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ETHIOPIA: NEEDS ASSESSMENT FOR IMPLEMENTATION OF A PUBLIC–PRIVATE PARTNERSHIP IN HEALTH CARE WASTE MANAGEMENT IN ADDIS ABABA CITY

PRESENTED TO: ADDIS ABABA CITY ADMINISTRATION HEALTH DEPARTMENT

AIDSTAR-One
AIDS SUPPORT AND TECHNICAL ASSISTANCE RESOURCES

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CONTENTS

Acronyms ..... **v**

Definitions ..... **vii**

Executive Summary ..... **ix**

Findings ix

Background **1**

Scope of Work 3

Limitations 3

Objectives 3

Methodology 4

Part I. Legal, Technical and Institutional Aspects of Health Care Waste Management **7**

Results and Discussion 7

Part I Conclusion and Recommendations 19

Part II. Financial, Economic and Public–Private Partnership Aspects of Health Care Waste Management **23**

Results and Discussion 23

Part II Conclusion and Recommendations 33

References **37**

Annexes

Annex I. Public–Private HCWM Needs Assessment Data Collection Tool 41

Annex II. Public–Private HCWM Needs Assessment Data Collection Tool for Key Informants 51

Annex III. Selected Health Care Facilities for PPP–HCWM Needs Assessment 58

Figures

Figure 1. Color-Coding and Waste Labeling Practices at Health Facilities, Addis Ababa City 13

Figure 2. Sharps Handling Practices at Health Facilities, Addis Ababa City 13

Figure 3. Improper Waste Segregation Practices at Health Facilities, Addis Ababa City 14

Figure 4. High-Temperature Incinerator at a Private Health Facility in Addis Ababa City 16

Figure 5. Untreated and Improper Disposal of Health Care Waste in Health Facilities, Addis Ababa City 17

Figure 6. Water Treatment Plant at Private Health Facility, Addis Ababa City 19

Figure 7. Proposed Public–Private Partnership for Health Care Waste Management in Addis Ababa City 25

Figure 8. Proportion Matrices for On-Site Health Care Waste Management Compared to Services Provided Under a Public–Private Partnership 27

Figure 9. Analysis of the Technical and Financial Advantages of On-Site and Common Facilities in Health Care Waste Management 28
Figure 10. Investment Costs Needed to Set Up a Centralized Health Care Waste Management Facility for Addis Ababa City, in U.S. Dollars 30
Figure 11. Expected Operating Cost for a Centralized Health Care Waste Management System in its First Year, in U.S. Dollars 31

Tables

Table 1. Characteristics of Addis Ababa City Health Facilities by Ownership and Level 7
Table 2. Addis Ababa City Health Care Workers and Waste Handlers by Health Facility Level 9
Table 3. Estimation of Health Care Hazardous and General Wastes in Addis Ababa 11
Table 4. Capital Cost Estimation for Health Care Waste Treatment in Centralized and Decentralized Scenarios 35
Table 5. Estimation of Recurring Costs for Health Care Waste Treatment in Centralized and Decentralized Scenarios 35

ACRONYMS

AACA	Addis Ababa City Administration
AASWMA	Addis Ababa City Solid Waste Management Agency
AACHB	Addis Ababa City Health Bureau
AAWDRPO	Addis Ababa Waste Disposal & Recycling Project Office
AAEPA	Addis Ababa City Administration Environmental Protection Authority
AAFMHACA	Addis Ababa City Administration Food Medicine Health Care Administration and Control Authority
BMW	biomedical wastes
BOT	build, operate, and transfer
CI	confidence interval
CBMWTDF	Common Biomedical Waste Treatment and Disposal Facilities *(India)*
CMA	Cleansing Management Agency
DBOO	design, build, own, and operate
DCC	Dhaka City Corporation *(Bangladesh)*
EPA	Environmental Protection Agency
FMHACA	Food, Medicine, and Health Care Administration and Control Authority
FMOH	Federal Ministry of Health
FNG	Federal Negarit Gazeta
GHC	public health center
GHP	public hospital
GTP	Growth Transformation Plan
HBV	hepatitis B virus
HCV	hepatitis C virus
HCW	health care waste
HCWM	health care waste management
HF	health facility/health care facility
IP	infection prevention
ISA	incineration services agreement
MSE	Micro and Small Scale Enterprises
NEA	National Environmental Agency *(Singapore)*

NGO	nongovernmental organization
OFAG	Office of the Federal Auditor General
OSH	occupational safety and health
PASDEP	Plan for Accelerated and Sustainable Development to End Poverty
PC	private clinic
PCDD	polychlorinated dibenzo dioxin
PCDF	polychlorinated dibenzo furans
PDL	private diagnostic laboratory
PEP	post-exposure prophylaxis
PHP	private hospital
PPE	personal protective equipment
PPP	public–private partnership
PPP–HCWM	public–private partnership in health care waste management
PS	patient safety
RHB	regional health bureau
SWM	solid waste management
TEQ	toxic equivalency
USAID	U.S. Agency for International Development
WHO	World Health Organization

DEFINITIONS

Biomedical waste: Waste generated during the diagnosis, treatment, or immunization of human beings or in related research activities.

Effluent: Nonchemical liquid wastes that come out of laundry, kitchen, toilet, shower, and laboratory rooms, which may be contaminated by pathogenic microorganisms.

General waste: Waste largely composed of domestic or household waste; it is not hazardous to human beings.

Hazardous waste: Waste generated in health facilities that pose substantial or potential threats to the public health or the environment.

Health facilities: Hospitals, health centers, health posts, clinics, diagnostic centers, and other related facilities licensed to provide health services.

Health care waste management: The discipline associated with controlling the generation, segregation, collection, storage, transfer and transport, processing and treatment, and disposal of health care wastes in accordance with best principles of public health, economics, engineering, conservation, aesthetics, and environmental considerations.

Health care waste: A by-product of work in health care facilities that includes both general waste and potentially hazardous waste.

High-temperature incinerator: An incinerator that generates at least 1200°C in the secondary chamber and is fitted with environmental pollution controls.

Infectious waste: A term referring to all biomedical and health care waste known to have the potential of transmitting infectious agents to humans or animals, including material contaminated with blood or bodily fluids.

Medium-temperature incinerator: A two-chamber incinerator whose minimum temperature is 6000C.

Personal protective equipment: Safety equipment used to protect health care workers and waste handlers from nosocomial infections and injury when they are providing services in health care facilities. This equipment may include gloves, boots, aprons, goggles, and face masks with mouth covers.

Sharps: All objects and materials whose capacity to puncture or cut poses a potential risk of injury and infection. Examples include blades, broken glass, and syringes with needles.

EXECUTIVE SUMMARY

Health care waste management (HCWM), an issue of global concern, is a special concern for the Government of Ethiopia. With the national prevalence of HIV, malaria, and other infectious diseases, generation of health care waste (HCW) has increased. This increase, together with current poor management of HCW, puts health care workers, patients, waste handlers, scavengers, the environment, and the general public at risk.

A rapid needs assessment of health care waste management (HCWM) was essential to identify gaps and to make recommendations for a pilot project for a public–private partnership in health care waste management (PPP–HCWM) in Addis Ababa City. A facility-based mixed-methods study was conducted between August 7 and 20, 2013, in Addis Ababa City. Fifteen health care facilities—six of them (40%) public and nine of them (60%) private—were included in the study, along with 12 key stakeholders. Both primary and secondary data were collected using a semi-structured questionnaire and observational checklist. In addition, data collection included a review of relevant documents, field visits, key informant interviews, and discussions.

FINDINGS

Most key informants (92%) agreed that HCW and its management constitute a growing concern nationwide. A strategy document and legal instruments for HCWM, issued at national level, were recognized as important as a platform to create an enabling environment for improvements in HCWM service. All key informants agreed that the absence of HCWM legal instruments was a major gap in implementing sustainable a PPP—HCWM system in the city. Most health facilities (93.3%) did not characterize or quantify waste in their facilities. One private hospital was an exception.

In most facilities (67%), general waste was mixed and transported with hazardous wastes at various points; facilities' infectious waste, including incinerator ash, was at least partly disposed in municipal waste containers rather than kept and transported separately for final disposal. In other words, most health facilities in Addis Ababa City do not properly segregate HCW at the point of generation as recommended by *National Health Care Waste Management Guidelines* (FMOH 2008). On the other hand, no private or public institution is engaged in collecting and transporting hazardous HCW, and no institution is responsible for overseeing hazardous HCW transportation.

All health facilities have chosen incineration to treat HCW; only one private hospital was found to possess a high-temperature incinerator. In some facilities, incinerators were not functional, and HCW was discarded openly around the treatment facility and in some cases improperly disposed of in the municipal waste container. Most disposal equipment comprised small-scale incinerators that function at low temperatures and accordingly pose a risk to public health; facility managers had received complaints about air pollution from nearby residents.

The study also revealed that all health facilities studied lacked a budget for HCWM as a separate line item; HCWM was funded under various budget lines. Poor HCWM practices, lack of space, shortage of land, high resource requirements for on-site HCW treatment, and the absence of any centralized hazardous HCW treatment plant serving health facilities were among major additional gaps identified in the existing system.

Most health facilities (93%) expressed a willingness to outsource HCWM provided that proper pricing and monitoring mechanisms are in place. Thus, it was concluded that there is room for the private sector to play a critical role in HCW collection, transportation, treatment, and disposal in Addis Ababa City.

In summary, most health facilities do not properly manage HCW to the level recommended by Ethiopia's health care waste management guidelines. Given the identified gaps, recommendations include:

PART I

- Establishment of a HCW treatment plant through a public–private partnership approach.
- Strengthening HCW enforcement measures.
- Building a HCWM stakeholders' forum at city and national levels.
- Clarifying mandates among key stakeholders.
- Further investigation to quantify HCW.

PART II

- Resource mapping.
- Awareness creation and continuous capacity building.
- Strengthening of monitoring and regulatory mechanisms.
- Further investigation to determine both prices to be charged for HCWM and potential payment schemes.

Availability of standard HCW treatment facilities and technologies at both city and national levels is very poor. In Ethiopia, there is no facility that treats hazardous waste generated in different sectors. This study recommends establishment of a facility to provide HCW treatment services. The proposed project is believed to provide solution for this critical problem.

BACKGROUND

Health care waste management, an issue of global and national concern, is a special concern for the Government of Ethiopia. With the national prevalence of HIV, malaria, and other infectious diseases, generation of health care waste (HCW) has increased. This increase, together with poor management of HCW, puts health care workers, patients, waste handlers, scavengers, the environment, and the general public at risk.

Improving infection prevention (IP) and patient safety (PS) in health care settings is a nationwide initiative that involves the regular implementation of recommended IP practices in every aspect of patient care. Such practices include hand hygiene, injection and medication safety, and health care waste management (HCWM), among others. Limitations on resources make it difficult to control infection rates and exposure of patients and health care providers to health care–associated infections. Accordingly, materials, human resources, training, policies, and guidelines are needed to promote appropriate IP and PS practices (Federal Ministry of Health 2012a).

Muluken and Kume (2010) found that in developing countries, segregation, collection of waste using recommended color-coding containers, and storage of waste in isolated area were not satisfactory. Personal protective equipment and accessories were not provided and, when provided, were not used by health care workers. In addition, health care wastes from HFs were dumped either into facilities' backyards in a simple pit or into open roadside garbage bins. Few studies on HCWM in Ethiopia found waste segregation in surveyed HFs; none stored, transported, treated, or appropriately disposed of HCW. Evidence shows inadequate HCWM practices among health care workers across Ethiopian health institutions.

Best HCWM practices dictate that all waste be segregated at the source where it is generated and only then be handed over to the waste-handling service provider. Because each type of waste needs to be treated and disposed of differently, such waste segregation enables waste-handling service providers to use the most cost-effective method available without posing harm to people or the environment (AIDSTAR-One 2012).

Experiences elsewhere in the developing world and in such countries as Malaysia, Singapore, and South Africa have illustrated that centralized waste treatment and disposal systems operated under public–private partnerships (PPPs) present the most efficient and sustainable approach to solving HCWM challenges in short and long run (AIDSTAR-One 2012).

Experiences with a PPP for a centralized waste disposal treatment plant in Eastern Uganda have showed that the PPP model benefits health care workers, patients, the community, and the country at large. Here, the public sector (i.e., the government) provides overall leadership in managing HCW disposal, and the private sector contributes to the timely collection, transportation, and disposal at the centralized disposal plant in Iganga. Additional benefits from the partnership include:

- Accelerated private investment in health care waste disposal in the country.
- Availability of an acceptable and affordable, immediate, and long-term solution to HCW waste disposal.

