



REPORT

THE IMPLEMENTATION OF THE PROJECT

ON

**"ENVIRONMENTALLY SOUND MANAGEMENT OF
USED LEAD ACID BATTERIES
IN CAMBODIA"**

PREPARED BY THE PROJECT TEAM

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ACRONYMS AND ABBREVIATION



Art.	Article
ASEAN	Association of South East Asian Nations
BC	Basel Convention
BCG	Basel Convention Guidelines
BAT	Best Available Technology
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CP	Cleaner Production
CUTS	Customer Unity and Trust Society
DAAL	Department of Agronomy and Agricultural Land
DoE	Department of Environment
DEPC	Department of Environmental Pollution Control
EEC	European Economic Community
EPHA	Environmental Public Health Act
ESM	Environmentally Sound management
HW	Hazardous Waste
GEF	Global Environment Fund
ILMC	International Lead Management Center
INTERPOL	International Police
KoC	Kingdom of Cambodia
LAB	Lead Acid Battery
LABs	Lead Acid Batteries
MAFF	Ministry of Agriculture Forestry and Fishery
MF	Maintenance Free
MFA&IC	Ministry of Foreign Affair and International Cooperation
MoH	Ministry of Health
MIME	Ministry of Industry, Mine and Energy
MoEF	Ministry of Economic and Finance
MoC	Ministry of Commerce
MoE	Ministry of Environment
MoI	Ministry of Interior
MT	Million Tons
MoU	Memorandum of Understanding
MPWT	Ministry of Public Works and Transport
NGOs	Non- Governmental Organizations
NAP	National Action Plan
Para.	Paragraph
PIC	Prior Informed Consent
PPWM	Phnom Penh Waste Management
RAPS	Remote Area Power Supply
RGC	Royal Government of Cambodia
RGP	Royal Government Policy
SBC	Secretariat of the Basel Convention
TIWR	Toxic Industrial Waste Regulation
TM	Transboundary Movement
TT	Task Team
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
ULAB	Used Lead Acid Batteries
UPS	Uninterrupted Power Supply Units
VAT	Values Added Tax

EXECUTIVE SUMMARY

In Cambodia and other countries in the region, lead acid batteries (LAB) are consumed for use as the second power source after electricity, and they are used for a variety of domestic, commercial and social purposes, e.g. vehicle/engine and other facility operations, lighting, etc. The growth of LAB consumption in Cambodia has noticeably increased because electricity supply has not met the demand of people living in the city suburbs and rural areas.

With the increasing number of LAB uses, we recognized that the large amounts of used lead acid batteries (ULAB) generated can pose potential harmful effects on the environment and human health due to poor environmental management and a disregard for good hygiene controls. Such risks also posed problems for those involved in ULAB collection, storage, transportation and local recycling using low cost recovery methods. In addition, LAB related occupations¹ are also potentially exposed to negative impacts due to improper practices and a lack of awareness about the risks to health and the environment through poor operating procedures.

Detailed National legislation specifically targeting the management of ULAB does not exist, but there are some related statutory instruments that affect the industry such as the Law on Environmental Protection and Natural Resources Management; the Sub-Decree on Water Pollution Control; the Sub-Decree on Solid Waste Management; the Sub-Decree on Air Pollution and Noise Disturbance; and some other minor relevant regulations. This study indicated that the ULAB management process and the national laws are inadequate as is the awareness of technical officers in Government institutions of the requirements of environmentally sound management (ESM). A lack of public participation in such environmental and health matters is also a contributing factor to ESM implementation.

Another important case is that of the Ministry of Environment (MoE). As well as other concerned institutions the MoE did not broadly disseminate through any media systems the potential negative impacts to the environment and human health which are caused by LAB maintenance and ULAB² recovery occupations. Neither did it educate local communities and line institutions to make them aware of the potential environmental and health risks. Significantly, MoE and other concerned institutions have not yet pay more attention and set up effective mechanisms for improving the management of ULAB and LAB and the related occupations.

The main environmental and health threats arising from current practices are the release of hazardous materials from ULAB and flammable and obnoxious gas emissions during battery recharging and any ensuing recovery operations, albeit the recovery operations are few and far between as the majority of ULAB are transported to Vietnam for recycling. The materials that can be released into the environment during ULAB recovery operations include, lead oxides, lead sulfates and dilute sulfuric acid (as an acrid gaseous form). Some of these materials are released during various stages in the life cycle of the LAB, including recharging, ineffective and inefficient ULAB recycling and waste residue disposal. These “environmentally unfriendly” activities are all contributors to the pollution of soils, aquatic ecosystems, and sometimes, domestic air quality as well. Besides the LAB recharging and ULAB recycling, the storage of ULAB in homes, workplaces and children’s playground areas has resulted in large amounts of lead and acidic substances accumulating in places readily accessible to young children and worker’s families. These small stockpiles might be a risk to them and the local communities.

¹ If focuses on battery recharging, reconditioning, and other services in a battery retail shop

² ULAB related occupations are focused on ULAB collection, storage, transport and recycling

In essence, these constraints are the main obstacles to the implementation of the current Government Policy on Poverty Alleviation. Vice versa, the proper use of LAB, regular LAB maintenance and the sound management of ULAB would mean that there is no need to spend so much money for health care or environmental remediation. Similarly, battery users could save money³ by adopting an improved regime for the proper maintenance and use of a LAB.

Importantly, the challenges posed by ULAB and LAB related occupations and the potential harmful consequences were kept as a crucial issue for decision makers to take responsibility to resolve. Cambodia signed the Basel Convention on 2nd March 2001, but has yet to have the Convention ratified by the National Assembly. However, as the signatory of the Basel Convention, Cambodia has prepared an National Action Plan for the ESM of ULAB according to the provisions of the Basel Technical Guidelines.

The National Action Plan is a significant outcome of the project implementation on the ESM of ULAB in Cambodia with both, financial and technical support from the Secretariat to the Basel Convention. Noticeably, the National Action Plan preparation was accomplished under close cooperation of concerned ministries and line agencies, including the International Lead Management Center (ILMC⁴). Two important programs in the National Action Plan have been prioritized for urgent implementation in order to minimize potential risks to public health and the environment as soon as possible. The two prioritized programs are:

- 1) *Developing the Technical Guidelines on the Environmentally Sound Management of Used Lead Acid Batteries* – that is, drafting the Guidelines and the public information pamphlet on the ESM of ULAB that follow the Basel Technical Guidelines, disseminating this information and explaining to stakeholders and communities the significance of the advice and guidance.
- 2) *Training courses and seminars on the Environmentally Sound Management of Used Lead Acid Batteries* – that is, increasing the awareness and knowledge among those people involved in the recovery of ULAB, such as government staff, professional persons and those members of the public with jobs or responsibilities relevant to either new or used lead acid batteries.

As Cambodian people have a relatively low awareness of the potential threats posed by poor recovery procedures for ULAB and little understanding of the measures necessary to achieve the ESM of ULAB, it requires more time and greater resources from responsible institutions to disseminate information and educate stakeholders and local communities to follow the National Action Plan.

³ Through its life cycle

⁴ www.ilmc.org

1.0 NATIONAL BACKGROUND INFORMATION

1.1.0 Physical Geography

The Kingdom of Cambodia is the official title of Cambodia and this designation was determined during the 1990s. The KoC lies in Southeast Asia in the Southwestern part of the Indo-Chinese peninsula. It is located between latitudes 10° and 15° North and longitudes 102° and 108° East in the Tropical North, and covers an area of 181,035 Km². The KoC shares its 2,438 km border with Thailand, Laos PDR, and Vietnam. The country's maximum extent is about 580 km from east to west and 450 km from north to south. The total boundary of the country is 2,600 km of which approximately $\frac{5}{6}$ is land and $\frac{1}{6}$ is coastline. Approximately 86% of the total land area lays within the Mekong Catchment (MRC, 1998).

The Cambodian physical land features and geology varies from region to region. A geological depression from the northwest to the southwest formed old bay and the Mekong River carried sedimentation during the diluvia and alluvial epoch. Then, highlands and hills were flattened and the present landscape was formed. The significant geological characteristics of the mountains are Metamorphic rock from the Proterozoic era, and sedimentary rock from the Andesite, Basalt, Paleozoic and Mesozoic eras.

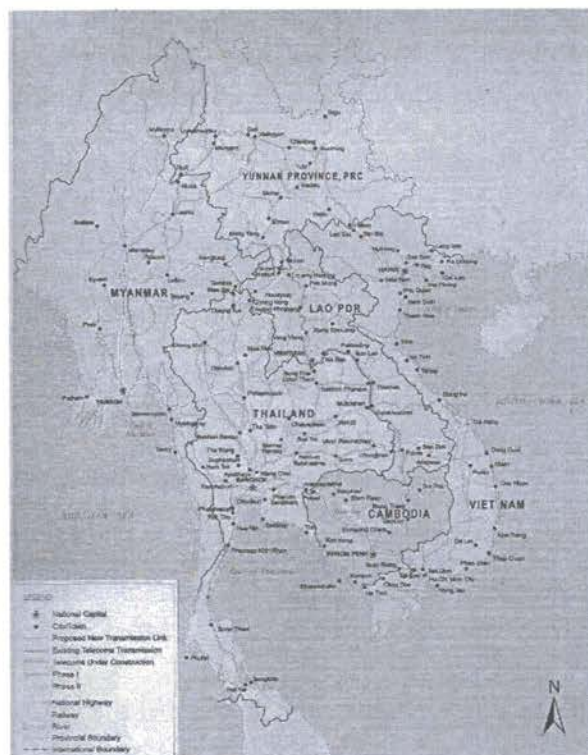
The geographic characteristics of Cambodia can be divided into five distinct types, such as the central plain, the northern mountains, the eastern highlands, the southwestern mountains, and the southern coastal region. Respective types are indicated below.

a) Central plain

The central plain of Cambodia is a low-lying alluvial plain surrounding the Tonle Sap Great Lake area and the Mekong River delta lies to the southeast of the plain. This region occupies most of the central part and it dominates the country. Transitional plains extended outwards from this region with thinly forested elevated areas no more than a few hundred metres above sea level.

b) Northern Mountains

Along the Cambodia-Thai border to the north, the Cambodian plain abuts a sandstone escarpment that marks the southern limit of the Dangrek Mountains. A southward facing cliff stretching for more than 300km from west to east rises abruptly from the plain ranging from 180 to 550 meters high.



Pic. 1.1: Location of Cambodia in Southeast Asia

c) Eastern Highlands

To the east of the Mekong River, the transitional plains merge with the eastern highlands and extend into Laos PDR and Vietnam. This is a region of mountains and plateaus with tremendous forests.

d) Southwestern Mountains

In the southwestern part of Cambodia, there are two distinct mountain ranges, namely, (i) the Cardamom Mountains, and (ii) the Elephant Mountains. These two mountain ranges form another region extending in large areas of land between the Tonle Sap and the Gulf of Thailand, keeping a physical barrier along the country's coast line. Mount Oral at 1,813 meters is the highest mountain in Cambodia and is located in this area.

e) Southern Coastal Region

The southern coastal region facing the Gulf of Thailand is a narrow lowland strip that is heavily wooded and sparsely populated. This area is separated and isolated from the central plain by the southwestern highlands.

1.2.0 Topography and Administrative Boundary

Topographically, Cambodia is a large, low-lying alluvial plain that surrounds the Tonle Sap Great Lake and this central area dominates the country. According to above geological characteristics and this topography, Cambodian territories are classified into the following categories and provinces as shown in the table below.

Table 1.1: Classification of Cambodia's Natural Regions by Provinces and Cities

Natural Regional Classification	Number of Provinces/cities	Name of Provinces/Cities
Plain	6	Phnom Penh, Kandal, Kampong Cham, Svay Rieng, Prey Veang, and Takaev.
Tonle Sap	8	Kampong Thum, Siem Reab, Bat Dambang, Pousat, Kampong Chhnang, Banteay Mean Chey, Otdar Mean Chey, and Krong Pailin.
Coastal	4	Krong Preah Sihanouk, Kampot, Krong Kaeb, and Kaoh Kong.
Plateau and Mountain	6	Kampong Spueu, Stueng Treng, Rotanak Kiri, Mondol Kiri, Kracheh, and Preah Vihear.

Source: National Institute of Statistics, MoP; Cambodia, 1998.

Phnom Penh is the Capital of Cambodia with the total land area of 290.06 km². According to the General Population Census of Cambodia in 1998, the population numbers in the Phnom Penh Municipality are 999,804 with a population density of 3745 persons per square kilometer.

1.3.0. Weather

1.3.1 Climate

The climate of Cambodia is typically hot and humid. It is influenced by some factors including: (i) the fact that the location is in the Inter-Tropical Convergence Zone; and (ii) the monsoon which has two distinct seasons:

- ❑ The dry season is from November to April and is associated with the northeast monsoon, which sends drier and cooler air throughout the country.
- ❑ The rainy season is from May to October during which time the rainfall is largely derived from the southwest monsoon drawn landward from the Indian Ocean.

1.3.2 Temperature

Generally, temperatures can vary depending on the three climatic zones:

- ❑ Coastal and mountainous areas – temperatures are generally high with little variation between seasons. The temperature can go below 20°C during the coldest month.
- ❑ Central plain – temperatures are generally also high with little variation between seasons. Monthly temperature ranges from 25°C in January to 40 °C, but is rarely higher than 40°C in April, the warmest month before the commencement of the rainy season. The coldest temperature can be lower than 15°C in December and January. The mean temperature is approximately 25 °C. Because of changing natural phenomena, in a few recently years, the temperature has been noticeably high and over 40°C between April and May causing hardship for those living in both urban and rural areas.
- ❑ Northern and North-eastern areas – the temperatures are high during the hottest month and the mean temperature is normally 25°C in the lowlands and 20°C in the uplands.

1.3.3 Humidity and Evaporation

The humidity and rates of evaporation changes with the seasons. The most humid month is July whilst the driest month is February. Generally, the humidity ranges between 65 to 70% in January and 85 to 90% in August. Annual evaporation is taken to be 2,000-2,200 mm. The highest evaporation occurs in March and April at 200-240 mm and lowest evaporation in September at 120-150 mm.

1.3.4 Rainfall

The annual rainfall varies from region to region. In the lowland area around Tonle Sap Great Lake, the annual rainfall ranges between 1,200 to 1,900 mm. In the Eastern region of the Mekong River, rainfall is generally between 1,800 to 3,000 mm. The heaviest rainfall, over 3,000mm per year, occurs along the coastal lowlands in the west. Lowest rainfall occurs in the “rain shadow” region of the Elephant Mountains and the Cardamom Mountains in the southwest and western regions (Kampong Spueu, Koh Kong and Pousat Provinces). The average annual rainfall over most of the country is between 1,000 and 2,500 mm. Precipitation also varies widely from year to year. From the latter part of July there may be periods without significant rainfall for ten or fifteen days or more at on occasions, referred to as the “short dry season” (farmers tends to delay planting on this account to minimize to risk of damage to rice or crop seedlings) (FAO-1994).

1.4.0 Hydrology

Cambodia's unique hydrological regime is a consequence of the Mekong River/Tonle Sap system. The section of the Mekong River, namely Khone Falls, is quite complex in its hydraulic performance. There are extensive floodplains, a complex delta and the well-known Tonle Sap Great Lake.

During the dry season, the flow of the Mekong River is at its lowest and is contained completely within the channel. At this time the Tonle Sap Great Lake will also have reached its lowest level and will only be a meter or so deep. As the monsoon rains commence, the river level starts to rise and floods the wetland close to the Mekong River, and local inflow also commences. As the level of the Mekong River at Phnom Penh continues to rise; the flow in Tonle Sap reverses and water flows from the Mekong River in Tonle Sap River, joining with local runoff to fill the Tonle Sap Great Lake to a depth of around 10 meters.

The flow into the Tonle Sap Great Lake continues for several months until the start of the dry season. The flow in the Mekong River gradually decreases until the Mekong water's level at Phnom Penh is lower than the water's level in the Tonle Sap Great Lake. The flow in Tonle Sap then reverses, and starts flowing toward Phnom Penh where it supplements the flow in the Mekong River. The flow in the Tonle Sap continues until, at the end of the dry season. The depth of the Tonle Sap Great Lake is again lowered to around one meter.

