



# Initial Environmental Examination

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Project Number: 41376-02  
September 2009

## LAO: Health Sector Development Program

Prepared by the Ministry of Health

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**Asian Development Bank**

**INITIAL ENVIRONMENTAL EXAMINATION (IEE)**

## ABBREVIATIONS

ACM	– asbestos carrying materials
ADB	– Asian Development Bank
AIDS	– acquired immune deficiency syndrome
ANC	– antenatal care
BOD	– Biological oxygen demand
CMR	– child mortality ratio
CPR	– contraceptive prevalence rate
DHO	– district health office
DOTS	– directly observed treatment short course
DPF	– Department of Planning and Finance
DRF	– drug revolving fund
EA	– executing agency; environmental assessments
EIA	– Environmental impact assessment
EARP	– Environmental Assessment and Review Procedures
EIAR	– Environmental Impact Assessment Report
EMP	– Environmental Management Plan
EmONC	– emergency obstetric and neonatal care
EU	– European Union
FIC	– fully immunized child
FDI	– foreign direct investment
GDP	– gross domestic production
GMS	– Greater Mekong Subregion
GOL	– Government of Lao PDR
Health SDP	– Health Sector Development Program
HEF	– health equity fund
HIV	– human immunodeficiency virus
HRD	– human resource development
HRH	– human resources for health
IA	– Implementing Agency
IEE	– Initial Environmental Examination
IEC	– information, education and communication
JFPR	– Japan Fund for Poverty Reduction
JICA	– Japan International Cooperation Agency
Lao PDR	– Lao People’s Democratic Republic
Lux Development	– Luxembourg Development
MDG	– millennium development goal
MFA	– Ministry of Foreign Affairs
MMR	– maternal mortality rate
MCH	– maternal and child health
MNCH	– maternal, neonatal, and child health
MOF	– Ministry of Finance
MOH	– Ministry of Health
MPI	– Ministry of Planning and Investment
NGO	– non-government organization

NGPES	–	National Growth and Poverty Eradication Strategy
NSEDP6	–	Sixth National Socio-economic Development Plan
NT2	–	Nam Theun 2
PASCA	–	Public Administration and Civil Service Authority
PAH	–	Project affected household
PHC	–	primary health care
PHCEP	–	primary health care expansion project
PCU	–	Project Coordination Unit
PHO	-	Provincial Health Office
PIA	-	Provincial Implementing Agency
PM	–	Particulate matter
PPTA	–	project preparatory technical assistance
PRSO	–	Poverty Reduction Support Operation
Project activity	–	All project sub-components at one location for the purposes of application of the EARPs
Project component	–	One of total project loan components in the overall project loan
Project sub-component	–	Sub-component of the project component; either civil building works, solid waste management facilities or wastewater treatment facilities
UXO	-	Unexploded ordnance
VHC	–	village health committee
WHO	–	World Health Organization
WHS	–	World Heritage Site
VHV		Village Health Volunteer
WWTP	–	Wastewater treatment plant
WREA	–	Water Resources and Environment Administration

#### WEIGHTS AND MEASURES

Ha	–	Hectare
Kg	–	Kilogram
Km	–	Kilometer
L / l	–	Liter
m	–	Meter
mg	–	Milligram
µg	–	Microgram

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## I. INTRODUCTION

### A. Background of the Project

1. The Lao PDR has made good progress toward the health-related MDGs 1, 4, and 5. Under the stewardship of the Ministry of Health (MOH), significant progress has been made in its strategy to expand the PHC network in Lao PDR in the past eight years. By 2008, there were already 126 district hospitals, 789 centers servicing 51% of all villages (on average, one health center services 8 villages), and nearly 13,820 Village Health Volunteers in 5,668 villages with drug kits for villages that are more than 2 hours walking distance to the nearest fixed health facility. Good progress has been made in reducing infant and under-five mortality, and halting increases in HIV/AIDS, malaria, and TB. Access to safe water has surpassed MDG targets and access to latrines will likely achieve its target.

2. Despite this progress, however, maternal mortality remains unacceptably high, too few women are assisted by skilled health personnel when they deliver, and under-nutrition in children persists. Ethnic minorities and large segments of the population living in remote, scattered, and isolated areas remain underserved with affordable and high quality health services. The quality, quantity, and skill mix of the health workforce do not meet required standards. The Mid-term Review of the 6<sup>th</sup> HSDP identified that chief among the challenges in the health sector is that the supply of health services is not keeping pace with rapidly increasing demand.

3. To assist the GOL to address these identified challenges the ADB is proposing to finance the Health Sector Development Program with a grant comprised of a program and project component to continue supporting the gains of the health sector. The project component would be implemented in six provinces<sup>1</sup> and will upgrade and improve the civil works facilities of 8 district hospitals<sup>2</sup> and 25 health centers<sup>3</sup>. The sub-projects will have a direct impact on the reduction of maternal and child mortality as part of the coordinated actions to address health sector development constraints in the northern and southern provinces. IEE was carried out for the 8 priority hospitals and selected health centers contributing to Output 2, increased access to health services for mothers, children and ethnic groups. Rapid environmental assessment screening was prepared for the sites visited. The following Table 1 summarizes the overall project outputs of the sector development grant:

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<sup>1</sup> The six provinces are Xiengkhouang, Louang Prabang, Oudomxay, Phongsaly, Attapeu and Salavanh.

<sup>2</sup> The district hospitals to be upgraded/improved are: Mok-mai District Hospital in Xeingkhouang Province; Nambak, Phoukhoun and Viengkham District Hospitals in Louang Prabang Province; Sanamxai District Hospital in Attapeu province; Lao Ngam and Vapi District Hospitals in Salavanh Province; and Bounneau Distict Hospital in Phongsaly Province

<sup>3</sup> 13 health centers in Xiengkhouang Province, 3 health centers in Louang Prabang Province, and 9 health centers in Oudomxay Province are to be upgraded or replaced

**Table1. Summary of Outputs**

Output No.	Outputs	Scope of Project	Scope of Program
1	Strengthening Planning and Financial Management Capacity	Strengthen central, provincial, and district capacity for strategic planning, operational planning, and financial management	Leadership: budget for advocacy and planning support
2	Increased Access to Services, In particular for Women and Children and Ethnic Groups	Upgrade and equip health facilities; procure essential MNCH equipment; capacity building for model health villages	Facility/equipment repair and maintenance; recurrent costs for operations; model health villages expansion
3	Better Quality of Human Resources for Health	Training to reduce maternal, child and neonatal mortality and improving quality of educational institutions; clinical support for rural health facilities	In-service training at provincial/district level; PHC workers training; incentives for health staff
4	Expanded Health care Financing for the Poor	Central MOH management of health equity funds (HEF)	Expansion of health equity funds (HEF)

## B. Purpose and Structure of the Report

4. The project is categorized as a Category B project in accordance with the ADB's *Environment Policy*. The Initial Environmental Examination (IEE) that is presented in this report has been prepared to comply with the requirements of ADB in relation to environmental assessment of ADB financed projects. In particular, the IEE has been prepared to fulfill the requirements of the ADB's *Environmental Policy and Operations Manual (OM) 20: Environmental Considerations in ADB Operations*. The IEE has been based on the guidance contained in the ADB's *Environmental Assessment Guidelines (2003)* for sector development loans<sup>4</sup>.

The following methodology has been implemented in the preparation of the IEE:

- (i) Review of project-related documents and literature related to the project area
- (ii) Site visits to view conditions in project area and the location of the project
- (iii) Consultation with local and national authorities to source information on project area characteristics and potential project impacts
- (iv) Identification of existing environmental and socio-economic characteristics to develop project baseline data
- (v) Analysis of typical environmental impacts of project components and identification of suitable typical mitigation measures to ameliorate potential impacts
- (vi) Development of institutional arrangements for implementation of environmental management and monitoring
- (vii) Development of a set of environmental criteria for future project activity selection
- (viii) Development of environmental assessment and review procedures (EARPs) for future project components

<sup>4</sup> ADB. 2003. *Environmental Assessment Guidelines*. Manila.

## II. DESCRIPTION OF THE PROJECT

### A. Project Overview

5. The Project will upgrade and improve the civil works facilities of 4 district hospitals<sup>5</sup> and 20 health centers<sup>6</sup>, provide the essential equipment for these district hospitals, and will replace equipment required for maternal, child, and neonatal care in district hospitals and health centers in 4 northern provinces (Table 2). Investments will be made where needed for adequate and safe water, sanitation, and medical waste management systems, including appropriate wastewater systems of hospitals and health centers. The 4 northern provinces include: Xiengkhouang, Louang Prabang, Oudomxay and Phongsaly.

**Table2. Civil Works and Equipment Components**

<b>CIVIL WORKS</b>				
<b>Province</b>	<b>District</b>	<b>District Hospital Civil Works</b>	<b>No. of Health Centers (Upgrading)</b>	<b>No. of Health Centers (Replacement)</b>
Xiengkhouang	Mok-mai	Renovation and waste management	3	5
Luang Prabang	Nambak	Upgrade Type A		3
Oudomxay	Viengkham	None	7	2
Phongsaly	Bounneua	Upgrade		
<b>EQUIPMENT</b>				
<b>Province</b>	<b>District</b>	<b>No. of District Hospitals to be Equipped</b>	<b>No. of Health Centers to be Equipped</b>	
Luang Prabang	Nambak	1		
	District Hospitals A	7		
	District Hospitals B	34		
	Health Centers		150	

### B. Type of Project

6. The Health Sector Development Program is being financed through a program grant with program and project components between the ADB and the GOL.

### C. Category of Project

7. The project has been categorized as Category B in accordance with the ADB's Environmental Policy.

5 The district hospitals to be upgraded/improved are: Mok-mai District Hospital in Xeingkhouang Province; Nambak, Phoukhoun and Viengkham District Hospitals in Louang Prabang Province; Sanamxai District Hospital in Attapeu province; Lao Ngam and Vapi District Hospitals in Salavanh Province; and Bounneua Distict Hospital in Phongsaly Province

6 13 health centers in Xiengkhouang Province, 3 health centers in Louang Prabang Province, and 9 health centers in Oudomxay Province are to be upgraded or replaced

## **D. Need for Project**

### **Health Care Sector in Lao PDR**

8. The MOH conducted a Mid-Term review of the Sixth Health Sector Development Plan in September 2008. There have been measurable and demonstrable improvements in both health status and health service coverage. Infant, child, and maternal mortality have fallen. Total fertility rates have declined by one third and contraceptive prevalence rates are approaching 40%, although unmet need for family planning remains high. Life expectancy has increased to 61 years of age. Nearly 70% of children less than one year of age are immunized against measles; and 87% of children under five sleep under an insecticide treated net. Maternal mortality remains unacceptably high, too few women are assisted by skilled health personnel when they deliver, and under-nutrition in children persists.

9. Communicable diseases continue to pose substantial health risks in Lao PDR. Malaria is the leading cause of morbidity and mortality with 70% of the population at risk. Cholera, measles and dengue outbreaks have occurred with increasing frequency. Although Laos is a low HIV prevalence country with an estimated adult seroprevalence of 0.1%, seroprevalence in female sex workers has increased from 0.9% in 2001 to 2% in 2005. Heterosexual sex is the most common mode of transmission, accounting for 85% of HIV cases. The incidence of tuberculosis has stabilized as the DOTS program has expanded to all districts. In early 2008, several new outbreaks of avian influenza in poultry were reported in the northern region bordering with China and Myanmar. Two confirmed human cases of avian influenza infection were reported in early 2007.

10. Official national data on risk factors for non-communicable disease for Lao PDR do not exist. Road accidents are of rising concern as traffic and speed of vehicles due to road improvements increase. Mental health issues, particularly drug abuse, are also a growing concern. Anecdotally, tobacco and alcohol consumption remain a concern despite the absence of statistically reliable data on the prevalence of use and their sequelae.

11. The Mid-term Review of the 6<sup>th</sup> HSDP identified the challenges and constraints that confront the health sector. Chief among these is that the supply of health services is not keeping pace with rapidly increasing demand. Large segments of the population in Lao PDR living in remote, scattered, and isolated localities remain underserved. Bringing affordable, high quality health services to these people is the greatest challenge facing the health sector.

12. In addition maternal, infant and child mortality remain stubbornly high and efforts to address these must be intensified. Newly emerging diseases and endemic communicable diseases will pose threats as environmental degradation, pollution and climate change create habitats conducive to the proliferation of existing and new pathogens. Rapid socio-economic development, increased life expectancy, urbanization, and lifestyle and behavioral changes will result in an increased prevalence of chronic, non-communicable diseases such as diabetes, hypertension, cardiovascular diseases, strokes, mental illness, over consumption of tobacco and alcohol, dietary changes, traffic fatalities and injuries, STIs, HIV/AIDS, and abuse of drugs will become more prevalent.

13. The quality, quantity, and skill mix of the health workforce does not meet required standards. Structural/Organizational Challenges must still be addressed to make the MOH structures at the central, provincial, and district level more streamlined and efficient. The level of public expenditure in the health sector is inadequate to meet MDGs and health sector targets.

14. Finally, there is a need for more effective, transparent and integrated planning and budgeting of all sources of funding for the health sector. Vertical programs continue to be conceived, designed, and funded at the central level with little input from the provinces and scant consideration for the unique ethnic and cultural environments where they will be implemented. Management of vertical programs remains centralized, and decision making and funding bypass the provincial health authorities responsible for coordinating comprehensive health care programs in their provinces, leading to fragmentation, overlap, and duplication at the provincial and district levels..

### E. Project Location

15. The project locations are in the mountainous Northern Provinces of Xiengkhouang, Louang Prabang, Oudomxay and Phongsaly stretching around 400 kilometers on the northeastern part of Lao PDR (Figure 2.1).

16. The population coverage of these provinces is about 1.0 million, or 20% of Lao PDR's total population of 5.6 million (2005). The project areas are largely rural and agricultural, with tourism as one of their popular means of income. In terms of poverty, these areas are at about the national average with the northern provinces slightly poorer than the southern provinces. The mountainous areas of the northern provinces have remote villages where scattered clusters of minorities live.