- Increased HF access to quality disposal methods, freeing managers to focus on other issues.
- Protection for health care workers, communities, and the environment. A centralized system will improve HCW management practices, reducing risk of health care worker, patient, community, and environmental exposure to hazardous waste.
- Timely removal of expired medicines from the health system, reducing the risk of improper use.
- Reduced burden on the Federal Ministry of Health (FMOH), allowing it to concentrate on such other important areas such as improving health care access.
- Improved, wide-scale quality of health care (AIDSTAR-One 2012).

In addition, when based on good practices, PPP offers a win–win benefit to both the public sector and the private sector in delivering public infrastructure, goods, and services. The major benefits to government are the speed, efficiency, and effectiveness associated with applying private business practices to delivery of public services, ensuring value for money. Private-sector involvement in public-sector service delivery also forces the procurement process to be transparent and competitive. As a result, under a PPP framework, the long-term costs of the service delivery can be assessed more realistically, in turn promoting more efficient use of resources. In addition, PPP helps improve facilities' service delivery and management through innovation, customer care, and ultimately an increase in cash flow. Another major benefit of PPP is that it enables governments to tap into private capital to provide public services. By using PPP as a strategic service and infrastructure delivery mechanism, government is able to pool private capital to complement public budget resources to speed up economic and social development (Asubonteng 2011).

Although the use of PPPs has been spreading rapidly in Europe, Asia, and Latin America, as well as in parts of Africa, its implementation in Ethiopia has so far been limited. Divestitures and privatizations seem to have stifled most of the private-sector interventions that were created by the government under the market-based Plan for Accelerated and Sustainable Development to End Poverty (PASDEP), the Growth Transformation Plan (GTP), and other development plans. The huge demand for public infrastructure, agriculture, and basic services in the country remains unmet. In Ethiopia, PPPs would allow such private umbrella organizations as the Addis Ababa Chamber of Commerce and Sectoral Associations (AACCSA) to bring innovative development ideas to the public–private partnership dialogue, ideas that could yield business opportunities and/or projects for wealth creation. For instance, a number of initiatives such as PPP in health care delivery (e.g., telemedicine in South Africa), PPP in crime prevention and control (e.g., via joint investigations and shared communication systems in Ghana), and PPPs in dry waste recycling (e.g., in Malawi, Lesotho, Namibia, and South Africa) have emerged from initial ideas of private-sector umbrella bodies and community-based associations (Asubonteng 2011).

Asubonteng found that contrary to the belief that PPPs are nonexistent in Ethiopia, 50 percent of private and public-sector agencies, development partner agencies, and AACCSA are piloting one form of PPP or another. PPP initiatives can be found in housing, construction, dry waste management and recycling services, agriculture and food processing, irrigation for small-scale farming, the management of the Addis Ababa City Government Exhibition Centre, textile and garment processing, and prepaid and unified metering.

According to the *Federal Democratic Republic of Ethiopia Ministry of Health 2011/12 Health and Health Related Indicators* (Federal Ministry of Health 2012a), Addis Ababa City HFs comprised 48 hospitals, 75 health centers, 573 clinics, 189 pharmacies, and 232 drug stores.

In view of the continued increase of health facilities and challenges of unsafe healthcare practices in Addis Ababa City, AIDSTAR-One/Ethiopia, funded by PEPFAR through USAID and implemented by John Snow, Inc. (JSI), was asked to create a framework for the establishment of a centralized health care waste treatment and disposal system to be implemented under a public–private partnership.

This report contains the findings of the PPP–HCWM needs assessment conducted in Addis Ababa City exploring the legal, institutional, and technical aspects of existing HCWM practices on the one hand and the financial and economic implications of public–private HCWM on the other. This report also makes recommendations that can be used as a platform for implementing a pilot project for a public–private partnership in HCWM in Addis Ababa City.

SCOPE OF WORK

The needs assessment addressed legal, institutional, technical, and financial aspects of Addis Ababa City HCWM practices. Relevant information was collected from key stakeholders, important documents reviewed, and finally, based on the findings, recommendations were made for the implementation of a pilot project for a public–private partnership in health care waste management (PPP–HCWM) in Addis Ababa City.

LIMITATIONS

Limitations of this assessment include:

- The purposive sampling may limit generalizability.
- Because reliable information were lacking on HCW generation and HF cost data, HCW quantities were estimated based on secondary data, and cost issues were based on assumptions.

OBJECTIVES

OVERALL

The overall objective was to conduct a HCWM needs assessment, to identify gaps, and to propose recommendations for the implementation of a pilot project for a public–private partnership in HCWM in Addis Ababa City.

SPECIFIC

The specific objectives were:

- To review relevant documents to understand HCW generation and composition by HF level and ownership and to examine the existing legal framework (i.e., policies, strategies, and guidelines) for the implementation of PPP–HCWM in Addis Ababa City.
- To assess functional elements of the existing HCWM system by HF level and ownership; and to examine key stakeholders' institutional set-up (i.e., organizational structure, plan, awareness, and perception) that will facilitate PPP–HCWM implementation.

- To examine the total budget and unit cost allocated to HCWM in public and private HFs and analyze its share of the total budget.
- To estimate monthly or annual total and unit costs to establish and maintain a PPP–HCWM; and to examine public and private HF willingness and capacity to fund HCWM services.
- To propose financial modality options and to recommend a model or models that could feasibly be used to create a sustainable PPP–HCWM; and to identify gaps and propose practical recommendations implementing PPP–HCWM.

METHODOLOGY

STUDY DESIGN AND AREA

The assessment was a facility-based mixed methods study and was conducted in Addis Ababa City.

SAMPLING METHOD

Primary data was collected to triangulate and support the secondary data that was available at the time of the study. Based on the assessment's rapid nature, a purposive sampling method was employed to select HFs and key stakeholders. This sampling type was expeditious yet appropriate, given HFs' similarity at each level. A total of 15 facilities (six public and nine private) and 12 key stakeholders were selected to participate in the assessment.

The purposive sampling may limit generalizability, particularly outside Addis Ababa City. But given HFs' overall homogeneity at each level in Addis Ababa City, the results can provide insight and support available information (Annexes III and IV).

DATA COLLECTION TOOLS AND PROCEDURES

Tools

The assessment team developed structured and semi-structured questionnaires and an observational checklist (Annexes I and II) used at HFs plus guiding questions for key stakeholders (e.g., policy makers, regulatory staff, donors, partners, and service providers) pertinent to Addis Ababa City HCWM. Data collection tools were developed in English, and data was collected from August 7 to 20, 2013, by an assessment team with expertise in data collection, organization, and analysis.

Methods

The study team employed the following methodologies:

Review of Documents

The assessment team reviewed relevant documents related to PPP–HCWM technical, institutional, and regulatory frameworks at global, national, and regional levels. In addition, other relevant country experiences, reports, and previous research were reviewed.

Site Visits

The assessment team visited the 15 selected HFs to collect firsthand information on existing HCWM practices (i.e., HCW segregation, handling and storage, collection and transportation, treatment and disposal) using the questionnaires and observational checklist.

Discussion and Interviews

The team conducted interviews and discussions with the heads of or assigned key informants at federal-, city-, and facility-level organizations using the semi-structured questionnaire. In-depth interviews were conducted with 12 key stakeholders using guiding questions related to PPP–HCWM. With consent, key stakeholder interviews were tape recorded.

Data Quality Management and Analysis

To maintain data quality, the assessment team cleaned and edited the data daily. Both qualitative and quantitative data were organized and analyzed using the Statistical Package for Social Sciences (SPSS) Statistics Version 17.0.2. Assessment findings were tabulated and displayed in tables and figures as appropriate.

ETHICAL ISSUES

The consent of HF heads and key informants was solicited via a formal letter to all HFs and key stakeholders. Permission was secured at all levels. All study participants were informed as to the assessment's aim before their participation was requested. Study participants provided informed consent, and all responses were kept confidential.

ORGANIZATION OF THE REPORT

In this report, two chapters document assessment findings. Part I addresses HCWM's legal, technical, and institutional aspects, with conclusions and recommendations. Part II discusses a PPP–HCWM's financial and economic aspects, with conclusions and recommendations. Part II was developed partly based on the findings and recommendations outlined in Part I.

PART I
LEGAL, TECHNICAL AND INSTITUTIONAL ASPECTS OF HEALTH CARE WASTE MANAGEMENT

RESULTS AND DISCUSSION

HEALTH CARE FACILITIES

A total of 15 HFs were assessed. Of these, six were hospitals (two of them public and four private); four were public health centers; and five were private clinics. The six hospitals had a total bed capacity of 765 (ranging from 39 to 215 beds), and the four health centers had a total bed capacity of 56 (ranging from 8 to 20 beds). Three of the private clinics had a total of 20 beds (ranging from 5 to 10 beds); the remaining two reported no bed service (Table 1). Of the 13 HFs, bed occupancy rate ranged from 41% to 90% for hospitals; 0.4% to 30% for health centers; and 60% to 100% for clinics. Outpatients averaged 228 patients per day for all HFs (ranging from 25 to 800). Outpatient flow at one public hospital (GH2), at 218 patients per day, was comparable to that of one of the private hospitals (PHP2), at 220 patients per day. Public health centers had a very low outpatient flow and bed occupancy rate, indicating that they were not used extensively.

A study conducted on nine HFs by Haylamicheal et al. (2011) indicated that at HFs, the daily quantity of both waste generated and hazardous waste increased with increases in the number of patients and bed occupancy.

Table 1. Characteristics of Addis Ababa City Health Facilities by Ownership and Level

	Public						Private								
Characteristics	Hospital		Health Centers				Hospital				Higher Clinic				
Name	GHP1	GHP2	GHC1	GHC2	GHC3	GHC4	PHP1	PHP2	PHP3	PHP4	PC1	PC2	PC3	PC4	PDL
Beds	215	210	18	20	10	8	153	39	67	81	NA	10	5	5	n/a
Bed Occupancy Rate	60	71	25	2.2	0.4	30	90	41	62.8	78	NA	100	70	60	n/a
Wards and Units	4	6	11	3	2	7	8	6	3	7	3	2			n/a
Avg. Inpatients/Day	26	23	2	5/mo	NA	2/wk	95	16	9	50	NA	10	3	3	n/a
Avg. Outpatients/Day	800	265	130	218	175	300	450	220	298	200	30	200	25	20	85

GHP: Public hospital. GHC: Public health center. PHP: Private hospital. PC: Private clinic. PDL: Private diagnostic laboratory.

THE HEALTH CARE WASTE MANAGEMENT REGULATORY FRAMEWORK

Provision of HCW regulatory instruments is one of the first key steps in establishing good practices for proper HCW handling and disposal and for the operation of a sustainable HCWM system. During the assessment, most HF managers and representatives (80%) indicated awareness of existing national HCWM regulatory frameworks. Six interviewees (40%) reported having a copy of the HCWM guidelines.

The FMOH 2008 national HCWM guidelines require each HF to have a comprehensive HCWM plan as part of an overall health care strategy. However, in an assessment conducted by the FMOH in 2011, none of the 35 HFs visited had HCWM plans. Implementing a proper HCWM plan requires a regular internal and external audit plan. But of the assessed HFs, only three had had their HCWM system audited by an external body, and only one reported having a regular internal audit plan for its HCWM practices.

Most key informants indicated that HCWM is a growing concern in urban and rural areas of Addis Ababa and Ethiopia overall. To address the problem, different policy instruments have been issued at national level. The specific HCWM legal documents include: infection prevention guidelines, a HCWM strategy and implementation plan, and HCWM guidelines, directives, and minimum standards for HFs. The national-level documents are seen as a platform that creates an enabling environment in which to begin to improve HCWM services. However, all informants noted that HCWM legal instruments were not yet enforced—a major gap in implementing a sustainable PPP–HCWM system in the country.

Most stakeholders among regulatory staff and service providers highlighted an overlap between the mandate for regulatory staff and service providers at federal level and those at regional and city level. For example, the mandate on HCWM given to the federal Food, Medicine and Health Care Administration and Control Authority (FMHACA), the Addis Ababa Environmental Protection Authority (AAEPA), and the Addis Ababa City Administration (AACA) solid waste management agency was not clearly defined, and there was a mandate gap on which agencies would provide HCWM operational service.

INSTITUTIONAL SET-UP AND MANPOWER

In promoting safe HCWM, the institutional set-up and assignment of responsibility are critical. Interviewed about the department, unit, or staff responsible for HCWM, 12 HFs (80%) reported having designated a staff member to be in charge of HCWM; 10 of this dozen (67%) said that the staff in charge mentor mainly waste handlers.