As the Tonle Sap Great Lake fills, both from the Mekong River and from local inflow, it increases in area from about 3,000 km² at the end of the dry season to about 16,000 km² at the end of the wet season. The Table 1.2 below indicates the sources of water that flood and flow into the Tonle Sap Great Lake.

Table 1.2: Water Sources that Flood or Flow into the Tonle Sap Great Lake

Sources of flooded water	Percent %
Mekong River	62
Local Inflow	38
Total	100

Source: Mekong River Commission (MRC, 1998)

The unique hydrological system is central to the national economy that supports fisheries, agriculture and water transportation. The inundation of the flooded forests surrounding the Tonle Sap Great Lake during the wet season brings a huge amount of external organic matter into the aquatic system resulting in plankton blooms and surges in fish productivity. Substantial fish migrations from the Tonle Sap Great Lake during the dry season help to restock fisheries in the MR and in many tributary rivers. Whereas soil fertility is generally poor in most of the country, the annual flooding of agricultural land leaves the soil close to the Mekong River's basin very fertile.

1.5.0 Economic Profile

1.5.1 Economic Reform

Any analysis of Cambodia takes into account the recent political history. The country was subjected to domestic unrest, insurgency, civil war, and massive population dislocation during the period 1969 to 1991. From 1975 to 1979 the cities themselves became the symbols of a way of life antithetical to the regime in power and were forcibly evacuated. Only after the 1991 Paris Peace Accords and the two years of UN transitional administration did the country begin return to normalcy.

Political strife has abated, the economic is stabilizing, communities are slowly being rebuilt and political and administrative reforms are in the making. However, Cambodia remains one of the poorest countries in the world. According to the 1994 UNDP Human Development Report, with a

per capita income of US\$252 per year, Cambodia is ranked 147 out of 173 countries in the world. This per capita income changed to US\$ 300 in 1996 (Ministry of Finance, 1996).

Over one third of the population lives below the poverty line and 90% live in rural areas. Human and physical capital has been depleted by decades of conflict, resulting in severe capacity constraints, and social indicators are among the worst in the region. Social capital, destroyed by years of civil war, has to be restored and trust in public institutions reestablished. The growth of private businesses and a sustainable utilization of natural resources, essential for Cambodia's medium and long term growth perspective, is still constrained by low capacity, both individually and institutionally, poor infrastructure, limited access to credit facilities and a weak regulatory framework.

1.5.2 Economic Overview

As mentioned above, the Cambodian economy was virtually destroyed during the year of civil war from the 1970s to 1990s, which adversely affected the national economy and it fell from year to year from the whole of that period. As an example, rice was imported in 1974 under wartime conditions, while agricultural production of the most profitable export items, like rice, rubber, fisheries, crops, etc., plunged sharply. In addition, the civil war also disrupted Cambodia's fledgling manufacturing industry and severely damaged the infrastructure.

After the Khmer Rouge regime was toppled in the dawn of 1979, over 80% of Cambodians started to resume their lives as farmers, though mostly at a subsistence level. By the mid-1990s, Cambodia once more achieved self sufficiency in rice production and some other crops as well. Cambodia began to export small quantities of products such as rice, vegetable crops, timber wood, fish, etc. Furthermore, the country's infrastructure was upgraded step by step during the 1990s with the support of international organizations and donor countries. Based on the Royal Government's Policy towards the rural development, to date the infrastructure is being restored satisfactorily.

In the National Economic Development Plan, agriculture, forestry and fisheries are recognized as the high priority sectors for Economic Development, based on the existence of abundant natural resources. The table below indicates the gross domestic product (GDP) by economic activity.

Table 1.3: GDP Composition and Annual Growth (in per cent per year)

Real GDP % share (at current prices)	Year								
	1993	1994	1995	1996	1997	1998	1999	2000	2001
Agriculture	40.9	41.9	46.2	41.7	42.2	41.9	40.4	35.6	31.9
Industry	12.7	13.0	13.0	14.6	16.0	17.2	18.4	22.7	24.4
Service	43.5	39.9	36.6	38.7	37.4	36.6	37.0	37.7	43.6

Source: Ministry of Economy and Finance; National Bank of Cambodia; National Institute of Statistics/ Ministry of Planning

1.6.0 Population

In 1990, the population was estimated to be about 9 million with a growth rate of between 2.5-3.0% per year and 88 % of the population lived in the rural areas. With the support of UNFPA and in conjunction with the Royal Government and Royal Decree (Kret) No. JS/RKT/02-96/08, "Census '98 for development" was launched on March 3 and ran through to March 12, 1998. The exercise

was based on the General Population Census of Cambodia dated February 29, 1996. The outcome of the exercise showed that the 1998 population had grown to 114,437,656 persons. Among this number were 5,511,408 males and 5,926,248 females (*see Table below*) with a growth rate 2.49%. This means that the population will be about 20 million by the 2020's.

Table 1.4: Area, Population, and Numbers of Districts/Communes/Villages by Natural Regional Classification

No.	City/Province	Area (km ²)	Population	Districts	Communes	Villages
Plain Region						
1	Phnom Penh City	267	999,804	7	76	637
2	Kandal	3,591	1,075,125	11	147	1,087
3	Kampong Cham	9,799	1,608,914	16	173	1,748
4	Svay Rieng	2,966	478,252	7	80	690
5	Prey Veng	4,883	946,042	12	116	1,136
6	Takeo	3,563	790,168	10	100	1,116
Tonle Sap Region						
7	Kampong Thum Province	13,814	569,060	8	81	737
8	Siem Reab Province	15,271	696,164	12	100	882
9	Battambang Province	10,433	793,129	12	89	611
10	Pou Sat Province	12,692	360,445	6	49	495
11	Kampong Chhnang Province	5,521	417,693	8	69	546
12	Banteay Mean Chey Province	9,937	577,772	8	63	604
Coastal Region						
13	Sihanoukville City	868	155,690	3	22	85
14	Kampot Province	5,209	528,405	8	92	477
15	Kep City	335,80	28,660	2	5	16
16	Koh Kong	11,160	132,106	8	32	127
Plateau and Mountain						
17	Kampong Spueu Province	7,017	598,882	8	89	1,319
18	Stueng Treng Province	11,092	81,074	5	34	128
19	Ratanakiri Province	10,782	94,243	9	50	240
20	Mondulkiri Province	14,288	32,407	5	21	98
21	Kratie Province	11,094	263,175	5	46	257
22	Preah Vihear Province	13,788	119,261	7	49	204
23	Otdor Mean Chey Province	6,158	68,279	4	18	108
24	Pailin City	803	22,906	2	8	58

Source: 1) General Population Census of Cambodia 1998: Final Census Results

2) Cambodia Statistical Yearbook 2000; Ministry of Planning

2.0 USED LEAD ACID BATTERY PROJECT

2.1.0 Background to the Project

The Project on “*The Environmentally Sound Management of Used Lead Acid Batteries in Cambodia*” is a prioritized project of the SBC focusing on toxic and HW and the negative affects to human health and the environment.

- The SBC has initiated projects to prepare inventories of ULAB in the Caribbean, Central America, Venezuela and Colombia.
- Cambodia is the first country in Southeast Asia to receive support for a project for a ULAB survey to compile an National inventory from the SBC.

Cambodia signed the BC on 02 March 2001. In 2002, the MoE made a project proposal to the SBC, namely, “*The Environmentally Sound Management of Used Lead Acid Batteries in Cambodia*” and received approval from the SBC in 2003. The project was started early in December 2003, and was expected to finish in late August 2004 as scheduled under the close collaboration and technical assistance from Mr. Brian Wilson, an expert of the ILMC. But due to financial problems, this schedule was extended to April 2005.

2.1.1 ULAB Management Situation in Cambodia

In Cambodia there is no formal information or data that specifically addresses the correct procedures for ULAB collection, transportation, recycling and related environmental and health impacts resulting from:

- Battery recharging and reconditioning;
- ULAB storage; and
- ULAB recycling and residue disposal.

National data on the consumption of lead acid batteries and ULAB generation is not readily available. Certainly, ULAB are collected by scavengers in local communities for either recycling locally or for transport to adjacent countries, such as Vietnam, as the market demands.

Currently, there is no specific government institution paying much attention to the management and recycling of ULAB and its residues, because ULAB are not disposed of at dumpsites in Cambodia, but are collected by scavengers for recycling and their awareness of health and environmental impacts is limited.

According to the following legal instruments, the MoE has an important role to play in the management and recycling of ULAB:

- Law on Environmental Protection and Natural Resources Management;
- Sub-Decree on Solid Waste Management;
- Sub-Decree on Water Pollution Control; and
- Sub-Decree on Air Pollution Control and Noise Disturbance.

The MoE has resolved a few cases where communities have complained about ULAB recycling with some illegal activities being terminated and some others shutting down themselves. However, no survey or analysis of environmental and human health impacts resulting from the following activities has been undertaken:

- Lead acid battery recharging, servicing and/or reconditioning;
- ULAB storage; and
- ULAB recycling and residue disposal.

2.2.0 MOU between SBC and MoE of Cambodia

The MoE of Cambodia and the SBC signed an MOU in 2003 for implementing the project on "The Environmentally Sound Management of Used Lead Acid Batteries in the Kingdom of Cambodia". The MOU was focused on:

- Undertaking a diagnosis and assessment of ULAB in the KoC with three stages: (i) a desk-top study; (ii) technical field work; and (iii) a workshop.
- MoE will prepare a National Action Plan for the environmentally sound management of ULAB assisted by the expert on recycling lead acid batteries.
- Finally the whole process will be used to provide technical training on diagnosis, assessment and formulating recycling plans for generic waste streams.
- The Department of Pollution Control of the MoE assisted by the appointed consultants (one expert on lead acid batteries and one training expert) shall carry out the following tasks:
 - *Task One* - Making use of the Briefing Notes and Questionnaires for the Desk-top Study and Technical Study for the collection of the information required for the completion of the assessment phase, undertake a diagnosis and assessment of lead acid batteries in Cambodia:
 - i) Desk-top study;
 - ii) Technical field study; and
 - iii) Technical Report.
 - *Task Two* – submit an interim Technical Report to the Secretariat by Memorandum.
 - *Task three* – consolidate and discuss the findings of the diagnosis and assessment so as to prepare a national recycling plan for used lead acid batteries.
 - *Task Four* – prepare a national recycling plan for used lead acid batteries.
 - *Task Five* – stakeholder consultation of the draft plan.
 - *Task Six* – organize training and a transfer of knowledge on hazardous waste inventories so that the Ministry of Environment can undertake inventories of other waste streams.
 - *Task Seven* – submit a final report, before the end of a 9 month period from the inception of the project, which includes the national recycling plan for used lead acid batteries and a set of generic guidelines to assist in applying the process of diagnosis and planning to other waste streams.

2.3.0 Objectives and Outputs of the Project

The objectives and outputs of the Project “*The Environmentally Sound Management of Used Lead Acid Batteries in Cambodia*” are summarized below.

2.3.1 Project Objectives

As stipulated in the Memorandum of Understanding (MOU) agreed between the MoE and the SBC, the main objectives of the project include:

- ❑ The Identification of the consumption flows of lead acid batteries, ULAB management and recycling, and any subsequent harmful effects on the environment and human health.
- ❑ The Identification of data and information gaps and procedures to improve the methodology towards the sound management and recycling of ULAB and the legal instruments that will support ESM.
- ❑ The preparation of a National Action Plan for managing ULAB recycling based on ESM that builds on support and participation from interested government agencies and the private sector.
- ❑ Increasing the knowledge and environmentally sound methods of ULAB management to the staff of concerned ministries/institutions and the private sector including recycling, domestic and transboundary ULAB transportation.
- ❑ Securing strong support from the Royal Government of Cambodia from those concerned ministries and full public participation.

2.3.2 Expected Outputs

Based on the achievements of the above project objectives, the expected outputs would be:

- ❑ Decision makers, the staff of concerned ministries, line agencies and the public will be more aware of the usefulness of environmentally sound recycling of ULAB and that is another key issue in applying the Royal Government Policy for poverty alleviation, especially as this project will identify and negate the adverse effects resulting from unsound management and recycling of ULAB.
- ❑ The outcomes of the survey as well as the comments and suggestions from stakeholders will be considered in the preparation of the National Action Plan for managing and recycling ULAB based on environmentally sound practices.
- ❑ Full support from the Royal Government of Cambodia, those concerned institutions and public participation, including NGOs.

2.4.0 Project Coordinating Unit, Steering Group, International Consultant/Trainer and Project Operational Organization

2.4.1 Project Coordinating Unit

The project coordinating unit (PCU) was based at the Ministry of Environment (MoE). Three technical staff of MoE were selected to implement the project⁵, namely:

⁵ Their tasks were implemented based on the MoU of the Project

- 1) Project Team Leader– Mr. Chrin Sokha, Deputy Director;
- 2) Project Researcher– Mr. Ken Choviran, Office Chief ; and
- 3) Field Engineer– Mr. Sreng Sophal, Vice Office Chief

2.4.2 Steering Group Component

Members of the Steering Group were drawn from concerned ministries and line institutions as follows:

- 1) H.E. Khieu Muth, Director General, MoE
- 2) Ms. Prak Piset Rangsey, Director of Health Prevention Department, MoH
- 3) Mr. Chhay Sokhorn, Director of Law and Consul Department, MFAIC
- 4) Mr. Srun Sokhom, Deputy Director, Department of Agronomy and Land Improvement, MAFF
- 5) Mr. By Pitou, Office Chief, MIME
- 6) Mr. Bun Ngoung, Deputy Director, MPWT
- 7) Mr. Srey Serewat, Deputy Director, MPWT
- 8) Mr. Klok Chourn, Deputy Director, Department of Kamcontrol; MoC
- 9) Mr. Chroeng Davanara, Deputy Director, MoI
- 10) Mr. Chea Hak, Office Chief, Department of Customs; MoEF
- 11) Mr. Heng Laiorn, Governor, Phnom Penh Solid Waste Management, Phnom Penh Municipal Authority

This steering Group had their roles to participate the project implementation defined as outlined below:

- To attend the meetings or workshop in order to find out about appropriate countermeasures at national and international levels based on national and international legal instruments.
- To provide information and data relevant to the ULAB survey and sources of ULAB generation.
- To facilitate and cooperate with the Task Team who conducted the ULAB survey and determined the possible and various harmful effects resulting from ULAB recycling and disposal at designated sources.
- To review and provide comments or suggestions on a draft National Action Plan for managing and recycling ULAB, including provisions to provide more support for the draft plan.

2.4.3 International Consultant and Trainer

- A. As stipulated in the MoU, the SBC would provide additional support to Cambodia for carrying out the project to meet the agreed outputs. The additional support was provided by an international consultant and a trainer. The International Consultant's tasks included:
 - To review a draft National Action Plan prepared by the Task Team;

- Assisting the Task Team in preparing survey questionnaires and dealing with the ULAB survey results;
- To review the technical reports to ensure compliance with BAT and best practices;
- To provide capacity building and development to the Government staff responsible for ULAB recovery and reuse.

Mr. Brian Wilson of the ILMC, is the LAB and ULAB Recycling Expert working with the UNEP/SBC who provided extensive assistance and guidance to the PCU in the preparation of, (i) the Project Work-plan; (ii) relevant questionnaires for both the Desktop study and Field surveys; (iii) the National workshop on "ULAB Inventory in the Kingdom of Cambodia" in May 2004 and the subsequent report; (iv) the draft National Action Plan for ULAB management in Cambodia; and (v) the National seminar on *"The Dissemination of the Project Operational Outcomes on the Environmentally Sound Management of Used Lead Acid Batteries in the Kingdom of Cambodia"* held in the middle April 2005. Additionally, he provided valuable comments to PCU in the preparation of the project final report.