### F. Project Components

17. The Civil Works components of the Project has four sub-components: (i) upgrading and renovating district hospitals, (ii) upgrading and replacing health centers, (iii) providing essential medical equipment for the district hospitals and health centers, and (iv) improving health care waste management system and wastewater management facilities (Table 2). No new construction in sites other than existing will be supported by the sector development grant.

**Figure1. LAO PDR MAP**



## 1. Upgrade and renovate District Hospitals

The Project will support civil works upgrades and renovation in 4 district hospitals in 3 provinces, namely:

- (1) Mok-mai District Hospital (Xiengkhouang Province)
- (2) Viengkham District Hospital (Louang Prabang Province)
- (3) Nambak District Hospital (Louang Prabang Province)
- (4) Bounneua District Hospital (Phongsaly Province)

18. The hospitals were selected on the basis of provincial priorities, surveys during project preparation (including an assessment of environmental and resettlement issues), location and access with respect to other higher-level health referral facilities, and evaluation by ADB and MOH to assure consistency with the program goals and priorities, national plans, and guidelines. In coordination with the provinces, a schedule will be developed for each civil works project that will set out benchmarks for clearing existing sites, completion of hospital program descriptions and architect plans, completion of bidding documents, and other measures of progress.

19. Once completed, newly constructed and renovated facilities need to be properly maintained to realize benefits and justify investments. The Program will support the preparation of guidelines for preventive maintenance, the collection and translation of technical manuals, and the training of hospital personnel in preventive maintenance procedures. GOL will ensure on-going financing of recurrent maintenance costs by way of the sector development program approach.

## 2. Upgrade and replace Health Centers

20. The project will support upgrade and replacement of 20 health centers in:

- |                              |                          |
|------------------------------|--------------------------|
| (1) Xiengkhouang Province    | 3 upgrade, 5 replacement |
| (2) Louang Prabang Province: | 3 replacement            |
| (3) Oudomxay Province:       | 7 upgrade, 2 replacement |

21. The health centers were selected based on the poor physical condition of the existing structures due to age and lack of repair and maintenance, the priorities of the provinces in providing access to remote villages with high demand for services and those underserved especially the rural poor and ethnic minorities, and health centers reasonably accessible for carrying out the civil works improvements i.e. routes for transport of construction materials and supplies to the sites.

## 3. Provide essential medical equipment for the district hospitals and health centers

22. The Project will finance the procurement of essential equipment for the following number of district hospitals and health centers:

(1) Type A <sup>7</sup> DH (Nambak DH in Louang Prabang Province)	= 1
(2) Type A District Hospitals in the Northern Provinces	= 7
(3) Type B District Hospitals in the Northern Provinces	= 34
(4) Health Centers (minor equipment)	= 150

23. Equipment purchases will be in accordance with established MOH standards and procedures. Old and non-functioning equipment and apparatus will be replaced to be able to upgrade technology for existing procedures, or provide new services. The Project will also support the purchase of an initial inventory of reagents and other supplies needed to properly utilize the new equipment. Procurement and supply of equipment will be closely coordinated with civil works. The Project will ensure that health personnel are properly trained to use the equipment, and that operating manuals are also supplied in the Lao language. Through the program sector approach, GOL will be able to provide for the supplies needed to operate the equipment, as well as for the recurrent costs of repair and maintenance during and beyond the project period.

#### 4. Improve health care waste management systems and wastewater management facilities

24. Part of the investments includes the funds to ensure that all facilities included in this Project have adequate safe water, sanitation, and medical waste management systems, including waste water systems, proper containers to segregate contaminated and hazardous waste, proper collection and storage facilities, and appropriate technologies for treatment and/or disposal facilities. Hospital personnel in all facilities will be trained in the theory, methodologies, and supervision of modern waste management practices. In addition, the Project will support consulting assistance to work with authorities in each target province to develop a province-wide plan for the management of health care waste.

25. For the purposes of the IEE the activities in this component have been divided into the following sub-components:

- (i) **Sub-Component 1 - Civil Building Works:** Includes upgrading of existing buildings and associated works such as landscaping, utilities supply and provision of access. Typical pre-construction activities include site preparation including UXO clearance as required. Typical construction activities include existing structure demolition, earthworks, minor excavations, building and structure construction, landscaping, utilities and equipment installation and development of site access roads. The pre-construction and construction period for each sub-component will vary and may range from several weeks to several months. Construction worker numbers will also vary. Operation involves day to day operation of hospital in-patient and out-patient facilities.
- (ii) **Sub-Component 2 - Solid Waste Management Facilities:** There are four options for solid waste management facilities to be developed under the project: (i) transportation of

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<sup>7</sup> Type A and Type B district hospitals are distinguished by the number and type of staff, health services capabilities, equipment and infrastructure. Type A district hospitals provide general and obstetric surgery, emergency obstetrical care (EmOC) and pediatrics services. Type B district hospitals do not provide general surgery. The standards of care and levels of utilization at these facilities vary and not all district hospitals can provide the requisite standard of care assigned for their classification.

medical waste for disposal at an approved and dedicated disposal facility such as a provincial hospital; (ii) permanent burial in specially designed, secure landfills which will incorporate lining and leachate management systems; (iii) sterilization using either chemicals or steam; and (iv) incineration using an approved incinerator designed to mitigate hazardous emissions.

Typical pre-construction activities include site preparation, including UXO clearance, and land acquisition. Typical construction activities include earthworks, excavations, structure construction, landscaping, utilities and equipment installation and development of site driveways. The pre-construction and construction period for each sub-component will vary but will average several weeks to several months. Construction worker numbers will also vary. Operation activities will vary according to the type of facility but will include receipt of waste, burial of waste, burning of waste, general site maintenance, and odor and vermin control.

- (iii) **Sub-Component 3 - Wastewater Treatment Facilities:** The options for wastewater treatment facilities to be developed under the project have yet to be determined. However, wastewater treatment facilities will typically be approved multi-chambered septic tanks or package-type treatment plants installed at hospital facilities to treat effluent to meet relevant Lao PDR effluent standards under the regulatory supervision of WREA prior to discharge to waterways or district and village drainage systems. Typical pre-construction activities include site clearing within the existing site. Typical construction activities include earthworks, excavations, structure construction, landscaping, utilities and equipment installation and development of site driveways. The pre-construction and construction period for each sub-component will vary but will average several weeks to several months. Construction worker numbers will also vary. Operation activities will vary according to the type of facility but will include wastewater treatment process control, site maintenance, and odor control.

## **G. Project Cost and Implementation Arrangements**

26. Estimated total investment of the project and program component is \$20.8 million; with an ADB grant of \$20 million and \$0.8 million as in kind counterpart contribution from the Government of Lao PDR (GOL). The project grant component is estimated at \$10.8 million.

27. The Executing Agency for the project is the Ministry of Health (MOH). The provincial implementing agencies (PIAs) will be established in the Provincial Health Offices in the targeted provinces. The Department of Planning and Budgeting in MOH will house the Project Coordination Unit (PCU) with responsibility for overall planning and coordination of implementation, including programming, budgeting, financial planning, accounting and reporting. The PCU will receive overall direction and policy guidance from a Project Steering Committee (PSC). The PSC will include representatives of the main central level agencies, including the WREA, as the environmental regulatory agency. The PIA will be responsible for day-to-day coordination, and supervision of project implementation. The PIA will receive support in co-ordinating the provincial and district level agencies including the provincial WREA offices.

28. The main environmental responsibility resides in PIAs. PIAs are responsible for carrying out and preparing for IEEs in accordance with an environmental assessment and review framework (EARF) that shall be prepared for the Project. The PIAs will also be responsible for the implementation of the Environmental Management Plans (EMP) during detailed design and construction, with overall guidance from the PCU. During operation, responsibility for EMP

implementation rests primarily with the MOH designated environmental unit to handle sanitation, health care waste management, and wastewater management.

### **III. DESCRIPTION OF THE ENVIRONMENT**

#### **A. Physical Resources**

##### **1. Topography and Soils**

29. Lao PDR's district hospitals and health centers in the northern provinces such as Xiengkhouang, Louang Prabang, Oudomxay and Phongsaly are scattered across hilly and mountainous terrain, and connected through a system of winding, paved and unpaved roads while in the southern provinces of Attapeu and Salavanh, the health facilities are scattered across plateaus and valley floors and along the Mekong flood plain and connected by comparatively better roads. Many of the remote health centers are not accessible by main road connections and could take a few hours of travel by footpaths and trails, and less with the use of bicycles or motorbikes.

30. Predominant rock types around the country are sandstones, mudstones and limestone of marine sedimentary origin, interspersed with igneous rock. Soils derived from these mainly sedimentary rocks are typically neutral to slightly acidic and sandy to sandy clay in texture. Soils on flat terrain or on valley floors are often alluvial and used for rice cultivation, both rain-fed and irrigated while those on sloping land tend to be poorer, and suited to shifting cultivation. In the more sloping terrain, soils are usually heavily leached, and acidic, and thereby have poor fertility and water retention.

##### **2. Climate and Air Quality**

31. Lao PDR has a tropical monsoon climate which features a dry season (November to February) and a wet season (May to October). The dry season is generally cooler, though temperatures rise significantly in March and April prior to the onset of the rains. Rainfall is generally high, averaging 1,600mm over the country and reaching 3,700mm, at higher elevations in the south. Sustained high rainfall during the wet season is common particularly during July and August, leading to soil saturation, rendering sloping land vulnerable to landslides. Dry seasons appear to be more pronounced to the southwest of the country but they can be long enough in most parts of the country to cause difficulty in sourcing adequate water for households and other users, and for irrigation despite the high rainfall as a whole. The yearly average temperature is about 28 degrees C, rising to a maximum of 38 degrees C during April and May. The weather in the mountains in the north and in the high range of the Annamite Chain bordering Vietnam in the east is semi-tropical. The difference in day and night temperatures is about 10 degrees C. Lao PDR has around 2,300-2,400 hours of sunlight per year. The atmospheric humidity is usually 70-80%, and 75-90% of the precipitation is recorded in the rainy season, from May to October. Rainfall in the dry season, November to April, accounts for only 10-25%. There is a sharp difference in rainfall between regions.

32. Air quality (AQ) monitoring is still not a routine practice in the country. Monitoring of the concentrations of pollutants in the air remains to be on an ad-hoc project basis. The most recent monitoring conducted was in March to April 2004 in three sites in Vientiane. Prior to this, a DANIDA-funded study also monitored air quality in 2003 to 2004 in seven different sites in Vientiane. There is no information whether the government is planning to install air quality

monitoring systems or conduct routine monitoring in the next few years. Since monitoring was conducted only for 3 consecutive days per year at most, AQ data results are insufficient for comparison with annual guidelines of the World Health Organization (WHO).

### **3. Drainage Network and Surface Water and Groundwater Quality**

33. The river systems in the Project Areas comprised of rivers and springs in the region mostly feed into the Mekong River. The Mekong River flows for about 1,860 km through Lao PDR. The Mekong River basin covers nearly 90 percent of the total area of the country. In addition to the Mekong, several smaller river basins drain from Lao PDR towards Vietnam. The rivers' discharge follows the pattern of rainfall: about 80 percent during the rainy season (May October) and 20 percent in the dry season (November to April). For some rivers in the central and southern parts of the country (particularly Nam Xebangphay, Nam Xebanghieng and Nam Xedone) the flow in the dry season is reduced to around 10 to 15 percent of the annual flow. The water level in the Mekong River may fluctuate by up to 20 m from wet to dry seasons.

34. Monitoring of water quality has not been carried out in any extensive way in the project provinces.

### **4. Water Resources**

35. About 90% of the area of Lao PDR forms part of the Mekong river basin, some 25% of the total extent of the basin, contributing to around 35% of its total flow. There are 32 sub-basins identified. Due to high rainfall levels over the country and the inflow of the Mekong River, water reserves in Lao PDR are vast, as evidenced by the growing number of major hydropower schemes being built in the country. The total quantity of surface water each year is estimated at 190 billion m<sup>3</sup> per year, equating to around 35,000 m<sup>3</sup> annually per capita. A constraint on water use, however, is the length of the dry season, potentially affecting town water supplies where there is a high demand for irrigation water. At present, around 1 billion m<sup>3</sup> of water are extracted for use each year, mainly for irrigation (82%). There is considerable scope for the expansion of irrigated land. The extent of groundwater reserves is much smaller but still substantial, around 38 billion m<sup>3</sup> per year.

36. Freshwater reserves are also diverse, ranging from small, high altitude mountain streams to the Mekong River and giving rise to correspondingly diverse aquatic habitats. Several fish species show a high degree of endemism. Wetlands are significant aquatic habitats, occurring mainly in the south of the country near the Mekong River. Fish are an important economic resource and fisheries management also needs to strike a balance between commercial exploitation and conservation. Fisheries make up approximately 13% of the GDP.

### **B. Ecological Resources**

37. Lao PDR is endowed with considerable forest resources, occurring in a range of forest types that vary according to altitude, rainfall and soil types, and represent habitats of international conservation value. Non-timber forest products are important as a food and tradeable commodity source for many communities. Forest plantations have been established with varying success, due mainly to the standards of planning and management of forest plantations. A number of plant and animal species have high endemism. A National Protected Area system has been established, consisting of areas covering nearly 14% of the total land area. Management focuses on conservation, integrating traditional land uses in most cases.

38. Lao PDR's progress towards meeting the environment MDGs<sup>8</sup> with respect to forest resources is satisfactory with the exception of land forest cover. Forests provide an important resource for villages. Deforestation, the destruction of indigenous forests and woodlands, can be caused by various factors, including logging, the conversion of forests and woodlands to agricultural and grazing land, or felling of trees for firewood and building material. These have been notable in the northern provinces particularly in Louang Prabang province. The land forest cover across the country declined from 47 percent in 1990 to 42 percent in 2002. Much of the reduction took place during the mid-1990s, when forestry contributed up to 13 percent of agricultural GDP. Whatever slowdown in the deforestation rate might have occurred, still over nine in ten rural households extracted in 2002 – 2003 fuel wood, bamboo and timber from forest land.

