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Cambodia: Second Health Sector Support Program – Third Additional Financing

Updated Environmental Management Plan

PREPARED FOR	PREPARED BY
The World Bank, *Washington D.C.*	**Ministry of Health** *Royal Government of Cambodia*

CAMBODIA: THIRD ADDITIONAL FINANCING FOR THE SECOND HEALTH SECTOR SUPPORT PROGRAM

UPDATED

ENVIRONMENTAL MANAGEMENT PLAN

Prepared for

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1.0 INTRODUCTION

In 2002, the Ministry of Health, with support from the EVS Environment Consultants (EVS), undertook an environmental review (ER) of the Cambodia Health Sector Support Project (HSSP). This was done during Project preparation and included development of an environment management plan (EMP). In 2008, the ER and EMP were reviewed and revised as part of preparation for the Cambodia's Second Health Sector Support Program (HSSP2), taken into account the Cambodia's environmental laws, regulations, policies and other relevant legislation to ensure that applicable environmental assessment requirements were fully addressed during Program implementation.

The 2008 ER assessed potential environmental and human health impacts of the HSSP2, particularly with regard to: (a) construction and rehabilitation of health care facilities (HCF) focusing on operational health care waste management (HCWM) practices, incinerator use, arsenic in groundwater, and extraction of asbestos when present during civil works; and (b) pesticide use in malaria and dengue vector control programs. The HSSP2 triggered the following safeguards: Environmental Assessment (OP/BP 4.01), Pest Management (OP 4.09), Indigenous Peoples (OP/BP 4.10), and Involuntary Resettlement (OP/BP 4.12).

The EMP is the instrument that describes the safeguards against the main risks: civil works, including asbestos; health care waste management, and pest management. The 2008 HSSP2 EMP recommends appropriate mitigation measures and monitoring programs to be followed with a view to guiding the Program design and incorporating appropriate management plans during HSSP2 implementation.

In October, 2013, the First Additional Financing (AF1) for HSSP2 of USD 13.44 million was approved. The additional financing was used to scale up the number of health equity funds (HEFs) and service delivery grants (SDGs) that finance health services as well as fill financing gaps for other activities such as training and operating costs. In September 12, 2014, the Second Additional Financing (AF2) of US$ 12.69 million was approved. The AF2 is being used to fill financing gap for HEFs and SDGs for approximately nine months from the fourth quarter of 2014 to the second quarter of 2015. AF1 and AF2 triggered the same policies as the Original Program. The 2008 EMP was updated for AF2 to reflect lessons learned during safeguards implementation of HSSP2 and AF1. EMP has been attached with bidding documents to inform contractors and engineers about their responsibility to comply with required safeguard policies and tools. The task team paid close attention to monitoring the Program implementation and found that the environmental adverse impacts were minimal and site specific. These were mitigated through applying good construction and good construction management practices. Implementation of safeguard policies under HSSP2 and AF1 and AF2 has been satisfactory. The HSSP2 closing date has been extended from June 30, 2014 to December 31, 2015 to allow adequate time for completion of remaining civil works and procurement of medical equipment from the original project.

The Third Additional Financing (AF3) of the Second Health Sector Support Program (HSSP2 – P102284) is prepared to reflect the additional donor receipts to support the Multi Donor Trust Fund (MDTF) of HSSP2. The additional funds consist of AUD 8 million (US$ 6.26 million equivalent) and Euro 6 million (US$ 6.74 million equivalent) from the Government of Australia and Germany, respectively. These funds will be used to: (a) cover a financing gap for an additional 6 months from July 1, 2015 to December 31, 2015, for the Service Delivery Grants (SDGs) in existing 36 Special Operating Agencies (SOAs); and (b) scaling up of Health Equity Funds (HEFs) from 61 to all 88 Operational Districts (ODs) in the country. These activities are consistent with the Original Program and AF1 and AF2 support. There is no new activity under AF3. The original Program funds have not been fully disbursed will be used during the implementation of AF3 to finance civil works and procurement of equipment that had already been planned as part of the original Program. As part of the preparation for AF3, the EMP of AF2 has been updated to reflect findings and recommendations made by the recent partial environmental assessment carried out in January 2015.

1.1 PROGRAM DESCRIPTION

The original Program (HSSP2):

HSSP2's development objective (DO) is to support the RGC Health Strategic Plan 2008-2015 to improve access to, and utilization of effective, efficient and quality health services to improve the health status of the Cambodia population by (a) strengthening primary health care and essential referral services, (b) strengthening health financing and social protection mechanisms for the poor; and (c) strengthening human resources and institutional capacity on the Ministry of Health.

The original Program has a health system strengthening focus, with four components that are aligned to the government's Health Strategic Plan 2008-2015 (HSP2). It includes: (A) **Strengthening Health Service Delivery** through: (i) the provision of SDGs and contracting for health services at provincial level and below and (ii) investments for the improvement, replacement, and extension of the health service delivery network. (B) **Improving Health Financing** which will support (i) health protection for the poor through the consolidation of HEFs under common management and oversight arrangements and expansion of health equity fund coverage; and (ii) supporting the development of health financing policies and institutional reforms. (C) **Strengthening Human Resources** will focus on (i) strengthening pre- and in-service training; (ii) strengthening human resource management in the Ministry of Health (MOH). (D) **Strengthening Health System Stewardship Function** by supporting (i) development of policy packages identified, strengthening the institutional capacity (in particular meeting the demands from Decentralization and Deconcentration); (ii) private sector regulation and partnerships; (iii) supporting governance and stewardship functions of the national programs and centers overseeing the three HSP2 strategic programs; and (iv) empowering new structures for increasing local accountability of health care providers to citizens.

The HSSP2 provides grants for service delivery (HEFs and SDGs), scaling up the health infrastructure, and providing training and technical assistance.

The AF1 expanded coverage of HEFs and SDGs and other financing gaps.

The AF2 expanded coverage of HEFs and SDGs.

The AF3 will support the following:

- **Component A: Strengthening Health Service Delivery.** Financing SDGs in existing 36 SOAs.
- **Component B: Improving Health Financing.** Financing HEFs in the existing 61 Operational Districts (ODs) and scaling up in 27 additional ODs (to cover all 88 ODs in the country) covering all estimated 3 million poor people or 100 percent of the poor in Cambodia by end of 2015. The existing Subsidy Schemes (SUBOS) at the HC level financed from the national budget will be streamlined into the HEF scheme.
- **Component C: Strengthening Human Resources.** No additional financing.
- **Component D: Strengthening Health System Stewardship Functions.** No additional financing.

Continued financing HEFs and SDGs is consistent with the Program's development objective. As with the original Program, AF1 and AF2, AF3 is expected to have a positive impact on the lives of peoples throughout Cambodia, particularly the poorest people, by improving their access to and utilization of effective and efficient health services. AF3 will not affect natural habitats, and forests, or cultural resources. No new safeguard policies will be triggered by the proposed activities under AF3.

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2.0 ENVIRONMENTAL ASSESSMENT

2.1 CIVIL WORKS

2.1.1 Health Facility Construction and Rehabilitation

The AF3 will not finance civil works. However, some civil works planned under the original Program that have not been completed will be executed during the implementation of AF3. They include: clean rooms for the national laboratory for drug quality control, a bunker for installation of a linear accelerator, and upgrading of water sanitation and electricity systems in 280 health centers.

The ER for the HSSP determined that under Cambodia's environmental assessment guidelines, an environmental assessment is not required for health care facility construction and rehabilitation. However, when appropriate AF3 will follow the same guidelines as HSSP and HSSP2 which pay particular attention to: (i) design of hospitals and health centers by including in the construction basic facilities such as water supply, incinerators at health facilities, and wastewater treatment system and (ii) proper handling and disposal of hazardous building materials such as asbestos that may be present at facilities undergoing rehabilitation.

Under the HSSP2, 121 health centers, five (5) health posts, 26 additional delivery rooms, two (2) regional training centers, one (1) provincial referral hospital, the national laboratory for drug quality control and 14 referral hospital's maternity rooms have been constructed. In addition, 12 non-communicable disease clinics have been established and 103 HCs have been upgraded with Solar Panel for lighting. Measures to mitigate environmental hazards during construction, including preliminary site works and site clearance, demolition, removal, relocation and disposal, are clearly stated in the bidding documents.

The partial environmental assessment, focused on compliance to EMP, particularly during construction, and Health Care Waste Management was carried out as part of AF3 preparation to gain lessons learned and gaps from HSSP2 implementation to update further the updated EMP of AF2 for implementation during AF3. The assessment confirmed that in most cases construction was undertaken following best practices and complied with measures described in the EMP. Most proposed sites were located on the premises of the referral hospitals or health centers. In some cases, minor issues related to improper management of construction waste and limited attention given to the management of on-site-safety were observed. These issues have been mitigated through good construction and good construction practices under regular monitoring of the construction supervision firm, the Ministry of Health (MOH) officials and the task team. The status of EMP implementation is reported in the civil work progress reports.

The government banned the use of asbestos-containing fibre concrete materials in 2000 so there was limited risk given no demolition of refurbishment of old building during the HSSP2. The civil works contracts contain a provision on the use of asbestos-free building materials (e.g clay roofing tiles) and this was regularly monitored. For example, all roofs are clay tiles.

Total floor space of each building covered by the HSSP2 is below 3,500 m^2, which is well below the 8,000 m^2 size threshold for new buildings requiring assessment by the Ministry of Environment. No building heights exceed 6 m; again well within the 12 m height threshold. Similarly, design models for health centers – both outpatients and combined outpatients and inpatients – provide for modest sized buildings with a maximum floor space of 110 m^2 and a height not exceeding 6 m. Design of facilities supported under the program are reviewed and approved by IDA. The government is also supported by an external design and engineering firm. None of the sites are located near historical objects, natural protected zones or parks.

Asbestos, a fibre mined in several countries, has been widely used worldwide as a construction material and insulator because of its strength, durability and heat resistance characteristics. In recent years, evidence on the adverse health effects of exposure to asbestos has been mounting globally leading to urgent calls to cease production of the most-harmful asbestos types, limit the use of less-harmful asbestos (e.g., discontinued spraying of asbestos), and to impose strict exposure standards for workers handing raw asbestos and asbestos-containing products. Occupational exposure to asbestos by inhalation can cause asbestosis (scarring of the lung tissue), lung cancer, and mesothelioma (cancer of the lung's lining).

The main activities that might have implications under the Program were for asbestos generation and management of the construction of health care facilities. Since 2000, the government has banned the use of asbestos-containing fibre concrete materials, and construction is closely supervised to ensure that contractors will not use cheap asbestos-containing materials. The civil works contracts also contain a provision on the use of asbestos-free building materials. All constructions use clay roofing tiles.

Recommended follow up actions detailed in the Environmental Management Plan include surveying health care facilities to be demolished for construction of new health facilities during the implementation of HSSP2 in order to quantify the risk posed by asbestos that may be present in existing structures and to determine appropriate occupation health and environmental mitigation measures.

Clearance and preparation of sites may be required since in many areas there were existing health care facilities. Therefore, hazardous waste from the facility may exist. This waste would have to be cleaned before the construction starts. Also appropriate disposal for this waste must be carried out.

2.1.2 Drinking Water Quality Considerations relating to ensuring the supply of safe drinking water to new and rehabilitated HCF are outlined in this section. Particular attention is given to potential risks associated with arsenic in groundwater and microbial water quality.

It was observed during HSSP2 implementation that most of referral hospitals and health centers use clean private water supply. For the few remote health centers where there is no clean water supply, it is reported that water quality is good, transparent and no smell. But there is no laboratory test done to prove the water quality in these health centers.

National Drinking Water Quality Standards: Former Ministry of Industry, Mines and Energy **(**MIME), now known as Ministry of Industry and Handicraft (MIH), with the support of World Health Organization (WHO), has developed Water Quality Standards (WQS) in 2004. The current standards were supposed to amend every five (5) years. The newly proposed standards, National Water Quality Standards and Guidelines, have only come into shape in 2011. In the absence of an approved new version, the 2004 standards are still valid.