B. The international trainer was required to:

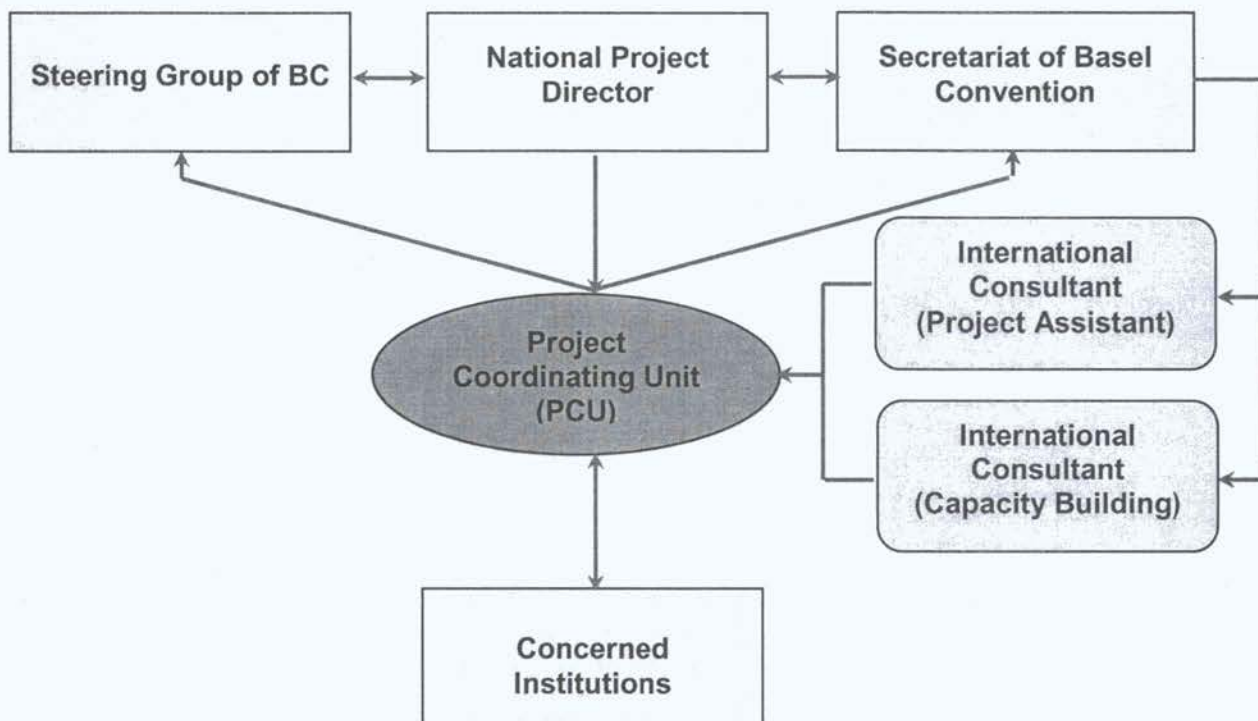
- Coordinate with the PCU to prepare and conduct the training related to ULAB management; and
- Evaluate the awareness of participants who attended the training course and submit a report to the PCU and the SBC.

Mr. John Dickie, an expert from New Zealand was selected as the SBC International Trainer to be engaged in the Cambodian training sessions on the ESM of ULAB. Based on the Cambodian ULAB management's view, his sessions would include:

- The findings from the Cambodian program to date (including an overview of the outcomes and recommendations of the May Workshop);
- Industry perspectives (LAB suppliers; ULAB collectors/exporters) and relevant institutional structures;
- International and Cambodian Context;
- Technical Aspects about the management of ULAB;
- Relevant hazardous waste management practices pertinent to ULAB; and
- Further discussions on respective training themes

2.4.4 Project Operational Structure

The diagram below shows the inter-relationships necessary between the PCU and the other concerned ministries, line agencies, and the SBC to accomplish the ULAB project in Cambodia.



Pic. 2.1: Project operational structure

2.5.0 Project Scope

The major activities were implemented on the basis of the MOU and the TOR for the project. The activities required under the terms of the MOU were: (i) desktop study and field survey; (ii) Submitting an interim report for ULAB management and the environmental and human health Impacts; (iii) to hold a national workshop for the dissemination of the results of the desktop study and the field survey; (iv) and (v) prepare, adopt and disseminate a draft National Action Plan; (vi) build ULAB related management capacity; and (vii) submit a final report to the SBC.

2.5.1 Desktop study

To conduct a **Desktop Study** to collect and analyze any related information in order to identify and the scope of the project and information gaps:

- ❑ Importation and distribution of batteries and leaded products by retailers according to consumer demands.
- ❑ Practical experiences of collecting, storing, transporting and recycling of ULAB throughout the country.
- ❑ Environmental legal instruments and their current implementation within the public and private sectors.
- ❑ The potential occupational health and environmental impacts caused by lead acid battery recharging/servicing/reconditioning and recycling of ULAB and any residue disposal.

In this phase, the PCU members fulfilled relevant tasks as indicated bellows:

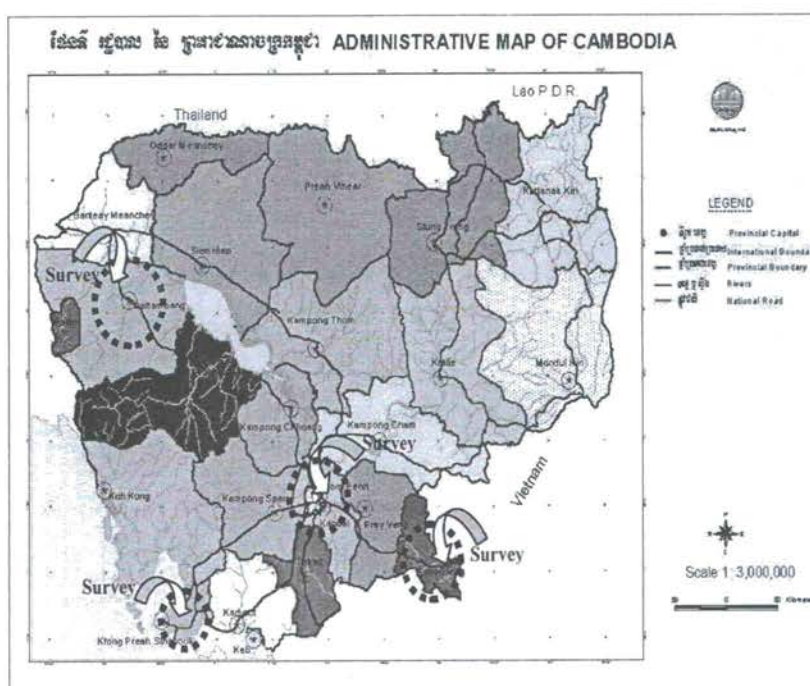
- Collect, by using the Briefing Notes and Draft Questionnaires for the desktop study the necessary information to prepare the Desktop study.
- The scope of the collected information will follow the Questionnaires for the Desktop Study included:
 - Battery related national lead supply and demand
 - Collection and transport of ULAB
 - ULAB Recycling facilities
 - Trade in both new LAB and ULAB
 - Legislation – in particular laws relating to ULAB
- Collected specific information included:
 - Consumption volume of lead acid batteries
 - Annual UALB generation
 - Export and import of lead scrap material including ULAB
 - ULAB collection schemes and recycling facilities (including the structure of the industry)
 - Environmental and occupational performance related to the recovery and recycling of used lead acid batteries

2.5.2 Field Survey

According to an agreement between the Secretariat of the Basel Convention, the ILMC and Cambodia's Environment Ministry, the field survey of ULAB was conducted at designated cities and in the provinces. These survey areas were selected on the basic concept of comparing the ULAB situation in areas of high living standards in the cities and low living standards in the rural areas of the country. The selected designations were Phnom Penh City, Sihanoukville City, Battambang Province, and Svay Rieng Province.

The designated sources for the survey included battery retailers and related lead acid battery occupations, battery recharging/servicing/reconditioning shops, waste collection yards, ULAB recycling handicraft/places, areas/places that used LAB to store solar energy, for example, schools, pagodas, public parks and a Telecoms Company. For the field survey, the team had the following tasks:

- Collecting the relevant information and data concerning the ESM of used lead acid battery management in the country by using the Briefing Notes and Draft Questionnaires for the Technical Study (ANNEX-1a, 1b, 1c, 1d, 1e).



Pic. 2.2: The Kingdom of Cambodia showing the Survey Areas

- ❑ Compiling the available information disposal costs as well as direct and indirect expenses in case any lead operations have been or are carried out in the country.
- ❑ Preparing and carry out the field visits and plant assessments that are necessary for completing the above tasks.

The scope of the information collected in the recycling plans followed the Questionnaires for the field study and included (i) retail, collection, storage, transport of ULAB; (ii) environmental interviews relevant to LAB/ULAB occupations; (iii) ULAB management processes; (iv) occupational health; and (iv) awareness and attitudes

2.5.3 Identification of impacts and priority concerns related to LAB /ULAB

The main cause of the environmental and health threats arising from current practices are the release of hazardous and toxic materials from ULAB and obnoxious gas emissions during battery recharging and certain illicit recovery operations. Depending on the phase of the LAB life cycle and the activity, the materials released into the environment include lead oxides, lead sulfates, dilute sulfuric acid and toxic residues. These “unfriendly” activities are all contributors to the pollution of the soil, aquatic ecosystems, and sometimes, domestic air quality as well.

Besides the LAB recharging and ULAB recycling, the storage of ULAB in homes, workplaces and children’s playground areas has resulted in large amounts of lead and acidic substances accumulating in places readily accessible to young children and worker’s families. These small stockpiles might be a risk to them and the local communities if the batteries develop leaks or are used for purposes other than providing portable power.

2.6.0 Project Work-Plan

It was a new task for Cambodia to prepare a National Action Plan for managing ULAB based on ESM. To do it, Cambodia firmly required assistance and supports from the SBC and international consultants, although Cambodia did undertake some of the conventional tasks.

According to the project TOR and the advice of Mr. Brian Wilson – an expert of ILMC/SBC, the PCU could set up the project work plan from December 2003 and to finish in September 2005 (for more detail see ANNEX-2). As mentioned earlier, a lack of funds to implement the work plan meant that the PCU could not finish the project as scheduled, but had to wait for additional support from the SBC. The PCU finished the project in April 2005.

2.7 0. Obtain Data / Information

The number of ULAB generated annually for recycling in Cambodia and the numbers exported were estimated through a desktop study that collected and collated available data from Government agencies such as: the MoE; the Ministry of Economics and Finance (Department of Customs), the Ministry of Commerce, and the Ministry of Public Works and Transport.

The quantities of ULAB generated and recycled annually were calculated from the following data:

- Motor vehicles licensed annually;
- New and foreign used vehicles licensed annually;

- Average lifetime of automobile batteries – locally based data; and
- Year when battery was last changed.

Table 2.1: Vehicles Licensed in Cambodia

Year	Type of Vehicle Licensed	No. of Vehicles(No. of Batteries per vehicle)	Total No. of batteries
1999	Truck	857 (1)	857
	Trailer	32 (1) ^x	32
	Omnibus	56 (2) ⁺	112
	Minibus	56 (2) ⁺	1008
	Car	8,072 (1)	8,072
	Motorcycle	20,147 (1)	5037 [♦]
Total		30,172	15,118
2000	Truck	636 (1)	636
	Trailer	2 (1)	2
	Omnibus	39 (2)	78
	Minibus	657(1)	657
	Car	7,894 (1)	7,894
	Motorcycle	24,796 (1)	6199 [♦]
Total		34,024	15,466
2001	Truck	626 (1)	626
	Trailer	3 (1) ^x	3
	Omnibus	71(2) ⁺	142
	Minibus	593 (1)	593
	Car	6,117 (1)	6,117
	Motorcycle	43,690 (1)	10,923 [®]
Total		51,100	18,404
2002	Truck	1,189 (1)	1,189
	Trailer	81 (1)	81
	Omnibus	182 (2)	364
	Minibus	903 (1)	903
	Car	7,510 (1)	7,510
	Motorcycle	16,956 (1)	4,239 [®]
Total		26,821	14,286

Source: Statistics of Vehicles Registered, 2004; Ministry of Public Works and Transport

The total number of ULAB estimated to be recycled annually was calculated, based on data obtained from the survey of local populations on:

- Average lifetime of automobile batteries by user – 1 year for cars

^x One battery is used

⁺ Two batteries are used

[®] 1 motorcycle battery = 0.25 mass of typical automotive battery

- b) Last year of change of battery by vehicle – Approximately 50% of registered vehicles replace the batteries every year

The estimated total batteries to be recycled per annum including as follows:

- i) *In year 1999* – Estimated number of batteries available for recycling were:
 $0,5 \times 15,118 = 7,559$ units

At an average of 51 wt.% Pb (as metallic lead plus Pb compounds) per battery, each battery is 11,5 kg, so total lead content for recycling is 44,333 kg.

- ii) *In year 2000* – Estimated number of batteries for recycling: $0,5 \times 15,466 = 7,733$ units

At an average of 51wt.% Pb (as metallic lead plus Pb compounds) per battery, each battery is 11,5 kg, so total lead content for recycling is 45,354 kg.

- iii) *In year 2001* – Estimated number of batteries for recycling: $0,5 \times 18,404 = 9,202$ units

At an average of 51wt.% Pb (as metallic lead plus Pb compounds) per battery, each battery is 11,5 kg, so total lead content for recycling is 53,969 kg.

- iv) *In year 2002* – Estimated number of batteries for recycling: $0,5 \times 14,286 = 7,143$ units
At an average of 51wt.% Pb (as metallic lead plus Pb compounds) per battery, each battery is 11,5 kg, so total lead content for recycling is 41,894 kg.

2.7.1 Flow of LAB

This section provides an overview of the relevant sources of battery and related material sale outlets, recharging and conditioning shops, solar energy power supplies and telecoms companies that were surveyed by the PCU.

a) Battery Sales Outlets

Small automotive battery retail outlets in the remote and downtown areas of Cambodia are selling new lead acid batteries for trucks, cars, motor cycles and domestic use (burglar alarms, back up systems, and so on).

The respective LAB shops had a stocks of 100 to 400 brand new batteries with different a power storage capacities and imported from various countries, e.g. Vietnam, Japan, South Korea and Thailand.

Local people in Cambodia make some battery components and these can be seen in picture No. 2.3. All the batteries on sale were good quality and branded names. The majority of the batteries appeared to be made with the latest maintenance free technology using lead/calcium alloys grids. Sales varied, but on average, the shops would expect to sell from 10 to 20 batteries per day in the downtown areas and 1- 5 in the remote areas of the provinces.



Pic. 2.3: Typical view of a battery shop in a remote and a downtown area

Generally, shops did not take a ULAB in exchange for new battery sale and the customer was expected to take the ULAB with him or her when they left the shop. In the event that a ULAB was left on the premises, it would be removed by one of the many scavengers. At present, ULAB are not returned to sales outlets because there is no incentive for the buyer and there is limited storage place at the shops.

The shops also service batteries, that is, the staff will test a battery to determine whether it needs to be replaced, topped up with deionized water or recharged. Many batteries in use still require the caps to be removed when being charged to permit the gases given off to escape to atmosphere. In some instances during charging the electrolyte can spill out of the top of the battery as the electrolyte “bubbles” fiercely. In these instances, and when batteries are being topped up, the owner places the battery in a small bunded area specially built to put the batteries in when being serviced to prevent spillage onto the paved area outside the shop. Usually, the shops had sufficient recharging units for about 20-50 batteries and capacity up to 100 batteries in rural areas where energy supply cannot be accessed and there is high demand during certain seasons.



Pic. 2.4: Local battery selling shop with recharging service

b) Recharging and reconditioning of LAB

Battery recharging shops located in remote and downtown areas of Cambodia were engaged in servicing and reconditioning batteries and collecting ULAB for resale to the waste recyclers.

At present, ULAB collection is not a good business because the battery users are selling ULAB directly to the scavengers who will always come to their home to collect any ULAB. Generally, there are only 1 or 2 ULAB that can be bought from battery users every 2 to 3 months. There is only a small minority of shops reconditioning the ULAB, because the users prefer to sell the ULAB to a scavenger than pay for reconditioning. The battery charging aspect of the business has been declining in the downtown areas due to the increasing number of homes with a direct and reliable supply of electricity. On other hand, it had been increasing dramatically in the remote areas due to the increasing number of TVs, domestic lighting and other demands such as catching fish by electrocution and rat catching in the rice fields.

Forty to one hundred 12 volt automotive batteries are charged in series daily in the remote areas (see pictures below). Usually, a diesel generator is used to produce a DC current to recharge the batteries, especially in the remote areas, and this takes about 5 to 8 hours depending on number of batteries to recharge, the types and sizes. Normally battery acid consumption, to top up the electrolyte, is about 10 to 60 liters per month. Once recharged, a battery should normally last for 3 days, sometimes 5 days depending on the recharging technique, the demand on the battery, and the battery's age and quality.