39. Land immediately surrounding most district centers is usually extensively cultivated. Trees and shrubs tend to occur mainly along waterways, between fields, or in isolated patches. Intact, relatively undisturbed forests can occur near the towns, associated with temples where they are protected for religious or cultural purposes or on steep slopes where access for tree felling and extraction is difficult.

40. As part of its efforts to conserve its forest resources and biodiversity, Lao PDR established the National Protected Area (NPA) system through a Prime Ministerial Decree in 1993. The decree states that the National Protected Areas (NPAs), formerly known as National Biodiversity Conservation Areas (NBCAs), are managed resource areas (*IUCN Category VI* Protected Areas). They are designed to (i) preserve natural resources, (ii) protect the abundance of nature and the environment of such nature, and (iii) preserve the beauty of natural scenery for leisure resorts, study and research.

41. Lao PDR has established 20 NPAs and two Corridors, covering almost 3.4 million hectares, or more than 14 percent of the country. Moreover, large areas have been designated as Protection or Conservation Forest at Provincial and District levels. All these classes of forest now cover over 5.3 million ha, bringing the total land area under some degree of protection to more than 22 percent. The management of the NPA System is based on an integrated conservation and development approach, which seeks to maximize local development while minimizing degradation of the area's biodiversity.

## **C. Economic Development**

### **1. Economic Structure**

42. The Lao PDR economy continues to grow, but at a relatively slower pace as the impacts of the global financial turmoil are starting to be felt. Real GDP growth is expected to slow in 2008 to about 7 percent as result of the impacts of the global financial crisis. GDP growth is also projected to slow to between 5 and 6 percent in 2009. However, growth remains fairly strong and still driven by the ongoing hydropower projects as well as agro-processing industries, construction and other services. The resource sector contributes over 2 percent and non-resource sectors another 5 percent to the growth rate in 2008. In addition to domestic consumption, medium term growth will be sensitive to changes in global commodity prices (mainly metals and agriculture) as well as to demand and investment from neighboring countries (especially Thailand, China and Vietnam).

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8 As described in Lao PDR Poverty Assessment Report , September 2006

43. The macroeconomic situation continues to be relatively stable, with inflation back at one digit level. After peaking at 10.3 percent in May 2008, the year-on-year inflation rate dropped precipitously to 6.5 percent in October 2008, due to sharp decline in oil and food prices. Lower fuel prices brought down the cost of transportation, construction materials and other products, leading to further decline in core inflation. The kip nominal exchange rates remained strong and appreciated by about 2 percent against the US dollar, and by 11 percent against the Thai baht between May and October 2008.

## 2. Land Use

44. The Lao People's Democratic Republic (Lao PDR) is a landlocked country with a total area of 236,800 km<sup>2</sup> or 23,680,000 hectares. Urban areas take up less than one percent of the total land area. The country is divided into sixteen provinces, one special zone, and Vientiane Capital City. With a population of about 5.6 million in 2005, the Lao PDR is the second least populated country in the Association of South-East Asian Nations (ASEAN).

45. Lao PDR's mountainous terrain precludes expansive permanent agriculture, with 70 percent of the land area having a slope of more than 20 degrees. The area suitable for intensive agriculture is estimated at nearly 1.9 million hectares, or only 8 percent of the total land area, which consists of permanent pasture, arable lands and permanent crops. The arable land consists mainly of narrow valleys and the productive silt rich in the flood plain of the Mekong River and its tributaries. The arable land under cultivation is estimated to be 800,000 ha. This comprises 43 percent of the intensive agricultural land, or only 3.4 percent of the total land area. Rice is grown on 78 percent of this.

## 3. Administrative Areas

46. Administrative areas in the project area are identified in Table 31.

**Table 3.1 Administrative Units in Project Provinces**

	Districts	Villages
Xiengkhouang	8	541
Louang Prabang	11	855
Oudomxay	7	587
Phongsaly	7	607

Source: Population and Land Usage Survey, 2005, Department of Statistics.

## 4. Population and Community Structure

47. The total population of the project area is approximately 1.0 million, representing about 20% of national population. The average population density in Lao PDR is 23 people per square kilometer giving the country the lowest population density in Asia. The highest population density in Laos is in Vientiane Capital, with 149 per square kilometer. About 85% of the population are rural dwellers. Over 70% (2,220,547) are engaged in productive work, and

936,870 are unemployed, a classification which includes students (69.4%), domestic workers (12.6%), the elderly people (14.6%). There are 576,758 people working in towns, and 2,580,659 in the countryside.

48. The country has 49 ethnic groups that are officially recognized by the Government and these are grouped based on 4 ethno-linguistic families: the Tai-Kadai family (also known as the Lao ethnic group), 64.9%; the Austro-Asiatic family (also known as Mon-Khmer), 22.6%; the Hmong group (Hmong, Yao and other Hmong-Tien groups), 8.5% and, the Sino-Tibetan groups, 2.8%. Shifting agriculture systems are long established in the uplands. Traditional practice features long fallow periods between cultivations, allowing substantial forest regeneration. However, as demand for land increases and fallow periods are reduced, the effects of shifting agriculture can be harmful.

## **D. Social and Cultural Resources**

### **1. Socio-Economic Conditions**

49. The UNDP has identified a Human Development Index (HDI) for the provinces in Lao PDR<sup>9</sup>. The HDI is representative of a number of socio-economic development characteristics and factors such as illiteracy, poverty, access to infrastructure and services, child mortality, and life expectancy. A score of 1 for each factor is the best performance and the closer a score is to 0, the poorer the performance has been for that factor. The scores are then combined to reach an overall HDI score. Provinces in Lao PDR have been ranked, based on their composite HDI score, from 1 (the province that performs best over the range of factors) to 61 (the province that performs worst over the range of factors).

### **2. Poverty**

50. Table 3.2 summarizes available data on poverty levels in the project provinces.

**Table3.2 Poverty in Project Provinces**

Province	Total poverty rate (%)	Urban poverty rate (%)	Rural poverty rate (%)
Xiengkhouang	37	14	43
Louang Prabang	40	26	44
Oudomxay	46	28	50
Phongsaly	38	25	40

Source: The Geography and Poverty and Inequality in the Lao PDR, Swiss National Centre of Competence in Research North-South; International Food Policy Institute, 2008

### **3. Public Health**

#### **a. Maternal, Child and Neonatal Health**

51. Table 3.3 summarizes incidence of infant and child mortality by the direct estimate method in the project areas classified according to North and South Provinces.

<sup>9</sup> UNDP. 2003.

**Table3.3 MNCH Health Indicators in Project Area (per 100,000)**

	Neonatal Mortality Rate	Post-neonatal Mortality Rate	Infant Mortality Rate	Child Mortality Rate	Under-5 Mortality Rate
Northern Provinces	31	33	64	27	80
Southern Provinces	22	35	57	25	72

Source: Lao Reproductive Health Survey, UNFPA 2005

### **b. Health Care Facilities and Access**

52. Table 3.4 summarizes the health care facilities managed by the Ministry of Health in the project areas.

**Table3.4 Health Establishments under Ministry of Health in Project Areas**

Provinces	Total	Regional Hospital	Provincial Hospital	District Hospitals	Health Centers
Xiengkhouang	62	0	7	7	48
Louang Prabang	71	1	0	11	59
Oudomxay	47	1	0	6	40
Phongsaly	31	0	1	6	24

Source: Provincial Health Offices, Lao PDR, 2009

### **c. Health Care Waste Management in Lao PDR Northern and Southern Provinces**

53. A key component of the project is the improvement of health care waste management practices in the project area. The results of a review of existing health care waste management practices in the project area are summarized below.

#### **i. Healthcare Waste Generation**

54. Healthcare waste (HCW) generated from hospitals includes both non-hazardous waste and hazardous waste. No quantification of non-infectious and infectious waste components of HCW has been available in the project areas. WHO estimates that about 85% of the HCW from developing countries is non-infectious or generally risk-free healthcare waste, which is comparable to domestic waste. The remaining 15% of healthcare waste is regarded as hazardous and may create a variety of health risks. Hazardous healthcare waste can be classified into the following categories: infectious waste, highly infectious waste, sharps, pathological/anatomical waste, pharmaceutical waste, genotoxic waste, chemical waste, waste with high content of heavy metals, pressurized containers, and radioactive waste.

55. The amount of HCW generated depends on the hospital size and its scope of services. There has been no data recorded of HCW generation rates in Lao PDR. According to surveys on HCW management conducted by the MOH in Vietnam and WHO, a provincial general hospital typically generates 0.64 kg/bed/day of general HCW and 0.14 kg/bed/day of hazardous HCW, while a district hospital typically generates 0.62 kg/bed/day of general HCW and 0.11 kg/bed/day of hazardous HCW. In terms of the relative proportion of hazardous waste generated, infectious waste and pathological waste represents about 15%, sharps represent

about 1%, chemical and pharmaceutical waste represents about 3%, other waste such as waste with high content of heavy metals, and pressurized containers share represent less than 1%.

## ii. Healthcare Waste Minimization

56. Waste minimization is defined as the prevention of waste production and/or its reduction. This is not regularly practiced by healthcare establishments in the region. Minimization measures such as source reduction (modification of purchasing procedures, control of inventory, and production of less toxic materials), good management and control practices applied particularly to the purchase and use of chemicals and pharmaceuticals, and using of recyclable materials are not typically implemented.

57. Healthcare waste contains quantities of valuable and recyclable materials such as plastic, metals, paper and carton. However, waste recycling is not centrally implemented at hospital level despite the fact that it is carried out unofficially by the different offices.

## iii. Healthcare Waste Segregation

58. Lao PDR has not implemented segregation of wastes into color-coded bags or containers. Other countries like Vietnam, for example have institutionalized the segregation of three separate containers into different colors: general waste in green bags, clinical waste in yellow bags, and toxic wastes in black bags. Lao PDR should develop its own system, possibly a Manual for Health Care Waste Management under the leadership of the MOH and in coordination with the relevant regulations by the WREA as regulatory body. In other developing countries, sharps are segregated and placed into rigid containers with certain specifications to avoid accidental punctures during handling. In Lao PDR, the provincial hospitals are generally responsible for the sharps. However, their treatment and ultimate disposal has not progressed into something environmentally acceptable. The provincial hospitals after collecting the hazardous wastes from the district hospitals, either incinerate them using low-temperature open incinerators or bury them at unsecured waste pits within their property boundaries. The successful practice of waste segregation and disposal is one of the biggest challenges in HCW management in most developing countries such as Lao PDR. There are limitations reported, as follows:

- (i) Knowledge, attitude and practices among waste generators including hospital staff, patients and visitors are unsatisfactory
- (ii) Supply of equipment for waste segregation, especially sharp containers is insufficient in both the district hospitals and health centers
- (iii) No system has been generally introduced as a policy by the relevant authorities for enforcement

## iv. Healthcare Waste Collection

59. Of the district hospitals surveyed, there has been generally no staff assigned to be responsible for collecting healthcare waste from the generation point to interim storage points in the departments. Some weaknesses in collection have been observed in the region as follows:

- (i) Provision of equipment, waste containers in different sizes are not sufficient
- (ii) There is no budget appropriation for staff nor equipment and materials to meet these recurring needs
- (iii) Design of hazardous waste containers do not meet requirements

- (iv) Codification and labeling, waste bags and containers, especially those for clinical waste and chemical waste are not properly color-coded and labeled

#### **v. Healthcare Waste Transportation**

60. Some primary health care workers are made responsible for internal collection from the district hospitals. All of the district hospitals visited lack specialized devices for waste transportation. Hazardous waste is often transported by hand causing spillage and spread of disease throughout the hospital. Internal transportation plans in which the timetable and route of transportation are clearly identified are not available.

61. No private contractors or responsible government agency transports general waste out of the hospitals to a disposal facility. The district hospitals themselves manage their HCW internally, except for the UNICEF sharp safety boxes and certain anatomical wastes that the districts send to the provincial hospitals for disposal.

#### **vi. Healthcare Waste Storage**

62. All of the visited district hospitals do not have a formally designated place to store healthcare waste except for different cans and bags of different sizes and materials. Most of the storage containers in district hospitals and health centers, do not meet design and operating regulations because of the following shortcomings:

- (i) The storage areas do not incorporate separate places for different categories of healthcare waste. As a result general waste and clinical waste that were segregated at sources and separately collected and transported are mixed again at storage places. Chemical waste is not collected and centrally stored. Liquid wastes are disposed of in the sinks although some of the hospitals have separate septic vaults for liquid wastes for wastes that are disposed
- (ii) The storages do not have roofs and locks. Unauthorized people, animals, rodents and insects can easily access hazardous waste causing risks of spillage and disease spread.
- (iii) Storage duration often exceeds 24 hours in hot weather.

#### **vii. Healthcare Waste Treatment**

63. No models for health care waste treatment were observed in the district hospitals visited.

64. Healthcare waste treatment technologies applied in the region are (i) medium temperature incineration, (ii) low temperature incineration, (iii) waste burial, (iv) steam autoclave, (v) chemical disinfection:

- (i) Medium temperature incineration: Pyrolytic incinerators that incinerate waste at 800 – 900°C are reported to be used at the provincial hospitals but these have not been confirmed by actual visits. The emissions from incinerators have not been monitored since they were installed, but polluting gas emissions and high operating costs are reported.
- (ii) Low temperature incineration: Drum incinerators, brick incinerator or one-chamber, open incinerators are still common in district hospitals even though their design is out of date. Because of low effectiveness and high environmental

- impacts, such incinerators are no longer recommended. The gas emissions from these incinerators have reportedly been very pollutive.
- (iii) Waste burial: District hospitals bury healthcare waste on their premises. Safe burial of healthcare waste is recommended by WHO. However, in comparison with requirements of sanitary landfill, the bury pits observed in hospitals often have the following shortcomings: (i) inadequate sealing of base and sides to minimize the movement of wastewater or leachate off site, (ii) no presence of site personnel capable of effective control of daily operations, (iii) no surface water collection, (iv) access to site and working areas difficult for waste delivery and site vehicles, (v) lack of surface water collection trenches around site boundaries, (vi) lack of a final cover to minimize rainwater infiltration when each phase of the landfill is completed
  - (iv) Wet thermal disinfection: Steam autoclaves are commonly used by hospitals to primarily treat highly infectious waste. Although wet thermal disinfection has been introduced in Lao PDR at present, application of autoclave for healthcare waste treatment is still limited to microbiological laboratories where highly infectious waste is mostly generated.
  - (v) Chemical disinfection: Using disinfectants to treat contaminated materials is very common in provincial and district hospitals throughout the region. However, application of chemical disinfection for healthcare waste treatment, particularly for highly infectious waste treatment is still limited to microbiological laboratories and in areas of infectious disease outbreaks.