Table 1.Current National Drinking Water Quality Standards (2004 Version)- only key parameters are listed here

Water Quality Indices	2004	
	Unit	Standard Values
pH	-	6.5-8.5
Color	TCU	5
Turbidity	NTU	5
Residual Chlorine	Mg/l	0.2-0.5
Ammonia	Mg/l	1.5
Chloride	Mg/l	250
Hardness	Mg/l	300
Iron	Mg/l	0.3
Manganese	Mg/l	0.1
Sodium	Mg/l	200
Total Dissolved Solids	Mg/l	300

Source: JICA WASH sector overview, 2012

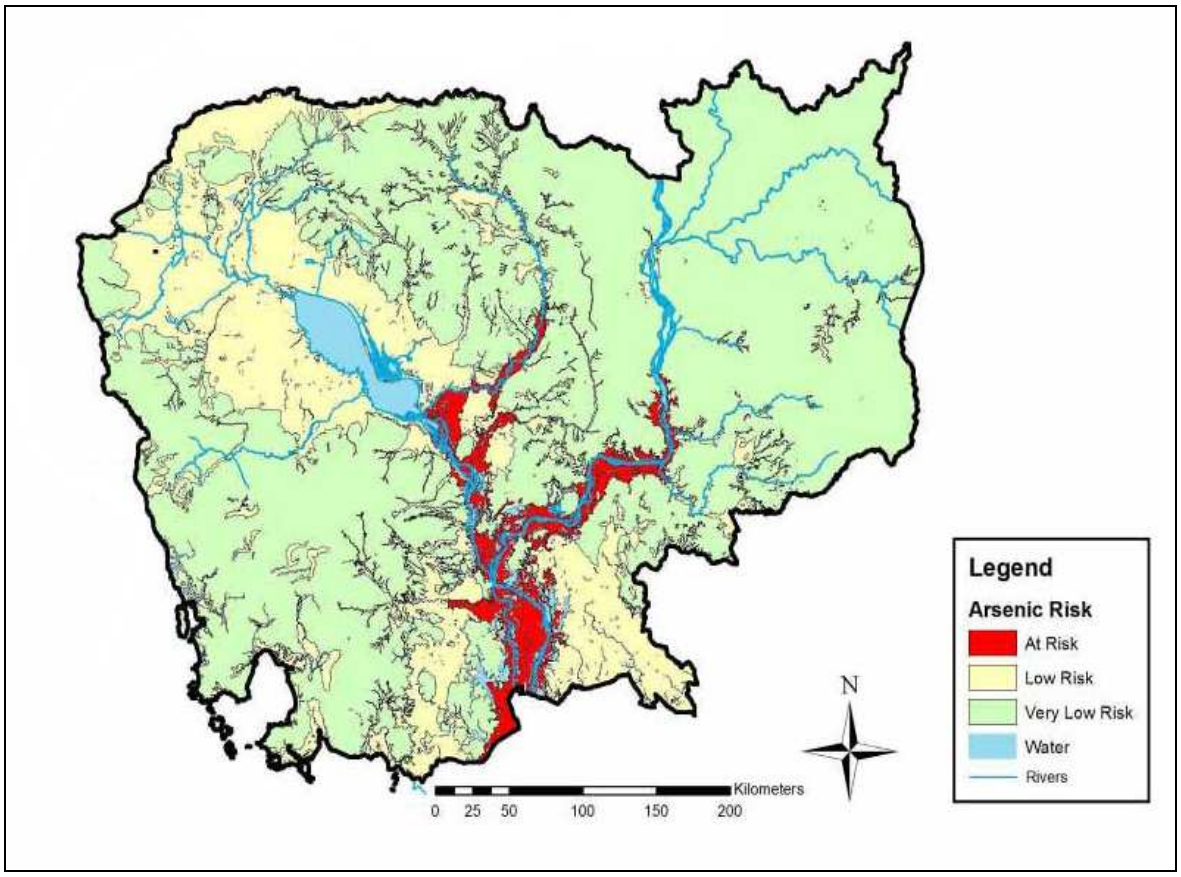
Arsenic

The potential for naturally occurring arsenic to appear in groundwater was identified as a concern in connection with provision of safe water supply to HCF. In recent years, it has

become increasingly apparent that drinking water guidelines are quite frequently exceeded in available water sources worldwide. Arsenic is now recognized as one of the most serious inorganic contaminants in drinking water on a global basis (UN/WHO, 2001). Consumption of elevated levels of arsenic in drinking water over long periods of time has been associated with a variety of human health problems including skin disorders and respiratory, cardiovascular, immune, reproductive, gastrointestinal and nervous system ailments.

Both surface and groundwater are used as sources of drinking water in Cambodia. Although surface water quality is generally very high and is the preferred source of drinking water, an estimated 50% of the country's population currently uses groundwater. A 2001 water quality study indicated that groundwater from certain areas of the country contains levels of arsenic that could pose problems for human health (Feldman). Arsenic levels measured are summarized by province in Table 1 (Note: Phnom Penh was not included in the study area). These values represent the highest or 'worst case' arsenic levels measured for individual wells in each province – spatial variability for arsenic is typically high and it is not unusual to get widely different measurements even for wells located in the same village. Study results reveal that several water sources, in both urban and rural locations, were found to contain arsenic concentrations above WHO's recommended limit of 10 µg/l (WHO, 1993). The highest arsenic concentrations were detected in Kandal Province. Elevated levels were also detected at sampling locations in Kratie, Svay Rieng, Kampong Thom and Battambang provinces, all of which are included in the HSSP2.

Arsenic Contamination Areas: A total of 1,607 villages in 318 communes of 49 districts of the 6 provinces (Kandal, Prey Veng, Kampong Cham, Kampong Chhnang, Kampong Thom and Kratie) and peri-urban Phnom Penh are estimated to be the most at risk (UNICEF, 2009). The minimum value that was set in the NDWQS is 0.05mg/L for public or private water supply, regardless of its sources including groundwater, surface water and rainwater, which are intended for human consumption. The most contaminated areas were evidenced mainly in sediments near the major rivers, Mekong, Bassac, and Tonle Sap River. Arsenic Risk Map shows areas most at risk in Figure 6.



Source: UNICEF, 2009

Table 2 Overview of groundwater arsenic levels in Cambodia.

Province	Arsenic Concentration (µg/l)
Banteay Mean Chey	< 10
Battambang	> 50
Kampong Cham	< 10
Kampong Chhnang	< 10
Kampong Speu	< 10
Kampong Thom	10 – 50
Kampot	No Data
Kandal	>100
Koh Kong	No Data
Kratie	> 100
Keb	No Data

Pailin	No Data

Preah Sihanouk	No Data
Mondolkiri	No Data
Oddar Meanchey	No Data
Pursat	< 10
Preah Vihear	No Data
Prey Veng	< 10
Rattanakiri	No Data
Siem Reap	< 10
Steung Treng	No Data
Svay Rieng	10 – 50
Takev	< 10

It is noted that monitoring of arsenic in groundwater has not yet been completed in all twelve provinces (i.e., indicated by shading in Table 2) targeted by the HSSP; no data is currently available for six of these twelve provinces. Feldman's (2001) study covered only thirteen Cambodian provinces and municipalities due to budget and time constraints. Follow up sampling completed by the WHO and UNICEF subsequently included Stueng Treng Province and increased the number of wells sampled – groundwater arsenic in Stueng Traeng was found to exceed 10 µg/l. JICA have also completed extensive sampling of villages in Central and Southern Cambodia. Although these studies augment the spatial coverage of groundwater arsenic surveys in Cambodia some data gaps remain in the HSSP provinces. Specifically, limited or no data is presently available for Kampot, Koh Kong, Krong Keb, Krong Pailin, Oddar Meanchey, and Preah Vihear. Of these provinces, it is likely that low arsenic levels are prevalent in Kampot and Krong Keb (P. Feldman, Personal Communication). The surficial geology of Cambodia is dominated by the Mekong and Tonle Sap river systems. Study results suggest that elevated arsenic levels are closely correlated with alluvial sediments (i.e., river deposits). Lower groundwater arsenic levels have been measured in the southeastern, southwestern, and northeastern provinces where bedrock lies closer to the surface. Extrapolating from available geological and groundwater survey data suggests that groundwater arsenic may be elevated in Krong Pailin and Preah Vihear, with lower levels likely in Oddar Meanchey (P. Feldman, Personal Communication).

The Royal Government of Cambodia developed the Drinking Water Quality Standard (DWS) for Cambodia in 2004 with the aim to ensure that drinking water will be safe in the future, there are no health risks to the public, to serve as a basis for the design and planning of water supply treatment, and to provide a benchmark for assessing long-term trends in the performance of the water supply system. It should be noted that some of the DWS differ from WHO guideline values. These differences were carefully noted and debated during the development of these Standards. In particular, the Arsenic standard of 50 ppb is higher than the WHO guideline value of 10 ug/l. The higher level of 50 ug/l was selected in recognition of several key facts: 1) it will be very difficult and costly to monitor and enforce a standard of 10 ug/l in Cambodia at the present time; 2)[11]the potential health risk of ingesting water with arsenic levels between 10 and 50 ug/l is low relative to the risk posed by water with bacteriological contamination, and more attention should be placed on monitoring and

enforcing the latter standard in Cambodia; and 3) other countries in the region are using 50 ppb as their standard. It was concluded that while 10 [ug/l may be a desirable long-term goal for arsenic in drinking water, it was an impracticable level to use in Cambodia at the present time.

Microbial Water Quality

Problems posed by bacteriological contamination of drinking water supply continues to be the most important health related concern in Cambodia's water supply sector. Feldman (2001) emphasizes that the human health threat from bacteriologically unsafe drinking water is by far the most important water quality issue in Cambodia at the present time and urges that national attention should continue to focus on this well-documented public health threat. Recognizing this threat, both the WHO and UNICEF have recommended that attention also be given to ensuring microbial water quality of drinking water supplied to HCF under the HSSP2. To this end, recommendations contained in the Environmental Management Plan are intended to ensure the overall quality of drinking water utilized by hospitals and health centers.

2.2 Health Care Waste Management

Health care waste includes all wastes generated in the delivery of health care services. WHO (1999a) estimates that 75-90% of waste produced by the health care facilities originates from non-risk or general sources (e.g., janitorial, kitchens, administration) and is comparable to domestic waste. The remaining 10-25% of HCW is classified as hazardous and poses a variety of potential health risks. Categories of health care waste, as defined in WHO (1999a), which are considered of most concern in Cambodian health care facilities are summarized in Table 2.

Table 2 Health care waste characteristics and hazards profile.

Classification	Characteristics/Associated Hazards
Infectious	Comprises waste that is suspected to contain pathogens including laboratory cultures, surgery and autopsy wastes from patients with infectious diseases, bodily wastes from patients in infectious disease wards, and miscellaneous waste such as disposable gloves, tubing and towels generated during treatment of infectious patients). Pathogens from infectious waste may enter the human body through puncture of skin cuts, mucous membranes, inhalation or ingestion.
Pathological	Consists of tissue, organs, body parts, blood and body fluids. Pathological wastes are considered a sub-category of infectious wastes and pose the same hazards.

Sharps	Describes items that could cause cuts or puncture wounds, including hypodermic needles, scalpel, and broken glass. Because sharps can not only cause cuts and punctures but also infect these wounds if they are contaminated with pathogens, this sub-category of infectious wastes is considered very hazardous.
Chemical	Consists of discarded solid, liquid and gaseous chemicals with toxic, corrosive, flammable, reactive, and genotoxic properties. Chemicals most commonly used in HCF include formaldehyde, photographic chemicals, heavy metals such as mercury from broken clinical equipment, solvents, organic and inorganic chemicals, and expired, used or spilt pharmaceuticals. Hazards from chemical and pharmaceutical waste include intoxication as a result of acute or chronic exposure from dermal contact, inhalation or ingestion and contact burns from corrosive or reactive chemicals.
Radioactive	Includes solid, liquid and gaseous materials contaminated with radio nuclides; produced as a result of procedures such as *in-vitro* analysis of body tissue and fluid, *in-vivo* organ imaging and various investigative and therapeutic practices. Because radioactive waste is genotoxic, health workers in handling active sources and contaminated surfaces must take extreme care.