Pic.2.5: Typical a battery recharging shops in the downtown and remote areas

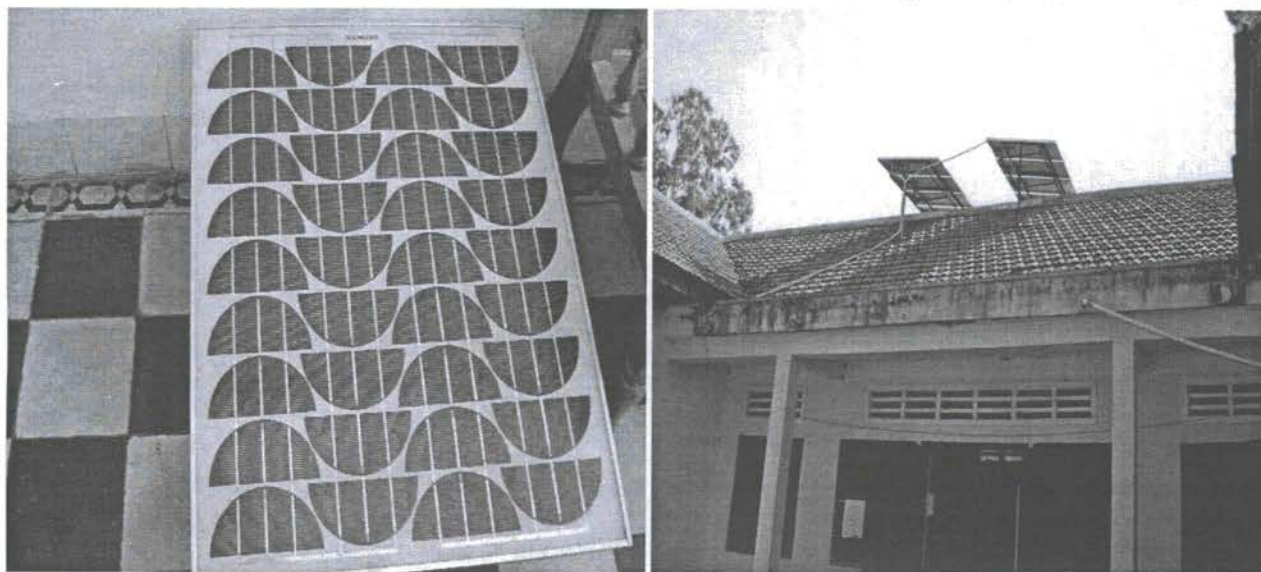
c) Solar Energy Power Supply

Solar energy Remote Area Power Supply units (RAPS) have only recently been introduced in Cambodia due to the cost of the equipment. Consequently, only a few RAPS units have been installed by local people. Mostly they have only been installed with government assistance or through international organizations or NGO aid programs at public schools, parks, municipal buildings and bridges.

The RAPS consists of solar panels that convert sunlight into electrical power to charge specially designed deep discharge lead acid batteries. Generally, these batteries are used to provide AC electrical power for lighting, TVs, computers and other IT equipment in place of the mains or grid electrical supply when it is unavailable. Most of the deep discharge lead acid batteries are good branded names from Germany and Japan. To date, around 10,000 such batteries have been imported into Cambodia by local private companies. These batteries are 50A, 70A, 100A, 120A and 200A

and normally have an average life from 10 to 15 years, but in Cambodia its useful life is only 7 years only due to the hot climate.

Solar energy RAPS units have only recently been introduced in Cambodia due to the cost of the equipment. Consequently, only a few RAPS units have been installed by local people. Mostly they



Pic. 2.6: RAPS installed at a public school in Svay Rieng province

have only been installed with government assistance or through international organizations or NGO aid programs at public schools, parks, municipal buildings and bridges.

d) Telecom Company

Major telecom companies, namely, Samart, Mobitel and Camshin are using lead acid batteries and converters to produce the AC electrical power for telephone operations. Most of the batteries are branded names from Germany, Japan and Malaysia. The number of stations and batteries are shown in the Table 2.2.

Table 2.2: Number of Stations and Batteries

Company name	Number of stations	Number of batteries
Samart	132	369
Mobitel	200	5,760
Camshin	300	3,000

2.7.1.1 Imports

The import of lead, acid and batteries is the responsibility of the Department of Customs, the Ministry of Economic and Finance in cooperation with the Department of Kamcontrol, Ministry of Commerce. Generally, leaded substances and materials are imported from Vietnam, Thailand, Japan, South Korea, and Malaysia... etc. The import data can be obtained from the Department of Customs. Any lead, acid and batteries are only imported for domestic use and this has dramatically increased as shown in the Table 2.3.

Table 2.3: Imported of Lead, Acid and Batteries in Custom List

Year	Lead (t)	Acid (l)	LAB (kg)
2000	10,930	139,276	4,140,885
2001	1,100	1,999,770	31,083,792
2002	2,000	1,808,067	1,896,193
2003	10,109	965,280	3,165,354

Source: Department of Custom, MoEF, 2004

2.7.1.2 Consumption and Maintenance

The most surprising fact to emerge from the households surveyed in the rural areas is that there is widespread use of automotive, truck or motorcycle LAB for their domestic electrical supply. The batteries are mostly used to power portable TVs and household lighting. The low uptake of grid power supplies in these remote districts may be linked to poor TV reception and the use of dry cell batteries in the absence of battery recharging shops.

Most encouraging was that the surveys revealed that households confirmed that they would prefer to sell their old battery for recycling rather than dump it. The knowledge associated with LAB maintenance is still limited throughout the country due to the poor LAB labeling.

2.7.2 Flow of ULAB

This section would focus on the Recyclable Waste Collecting Sites associated with ULAB collection, packing and transport, export and recycling.

2.7.2.1 Collection, Packaging and Transportation

Most of the collection sites were constructed on a plot with the soil as the floor or base, except for just a few sites that were constructed on paved areas.

Scavengers collect ULAB from small ULAB collection sites in various districts of the provinces and from local users. Usually, the scrap yard owner has his own collection network for ULAB all over the province and in many cases the neighboring province. The ULAB are transported by hand-cart, bicycle, motorcycle and small truck to a recyclable waste collecting site.

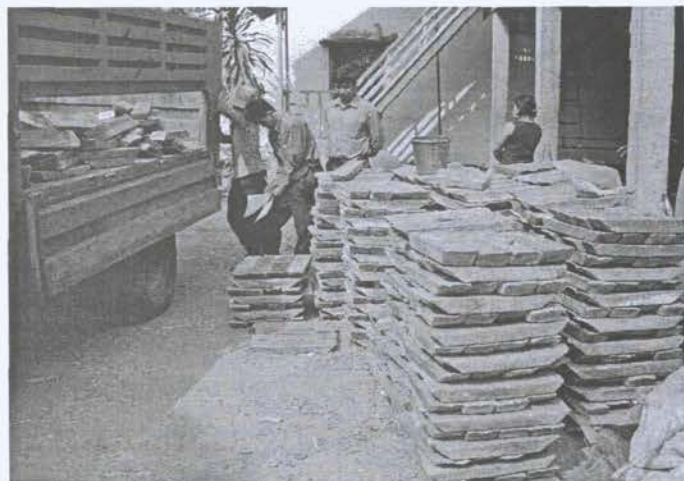
All ULAB are sold to merchants in Phnom Penh Municipality and then resold to dealers abroad for recycling. Before selling the ULAB they are stored in a secure room or compound together with other piles of recyclable waste. Usually, scavengers drain the acid from the battery before selling it to the owner of the collection site because battery acid is not purchased. Most of the scavengers drain the electrolyte from the battery at the point of purchase to lighten the transport load.

2.7.2.2 Exports

Generally, the used lead acid battery is collected or purchased by waste collectors



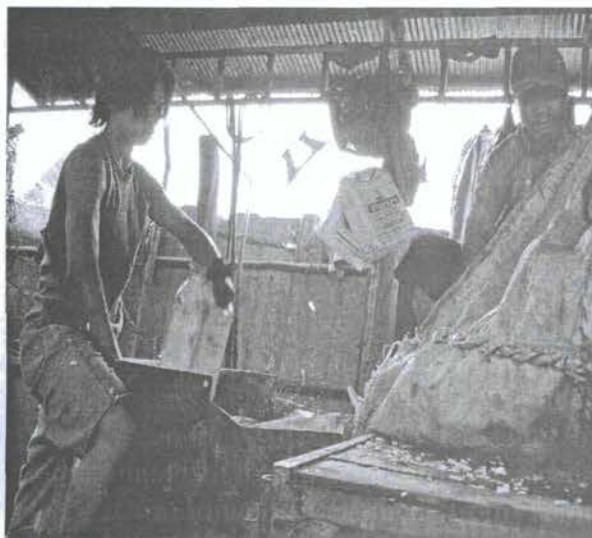
Pic.2.7: Various types of ULAB collection by local scavengers



Pic.2.8: ULAB recycling products in Battambang Province that will export to adjacent countries

or scavengers, who operate in all urban and rural areas to collect, used lead acid batteries. Every used lead acid battery that is collected in this way is sold to local/central merchants and then exported seemingly illegally for recycling in other countries. Unfortunately, there is no official information about to which countries the lead acid battery waste is exported. However, according to unofficial information obtained from some scavengers and dealers during the survey, the destinations for the transboundary movement of recyclable lead acid battery waste could be Vietnam and Thailand. Further investigation is necessarily in order to find out the exact passage of this apparently illegal trade.

2.7.2.3 Recycling



Pic.2.9: General view of ULAB recycling handicraft in Battambang Province

There are no reports that pinpoint the location of ULAB recycling in Cambodia or identify a common methodology for dealing with ULAB recycling. Among the four designated survey areas, the Task Team has only seen one small-scale site that recycles ULAB in Battambang Province. A ULAB recycling enterprise built on a plot of land. The recycling enterprise still has two separate lead smelting sites. The first one is a plot (60 x 100) surrounded by rice fields and about 8 km from the enterprise and 2 km from populated areas. The ULAB breaking operation is manual. The lead bearing waste was placed on the ground near the smelting furnace. The battery cases are sent to the milling machine and the remainder, such as the plate separators, are put into a pile for incineration.

The lead bearing waste is melted in the open and without any form of ventilation or extraction using a small crude melting furnace made from a length of metal tube about 1 m long and 0.4 m in diameter see picture 12. Charcoal is added to the leaded scrap as it is charged to the melting furnace in order to encourage reduction of some of the battery paste (lead oxide) to produce metallic lead (lead bullion).



Pic.2.10: Overview of the ULAB recycling site

After the first melting operation had been shut down temporarily, due to the complaints made by people living and working close to the operation, the melting furnace was moved to another site about 2 km from the first one and this is located at a small empty elevated plot of land surrounded by a vast rice field. The lead output and the operating procedures were the same, but the battery breaking process was still carried out at the first smelting site. Right now, the second melting site would seem to be secure for the owner because nobody has complained yet.

The final stage of smelting is a lead cake processing. Products of lead cake were kept in a particular area for transporting out in according to internal and external demand.

2.7.3 Environmental Concerns

The contents of this section are divided into two parts: lead acid battery and used lead acid battery occupations.

2.7.3.1 Relevant LAB Occupations

Generally, in the remote areas, the recharging shop areas were mostly under a thatched or zinc roof and open on all four sides, although some premises were under cover, especially those that doubled as the family home where everyone eat together and the children played in and around the charging zone. The floor was the natural soil or wooden decking which allowed the acid to spill easily onto the ground through the gaps and holes between the slats. Furthermore, it was easy to see that acid spillage and leaks that have occurred during the recharging processes contaminated the soil around the shops. Some battery acid had been poured into tanks or some other suitable plastic container and stored for reuse, but in most cases the acid drips and leaks onto the ground and finds its way into a drainage ditch near the shops.

On other hand, in the downtown areas, the recharging shops are mostly to be found under the paved area of a block of flats. It was noticed that in some cases battery acid spillage drains directly to the public drainage system and that could result in contamination..



Pic.2.11: Improper management of acid at recharging shop



Pic.2.12: The spillage of acid during recharging process and its negative effects

It is very important to wear personal protective equipment (PPE), such as gloves, goggles and masks, during the recharging process, due to the health risks posed by the safety hazards. Unfortunately, workers said that they found it inconvenient to wear PPE. Some workers had never worn PPE, but some just wear it when the battery acid bubbles due to a lack of understanding of personal safety. Interestingly, all the battery recharging workers, and some of those living close to recharging sites, recognized by themselves that there are increasing difficulties associated with skin burns and breathing problems. Furthermore, there is now a real concern among the task team because health and safety monitoring has never been carried out at battery charging and service centers.



Pic.2.13 : Carelessness of using of personal protective equipment and related harmful impact

2.7.3.2 Relevant ULAB Occupations

The environmental concerned with ULAB is happened often in the recyclable waste collecting yards and recycling facility.

2.7.3.2.1 Collection, Storage, Packaging, Transportation

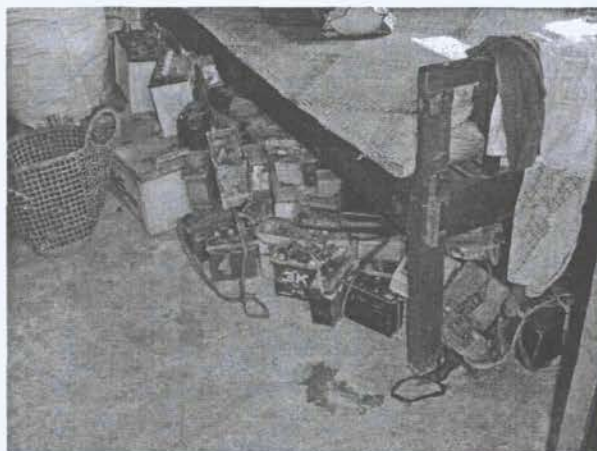


Pic.2.14: View of disordered storage of ULAB at waste collection yard

Before selling the ULAB they are stored in a secure room or compound together with other piles of recyclable waste. The storage aspect as indicated in the Pic. shows clearly the lack of awareness towards the occupational health impacts. Generally, collected ULAB were stored messily and let hazardous compounds freely poured out to the ground.

During the survey, the PCU team sometimes found ULAB were stored inside houses and on one occasion in a bedroom under a bed. Another remarkable case was that the floor of a room in a house was just soil and could easily have been contaminated by spillage of battery acid as well as lead compounds⁶.

Commonly, owners of waste collection yards do not know or seem to care about the potential harmful effects to their health and the environment resulted from daily exposure to improper practices. In their opinion, they merely think how they can get some income from a daily job to support the demands of just living and in many cases, to support their families.



Pic.2.15: Improper storage of collected ULAB under the bed of one waste collection yard in Veal Reng, Sihanoukville City

Within the confines of the collecting and storage areas, battery acid was drained directly into the ground. It would then find its way to a ditch and finally into the public drainage and sanitation system, resulting in water contamination. In short, there was no attempt to keep the acid in a tank or a container at the collection site. One of the most noticeable side effects of this poor practice was a bad odor in the storage rooms and around the premises.



Pic.2.16: Un-using of personal protective equipment during the collection/carrying ULAB at waste collection yard.

Generally, workers were not wearing any gloves, goggles or masks when handling ULAB, except for a few scavengers and an owner who was working on other waste materials. Such behavior is particularly disappointing because in one case, the owner and the workers were aware of the risks of skin burns caused by the battery acid and still did not wear gloves, but no one seems to be aware of the hazards associated with occupational lead exposure. Furthermore, the workers had never heard about any educational programs related to the management of ULAB introduced by the relevant governmental agencies or NGOs.

⁶ Lead particles were existed in ULAB

2.7.3.2.2 Recycling

The environmental conditions at the ULAB recycling facility and around the plot were unpleasant due to a bad smell from the milling process and the piles of battery cases containing acid. The breaking process area is under a corrugated zinc roofed hut open on all four sides. The floor is soil that is contaminated by spillage of the battery contents including the acid during the battery breaking process.



Pic.2.17: A bad smell and contaminated soil at the enterprise

Additionally, there are two big compounds close to the lead melting site with rubbish and waste burning in the open on the plot. Ground and surface water either flows from the melting site into both compounds or into the rice field during the rainy season. There were plenty of fish in the ponds and local people and the owner of the melting furnace, eat the fish. Sometimes the water from the ponds has been drunk by the local people and used for irrigating farmland.