The number of designated health care workers and waste handlers working at HFs varied by type and level of service delivered. The mean number of health care workers was 336 for public hospitals, 159 for private hospitals, 61 for public health centers, and 49 for private clinics. The mean number of waste handlers was 63 at public hospitals, 30 at private hospitals, seven at public health centers, and eight at private clinics.

Table 2. Addis Ababa City Health Care Workers and Waste Handlers by Health Facility Level

Facility Level	Health care workers	Waste Handlers
Hospitals		
Private	159	30
Public/Government	336	63
Health Centers	61	7
Clinics	49	8

CAPACITY BUILDING

Training in health and safety is intended to ensure that workers know of and understand the potential risks associated with HCW and the rules and procedures they are required to respect for its safe management. They should be informed as to the importance of consistent use of personal protective equipment (PPE) and should be aware of where to obtain post-exposure prophylaxis (PEP) in case of a needle-stick injury or other exposure to blood or other potentially infected wastes. Health care personnel should be trained in emergency response so that they know the protocols to follow in the event of injury by a waste item; the necessary equipment should be easily available at all times. Procedures for different types of emergencies should written and readily at hand. Spills of hazardous chemicals or highly infectious materials should be cleaned up by designated, specially trained personnel (Prüss-Ustun et al. 2013).

According to the study conducted by Muluken and Kume (2010), after adjusting in multivariate analysis, HCW training was significantly associated with appropriate HCWM practice. Health care workers trained on HCW were 2.29 times more likely to practice appropriate HCWM than their untrained counterparts [OR, 2.29; 95% CI (1.24, 4.24)]. However, most HF managers or designated persons (73%) reported that all staff had received at least one training in HCWM. Of the 11 HFs that provided at least one training, six (54%) were in the public sector and the rest in the private sector. The FMOH (2012b) *Minimum Standards for Hospitals, Health Centers and Clinics* prescribes that that health care staff receive the training necessary to perform their assigned job responsibilities.

HEALTH CARE WORKER SAFETY

HCW generation, segregation, transportation, treatment, and disposal involves handling potentially hazardous materials. Therefore, protection against personal injury is essential for all workers. Personal protective equipment (PPE) is a key occupational health and safety measure.

All facilities studied for this needs assessment reported providing at least three types of PPE (i.e., heavy-duty gloves, latex gloves, and aprons) for waste handlers and health care workers. However, in most facilities, it was observed that waste handlers use disposable latex gloves rather than heavy-duty gloves to handle HCW. Although the latex gloves protected the handlers from blood and bodily fluids, they provided no protection from cuts on the hands or needle-stick injuries. A FMOH rapid assessment in 2011 reported similar findings: in only 10 HFs (28.6%) did waste handlers have complete PPE; handlers in 45.7% had partial PPE and those in 25.7% had none. At most waste treatment sites where respirators or goggles had been provided to waste handlers, most were not wearing them when observed and put them on only upon spotting visitors.

The nonexistent or inappropriate usage of PPE by health care workers and waste handlers observed at HFs during field visits reveals a lack of attention to the issue that requires, at facility level, sufficient budget, continuous awareness raising, and a HCWM monitoring plan to remedy.

PREVALENCE OF NEEDLE-STICK INJURIES AND OTHER EXPOSURE

According to a World Health Organization HCWM policy paper (2004), epidemiological studies indicate that a person who experiences a single needle-stick injury from a needle used on an infected patient has risks of 30%, 1.8%, and 0.3% to become infected with, respectively, hepatitis B (HBV), hepatitis C (HCV), and HIV.

For the present needs assessment, all HF managers were asked about the prevalence of needle-stick injuries. Seven HFs (47%) reported one or more needle-stick injuries or exposure to blood or bodily fluids during the preceding six months. Needle-stick injuries were reported mostly during administration of injections, exposure to blood or bodily fluids mostly during service delivery.

AVAILABILITY OF POST-EXPOSURE PROPHYLAXIS

Among the 15 HFs surveyed for this assessment, eight (53%) made PEP available on site. Of that group, four were hospitals, three were health centers, and one was a clinic. Private clinics and HFs were less likely to offer PEP. Two public hospitals and one public health center did not offer PEP services.

PROVISION OF HEPATITIS B VACCINATION

Because viral hepatitis B infections have been reported among health care personnel and waste handlers, immunization against HBV is recommended; for waste handlers, tetanus immunization is also advised (World Health Organization 2011a). However, in an FMOH study (2012c), none of the health care workers or waste handlers in the HFs visited were immunized against either hepatitis B or tetanus.

However, during the present needs assessment, most HFs (53%) reported providing HBV immunization to their health care workers and waste handlers. The percentage is higher (62.5%) among public-sector HFs than in private-sector institutions. This finding may be attributed to provision of nationwide mass vaccination to groups of individuals at high risk of acquiring HBV infection, including health care workers and waste handlers.

CURRENT HEALTH CARE WASTE MANAGEMENT PRACTICES AT FACILITIES

Waste Generation and Characterization

The research team for the present needs assessment attempted to gather secondary data and information from the HFs they surveyed. Most respondents indicated awareness of the hazardous and nonhazardous nature and characteristics of HCW. However, except for one private hospital, most interviewees did not characterize or quantify waste in their facilities. To build a picture of the HCW types and quantities, the team consulted secondary data produced elsewhere in Ethiopia as well as other countries.

Assumptions and calculations were as follows:

- Total tons of HCW per day = average waste generation rate per day per facility x total number of HFs per category.
- Total tons of HCW per year = average waste generation rate per day per facility x total number of HFs per category x the number of working days per year.
- There are 49 hospitals, 75 health centers, and 726 clinics in Addis Ababa City.
- The average number of working days per year was estimated to be 264.
- Of the total HCW, 80% was estimated to be general waste, and the remaining 20% hazardous waste (World Health Organization 2000).

It should be noted that the average daily waste generation rate per facility varies with the level of facility. Accordingly, the average HCW generation per hospital per day is estimated to be 236 kilograms. This was calculated using the mean waste generation rate per hospital reported by previous research (Solomon 2005; Haile 2008).

To estimate the quantity of waste generated from health centers and clinics, the average waste generation rates reported by Muluken and Kume (2010) were used, and the average daily generation rate per health center was 1.79 kilograms. It is to be noted that the estimated figures are only indicative and should not be taken as accurate. Due to lack of data, no estimates could be made for clinics' hazardous and nonhazardous waste quantities.

Based on these calculations, the estimated total HCW generated by Addis Ababa City HFs is more than 12 tons per day (Table 3)—three tons of it hazardous waste and the other nine tons general waste.

Table 3. Estimation of Health Care Hazardous and General Wastes in Addis Ababa

Health Facility Type	No. of Facilities	Generation (Kg/Day)	Hazardous Waste (Tons/Day)	General Waste (Tons/Day)	Total HCW (Tons/Yr)	Total Hazardous Waste (Tons/Yr)	Total General Waste (Tons/Yr)
Hospital	49	236	2.3	9.3	3053	611	2442
Health Center	75	1.79	0.03	0.1	35.4	7.1	28.4
Total	124	1.79–236	3	9	3088	618	2470

Segregation

Waste segregation at the point of generation is important for the safe management of HCW. The national health care waste management guidelines specify that a scheme of three color-coded bins be used in waste segregation systems (Figure 1) and that any unsegregated waste be treated as hazardous (and this is not cost effective).

Of the 15 HFs assessed, 12 (80%) stated that they labeled waste containers as infectious and general wastes; observation confirmed this assertion. Only eight HFs (53%) reported utilizing the mandated color coding.

Based on FMHACA minimum standards, sharps should be placed in a puncture-resistant container especially designated for deposit of hazardous waste.

On the day of the assessment survey, safety boxes for sharps disposal were available in seven HFs (47%), and in these, observers saw sharps being put into the safety box immediately after use. Of the seven, five were public and two were private. Of the remaining eight, three segregated sharps in small cartons, containers that were neither puncture resistant nor waterproof (Figure 2).

This finding recalls that of Fikru (2004) but is significantly greater than reported by Yemane and Millogo (2000). Fikru described 46% of HFs using sharps boxes to segregate wastes at the point of generation. Yemane and Millogo indicated that immediate collection of sharps in a safety box was observed only in two of the 52 HFs assessed (approximately 4%).

Observation at HFs with labeled, color-coded bins documented that all were segregating waste by color code. However, in most HFs, general waste was seen to be mixed with hazardous waste at various points (Figure 3).

Other literature reported significantly lower usage of recommended color coding (Federal Ministry of Health 2012c; Habtetsion et al. 2009; and Tewodros 2008). The FMOH reported that 37.1% of HFs studied segregated HCW at the source and 48.6% segregated sharps; the remaining 14.3% observed no protocols. In total, five HFs (14.3%) were using color-coded waste containers. Habtetsion et al. reported an absence of HCW segregation practices in 75% of HFs (N=71). In his study of two hospitals (one private, one public), Tewodros observed mixing of nonsharp infectious wastes with other waste and an absence of color-coded segregation bins. Similarly, an environmental audit on hospitals (N=6) conducted by the Office of the Federal Auditor General (OFAG; 2008) confirmed that waste was not segregated and in fact that different HCW streams were mixed and the containers left open in passageways. Others (Haylamicheal et al. 2011; Mussie 2010; Solomon 2005) also observed the mixing of hazardous HCW with general waste in HFs because of the absence of labeled containers.

The preponderance of evidence thus reveals that most HFs in Addis Ababa City do not properly segregate HCW at the point of generation as recommended by national HCWM guidelines. To effectively manage and significantly reduce the amount of potentially hazardous HCW, waste segregation at the point of generation, using appropriate color-coded waste containers, is key (Ananth et al. 2010; Graikos et al. 2010; Moritz 1995; Prüss et al. 1999).

Figure 1. Color-Coding and Waste Labeling Practices at Health Facilities, Addis Ababa City

Figure 2. Sharps Handling Practices at Health Facilities, Addis Ababa City

Figure 3. Improper Waste Segregation Practices at Health Facilities, Addis Ababa City

Collection and Transportation

Health care waste, segregated at the source of generation and then collected, must often be stored prior to transport for final treatment and/or disposal off site. All the surveyed HFs reported having a waste collection system in place. Specifically, all reported using waste buckets to collect and transport waste to treatment facilities or temporary waste storage sites. All facilities were collecting waste daily from its point of generation.

According to a study by the Disease Prevention and Control Department of the Federal Ministry of Health (2004) in four federal hospitals, all used plastic buckets to collect HCW. A more recent Federal Ministry of Health study (2012c) found that at most public and private HFs, HCW was carried in bins or baskets to an on-site treatment facility, and collection was once daily, as found by this assessment. However, the national HCWM guidelines specify that trolleys or carts be used for transporting bags of infectious waste within facilities.

Of surveyed HFs, only two (13%) possessed a locked HCW storage room on site. The 2012 Federal Ministry of Health study reported no HCW storage rooms.

In the survey for the current assessment, all HFs described an on-site transportation system consisting of waste handlers using buckets to carry HCW to treatment or on-site storage/disposal points, a finding similar to that of the 2012 FMOH study, which indicated that virtually all public HFs (99.6%) and many private facilities (40%) were transporting HCW to on-site treatment and disposal facilities.

Of the HFs surveyed for the current assessment, eight (53%) indicated that they have contracted with an outside service to transport HCW and the remaining seven—one private hospital, three public health centers, and three private clinics, or 47% of HFs—had no plans for transporting HCW to off-site facilities for processing. Of eight HFs that reported having HCW transported off-site, five was provided by the Cleansing Management Agency (CMA), while one facility was served by Micro and Small Enterprises, one clinic used its own transport, and another used a private service provider.

According to the 2012 Federal Ministry of Health study, 14 HFs (40%) contracted with private companies and municipalities to transport waste to the municipal waste disposal site. Similarly, key informants at the Cleansing Management Agency indicated that 10 private companies transport

municipal waste and general waste from secondary collection points and communal waste bins to the Repi landfill, the 36-hectare municipal landfill on the outskirts of Addis Ababa City. Key informants revealed that the Cleansing Management Agency is transporting only general or nonhazardous waste.

Thus, no private or public institution is collecting the hazardous portions of HCW. In the absence of an institution responsible for transporting this type of HCW (both untreated HCW and ash from incinerated HCW, including hazardous HCW), it is either mixed with general waste and disposed of at the municipal dump or illegally disposed of by HFs.