A wide number of persons are potentially at risk from health care waste, both inside and outside of health care facilities. Exposure to hazardous health care waste can result in disease or injury to:

- Medical doctors, nurses – Occupation health risks to health care workers are numerous and varied with the greatest risk being infection (e.g., HIV/AIDS and hepatitis B and C) through injuries from contaminated sharps.
- Auxiliary and maintenance staff – Hospital workers such as janitors are at significant risk of infection or injury due to improper handling of infectious and chemical wastes at HCF.
- Patients and visitors – Although risks of exposure to hazardous waste are considered lower than for hospital staff there is a potential for accidental exposure to infectious sharps and chemical waste (e.g., children accompanying families during extended stays at HCF are particularly at risk).
- Workers at waste disposal facilities (e.g., incinerators and landfills) – Waste management workers are at significant risk of infection or injury from hazardous wastes; particularly scavengers at open landfills who are either not aware or ignore risks and often do not wear even rudimentary protective clothing.

Generally accepted strategies for health care waste management encompass: (i) waste minimization, recycling, and reuse; (ii) proper handling, storage and transportation of HCW;

and (iii) treatment of waste by safe and environmentally sound methods. These strategies are intended for tiered application – initially focusing on managing waste generation before moving on to actual disposal. Significant reductions in waste generated by health care facilities can be achieved through source reduction, use of recyclable products, and good management and control practices. Of these measures, waste segregation – careful sorting of waste matter into different categories – is critical to minimization of health care wastes; resulting in significant reduction of hazardous waste that needs to be handled and treated. Although safety concerns necessarily limit opportunities to reuse medical equipment (i.e., aside from items that are intended to be reusable), segregation and subsequent recycling of materials such as plastics, metal, paper and glass is often practical and can represent an income source for health care facilities.

Segregation of health care waste is intended to ensure that wastes are properly identified and separated and that different waste streams are handled and disposed of correctly. It typical involves sorting different wastes into color-coded plastic bags or containers at source. Recommended handling and disposal practices for different categories of health care waste will vary according the resources available to health care facilities. Examples of WHO (1999a) recommended health care waste handling practices appropriate for health care facilities that apply minimal waste management programs are:

- General health care waste (in black bags or containers) should join the domestic refuse stream for disposal.
- Sharps should be collected together into puncture-proof yellow safety boxes and held for high-temperature incineration. Encapsulation and disposal to a secure landfill is a suitable alternative for sharps.
- Highly infectious waste should be sterilized by autoclaving as soon as possible. For other infectious waste, disinfection is sufficient to reduce microbial content. Treated infectious waste should then be deposited in yellow bags and containers marked with the international infectious substance symbol. Incineration is the preferred method for disposal of infectious waste although land filling is also appropriate. Blood should be disinfected before discharge to the sewer system or wastewater treatment plant, if available, or may be incinerated.
- Large quantities of chemical wastes should be packed in chemical-resistant containers and sent to specialized treatment facilities. Small quantities of chemical waste can be held in leak proof containers and enter the infectious waste stream for incineration or land filling. It is noted that incineration at low temperatures may be insufficient to destroy thermally-resistant pharmaceuticals.
- Waste containing high heavy metal concentrations should be collected separately in brown containers and sent to specialized treatment facilities.
- Low-level radioactive waste should be collected to yellow bags or containers for incineration. High-level radioactive waste must be sent to specialized disposal facilities.

Incineration is a widely used treatment method for most hazardous waste generated by health care facilities. Incinerators can range from simply, single-chamber combustion units to

sophisticated, high-temperature plants. WHO (1999a) notes that all types of incinerator, if operated properly, eliminate pathogens from waste and reduce the waste to ash. Used correctly, incineration allows for a very significant reduction of waste volume and weight and is typically selected to treat wastes that cannot be recycled, reused or safely disposed of to landfills. The key to environmentally-safe incineration is proper segregation of waste streams within health care facilities – inappropriate waste types include large volumes of chemicals, photographic and radioactive wastes, PVC plastics, and waste with a high mercury or cadmium content. Incineration of these wastes causes the release of toxic emissions to the atmosphere if insufficiently high incineration temperatures are attained or in the absence of adequate emission controls.

Land filling of wastes that cannot be safely incinerated is regarded as an acceptable disposal option if proper precautions are taken to minimize potential exposure to infectious wastes. Disposal of health care waste to open landfills is not considered acceptable. Open landfills are characterized by the uncontrolled and scattered deposit of wastes at a site which can lead to groundwater and surface water pollution and a high risk to scavengers working at the landfill. Instead, health care waste should only be deposited to sanitary landfills that are designed to prevent contamination of soil, surface water, and groundwater and limit air pollution, odors and direct contact with the public. In the absence of sanitary landfills – which may not be feasible for cost and technical reasons – health care waste can be safely disposed of to landfills that provide for controlled dumping; including measures to control leachate release from the site, confined disposal of wastes, and rapid burial to avoid human or animal contact.

Recognizing that sanitary or engineered landfills are unlikely to be available in remote locations, another option is safe burial of health care waste on health care facility premises. On-site disposal represents an acceptable disposal option only if certain requirements are met as follows:

- Restricted access to disposal site by authorized personnel only
- Lining of burial site with a material of low permeability such as clay to prevent groundwater pollution
- Limit use to hazardous materials which cannot safely be incinerated to maximize the lifetime of a landfill

Guidelines under the existing Health Care Waste Generation and Management Plan are deemed adequate and compliance during HSSP2 has been good. The Guidelines incorporate best health care waste management practices and are intended for practical application at health care facilities. Training on the Guidelines has been provided to health facility staff all over Cambodia by Department of Hospital Services at provincial level. Maintenance of incinerators at health facility level remains the area for improvement.

During implementation of HSSP2, the national infection prevention and control guidelines for health care facilities have been finalized and widely disseminated. The Department of Hospital Services of the MOH trained health facility staff on health care waste collection and disposal. Potential risks to environmental and human health associated with hospital wastes, particularly hazardous chemical and infectious wastes were well-defined and managed

through the adoption of proper policy practices of health care waste Management. Health facilities were generally clean and equipped with waste containers for both normal and infectious wastes. Segregation of general, non-hazardous waste from infectious and hazardous waste (as well as used needles and syringes) was observed. Solid, non-infectious wastes were collected, stored and properly transported to local landfill. Incinerators in the hospitals were used to burn infectious wastes. A system has been established to safely collect sharp wastes from health facilities for incineration in the designated high temperature incinerators (Sicsim). The environmental assessment conducted as part of AF3 preparation found that weak management and limitation of budget at health facility level hinders implementation of the guidelines for health care waste management, including proper waste segregation and storage, and maintenance of incinerators. Although in theory, facilities should be using part of the revenue they generate from HEFs and SDGs to cover the cost of waste management.

At the provincial and district referral hospitals, liquid waste is discharged into a septic lagoon or an open pit. The liquid waste is diluted and within safe limits for disposal in septic tanks/sewer lines. For the construction of the national laboratory for drug quality control, the environmental impact assessment was conducted and the environmental management plan (EMP) was prepared and cleared by the World Bank, and the chemical waste treatment tank was constructed to store and treat chemical waste water. There was no evidence that the water supply, especially from water wells, for health centers has been regularly tested to confirm free microbial and arsenic content. Water filter has been installed at some health centers by different NGOs and clean water has been available for most referral hospitals, however.

2.2 Wastewater

Wastewater from health care facilities represents a sub-category of health care waste that should be addressed in planning construction and rehabilitation as part of the Project. WHO (1999a) notes that although wastewater from health care facilities is typically of a similar quality to urban wastewater, it may also contain potentially hazardous components. Microbiological pathogens introduced into the wastewater stream by patients being treated for enteric diseases are of most concern. Lesser hazards are posed by small quantities of hazardous chemicals, pharmaceuticals, and other pollutants commonly found in health care facility wastewater. Adherence to the hazardous waste segregation practices described in the preceding section provides assurances that chemicals and pharmaceuticals are not entering the wastewater stream.

Typically sewage discharged from health care facilities is greatly diluted and as such no significant health risks should be expected if effluents are treated in municipal wastewater treatment plants (WWTP). In more remote locations where it is not feasible to connect to municipal WWTP then appropriate precautions must be taken to avoid health risks associated with untreated or inadequately treated sewage to the receiving environment (e.g., wetlands or agricultural lands immediately[16] adjacent to a health care facility). Where possible, health care facilities should be connected to municipal systems. Where there are no sewage systems, technically sound on-site sanitation should be provided. Recommended

mitigation measures covering wastewater from health care facilities are elaborated in Section 3.1 – Environmental Management Plan.

2.5 DENGUE VECTOR CONTROL

2.5.1 Pesticide Use

Larvicides intended for use in dengue vector control programs as part of the HSSP2 are summarized in Table 3. All products have successfully passed WHO's Pesticide Evaluation Scheme (WHOPES). The WHOPES was set up in 1960 to promote and coordinate the testing and evaluation of pesticides for public health. WHOPES reviews and recommendations are based on methodologies developed through extensive consultation with the international community and should be considered authoritative.

Table 3 Larvicides to be used in vector control programs.

Insecticide/Larvicide Intended for Use and Specifications	Quantity Required (estimate/year)	Purpose	Comments on Environmental Safety
Temephos (Abate®1% sand granules) applied in a dosage of 1g/10 liter	160 metric tons x 5 years	Larvicide of choice for *Aedes aegypti* control in portable water containers	Successfully passed by WHOPES

AF3 will not finance any new larvicides though the dengue program will continue during the AF3. Malaria commodities were not financed under HSSP2.

2.5.2 Human Health Risks

The larvicide Temephos (commonly known by the trade name Abate® in Cambodia) used in dengue vector control is classed as an orgnophosphate. This pesticide has a very low toxicity to humans. Potential exposure routes are ingestion, inhalation of dust and to some extent dermal contact (i.e., skin contact is considered insignificant because absorption is inherently slow). The Temephos formulation used in HSSP and HSSP2 (i.e., 1% sand granules) is thought to present minimal risk to humans – no adverse effects have been observed during occupational handling or in the general population using treated water over extended periods. Similarly, no poisoning in humans as a result of accidental exposure has been documented (WHO, 2001; 1999b; 1975).

The original project and the AF1 financed larvicides (Abate and BTI) that were certified by WHO's Pesticide Evaluation Scheme (WHOPES) for dengue control. The products were transported in safe containers provided by the venders and used containers were disposed of according to the best practice; they were not used for storage or other purposes. Insecticide suppliers provided spoons to ensure proper quantity of insecticide put in water jars.

2.5.3 Environmental Risks

The toxicity of the pesticides intended for use in malaria and dengue vector control programs in Cambodia to non-target species varies widely. Laboratory and field tests indicate that Deltamethrin is only slightly toxic to birds but is moderately to very highly toxic to fish. Temephos has been shown to be highly toxic to some bird species but moderately toxic to others. It is considered highly toxic to bees and moderately to highly toxic to fish. Both Deltamethrine and Temephos have been shown to be very highly toxic to aquatic invertebrates (WHO, 1999b; 1984; 1975).

Environmental risks to non-target species, particularly aquatic organisms, can result from the unintentional release of these pesticides through improper handling or disposal. Although Deltamethrin and Temephos are highly toxic to aquatic organisms, under normal circumstances negligible quantities are likely to be released into ponds, streams and rivers. In assessing potential toxicity to non-target organisms it is important therefore to recognize that risk is a product of toxicity and exposure (i.e., there is little or no risk even at high concentrations if no exposure actually occurs). Exposure, if any, is likely to be short-term because: (i) these pesticides break down rapidly to products that are non-toxic to aquatic organisms; (ii) rapid dilution will occur in flowing waters; and (iii) products typically are rapidly adsorbed to suspended solids and bottom sediments.

3.0 ENVIRONMENTAL MITIGATION MEASURES

3.1 ENVIRONMENTAL MANAGEMENT PLAN

The intent of an EMP is to recommend feasible and cost-effective measures to prevent or reduce significant adverse impacts to acceptable levels. For purposes of AF3 for which environmental impacts are expected to be limited gauging from HSSP and HSSP2 experience (Category B), particular attention is given to outlining best management practices and design measures which should be put in place to ensure that environmental impacts are minimized during civil works activity and that human health and environmental concerns are fully addressed on an ongoing basis during Program implementation. Best management practices and mitigation measures are detailed by activity in the following sections.