#### **viii. Wastewater Collection and Treatment**

65. Hospital wastewater includes rainwater, wastewater generated from healthcare activities and wastewater from toilets. Old hospitals often have a collection system for storm water, a collection system and septic tanks for wastewater from toilets but only a few of those visited have separate collection lines and separate septic tanks for wastewater generated from healthcare activities. In consequence, wastewater from healthcare activities with a high content of pathogens and certain amount of pharmaceuticals and chemicals is discharged into the stormwater system line or discharged onto the land without any treatment. Beside these weaknesses in design, there are weaknesses in operation and maintenance in terms of wastewater collection and treatment as follows:

- (i) Hospital staff often discharge chemical and pharmaceutical waste into wastewater collection systems. This practice can harm the wastewater treatment plant.
- (ii) In the health centers and district hospitals areas visited, staff and patients do not know how to properly use toilet and sanitary facilities in the hospitals. This often results in blockages of the wastewater collection system. Regular and corrective maintenance of wastewater collection system is rarely carried out.

#### **4. World Heritage Sites**

66. Table 3.5 identifies Lao PDR's World Heritage Sites.

**Table 3.5 Decreed and Proposed Cultural/Historical Sites in Lao PDR**

Province	Cultural and/or Historical Sites and/or World Heritage sites (WHS)
Xiengkhouang	The Plain of Jars
Louang Prabang	Louang Prabang Town
Champassak	Vat Phou Temple Complex and Champassak Heritage Landscape

Source: Lao PDR Ministry of Tourism, 2009

#### IV. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

##### A. Environmental Assessment Methodology

67. In order to identify potential environmental impacts of the project component of the sector development grant, environmental screening was first carried out using the ADB rapid environmental assessment forms (REAs) to screen the proposed upgrading and replacement of the district hospitals and health centers. The REAs categorized most of the health centers based on the sampling of site surveys as Category C. The district hospitals are all existing facilities and as such bring mostly positive impacts for the environment. However, in accordance with the ADB guidelines, the potential impacts of health care waste, being hazardous along with those of poor sanitation and wastewater management categorized the hospitals as Category B.

68. For the purposes of the assessment, the following categories of impacts have been developed<sup>10</sup>:

- (i) **NO IMPACT:** The potential impact of the project is assessed as NO IMPACT if the project activity is physically removed in space or time from the environmental component, or if the impact is so small as to be un-measurable (i.e. negligible).
- (ii) **MAJOR IMPACT – POSITIVE OR NEGATIVE:** An impact is said to be MAJOR if the project has the potential to affect an environmental component. The following criteria were used to determine whether a given impact is MAJOR:
  - spatial scale of the impact (site, local, regional, or national/ international);
  - time horizon of the impact (short, medium, or long term);
  - magnitude of the change in the environmental component brought about by the project activities (small, moderate, large);
  - importance to local human populations;
  - compliance with international, national, provincial, or district environmental protection laws, standards, and regulations;
  - compliance with ADB guidelines, policies, and regulations.
- (iii) **MINOR IMPACT – POSITIVE OR NEGATIVE:** If an impact occurs but does not meet the criteria for a Major Impact it is assigned the category MINOR. Minor impacts occur along a spectrum ranging from those impacts that are close to

<sup>10</sup>These categories have been applied to other ADB infrastructure projects and have been adapted from ADB, 1997 *Environmental Impact Assessment in Developing Countries*.

being major impacts to those that are close to being negligible impacts. The judgments made in relation to the position of specific impacts along this spectrum are discussed in the text accompanying the environmental screening.

- (iv) **UNKNOWN IMPACT:** The potential impact of the project will be assessed as being UNKNOWN if the magnitude of the effect cannot be predicted for any of the following reasons:
- the nature and location of the project activity is uncertain;
  - the occurrence of the environmental component within the study area is uncertain;
  - the time scale of the effect is unknown; or
  - the spatial scale over which the effect may occur is unknown.

## B. Screening of Typical Environmental Impacts of Project Components

69. The purpose of this section is to undertake further screening of typical environmental impacts of project components. The screening addresses the following structural project sub-components to be implemented under sector development program: (i) civil building works; (ii) solid waste management facilities and (iii) wastewater treatment facilities. The assessment covers the pre-construction, construction and operation stages of the project as described in Section II.

The following key is used in the environmental screening.

NO impact	O
MINOR NEGATIVE impact	X
MAJOR NEGATIVE impact	XX
MINOR POSITIVE impact	✓
MAJOR POSITIVE impact	✓✓
UNKNOWN impact	?

**Table 4.1: Environmental Screening of Structural Sub-Components**

POTENTIAL IMPACT	PRE-CONSTRUCTION STAGE	CONSTRUCTION STAGE	OPERATION STAGE	DISCUSSION OF IMPACT AND MITIGATION MEASURES
Impacts on the natural environment				

POTENTIAL IMPACT	PRE-CONSTRUCTION STAGE	CONSTRUCTION STAGE	OPERATION STAGE	DISCUSSION OF IMPACT AND MITIGATION MEASURES
Dust generation and air emissions	O	X	O	<b>Civil Building Works</b> During construction minor, localized, temporary impacts may result from dust generation. Mitigation measures will include use of water for dust suppression, minimization of the size and duration of cleared areas and progressive re-vegetation of exposed areas. Work may be stopped in extreme windy conditions if dust impacts at nearby receivers are severe. No impacts are expected during the operation phase of the works.
	O	X	O	<b>Solid Waste Management Facilities</b> As above for dust emissions.  Incinerator facilities will be designed and controlled to ensure compliance with relevant Lao PDR air quality emissions standards namely criteria contained in WREA regulations on: Air quality - Exhaust gas of medical solid waste matter incinerators - Permitted level.
	O	X	O	<b>Wastewater Treatment Facilities</b> As above.
Odor generation	O	O	O	<b>Civil Building Works</b> No impacts
	O	O	X	<b>Solid Waste Management Facilities</b> During operation improper use or maintenance of waste storage areas may result in minor, localized impacts from odor generation. Mitigation measures will include development of operational procedures for temporary and permanent waste storage areas, regular removal of waste from temporary storage areas and training of personnel in proper waste management practices.
	O	O	X	<b>Wastewater Treatment Facilities</b> During operation improper use or maintenance of wastewater treatment facilities may result in minor, localized impacts from odor generation. Mitigation measures will include development of appropriate operational procedures and training for personnel.
Noise generation	O	X	O	<b>Civil Building Works</b> During construction minor, localized, temporary impacts may result from noise generation from construction vehicles and equipment. Mitigation measures will include restriction of noisy activities to day time hours, proper maintenance of vehicles and equipment, erection of temporary acoustic shields in the vicinity of sensitive receivers and notification of the local community of the duration and extent of construction works. No impacts are expected during the operation phase of the works.

POTENTIAL IMPACT	PRE-CONSTRUCTION STAGE	CONSTRUCTION STAGE	OPERATION STAGE	DISCUSSION OF IMPACT AND MITIGATION MEASURES
	0	X	0	<b>Solid Waste Management Facilities</b> As above
	0	X	0	<b>Wastewater Treatment Facilities</b> As above
Erosion and sedimentation	0	X	0	<b>Civil Building Works</b> During construction localized erosion of exposed areas and resulting sedimentation of waterways may occur. Mitigation measures will include installation and maintenance of erosion control and sediment capture devices, minimization of the size and duration of exposed areas and progressive re-vegetation of exposed areas.
	0	X	0	<b>Solid Waste Management Facilities</b> As above
	0	0	0	<b>Wastewater Treatment Facilities</b> No impact
Surface water quality deterioration	0	X	0	<b>Civil Building Works</b> During construction surface water quality could be adversely affected as a result of sediment laden runoff entering waterways, spills or leakages of chemicals, fuels or oils used during construction, untreated effluent from construction workers entering waterways or improper disposal of solid waste. Mitigation measures will include implementation of erosion and sediment controls, development of storage areas for construction materials in locations removed from waterways, implementation of portable or other suitable toilet facilities for construction workers and regular removal of effluent for treatment, provision of bins for solid waste collection and training of construction workers in requirements to protect waterways.

POTENTIAL IMPACT	PRE-CONSTRUCTION STAGE	CONSTRUCTION STAGE	OPERATION STAGE	DISCUSSION OF IMPACT AND MITIGATION MEASURES
	0	X	✓	<p><b>Solid Waste Management Facilities</b>            During pre-construction and construction surface water quality could be adversely affected as a result of sediment laden runoff entering waterways, spills or leakages of chemicals, fuels or oils used during construction, untreated effluent from construction workers entering waterways or improper disposal of solid waste. Mitigation measures will include implementation of erosion and sediment controls, development of storage areas for construction materials in locations removed from waterways, implementation of portable or other suitable toilet facilities for construction workers and regular removal of effluent for treatment, provision of bins for solid waste collection and training of construction workers in requirements to protect waterways.</p> <p>During operation improved measures for storage or disposal of solid waste will result in positive impacts to surface water quality. All landfill facilities will incorporate lining systems and leachate management to minimize impacts on water quality. Discharge from solid waste facilities will comply with criteria contained in the applicable Lao PDR and WREA regulations.</p>
	0	0	✓	<p><b>Wastewater Treatment Facilities</b>            No impacts during construction.</p> <p>During operation improved measures for storage or disposal of liquid waste will result in positive impacts to surface water quality. Discharge from wastewater treatment facilities will comply with criteria contained in the applicable Lao PDR and WREA regulations</p>
Changes to surface water availability	0	0	0	<p><b>Civil Building Works</b>            No impacts.</p>
	0	0	0	<p><b>Solid Waste Management Facilities</b>            No impacts.</p>
	0	0	0	<p><b>Wastewater Treatment Facilities</b>            No impacts.</p>

POTENTIAL IMPACT	PRE-CONSTRUCTION STAGE	CONSTRUCTION STAGE	OPERATION STAGE	DISCUSSION OF IMPACT AND MITIGATION MEASURES
Groundwater quality deterioration	0	X	0	<p><b>Civil Building Works</b>            During construction groundwater quality could be adversely affected as a result of sediment laden runoff entering waterways, spills or leakages of chemicals, fuels or oils used during construction, untreated effluent from construction workers entering waterways or improper disposal of solid waste. Mitigation measures will include implementation of erosion and sediment controls, development of storage areas for construction materials in locations removed from waterways, implementation of portable or other suitable toilet facilities for construction workers and regular removal of effluent for treatment, provision of bins for solid waste collection and training of construction workers in requirements to protect waterways.</p>
	0	X	✓	<p><b>Solid Waste Management Facilities</b>            During pre-construction and construction groundwater quality could be adversely affected as a result of sediment laden runoff entering waterways, spills or leakages of chemicals, fuels or oils used during construction, untreated effluent from construction workers entering waterways or improper disposal of solid waste. Mitigation measures will include implementation of erosion and sediment controls, development of storage areas for construction materials in locations removed from waterways, implementation of portable or other suitable toilet facilities for construction workers and regular removal of effluent for treatment, provision of bins for solid waste collection and training of construction workers in requirements to protect waterways.</p> <p>During operation improved measures for storage or disposal of solid waste will result in positive impacts to groundwater quality.</p>
	0	0	✓	<p><b>Wastewater Treatment Facilities</b>            No impacts during construction.</p> <p>During operation improved measures for storage or disposal of liquid waste will result in positive impacts to groundwater quality.</p>
Changes to groundwater availability	0	0	0	<p><b>Civil Building Works</b>            No impacts.</p>
	0	0	0	<p><b>Solid Waste Management Facilities</b>            No impacts.</p>
	0	0	0	<p><b>Wastewater Treatment Facilities</b>            No impacts.</p>

POTENTIAL IMPACT	PRE-CONSTRUCTION STAGE	CONSTRUCTION STAGE	OPERATION STAGE	DISCUSSION OF IMPACT AND MITIGATION MEASURES
Soil contamination / disturbance of hazardous soils	X	X	0	<b>Civil Building Works</b> During pre-construction and construction clearing activities may result in disturbance of soils that have been previously contaminated by solid or liquid waste. Mitigation measures will include pre-construction observation of potential areas of contaminated soils and implementation of specific measures in those areas to remove contaminated soils by trained personnel for suitable disposal.
	X	X	✓	<b>Solid Waste Management Facilities</b> During pre-construction and construction clearing activities may result in disturbance of soils that have been previously contaminated by solid or liquid waste. Mitigation measures will include pre-construction observation of potential areas of contaminated soils and implementation of specific measures in those areas to remove contaminated soils by trained personnel for suitable disposal.  During operation improved measures for storage or disposal of solid waste will result in positive impacts to soil quality.
	0	0	✓	<b>Wastewater Treatment Facilities</b> During operation improved measures for storage or disposal of liquid waste will result in positive impacts to soil quality.
Flooding, drainage & hydrology	0	X	0	<b>Civil Building Works</b> During construction impacts may occur if works are undertaken in major floodways or drainage canals. Works in such locations will be avoided.
	0	X	0	<b>Solid Waste Management Facilities</b> As above
	0	X	0	<b>Wastewater Treatment Facilities</b> As above
Effects on biodiversity	0	0	0	<b>Civil Building Works</b> No impacts are expected to occur as all the works are located in areas with low biodiversity values.
	0	0	0	<b>Solid Waste Management Facilities</b> As above
	0	0	0	<b>Wastewater Treatment Facilities</b> As above
<b>Impacts on the socio-economic environment</b>				