In field observations, it was seen that some infectious waste from most HFs (incinerator ash included) was disposed of in municipal waste containers.

Treatment of Infectious Waste

Infectious health care waste presents a higher risk to health and should be treated prior to disposal; a number of different options are available, including incineration, chemical treatment, autoclaving, microwaving, and shredding/compacting (Department of Protection of the Human Environment, Water, Sanitation and Health, World Health Organization 2004).

Incineration

Incineration is the most widely used treatment for HCW in the surveyed facilities: All 15 HFs reported using incineration to treat waste. Of reported incinerator technologies, only one private hospital used a high-temperature incinerator (Figure 4), two incinerators were not functional, and the remaining incinerators comprised low-temperature models lacking air pollution control devices and were thus not environmentally friendly.

In the 2004 Federal Ministry of Health study, all hospitals surveyed used low-temperature incinerators to treat infectious waste; one hospital used a plasma gasification incinerator; and half used open burning to treat rubbish and expired drugs. Tewodros and Mussie also noted use of incineration technologies for HCW treatment in studied hospitals. Mariam et al. (2005) found that only 50% of the HFs (n=121) used a simple incinerator; in 65% of HFs (n=71), Habtetsion et al. observed the burning of HCW in open holes, enclosures, and open areas.

Although national HCWM guidelines recommend double-chamber incinerators (>850°C) as the optimal method of waste treatment, most HFs (80%) use low-temperature technology that generates air pollution.

The 2006 Federal Democratic Republic of Ethiopia Environmental Protection Authority survey found the annual dioxins, polychlorinated dibenzo dioxins and polychlorinated dibenzo furans (PCDD/PCDFs) released from various sources to be 214.70 g TEQ (toxic equivalency), where uncontrolled combustion of HCW accounted for 26% of total PCCD/PCDFs released. The lack of a proper HCW treatment and disposal system may have adverse impacts on human health and the environment (Shinee et al. 2008)—for instance, through the release of hazardous gaseous emissions (Alvim-Ferraz and Afonso 2005). As a ratifier of the Stockholm Convention on Persistent Organic Pollutants, Ethiopia is obligated to eliminate or significantly reduce emissions of dioxins and furans from HCW incinerators (Stockholm Convention 2009).

Facility managers, interviewed for this assessment, noted that they had received complaints about air pollution from local residents: the Constitution of the Federal Democratic Republic of Ethiopia (Federal Negarit Gazeta 1995) gives all citizens "the right to a clean and healthy environment," and Proclamation No. 300/2002, the Environmental Pollution Control Proclamation (Federal

Democratic Republic of Ethiopia 2002) stipulates that "No person shall pollute or cause any other person to pollute the environment by violating the relevant environmental standards." Anyone committing such an offense is liable, on conviction, to a fine or a term of imprisonment, depending on the seriousness of the offense committed.

Figure 4. High-Temperature Incinerator at a Private Health Facility in Addis Ababa City

In facilities where the incinerators were observed to be not functional, HCW were discarded openly around the treatment facility, and in some cases, untreated infectious wastes were improperly disposed of in the unfenced municipal garbage container (Figure 5). Facilities with nonfunctional incinerators may also treat HCW by open burning.

The 2012 FMOH survey also found that few public health centers incinerators were fenced to restrict access by unauthorized persons. Yemane and Millogo reported that 50% of surveyed facilities dumped sharps openly on the ground in and around HFs.

When improperly handled, HCW can cause disease as well as serious air, water, and soil pollution. Such inappropriate practices as disposing of medical waste in municipal dust bins, in open spaces, in bodies of water, and the like can spread diseases (Manyele 2004). Staff and patients in health care establishments, workers in waste treatment and disposal facilities and the community at large are at risk of exposure to health hazards associated with HCW.

Figure 5. Untreated and Improper Disposal of Health Care Waste in Health Facilities, Addis Ababa City

Other Health Care Waste Treatment Options

Ten HFs (67%) reported using chemical sterilizers (chlorine solution) for disinfection of cultures and stocks of infectious agents, buckets, gloves, apron etc. Similarly, 13 facilities (87%) were using autoclaves/steam sterilizers for disinfection of recyclable items such as scissors and pans. During the 2012 FMOH survey, 65.7% of HCFs were using chemical decontaminants and autoclaves for disinfection.

In summary, the health care waste treatment practices of the surveyed facilities are primarily waste incineration technologies, though sterilizers (chlorine and steam) are utilized by some. Most of these technologies are small-scale incinerators that operate at low temperature and hence pose a risk to public health.

Disposal Practices

For final disposal of waste, only five HFs (33%) reported having an ash pit on the premises. Of these five, two HFs disposed of burned needles in their ash pits, and one reported using a designated needle pit to hold burned needles. All facilities that provide delivery services used "placenta pits" to dispose of placentas; two facilities used a placenta pit to dispose of other anatomical wastes.

The 2012 FMOH study had similar findings: 28 public HFs (80%) were disposing of waste on site in ash pits or in open dump sites. Most HFs (98.6%) dumped anatomical wastes in placenta pits; the rest had no placenta pit. The national HCWM guidelines mandate disposal of treated infectious solids and incinerator ash in landfills.

For the current assessment survey, eight HFs (53%) reported using off-site disposal (mainly Addis Ababa City's Repi landfill). Of the eight HFs, three indicated that they disposed only of general waste in this manner, suggesting that HFs without an ash pit who are disposing of HCW off site may be depositing ash at the municipal dump site.

A key informant from the Waste Recycling and Disposal Project Office pointed out that Repi landfill lacks a separate cell for HCW, although it does receive HCW, including sharps; landfill workers and scavengers often report needle-stick injuries, possibly resulting from improperly disposed of HCW. Miyazaki and Une (2005) attributed municipal waste handlers' needle-stick injuries to poor segregation of HCW in 30% of Japan's municipalities. Lack of a proper HCW disposal system may adversely impact human health and the environment when incineration ash contains hazardous substances (Zhao et al. 2009).

The Federal Democratic Republic of Ethiopia's Proclamation No. 661/2009, the Food, Medicine and Health Care Administration and Control Authority Proclamation, prohibits collecting or disposing of solid, liquid, or other wastes in a manner contaminating the environment and harmful to health; and mandates that waste generated from health or research institutions be handled with special care and that these institutions' disposal procedures meet all relevant standards.

Effluent Disposal

Ethiopia's national HCWM guidelines forbid the release of untreated HF waste water into the environment because of such harmful contents as microbiological pathogens, hazardous chemicals, pharmaceuticals, and radioactive isotopes. In addition, the Federal Democratic Republic of Ethiopia Proclamation No. 661/2009 prohibits discharging untreated waste generated from septic tanks, seepage pits, and industries into the environment, water bodies, and water convergences.

Of HFs surveyed for this assessment, five (33%) reported having an on-site waste water treatment plant. Of the remaining 10 facilities, two reported having connected their effluent to the Addis Ababa water supply and sewerage system. Some facilities reported treating liquid infectious waste from laboratories with chlorine solution and dilution chemicals prior to disposal.

A related study made by the Addis Ababa Environmental Protection Authority (2005) on HFs (N=6) found that although some hospitals had waste storage tanks, leakages and overflows allowed HCW water to flow or move via runoff into streams and rivers both nearby and far away from the hospitals. Supporting this finding, Mussie's 2010 study of three HFs described that although one HF stored its wastewater in a septic tank, two HFs released untreated wastewater into nearby water bodies. Emmanuel et al. (2009) found improper HF wastewater disposal practices contaminating groundwater with pathogens and toxic chemical substances at levels that posed risks to human health.

Thus, despite legal mandates, most surveyed facilities lack wastewater treatment facilities and discharge untreated effluent into the environment.

Figure 6. Water Treatment Plant at Private Health Facility, Addis Ababa City

PART I CONCLUSION AND RECOMMENDATIONS

CONCLUSION

This HCWM needs assessment, conducted to gain insight about current practices in Addis Ababa City, provides stakeholder perspectives pertinent to HCWM there and in Ethiopia as a whole. Findings demonstrate gaps and identify a need for a public–private partnership in HCWM in Addis Ababa.

To establish a sustainable HCWM system, all system elements must be in place (i.e., a legal framework and managerial, technical, and financial infrastructure) and must be both implemented and enforced. Currently, although an enabling environment exists in the form of proclamations, directives, standards, guidelines, and procedures, the legal instruments for oversight and enforcement are not yet in place. There is also an overlap in the mandate of different institutions to regulate hazardous waste management in the city.

The assessment found that most HFs do not properly manage waste to the level recommended by the national HCWM guidelines. Inadequate HCWM may be attributed to negligence; lack of awareness, capacity, and budget; the absence of infection prevention commodities in the local market and of alternative HCWM technologies at the city level; and other factors. Most surveyed HFs lack data on the quantity and type of HCW they generate.

Solving existing HCWM problems requires both long- and short-term plans at facility and city levels. In the short term, facilities must designate a qualified professional whose primary job function is HCWM. In addition, strengthening the IP committee, providing on-the-job training to health care workers and waste handlers, and developing a HCWM plan may help fill gaps. The assessment revealed poor HCW treatment facilities in most health complexes; maintaining treatment facilities may also reduce current problems. Over the long term, each HF needs to develop a HCWM plan aligned with national guidelines and other regulatory standards and to assign sufficient financial, material, and human resources to HCWM activities.

At the city level, in the short term, strengthening monitoring and supervision activities is important. For process gaps, the city administration and other stakeholders need to collaborate on an action plan to prevent recurrence of HCWM problems.

A major HCWM problem was the absence of any facility to treat and dispose of hazardous wastes generated by HFs, pharmaceutical companies, and institutions and organizations in other sectors. Over the long term, this is an issue that the city needs to address. The experience of other countries—who have found establishment of a common HCW treatment plant as the best way to manage such a problem—Addis Ababa City Health Bureau (AACHB), in collaboration with other stakeholders, should establish a facility to provide HCW treatment services. How such a facility might function or operate is discussed in Part II of this report.

RECOMMENDATIONS

Based on the problems and conclusions identified in this assessment, the study team recommends:

Strengthening of enforcement measures for implementation must increase. Directives and guidelines have been developed at the national level for managing HCW-related problems, but enforcement has been minimal.

Clarify the mandates of relevant stakeholders. These include the Addis Ababa City Bureau of Health, Addis Ababa Environmental Protection Authority, Addis Ababa Cleansing Management Agency, and Addis Ababa Food, Medicine and Health Care Administration and Control Authority. A major gap in the legal framework has been an overlap in the role and responsibilities of such regulatory institutions.

Establish a national HCWM stakeholders' forum. HCWM activities involve various stakeholders, and this forum will facilitate discussions among them.

Consider establishing a HCW treatment plant to serve HFs and others. This would help solve the longstanding problem of hazardous waste treatment at city and national levels.

Conduct further investigation to obtain data on HF waste generation and quantity and other relevant information. Current information on these topics is limited.

Install pyrolytic incinerators to treat infectious HCW of city HFs, both large and small. Effective treatment of infectious HCW is integral to HCWM. Treatment options fall into two groups: combustible technologies and noncombustible technologies. Given increasingly stricter emission standards for incineration, noncombustible HCW treatment technologies (e.g., autoclave/steam sterilization and microwaving) are rapidly becoming more widely used. However, because they are sophisticated and highly expensive for developing countries such Ethiopia, incineration—already utilized across the city to treat most hazardous HCW and waste that cannot be recycled, reused, or disposed of in a landfill—remains the single most affordable technology for health facilities in Addis Ababa and Ethiopia as a whole. Pyrolytic incinerators, which comprise a double chamber and a postcombustion chamber, are very efficient, producing temperatures as high as 900–1200°C during combustion and minimizing smoke and odors. The following two options should be considered:

- Option 1—Install a centralized, or off-site pyrolytic incinerator, or comparable equipment with thermal destruction technology. It should be in an appropriate location (e.g, at Chebe Woregenu, Addis Ababa's proposed new landfill, which is being established per information from Addis Ababa City Administration, 37 km east of the city. HCW generated by all HFs would be

collected, transported, and treated in this central facility. It would need to handle up to 750 kilograms per hour, or more than three tons per day.

- Option 2—Install four decentralized treatment facilities. Locations would take into consideration the distribution of HFs across the city, and one or more of the treatment facilities might be in HFs that have adequate space on their premises. HFs would collect and transport their hazardous wastes to the nearest treatment facility for incineration.