3.1.1 Health Care Facility Construction and Rehabilitation

Although it has already been determined that an environmental assessment is not required for the health care facility civil works that will be executed, the MOH will continue to follow the same practices from HSSP and HSSP2.

Available preventive and mitigation measures for potential negligible and moderate impacts include:

- Design consideration in health centers and hospitals will ensure that adequate water system, incineration and wastewater treatment system are included in the design and construction package. This approach has been proven to be effective under both phases, and therefore will be continued during AF3.
- Consultation with the local community regarding site selection. Community should be informed about EMP and directors/staff of RHs/HCs should be encouraged to monitor the implementation of EMP.
- Design specifications that provide for minimization of disruption of natural vegetation and terrestrial and aquatic habitats.
- Design modifications for flood prone areas.
- Supervision and monitoring of construction (e.g., restricting work to daylight hours, limiting noise and dust emissions, safe traffic control, occupational health and safety). These instructions have been reiterated to all contractors and rigorous monitoring will be conducted to ensure that prevention and mitigation measures are followed.
- In areas where old and derelict buildings or existing health care facility are being removed for the new construction or refurbished, the site will be cleaned and decontaminated before any construction starts.
- Appropriate waste disposal plan will be identified and implemented where hospital or hazardous waste exists.
- In case required, appropriate protective gear will be provided to construction workers to ensure their health and safety while working on health care facility construction. This may specially be an issue of relevance for areas where the new construction or refurbishing is to take place in old and derelict health care facility sites, or within the compound of an existing health care facility.
- In areas where construction is to take place within an existing health center or hospital compound, appropriate measures will be taken to ensure minimum disturbance and impact to the hospital. This could be in the form of enclosures for the construction site, low noise, vibration and smoke producing machines. The construction plan also will be discussed with the health care facility management to ensure minimum disturbance.

3.1.2 Asbestos

Until now no asbestos has been found in 19 health care facilities under the HSSP2. Recommended mitigation measures to avoid or minimize occupational health risks associated with asbestos exposure include:

- Survey of all building structures by qualified and experienced building inspectors to determine whether asbestos is present in structures.
- Adherence to best practices regarding asbestos that meet the Good Practice Note provided in the WBG Environmental, Health and Safety Guidelines annexed to this version of EMP to ensure construction worker protection during renovation and demolition activities. Occupational exposure can be avoided by controlling dust emissions, and through use of effective respiratory protective equipment.
- Ensuring that demolition waste is disposed of at secure landfills, or handled by a reputable hazardous waste management facility.
- Prohibition on procurement of asbestos-containing building materials.
- Close supervision and monitoring of all demolition and construction activities. (Good Practice Note: Asbestos: Occupational and Community Health Issues. WBG, May 2009).

3.1.3 Drinking Water Quality

Ensuring the safe supply of water to health care facility is of paramount concern. Microbial water quality represents the most serious human health threat in Cambodia with infectious diseases caused by pathogenic bacteria, viruses and protozoa or by parasites representing a common and widespread health risk associated with drinking water. Microbial water quality is of most concern for untreated surface waters and shallow groundwater obtained from open wells – hand pump wells commonly used to tap aquifers at depths of greater than 15m are generally considered to provide water that is safe from a biological perspective, if the wells are properly drilled and maintained.

Available water quality data indicates that chemical water quality, particularly for surface waters, is generally very good in Cambodia, but that groundwater in certain areas of the country contains levels of chemicals that could pose problems for human health. The most important of these chemicals is arsenic which has been found to exceed the Cambodia Drinking Water Quality Standards of 50 µg/l. in some HSSP2 provinces – most notably Kandal, Battambang and Kratie. Although water chemistry sampling has yet to be undertaken in all HSSP2 provinces, elevated arsenic levels may occur in for Krong Pailin and Preah Vihear based on geological evidence.

Based on available information on groundwater arsenic levels in the Program provinces, it is recommended that a water quality monitoring program be included as part of project implementation to confirm that water supply to health care facility will meet the Cambodia Drinking Water Quality Standards – particularly for microbial quality and arsenic content. Although data exist for some of the rural communities to be served by the health care facility, the high spatial variability of groundwater arsenic necessitates that drinking water supply be tested at all existing and planned health care facilities as the only certain way of determining its portability. Routine follow up monitoring of water supply also will be undertaken to ensure that water continues to meets drinking water guidelines. Provision of simple testing kits and delivery of basic training to MOH and provincial health department staff will enable their involvement in monitoring of water quality on an ongoing basis.

Available mitigation and remedial measures to ensure microbial quality of surface waters include (WHO, 1993):

- Pre-treatment of surface waters through impoundment in reservoirs. Microbial quality can be improved considerably as a result of sedimentation and the effect of ultraviolet content of sunlight.
- Use of slow sand filtration or an activated carbon system as simple and effective methods for removing pathogenic bacteria, viruses, and parasites.
- Disinfection, typically through chlorination, to provide an effective barrier to transmission of waterborne bacterial and viral diseases.

Available mitigation and remedial measures when high arsenic levels are found in drinking water sources include:

- Investigate possibility of digging deeper wells based on feasibility studies to access groundwater from below alluvial areas. Hand pump wells are typically 30 m deep compared to deep aquifers at 70-120 m depths.
- Extending water supply to health care facilities from proven water sources such as municipal water systems or pumping from other safe wells.
- Substitution of alternative low-arsenic sources of drinking water such as rainwater or potable surface water where available and appropriate. Alternative water supplies such as surface water will be tested to ensure compliance with drinking water guidelines (e.g., microbial water quality).
- Segregation of water use within health care facilities. Water from safe wells, surface water sources or bottled water purchased from commercial suppliers will be used exclusively for consumption by patients and health care facility staff.
- Treatment of water supply to remove arsenic. This is considered the least preferable option due to high installation costs, and high maintenance requirements.

3.1.5 Health Care Waste Management

Guidelines have been developed by the MOH for use by health care facility in handling and disposal of health care waste. These guidelines are intended to supplement WHO's comprehensive health care waste management guidelines (WHO, 2000; 1999a) and focus on practical aspects of safe hospital waste management, including waste minimization, collection, segregation, storage, transportation, and disposal. Additional guidelines on injection safety have also been developed by the MOH to provide specific guidance to health care facilities on the distribution, use, collection and safe destruction of disposable syringes and safety boxes.

Feedback from WHO and UNICEF safe injection experts obtained in completing the ER indicated that the guidelines reflect best21practices but that attention should be given to ensuring their proper application by health care facilities. Notwithstanding the availability of health care waste management guidelines, it is apparent that there is considerable scope

for adopting more rigorous health care waste management practices in health centers and referral hospitals. Although training on health care waste management has been provided to health facility staff throughout the country, there is still uneven application of guidelines regarding proper waste handling and disposal. To address this weakness it is recommended that the AF3 will support for improving waste management practices at health care facilities as part of improved overall quality of care, where it is applicable. MOH Recognizing that sustaining adequate waste management practices at health care facilities ultimately depends on auxiliary staff, it is highly recommended that waste management responsibilities be clearly defined and linked with performance based monitoring and evaluation.

Adequate waste handling and disposal infrastructure and management systems should be put in place at health care facilities. A standard health care waste management package intended to improve health care waste handling at health care facilities would encompass: (i) color-coded waste plastic bags and containers; and (ii) safety boxes for disposal of used needle and syringes. Additional assessment of available health care waste disposal options is required before finalizing recommended disposal practices. Preliminary findings of the ER suggested that incineration and disposal to landfills are preferred disposal options. However, it is necessary to fully evaluate the appropriateness of all disposal strategies within the context of overall health care waste management in finalizing guidance to health care facilities concerning best practices. The segregation of waste at source to minimize mixed waste must be practiced as it would improve the waste disposal system. Therefore an appropriate system and management should be put in place to ensure waste segregation at the point of generation itself.

Safe disposal practices for wastewater as specified in the MOH's Waste Management Guidelines should be followed in handling of sanitary wastes from health care facilities. Specific mitigation measures to ensure environmentally-safe disposal of wastewater from health care facilities are also described in WHO (1999a). Recommended practices include:

- Where possible, hospitals should be connected to municipal WWTP.
- Hospitals that are not connected to municipal WWTP should install compact on-site sewage treatment (i.e., primary and secondary treatment, disinfection) to ensure that wastewater discharges meet applicable permit requirements. This should continue to be monitored by the project
- Health care facilities in remote locations should provide for minimal treatment of wastewater through affordable means such as lagooning; the system should comprise two successive lagoons to achieve an acceptable level of purification, followed by infiltration of the effluent to the land.
- Sewage from • Health care facilities should never be used for agricultural or aqua-cultural purposes.
- Sewage should not be discharged into or near water bodies that are used for drinking water supply or for irrigation purposes (i.e., infiltration to soil must take place outside of the catchment area of aquifers). 22
- Convenient washing and sanitation facilities should be available for patients

and their families, and Health care facilities staff to minimize the potential for unregulated wastewater discharge.

- Where septic tanks are used for the treatment and disposal of toilet waste it should be ensured that the septic tanks do not leak and appropriate management systems are identified for them. The septic tanks should also be of appropriate size to handle all the waste they are supposed to receive.

3.2 PESTICIDE MANAGEMENT AND MONITORING PLAN

The intent of the Pesticide Management and Monitoring Plan (PMMP) is to summarize mitigation measures and best management practices with a view to minimizing or avoiding any potential adverse human health or environmental effects that have been identified for malaria and dengue vector control programs to be funded under the AF3.

Recognizing that all pesticides are toxic to some degree, it is paramount to ensure that proper care and handling practices form an integral part of any program involving their use. In formulating management practices, it is necessary to take into account both the nature of the pesticides being used (i.e., their formulation and the proposed methods of application) and any existing safeguards that have been incorporated into programs to address potential occupational safety and environmental concerns. Guidelines and training materials have already been developed for the dengue programs, and few improvements are considered necessary to ensure the continued safety of these activities.

3.2.2 Dengue

Larviciding programs inherently pose fewer occupational health and environmental risks due to the pesticide formulations used, their controlled application, and the lower potential for exposure of health care workers involved in program implementation. Notwithstanding these factors, extensive safeguards have been developed by the CNM and WHO to minimize or avoid potential human health and environmental problems.

Dengue programs undertaken in Cambodia are scheduled to coincide with the peak transmission period occurring during the rainy season. Two applications of Temephos are made each year in targeted provinces; in May-June and repeated in July-August. In preparation for field distribution, approximately 160 metric tons of Temperos is procured annually by the MOH for use in dengue programs. Purchased Temperos is securely stored in a government warehouse until immediately prior to program implementation at which time casual workers are employed to pre-package the granular product into 20g satchels. Pre-packaging is intended to facilitate field activities (i.e., addition of a 20g satchel of Temperos to a standard 200 liter water jar or two satchels to the alternative 400 liter container size provides the required dosage) and increase the efficacy of the chemical when placed in water containers. Although some safety precautions (e.g. children are not allowed to be involved or present) are taken in the[23]packaging of Temperos, it is recommended that these safeguards be strengthened to addressed potential occupational health concerns. Specifically, strict precautions will be taken in handling the chemical such as:

ensuring adequate building ventilation; wearing protective gloves to avoid dermal contact; wearing protective masks to avoid inhalation of chemical dust; and washing of hands after handling.

Comprehensive guidelines have been developed by the CNM for Temephos larviciding programs to address potential human health and environmental concerns during field operations. Safeguards include:

- Tiered supervision by CNM, provincial and district health departments to closely track all aspects of inventory and distribution of stocks.
- Daily supervision of all field activities to ensure proper handling and household coverage.
- Water containers that are used frequently and those holding fish and other aquatic life are not treated.
- Households are educated on proper procedures for care and handling of water containers to which Temperos has been added (e.g., remove Temperos before washing containers).
- First aid procedures are explained for use if Temephos is accidentally ingested.

Safeguards developed by the CNM for dengue programs in Cambodia are considered to represent best available practices. With the exception of the need to strengthen occupational health practices during pre-packaging of Temperos into satchels, available guidelines are comprehensive and inclusive. Provision should be made for: (i) regular delivery of training to PHD and OD staff involved in program implementation to ensure that each person knows precisely what their responsibilities are; and (ii) ongoing monitoring and evaluation to ensure compliance with safeguards.