POTENTIAL IMPACT	PRE-CONSTRUCTION STAGE	CONSTRUCTION STAGE	OPERATION STAGE	DISCUSSION OF IMPACT AND MITIGATION MEASURES
Land acquisition & changes to land use	0	0	0	No impact
Amenity of surrounding land use	0	X	0	<b>Civil Building Works</b> During construction minor, localized and temporary negative impacts to amenity of surrounding land use may occur in the form of dust and noise generation. Such impacts will be readily mitigated through the range of measures previously described.
	0	X	0	<b>Solid Waste Management Facilities</b> As above during construction.  During operation new solid waste management facilities may generate small amounts of odor; any such impacts will be minor, temporary and localized.
	0	0	0	<b>Wastewater Treatment Facilities</b> No impact
Disruption to community structure	0	X	0	<b>Civil Building Works</b> The relatively small number of construction workers that will be required to undertake the civil works will minimize potential impacts to minor levels. Where possible local workers will be engaged to undertake the civil works. External workers will be housed within the community wherever possible to maximize integration and minimize disruption. Construction workers will be trained on health and safety issues and suitable interactions with the local community.
	0	X	0	<b>Solid Waste Management Facilities</b> As above.
	0	X	0	<b>Wastewater Treatment Facilities</b> As above

POTENTIAL IMPACT	PRE-CONSTRUCTION STAGE	CONSTRUCTION STAGE	OPERATION STAGE	DISCUSSION OF IMPACT AND MITIGATION MEASURES
Risks to public health and safety	X	0	✓✓	<p><b>Civil Building Works</b></p> <p>The demolition of existing structures will result in the disturbance of asbestos building materials which may enter the atmosphere and cause adverse health impacts for nearby receivers if not properly managed. Management principles for management of asbestos materials will be incorporated into project EMPs (Appendix 1).</p> <p>Inspection for and clearing of UXO will be carried out by specialist personnel prior to the commencement of construction works.</p> <p>During operation the project will result in improved quality of health services, improved management of potentially hazardous medical waste and improved access to health services for disadvantaged groups; such outcomes will result in significant positive benefits for local communities in the project area.</p>
	0	0	✓	<p><b>Solid Waste Management Facilities</b></p> <p>Improved solid waste facilities will result in public health benefits.</p> <p>Inspection for and clearing of UXO will be carried out by specialist personnel prior to the commencement of construction works.</p>
	0	0	✓	<p><b>Wastewater Treatment Facilities</b></p> <p>Improved liquid waste facilities will result in public health benefits.</p>
Risks to health and safety of workers	X	X	0	<p><b>Civil Building Works</b></p> <p>The demolition of existing structures will result in the disturbance of asbestos building materials which may cause adverse health impacts for workers if not properly managed. Management principles for management of asbestos materials will be incorporated into project EMPs (Appendix 1). Workers will be provided with appropriate personal safety equipment and will be trained in its use prior to commencement of work on the site.</p> <p>Inspection for and clearing of UXO will be carried out by specialist personnel prior to the commencement of construction works.</p>
	0	0	✓	<p><b>Solid Waste Management Facilities</b></p> <p>During operation improved management of health care waste will result in benefits to health and safety of hospital workers by reducing exposure to potentially dangerous waste.</p> <p>Inspection for and clearing of UXO will be carried out by specialist personnel prior to the commencement of construction works.</p>

POTENTIAL IMPACT	PRE-CONSTRUCTION STAGE	CONSTRUCTION STAGE	OPERATION STAGE	DISCUSSION OF IMPACT AND MITIGATION MEASURES
	0	0	✓	<b>Wastewater Treatment Facilities</b> During operation improved management of health care waste will result in benefits to health and safety of hospital workers by reducing exposure to potentially dangerous waste.
Impacts on items of cultural heritage	0	0	0	<b>Civil Building Works</b> No impact
	0	0	0	<b>Solid Waste Management Facilities</b> No impact
	0	0	0	<b>Wastewater Treatment Facilities</b> No impact
Changes to traffic conditions	X	X	0	<b>Civil Building Works</b> During pre-construction and construction localized, temporary minor impacts may occur as a result of construction traffic movements and works that may encroach onto public roads. If impacts are considered likely to be significant works resulting in large numbers of traffic generation will be carried out during off peak hours. Any disruption to movements on public roads will be signposted and the local community informed of changes to access and traffic conditions. Lights will be provided for any work undertaken at night on public roads.
	0	0	0	<b>Solid Waste Management Facilities</b> No impact
	0	0	0	<b>Wastewater Treatment Facilities</b> No impact

### C. Sector Level Environmental Assessment

70. The civil works and equipment upgrades will result in significant regional social benefits. The project component is key to the improved quality of health services and improved access to health services, together with improved staffing, particularly for mothers, children and disadvantaged groups such as ethnic minority groups. Such outcomes will result in significant positive benefits for local communities in the project area in terms of improved public health, improved livelihoods and poverty reduction through reduction of productive time lost to illness.

71. Sector wide environmental benefits will occur in terms of improved surface water and groundwater quality and reduced risk of soil contamination will result from improved management of solid and liquid waste.

72. During operation, the overall amount of health care waste generated will increase; however, the project incorporates provisions for significant improvements to the management of health care waste and thus overall net impacts will be minor. Principles for management of health care waste will be incorporated into operational manuals for each health care facility and personnel will be regularly trained on the implementation of correct health care waste management practices.

## V. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PLAN

### A. Institutional Arrangements

73. Table 5.1 summarizes the proposed environmental management responsibilities of key parties involved in the project.

**Table 5.1: Environmental Management Institutional Arrangements**

Agency	Environmental Management Responsibilities
ADB	Sign grant agreement with GOL including environment-related covenants Review of site specific EAs and environmental monitoring reports
MOH PCU	Responsibility for overall project implementation, including environmental management activities and implementation of EARPs Coordination of environment-related activities of PIAs including implementation of aspects of EARPs
MOH	Responsibility for project operation including operation stage environmental performance Allocation of staff with responsibility for environmental issues during operation
PIAs	Responsibility for province level project implementation Responsibility for implementing EARPs including preparation of environmental assessments - and obtaining environmental approvals for works within province Responsibility for pre-construction stage and construction stage environmental management, monitoring and reporting
WREA	Provision of advice to PIAs as required on environmental issues
WREA and ADB	Approval of EMPs for works within districts
Construction contractors	Implementation of environmental management commitments contained in site specific EMPs Monitoring and reporting of environmental performance

74. Responsible personnel assigned by the MOH would have primary responsibility for environmental issues and activities during project implementation

## B. Environmental Mitigation Plan

75. Table 5.2 contains the proposed environmental mitigation plan for the pre-construction, construction and operation stages of all project sub-components as assessed. During project implementation, the EMPs for the site specific project sub-components will be validated as a continuing process. Reference will be made to new site information obtained to update site specific mitigation measures for inclusion in the EMP.

**Table 5.2: Environmental Mitigation Plan**

Issue	Performance Objective	Mitigation Measure	Responsibility for Implementation
<b>Pre-Construction Stage</b>			
Soil contamination	Avoid disturbance of contaminated soils	Undertake pre-construction observation surveys of site to identify potential areas of contamination and avoid disturbance of such areas as far as practical	PIA
Risks to public and worker health and safety	Minimize risk of accidents to public and construction workers	Undertake inspection for, and clearing of, UXO by specialist personnel prior to the commencement of construction works.	PIA
<b>Construction Stage</b>			
Dust and emissions generation	Minimize emissions of dust and other pollutants	Minimize size and duration of cleared areas Cover all trucks carrying materials to or from the site Ensure construction equipment and vehicles are maintained in good condition Implement dust suppression measures including watering during windy conditions	Construction contractor
Odor generation	Minimize odor generation	Install sanitary toilets in construction site and regularly maintain toilets Collect waste and store in secure temporary storage areas before regular removal from site for disposal to landfill	Construction contractor
Noise generation	Minimize noise generation	Ensure construction equipment and vehicles are maintained in good condition Limit noisy construction activities to day time hours Notify nearby community of schedule and duration	Construction contractor

Issue	Performance Objective	Mitigation Measure	Responsibility for Implementation
		of construction works	
Erosion and sedimentation	Minimize erosion of exposed surfaces	<p>Install sediment capture devices</p> <p>Construct diversion drains to direct clean runoff away from disturbed areas</p> <p>Minimize size and duration of cleared areas</p> <p>Undertake progressive re-vegetation of cleared areas</p> <p>Undertake dredging in wet season where practical when sediment loads are already high</p>	Construction contractor
Surface water and groundwater quality	Minimize generation of potential water pollutants	<p>Store chemicals in secure area, with concrete floor and weatherproof roof</p> <p>Ensure construction equipment and vehicles are maintained in good condition</p> <p>Install sanitary toilets and washing facilities at construction site</p> <p>Remove waste from site regularly for disposal to landfill</p>	Construction contractor
Soil contamination	Avoid adverse impacts from disturbed soils	If potentially contaminated soils are to be disturbed remove soil from site for disposal in landfill	Construction contractor
Flooding, drainage & hydrology	Avoid adverse effects on floodways and drainage lines	Avoid construction works in floodways or drainage lines	Construction contractor
Disruption to community structure	Minimize disruption to community structure	<p>Maximize engagement of local laborers</p> <p>House external construction workers in local dormitories / guest houses</p> <p>Train construction workers on suitable interactions with local community and hygiene and personal safety measures</p>	Construction contractor
Risks to public and worker health & safety	Minimize risk of accidents involving public or construction workers	<p>Implement safety measures identified in Appendix 1 during removal and disturbance of asbestos.</p> <p>Provide safety equipment to construction workers and train them in its use</p> <p>Secure construction site and restrict access by local community</p>	Construction contractor
Traffic and access	Minimize disruption to traffic	Install temporary access to affected properties	Construction

Issue	Performance Objective	Mitigation Measure	Responsibility for Implementation
	movements and property access	<p>Reinstate good quality permanent access to affected properties on completion of construction works</p> <p>Install signage and lighting for works carried out on public roads</p> <p>Notify nearby community of schedule and duration of construction works</p>	contractor
<b>Operation Stage</b>			
Emissions generation	Comply with relevant Lao PDR Emission standards	Ensure emissions from incinerator operation comply with relevant standards	MOH and WREA
Odor generation	Maximize benefits of project operation	<p>Develop operating procedures for health care waste management systems based on principles contained in Appendix 2</p> <p>Train personnel in implementation of operating procedures</p>	MOH
Surface water and groundwater quality	Maximize benefits of project operation	<p>Incorporate lining systems in landfill facilities</p> <p>Ensure effluent from wastewater and solid waste facilities complies with relevant Lao PDR standards prior to discharge</p> <p>Develop operating procedures for health care waste management systems and wastewater treatment facilities based on principles contained in Appendix 2</p> <p>Undertake regular maintenance of solid waste and wastewater treatment facilities</p> <p>Train personnel in implementation of operating procedures</p>	MOH
Soil contamination	Maximize benefits of project operation	<p>Develop operating procedures for health care waste management systems and wastewater treatment facilities based on principles contained in Appendix 2</p> <p>Undertake regular maintenance of solid waste and wastewater treatment facilities</p> <p>Train personnel in implementation of operating procedures</p>	MOH
Risks to public & worker health and	Maximize benefits of project operation	Secure solid waste and wastewater treatment facilities to avoid public access to facilities	MOH

Issue	Performance Objective	Mitigation Measure	Responsibility for Implementation
safety		Develop operating procedures for health care waste management systems and wastewater treatment facilities based on principles contained in Appendix 2  Undertake regular maintenance of solid waste and wastewater treatment facilities  Train personnel in implementation of operating procedures	

### C. Environmental Monitoring Plan

76. Tables 5.3 and 5.4 contain the proposed environmental monitoring plan for the pre-construction, construction and operation stages of the project components. Two types of environmental monitoring are proposed to be implemented:

- (i) Environmental effects monitoring is conducted to estimate the impacts of the sub-project on ambient environmental conditions.
- (ii) Project environmental performance monitoring is conducted to evaluate compliance with environment-related operating procedures, national standards, and/or contractor specifications including the requirements of the EMP.

77. The following plan identifies the relevant site specific monitoring measures for inclusion in the EMP.

**Table 5.3: Environmental Effects Monitoring Plan<sup>11</sup>**

Mitigation Measure	Parameters	Location	Methods	Frequency	Responsibility
<b>Pre-construction</b>					
No monitoring required					
<b>Construction</b>					
Dust suppression	Visible dust levels in atmosphere	Throughout construction site	Visual observation	During windy conditions	Construction contractor / PIA
Noise minimization	Noise levels near sensitive receivers	Throughout construction site	Observation	During noisy activities	Construction contractor / PIA
Water quality protection	Visible sediment, waste or other pollutants in waterways	At surface waterways and wells in vicinity of construction site	Observation	Weekly or after rain events	Construction contractor / PIA
<b>Operation</b>					

<sup>11</sup> Resettlement and livelihood related monitoring is contained in the project Resettlement Plan and is not included in this table

Mitigation Measure	Parameters	Location	Methods	Frequency	Responsibility
Air emissions control	TSP, SO <sub>x</sub> , NO <sub>x</sub> ,	Ambient conditions at site boundary	As specified in Lao PDR standards	Weekly for first 6 months and then monthly thereafter	MOH
Water quality protection	BOD, COD, TSS, total coliform, E. coli, oil/grease	In waterways and wells in vicinity of effluent discharge from solid waste or wastewater facilities	As specified in Lao PDR standards	Weekly for first 6 months and then monthly thereafter	MOH

**Table 5.4:** Environmental Performance Monitoring Plan<sup>12</sup>

Mitigation Measure	Parameters	Location	Methods	Frequency	Responsibility
<b>Pre-construction</b>					
No monitoring required					
<b>Construction</b>					
Dust suppression	Covering of trucks & use of dust suppression methods	Throughout construction site	Visual observation	During windy conditions	Construction contractor / PIA
Water quality protection	Condition of erosion and sediment controls	At surface waterways and wells in vicinity of construction site	Observation	Weekly or after rain events	Construction contractor / PIA
Worker and public health and safety	Implementation of asbestos management principles	At affected worksites	Observation	During removal of asbestos	Construction contractor / PIA
<b>Operation</b>					
Air emissions control	All criteria in Lao PDR - Air quality - Exhaust gas of medical solid waste matter incinerators - Permitted level.	At incinerator discharge	As specified in Lao PDR standards	Weekly for first 6 months and then monthly thereafter	MOH
Water quality protection	BOD, COD, TSS, total coliform, E. coli, oil/grease, heavy metals	At effluent discharge from solid waste or wastewater facilities	As specified in Lao PDR standards	Weekly for first 6 months and then monthly thereafter	MOH

<sup>12</sup> Resettlement and livelihood related monitoring is contained in the project Resettlement Plan and is not included in this table

#### D. Environmental Monitoring and Reporting

78. Table 5.5 contains the proposed environmental monitoring and reporting system for the pre-construction, construction and operation stages of the project.