Construct a secured pit for hazardous wastes at the municipal disposal site. HF wastes are hazardous and nonhazardous. General wastes, which are nonhazardous, can be disposed of at the municipal disposal site. Hazardous wastes, including treated HCW and incinerator ash, must be disposed of in a secured pit. The AACHB, in collaboration with the Waste Recycling and Disposal Project office, should play significant roles in realizing this notion. Over the long term, all treated residues and ash from incineration and all chemically disinfected nonsharps should be disposed of in the proposed new Addis Ababa City Administration sanitary landfill.

Establish a public–private partnership for collecting and transporting hazardous HCW in Addis Ababa City. Currently no private or public institution is doing this.

PART II
FINANCIAL, ECONOMIC AND PUBLIC–PRIVATE PARTNERSHIP ASPECTS OF HEALTH CARE WASTE MANAGEMENT

The following pages explore the financial, economic, and public–private aspects of HCWM and include conclusions and recommendations. Part II is based on assessment findings and recommendations discussed in Part I.

RESULTS AND DISCUSSION

HEALTH CARE WASTE MANAGEMENT FINANCING

Implementing a proper HCWM plan at facility level requires designated resources and budget. This assessment attempted to identify budgets allocated for HCWM and the proportion occupied by HCWM budget in total HF budgets. No HFs in the assessment allocated a specific budget for HCWM as a separate line item; HCWM budgets are routinely included under other budget lines. Thus, determining the proportion of budget allocated to HCWM at the facility level was not possible. This assessment's findings are similar to those of the 2012 Federal Ministry of Health study in that most HFs have not given HCWM the attention it requires in terms of direct funding.

For this assessment, HFs were asked whether the budget allocated for HCWM was adequate. Of the 15 HFs studied, five reported the budget to be sufficient and the rest termed the allocated budget inadequate. The remaining three facilities were unable to provide information.

However, even in HFs identifying the budget as adequate, the assessment team observed drawbacks and limitations in implementing HCWM associated with budget constraints. For example, PPE, including goggles and masks, were not always provided to all waste handlers and laundry unit staffs. In addition, although the national HCWM guidelines spell out the importance of having designated personnel managing HCW, there were trained, responsible officers managing HCW as their main job responsibility in only 20% of HFs. In most private clinics, waste management issues are handled by health or administrative staffs as a secondary responsibility.

From the interviews with health professionals and administrative staffs, many challenges to implementing proper HCWM practices in HFs emerged. For example, standardized waste handling materials are lacking—most private facilities reported difficulties purchasing puncture-resistant

safety boxes and were forced to collect sharps waste in cardboard boxes. General waste collection was another challenge. Although HF water bills include high fees for general waste collection, this service is provided only irregularly.

Despite these gaps, most HFs are interested in outsourcing HCWM activities. In Addis Ababa City HCWM, the private sector might play a critical role in waste collection, transportation, treatment, and disposal.

PUBLIC–PRIVATE PARTNERSHIP ARRANGEMENTS

A public–private partnership can be defined as an arrangement between a public body and a private party or parties, including community beneficiaries, for the purpose of designing, financing, building, and operating an infrastructure facility that would normally be provided by the public sector. In other words, a PPP is a contractual agreement between a governmental organization and a private party whereby the latter performs all or certain parts of the government organization's service delivery, infrastructure provision, or administrative functions, and assumes the associated risks. In return, the private party receives a fee, which may take the form of user charges or direct payments from the government, in accordance with predefined performance criteria.

In Ethiopia, a PPP can be defined as an engagement and relationship between the public sector (including development partners) and the private sector as well as civil society (including community beneficiaries, the poor, and vulnerable groups). A PPP can be developed and promoted in Ethiopia by putting in place a partnership framework that will facilitate the pooling of local innovation, efficiency, risk management, and cutting-edge technology and applying guiding principles from the private sector. To achieve positive synergies, public-sector authority, asset ownership, and budget support, as well as public education powers, capacity development support, and application of relevant PPP guiding principles, among other things, will also be required (Asubonteng 2011).

According to Asubonteng, a PPP based on good practices is a win–win situation for both public and private sectors in the delivery of public infrastructure, goods, and services. Major benefits for the government are the speed, efficiency, and effectiveness associated with private business practices to public service delivery as well as value for money. For private-sector service providers, PPP investment offers the opportunity to access public powers and competencies as well as to have significant influence on government decision making relating to urban development, infrastructure, service delivery, and similar activities.

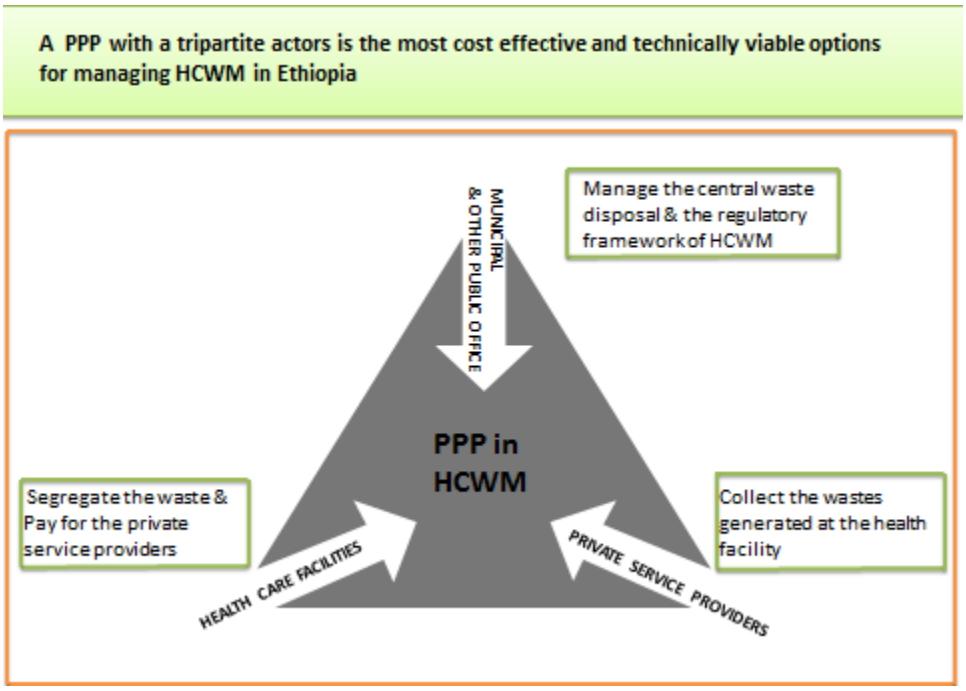
Experience has shown that a permissive policy and legal framework as well as a suitable investment climate are needed for a PPP to be effective. Also required is a detailed, well-prepared infrastructure investment plan clearly indicating the extent to which PPPs could be utilized. Both government and private parties may need to make changes in their institutional setup to comply with public procurement procedures and to facilitate negotiations, contract management, operational efficiency, and customer satisfaction.

PUBLIC–PRIVATE PARTNERSHIP FOR HEALTH CARE WASTE MANAGEMENT IN ADDIS ABABA CITY

As discussed in Part I, for most HFs covered by this assessment, HCW handling practices (e.g., generation, storage, transportation, treatment, and disposal) present risks to public health and the environment. Many Addis Ababa HFs do not meet the minimum standards of the national guidelines.

Establishing a tripartite PPP–HCWM that involves the public sector, private service providers, and HFs is one strategy that might meet this challenge. The study team investigated the enabling environment and HF willingness to participate in a PPP arrangement for Addis Ababa City HCWM.

Figure 7. Proposed Public–Private Partnership for Health Care Waste Management in Addis Ababa City



The national HCWM guidelines permit private-sector involvement in HCWM operations after institutional qualification by regional health bureaus (RHBs) for competency and by regional environment bureaus for operation; the guidelines require that all contracts with private contractors for HCW collection, on-site or off-site transportation, treatment, and disposal be approved by regional health and regional environment bureaus. Memorandums of understanding with private contractors must spell out each party's duties and responsibilities for HCWM procedures, including HCW handling, transportation, and final disposal.

Federal Democratic Republic of Ethiopia Proclamation No. 300/2002, the Environmental Pollution Control Proclamation, exempts new imported pollution-control equipment from customs duty, upon verification by the relevant authority. For potential HCWM service providers importing technologies and related materials services, this is a benefit.

Also affecting the PPP's success is HF acceptance of the arrangement and willingness to participate. The role of all HF staff in segregating HCW at the source is critical, and the HFs need to have sufficient financial capacity to cover the cost of obtaining the service from outside providers. The assessment team found that most HFs are interested in outsourcing HCWM activities if quality service providers were available at reasonable price; only one of the 15 HFs assessed was uninterested, doubting the usefulness of outsourcing the service given its own well-established HWCM practice.

Asked to identify what services they might need, most HFs interested in outsourcing HCWM expressed interest in having service providers collect, transport, treat, and dispose of both solid and liquid wastes. Observers noted that most privately owned HFs operate in buildings or houses not specifically designed to provide health services and lack space to undertake construction or any other expansion activities to accommodate HCWM activities.

Despite this interest in outsourcing waste collection and transportation, HFs have reservations about the availability of reliable service providers; the irregularity of collections in the current general waste collection system is not persuasive.

Many of the assessed HFs do have experience outsourcing other activities and operations partially or completely to the private sector or to other service providers—nearly 34% of HFs have done so. All HFs have outsourced service for security to private service providers. In interviews, the executive officer of GHP2 and the medical director of GHP1 implied that it has been hospitals' desire to eventually outsource nonmedical activities such as laundry, waste management, and cafeteria services to competent providers.

These initiatives and the HFs' willingness to outsource HCWM activities can serve as a good entry point to introduce a PPP for HCWM in Addis Ababa City. Although no data exists on how much budget HFs allocate for HCWM, it is known that they do have financial resources that can be shifted to pay for HCWM services. In addition, through the health care financing program—a strategy to increase funding for health by improving resource mobilization and to ensure equitable resource allocation, efficiency of resource utilization and financial protection of its citizens—HFs have begun to use the revenue they generate to improve the health services they provide. With a PPP–HCWM in place, both facilities and investors could benefit, since part of the health-care-financing program revenue could be used to cover the cost of HCWM activities.

In contrast, the limited flexibility in public procurement procedures may pose its own challenge in the early stages of PPP implementation. During the assessment, the team learned that the facilities cannot engage in long-term contractual agreements with certain suppliers; instead, annually or biannually, they must select and reselect suppliers via competitive bids. For this reason, and because some investments require a long recovery period and are sector-specific, investment by private-sector actors might be risky. Both government and city administration must consider this issue to attract sufficient investors in service provision.

COSTS ASSOCIATED WITH HEALTH CARE WASTE MANAGEMENT

Waste management, including segregation, recycling, packaging, storage, treatment, and disposal, are necessary for economic and technical as well as environmental reasons. Economically, it makes sense to rationalize and minimize waste production and to separate hazardous from nonhazardous waste, because it is both compulsory and costly to incinerate hazardous waste.

The first step in HCWM—developing a viable approach to waste segregation and handling—will be handled at the sites where waste is generated and is the responsibility of HF management and all HF staff. The main costs associated with waste segregation include:

- Costs associated with procurement of materials, including color-coded buckets or bins, trolleys, and wheeled containers.

- Cost of such consumables as plastic bags (bin liners), safety boxes, and bleach and other disinfection materials.
- Cost to construct storage space and to maintain equipment.
- Labor costs.
- Cost of full and appropriate PPE for all staff members.
- Cost of training and behavior-change communication materials and job aids.

After the waste segregation process is completed, cost items depend on which of several technologies a HF uses, either on site or off site, to treat and dispose of its waste.