Institutional Arrangements

Ministry of Health. In line with the Program's implementation arrangements, the Hospital Service Department of MOH will ensure that all health care facilities supported under the Program follow the basic design parameters for health centers (i.e. building to have septic tank, water system and incinerator) and hospitals and also adopt and apply the health care waste Management Guidelines for managing health care waste. The Hospital Service Department, which co-chairs health impact assessment committee, will supervise implementation of the EMP in line with the monitoring schedule of the Program operational plan. During construction, the civil work supervision firm will provide direct supervision and monitoring of MEP implementation and report on the civil work progress reports on the regular basis.

Health Care Facilities. Each health care facility will follow the basic design of health centers and/or hospitals and ensure that civil works contracts contain a clause on good environmental practice and proper housekeeping measures, including adherence by contractors to the use of asbestos-free construction materials. The facility will ensure that health care waste generated will be properly managed through the24adoption of the health care waste Management Guidelines. Incinerators will be properly maintained to ensure that medical waste are

burned and disposed off according to the guidelines. And, surrounding communities/residents will not be disturbed from smell and smoke from incinerating of waste from the HCs/RHc.

Ministry of Environment (MOE). During Program implementation, the MOE will be consulted to review health care facility screening outcomes and other civil works activities that have environmental impacts and which will be covered by the Government's environmental impact assessment sub-decree.

World Bank. The World Bank, through its Task Team, will monitor compliance by the borrower and the health care facility operators of the environmental measures to address environmental and health care impacts.

Information on the proper management, storage and usage of pesticides must be given to the health workers involved in the program to ensure that minimum contamination and toxicity of the environment and in the health care facilities. An appropriate waste disposal system should also be identified for the waste generated from the pesticide program. This waste would largely consist of the pesticide containers and pesticide dispensers.

The EMP established to be applied for the original project was disclosed at the MOH website, the World Bank Infoshop, to all NGOs engaged with MOH through MEDICAM (NGO umbrella for health), and through HSSP2 dissemination workshop to all implementing units at national and subnational level. During the preparation process of AF1, it was re-disclosed at the MOH website and the World Bank Infoshop in September 2013. The updated EMP for the AF2 was re-disclosed at the MOH website, the World Bank Infoshop, to all NGOs engaged with MOH through MEDICAM, to contractors and consultants who engage with construction and rehabilitation of health facilities financed by HSSP2, and to the civil work supervision firms in October 2014. The updated EMP for AF3 will also be disclosed at MoH website, the Bank InfoShop, to all NGOs engaged with MOH through MEDICAM, to contractors and consultants who engage with construction and rehabilitation of health facilities financed by HSSP2, and to the civil work supervision firms. The environmental issues and mitigation measures are summarized in annex 1 below. All these measures will be included in bidding document and the contractor's and supervision firm's work plans as part of the specifications for construction that will be followed to address any potential environmental safeguard concerns.

Monitoring, Supervision and Reporting

The selected contractor(s) shall submit their completed work plans to the Project Director prior to initiating the civil works. The Contractors' Work plans should incorporate all agreed EMP measure described above, clearly listing:

(a) Possible environmental problems that may occur during construction; and

(b) Measures that must be strictly followed to prevent the possible environmental impact.

The civil work supervision firm should incorporate the status of EMP implementation into the civil work progress reports regularly.

The Program's civil work coordinator and civil work supervision Engineers will monitor compliance to EMP by the civil work contractors during their regular site supervision.

Table 5. Monitoring Plan (during construction)

Activity	Monitoring needs	Responsibility
Ambient air quality	Fortnightly monitoring. To be undertaken at the construction site.	The construction supervisor consultants
Noise levels	Weekly – morning, afternoon and evening. It is assumed no activity will take place at night. To be undertaken at the construction sites and a point of neighboring settlements near the construction sites, and at point on the access route for vehicles.	The construction supervisor consultants
Water Quality	Once before construction work starts, then on a fortnightly basis throughout construction phase. At water sources or at an appropriate point just below the construction sites near the river, where construction material or waste could be discharged unintentionally, near waste disposal sites.	The construction supervisor consultants
Waste management	Weekly At the labor camps and at the sites where waste is temporarily disposed and stored	The construction supervisor consultants Log of waste collection and disposal should be maintained by the construction company for inspection by the construction supervisor.
Site Safety	Fortnightly At the construction sites, waste disposal and material procurement sites and also at the labor camps. To ensure all required precautionary measures have been undertaken and all machinery (like safety alarms, fire extinguishers) etc are working properly	The construction supervisor consultants Log of accidents etc and follow-up action to be maintained by the construction company and for inspection by construction supervisors.

Cost Estimation for Monitoring EMP Implementation

No	Items	Unit	Rate	Quantity	Amount (US$)
1	Regular internal monitoring (Quarterly)	Trip	5,000	6	30,000
2	Training and meeting (MoH staff, consultants, and contactors/and engineers)	Round	2,000	3	6,000
A	**Sub-total**				**36,000**
B	Contingency		10%		3,600
C	**Grand-total**				**39,600**

Annex 1.

Sample Format for Environmental Management Plan/ SAMPLE SAFETY SECURITY AND ENVIRONMENT

Phase	Issues	Measures	Results of Monitoring and Feedback
Pre-Construction	**Site Clearance and UXO clearance**	All the vegetation must be stripped from the area of construction. This has to be done very carefully. The valuable or reusable materials from the demolished construction should keep as the property of the health facilities (health center or referral hospital), and shall be stored in the storage area provided. The Contractor shall dispose of rubbish remains from the demolition/construction away from the hospital property. If Unexploded Ordnances' (UXO) are discovered on site during construction, Contractors must immediately stop all works until the UXO are removed and the site certified as clear.	
	Set Out of Works	The Contractor shall set out the location of the works and clearly mark the location of corners with timber pegs. Offset pegs shall also be located at one-meter offsets so that all corner points can be located again after excavation of soil for the correct construction of footings.	

Construction	**PROTECTION OF WATER RESOURCES**	All existing stream courses and drains within, and adjacent to, the Site will be kept safe and free from any debris and any excavated materials arising from the Works. Chemicals, sanitary wastewater, spoil, waste oil and concrete agitator washings will not be deposited in the watercourses. In the event of any spoil or debris from construction works being deposited on adjacent land or any silt washed down to any area, then all such spoil, debris or material and silt shall be immediately removed and the affected land and areas restored to their natural state by the Contractor to the satisfaction of the Supervising Engineers.	

	ASBESTOS MANAGEMENT	The Contractor shall Adherence to best practices regarding asbestos that meet the Good Practice Note provided in the WBG Environmental, Health and Safety Guidelines annexed to this version of EMP to ensure that no Asbestos based materials will be used in the construction. If Asbestos products such as roofing sheets are found on site, or present in old structures that are to be demolished by the Contractor, they must be removed carefully from site, if possible without breaking, before demolition of the old building, or construction of the new building commences. The Asbestos is to be wetted to prevent dust and if any cutting or abrading is necessary, then the material must be kept wet during working to prevent dust. Asbestos products removed from old structures are not to be stored in the RH/HC compounds. Demolition methods which could cause these materials to become an environmental concern are prohibited in this Program, and the prospective contractors are to make their bids accordingly, or propose control and monitoring techniques that will assure these materials will not become environmental concerns.	

	PROTECTION OF HISTORICAL AND CULTURAL RESOURCES	The Contractors is required to protect sites of known antiquity, by placing barriers and fencing to prevent access or damage to the site. The Employer will not approve constructions in locations that would cause physical or aesthetic damage to sites of cultural importance or of known antiquity. In the event of unanticipated discovery of cultural or historical artifacts (moveable or immovable), or human remains in the course of the work, the Contractors shall take all necessary measures to protect the findings. If continued work would endanger the findings, the work should be suspended until a solution for preservation of the artifacts is agreed.	
	NOISE AND DUST	The Contractor shall ensure that the construction does not create noise or dust hazards. Construction materials shall be stored on site in properly constructed storage areas, and construction equipment such as generators or concrete mixers shall be in good working condition, so that they do not produce excessive noise. Should demolition activities begin to generate visible airborne dust, the contractor(s) will cease the activity(s) which generate the dust: (i) until the dust is controlled with means such as water spray or (ii) another demolition technique which does not generate airborne dust is substituted.	

	CLEAN WATER AND SANITATION FACILITIES	The contractor shall provide at the site potable (safe from a health standpoint) drinking water for construction worker. The Contractor shall ensure facilities at the construction site for the workers. The facility will be dismantled, pit filed and site cleaned to pass inspection of the Construction Supervisor when permanent privy facilities available for the construction workers are constructed and operational at the sites. The privy shall be located more than 30 meters of an existing water supply wells or surface water body, unless a lack of available site area or other extenuating circumstance prevents such a safety distance. Alternatives shall be approved by the Construction Supervisor.	
	Disturbance: Nearby offices and residents can be disturbed by prolonged construction.	The contractor will perform construction activities within appropriate time frame which does not disturb work of officers or living of local residents.	
Post-Construction	Site Clearing: Cleaning the site after construction and disposing wastes properly so that they are not dangerous to the environment.	The contractor will clean the site carefully and remove all construction waste materials and dump it at designated dumping site. Burning of waste should not be encouraged.	

Annex 2.

Good Practice Note: Asbestos: Occupational and Community Health Issues

1. SUMMARY

The purpose of this Good Practice Note is to increase the awareness of the health risks related to occupational asbestos exposure, provide a list of resources on international good practices available to minimize these risks, and present an overview of some of the available product alternatives on the market. The need to address asbestos-containing materials (ACM) as a hazard is no longer under debate but a widely accepted fact.

Practices regarding asbestos that are normally considered acceptable by the World Bank Group (WBG) in projects supported through its lending or other instruments are addressed in the WBG's General Environmental, Health and Safety (EHS) Guidelines.[1] This Good Practice Note provide background and context for the guidance in the WBG EHS Guidelines.

Good practice is to minimize the health risks associated with ACM by avoiding their use in new construction and renovation, and, if installed asbestos-containing materials are encountered, by using internationally recognized standards and best practices (such as those presented in Appendix 3) to mitigate their impact. In all cases, the Bank expects borrowers and other clients of World Bank funding to use alternative materials wherever feasible.

ACM should be avoided in new construction, including construction for disaster relief. In reconstruction, demolition, and removal of damaged infrastructure, asbestos hazards should be identified and a risk management plan adopted that includes disposal techniques and end-of-life sites.

2. ASBESTOS AND HEALTH RISKS

2.1. WHAT IS ASBESTOS, AND WHY ARE WE CONCERNED WITH ITS USE?

Asbestos is a group of naturally occurring fibrous silicate minerals. It was once used widely in the production of many industrial and household products because of its useful properties, including fire retardation, electrical and thermal insulation, chemical and thermal stability, and high tensile strength. Today, however, asbestos is recognized as a cause of various diseases and cancers and is considered a health hazard if inhaled.[2] The ILO estimates that over the last several decades 100,000 deaths globally have been due to asbestos exposure,[3] and the WHO states that 90,000 people die a year globally because of occupational asbestos exposure.[4]

[1] http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/gui_EHSGuidelines2007_GeneralEHS/$FILE/Final+-+General+EHS+Guidelines.pdf (pp. 71, 91, 94) .

[2] http://www.who.int/occupational_health/publications/draft.WHO.policy.paper.on.asbestos.related.diseases.pdf. See also Stayner L, et al., "Exposure-Response Analysis of Risk of Respiratory Disease Associated with Occupational Exposure to Chrysotile Asbestos." *Occupational Environmental Medicine.* 54: 646-652 (1997).
[3] http://www.ilo.org/wow/Articles/lang--en/WCMS_081341
[4] http://www.who.int/occupational_health/publications/asbestosrelateddiseases.pdf

Over 90% of asbestos[5] fiber produced today is chrysotile, which is used in asbestos-cement (A-C) construction materials: A-C flat and corrugated sheet, A-C pipe, and A-C water storage tanks. Other products still being manufactured with asbestos content include vehicle brake and clutch pads, roofing, and gaskets. Though today asbestos is hardly used in construction materials other than asbestos-cement products, it is still found in older buildings in the form of friable surfacing materials, thermal system insulation, non-friable flooring materials, and other applications. The maintenance and removal of these materials warrant special attention.