**Table 5.5: Environmental and Monitoring Reporting Requirements**

Project Phase	Type of Monitoring	Description	Responsibility	Reporting Requirements
Construction	Contractor's Environmental Performance Monitoring	Self monitoring of environmental effects of construction work in terms of environmental performance monitoring requirements identified in EMP. Undertaken on an ongoing basis throughout construction works with regular monitoring frequencies.	Construction contractor	Monthly reports to PIAs
	EMP Compliance Monitoring	Monitoring of Contractor's compliance with EMP requirements. Undertaken regularly throughout construction period. Monitoring based on combination of observation and review of Contractor's environmental performance monitoring results.	PIAs	6 monthly reports to PCU/ ADB
Operation	Operation Environmental Monitoring	Monitoring of performance of project operation. Undertaken on a regular basis over life of project and self reporting of compliance with EMP operation stage commitments.	MOH	1st year: 3 monthly reports to ADB and WREA Subsequent years: 6 monthly reports to WREA

#### E. Environmental Management Budget

79. Environmental management costs include costs both at the level of individual project sub-components as well as project component-wide environmental management costs. An environmental management budget to cover costs for management and monitoring both at the level of the district hospitals and the health centers will be established. A certain percentage of the total project costs can be allocated for this fund upon agreement with the MOH.

80. The EMP budget will include the following components:

- (i) Marginal costs for implementation of environmental mitigation measures during pre-construction, construction and operation stages
- (ii) Marginal costs for implementation of environmental monitoring measures during pre-construction, construction and operation stages

## VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

### A. Public Consultation Undertaken to Date

81. Consultations undertaken to date on the project scope under the health sector development program has involved the following:

- (i) Meetings and consultations with Provincial Health Office directors and their representatives in each project province to inform them about the need for rapid environmental assessments and obtain the current status of the district hospital facilities and health centers and the upgrades or improvements that they are proposing based on their own diagnosis.
- (ii) Meetings and consultations with each District Health Office Director and/or Hospital Director together with their management and staff in each of the health facilities to brief them about the environmental assessments that each hospital has to undertake to identify the current status of environmental conditions in the vicinity of the health facilities and identify the scope of required project interventions.

82. The initial public consultations showed a high level of acceptance of the project as the project will improve the hospitals' and health centers' current state and capability for improved efficiency and capability for hospital service delivery particularly to achieve the MOH's MDG goals. Some of the related environmental concerns included the lack of proper management of health care waste, the lack of adequate staff for operations and maintenance of the facilities, the inadequacy of water supply at certain times of the year, internal drainage problems during the rainy seasons and the basic lack of medical and non-medical equipment. Such concerns will be incorporated in the mitigation and monitoring plans during project design and implementation. Public consultation is an on-going process and the consultations will continue with the project affected communities and relevant NGOs, if any, during the detailed design and implementation phases of the project.

**Table 6.1: Summary of Issues Raised in Public Consultation Activities**

Date	Locations/Provinces	Persons met (Name) and Position	Issues Raised	Response by PPTA/Environmental Consultant and MOH Civil Works Staff
<b>1</b>	<b>Xieng khouang</b>			
31/3/09	1.1 Muang Mok Hospital	Mr. Ka So Song Deputy Director, District health Office	The lack of adequate staff for operations and maintenance of the facilities. Need 2 Environmental technicians to handle waste management.  The inadequacy of water supply at certain times of the year. broken toilets and lack of water is a problem. Internal drainage problems during the rainy season and lack of wastewater treatment	To be addressed with human resources development during project implementation.  Availability of water to be surveyed during site survey and options to ensure both quality and quantity of water to be studied and addressed as part of the construction process.  Water drainage to be incorporated in the construction design.
		Mr. Vixay Song Deputy Director, District health Office		
		Ms Chanthy MCH		
		Mr. Bounveun Practitioner	How wastewater is treated?	To be incorporated in the environmental management plan based on the established Health Care Waste Management standards
		Mr. Tui Thongchanh Youth's Union		
		Mr. Yangpaochang Youth's Union		
		Ms Khamta Women's Union		
		Ms Douangsamone Women's Union		
1/4/09	1.2 Phaxay District Hospital	Dr, Bounma Souyavong Director of District health office		
		Dr. Khanthaly Thavivone Practitioner		
		Mr Vansai On napha Youth's Union		
		Ms Souvanna Simahalath Women's Union	Protection of privacy for women? Separate toilets?	Various construction specifications will ensure privacy such as: examination rooms with locks; frosted glass windows/curtains, orientation of examination/delivery tables, signs on the doors of toilets, etc.
2/4/09	1.3 Provincial Health Dpt	Dr. Bounpheng Sinnavong Chief of F&D division		

		D. Vinyane Cheuyangsaijou Deputy Director of Provincial Health		
		Dr. Bouaphanh Vongmachanh Chief of technical officer		
		Mr. Khambone Soumphonphakdy Civil work technical officer	How local authorities are involved in the architectural plan development process.	Local authorities are consulted at various stages of the plan development. Final plans are submitted to local authorities for review, comments, approval.
		Dr. Bouasone Sinouanethong Director of Provincial Health Dpt		

Date	Locations/Provinces	Persons met (Name) and Position	Issues Raised	Response by PPTA/Environmental Consultant and MOH Civil Works Staff
<b>2</b>	<b>Luang-Prabang province</b>			
2/4/09	Phoukhoun District Hospital	Mr. Viladeth Chittalath Provincial Planning officer		
		Mr Khamxay Heungmany Chief of Administrative Office		
		Mr Sengthong HSDP of DHO		
		Mr. Somsy Heu Youth's Union		
3/4/09	2.1 Provincial Health Dpt	Dr. Bounthieme Siphada HSDP Technical officer		
		Dr. Amone Sirivong Director of Provincial Health Dpt		
4/4/09	2.2 Viengkham District Hospital	Mr. Thongdaly Chief of Administrative Office		
		Ms. Phonemany Phomthachack Deputy Director of District Health Office		
		Mr. Sivone Chief of District Hospital		
		Mr Sengthong Soulavanh Youth's Union	Does construction/renovation and waste management provides work opportunities for local people?	Yes potentially. Training opportunities may also be provided to local people for health training or maintenance.
		Mr. Thou Lo Youth's Union	Animals are entering in the hospital area.	All facilities would have a fence and doors to prevent this issue.
6/4/09	2.3 Nambak District Health Office	Dr.Somphone Deputy District Health officer	The lack of proper management of health care waste. Referring to Nambak DH and old facilities built using Vietnamese and GOL funds	To be incorporated in the environmental management plan based on the established Health Care Waste Management standards
		Dr. Boui	Lack of medical and non-medical	To be addressed by the project

	3.4 District Hospital	Director of District Officer Dr. Nengsong Yiatou Deputy Chief of District hospital	equipment.	
		Dr. Sombath Atsaphangthong Deputy Chief of District hospital	Does hospital plan accommodate for disabled?	Buildings would be linked with covered concrete paths that facilitate circulation and access to buildings. One toilet will be specifically designed for disabled.
		Mr. Singkham Phoumiphonh Youth's Union	How bad when burning wastes, particularly plastic smell, is addressed. This is an annoyance for households around the hospital	Wastes would be sort and wastes with potential bad smell would be burned outside with specific procedures.
<b>Date</b>	<b>Locations/Provinces</b>	<b>Persons met (Name) and Position</b>		
<b>3</b>	<b>Oudomxai province</b>			
8/4/09	3.1 Provincial Health Dpt	Dr. Koukeo Saiyachack Project Implementing Agency, CDC P		
		Dr. Pavith Khemmanith, HSDP, Central level		
	3.2 Na Mo District Hospital	Dr. Ounkham Losavatdy Director of District Health Office		
		Mr. Somphanh Phoumixai Deputy Director of District Health Office		
		Mr. Bounpeung Mekaloun Director of District Hospital		
9/4/09	3.3 La District Office	Dr. Khampheng Orlavong Director of District Health Office		
		Mr. Khamlang Lattavong Deputy Director of District Health Office		
		Ms. Somkhith Thanichanh Women's Union	Are there possibilities for supporting family members to stay or cooking?	A specific place is dedicated for families cooking. There are not specific accommodation planned but arrangement can be locally found.
<b>Date</b>	<b>Locations/Provinces</b>	<b>Persons met (Name) and Position</b>		
<b>4</b>	<b>Attapeu Province</b>			
		Mr. Phoukieng Viengkeo For Director of Health Office		
		Mr. Vilasack Navongsa Technical officer		
23/4/09	4.1 Sanamxai District Hospital	Mr. Bounthith Luangoudom Director of District Health office		
		Ms. Sonenapha Women's Union	The circulation between buildings is difficult during the rainy season.	Buildings would be linked with covered paths.
		Ms. Kongvilay	During the rainy season, residual water	Construction/renovation includes water

		Women's Union Mr. Mixay Singsombath Youth's Union	contributes to mosquito increase	drainage.
<b>Date</b>	<b>Locations/Provinces</b>	<b>Persons met (Name) and Position</b>		
<b>5</b>	<b>Saravane Province</b>			
24/4/09	5.1 LaoNgam District Hospital	Mr. Somphane Silany Deputy Chief of administrative office		
		Mr. Phaosakoune Deputy Director of district Office		
		Mr. Thavong Deputy Director of district Office		
		Mr. Sifong Phiengsavanh Deputy Director of District Hospital		
		Mr. Sangvane Youth's Union		
		Ms. Vilayvanh Women's Union	Is the project addressing water supply in the village?	The project would address water supply and water drainage in the facility and ensure that it does not create problem around the facility. It does not directly address water supplies, drainage, and waste management in the village.
27/4/09	5.2 Vapy District Hospital	Mr. Domvilay Deputy Director of District Health Office		
		Ms. Khamsonne District Hospital Administrative		
		Dr. Khambao Director of District Hospital		
		Ms. Kengkham Women's Union	Medical wastes are not well managed. For example, we can find needles around health facilities.	The construction and equipment of the hospital will provide capacity to manage wastes. However, there is a lot to do to change attitudes among facility staff and users.
		Mr. Bounteung Youth's Union	It is sometimes difficult to know where to go in the hospital.	Services will be indicated on boards. Considering many people cannot read, a reception would be at the entrance of the hospital to orient patients.

## **B. Future Public Consultation and Disclosure**

83. In order to ensure that future project activities are conducted in a participatory sense and that community concerns and opinions about potential environmental impacts are taken into account during subproject design, construction and operation, a range of public consultation and disclosure activities will be implemented throughout activity preparation, implementation and operation. These activities, which have been developed to meet the requirements of both GOL and ADB safeguards requirements, are summarized in the following sections.

84. The following consultation activities will be implemented during the finalization of the detailed design of project activities:

- (i) District level workshops in each district contained in the project area to discuss project interventions, potential environmental impacts of project activities and required mitigation measures. Representatives at the workshops will include stakeholder agencies, mass organizations (Womens' Union, Youth Union and Farmers Association, and other identified by the MOH), other relevant district level organizations.
- (ii) Meetings with potentially affected households, sensitive receivers (schools, temples, etc.) and landowners to discuss specific issues of concern and mitigation measures required.

85. The public consultation activities carried out and the subsequent outcomes will be documented in the environmental assessment documents to be prepared for each site and records of the public consultation appended to the document as outlined in the Environmental Assessment and Review Procedures for the project.

86. To ensure ongoing community involvement during project construction and operation, the following activities will be carried out for each project activity.

- (i) Community information on construction schedule and activities and details of any expected impacts and measures to control them by means of newspaper and loudspeaker announcements and direct communication by local authorities to affected households
- (ii) Establishment of a grievance redress mechanism to allow community members to report concerns regarding construction activities including environmental pollution concerns.

87. The requirements for future consultation activities during subproject construction and operation will be documented in the site specific environmental assessments to be prepared during project implementation.

## **VII. ENVIRONMENTAL ASSESSMENT AND REVIEW PROCEDURES**

### **A. Introduction**

88. The following Environmental Assessment and Review Procedures (EARPs) document the procedures for the environmental assessment of the project sub-components that will be implemented under the program. The EARPs shall be harmonized with the GOL's environmental assessment requirements as far as possible to ensure a streamlined environmental assessment process for project loan activities. The EARPs have been developed to comply with the ADB's *Environmental Assessment Guidelines* (2003).

## **B. Overview of Types of Project Sub-Components to be Assessed**

89. The project components of the grant comprise the following structural sub-components which are subject to the EARPs:

- (i) Civil works for hospital building upgrading
- (ii) Solid waste management facilities at existing hospitals
- (iii) Wastewater treatment facilities at existing hospitals
- (iv) Associated construction works including access roads, fencing, drainage and landscaping works

90. All project sub-components at one location will be grouped together to form a 'project activity' for the purposes of the application of the EARPs.

## **C. Lao PDR's Environmental Assessment and Review Procedures**

91. Lao PDR's environmental assessment and review procedures shall follow the provisions of the WREA as the regulatory agency entrusted with the approvals of environmental impacts of the proposed projects.