Pic.2.18: Water quality and aquatic life which negatively affected by related activities of ULAB recycling

Consistent with the decline of aquatic environment and ecosystem as show in above picture, the PCU team found dead-grasses and bushes surrounding the area of ULAB recycling. In addition to the loss of the environment and natural aesthetics, huge amounts of furnace residues resulted from the ULAB recycling were dumped in that area. We wonder what is the groundwater quality in that area?



Pic.2.19: Remaining residues disposal and its harmful impacts to bushes in area close to the melting furnace site

The workers at the sites were working without gloves, goggles or masks during the separating and milling processes, although they had been issued with both gloves and masks, but for some reason, were not wearing them. Most of them were aware of the risks of burns to the skin caused by battery acid, but no one was aware of the hazards associated with occupational lead exposure see picture 25. For instance, the ULAB breaking operation is manual and the workers were not wearing gloves, goggles or masks, resulting, not unexpectedly, in the palms of the hands visibly burned by the battery acid see picture 26. The local people maintained they suffered from frequent headaches, found it very difficult to breath at night and there was a bad smell from the site. The workers not only suffered burns to the palms of the hands, but often had headaches, chest pains and breathing difficulties. Health monitoring, particularly blood lead monitoring is never done by the enterprise and it would appear that nobody takes responsibility for occupational health at the enterprise.

2.8.0 National Structure and Non-Regulatory Mechanisms

2.8.1.0 Waste Management Policy

Proper management practices of all kinds of solid wastes, wastewaters, and smoke emissions throughout the country is one of the environmental policy aims in implementing the poverty alleviation policy⁷.

Achieving this policy has potentially tremendous beneficial outcomes and will be well received by the local populations. Firstly, maintaining and protecting public health against harmful impacts resulting from environmental pollution means people be healthier and have more time available for paid employment and therefore, more money, especially if they do not have to spend money on healthcare. Secondly, properly managed waste recycling will enable the proper utilization of domestic facilities, such as growing food raising chickens; in other words, the people can invest their own money and make money. Thirdly, without any contamination of the local flora, composting once again becomes the best low cost practical method for the production of crop fertilizer. People do not need to spend money buying chemical fertilizers to improve their farmland,

⁷ The prioritized policy of the current Royal Government of Cambodia.

they can use their own composted fertilizer. Correct use of composted fertilizers is eco friendly to all environments and living creatures. Fourthly, urban aesthetics needs proper waste management, otherwise the city areas will be confronted with many socio-economic challenges.

2.8.1.1 Waste Management Legislation

Environmental management was introduced in Cambodia during the 1990s, and of course, the Royal Government of Cambodia started to pay attention to this sector. To strengthen the effectiveness of environmental management, the Royal Government of Cambodia approved the Law on Environmental Protection and Natural Resources Management (LEPNRM) in 1996. Chapter V of this law focuses on the inventory of sources and quantity of imported/exported toxic and hazardous substances, including the interception and prevention of all polluted phenomena caused by these substances. By stipulation of the LEPNRM, the environmental related Sub-Decrees were adopted. These are:

- ❑ Sub-Decree on Water Pollution Control on April 6, 1999.
- ❑ Sub-Decree on Solid Waste Management (SSWM) was also established and adopted by the Royal Government on 27 April 1999.
- ❑ Sub-Decree on EIA Process on August 11, 1999.
- ❑ The Sub-Decree on Air and Noise Pollution Control was prepared by MoE and was approved by the RGC on July 10, 2000

Besides these Sub-Decrees, some critical Regulations, Practices (Prakas)⁸ or Guidelines were issued by MoE in cooperation with the concerned ministry in order to strengthen the effectiveness of environmental quality management. The additional legislation included:

- ❑ Practice on the Provision of Duties to carry out the SWM for Urban and Provincial Environmental Departments, June 2, 1999.
- ❑ Guideline on Boosting the Carrying out of SWM (20 August 1999)
- ❑ Practice on Industrial Hazardous Waste Management (May 26, 2000).
- ❑ Practice on the Proceeding of the Department of Environmental Pollution Control July 27, 2000.
- ❑ Practice on Industrial Sludge Management (October 9, 2000).
- ❑ Practice on the Collection and Transportation of Industrial Solid Waste in PPM (August 20, 2002).
- ❑ Announcement on the Halting of Selling or Providing and Burning of Industrial Solid Waste (January 16, 2003).
- ❑ Guideline on the Management of Industrial Wastes at Factories, Enterprises and Companies (January 16, 2003).

⁸ It is a local call that has a meaning of Directives.

- Joint Practice of MoE and the Ministry of Interior (MoI) on Solid Waste Management in Cities and Provinces (February 25, 2003).

According to the review of these legal instruments, we cannot find any specific Practice (Prakas) or Guideline towards the management of residues resulting from the burning of medical wastes, toxic/hazardous wastes or from the burning of dead bodies. In this regard, these residues are freely disposed of anywhere without any involvement of the concerned institutions. It is a considerable problem, but looking deeply into the management process of responsible institutions, especially the MoE in particular, the inadequate “know how” of staff is more of a major challenge.

Adjusting to the development process of socio-economic and other factors at both national and international levels, the MoE has a plan to amend the Laws and related Sub-Decrees in order to strengthen the effective implementation of environmental protection and natural resource management. In this case, the MoE is collaborating with concerned institutions and should be able to set up some Joint Practices (Prakases) that aim to manage special wastes and residues; for example, residues resulting from the incineration of medical wastes, any other toxic/hazardous substances, or dead bodies.

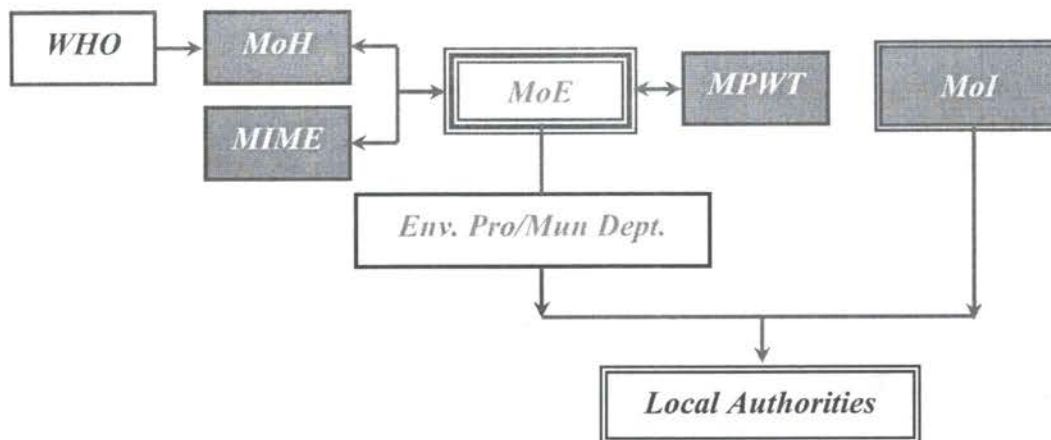
2.8.1.2 ULAB Management Policy

ULAB have not been managed properly since the Royal Government of Cambodia signed the Basel Convention in March 2001. As the Convention has not been ratified by the National Assembly yet, this is probably a good time for Cambodia to conduct ULAB related management activities through the Project on *"The Environmentally Sound Management of Used Lead Acid Batteries in Cambodia"*, supported by SBC/UNEP. In this way the project should facilitate the necessary steps to bring the Cambodian Environmental Infrastructure, Policies and Laws into line with the requires of the Basel Convention, thereby making ratification and fully meaningful process, especially if the lessons learned through the ULAB experience are applied to other waste streams. As a result of progress to date, the *"National Action Plan for the Environmentally Sound Management of Used Lead Acid Batteries"* has been established. It is the national strategy aimed at implementing and promoting the ESM of ULAB in order to mitigate and eliminate the serious potential risks and hazards to public health and the environment, as well as possibly reducing some expenditure by the correct use and maintenance of LAB.

2.8.1.3 Institutional Infrastructure and Its Mandates for LAB/ULAB Management

Typically, the management of ULAB and LAB related occupations is not a task that is assigned to a specific government institution, but rather is dealt with by the various concerned ministries and line agencies. However, looking at the nature of the environmental and human health impacts, we understand that the MoE has the strongest role in the management of ULAB and LAB related occupations compared to other concerned institutions.

Generally, the institutional structures and mandates on ULAB and LAB related occupations are not similar to the structure for solid waste management in Cambodia. Indeed, the structure for solid waste management in Cambodia merely shows the institutions that are involved with solid waste and other toxic or hazardous substances (see Pic....), but the institutional structure of ULAB and LAB related occupations management will focus widely on related institutions responsible for (i) the environment and public health; (ii) occupations; (iii) recycling and manufacturing; (iv) LAB/ULAB import and export; and (v) dissemination and education.



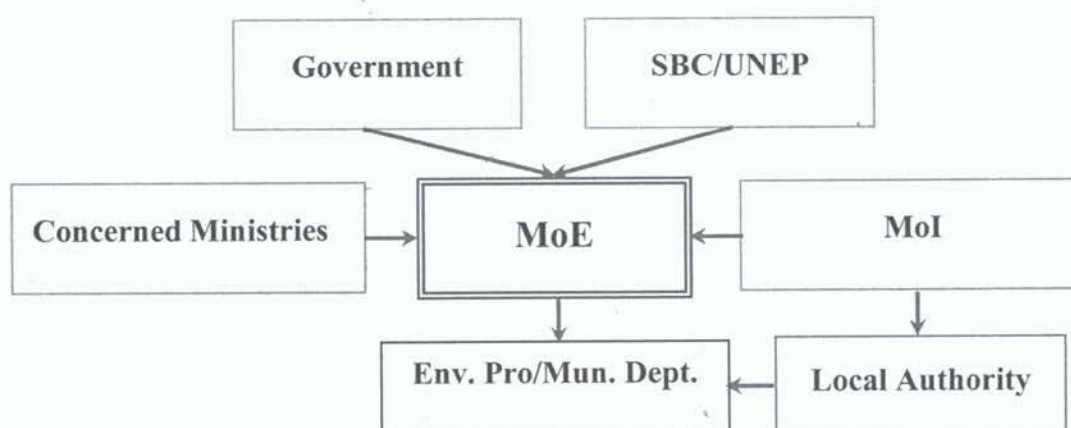
Pic.2.20: Structure of Solid Waste Management in Cambodia

According to the particular mandates provided by the Royal Government of Cambodia, more government institutions are considered to be involved in ULAB and LAB related occupational management, although there is no activity at the present time. However, the proposed responsibilities of related institutions regarding ULAB and LAB related occupational management should be implemented based on the present mandates.

- a) *Government* – provides support to boost the implementation of the National Action Plan as well as possibly allocating the budget to achieve the targets towards the ESM of ULAB and LAB related occupations in parallel with the National Strategy of Poverty Alleviation.
- b) *Ministry of the Environment* – with the cooperation of other ministries and line institutions, the MoE has a function to monitor the levels of environmental pollution caused by either; (i) LAB recharging and reconditioning; (ii) ULAB collection, storage, packaging and transport; and (iii) ULAB recycling and residue disposal. Furthermore, the MoE has to follow up any monitoring to ensure proper control of atmospheric emissions and environmental discharges complying with the ESM of ULAB. In addition, the Ministry will conduct educational programs throughout the public and private sectors as required.
- c) *Ministry of Health and the Ministry of Labor and Vocational Training* – is responsible for applying control mechanisms and educating workers about the maintenance of good occupational health in the recovery of ULAB in close cooperation with concerned institutions. Duties include assessing health effects caused by LAB recharging and ULAB recovery and recycling.
- d) *Ministry of Education, Youth and Sport* – is also a main institution responsible for implementing educational programs to high schools and related technical institutes, etc.
- e) *Ministry of Economics and Finance and the Ministry of Commerce* – responsible for providing a record of battery and ULAB related imported/export, including related ULAB products to responsible institutions to carrying out Basel Convention related tasks as Cambodia is a Party to the Convention.
- f) *Ministry of Interior* – should become a major government institution that plays a particularly important role in monitoring/controlling and boosting the implementing activities of local

authorities dealing with socio-economic development, and environmental/public health maintenance and protection.

- g) *Ministry of Public Works and Transport* – is responsible for technical practices dealing with the utilization of LAB and proper maintenance procedures. An additional and important task is the responsibility for managing the means of ULAB transport in a manner that avoids causing harm to the environment.
- h) *Local Authorities* – are responsible for ensuring cooperation with concerned institutions in maintaining control, dissemination and education, following up and reporting on compliance with the technical guidelines and/or the managerial procedures of the respective institutions.
- i) *Private Sector* - must adopt and implement ESM practices for the recovery of ULAB based on the Basel Technical Guidelines and the awareness and knowledge gained at the Government run training courses and seminars about the risks associated with poor operating procedures. The Private Sector must act in close cooperation with the institutions responsible for the completion of the ULAB project.
- j) *BCS/UNEP and ILMC* - will continue to provide technical support to the Government of the KoC while the Environment Ministry implements its tasks based on the Basel Convention and the Technical Guidelines and the National Action Plan.



Pic.2.21: Proposed Institutional Structure o ULAB Management

2.9.0 Legal Mechanisms

Harmful impacts caused by ULAB and LAB in related occupations have generally not yet been surveyed and analyzed because of national constraints regarding financial and technical support. Therefore, the awareness of, and the consideration of, and the support from the Royal Government of Cambodia, concerned ministries/agencies and the public on ULAB and LAB related occupational management, is at the present time somewhat limited.

Up to now, the related environmental reports, educational and management programs, etc. have not addressed ULAB and LAB related occupations, but we know that the public is concerned about this matter. To effectively achieve the management program and activities, this requires support from decision makers and the public. Moreover, the implementation must be in a legal framework.

2.9.1 National Legal Instruments for ULAB Management

At the present time, there is no specific legal instrument in place for ULAB and LAB related occupational management, including any related reports or information. However, some legal instruments may include some goals or directions aimed at indirectly managing it. Due to our limited awareness regarding the nature of causes and effects of ULAB and LAB related occupations, we are not certain which existing legal instruments might cover it. Related environmental legal instruments were considered to be involved in the management of ULAB and LAB related occupations, and these are indicated in the table below.

Table 2.4: Related Environmental Legal Instruments of ULAB and LAB related Occupation Management

Theme of Legal Instruments and Adopted Date	Responsible Institution	Purposes	Relevant Articles or Provisions	Remarks
Law on Environmental Protection and Natural Resources Management (December 24, 1996)	MoE	The law aims to protect and promote environmental quality and public health in as many ways as possible	Article 12, 13 and 15	The law is widely implemented throughout the country, however some articles need to be amended based on current requirement
Sub-Decree on Water Pollution Control (April 6, 1999)		The Sub-Decree aims to mitigate and minimize water pollution as well as improving the wastewater management for sustaining good water quality suitable to for human consumption.	Article 6, 8, 31, and 32	This Sub-Decree is widely implemented, and covers both point sources and non-point sources of water pollution throughout the country. Some articles need to be amended based on the real requirement in present time. Water quality parameter standard was attached to this Sub-Decree.
Sub-Decree on Solid Waste Management (April 27, 1999)	MoE	The Sub-Decree regulates solid waste and hazardous waste management, including ULAB, with proper technical matters and safe ways to ensure the protection of human health and the conservation of biodiversity.	Article 6, 12, 13, 14, 15, 17, 20, 21, 22, 23, 26 and 24	This Sub-Decree is widely implemented, and it covers the management of wastes and any types of hazardous wastes in terms of collection, transportation, disposal, recycling, etc. Some articles need to be amended based on the real requirement in present time. Hazardous substances were attached in the Sub-Decree.
Sub-Decree on EIA Process (August 11, 1999)	MoE	The Sub-Decree aims to review and monitor various development projects relevant to minimizing and phasing out of various environmental pollution issues	Article 6, 7, 8, 16, 23, 24, 26, 29	This Sub-Decree is widely implemented and applies to existing and new projects and covers the management of wastes and any types of hazardous wastes. Annex of project types should be made EIA were included.
Sub-Decree on Air Pollution and Noise Disturbance	MoE	Its purpose is to protect environmental quality and public health from air	Article 1, 4, 5, 8, 12, 18, 30,31	The Sub-Decree is implemented in limited scope, because of a lack of knowledge of staffs and

Theme of Legal Instruments and Adopted Date	Responsible Institution	Purposes	Relevant Articles or Provisions	Remarks
(July 10, 2000)		pollutants and noise pollution through monitoring, curbing and mitigation activities		related facilities that support the implementing activities. Standard of Hazardous substance releasing into the atmosphere was attached in the Sub-Decree.
Guideline on Boosting the implementation of SSWM (20 August 1999)	MoE	The Guideline's purpose is to strengthen carrying out SSWM throughout the country	Provision 1, 2, 3, 4 and 5	Key stakeholders obtain greater awareness and support this Guideline
Guideline on Boosting the implementation of Sub-Decree on Water Pollution Control	MoE	To strengthen the follow up for the protection of water quality through the setting up of regulations and monitor/control pollution which caused impair to the water sources	Version 2 5, and 6	This Guideline is widely implemented today
Prakas on the Collection and Transportation of Industrial Solid Waste in PPM (August 20, 2002)	MoE	This Prakas aims at managing industrial wastes at proper dumping sites with regular monitoring	Provision 8	It is being used for managing industrial wastes in PPM and Kandal Province
Joint Prakas of MoE and the Ministry of Interior (MoI) on Solid Waste Management in Cities and Provinces (February 25, 2003)	MoE/MoI and Local authorities	This Joint Prakas aims at managing solid wastes in cities and provinces in effective ways in order to ensure public health protection, aesthetics, environmental quality, and biodiversity	Provision 2, 9, and 10	Implementation began in late 2003

2.9.2 The Linkage between National and Regional/International Legal Instruments

The outcomes of the survey on ULAB generation and LAB related occupations as well as the environmental and health impacts throughout the country became the basis for preparing the National Action Plan for the Environmentally Sound Management of Used Lead Acid Batteries (in conjunction with information on other hazardous wastes and substances).

