nursing and Midwifery. www.rihs.edu.bt
- Laabar, T. D., Siriwong, W., & Robson, M. (2012). Hospital Waste Management: A Study On Knowledge, Attitude And Practice Among Health Staff And Waste Handlers In Jigme Dorji Wangchuck National Referral Hospital, Thimphu, Bhutan. In *J Health Res* (Vol. 26, Issue 5). http://www.jhr.cphs.chula.ac.th
- Letho, Z., Yangdon Id, T., Lhamo, C., Limbu, C. B., Yoezer, S., Jamtsho, T., Chhetri, P., & Tshering, D. (2021). Awareness and practice of medical waste management among healthcare providers in National Referral Hospital. https://doi.org/10.1371/journal.pone.0243817
- Ministry of Health. (2011). *National Immunization Policy and Strategic Guidelines*. https://www.moh.gov.bt/publications/guidelines-2/
- Ministry of Health. (2020). SoP for Decontamination and Disinfection of COVID-19 Contaminated Area.
- Ministry of Health. (2022). Annual Health Bulletin. www.health.gov.bt
- Ministry of Health. (2023). Annual Health Bulletin. www.health.gov.bt
- Ministry of Health. (2018). National Guideline on Infection Control and Medical Waste Management. https://www.moh.gov.bt/wp-content/uploads/afd-files/2014/11/ICMWMguideline.pdf
- Ministry of Health, & World Health Organization. (2022). *The People's Pandemic: How the Himalayan Kingdom of Bhutan staged a world-class response to COVID-19*. https://iris.who.int/handle/10665/362219
- MoH. (2021). National Health Accounts. https://www.moh.gov.bt/
- NEC. (2012). Waste Prevention and Management Regulation 2012.
- NEC. (2016). Regulation for Environmental Clearance of Projects.
- NEC. (2022). Bhutan State of the Environment Report 2022. www.nec.gov.bt
- NSB, & Escap, U. (2021). Bhutan Waste Accounts Report.
- Rayhan, M. R. I., Liza, J. M., & Rahman, M. M. (2022). Assessment of COVID-19 vaccinationrelated medical waste management practices in Bangladesh. *PLoS ONE*, 17(8 August). https://doi.org/10.1371/journal.pone.0273053
- Thimphu Thromde Office. (2019). Draft Thimphu Waste Management Plan. www.nec.gov.bt

- UNDP, & Cheizom, P. (2023). Environmental and Social Impact Assessment & Environmental and Social Management Plans Final Report.
- UNDP, & MoH. (2022). Field Mission Report on HCWM.
- UNICEF-Bhutan. (2022). Annual Report 2021-Accelerating Results for Every Child in Bhutan. https://www.unicef.org/bhutan/media/3066/file/Annual%20Report%202021.pdf
- Wangmo, N. (2013). Infectious Waste Management in Bhutan: An Analysis of Policy and Practice.
- WHO. (2020). STANDARD OPERATING PROCEDURE (SOP) Waste management of used COVID-19 vaccines vials and ancillary supply. In 2022.
- WHO. (2022). *Management and safe disposal of COVID-19 vaccination waste at health facility level*. http://apps.who.int/iris/bitstream/handle/10665/85349/9789241548564_eng.pdf
- WHO. (2024). WHO SEA Region COVID-19 Vaccination dashboard. https://www.who.int/southeastasia/health-topics/immunization/covid-19vaccination?fbclid=IwAR3_3_66gekXcNpD2Qcb0MPHVh80pqYEzV3c7AUtMvXIWxwp TQjeJ-YbTQw
- Yangdon, T., Punpeng, T., Mongkolosomit, S., Nanthapong, K., & Yangden, K. (2023). Sustainable Management of Facemask Waste Generated From COVID-19 Pandemic in Bhutan. *Journal of Health Research*, 37(5), 341–348. https://doi.org/10.56808/2586-940X.1042