## **D. Specific Procedures to be used for Project Sub-components under the Sector Development Grant**

92. The procedures on responsibilities and authorities will be agreed between the MOH and ADB. The environmental criteria for future project selection will be discussed between the two parties in accordance with the relevant ADB guidelines. The Procedures for Environmental Assessment of Project Sub-components will follow the ADB guidelines as follows:

### **1. Environmental Categorization**

93. The first step in the EARPs will be the determination of the environmental categorization for each subproject in terms of both ADB and GOL requirements.

94. In terms of ADB environmental categorization, the environmental selection criteria that have been developed for subprojects will ensure that all subprojects will be classified either as:

- (i) Category B in accordance with the ADB's *Environmental Assessment Guidelines* and thus subject to preparation of an IEE; or
- (ii) Category C in accordance with the ADB's *Environmental Assessment Guidelines* and thus not subject to formal environmental assessment.

95. The determination of whether a subproject is Category B or Category C will be made by the EA using guidance from the ADB's *Environmental Assessment Guidelines*.

### **2. Preparation of Environmental Assessment Documents**

96. The environmental assessment documents will be prepared by the EA, in this particular case the MOH, and approved by the relevant government bodies as provided for by the WREA regulations on environmental impact assessments.

### 3. Requirements for Environmental Management Plans

97. The EA will be required to include an Environmental Management Plan (EMP) for each project sub-component. The EMP will address environmental mitigation and monitoring activities, institutional arrangements and strengthening requirements, public consultation activities during project implementation and operation and environmental monitoring and reporting requirements.

98. Table 7.1 summarizes the potential impacts and proposed mitigation measures for the project activities that will form the basis of the EMP for each project sub-component.

**Table 7.1: Environmental Impacts and Mitigation Measures**

Issue	Performance Objective	Mitigation Measure	Responsibility for Implementation
<b>Pre-Construction Stage</b>			
Soil contamination	Avoid disturbance of contaminated soils	Undertake pre-construction observation surveys of site to identify potential areas of contamination and avoid disturbance of such areas as far as practical	PIA
Risks to public and worker health and safety	Minimize risk of accidents to public and construction workers	Undertake inspection for, and clearing of, UXO by specialist personnel prior to the commencement of construction works.	PIA
<b>Construction Stage</b>			
Dust and emissions generation	Minimize emissions of dust and other pollutants	Minimize size and duration of cleared areas Cover all trucks carrying materials to or from the site Ensure construction equipment and vehicles are maintained in good condition Implement dust suppression measures including watering during windy conditions	Construction contractor
Odor generation	Minimize odor generation	Install sanitary toilets in construction site and regularly maintain toilets Collect waste and store in secure temporary storage areas before regular removal from site for disposal to designated landfill sites	Construction contractor
Noise generation	Minimize noise generation	Ensure construction equipment and vehicles are maintained in good condition Limit noisy construction activities to day time hours Notify nearby community of schedule and duration of construction works	Construction contractor
Erosion and sedimentation	Minimize erosion of exposed surfaces	Install sediment capture devices or silt fences Construct diversion drains to direct clean runoff	Construction contractor

Issue	Performance Objective	Mitigation Measure	Responsibility for Implementation
		<p>away from disturbed areas</p> <p>Minimize size and duration of cleared areas</p> <p>Undertake progressive re-vegetation of cleared areas</p> <p>Undertake dredging in wet season where practical when sediment loads are already high</p>	
Surface water and groundwater quality	Minimize generation of potential water pollutants	<p>Store chemicals in secure area, with concrete floor and weatherproof roof</p> <p>Ensure construction equipment and vehicles are maintained in good condition</p> <p>Install sanitary toilets and washing facilities at construction site</p> <p>Remove waste from site regularly for disposal to landfill</p>	Construction contractor
Soil contamination	Avoid adverse impacts from disturbed soils	If potentially contaminated soils are to be disturbed remove soil from site for disposal in landfill	Construction contractor
Flooding, drainage & hydrology	Avoid adverse effects on floodways and drainage lines	Avoid construction works in floodways or drainage lines	Construction contractor
Disruption to community structure	Minimize disruption to community structure	<p>Maximize engagement of local laborers</p> <p>House external construction workers in local dormitories / guest houses</p> <p>Train construction workers on suitable interactions with local community and hygiene and personal safety measures</p>	Construction contractor
Risks to public and worker health & safety	Minimize risk of accidents involving public or construction workers	<p>Implement safety measures identified in Appendix 1 during removal and disturbance of asbestos.</p> <p>Provide safety equipment to construction workers and train them in its use</p> <p>Secure construction site and restrict access by local community</p>	Construction contractor
Traffic and access	Minimize disruption to traffic movements and property access	<p>Install temporary access to affected properties</p> <p>Reinstate good quality permanent access to affected properties on completion of construction works</p> <p>Install signage and lighting for works carried out on public roads</p>	Construction contractor

Issue	Performance Objective	Mitigation Measure	Responsibility for Implementation
		Notify nearby community of schedule and duration of construction works	
<b>Operation Stage</b>			
Emissions generation	Comply with relevant Lao PDR Emission standards	Ensure emissions from incinerator operation comply with relevant standards	MOH and WREA
Odor generation	Maximize benefits of project operation	Develop operating procedures for health care waste management systems based on principles contained in Appendix 2  Train personnel in implementation of operating procedures	MOH
Surface water and groundwater quality	Maximize benefits of project operation	Incorporate lining systems in landfill facilities  Ensure effluent from wastewater and solid waste facilities complies with relevant Lao PDR standards prior to discharge  Develop operating procedures for health care waste management systems and wastewater treatment facilities based on principles contained in Appendix 2  Undertake regular maintenance of solid waste and wastewater treatment facilities  Train personnel in implementation of operating procedures	MOH
Soil contamination	Maximize benefits of project operation	Develop operating procedures for health care waste management systems and wastewater treatment facilities based on principles contained in Appendix 2  Undertake regular maintenance of solid waste and wastewater treatment facilities  Train personnel in implementation of operating procedures	MOH
Risks to public & worker health and safety	Maximize benefits of project operation	Secure solid waste and wastewater treatment facilities to avoid public access to facilities  Develop operating procedures for health care waste management systems and wastewater treatment facilities based on principles contained in Appendix 2  Undertake regular maintenance of solid waste and wastewater treatment facilities  Train personnel in implementation of operating procedures	MOH

99. Tables 7.2 and 7.3 summarize the proposed monitoring measures for the project activities that will form the basis of the EMP for each project sub-component.

**Table 7.2: Environmental Effects Monitoring Plan<sup>13</sup>**

Mitigation Measure	Parameters	Location	Methods	Frequency	Responsibility
<b>Pre-construction</b>					
No monitoring required					
<b>Construction</b>					
Dust suppression	Visible dust levels in atmosphere	Throughout construction site	Visual observation	During windy conditions	Construction contractor / PIA
Noise minimization	Noise levels near sensitive receivers	Throughout construction site	Observation	During noisy activities	Construction contractor / PIA
Water quality protection	Visible sediment, waste or other pollutants in waterways	At surface waterways and wells in vicinity of construction site	Observation	Weekly or after rain events	Construction contractor / PIA
<b>Operation</b>					
Air emissions control	TSP, SO <sub>x</sub> , NO <sub>x</sub> ,	Ambient conditions at site boundary	As specified in Lao PDR standards	Weekly for first 6 months and then monthly thereafter	MOH
Water quality protection	BOD, COD, TSS, total coliform, E. coli, oil/grease	In waterways and wells in vicinity of effluent discharge from solid waste or wastewater facilities	As specified in Lao PDR standards	Weekly for first 6 months and then monthly thereafter	MOH

**Table 7.3: Environmental Performance Monitoring Plan<sup>14</sup>**

Mitigation Measure	Parameters	Location	Methods	Frequency	Responsibility
<b>Pre-construction</b>					
No monitoring required					
<b>Construction</b>					
Dust suppression	Covering of trucks & use of dust suppression	Throughout construction site	Visual observation	During windy conditions	Construction contractor / PIA

<sup>13</sup> Resettlement and livelihood related monitoring is contained in the project Resettlement Plan, if any, and is not included in this table

<sup>14</sup> Resettlement and livelihood related monitoring is contained in the project Resettlement Plan, if any, and is not included in this table

Mitigation Measure	Parameters	Location	Methods	Frequency	Responsibility
	methods				
Water quality protection	Condition of erosion and sediment controls	At surface waterways and wells in vicinity of construction site	Observation	Weekly or after rain events	Construction contractor / PIA
Worker and public health and safety	Implementation of asbestos management principles	At affected worksites	Observation	During removal of asbestos	Construction contractor / PIA
<b>Operation</b>					
Air emissions control	All criteria in Lao PDR WREA regulations- Air quality - Exhaust gas of medical solid waste matter incinerators - Permitted level.	At incinerator discharge	As specified in Lao PDR standards	Weekly for first 6 months and then monthly thereafter	MOH
Water quality protection	BOD, COD, TSS, total coliform, E. coli, oil/grease, heavy metals	At effluent discharge from solid waste or wastewater facilities	As specified in Lao PDR standards	Weekly for first 6 months and then monthly thereafter	MOH

#### 4. Requirements for Public Consultation and Disclosure

100. There is a requirement that public consultation and information disclosure takes place for each project activity during preparation of the EA. The following minimum requirements for public consultation and disclosure must be met for each project activity.

101. At the outset of the preparation of the EA, local authorities and community representatives in the vicinity of, or who are likely to be affected by, the project should be informed of the project activity and given an opportunity to provide feedback on potential environmental issues or required management measures. The following activities will be carried out for each project activity:

- (i) District level workshops in each district contained in the project area to discuss project interventions, potential environmental impacts of project activities and required mitigation measures. Representatives at the workshops will include stakeholder agencies, mass organizations (Womens' Union, Youth Union and Farmers Association), other relevant district level organizations and NGOs if any.
- (ii) Meetings with potentially affected households, sensitive receivers (schools, temples, etc.) and landowners to discuss specific issues of concern and mitigation measures required.

102. In addition, information on the project activity and consultation activities will be provided to the local community through newspaper notices and/or public announcements.

103. Following approval of the environmental assessment document, a copy of the approval and a summary of the environmental assessment document will be sent to all affected provinces, districts and villages. Information regarding the approved project and the proposed environmental management measures will be posted at suitable locations on the project site.

104. The public consultation activities carried out and the subsequent outcomes must be documented in the EA and the records of the public consultation appended to the document.

## **5. Review of Environmental Assessment Documents by GOL and ADB**

105. At the same time that the Environmental Assessment Documents are submitted to the relevant GOL authorities (in Lao language), it will also be submitted by the MOH (in English language) to the ADB. The ADB will review the document for compliance with its environmental safeguards requirements.

106. All environmental assessment documents prepared using these EARPs will be reviewed and approved by the GOL. The approval process that will be implemented by the GOL will be in accordance with the specific decree requiring the same.

107. For sub-projects with a value of more than \$1million, approval of environmental assessment documents will be required from the ADB prior to the commencement of construction works.

## **VIII. FINDINGS AND RECOMMENDATIONS**

### **A. Findings**

108. The project components to be implemented under the Health Sector Development Program are expected to have a range of major social benefits, particularly for mothers, children and ethnic minority groups. The proposed project is expected to benefit some 275, 000 people comprising the service population of the district hospitals to be upgraded and some 200 health center villages in the target northern and southern provinces. It is also expected to raise policy reforms on the regulation of the hospitals and health centers with respect to hospital facility and equipment standards, environmental protection, sanitation and hygiene standards, environmental regulation issues particularly on health care waste management (non-hazardous and hazardous) issues, and quality of health care delivery.

109. The majority of negative impacts is minor and expected to occur during the construction phase and will be localized and temporary. Such impacts, which will include generation of noise and dust, deterioration of water quality through sediment laden runoff or improper waste disposal, exacerbation of local flooding conditions, and disruption to property access or commercial activities, will be readily managed to acceptable levels through implementation of standard construction environmental management practices.

110. Operation stage environmental impacts can be mitigated to acceptable levels through appropriate design of subprojects and implementation of basic operation and maintenance (O&M) environmental management practices particularly in relation to solid waste and wastewater treatment facilities.

111. No further environmental assessment of the project loan is therefore required and no full environmental impact assessment (EIA) is required to be prepared.

## B. Recommendations

112. Based on the analyses contained in IEE the following recommendations are made:
- The IEE concluded that no significant environmental impacts from an environmental Category A project will occur as a result of the project and program grant for the HSDP. The project classification of Category B will continue to be monitored during project implementation.
  - To ensure that environmental issues receive an appropriate level of recognition and action in its implementation, it is recommended that the grant agreement between the ADB and the GOL (through the MOH) make specific reference to environmental issues and include the relevant covenants for action in the said documents.
  - Environmental compliance certificates or its equivalent form in GOL be issued by the WREA prior to any work in civil works is contracted for construction.

## IX. CONCLUSIONS

113. The ADB is proposing to provide funding to the GOL in the form of a program grant with project and program components to support the implementation of the Health Sector Development Program of Lao PDR. The project components for civil works, which is the subject of this IEE will be implemented in 4 northern and involves the upgrading and improvements of health facilities as well as support for essential equipment, human resources development and improved access to health services especially for mothers, children and ethnic minorities. No new construction of district hospitals and health centers in new locations are included.

114. An IEE has been prepared for the project to meet the requirements of the ADB's Environment Policy and follows the guidance contained in the ADB's *Environmental Assessment Guidelines* (2003). The IEE has been prepared to comply with the ADB's guidelines for sector development loans.

115. The project activities are expected to have a range of benefits on the natural and social environment, and only minor or negligible negative environmental impacts. The majority of minor negative impacts are expected to occur during the construction phase. These will be localized, minor and temporary and will be readily managed to acceptable levels through the implementation of standard construction environmental management practices. Operation stage environmental impacts can be mitigated to acceptable levels through appropriate design of subprojects and implementation of basic operation and maintenance (O&M) environmental management practices.