Because the health risks associated with exposure to asbestos area now widely recognized, global health and worker organizations, research institutes, and some governments have enacted bans on the commercial use of asbestos (see Box 1), and they urge the enforcement of national standards to protect the health of workers, their families, and communities exposed to asbestos through an International Convention.[6]

BOX 1. BANS ON THE USE OF ASBESTOS AND ASBESTOS PRODUCTS

A global ban on commercial use of asbestos has been urged by the Building and Wood Workers Federation (IFBWW), the International Metalworker's Federation, the International Trade Union Confederation, the government of France, and the distinguished scientific group Collegium Ramazzini. All member states of the European Union and over 40 countries worldwide (see Appendix 1) have banned all forms of asbestos, including chrysotile.[7] In June 2006, the General Conference of the ILO adopted a resolution to "promote the elimination of all forms of asbestos and asbestos-containing materials."

- Landrigan PJ, Soffritti M. "Collegium Ramazzini Call for an International Ban on Asbestos." *Am. J. Ind. Med.* 47: 471-474 (2005).
- The International Ban Asbestos Secretariat keeps track of national asbestos bans. http:// ibassecretariat.org./lka_alpha_asb_ban_280704.php
- General Conference of the International Labor Organization, "Resolution Concerning Asbestos," *Provisional Record*, International Labor Conference, Ninety-fifth Session, Geneva, 2006, Item 299, pp. 20/47-48.
- World Health Organization: http://www.who.int/occupational_health/publications/asbestosrelateddiseases.pdf

2.2. HEALTH CONCERNS LINKED TO ASBESTOS-CONTAINING PRODUCTS

Health hazards from breathing asbestos dust include asbestosis, a lung scarring disease, and various forms of cancer (including lung cancer and mesothelioma of the pleura and peritoneum).[8] These diseases usually arise decades after the onset of asbestos exposure. Mesothelioma, a signal tumor for asbestos exposure, occurs among workers' family members

[5] Asbestos defined in Castleman, B. *Asbestos: Medical and Legal Aspects* 5th Ed. New York: Aspen, 2005, 894 pp.

[6] ILO Asbestos Convention No. 162, (see http:www.ilo.org/ilolex or http://www.itcilo.it/actrav/osh_es/m%F3dulos/legis/c162.htm)

[7] http://www.who.int/occupational_health/publications/asbestosrelateddiseases.pdf. Directive 2003/18/EC of the European Council and Parliament amending Council Directive 83/477/EEC, and Directive 99/77/EEC

[8] http://www.euro.who.int/document/aiq/6_2_asbestos.pdf

from dust on the workers' clothes and among neighbors of asbestos air pollution point sources.[9] Some experimental animal studies show that high inhalation exposures to all forms of asbestos for only hours can cause cancer.[10] Very high levels of airborne asbestos have been recorded where power tools are used to cut A-C products and grind brake shoes. For chrysotile asbestos, the most common variety, there is no threshold (non-zero) of exposure that has been shown to be free from carcinogenic risks. Construction materials are of particular concern, because of the large number of workers in construction trades, the difficulty of instituting control measures, and the continuing threat posed by in-place materials that eventually require alterations, repair, and disposal.[11] Renovations and repairs in buildings containing A-C materials can also endanger building occupants. In addition to the problems from products made with commercial asbestos, asbestos also occurs as a contaminant in some deposits of stone, talc, vermiculite, iron ore, and other minerals. This can create health hazards for workers and residents at the site of excavation and in some cases in the manufacture and use of consumer products the materials are used to make. While asbestos is a known carcinogen when inhaled, it is not known to be carcinogenic when ingested, as through drinking water,[12] although pipe standards have been issued for asbestos-cement pipes conducting "aggressive" water.[13]

From the industrial hygiene viewpoint, asbestos creates a chain of exposure from the time it is mined until it returns to the earth at landfill or unauthorized disposal site. At each link in the chain, occupational and community exposures coexist. Workers in the mines are exposed to the fibers while extracting the ore; their families breathe fibers brought home on work clothes; workers in the mills and factories process the fiber and manufacture products with it; and their families are also secondarily exposed. Communities around the mines, mills, and factories are contaminated with their wastes; children play on tailings piles and in contaminated schoolyards; transportation of fiber and products contaminates roads and rights-of-way.[14] Tradesmen who install, repair and remove ACM are exposed in the course of their work, as are bystanders in the absence of proper controls. Disposal of asbestos wastes from any step in this sequence not only exposes the workers handling the wastes but also local residents when fibers become airborne because of insufficient covering and erosion control. Finally, in the absence of measures to remove ACM from the waste stream and dispose of them properly, the cycle is often repeated when discarded material is scavenged and reused.[15]

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[9] "Asbestos." *World Health Organization IARC Monographs on the Evaluation of Carcinogenic Risks to Humans/ Overall Evaluations of Carcinogenicity: An Updating of IARC Monographs 1 to 42*, Suppl. 7. Lyon: International Agency for Research on Cancer, 1987, pp. 106-116.

[10] Wagner JC, Berry G, Skidmore JW, Timbrell V. "The Effects of the Inhalation of Asbestos in Rats." *Br. J. Cancer* 29: 252-269 (1974).

[11] International Program on Chemical Safety, "Conclusions and Recommendations for Protection of Human Health," *Chrysotile Asbestos*, Environmental Health Criteria 203. Geneva: World Health Organization, 1998, p. 144.

[12] http://whqlibdoc.who.int/hq/2000/a68673_guidelines_3.pdf

[13] http://whqlibdoc.who.int/hq/2000/a68673_tech_aspects_4.pdf

[14] Jones, Robert "Living in the Shadow of the Asbestos Hills (The Need for Risk Based Cleanup Strategies for Environmental Asbestos Contamination in South Africa)." Environmental Exposure, Crisis Preparedness and Risk Communication, Global Asbestos Congress, Tokyo, Japan, November 19 - 21, 2004. http://park3.wakwak.com/~gac2004/en/index_abstract_e.html. See also Oberta, AF "Case Study: An Asbestos Cement Plant in Israel -- Contamination, Clean-up and Dismantling." Hellenic Asbestos Conference, Athens, Greece, October 29 - 31, 2002. http://www.ibas.btinternet.co.uk/Frames/f_lka_hellen_asb_conf_rep.htm

[15] Boer, A.M., L.A. Daal, J.L.A. de Groot, J.G. Cuperus "The Combination of the Mechanical Separator and the Extraction Cleaner Can Process the Complete Asbestos-containing Waste-stream and Make it Suitable for Reuse."

2.3. INCREASING USE OF ASBESTOS FIBER

There is evidence that, after a decline in the 1990s, the use of asbestos fiber is increasing globally. A recent study[16] shows that a 59% increase in metric tons was consumed in 12 countries from 2000 to 2004.

3. INTERNATIONAL CONVENTION AND STANDARDS FOR WORKING WITH ASBESTOS

3.1. INTERNATIONAL CONVENTION

The International Labor Organization (ILO) established an Asbestos Convention (C162) in 1986 to promote national laws and regulations for the "prevention and control of, and protection of workers against, health hazards due to occupational exposure to asbestos."[17] The convention outlines aspects of best practice: Scope and Definitions, General Principles, Protective and Preventive Measures, Surveillance of the Working Environment, and Workers' Health. As of March 4, 2008, 31 countries had ratified the Convention;[18] 17 of them have banned asbestos.

Some of the ILO asbestos convention requirements:

- work clothing to be provided by employers;
- double changing rooms and wash facilities to prevent dust from going home on street clothes;
- training of workers about the health hazards to themselves and their families;
- periodic medical examinations of workers,
- periodic air monitoring of the work environment, with records retained for 30 years;
- development of a work plan prior to demolition work, to protect workers and provide for proper waste disposal; and
- protection from "retaliatory and disciplinary measures" of workers who remove themselves from work that they are justified in believing presents a serious danger to health.

Standard considerations for working with and procuring ACM are common to most projects. An overview of some basic ones is provided in Appendix 5.

3.2. INTERNATIONAL STANDARDS AND NATIONAL REGULATIONS

Standards and regulations for work involving ACM have been published by nongovernmental organizations and government agencies. Appendix 3 provides a listing of some resources, including international organizations (e.g., WHO, ISO, ASTM) and national governments (e.g., UK, US, Canada, South Africa). The resources range from manuals to individual standards and cover a variety of work guidelines, including surveys, identification, inspection, maintenance, renovation, repair, removal, and disposal. Some of the key issues discussed in these standards and regulations are as follows:

European Conference on Asbestos Risks and Management, Rome, Italy, December 4 -6, 2006. http://venus.unive.it/fall/menu/Boer.pdf

[16] R. Virta, US Geological Survey, 2007.

[17] www.ilo.org/ilolex

[18] http://www.ilo.org/ilolex/english/convdisp1.htm

- **The scale of occupational hazards.** The health risk is not simply a function of the properties of the ACM, but also reflects the type of work being done and the controls used. Although A-C products, for example, may seem to intrinsically present less of a risk than fire-proofing, air monitoring has shown that cutting dry A-C sheet with a power saw can release far greater amounts of airborne fibers than scraping wet, saturated fireproofing off a beam. The relationship between the nature of A-C products, the work being done and the controls used to control the release of fibers and debris is important (as discussed in ASTM E2394 and HSG189/2[19]).

- **Controlling exposure to airborne fibers.** Because asbestos fibers are primarily an inhalation hazard, the basic purpose of the regulations and standards is to control the concentration of asbestos fibers in the air inhaled by workers or others. Concentration limits have been set by regulations in numerous countries for workers whose duties involve contact with ACM; however, they do not purport to totally eliminate the risk of asbestos disease, but only to reduce it. Exposure limits for individuals other than workers, including occupants of buildings and facilities and the community, are lower than those for workers in deference to the very young and old as well as the physically compromised.

- **Measuring exposure to airborne fibers.** Compliance with exposure limits is demonstrated by air sampling in workers' breathing zone or in the space occupied by the affected individuals, with analysis of the sample by optical or electron microscopy, as explained in Appendix 3. Abatement protocols determine whether a building can be reoccupied after asbestos abatement.

- **Proper disposal.** Proper disposal of ACM is important not only to protect the community and environment but also to prevent scavenging and reuse of removed material. ACM should be transported in leak-tight containers to a secure landfill operated in a manner that precludes air and water contamination that could result from ruptured containers. Similar requirements apply to remediation of sites such as mines, mills, and factories where asbestos fiber was processed and products manufactured. (See EPA NESHAP regulations, Appendix 3.)

- **Transboundary movement of waste**. Waste asbestos (dust and fibers) is considered a hazardous waste under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. The Basel Convention imposes use of a prior informed consent procedure for movement of such wastes across international borders. Shipments made without consent are illegal. Parties have to ensure that hazardous waste is disposed of in an environmentally sound manner (ESM. Strong controls have to be applied from the moment of generation, to its storage, transport, treatment, reuse, recycling, recovery and final disposal[20]

- **Identifying asbestos products.** A-C products include flat panels, corrugated panels used for roofing, water storage tanks, and pressure, water, and sewer pipes. In some countries asbestos

[19] See Appendix 3.

[20] See Basel Convention Secretariat http://www.basel.int/

may still be used in making wallboard, heat-resistant gloves and clothes for industrial use, and brake and clutch friction elements and gaskets used in vehicles.[21] Thermal insulation containing asbestos and sprayed asbestos for insulation and acoustic damping were widely used through the 1970s and should be looked for in any project involving boilers and insulated pipes. Insulation dating from before 1980 should be presumed to contain asbestos unless analyzed and found not to. The microscopic methodology for analyzing bulk samples for the presence of asbestos is widely available in industrialized countries and is not expensive; it is less available in developing countries. In a developing country samples may have to be mailed out for testing; alternatively, training may be available for a laboratory in the country.

- **Training.** It is impossible to overemphasize the importance of training for working with ACM in any capacity—whether it involves inspections, maintenance, removal, or laboratory analysis. The duration of the training as well as the course content depends on the type of work the individual will be doing. Quality control and proficiency testing for laboratories and individual analysts are also important.