Preparing the National Action Plan enables Cambodia to determine effective activities to intercept and mitigate negative consequences resulting from ULAB and LAB related occupations. For Cambodia to implement the National Action Plan and the requirements of the Basel Convention and the Basel Technical Guidelines, the Government requires various capacity building and institutional strengthening, including the strengthening of legal implementation with the full support from decision makers and from donors. Furthermore, applying the ASEAN Agreements toward environmental protection and natural resources conservation is a key tool to reducing the various harmful effects derived from ULAB.

2.10.0 Public Awareness

2.10.1 Future Trends

The report of the PCU team responsible for the ULAB survey in selected cities and provinces has clearly identified that all related facilities and equipment for ULAB collecting, storage, transporting, recycling etc., are low-level or outdated technologies and facilities, especially those that are not equipped with environmental pollution controls. In the same way, the practices currently employed in LAB occupations throughout the country are certainly poor and subject of lead exposure and acid burns at all the facilities visited

The awareness of both the public and private sectors regarding the adverse health effects of ULAB and LAB related occupations seems to be very limited. For instance, people freely undertake their occupations related to LAB/ULAB in and/or close to residential areas without any awareness about the health issues.

Some Government institutions are aware of this but no countermeasures have taken place (some workers undertake such activities without wearing safety equipment and/or their production facilities are not equipped APCS, etc.). These examples illustrate some of the constraints within government institutions including a lack of related legal tools which are aimed at mitigating and phasing out the negative consequences of ULAB recovery.



Pic.2.22: LAB recharging service in area close to a bedroom

If harmful effects to the environmental and public health continue and gradually increase without any concerns and/or measures from key stakeholders, and without any suitable management mechanism in place, and without assistance and cooperation from international communities, the Cambodian people and the environment will face high risks and hazards. It is therefore necessary and important for ESM to be implemented to mitigate and eliminate the causes and effects resulted from ULAB and LAB related occupations, in particular those involving willing participants from local and regional stakeholders.

2.10.2 Summary Programs/Activities for LAB/ULAB Occupational Monitoring

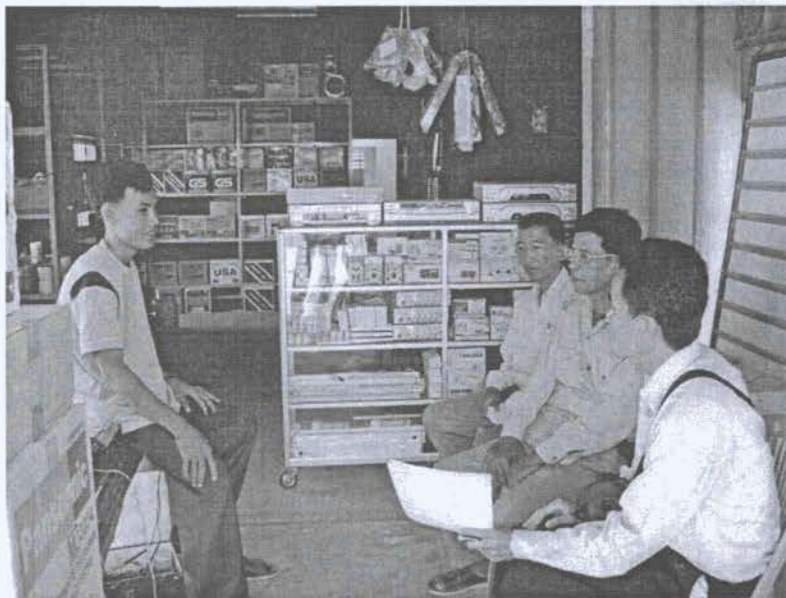
No report has been prepared addressing programs or activities regarding the management of ULAB and LAB occupations. In addition, there is no survey or research for the environment and human health impacts caused by the LAB and ULAB industries.

As indicated earlier, based on the desktop study and field surveys, no such programs or activities exist. Responsible and/or concerned institutions do have not enough capacity in terms of both a budget and knowledge. The equipment to deal with the analysis and assessment of harmful impact of environment, the ecology and public health does not exist either. Furthermore, a specific legal

tool for ULAB and LAB related occupations does not exist. In this regard, cause and effect, as well as the ESM of ULAB and LAB related occupations is a new theme for Cambodia, which requires capacity building and institutional strengthening in order to reach any reasonable and related goals.

2.10.3 Current Level of Information, Awareness and Education

Before conducting the survey we did not know about the awareness of both the public and private sectors regarding ULAB and LAB related occupation. As mentioned earlier, there are no reports or documents addressing these matters in Cambodia. After completing the desktop study and field survey, the PCU team concluded that both the public and private sectors have limited levels of ESM management of ULAB and LAB related occupations and their harmful effects, despite the level of concern held by international communities and developed countries. As a result of this concern, the international communities and developed countries undertook efforts to identify effective countermeasures to abate these impacts, and these experiences are now being shared and applied in developing countries such as Cambodia. There are many examples that illustrate the low levels of awareness among the public and concerned institutions:⁹



Pic.2.23: Basic knowledge towards LAB/ULAB dissemination through the TT field visit.

- ❑ ULAB were collected and stored in a mess in house bedroom without any preventative measures. The storage place commonly is a children playground.
- ❑ ULAB and LAB related occupations are carried out without using proper safety equipment.
- ❑ LAB are recharged and/or reconditioning in houses where families live, which could cause high risks of health hazards to the people living there, especially young children and mothers who stay at home (including domestic animals as well).
- ❑ There are no countermeasures to promote sound and safe practical methods of working in ULAB and LAB related occupations, although recognized that poor practices caused major concerns to the environment and human health.

The national workshop, the seminar and the training sessions, as well as the meetings of the Steering Group, led to a greater awareness of the relevant causes of the adverse effects to workers and the environment in ULAB and LAB related occupations. Additionally, although there is no public awareness program in place, the ULAB survey in selected cities and provinces was very important and had a certain profile that did attract the attention of key stakeholders, especially local authorities who helped raise awareness on these issues. Hopefully this exercise will encourage their

⁹ More details on such matters are explored in Chapter 9.

support and participation in activities related to reducing and halting any harmful impacts in the future. This means that local authorities and their respective communities, and the concerned ministries need to start to develop a greater awareness about ULAB and LAB related occupations and the potential harmful consequences. There is undoubtedly a requirement to set up ESM and the relevant mechanisms for future applications. However, an educational program on these issues is very important and should be developed as part of a contribution to carry out the poverty alleviation strategy.

3.0 PRELIMINARY BUILDING OF AWARENESS

Before conducting a survey on ULAB and LAB related occupations we did not know about the awareness of both the public and private sectors regarding the flows of LAB uses and ULAB recycling and disposal, including any harmful impacts to the environment and public health. There is no report or document addressing this matter in Cambodia.

After completing the ULAB and LAB related occupational services in the selected areas of Phnom Penh City, Sihanoukville City, Battambang Province and Svay Rieng Province, the TT concluded that both the public and private sectors have limited levels of awareness towards the harmful effects caused by LAB related occupations, ULAB recovery and recycling residue disposal. Through interviewing people during the field trips, we ascertained that there are no institutions from either the public sector or the NGO community to contribute to an awareness program to explain the negative effects of poor LAB/ULAB management. It means ULAB and LAB related occupations in Cambodia has been managed poorly at all levels.

Public awareness of the issues at hand is very important for all concerned. In order to enhance the capacity of those people involved in LAB/ULAB Management, not only in the private sector, but also in the public sector and the NGO community, the Ministry of the Environment and line institutions should cooperate and share relevant experiences to ascertain the best approaches to convey to local communities the sound management principles for used lead acid batteries, including an outline of recovery practices that avoid the negative effects commonly associated with ULAB recovery.

Regarding the above constraints, the PCU supported by the SBC conducted the national workshop and seminar, and undertook the technical training course relevant to ULAB/LAB management and based on the core principles of ESM.

3.1.0 National Workshop and Seminar

The National Workshop on the Inventory of Used Lead Acid Batteries in Cambodia¹⁰ was conducted on 13-14 May 2004 and presided over by H.E. Chhann Saphan, Secretary of State of MoE, and distinguished guests such as Dr. Thanavat Yuncaya, regional representative of UNEP and Mr. Brian Wilson, ILMC and International Expert for ULAB on behalf of the SBC.

Participants of the workshop were representatives from different sectors such as the Private Sector, NGOs, MoE (center and local offices) and line institutions. The workshop focused on:



Pic.3.1: Photo of distinguish guests and participants during the National workshop on the Inventory of ULAB in Cambodia, 13-14 May 2004

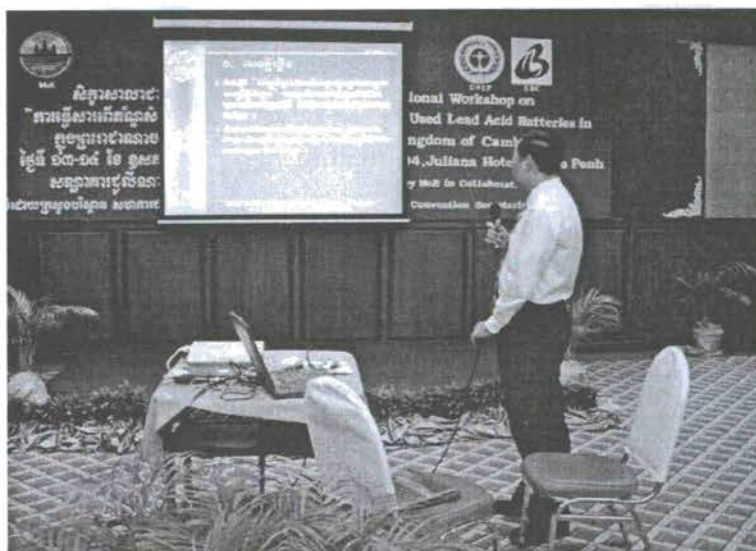
¹⁰ Four selected areas were Phnom Penh City, Sihanoukville City, Battambang Province, and Svay Rieng Province

- ❑ Showing the outcomes of the Desktop study and field surveys and assessments in order to determine:
 - The data and information gaps;
 - Any deficiencies in current legal tools and their use, ULAB management procedures, private sector and government agencies awareness.
- ❑ Identifying the flow of leaded substances such as LAB and ULAB.
- ❑ Present management of ULAB which included the collection, storage, packaging, transportation, recycling and residue disposal.
- ❑ The findings and conclusions of the harmful impacts to the environment and human health.
- ❑ Preparing a draft National Action Plan for the ESM and recycling ULAB, including in the plan a national environmental management program and other developmental projects in a sustainable manner.
- ❑ Identifying the requirements for capacity building and promoting the awareness of the ESM of ULAB for concerned government agencies and the private sector.

Through this workshop, participants of the concerned ministries, line agencies, NGOs and the private sector gained a great insight and were made more aware of the harmful effects caused by poorly managed LAB and ULAB operations and the related occupations. They were also made aware of many of the simple countermeasures that can be taken to mitigate the risks associated with lead exposure.

Besides the above national workshop, the PCU also conducted a national seminar for disseminating the National Action Plan for the environmentally sound management of used lead acid batteries, on 4 April 2005, and H.E Khieu Muth, Secretary of State of MoE presided over this seminar. All representative environmental provincial/municipal departments, including NGOs and the private sector attended the seminar. Objectives of the seminar aimed to:

- ❑ Introduce the participants to the roles and obligations of the Parties to the BC dealing with the management of hazardous wastes..
- ❑ Showing the current situation with ULAB management which focused on:
 - The general flow of LAB and ULAB in urban and rural areas;



Pic.3.2: Presentation of the objectives and expected outputs of the National workshop, by Mr. Chrin Sokha, Deputy Director of the Department of Environmental Pollution Control, Ministry of Environment

- The adverse environmental and human health impacts resulting from improper management of ULAB and/or occupational practices associated with LAB.
 - General awareness on LAB/ULAB occupations; and
 - ULAB management activities and procedures, including relevant existing legislation.
- Indicating the gaps in managing LAB/ULAB related occupational practices as well as raising any basic requirement for improvement.
- Disseminating the "**National Action Plan For The Environmentally Sound Management Of Used Lead Acid Batteries**" – the future plan for applying throughout the country the goal of reducing or eliminating the adverse environmental and human health impacts.
- Introducing the two selected prioritized programs to prepare Technical Guidelines and set up a series of training sessions to demonstrate how to reduce population lead exposure and adverse environmental impacts within the National Action Plan and the strategies to implement them as soon as possible.

The expected outputs of the seminar were that participants would get a preliminary awareness of sound ULAB management and that of LAB related occupations, and hopefully, this awareness would be transferred to local stakeholders/ communities by the participants of the seminar.

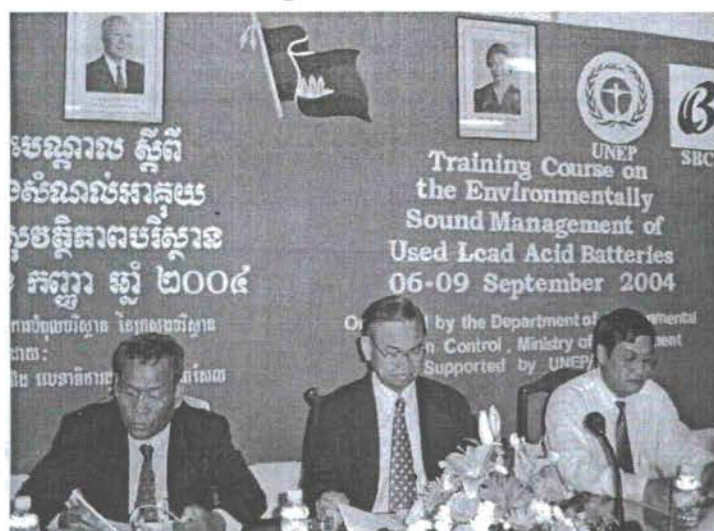


Pic.3.3: National action plan presented by Mr. Ken Chorviran, Office Chief, Department of Environmental Pollution Control, Ministry of Environment

3.2.0 Training Course

Mr. John Dickie – was the designated international ULAB training expert agreed by the SBC. The training course was conducted from 6 - 9 August 2005. The objectives of the course were aimed at educating trainees from the public and private sectors about: (i) the management procedures for ULAB based on internal and external experiences; (ii) existing legislation and future requirements; and (iii) harmful effects occurring from improper management of LAB/ULAB related occupations.

Besides the above topics, Mr. John Dickie also raised significant issues associated with the poor environmental management of medical wastes and improper disposal of chemicals and their



Pic3.4.: H.E Dr. Mok Mareth, Senior Minister, Minister for the Environment presided over the Training course on the Environmentally Sound Management of ULAB, 06-09 September 2004

residues; all of which will cause harmful effects to the environment and public health if not disposed of correctly. Appropriate sessions were allocated for discussion time to determine some appropriate solutions for Cambodia. Through this training course, Cambodia could prioritize its main waste problems as indicated in the table below.