116. The IEE includes an Environmental Management Plan (EMP) defining the types of environmental mitigation and monitoring measures required to offset potential negative environmental impacts. The development of the EMP has taken into account the likely level of technical, financial and human resources available for each of the subprojects. The EMPs will be updated as project implementation progresses beginning with the detailed design. Site-specific conditions may change the nature of the assumptions on the EMPs as the details of the upgrades and improvement projects of the hospitals and health centers become more precise and sensitive to the prevailing environmental conditions of the different project locations.

117. A series of recommendations have been made in relation to incorporation of environmental commitments in the loan agreement, provision of adequate support for EARP

implementation and environmental capacity building, and integration of environmental issues into all stages of project development and implementation.

118. Based on the findings of the IEE, it is concluded that provided that recommendations contained in the Findings and Recommendations section of the IEE are implemented, the project will not have a significant effect on the environment. The upgrades of the health facilities, overall, will bring forth more positive than negative environmental impacts. In view of this, an EIA is not required to be prepared for this project grant. Individual project activities will be assessed and site specific environmental mitigation and monitoring measures will be developed and implemented accordingly as set out in the EMPs.

## **X. REFERENCES**

- ADB. 2002. Environmental Policy and Operations Manual 20
- ADB. 2003. Environmental Assessment Guidelines. Manila.
- ADB. 1997. Environmental Impact Assessment in Developing Countries.

## **Appendix 1: MANAGEMENT PRINCIPLES FOR HANDLING AND REMOVAL OF ASBESTOS**

119. Asbestos is the name applied to a group of six naturally occurring silicate mineral chains, of which the long fiber chrysotile is the most common. The material was appreciated because of its properties. Asbestos fibers are virtually indestructible, resistant to chemicals and heat, and they are very stable in the environment. They do not evaporate into air or dissolve in water, and they are not broken down over time. However, because it is so hard to destroy asbestos fibers, the body cannot break them down or remove them once they are lodged in lung or body tissues. They remain in place where they can cause disease. Particular attention is therefore required during works which will potentially disturb asbestos containing materials.

120. Based on International Labor Organization recommendations, the following minimal requirements should be adhered to in the management of asbestos during project works.

(i) conduct careful inspection and documentation of the premises and testing of materials to assess the presence of asbestos containing materials (ACM).

(ii) for small quantities of ACM in a particular building, and if the level of friable ACM is very low and unlikely to increase during demolition, the buildings may be removed without prior removal of asbestos. Workers may be provided with a suitable face mask and instructed to wash body, clothes and shoes after work before going home.

(iii) for larger quantities of ACMs, or if the level of friable ACM is significant or may become significant during demolition, special arrangements need to be made for the removal of ACM before the demolition of the building.

- Where available, a national or regional company will be contracted which is specialized or at least has substantial expert experience with removing asbestos.
- The firm will follow standard's general requirements covering subjects such as notification and reporting and monitoring.
- The workers will be trained, provided with appropriate PPE, work in shifts to ensure proper use of PPE, wash after work, and are properly supervised. Laundry should be done on site to minimize exposure of children.
- The authorities will ensure that the buildings surrounding the demolition site are vacated during removal of asbestos and following clean-up. If friable materials are expected, the building will be covered in a protective tent of plastic.
- The firm will in any case use wet methods or wetting agents except where this is infeasible.
- The asbestos-containing waste produced from the demolition operation must be kept wet at all times until it has been loaded for transport away from the demolition site.
- Asbestos waste must be placed in sealed, labeled, impermeable bags or other closed, labeled, impermeable containers.

Trucks with water-tight, dust-tight cargo haulers will take the containers to a proper storage place.

## Appendix 2: PROPOSED HEALTH CARE WASTE MANAGEMENT PRINCIPLES

121. The following principles that are generally based on the WHO guidelines are proposed to guide development of a healthcare waste management system at the different project locations of district hospitals and health centers off Lao PDR:

### 1. Waste minimization

Health care waste is an unavoidable product of any healthcare system. However, the district hospitals and health centers should carry out basic steps to minimize unnecessary waste generation. These steps include reduction of waste at the source, purchasing of products with environmentally-acceptable packaging and good management of chemical and pharmaceutical stocks, proper usage of medical equipment and materials, and the reuse or recycling of non-hazardous waste:

(a) Purchasing restriction and proper storage: The department of pharmaceutical and medical equipment should carry out monthly inventory of stored products and check their expiry date. The oldest batch of a product should be used first. The department of pharmaceutical and medical equipment should carefully purchase drugs, chemicals and consumables in order to avoid overstock;

(b) Waste recycle/reuse: Many kinds of healthcare waste can be reused or recycled. The opportunities for the center to reuse or recycle healthcare waste are the following:

- Recycle plastic and glass bottles, cardboards
- Return pressurized containers such as oxygen container to suppliers
- Sell heavy metal contained chemical such as fixed bath used in Radiology department to special recycle center

(c) Minimization of waste generation in all departments

### 2. Waste segregation at source

Waste generators (doctors, nurses etc...) must segregate general waste apart from hazardous waste at source (medical wards, laboratory). The health facility shall use color-coded plastic bags to contain different categories of waste in accordance with healthcare waste management regulation issued by Ministry of Health.

- Clinical waste except for sharps is collected in yellow plastic bags. These bags must be made of PE or PP, PVC bags should not be used if they will be incinerated. The plastic bags should be thick enough so that they are not torn or punctured during collection and transportation. Plastic bags are tightly closed and sealed when they are about three quarter full. Each plastic bags should have label that have information on waste category, date of collection, place in from the hospital where generated. Plastic bags should have biohazard symbols. The collected bags should be replaced immediately with new one of the same type. The bags are placed in metal or plastic containers that have the same color and pedal to open.
- Sharps including cut and broken needles are collected in container made of metal or high-density plastic or puncture-proof and impermeable material. The container should have yellow color and suitable label. The acquisition of needle breakers for

disposal should be explored further as a standard procedure for guarding against needle injuries.

- Large quantities of pharmaceuticals should be returned to suppliers. Small amount of pharmaceuticals are collected in yellow plastic bags with other clinical waste.
- Chemical and cytotoxic waste should be collected in black plastic bags. Large quantities of chemical waste should be packed in chemical resistant containers and sent to specialized treatment facilities (if available). This work should be done in a timely manner from the time of generation of the wastes.
- Non-hazardous waste should be collected in containers lined with green plastic bags. The center should have enough non-hazardous waste containers to place at all points where waste is generated. Hazardous waste should not allowed mixed with non-hazardous waste. General waste that can be recycled should be collected in green plastic bags with recycle symbol.

### **3. Collection, transportation and storage of waste**

#### **3.1 Waste collection**

- The district hospitals and health centers should set up a system of different sized green containers for decentralized collection of general waste. In departments, there small sized containers lined with green plastic bags for general waste collection can be used. Outside the buildings or units, big sized green containers to collect general waste from smaller containers in departments can be used.
- There should be containers for recycled waste collection. These containers should have green color and the “recycle” symbol. They are placed outside buildings or units and protected from losses.
- Location of waste containers should be clearly identified
- The designated hospital staff or each department should be made responsible for waste collection. Waste plastic bags are collected when they about three quarter full. Each plastic bags should have label that have information on waste category, date of collection, place in the center where produced. Plastic bags should have the biohazard symbol. The collected bags should be replaced immediately with new ones of the same type.

#### **3.2 Waste transportation**

- The designated hospital staff or each department should be made responsible for collecting and transporting waste from location of smaller containers inside the departments to the locations of bigger containers outside the departments. Route of waste transportation in departments should be clearly identified.
- An environmental worker should be assigned to be responsible for transporting waste to a central storage facility. Transportation devices are wheeled trolleys or carts that are not used for any other purpose and meet the following specifications: no sharp edges, easy to load and unload; easy to clean. The wheeled trolley is regularly cleaned. Hazardous waste in yellow bags and general waste in green bags are transported by different trolleys of the same color. The full containers should be

replaced daily by empty ones of the same type. Transportation route should not go through medical wards (clean area). Waste collection and transportation should be carried out at a designated time of day. In departments generating more waste such as surgery, obstetrics, operation theatre, collection and transportation of waste should be carried out promptly.

### 3.3 *Interim storage*

- The center should set up a centralized storage for healthcare waste.
- Location of the centralized storage should meet the following requirements: (i) belong to “dirty” zone in the center (near waste treatment facility and mortuary), (ii) far from medical wards and food storage (ii) at the end of main flow direction.
- Design of healthcare waste centralized storage must meet the following requirements:
  - o Have fence, door and lock to restrict unauthorized persons and animals, rat and insects to access.
  - o Have rigid floor, water supply, drainage and good ventilation.
  - o Waste trolley can easily access.
  - o Have separate storage for general waste, clinical waste and recycle waste
- Regulations on operation of central interim storage:
  - o Have proper hazardous symbol and banner with sentence: “*hazardous waste storage*”.
  - o Have the regulation that restricts unauthorized persons to access.
  - o Time of waste storage not to exceed 48 hours
  - o Clear responsibilities in maintaining and cleaning the waste storage

## 4. **Waste treatment and disposal**

- General healthcare waste is collected and disposed of independently by the district hospitals and health centers, except for the used needles used for vaccination that are placed in safety boxes provided by Unicef and sent to the provincial hospitals for proper disposal.
- Hazardous chemicals are managed by each hospital locally. There are no waste treatment facilities in the provinces. Hazardous chemicals should be collected and stored and treated by the proper incineration method.
- Clinical waste will have to be treated on-site or off-site after due consideration by the MOH and the WREA of policies and guidelines regarding the treatment and disposal of health care waste. At present there are no specific guidelines or manuals for health care waste management. The MOH should consider several factors in their decision of which treatment models and technologies to adopt. At present, there are 4 popular options of healthcare waste treatment as follows:
  - (i) Medium temperature incineration: pyrolytic incinerators that incinerate waste at 800 – 900°C appear in provincial level hospitals and often serve several hospitals around. The incinerator, if chosen, must meet the relevant technical requirements issued by the Water Resource and Environment Administration.

- (ii) Safe burial: District hospitals and health centers typically bury healthcare waste in their premises. Safe burial of healthcare waste is recommended by the WHO. However, in comparison with requirements of sanitary landfill, observed bury pits in hospitals often have the following shortcomings: (1) inadequate sealing of base and sides to minimize the movement of wastewater off the site, (2) no presence of site personnel capable of effective control of daily operations, (3) no surface water collection, (4) access to site and working areas difficult for waste delivery and site vehicles, (5) without surface water collection trenches around site boundaries, (6) Construction of a final cover to minimize rainwater infiltration when each phase of the landfill is completed.
- (iii) Wet thermal disinfection: steam autoclaves are commonly used by hospitals to primarily treat highly infectious waste. Wet thermal disinfection has not been introduced widely in Lao PDR but at present, application of autoclave for healthcare waste treatment is still limited in microbiological laboratories where highly infectious wastes are mostly generated.
- (iv) Chemical disinfection: using disinfectants to treat contaminated materials is very common in provincial and district hospital throughout the region. However, application of chemical disinfection for healthcare waste treatment, particularly for highly infectious waste treatment is still limited in microbiological laboratories and in infectious disease outbreaks.

## **5. Wastewater treatment**

Each hospital will have wastewater treatment plant. The chosen plant must meet relevant Lao laws and standards on industrial wastewater treatment plant and quality of hospital wastewater.

**Appendix 3: DETAILS OF PUBLIC CONSULTATION ACTIVITIES**

122. For the Health Sector Development Program's project components, two public consultations as a minimum are recommended:

- (1) Public consultation within the province of Louang Prabang for the Nambak and Viengkham District Hospitals. The proposed upgrades are comparatively more environmentally significant than the other provinces. Nambak DH, a Type A hospital is proposed for upgrading to a sub-regional hospital. It is convenient to include Viengkham DH as it is located in the same province.
- (2) Public consultation at an agreed venue for the Mok-mai DH. This district hospital is proposed for similar replacement, improvements and re-arrangement of functional units. The significance of the environmental impacts for these hospitals are similar.

Alternatively, public consultations may be conducted at each of the district hospital sites at the provincial level with the participation of all relevant stakeholders in accordance with the ADB guidelines on public consultation.

*(SAMPLE OF PUBLIC CONSULTATION DOCUMENTATION)***PUBLIC CONSULTATION AT \_\_\_\_\_ PROVINCE****MINUTES OF MEETING NO. \_\_**

FOR PUBLIC CONSULTATION IN \_\_\_\_\_ PROVINCE

**Date:****Time:****Location:** Provincial Health Office Of \_\_\_\_\_.

**Tasks:**

- 1) Disclose information about the Upgrade component of the HSDP Program;
- 2) Administer questionnaire and document;
- 3) Seek consultation from participants on potential environmental issues that may arise from pre-construction, construction and operation of the Project.

**Chairpersons:** Provincial Health Office official designate, EA representative, PPTA Engineer/Environmental Consultant

**1. AGENDA**

8.00-8.30	Registration	All participants
8.30-8.45	Welcome / opening	PHO official designate
8.45-9.15	Overview of project components and activities; potential Environmental Impacts of project; explain consultation questionnaire	EA representative, PPTA Engineer/Environmental Consultant
9.15-9.30	Administer questionnaire and collect	EA representative, PPTA Engineer/Environmental Consultant
9.30-10.00	Discussion, comments, and questions from participants on potential environmental impacts of project at _____ Province	All participants
10.00-10.15	Break	
10.15-10.30	Summary of issues raised	PPTA Engineer/Environmental Consultant
10.30-10.45	Environmental Mitigation Plan	PPTA Engineer/Environmental Consultant
10.45-11.15	Discussion, comments and questions from participants on Environmental Mitigation Plan	All participants
11.15-11.30	Summary of issues raised	PPTA Engineer/Environmental Consultant
11;30-11.45	Concluding comments	PHO Official Designate

**2. PARTICIPANTS**

Information on the \_\_ participants attending the meeting is given below:

**1) Local Government Agencies:**