4. ALTERNATIVES TO ASBESTOS-CONTAINING MATERIALS

4.1. GROWING MARKETPLACE

Safer substitutes for asbestos products of all kinds are increasingly available (see Appendix 4). These include fiber-cement products using combinations of local vegetable fibers and synthetic fibers, as well as other products that serve the same purposes.[22] The WHO is actively involved in evaluating alternatives.[23]

4.2. COST AND PERFORMANCE ISSUES

Fiber-cement roof panels using polyvinyl alcohol (PVA) or polypropylene combined with cellulose now cost 10-15% more to manufacture than A-C sheets. Polypropylene-cellulose-cement roofing, a new product, is made at a cost of about 12 percent more than A-C roofing and has superior impact resistance. The non-asbestos fiber-cement panels are lighter, less brittle, and have improved nailability over A-C. The increase in the overall cost of building construction that such products represent is to some degree offset by the obviation of special hygiene measures in installation/maintenance/renovation, the lack of a continuing hazard to building workers and occupants, and reduced costs of waste removal and disposal. Micro concrete tiles are cheaper than A-C to produce, and can be made in a basic workshop near the building site with locally available small contractors and materials, lowering transport costs. Compared with A-C pipes, iron pipes can be transported and installed with less difficulty and breakage, take greater compression loading and last longer.

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[21] In 2004, Russia, China, India, Kazakhstan, Thailand, and Ukraine together accounted for about three-quarters of world asbestos consumption. Other major consumers of asbestos are Iran, Brazil, Vietnam, and Indonesia.

[22] 7. The U.K. Health and Safety Executive commissioned a report that concluded that the main replacement fibrous materials for asbestos in fiber-cement products and brakes are less hazardous than chrysotile asbestos. See Harrison PTC, *et al.* "Comparative Hazards of Chrysotile Asbestos and Its Substitutes: A European Perspective." *Envir. Health Persp.* 107: 607-611 (1999). http://www.ehponline.org/members/1999/107p607-611harrison/harrison-full.html

[23] http://www.who.int/ipcs/assessment/asbestos/en/

5. WORLD BANK GROUP APPROACH TO ASBESTOS HEALTH RISK

The WBG EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP).[24] When one or more members of the WBG are involved in a project, the EHS Guidelines are applied as required by their respective policies and standards.

The WBG's EHS Guidelines[25] specify that the use of ACM should be avoided in new buildings and construction or as a new material in remodeling or renovation activities. Existing facilities with ACM should develop an asbestos management plan that clearly identifies the locations where the ACM is present, its condition (e.g., whether it is in friable form or has the potential to release fibers), procedures for monitoring its condition, procedures to access the locations where ACM is present to avoid damage, and training of staff who can potentially come into contact with the material to avoid damage and prevent exposure. The plan should be made available to all persons involved in operations and maintenance activities. Repair or removal and disposal of existing ACM in buildings should be performed only by specially trained personnel[26] following host country requirements or, if the country does not have its own requirements, internationally recognized procedures.[27] Decommissioning sites may also pose a risk of exposure to asbestos that should be prevented by using specially trained personnel to identify and carefully remove asbestos insulation and structural building elements before dismantling or demolition.[28]

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[24] Defined as the exercise of professional skill, diligence, prudence, and foresight that would be reasonably expected from skilled and experienced professionals engaged in the same type of undertaking under the same or similar circumstances globally. The circumstances that skilled and experienced professionals may find when evaluating the range of pollution prevention and control techniques available to a project may include, but are not limited to, varying levels of environmental degradation and environmental assimilative capacity as well as varying levels of financial and technical feasibility

[25] http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/gui_EHSGuidelines2007_GeneralEHS/$FILE/Final+-+General+EHS+Guidelines.pdf (pp. 71, 91, 94)

[26] Training of specialized personnel and the maintenance and removal methods applied should be equivalent to those required under applicable regulations in the United States and Europe (examples of North American training standards are available at: http://www.osha.gov/SLTC/asbestos/training.html)

[27] Examples include the ASTM International E1368 - Standard Practice for Visual Inspection of Asbestos Abatement Projects; E2356 - Standard Practice for Comprehensive Building Asbestos Surveys; and E2394 - Standard Practice for Maintenance, Renovation and Repair of Installed Asbestos Cement Products.

[28] http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/gui_EHSGuidelines2007_GeneralEHS/$FILE/Final+-+General+EHS+Guidelines.pdf (pp. 71, 91, 94)

APPENDIX 1. COUNTRIES THAT HAVE BANNED THE USE OF ASBESTOS

1. Argentina
2. Australia
3. Austria
4. Belgium
5. Bulgaria
6. Chile
7. Cyprus
8. Czech Republic
9. Denmark
10. Egypt
11. Estonia
12. Finland
13. France
14. Gabon
15. Germany
16. Greece
17. Honduras
18. Hungary
19. Iceland
20. Ireland
21. Italy
22. Japan
23. Jordan
24. Kuwait
25. Latvia
26. Lithuania
27. Luxembourg
28. Malta
29. Netherlands
30. Norway
31. Poland
32. Portugal
33. Republic of Korea
34. Romania
35. Saudi Arabia
36. Seychelles
37. Slovakia
38. Slovenia
39. South Africa
40. Spain
41. Sweden
42. Switzerland
43. United Kingdom
44. Uruguay

APPENDIX 2. WORLD BANK GROUP ASBESTOS REFERENCES

Policy guidance	*References*
ACM should be avoided in new buildings or as new material in remodeling or renovation • Existing buildings: ACM Survey and management plan needed • Disposal of ACM shall be carried out by specially trained individuals only following host country requirements, or in their absence, internationally recognized procedures	*Guidance: General Environment Health and Safety Guidelines April 2007, p 34 and 71*.
Some examples of project requirements: • risk assessment to determine extent of problem; surveys to abate asbestos exposure; management plan; removal by trained personnel; prohibition of ACM; procedures for handling, removal, transport, and disposal of asbestos.	• Ukraine -Equal Access to Quality Education (Project ID PO77738) • KH- Health Sector Support (Project ID: P070542) • ID- Health Workforce and Services (Project. ID: P073772) • Changchun, China -TBK Shili Auto Parts Co., (IFC, 2005)

APPENDIX 3. LIST OF RESOURCES FOR ASBESTOS STANDARDS AND REGULATIONS

NOTE: this listing is not meant to be all-inclusive, but is a sample of available information.

INTERNATIONAL STANDARDS

WHO Policy and Guidelines (www.who.org)

- www.searo.who.int/LinkFiles/Publications_and_Documents_prevention_guidelines.pdf(p. 70)
- www.searo.who.int/en/Section23/Section1108/Section1835/Section1864_8658.htm

International Organization for Standardization (ISO) (www.iso.org)

- ISO 10312 (1995): Ambient air -- Determination of asbestos fibres -- Direct transfer transmission electron microscopy method. [Method similar to ASTM D6281]
- ISO 13794 (1999): Ambient air – Determination of asbestos fibres – Indirect-transfer transmission electron microscopy method.
- ISO/FDIS 16000-7: Indoor air – Part 7: Sampling strategy for determination of airborne asbestos fibre concentrations.
- ISO 8672: Air quality -- Determination of the number concentration of airborne inorganic fibres by phase contrast optical microscopy -- Membrane filter method (1993) [Method similar to AIA RTM1]

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal

- Basel Convention Secretariat (www.basel.int)

International Labour Organization (www.ilo.org)

- Chemical Safety Card, ICSC 0014: www.ilo.org/public/english/protection/safework/cis/products/icsc/dtasht/_icsc00/icsc0014.htm

European Union

(europa.eu.int/smartapi/cgi/sga_doc?smartapi!celexapi!prod!CELEXnumdoc&lg=EN&numdoc=32003L0018&model=guichett)

- Directive 2003/18/EC amending Council Directive 83/477/EEC on the Protection of Workers from the Risks Related to Exposure to Asbestos at Work. (March 2003). Provides regulations including: worker protection, training and medical surveillance; inspections for asbestos-containing materials; notification of asbestos work; air sampling; exposure limits of 0,1 fibres per cm^3 (8-hr TWA) measured by Phase Contrast Microscopy.

NATIONAL STANDARDS

ASTM International (www.astm.org)

- Manual on Asbestos Control: Surveys, Removal and Management – Second Edition (March 2005). Author: Andrew F. Oberta, MPH, CIH. Discusses in detail how E2356, E2394 and E1368 are used to support an asbestos management program.
- E2356 Standard Practice for Comprehensive Building Asbestos Surveys. July, 2004. Covers baseline surveys for management of ACM and includes assessment protocols to make and prioritize removal vs. maintenance decisions. ASTM E2356 provides information for long-term management of ACM in a Baseline Survey and for preparation of the plans and specifications for a removal project. It contains detailed procedures and equipment (mostly ordinary hardware items) needed to take bulk samples of common types of suspect ACM. Once materials have been identified as asbestos-containing, an assessment is made as to which can be left in place. Quantitative assessment of the Current Condition and Potential for

Disturbance of all friable and non-friable materials allows removal priorities to be tabulated and graphically displayed. Budgetary estimates for removal can be established on the basis of the quantitative assessments.

- E2394 Standard Practice for Maintenance, Renovation and Repair of Installed Asbestos Cement Products (October 2004). Describes materials, hazardous operations, necessary precautions and infrastructure requirements with detailed procedures in appendices. Not intended for installation of asbestos-cement products in new construction or renovation.
- E1368 Standard Practice for Visual Inspection of Asbestos Abatement Projects (May 2005). Provides an approach to managing a removal project to enhance prospects of passing final inspections and clearance air sampling. Describes preparation, removal and inspection procedures and criteria.
- E2308 Standard Guide on Limited Asbestos Screens of Buildings (2005). Provides the minimum amount of information needed to facilitate a real estate transaction.
- D6281 Standard Test Method for Airborne Asbestos Concentration in Ambient and Indoor Atmospheres as Determined by Transmission Electron Microscopy Direct Transfer (TEM). A method for distinguishing asbestos from non-asbestos fibers on an air sample filter and identifying and quantifying smaller and thinner fibers than Phase Contrast Microscopy
- D7201: Practice for Sampling and Counting Airborne Fibers, Including Asbestos Fibers, in the Workplace, by Phase Contrast Microscopy (with an Option of Transmission Electron Microscopy)
- Combines methodology of NIOSH 7400 and 7402

Australia
(www.ascc.gov.au/ascc/AboutUs/Publications/NationalStandards/ListofNationalCodesofPractice.htm)

- Safe Removal of Asbestos 2nd edition [NOHSC: 2002 (2005)]
- Code of Practice for the Management and Control of Asbestos in the Workplace [NOHSC: 2018 (2005)]

U. K. Health and Safety Executive (http://www.hse.gov.uk/asbestos/index.htm)

- Asbestos Regulations (http://www.opsi.gov.uk/si/si2006/20062739.htm)
- Asbestos Essentials (http://www.hse.gov.uk/asbestos/essentials/index.htm). Includes sections on manager Tasks and methods and equipment.