Table 3.1: Prioritized problems in Cambodia

No.	Waste Type	Hazardous Scale	Prioritization
1	ULAB	4	1
2	Medical wastes	4	1
3	Chemicals for timber preservation	4	4
4	Disable-use engine oils	2	2
5	Mineral wastes	4	3
6	Plastic wastes	4	2
7	Electronic wastes	4	1
8	Pesticides	4	1
9	Vehicle tires (disable use)	4	3
10	Sludge (wastewater treatment plant)	4	3
11	Chemical wastes	4	2
12	PCBs	4	2
13	Dioxins and Furans	4	2
14	Rags and cloths (disable use)	3	3
15	Waste color (dying and washing factories)	4	4
16	Printing wastes (chemical residues)	2	3
17	Wastewater (washing - dying factories)	4	2
18	Wastes/residues (incinerator)	2	4

Legend

Hazardous scale:

1 – Low hazard

2 – Medium hazard

3 – High hazard

4 – Severe hazard

Prioritized scale:

1 – Highest priority

2 – High priority

3 – Medium priority

4 – low priority

As a conclusion, although Cambodia does not have a National Action Plan or a public awareness program in place, the ULAB survey as well as above national workshop/seminar and training course were very important and could attract the attention of key stakeholders, especially local authorities, and help raise awareness on these issues. Hopefully this will encourage their support and participation in activities related to reducing and eliminating any harmful effects to the environment and human health. This means that local authorities and communities, and concerned ministries should start to develop greater awareness of LAB and ULAB related occupations and their potential harmful consequences, and as a result set up ESM for future applications based on the guidelines of the BC. However, such an educational program on these issues is very important and should be developed as part of a contribution to carry out the poverty alleviation strategy.



Pic.3.5: Mr. John Dickie explained participants on technical issues towards ULAB management

4.0 NATIONAL ACTION PLAN FOR ULAB MANAGEMENT

The National Action Plan – a main component of the project, "the Environmentally Sound Management of Used Lead Acid Batteries in the Kingdom of Cambodia" has been addressed in the project work plan based on the regulations contained in the Basel Convention and Basel Technical Guidelines for the Sound Management of ULAB. This project was approved by the SBC and the United Nations Environment Program (UNEP) in October 2003 as proposed by the MoE of Cambodia. The "in kind" contribution of the Royal Government of Cambodia was manifest in the project's operation and also the preparation of the National Action Plan.

4.1.0 The Aims of the National Action Plan

The National Action Plan for the environmentally sound management of used lead acid batteries is recognized to be a key tool to strengthen support for the ratification of the Basel Convention.

In practice, the aims of National Action Plan include:

- ❑ Increasing the levels of awareness of ULAB collectors, transporters, recyclers and so on, to the potential risks posed by ULAB to the environment and human health throughout the country. Achieving this aim for the target groups will not only protect their health, but also the environment.
- ❑ Enhancing the awareness of decision makers from the responsible institutions to increase their support for the application of the Basel Convention for ULAB and other wastes.
- ❑ Increasing public participation in ULAB awareness and sound recovery in both urban and rural areas.
- ❑ Implementing the Basel Technical Guidelines for used lead acid battery management and recycling and integrating the procedures within national policy guidelines. Staff of the concerned institutions will then be able to adopt the practical skills to monitor the performance of the private sector and those people involved in the recovery of ULAB.

4.2.0 The Objectives and Targets

The National Action Plan for managing used lead acid batteries must be developed and implemented in order to protect the environment and public health against the potential risks resulting from lead acid battery recharging and ULAB collecting, transporting, packaging, and recycling, together with an understanding of the problems posed by the disposal of residues arising from the recycling processes.

The strategies and programs for the management of used lead acid batteries will guide the activities of those Government agencies involved with ULAB recovery throughout the country over the next several years.

To implement this National Action Plan, the MoE will cooperate extensively through public participation and public/private partnerships such as line ministries, NGOs, academia, industry, and other stakeholders to utilize their expertise. The MoE is further committed to a continuing exchange

of information with the general public as the National Action Plan is undertaken and to the rapid dissemination of any new findings as soon as they known.

The major goals of the National Action Plan are:

- ❑ The compilation and analysis of data and information related to the various uses of lead acid batteries and the environmental and health issues identified in cities, provinces and local communities throughout the country. The analysis will be based on the hazardous waste management protocols contained in the Basel Convention with the purpose of determining its adverse impacts to human health and the environment.
- ❑ The dissemination of information about the risks to human health and the environment posed by LAB and ULAB in order to raise the public's awareness and contribute towards improved protection, prevention and reduction of the potential risks from used lead acid batteries.
- ❑ The development of laws, guidelines or relevant statutes and decrees consistent with the Basel Convention or its Technical Guidelines to protect and prevent damage to human health and the environment.
- ❑ The development and fostering of public participation and public/private partnerships to gather scientific and technological information and data for assessing the potential human health risks.
- ❑ The introduction of mechanisms to inform and educate consumers and people who work with new or used lead acid batteries about the potential risks associated lead and the battery electrolyte.
- ❑ The reduction and ultimately the elimination of the risks and hazards associated with used lead acid batteries that cause harm to human health and the environment.

4.3.0 Proposed Management Program and Activities

This section describes the main activities of the National Action Plan aimed at managing used lead acid batteries in Cambodia in an Environmentally Sound Manner. Respective sub-sections are described below.

A. Inventory

- ❑ Reviewing the existing component of the Steering Committee for ULAB management comprising of the private and public sectors, educational institutions and so on.
- ❑ Establish the Task Force to conduct a representative survey of the entire country.
- ❑ Prepare a national report outlining the current state of used lead acid battery management including any environmental and health concerns, the information and data gaps and future requirements.
- ❑ Establish a database network among the interested and concerned ministries and agencies.

B. Setting Up the ULAB Management Policy

- ❑ Raise the awareness on sound used lead acid battery management procedures, environmental protection and the maintenance of good occupational health practices.
- ❑ Develop an incentive program for those people involved with new lead acid battery sales and used lead acid battery recovery.
- ❑ Develop guidelines, notification/declaration or related statutes on used lead acid battery management, which include procedures for collection, storage, and transport or shipping, including the transboundary movement regulations for ULAB.
- ❑ Develop a short-term and long-term period Strategic Plan on sound used lead acid battery management to be implemented in Cambodia.

C. Collecting Used Lead Acid Batteries

- ❑ Establish a suitable system that works through the battery retailers where a discount is given against the purchase price of a new battery provided a customer returns a used battery to the retailer for recycling.
- ❑ Set up used lead acid battery collection centers with a clear management structure and responsibility for the collection of used lead acid batteries in each district for the respective cities and provinces.
- ❑ Conduct training courses for used lead acid battery collectors, collection center managers/owners and scavengers regarding safe handling and collection methods and emergency procedures in the event of an accident where there is spillage of battery electrolyte during the movement of used lead acid batteries from collecting points to a collection center.
- ❑ Set up an enabling program to educate the general population about waste separation practices for every household and especially for ULAB and other hazardous wastes.

D. Storage of Used Lead Acid Batteries

- ❑ Develop appropriate safety procedures to ensure that employees wear goggles, neoprene gloves, neoprene boots and respirators in each storage area when necessary.
- ❑ Organize training courses for workers to explain how to inspect used lead acid batteries for leaks, cracks in the battery casing, missing vent caps and what procedures to take in the event of an electrolyte spillage.
- ❑ Ensure that any electrolyte recovered as a result of a leaking battery or a spillage is stored inside acid resistant plastic containers.
- ❑ As electronic testing is advised to determine whether the battery can be recharged and reused; notes and procedures for testing should be issued to garages and service centers accompanied by "on-the-job" training from a service engineer.
- ❑ ULAB storage sites must be inspected and monitored to ensure that any activities involving used lead acid batteries avoid risks to the environment and human health.

E. Transport and Shipping

- ❑ ULAB Training for drivers and related people who are responsible for transporting or shipping used lead acid batteries, including proper instruction in proper packing methods and emergency response procedures.
- ❑ Monitor and follow up the used lead acid battery transporting or shipping activities to ensure that potential risks and hazards to the environment and human health are avoided.

F. Consolidation of Safe Working

- ❑ Prepare related training materials for safe working with used lead acid batteries.
- ❑ Develop training courses and seminars relevant to used lead acid battery management.
- ❑ Educate and advise employers on the development of assurance systems for safe lead acid battery/used lead acid battery working.
- ❑ Disseminate the Basel Technical Guidelines on the Environmentally Sound Management of used lead acid batteries in Khmer to all interested parties and especially LAB retailers and ULAB collectors.
- ❑ Control, monitor, and evaluate the safe working practices and take remedial action if anyone is not in compliance with the Basel Technical Guidelines.

G. Workshops and Seminars

- ❑ Organize national workshops to explain and discuss the results of the survey, review the options for the implementation of environmentally sound management and determine the National priorities in conjunction with the National Action Plan.
- ❑ Develop and prepare training materials for the training courses and seminars for the environmentally sound management of used lead acid batteries for battery retailers, servicing personnel, used lead acid battery collectors and exporters in the respective cities and provinces. Each session will focus on the collecting, storing, packaging, transporting and safe handling of used lead acid batteries in accordance with the Basel Technical Guidelines and appropriate practices identified in the survey.
- ❑ The dissemination of the Basel Technical Guidelines for the ESM of used lead acid batteries to the public through community based briefing groups, and mass media such as television and radio.
- ❑ The dissemination of used lead acid battery management methodologies at public and private schools and the universities.
- ❑ Organise poster campaigns in places such as battery retail outlets, recharging shops, garages and repair shops, children's nursery groups, schools, and especially those close to scrap collection Yards and used lead acid battery centers.

4.4.0 The Prioritized Activities/Programs

Among the National Action Plans listed above, two programs have been prioritized for urgent implementation in order to arrest and minimize potential risks to public health and the environment as soon as possible. The two prioritized programs are:

Developing the Technical Guidelines on the Environmentally Sound Management of Used Lead Acid Batteries – is the main program aimed at improving lead acid battery and used lead acid battery management procedures throughout the country based on the Basel Convention and the Technical Guidelines.

Training courses and seminars on the Environmentally Sound Management of Used Lead Acid Batteries – is another crucial program to increase awareness and knowledge amongst those people involved in the recovery of ULAB, such as government staff, professional persons and those members of the public with jobs or responsibilities relevant to either new or used lead acid batteries.

4.4.1 Developing the Technical Guidelines on the ESM of ULAB

The major activities and work plan to achieve the preparation of the Guidelines and a local information pamphlet on ULAB Management in Cambodia are as follows:

a) Activities

- Collecting documents related to the used lead acid battery guidelines and hazardous wastes at both national and international levels;
- Drafting the Guidelines and the public information pamphlet on the environmentally sound management of used lead acid battery that follow the Basel Convention and the Technical Guidelines;
- Translation of the Basel Technical Guidelines into the Khmer language;
- Organization of a steering committee meeting to discuss the Guidelines; and
- Outlining and explaining the Technical Guidelines on Sound ULAB Management.

b) Work Plan

The work plan for the preparatory stages of the Guidelines on ULAB Management will be within a 12 month time frame as indicated in the table below.

Table 4.1: The Work Plan for Developing the Guidelines on ULAB Management

Activities	Duration											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Collect documents related to ULAB guideline.												
2. Translate guideline into Khmer language for dissemination and implementation												
3. Steering committee meeting												
4. National workshop for dissemination the translated the Basel Convention Guideline												
5. Draft the national technical guideline on ULAB management												
6. Adopt the national technical guideline on ULAB management												

4.4.2 Organizing the Training Courses/Seminars on ESM on ULAB throughout the Country

Training courses and seminars on the Environmentally Sound Management of Used Lead Acid Batteries – is another critical program to increase awareness and knowledge amongst those working in the ULAB recovery industry and LAB retailers and service center technicians.

The major activities dealing with increasing public awareness and technical capacity to implement the sound management of lead acid batteries and used lead acid batteries at both national and local levels are addressed as below within the designated timeframe.

a) Activities

- To prepare the material for and the structure of the course;
- Design a training needs form based on the shortcomings identified in the survey and the workshop;
- To communicate with the municipal and provincial environmental authorities to ensure that they complete the training needs form so that the appropriate personal attend each regional course;
- To follow up the implementation of the training proposal in each region;
- To assess the results and the appropriate methodologies used. If necessary the training programs will be modified to improve effectiveness;
- To prepare training needs appropriate to the environmentally sound management of used lead acid batteries at both national and local levels;
- To prepare the used lead acid battery management manual for public dissemination; and
- To assess stakeholder awareness including the general public.

b) Work plan

The work plan detailing the Training Courses/Seminars for the environmental sound management of used lead acid battery management is for a 12 month timeframe as indicated in the table below.

Table 4.2: The Work Plan for the Training Courses/Seminars on ULAB management

Activities	Time (month)											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Phnom Penh Municipality												
2. Kandal Province												
3. Takeo Province												
4. Kampong Speu Province												
5. Kampot Province												
6. Koh Kong Province												
7. Kampong Chhnang Province												
8. Pursat Province												
9. Battambang Province												
10. Banteay Mean Chey Province												
11. Kampong Cham Province												
12. Kratie Province												
13. Kampong Thom Province												
14. Siem Riep Province												
15. Prea Vihear Province												
16. Stung Treng Province												
17. Rotanak Kiri Province												
18. Mondol Kiri Province												
19. Sihanouk Ville City												
20. Svay Rieng Province												
21. Prey Veng Province												
22. Krong Keop												
23. Krong Paylin												
24. Otdor Meanchey Province												

4.4.3 Proposed Implementing Budget for the both Prioritized Programs

The estimated budgets for implementing the two prioritized programs/activities for the (i) Translation of the Basel Technical Guidelines for Dissemination and Developing the National Guidelines for the Environmentally Sound Management of ULAB; and (ii) Training Courses for the Environmentally Sound Management of ULAB are indicated in the tables below.

4.4.3.1 Proposed Budget for Developing the Guidelines on ESM of ULAB

The budget for translating the Basel Technical Guidelines and developing the Guidelines for the environmentally sound management of used lead acid batteries is estimated to be 36,600 US\$ (as indicated in the table below).

Table 4.3: Proposed Budget for Translating the Basel Technical Guidelines and Developing the National Guidelines for ULAB Management

No.	Description	Person	Amount (US\$)	Total (US\$)	Remarks
1	Translation task		1,000	1,000	
2	Printing		14,000	14,000	
3	Steering Group meeting				The meeting focuses on the translation of the Basel Convention and also the preparation of the National Technical Guidelines
4	National workshop for dissemination of the translated Basel Convention and the Technical Guidelines		5,000	5,000	
5	Preparing the national technical guidelines for ULAB management		9,600	9,600	The National Technical Guidelines should be developed after the public are made more aware of the Basel Convention and the Technical Guidelines
6	National workshop on the national technical guidelines for ULAB management and printing		7,000	7,000	
Total			36,600	36,600	

4.4.3.2 Proposed Implementing Budget for the Training Courses on the ESM of ULAB

The budget for conducting the training courses/seminars in all cities and provinces for both public and private sectors is estimated to be 46,060 US\$ (as indicated in the table below).

Table 4.4: Proposed Budget for Implementing the Training Courses/Seminars on Used Lead Acid Battery Management

No.	Description	Person	Amount	Total (US\$)	Remarks
1	Project coordinator (in US\$)	1	700	8,400	
2	Local Trainer (in US\$)	1	700	8,400	
3	Assistant (in US\$)	1	150	1,800	
4	Training course (in US\$)		800	19,200	3 days training
5	Travel of Project coordinator and Local Trainer (in US\$)		240	5,760	
6	Miscellaneous			2,500	
Total				46,060	

5.0 STEERING GROUP MEETING

As summarized in the *Sub-section 2.4.2 Steering Group Component*, the Steering Group was set up in compliance with the guidelines of the BC. Members of the Steering Group were drawn from concerned ministries, line institutions, and NGOs. Typically, Steering Group's members represented their own organizations, but also had important roles to cooperate and coordinate the PCU and provide relevant data or information, when requested by the PCU, for example, LAB/ULAB related occupations and/or situations relevant to health and the environment, relevant environmental legal instruments, and their requirement, etc. Significantly, respective organizational representatives have sufficient rights to raise ideas, comments or suggestions, or correct project operational activities where necessary, especially the preparing of appropriate National Action Plan for implementation throughout Cambodia.