Figure 8. Proportion Matrices for On-Site Health Care Waste Management Compared to Services Provided Under a Public–Private Partnership

Prioritization Buckets	Criteria	Options for Health care service providers: Onsite	Common facility under PPP
Financial factors	Start up cost	●	○
	Operation cost	◕	◔
Technical Factors	Control over the waste treatment	○	◕
	Availability of extra land for waste treatment	◕	◔
	Possibility for leveraging other waste treatment facilities	●	◔

Source: expert interview and Team analysis

○ = High Advantage, ◔ =Advantage, ◕ =Minimal Advantage & ● = No advantage

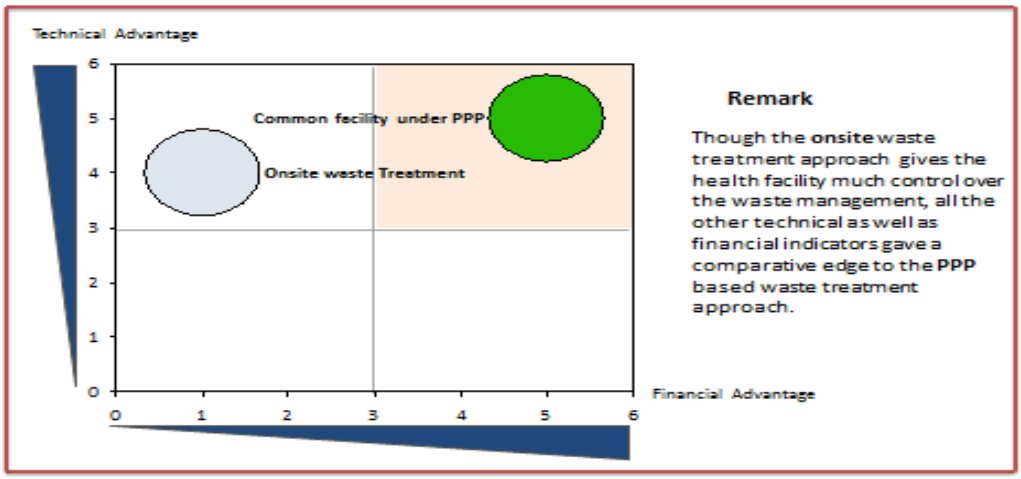
Investment in on-site treatment facilities, although potentially costly, allows a HF to control how the waste is treated and the costs associated with that treatment. Off-site treatment facilities may be more costly in total (for the entity establishing the facility), but if they are available, HFs are not required to fund start-up costs and instead can pay for services monthly or quarterly. Off-site treatment facilities also allow HFs to concentrate on their basic occupational function—providing health services—rather than on operations for the treatment of waste.

If off-site treatment facilities do exist and if HFs prefer to utilize these services for disposing of their waste, the associated costs are for the waste transportation and its treatment. If the decision is to have a facility on site, the costs include:

- Investment in land and facilities (e.g., for buildings, fencing, storage areas, and landfills).
- Capital equipment cost of the selected technology.
- Costs for installation and facility maintenance.

- Direct labor costs.
- Costs of supplies such as for PPE, treatment reagents, and spare parts.
- Operating costs (e.g., for labor, fuel, electricity, and transport vehicles).
- Costs of pollution control equipment, compliance fees, etc.
- Insurance premiums.

Figure 9. Analysis of the Technical and Financial Advantages of On-Site and Common Facilities in Health Care Waste Management



Cost Estimation

HCW disposal is expensive. However, the direct management costs should always be weighed against the indirect costs associated with mismanagement and suboptimal practices. The study team was not able to estimate with sufficient accuracy the overall initial and annual costs for the implementation of its recommendation. However, after analyzing the major capital and some recurring costs, the team has concluded that establishing an integrated, environmentally friendly HCWM and disposal system for Addis Ababa City would cost an estimated U.S.$2,117,800. The cost components available to the team were not exhaustive, and some of the price quotes obtained during the estimating process require further investigation. Nor was it possible to fully assess and compare available technologies and their prices during the assessment. To properly complete the cost estimations, resource mapping needs to be undertaken to determine HFs' geographic distribution and the waste generation of these HFs more definitively quantified.

A simple cost analysis was done by taking two alternatives. The first is a large centralized HCW treatment plant at the Chebe Woregenu proposed new sanitary landfill site. The option was to establish four treatment sites in selected HFs around the city.

There are two caveats regarding the calculation. First, given the limited information available, the assessment team calculated the cost based only on the costs of major components, as a starting point. In addition, facility-level costs and project management costs, including the cost of monitoring and technical support, were not included.

Centralized Common Treatment Plant

Costs for this project broadly encompass the capital investment requirement for setting up the facility (e.g., the transfer station, waste processing, and sanitary landfill development) as well as plant and machinery costs; costs required to procure equipment, vehicles, and machinery for collecting and transporting HCW within the project area; and recurring expenses for project operations, including costs for manpower, operating expenses for utility usage, miscellaneous expenses such as insurance, and the cost of maintaining equipment, vehicles, plant, and machinery related to the project.

Major capital and operation costs for the proposed Addis Ababa City HCW treatment facility include:

Capital Investment

Land acquisition and site selection. To construct the centralized waste treatment facility, at least two hectares of land in a nonresidential area (so as to keep environmental and social impacts minimal). The study team proposed that the treatment facility be established at the new sanitary landfill site in the Chebe Woregenu area 37 km east of the city. Such siting would have significantly reduce investment costs required for the project, because the costs of feasibility studies and other related costs have already been covered. In addition, some treatment technologies and facilities can be shared. Ground work and some related costs would be an estimated additional U.S.$13,297.

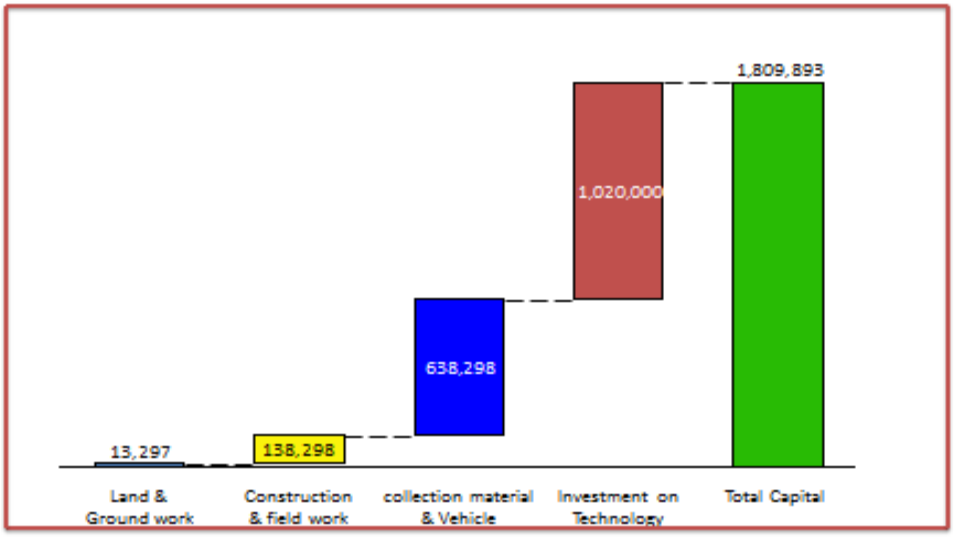
Construction and civil work. The major costs associated with construction of the centralized facility are for: administrative and site control offices; the site entrance and fencing; access roads; the waste inspection and sampling facility; equipment workshops and garages; signage and directions; water supply and lighting; a vehicle cleaning facility; and firefighting equipment. The total estimated cost, conservatively, would be U.S.$138,298.

Collection and transportation. Transportation is mandatory to move waste from its points of generation to the treatment facility, and the system must be secure and controlled to protect the public health. A transportation service provider with a capacity of 15 m^3 is required. This need could conceivably be met with a single truck but because HFs are so widely dispersed, more than one might be preferable. However, assuming one vehicle can collect waste from 80 facilities, 10 vehicles would be necessary, for a total expenses of around U.S.$638,298.

Investment in technology. Treating waste demands appropriate technologies. The proposed facility will use a combination of technologies to treat the waste collected from the city.

- *Incinerator:* Most HCW could be treated using a high-quality high-temperature incinerator with appropriate pollution controls (i.e., scrubbers). An incinerator with a processing capacity of 1000 kilograms per hour would suffice. The cost for such technology is estimated around U.S.$700,000.
- *Autoclave and shredder:* An alternative way to treat HCW is with an autoclave. The autoclave would sterilize HCW with controlled temperature and pressure, and an associated shredder would shred treated waste into unrecognizable pieces that can be dumped in landfill. The cost of this autoclave technology, with a capacity of 150 kilograms per hour, is estimated around U.S.$320,000.

Figure10. Investment Costs Needed to Set Up a Centralized Health Care Waste Management Facility for Addis Ababa City, in U.S. Dollars



Operation and Maintenance Work

In addition to capital investment, the project will entail costs for operations and maintenance to run the facility:

Labor. To operate the facility will require an estimated 53 personnel with varied experience and qualifications. Annually, the estimated staffing costs would total U.S.$104,399.

Utilities. The annual service fee for utilities, including water, electricity, and communications, is estimated to be U.S.$19,149.

Consumables. To maintain a supply of consumable materials (e.g., detergents, disinfectants, and safety materials), U.S.$37,234 will be required annually.

Administrative expenses. Costs such as transportation service for workers and insurance expenses may account annually for U.S.$17,872.

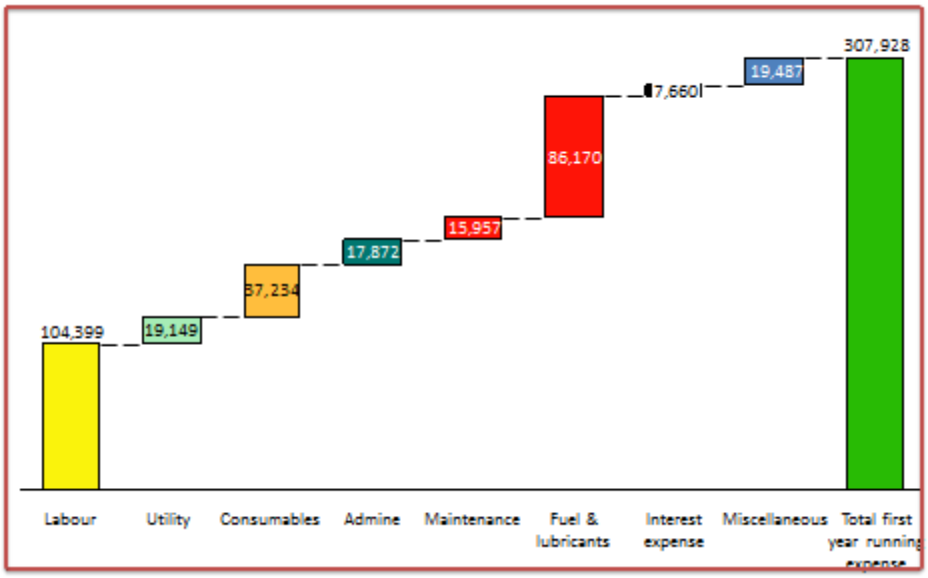
Maintenance. To ensure that the facility continues to function, equipment, vehicles, and facility grounds must be maintained. The estimated annual cost for this would be U.S.$15,957.

Fuel and lubricants. Fuel consumption for energy and transportation services is estimated to be U.S.$86,170 annually.

Interest expense. Interest on loans to finance the project is estimated to be U.S.$7,660 per annum.

Miscellaneous. To cover unforeseen expenses of the facility, U.S.$19,487 should be allocated annually.

Figure 11. Expected Operating Cost for a Centralized Health Care Waste Management System in its First Year, in U.S. Dollars



Decentralized Health Care Waste Management

Another solution to the challenges of HCWM in Addis Ababa City would be the formation of a geographically decentralized PPP–HCWM. Instead of one centralized HCW disposable center, a network of geographically decentralized waste treatment centers could be formed, depending on the HCW generation capacity of city HFs. A HCW generation map could be developed to identify potential waste treatment locations and to determine number of decentralized waste treatment centers that would be economically feasible and that could be managed under a PPP modality. Each center could manage waste generated in all HFs within a catchment area. A designated number of service providers could be assigned to each zone, or a single service provider could work across all the catchment areas.

This decentralized approach would require a relatively smaller capital investment to initiate and would reduce each HF's fee for transporting waste (because of decreased average distance from HFs to the nearest disposal site). The decentralized approach could also yield more timely services for HFs.

However, having multiple centers that comply with standard HCWM operating procedures (one center for each zone) would require considerable land, and the environmental and social consequences of treating and disposing of HCW across the city, including in populated areas, would have to be considered. Within some areas, especially on the outskirts, it would be possible to find the land, but in major, urbanized areas—the areas where most HFs are located—the cost of establishing these facilities might challenge implementation of a decentralized PPP system for HCWM.

PROJECT FINANCING AND IMPLEMENTATION

A partnership between the city government and the private sector could yield the financial resources required to establish the treatment capacity that Addis Ababa City HFs urgently require.

Public Sector

With a PPP arrangement, the public sector can support project implementation via a partial investment in the construction of the treatment facility. Other nations' experiences indicate that public-sector involvement in facilities has ensured quality service.