Publications include:

- Working with Asbestos in Buildings INDG289 08/01 C600. An overview (16 pages) of asbestos hazards and precautions
- MDHS100 Surveying, sampling and assessment of asbestos containing materials (2001). Contains many illustrations and examples of asbestos-containing products as well as sampling and analytical methods. MDHS100 is comparable in thoroughness to ASTM in its discussion of bulk sampling techniques and equipment, organizing a survey and assessment of ACM using a numerical algorithm based on the product type, extent of damage, surface treatment and type of asbestos fiber. The document contains numerous photographs of typical ACM found in buildings.
- HSG189/2 Working with asbestos cement (1999). Describes asbestos-cement products and methods of repairing and removing them, including fiber concentrations for controlled and uncontrolled operations.
- The Control of Asbestos at Work Regulations (2002). Requirements for the protection of

people being exposed to asbestos, including the requirement for those with responsibility for the maintenance and/or repair of non-domestic premises, to identify and manage any risk from asbestos within their premises
National Institute of Building Sciences (http://www.nibs.org/pubsasb.html) • Guidance Manual: Asbestos O&M Work Practices, Second Edition (1996). Contains procedures for small-scale work on friable and non-friable ACM including asbestos-cement products. • Asbestos Abatement and Management in Buildings: Model Guide Specification. Third Edition (1996). Contains information on project design and surveillance as well as applicable US regulations, plus removal contractor requirements for abatement work in specification format.
Austrian Standards Institute (http://www.on-norm.at/index_e.html) ONORM M 9406, Handling of products containing weakly bound asbestos, 01 08 2001. Contains a protocol and algorithm for assessing the condition and potential fiber release from friable asbestos-containing materials.
International Chrysotile Association (www.chrysotile.com). [*Please note this organization represents asbestos industries and businesses]* • Recommended Technical Method No. 1 (RTM1), Reference Method for the determination of Airborne Asbestos Fibre Concentrations at workplaces by light microscopy (Membrane Filter Method). Method using Phase Contrast Microscopy for counting fibers on an air sampling filter that does not distinguish asbestos from other fibers • Recommended Technical Method No. 2 (RTM2) Method for the determination of Airborne Asbestos Fibres and Other Inorganic Fibres by Scanning Electron Microscopy. Method that identifies smaller fibers than Phase Contrast Microscopy and can distinguish types of asbestos fibers.
U.S. National Institute for Occupational Safety and Health (www.cdc.gov/niosh/topics/asbestos) • Occupational Safety and Health Guidelines for Asbestos (www.cdc.gov/niosh/pdfs/0041.pdf) • Recommendations for Preventing Occupational Exposure (www.cdc.gov/niosh/topics/asbestos/#prevention) • Method 7400, Asbestos and other fibers by PCM (1994).Phase Contrast Microscopy method similar to AIA RTM1 that counts all fibers greater than 5µm long with a 3:1 aspect ratio • Method 7402 Asbestos by TEM (1994). Method using Transmission Electron Microscopy that identifies and counts asbestos fibers greater than 5µm long and greater than 0.25µm in diameter with a 3:1 aspect ratio
U.S. Environmental Protection Agency (www.epa.gov/asbestos) • Resources include managing asbestos-containing materials in buildings, schools, and the automotive industry. Includes procedures for inspection, analysis of bulk samples, assessment of friable ACBM, response actions (removal, encapsulation, enclosure), Operations and Maintenance, and clearance air sampling. • National Emission Standards for Hazardous Air Pollutants: Subpart M - Asbestos. 40 CFR Part 61. (1990). Regulations include: definitions of friable and non-friable asbestos-containing materials; notification requirements for renovation and demolition of buildings and facilities containing ACM; work practices to prevent visible emissions; disposal of ACM and waste material in approved landfills; and operation and closure of landfills. • 20T-2003 Managing Asbestos in Place: A Building Owner's Guide to Operations and Maintenance Programs for Asbestos-Containing Materials "Green book" (1990)

- Guidance document covering: organizing an Operations and Maintenance (O&M) program including training O&M workers; recognizing types of O&M; work practices and precautions for O&M work.
- EPA-600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials (1993) Polarized Light Microscopy, Gravimetry, X-ray diffraction and Transmission Electron Microscopy methods of identifying and quantifying asbestos fibers in bulk building materials. The identification of materials as containing asbestos is done by analysis of bulk samples, usually with Polarized Light Microscopy. The analytical procedures described and the equipment to perform the analyses is similar to that found in academic or commercial geology laboratories, but specialized training to identify and quantify asbestos fibers in bulk building materials is needed as well as quality control and proficiency testing programs.
- Polarized Light Microscopy, Gravimetry, X-ray diffraction and Transmission Electron Microscopy methods of identifying and quantifying asbestos fibers in bulk building materials

U. S. Occupational Safety and Health Administration (Department of Labor) (www.osha.gov/SLTC/asbestos) / (www.osha.gov/SLTC/asbestos/standards.html)

- Occupational Exposure to Asbestos (Construction Industry Standard) 29CFR1926.1101. (1994). Regulations for: Permissible Exposure Limits of 0.1 f/cc over a full shift (8 hr time-weighted average) and short-term exposure limit of 1.0 f/ml for 30 minutes; employee exposure monitoring for compliance with the PELs; work practices for friable and non-friable ACM; respiratory protection; worker decontamination and hygiene facilities; notification of employees and other employers of employees; medical surveillance; record-keeping and training.
- OSHA Method ID 160 Asbestos in Air (1994). Phase Contrast Microscopy method similar to NIOSH 7400

Ontario Ministry of Labour (Canada) (www.e-laws.gov.on.ca/DBLaws/Source/Regs/English/2005/R05278_e.htm)

- Ontario regulation 278/05 Designated Substance — asbestos on construction projects and in buildings and repair operations (2005). Regulations covering: respiratory protection and work procedures; inspections for asbestos; management of friable and non-friable asbestos; advance written notice; asbestos bulk sampling and analysis; glove bag requirements and procedures; negative air enclosures; and clearance air testing requirements (0.01 f/cc by Phase Contrast Microscopy).

WorkSafe British Columbia (Canada) (www2.worksafebc.com/publications/OHSRegulation/Part6.asp)

- Part 6 Substance Specific Requirements: Asbestos. Regulations covering: identification of asbestos-containing materials; substitution with non-asbestos materials; worker training; exposure monitoring; containment and ventilation of work areas; work practices; decontamination; respirators and protective clothing.

Republic of South Africa, Department of Labour (www.acts.co.za/ohs/index.htm - type 'asbestos' in search box)

- Occupational Health and Safety Act, 1993; Asbestos Regulations, 2001.Regulations covering: notification; assessment and control of exposure; Occupational Exposure Limit of 0.2 f/cc - 4 hr TWA measured by Phase Contrast Microscopy; training; air monitoring; medical surveillance; non-employee exposure; respirators, personal protective equipment and facilities; asbestos building materials including asbestos cement sheeting and related products; disposal.

APPENDIX 4. SOME ALTERNATIVES TO ASBESTOS-CONTAINING PRODUCTS

Asbestos product	*Substitute products*
Asbestos-cement corrugated roofing	Fiber-cement roofing using synthetic fibers (polyvinyl alcohol, polypropylene) and vegetable/cellulose fibers (softwood kraft pulp, bamboo, sisal, coir, rattan shavings and tobacco stalks, etc.); with optional silica fume, fly ash, or rice husk ash. Microconcrete (Parry) tiles; galvanized metal sheets; clay tiles; vegetable fibers in asphalt; slate; coated metal tiles (Harveytile); aluminum roof tiles (Dekra Tile); extruded uPVC roofing sheets; recycled polypropylene and high-density polyethylene and crushed stone (Worldroof); plastic coated aluminum; plastic coated galvanized steel.
Asbestos-cement flat sheet (ceilings, facades, partitions)	Fiber-cement using vegetable/cellulose fibers (see above), wastepaper, optionally synthetic fibers; gypsum ceiling boards (BHP Gypsum); polystyrene ceilings, cornices, and partitions; façade applications in polystyrene structural walls (coated with plaster); aluminum cladding (Alucabond); brick; galvanized frame with plaster-board or calcium silicate board facing; softwood frame with plasterboard or calcium silicate board facing.
Asbestos-cement pipe	*High pressure:* Cast iron and ductile iron pipe; high-density polyethylene pipe; polyvinyl chloride pipe; steel-reinforced concrete pipe (large sizes); glass-reinforced polyester pipe. *Low pressure:* Cellulose-cement pipe; cellulose/PVA fiber-cement pipe; clay pipe; glass-reinforced polyester pipe; steel-reinforced concrete pipe (large diameter drainage).
Asbestos-cement water storage tanks	Cellulose-cement; polyethylene; fiberglass; steel; galvanized iron; PVA-cellulose fiber-cement
Asbestos-cement rainwater gutters; open drains (mining industry)	Galvanized iron; aluminum; hand-molded cellulose-cement; PVC

APPENDIX 5. CONSIDERATIONS FOR WORKING WITH ASBESTOS MATERIALS IN EXISTING STRUCTURES

A. EVALUATION OF ALTERNATIVES

1. Determine if the project could include the installation, replacement, maintenance or demolition of:

- Roofing, siding, ducts or wallboard
- Thermal insulation on pipes, boilers, and ducts
- Plaster or fireproofing
- Resilient flooring materials
- Other potentially asbestos-containing materials

2. If the use of asbestos-containing materials (ACM) has been anticipated for new construction or renovation, provide information about alternative non-asbestos materials and their availability. For new construction, determine the expected difference for the entire project—on initial and operating costs, employment, quality, expected service life, and other factors—using alternatives to ACM (including consideration of the need for imported raw materials).

3. In many cases, it can be presumed that ACM are part of the existing infrastructure that must be disturbed. If there is a need to analyze samples of existing material to see if it contains asbestos, provide information on how and where can that be arranged.

4. Once the presence of ACM in the existing infrastructure has been presumed or confirmed and their disturbance is shown to be unavoidable, incorporate the following requirements in tenders for construction work in compliance with applicable laws and regulations.

B. UNDERSTANDING THE REGULATORY FRAMEWORK

1. Review the host country laws and regulations and the international obligations it may have entered into (e.g., ILO, Basel conventions) for controlling worker and environmental exposure to asbestos in construction work and waste disposal where ACM are present. Determine how the qualifications of contractors and workers who maintain and remove ACM are established, measured, and enforced.

2. Determine whether licensing and permitting of the work by authorities is required.

3. Review how removed ACM are to be disposed of to minimize the potential for pollution, scavenging, and reuse.

4. Incorporate the following requirements in tenders involving removal, repair, and disposal of ACM.

C. CONSIDERATIONS AND POSSIBLE OPERATIONAL REQUIREMENTS RELATED TO WORKS INVOLVING ASBESTOS

1. **Contractor qualification**

- Require that contractors demonstrate having experience and capability to observe international good practice standards with asbestos, including training of workers and supervisors, possession of (or means of access to) adequate equipment and supplies for the scope of envisioned works, and a record of compliance with regulations on previous work.

2. RELATED TO THE TECHNICAL REQUIREMENTS FOR THE WORKS

- Require that the removal, repair, and disposal of ACM shall be carried out in a way that minimizes worker and community asbestos exposure, and require the selected contractor to develop and submit a plan, subject to the engineer's acceptance, before doing so.

- Describe the work in detail in plans and specifications prepared for the specific site and project, including but not limited to the following:
  - Containment of interior areas where removal will occur in a negative pressure enclosure;
  - Protection of walls, floors, and other surfaces with plastic sheeting;
  - Construction of decontamination facilities for workers and equipment;
  - Removing the ACM using wet methods, and promptly placing the material in impermeable containers;
  - Final clean-up with special vacuums and dismantling of the enclosure and decontamination facilities;
  - Disposal of the removed ACM and contaminated materials in an approved landfill;[29]
  - Inspection and air monitoring as the work progresses, as well as final air sampling for clearance, by an entity independent of the contractor removing the ACM.

- Other requirements for specific types of ACM, configurations and characteristics of buildings or facilities, and other factors affecting the work shall be enumerated in the plans and specifications. Applicable regulations and consensus standards shall be specifically enumerated.

3. RELATED TO THE CONTRACT CLAUSES[30]

- Require that the selected contractor provide adequate protection to its personnel handling asbestos, including respirators and disposable clothing.

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[29] Alternative guidance for circumstances where approved landfills are not available for disposal of hazardous substances, such as asbestos, guidance is provided in the EHS General Guideline, reference above as well as in the Guideline on Waste Management Facilities. http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/gui_EHSGuidelines2007_WasteManagement/$FILE/Final+-+Waste+Management+Facilities.pdf

[30] Standard contract clauses for asbestos work exist but are too extensive for this short note. To view an example, the U.S. National Institute of Building Sciences "Asbestos Abatement and Management in Buildings: Model Guide Specification" has a complete set – in copyright form – and the clauses and instructions for using them fill a two-inch binder.

- Require that the selected contractor notifies the relevant authorities of the removal and disposal according to applicable regulations as indicated in the technical requirements and cooperates fully with representatives of the relevant agency during all inspections and inquiries.

4. RELATED TO TRAINING AND CAPACITY BUILDING

- Determine whether specialist industrial hygiene expertise should be hired to assure that local contractors learn about and apply proper protective measures in work with ACM in existing structures.

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