In Singapore, an incineration plant was established under a PPP arrangement between the National Environmental Agency (NEA) and private service providers. The plant was established under a DBOO model (**d**esign, **b**uild, **o**wn, and **o**perate). The NEA entered into long-term incineration services agreement (ISA) with the developer for the entire capacity of the plant over its entire life. NEA will set and monitor plant performance standards and will collect gate fees to fund ISA payments. If the developer can maintain the plant well, it may well be permitted to continue in operations for an additional period beyond the estimated life of the plant and yield additional earnings for the plant's developer.

In Bangladesh, the Dhaka City Corporation (DCC) entered into an agreement with PRISM Bangladesh, an NGO, to collect, transport, treat, and dispose of the entire city's HCW. Under this project, each facility generating HCW segregates waste into color-coded bins (i.e., for general and hazardous waste) and hands these segregated wastes over to PRISM's collection vehicles. Each hospital, clinic, diagnostic center, and similar facility, enters into a subscription agreement with PRISM for collection and disposal of medical waste.

Under the PPP arrangement, the public sector provides legal support. Concerned state agencies provide HFs with environmental clearance and a business operating license if they meet stated HCWM standards. Secondly, DCC provided land and necessary physical structures to accommodate the common treatment facility as well as dedicated land at no cost to establish the facility. Finally, the public sector authorizes collection charges and PRISM's operation. PRISM operates a HCW treatment facility at the DCC's Matuail landfill site, and this facility includes an autoclave and incinerator (acquired through grant support to PRISM from donor agencies) to appropriately treat the waste.

In India, two common biomedical waste treatment and disposal facilities (CBMWTDF) are operating at Belgchia in Howrah District and at Kalyani in Nadia District in the state of West Bengal. Both facilities provide services for collecting, transporting, treating, and disposing of biomedical wastes (BMW). Both treatment facilities operate under a BOT (build, operate, transfer) concession with a private service provider who has a double-chambered incinerator (with a primary chamber and secondary chamber, maintaining temperatures of 800+50°C and 1050+50°C respectively), with an automatic feeding system and a full-fledged pollution control system (i.e., a scrubber) as well as an autoclave with a shredder. The provider has financed acquisition of vehicles and other equipment. Each HF enters into an agreement with the provider. The West Bengal government has agreed on a service charge for collection, transportation, and treatment of BMW.

In Nepal, a feasibility study conducted to improve HCWM in Pokhara city proposed the establishment of a common HCW treatment facility. The concept was for a facility that would be municipally owned but privately operated. The city will build and own it at its own landfill site, and a private operator contracted by the city will operate and maintain the HCW treatment facility. The city will also fix the price or tariff for the transportation and treatment of HF-generated infectious waste. Under this program, the city is expected to provide legal support to promote source separation and a uniform color-coding system of HCW citywide.

Private Sector

Under the proposed arrangement, the private sector can play a crucial role, especially in collecting and transporting HF waste. Thus, the required investment in vehicles would be covered by the private sector. In addition, the private sector would handle the facility management. The private sector would provide labor and run the facility's operations.

At city level, the private sector has sufficient experience and involvement in collecting and transporting municipal wastes. Information gathered from AAWDRPO and CMA of Addis Ababa City documents 10 private service operators and 570 small and micro enterprises collecting and transporting municipal solid waste. The sector has 15 years' experience in fleet acquisition and human resource management. During the assessment, one provider expressed willingness to engage in HCW collection and transportation, with sufficient government support for operations such as his. Tax incentives on vehicles imported for HCW collection and transportation are one potential way to provide such support.

Currently, for the collection of municipal waste, the private sector receives service charges either directly from clients (especially for liquid waste) or from the city administration (especially for solid waste). The city administration calculates and collects a solid waste collection service charge from the general public and from institutions with their water bill. Then rather than charging clients directly, based on the amount of solid waste collected, the private service providers collect their fees from the city administration. Such an arrangement can remain in place for HCWM collection service.

For the collection of municipal waste, different pricing categories were in place for institutions and households. In the proposed new agreement for HCW services, the pricing should reflect parties' financial resources and daily HF waste quantities. In other areas, rates can be set either progressively based on such factors as the number of beds or the number of outpatients or as a lump sum based on the HF type and the services it provides. Detailed pricing analyses were not undertaken for this assessment, so no approach is recommended at this time.

PART II CONCLUSION AND RECOMMENDATIONS

CONCLUSION

HCWM practices observed at many HF did not comply with national HCWM guidelines. Most assessed HFs have no standardized HCW segregation, treatment, or disposal mechanisms. Interviews with facility staff and stakeholders suggest the reasons lie in limited management attention management to the issues, health care worker resistance to behavior change, insufficient supply of materials, old or outdated treatment technologies, and lack of sufficient budget. The fact that most surveyed HFs have no HCWM budget line and that specific HF fund allocations for HCWM were not found during this assessment does not imply that no funds are allocated.

Proper HCWM is costly. However, establishing a centralized HCW treatment facility may prove a moderating factor. Because Addis Ababa HFs would pool resources for HCWM under the proposed scenario, proper HCWM would become more economically viable. HFs would pay service charges while service providers would manage its collection, transportation, treatment, and disposal. Experiences from other countries indicate that a PPP can help address the problem efficiently. In Addis Ababa, most assessed HFs (93%) expressed willingness to outsource HCWM activities given proper pricing and monitoring mechanisms.

PPP arrangements for HCWM can function in many modalities. Based on assessment findings and experiences elsewhere, the study team proposes the establishment of a single centralized HCW treatment plant for Addis Ababa City, with plant construction and ownership to be controlled by the Government of Ethiopia or the city administration. Because the project site and some users are beyond the jurisdiction of the Addis Ababa Health Bureau, the federal government also needs to be involved in the project. In addition, the government would be responsible for creating regulatory frameworks and directives for all the concerned actors, including HFs, service providers, and institutions engaged in the process.

The public sector can invest in the project site (in the land acquisition and development stages), in construction of the facility, in investing in the disposal technologies, and so on. In so doing, the government becomes owner of the facility. The building and related infrastructures may provide service for more than 30 years, while investment in processing technologies might extend up to 15 years. On average, the common treatment facility is expected to be functional for 20 years. The funds required for financing these activities might be pooled from capital budget and donors.

HCW collection, transportation, and treatment would be managed by the private sector. In addition, the private sector would take responsibility for managing daily HCW treatment plant operations while government would engage in monitoring activities.

To fund service charges, HFs could draw on the portion of their budget currently used for HCWM and possibly supplemented by health care financing revenue. Availability of health-care financing as a resource may ensure the arrangement's sustainability. However, public HFs' procurement requirements may constrain their ability to engage in long-term supplier agreements, and because the recovery period for HCWM technology investment costs is longer than current permitted contractual periods, these would have to be extended in order for service providers to secure their investment.

Recommendations

Undertake a comprehensive resource mapping. This is required to determine the cost required for city HCWM. The daily and monthly rate of HCW generated, in kilograms, and its composition is needed to develop a clearer picture of current needs and the costs of meeting them.

Implement awareness-creation and continuous capacity-building activities in HFs. HFs are responsible for waste segregation at the point of generation, and effective waste segregation is a mandatory step in controlling HCWM costs.

Put in place monitoring activities and regulatory mechanisms. These must be in place to ensure that HFs and service providers meet their required standards.

Further investigate pricing and payment schemes. Other pricing and payment schemes may be more acceptable. And all parties require a firm understanding of the costs of participation in order to realistically commit to participation.

COST ESTIMATION FOR HEALTH CARE WASTE TREATMENT: CENTRALIZED AND DECENTRALIZED SCENARIOS

Table 4. Capital Cost Estimation for Health Care Waste Treatment in Centralized and Decentralized Scenarios

S/N	COST COMPONENT	SINGLE CENTRALIZED TREATMENT FACILITY	DECENTRALIZED PLAN, WITH FOURTREATMENT SITES
		ESTIMATED BUDGET (U.S. DOLLARS)	ESTIMATED BUDGET (U.S. DOLLARS)
1	Land and ground work	13,297	12,765
2	Construction and civil work	138,298	40,426
3	Collection material and vehicles	638,298	464,217
4	Investment in technology	1,020,000	21,702
	Total	1,809,893	539,110
	Average lifespan	20	5
	Annual capital cost	90,495	107,832

Table 5. Estimation of Recurring Costs for Health Care Waste Treatment in Centralized and Decentralized Scenarios

S/N	COST COMPONENT	SINGLE CENTRALIZED TREATMENT FACILITY	DECENTRALIZED PLAN, WITH FOUR TREATMENT SITES
		ESTIMATED BUDGET (U.S. DOLLARS)	ESTIMATED BUDGET (U.S. DOLLARS)
1	Labor cost (salary and benefits)	104,399	92,936
2	Utility expense	19,149	15,319
3	Consumable material cost	37,234	63,829
4	Admin cost	17,872	8,043
5	Maintenance cost	15,957	20,428
6	Fuel and lubricants	86,170	76,532
7	Interest expense	7,660	7,660
8	Miscellaneous	19,489	25,532
	Total	307,930	310,279

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ANNEX I

PUBLIC–PRIVATE HCWM NEEDS ASSESSMENT DATA COLLECTION TOOL

INTRODUCTION

Explain in brief:

- Aim of the Project
- Purpose of Data Collection
- Methods of Data Collection

General		
Name of Interviewer :	Date:	Time Started :
Person in charge for Interview: Name	Sex	Title
Name of Heath Care Facility:		
Address: Subcity Woreda House No. Tel. Fax: P.O.Box:		
Ownership: Government/Public	Private	Others(Specify)
Level: Hospital	Health Center	Clinic:
Year of Establishment:		
Total number of beds:	Bed Occupancy Rate:	
Number of wards/Units:		
Average number of inpatients per day:	Average number of outpatients per day:	

PART I

	HCWM Regulatory Framework	Yes	No	Comments
1	Do you have a copy of any guidelines/standards/manuals on health care waste management (HCWM)?*(Tick* **YES** *if observed; list the documents in use in the comments column)*			
2	Do you know about the National/FMOH HCWM strategy and/or guideline documents?			
3	Does the facility have HCWM plan? *(Tick* **YES** *only if observed)*			
4	Do you have HCWM auditing plan?			
4.1	If **YES,** have you conduct internal HCWM auditing activities?			
4.2	If **YES**, how frequently? *(Please ask for the audit committee minutes)*			
5	Were your HCWM practices audited by regulatory bodies?			
5.1	If **YES,** how frequently was the auditing conducted during the past year?			
5.2	If **YES**, when was the last time it was audited? (*Ask for the audit committee report)*			
	Institutional Setup and Human Power	**Yes**	**No**	**Comments**
6	Does the facility have a person/committee/unit in charge specific to HCWM? *(Write his title in comments column)*			
6.1	If **YES**, to whom is the person/committee/unit in charge of HCWM accountable?			
6.2	If **YES**, is the person/committee in charge of HCWM mentoring other staffs to segregate HCW?			

	Question		Number		
		Staff Type	**M**	**F**	**T**
	How many staff members are there at the health facility? *(Note the number by sex as applicable)*	Health care workers			
		Waste handlers and cleaners			
		Administrative			
		Others			
		Grand total			

8	**Type Of Departments/Wards/Services Provided by the Health Facility** ***(Tick as applicable)***			
	Type	**Yes**	**No**	**Remarks**
	Outpatient department (OPD)			
	Medical			
	Surgical			
	Ophthalmology			
	Maternity			
	Gynecology			
	Cardiology			
	Pediatrics			
	Orthopedics			
	Neurology			
	ENT			
	Internal medicine			
	Radiology/X-ray			
	Pharmacy			
	Blood bank			
	Laboratory			
	Research			

	Capacity Building Training	**Yes**	**No**	**Comments**
9	Have *all* the health care workers including waste handlers in this facility ever had training HCWM?			
9.1	If **YES**, specify the number of trainees? *(Please write how many in the Comments column)*			

	Health Care Worker Safety	**Yes**	**No**	**Comments**
10	Do you implement an infection prevention program in your facility?			
11	Are waste handlers provided with personal protective equipment (PPE)?			
12	Does your facility provide hepatitis B vaccination for health care workers and waste handlers?			
13	Has anyone at this facility had reported needle-stick injury or any other exposure to blood or bodily fluids in the last six months?			
13.1	If **YES,** how many individuals injured and/or exposed? (*Note how many)* Health care workers? …….. Waste handlers? …….....			

	Health Care Worker Safety	Yes	No	Comments
14	Does the facility have post-exposure prophylaxis (PEP) services?			

	Health Care Waste Management Practices	Yes	No	Comments	
	Waste generation and characterization				
15	Do you know the type of waste generated in your facility? *(If **YES**, tick those mentioned)*				
	Infectious				
	Sharps				
	Other hazardous health care waste				
	General/food waste				
16	Do you know the amount/quantity of waste generated/day?				
16.1	If **YES**, get a copy of doc. and fill the amount/quantity as applicable	**KG/DAY**	**M^3/DAY**	**KG/BED/DAY**	**%**
	Total waste being generated				
	General/nonhazardous health care waste generated				
	Hazardous health care waste generate				
16.2	If **NO,** get the proxy figure/estimation				
	Total waste being generated				
	General/nonhazardous health care waste generated				
	Hazardous health care waste generate				

17. Please specify existing health care waste management practices of the facility as applicable.

Functional Elements	Requirement	Existing Practice/Availability		Comments
		Yes	No	
Segregation	Waste labeling?			
	Three-bin color-coded system?			
	Safety boxes at all injection sites?			
Collection	Is there waste collection system in your health facility?			
	If **YES**, write methods collection in Comments column			
	If **YES**, write collection frequency in Comments column			
Storage	On-site locked storage room?			
	Puncture-resistant, leakproof storage containers?			

Functional Elements	**Requirement**	**Existing Practice/Availability**		**Comments**
		Yes	**No**	
Transportation	On-site transportation equipment? (wheelbarrow/trolley, bucket)			
	Off-site transpiration mechanism?			
Treatment	Incinerator Single chamber (brick) Double chamber (demon fort)			
	(For urban health center) Small-scale incinerator (SSI) Drum incinerator			
	Chemical sterilizer *(Describe type)*			
	Autoclave/steam sterilizer for reusable items			
Solid Waste Disposal (For all categories of Waste)	Secured watertight pit *(encapsulation for urban health center)*			
	Ash pit			
	Needle pit			
	Secured pit burial			
	Placenta pit Others*(specify)*			
Liquid Waste Management	Do you have waste water treatment system?			
	Where do you dispose your waste water? *(Note method of disposal in the Comments column)*			

18. How do you evaluate the general status of HCWM practice in your facility?
Poor _____Good_____ Very Good ___ No idea

19. What trends have you observed in HCWM practice of the facility over time?
Improved_____ Declined _____No change_____

20. Who provides you the following service at health facility?

	Type of Service	Service Provider *(Tick as applicable)*				
		Government	Private Company	Small and Micro Enterprises	Managed by the Facility	Others (Specify)
1	Waste segregation					
2	Storage Supply of waste bins/container Supply of IP commodities					
3	Transportation on-site					
	Off-site					
4	Treatment					
5	Solid waste disposal					
6	Liquid waste disposal (waste water/effluent)					

FINANCIAL, ECONOMIC, AND CONTRACTUAL ASPECTS

	Budget Allocation	Yes	No	Comments
21	What is the total budget for the facility this year? *(Write the amount under Comments)*			
22	Do you have allocated budget specific to HCWM?			
22.1	If **YES**, What amount/proportion is allocated to HCWM from the total amount?			
23	Do you think that the budget allocated to HCWM is sufficient?			
24	Are you interested to outsource part/full of HCWM services to private sector?			
24.1	If **YES**, Which type of HCWM services? *(Tick applicable options)*			
	Segregation			
	Collection			
	Storage			
	Transportation			
	Treatment			
	Solid waste disposal			
	Liquid waste disposal			
	Others *(specify)*			
24.2	If **NO**, why? *(Note the reason under Comments)*			
25	Do you have any past experience outsourcing services to the private sector?			
25.1	If **YES**, which type of services? *(Note which in the Comments column)*			

	Budget Allocation	Yes	No	Comments
25.2	If **YES**, How much does it cost the facility per month?			
26	Do you practice recycling of general waste?			
26.1	If **YES**, how much revenue has the facility earned in last year?			
27	Do you provide HCW treatment/disposal to any other facility?			
27.1	If **YES**, how much revenue did you gain from that activity during the last three year?			
28	Does your procurement procedure allow you to have a long-term contractual agreement (i.e., lasting more than three years) with a service supplier?			
28.1	If **NO,** what is the maximum year you are allowed to have a contractual agreement with a private sector operator? *(Note the number of years under Comments)*			
29	Are you willing to participate in the PPP–HCWM program?			

PART II

What are the major roles and responsibilities of your facility related to HCWM in Addis Ababa City?

_____

_____

_____

How do you evaluate the current HCWM practice and status of Addis Ababa City?

_____

_____

_____

What major challenges/gaps do you perceive in HCWM in Addis Ababa City?

_____

_____

_____

What issues should be addressed to improve city HCWM and to overcome challenges?

_____

_____

_____

What is your opinion on private-sector involvement in HCWM in Addis Ababa City?

_____

_____

_____

Which specific areas of involvement in HCWM do you recommend for the private sector?

_____

_____

_____

How do you define key stakeholders/actors and their major role in HCWM in Addis Ababa city?

Key Actors/Stakeholders	Major Role
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Do you have any best experiences/lessons that you want to share for the improvement of city's HCWM?

_____

_____

_____

What makes your facility different from others in relation to HCWM practice?

_____

_____

_____

In what way does your facility support/is it engaged in improving HCWM in Addis Ababa through the PPP–HCWM pilot project?

_____

_____

_____

What additional suggestion/opinion do you have to improve HCWM through a public–private partnership (PPP) modality?

_____

_____

_____

Time Finished: _____

Thank You!

PART III OBSERVATIONAL CHECKLIST FOR PPP–HCWM NEEDS ASSESSMENT

Please specify existing health care waste management practices as applicable.

Elements of HCWM	Application	Observed Practice?		Comments
		Yes	No	
Segregation	Waste labeling?			
	Three-bin color-coded system?			
	Safety boxes at all injection sites?			
Collection	Waste collection bins at health facility?			
Storage	On-site locked storage room?			
	Puncture-resistant, leak proof storage containers?			
	Separate storage for general waste?			
Transportation	On-site transportation equipments? (wheelbarrow/trolley, bucket)			
	Off-site transpiration mechanism?			
Treatment	Incinerator Single chamber (brick) Double chamber (demon fort)			
	(for urban health center) Small-scale incinerator (SSI) Drum incinerator			
	Chemical sterilizer			
	Autoclave/steam sterilizer for reusable items			
Waste Disposal	Secured watertight pit (encapsulation for urban health center)			
	Availability of functional ash pit			
	Availability of functional needle pit			
	Availability of functional secured pit burial			
	Availability of functional placenta pit			
Liquid Waste Management	Availability of waste water treatment system?			
	Does any open wastewater/effluent come from the facility?			
WASH Facility	Availability of functional hand-washing facilities?			
	Availability of functional toilet facilities?			
BCC Material/Instructions	Posted instructions, teaching aids. and posters at proper places?			
Workers Safety and Health	Availability and usage of PPE?			

ANNEX II

PUBLIC–PRIVATE HCWM NEEDS ASSESSMENT DATA COLLECTION TOOL FOR KEY INFORMANTS

INTRODUCTION

Brief:

- Aim of the Project
- Purpose of Data Collection
- Data Collection Methods

General		
Name of Interviewer :	Date	Time Started
Person in charge of interview: Name	Sex	Title
Name of organization:		
Address: Subcity Woreda House No. Tel. Fax: P.O.Box:		
Type: Government/Public	Private	Others *(Specify)*
Level: International	Federal	City

POLICYMAKERS

Please give your reflection/perception regarding HCWM problems in the country in terms of magnitude of the problem and level of awareness at various levels?

_____

_____

_____

What measures have been taken by the MOH/FMHACA/BOH to deal with the problem?

_____

_____

_____

Describe the policies, strategies, guidelines, etc. (at national and Addis Ababa levels) in relation to HCWM? Which of these legal tools takes in to account the PPP–HCWM strategy?

_____

_____

_____

Do the policies cover economic instruments (financial disincentives and economic incentives)? If YES, please provide details.

_____

_____

_____

Describe any institutional arrangement/structure at various levels, available human resource (including experience and qualification), role and responsibilities towards PPP–HCWM?

_____

_____

_____

What mechanism/s is/are established to enforce the legal instruments (directive, standard, guideline, procedures, and strategy)? If yes, describe the organization/department/unit that is responsible for legal enforcement

_____

_____

_____

If no, what have you intended to do and when?

_____

_____

_____

Describe the major gaps in implementing PPP–HCWM in Ethiopia/Addis

_____

_____

_____

Any comments/suggestions to establish a PPP–HCWM system in the capital/country?

_____

_____

_____

Thank You!

DONORS/PARTNERS

Please give your reflection/perception regarding HCWM problems in the country in terms of the magnitude of the problem and level of awareness at various levels?

_____

_____

_____

Describe your organization intervention (present/past) in addressing HCWM problems?

_____

_____

_____

How do you evaluate your organization support/s to curb the problem?

_____

_____

_____

What are the major challenges/gaps related to HCWM sector?

_____

_____

_____

Discuss your experiences and success stories related to PPP–HCWM? How do you evaluate the notion of introducing/adopting a PPP–HCWM approach in Addis Ababa or other parts of the country?

_____

_____

_____

Thank You!

SERVICE PROVIDERS

What type of service does your organization provide? (Collection, transportation, treatment, disposal?)

_____

_____

_____

List your clients by category and size (e.g., households, hotels, schools, offices, health care facilities, others)?

_____

_____

_____

Which types of HCW (i.e., nonhazardous and hazardous) do you receive?

_____

_____

_____

Describe the technologies for collection, transportation, treatment, and disposal of hazardous HCW? Please include the number, type (e.g., plastic bags, metal sheets, with/without cover, covered/open), color, size, ID, etc.).

_____

_____

_____

What kind of working requirement, procedures, or standards (packaging, weighing, check the quality/composition, recording etc) do your department/organization established to handle of hazardous health care wastes?

_____

_____

_____

Is there any treatment of hazardous wastes prior to disposal?

_____

_____

_____

Is there a separate cell /unit for the handling/disposal of hazardous HCW?

_____

_____

_____

Describe your organization's current efforts or future plans to handle special wastes?

_____

_____

_____

_____

_____

_____

Describe the occupational, safety, and health aspects of your workers who are involved in handling hazardous HCW (e.g., preventive approaches, equipment, regular health checkups).

_____

_____

_____

_____

_____

_____

GUIDING QUESTIONS FOR KII SWM SERVICE PROVIDERS

1. What is the legal and institutional mandate of your organization in relation to HCWM of Addis Ababa City?
2. Do you have any reliable data on the type and proportion of wastes generated from HFs of Addis Ababa City? If YES, provide the data.
3. How do you handle/manage hazardous health care wastes generated from health care facilities?
4. Who is responsible for collection/transportation/treatment and disposal of HCW from HFs? How frequently?
5. Which type of waste is your organization allowed to dispose of at your current disposal site?
6. What type of waste services are currently provided by the private sector?
7. Has there been any needle-stick injury reported at your facility during the past year? If YES, where and how many?
8. How many private-sector companies are engaged as waste service providers currently?
9. What is their contribution in terms of waste collection/transportation service coverage?
10. Which type of contract modalities/agreement do you exercise with private-sector involvement in the HCW sector so far?
11. What is the length of the contract period for waste services provided by the private sector?
12. What costs do you incur monthly/annually for waste services provided by the private sector?
13. What financial sources, mechanism, and payment modality do you have for private waste services provider?
14. What challenges do you observe so far among private-sector waste services providers?
15. Do you have any future plans for collection/transportation/treatment and disposal of HCW from HFs? If YES, describe your future plan.
16. Where is the proposed new sanitary landfill located? *(Please attach location map)*
17. What is the current development status of the new sanitary landfill? When will it be completed?
18. Is collection/transportation/treatment and disposal of HCW included in the future development of new sanitary landfill?
19. What makes your organization different from others? What are your best lessons learned/shared?
20. In which HCWM service areas do you recommend the best involvement of the private sector? Why?
21. What policy/institutional/technical issues need to be addressed to facilitate PPP– HCWM?
22. Any additional suggestion or reflections related to PPP–HCWM?

Thank You!

ANNEX III

SELECTED HEALTH CARE FACILITIES FOR PPP–HCWM NEEDS ASSESSMENT

SN	Health Care Facility		
	Level	**Ownership**	**Name**
1	Hospital	Public/Government	Zewditu
2			Menilik II
3		Private	Kadisko
4			Myung Sung
5			TekleHaymanot
6			Betezata
7	Health Center	Public/Government	Bole 17/17
8			Kazanchis
9			Arada
10			Lideta
11	Clinic	Private	United Vision
12			Universal
13			Senay
14			Abinet
15			Arsho Diagnostic Lab.

For more information, please visit aidstar-one.com.

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