During the project's operational steps, the Steering Group had meetings on seven occasions, which exceeded¹¹ the work plan. These meetings were to:

- Review and monitor the project operation of the PCU and the PCU proceedings report;
- Review and comment on the technical report;
- Provide comments and suggestions on the contents of the National Action Plan; and
- Extensively review and amend the National Action Plan, and circulate the National Action Plan to their organizational leaders for final review and decisions before submitting it for Government approval.

Through these Steering Group meetings, the MoE accepted many notable suggestions in preparing the ULAB management National Action Plan based on environmentally sound principles which suited the current Cambodian situation, and of course, this exercise will be kept as a base for the proper management other hazardous wastes/substances.

¹¹ It referred to the urgent requirement of Steering Group member and the PCU

6.0 CONCLUSION AND RECOMMENDATIONS

6.1.0 Conclusion

The project, namely, "The Environmentally Sound Management of Used Lead Acid Batteries in the Kingdom of Cambodia" was the first project of which Cambodia received support from the SBC in order to prepare a National Action Plan for ULAB management based on the current situation in the Kingdom. To achieve the goal to prepare a National Action Plan, the PCU, in cooperation with concerned ministries and line agencies, conducted a survey in four selected areas (Phnom Penh City, Sihanoukville City, Battambang Province and Svay Rieng Province) to examine the operations of LAB/ULAB industries and related occupations, and the human health and environmental concerns as well as the information gaps in any of the related sectors.

While carrying out the survey at the concerned ministries, provincial departments, local authorities, etc. and various sites, the PCU faced many problems regarding critical gaps in the management of ULAB and LAB related occupations, such as a lack of ULAB/LAB related awareness by both private and public sectors and a shortage of reliable data and information about the various pollution sources.

Referring to gaps mentioned above, the survey is considered very important for: (i) providing support and information to decision makers and stakeholders; (ii) encouraging public participation; and (iii) increasing the ESM related awareness and knowledge of stakeholders; and (iv) strengthening the implementation of a National Action Plan aimed at reducing and phasing out related potential adverse environmental and health impacts;

In the Cambodian context, in which awareness/knowledge, legal instrument application, and management is very limited, we must consider the above four key approaches and they should be applied as soon as possible in order to achieve the goals and objectives for intercepting, minimizing, and eliminating harmful impacts to human health and the environment. The four approaches are considered to collectively provide a single comprehensive and necessary approach. If one of the four key approaches is missing, we believe that undertaking the National Action Plan might be unsuccessful.

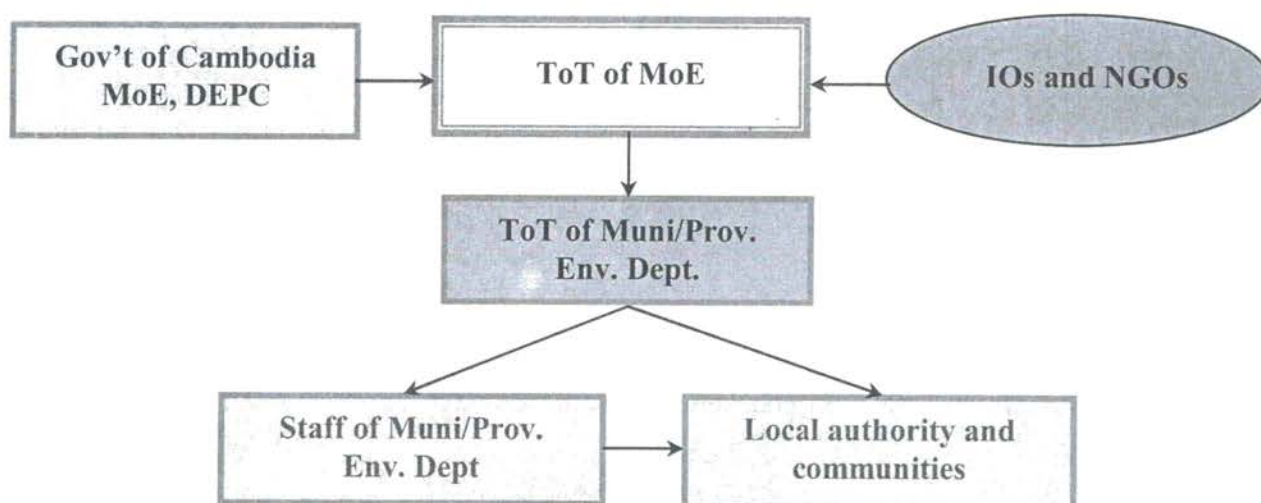
As Cambodia is faced with severe constraints related to the national budget and knowledgeable people in this area, the country requires further assistance in terms of both budget and technical support from the SBC and UNEP and other international communities and donors. Such support will assist Cambodia in accomplishing the above mentioned goals and objectives, which will provide benefits for not only the current generation, but also for the next generations.

6.2.0 Recommendation

As description earlier, for the effective implementation of the ESM of ULAB, the MoE together with the concerned institutions' cooperation should strengthen the implementation of both the prioritized programs in the **"National Action Plan For The Environmentally Sound Management Of Used Lead Acid Batteries"** and apply these programs throughout the country. At the same time, during and after disseminating these programs, the MoE should monitor progress and note the commitment and implementation of local authorities, communities and other stakeholders towards the ESM of ULAB.

Before dissemination the prioritized programs, MoE should consider on the training of trainers of which the crucial human resources plays an important role in bridging the technological transfer from central office to a particular local office (see Pic.6.1). For the KoC in particular the training of trainers is an effective way to securely disseminate technical knowledge and skills to local authorities and responsible institutions.

In the case of the Royal Government, it is paying most attention to implementing the Strategic Plan of Poverty Alleviation, but the Government is constrained by financial limitations, so the MoE and concerned institutions should consider the concept of a public/private partnership approach. The private sector is an important partner to the Government already, especially when without it the Government would have less capability to support their institutions, programs and activities. In this regard, the Government should encourage investors who can bring cost-effective methodologies of ULAB recycling that prevent any harmful effects to human health and the environment to apply in Cambodia.



Pic.6.1: Training for the trainers to build the capacity of provincial /municipal Environmental Departments – An Effective Way for KoC

No.

Introduction to the Project

The Department of Pollution Control at the Ministry of the Environment, with the assistance of the International Lead Management Center is undertaking an assessment of the recycling practices for used lead acid batteries in the Kingdom of Cambodia. This assessment will be in three stages:

1. A desktop study – this is the questionnaire that forms part of the desktop study
2. Technical fieldwork – to be conducted in conjunction with the desktop study
3. A workshop – where the results of the questionnaires and the fieldwork will be considered, discussed and a national action plan prepared.

A report will then be prepared by the Ministry of the Environment assisted and the framework used to provide technical training on setting up ULAB collection schemes, and the administration of the movement of ULAB for sound recycling in line with good practice and international conventions.

This questionnaire is designed to provide data and information for the desktop study.

1.0 General Information

Location	
Date	
Name of lead recycling plant/business/home	
Name of interviewee	
Position of interviewee	
Address	
Phone number	
Facsimile number	
E-mail	
Name of Interviewer	
Operational area (m ² /ha)	

2.0 Occupational Exposure

This table describes the probable occupational health impacts and policies to minimize exposures

1	Number of employees	
2	Age and service profiles	
3	Hours of work	
4	Are personnel issued with special clothing?	
5	Are eating and process areas segregated?	
6	Are the eating areas free of lead dust?	
7	Do employees wash prior to eating?	
8	Do workers understand the risks of working with lead?	

3.0 Retail and Collection

The Table below describes the local markets for new and reconditioned lead acid batteries.

1	Source of imported lead acid batteries	
2	Annual quantity of imported batteries: • Truck, bus, industrial • Automotive • Motorcycle • UPS	
3	Number of automotive battery sales	
4	Are used batteries collected at the battery shop?	
5	What happens to ULAB collected at retail outlets?	
6	How are ULAB stored at the retail outlets?	
7	How are ULAB collected at retail outlets transported to recyclers?	
8	Are batteries drained of electrolyte prior to transportation?	
9	Are ULAB reconditioned?	
10	What is the annual quantity of repaired or reconditioned batteries?	
11	Where are used batteries reconditioned?	
12	Are any used batteries exported for recycling?	
13	Where are used batteries exported for recycling?	

14	What are the regulations for the export of ULAB?	
15	How are ULAB shipped from the country of origin to another country for recycling?	
16	What special precautions are taken for the trans-boundary shipment ULAB?	
17	Is the battery electrolyte drained prior to trans-boundary shipment?	
18	What happens to ULAB that are not collected for recycling?	

No.

4.0 Awareness and Attitudes

1	What have you learnt about lead contamination from ULAB in?	
2	Have you ever attended a health awareness class about lead?	
3	Do you know the effects of lead exposure on the: • Environment; atmosphere, water, soil, eco systems • Population	
4	How often do you come into contact with Lead Acid Batteries?	
5	What do you do with your used ULAB and why?	
6	What do you think should be done with a used ULAB?	
7	In your opinion, how should the problem of lead contamination from ULAB be solved?	
8	What incentives would encourage you to return a used battery to a collection center?	
9	Do you know of any lead contamination awareness programs performed by any Governmental Institutions?	
10	Has the information provided been effective in encouraging you to dispose of your ULAB in an environmentally sound manner?	
11	How do you think these programs should be improved?	
12	<u>Are you aware of any incentive programs for returning used batteries for recycling? (ACL)</u>	
13	Do you have any comments or suggestions for the Government	

	Environmental Agencies that would help promote a sustainable environmentally sound and socio-economically acceptable solution to the recycling of ULAB?	
--	---	--

No.

5.0 Domestic Use

1	Are there lead acid batteries in the home, including UPS units?	
2	If so, how many?	
3	What are lead acid batteries used for in the home? • TV • Lighting • Refrigeration • Computers • Other uses	
4	What type of lead acid batteries are used in the home: • 12 volt car batteries • 12 volt truck batteries • Deep cycle batteries • Other batterie	
5	Were the lead acid batteries bought as new from a registered supplier?	
6	What is/are the make or brand of the battery/batteries	
7	Are the batteries reconditioned?	
8	How are the batteries recharged?	
9	How long do the batteries last?	
10	Are you aware of the health hazards that lead contamination and exposure can bring?	
11	What do you do with ULAB?	
12	Where do you take them?	
13	<u>Are the ULAB collected or do you have to take them to a collector?</u>	
14	Who collects ULAB?	
15	Are the ULAB recycled?	

ANNEX-1b: Cambodia - Used Lead Acid Battery Recycling Study Questionnaire

Introduction to the Project

The Department of Pollution Control at the Ministry of the Environment, with the assistance of the International Lead Management Center is undertaking an assessment of the recycling practices for used lead acid batteries in the Kingdom of Cambodia as part of a project sponsored by the Secretariat of the Basel Convention. This assessment will be in three stages:

- A desktop study – this is the questionnaire that forms part of the desktop study
- Technical fieldwork – to be conducted in conjunction with the desktop study
- A workshop – where the results of the questionnaires and the fieldwork will be considered, discussed and a national action plan prepared.

A report will then be prepared by the Ministry of the Environment assisted and the framework used to provide technical training on setting up ULAB collection schemes, and the administration of the movement of ULAB for sound recycling in line with good practice and international conventions.

In order to prepare for the assessment phase of the project and make informed decisions about the recovery options that are in the best interests of Cambodia essential data and information about the number of lead acid batteries in Cambodia has to be collected and collated. Your cooperation in the collection of this data would be most appreciated and helpful in determining an environmentally sound recovery system for ULAB in Cambodia.

Name of Government Agency	
How many trucks and buses were imported into Cambodia in: • 2003 • 2002 • 2001 • 2000 • 1999	
How many cars were imported into Cambodia in: • 2003 • 2002 • 2001 • 2000 • 1999	
How many motor cycles were imported into Cambodia in: • 2003 • 2002 • 2001 • 2000 • 1999	
How many UPS units were imported into Cambodia in: • 2003 • 2002 • 2001 • 2000 • 1999	

ANNEX-1c: Cambodia - Used Lead Acid Battery Recycling Study Questionnaire

Introduction to the Project

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In order to prepare for the assessment phase of the project and make informed decisions about the recovery options that are in the best interests of Cambodia essential data and information about the number of lead acid batteries in Cambodia has to be collected and collated. Your cooperation in the collection of this data would be most appreciated and helpful in determining an environmentally sound recovery system for ULAB in Cambodia.

Name of Government Agency	
How many trucks batteries were imported into Cambodia in: • 2003 • 2002 • 2001 • 2000 • 1999	
How many car batteries were imported into Cambodia in: • 2003 • 2002 • 2001 • 2000 • 1999	
How many 6 volt batteries were imported into Cambodia in: • 2003 • 2002 • 2001 • 2000 • 1999	
How many UPS units were imported into Cambodia in: • 2003 • 2002 • 2001 • 2000 • 1999	

ANNEX-1d: Cambodia - Used Lead Acid Battery Recycling Study Questionnaire

Introduction to the Project

The Department of Pollution Control at the Ministry of the Environment, with the assistance of the International Lead Management Center is undertaking an assessment of the recycling practices for used lead acid batteries in the Kingdom of Cambodia as part of a project sponsored by the Secretariat of the Basel Convention. This assessment will be in three stages:

- A desktop study – this is the questionnaire that forms part of the desktop study
- Technical fieldwork – to be conducted in conjunction with the desktop study
- A workshop – where the results of the questionnaires and the fieldwork will be considered, discussed and a national action plan prepared.

A report will then be prepared by the Ministry of the Environment assisted and the framework used to provide technical training on setting up ULAB collection schemes, and the administration of the movement of ULAB for sound recycling in line with good practice and international conventions.

In order to prepare for the assessment phase of the project and make informed decisions about the recovery options that are in the best interests of Cambodia essential data and information about the number of lead acid batteries in Cambodia has to be collected and collated. Your cooperation in the collection of this data would be most appreciated and helpful in determining an environmentally sound recovery system for ULAB in Cambodia.

Name of Government Agency	
How many trucks and buses were registered Cambodia in: • 2003 • 2002 • 2001 • 2000 • 1999	
How many cars were registered Cambodia in: • 2003 • 2002 • 2001 • 2000 • 1999	
How many motor cycles were registered Cambodia in: • 2003 • 2002 • 2001 • 2000 • 1999	

ANNEX-1e: Cambodia - Used Lead Acid Battery Recycling Study Questionnaire

Introduction to the Project

The Department of Pollution Control at the Ministry of the Environment, with the assistance of the International Lead Management Center is undertaking an assessment of the recycling practices for used lead acid batteries in the Kingdom of Cambodia as part of a project sponsored by the Secretariat of the Basel Convention. This assessment will be in three stages:

- A desktop study – this is the questionnaire that forms part of the desktop study
- Technical fieldwork – to be conducted in conjunction with the desktop study
- A workshop – where the results of the questionnaires and the fieldwork will be considered, discussed and a national action plan prepared.

A report will then be prepared by the Ministry of the Environment assisted and the framework used to provide technical training on setting up ULAB collection schemes, and the administration of the movement of ULAB for sound recycling in line with good practice and international conventions.

In order to prepare for the assessment phase of the project and make informed decisions about the recovery options that are in the best interests of Cambodia essential data and information about the number of lead acid batteries in Cambodia has to be collected and collated. Your cooperation in the collection of this data would be most appreciated and helpful in determining an environmentally sound recovery system for ULAB in Cambodia.

Name of Government Agency	Ministry of the Environment
What National Legislation exists for the control of ULAB?	
Are ULAB classified as a hazardous waste?	
What International conventions or protocols require the control of ULAB?	
Are there any control mechanisms for the transboundary movement of ULAB?	
Are ULAB exported to other countries for recycling?	
To which countries are ULAB exported from Cambodia?	
Are there records of ULAB exports and if so how many tons?	
List the environmentally sound ULAB recyclers in the region	1. 2. 3. 4. 5.

ANNEX-2: Project on Environmentally Sound Management of Used Lead-Acid Batteries in Cambodia

Activity Description	Timing	Responsibility		Needs and Approach
		Main	Cooperation	
1.0 Preparatory Arrangement				
1.1 Office preparation	Dec. 03	Task Team (TT)	-	Set out budget parameters Set up budget and accounts records Allocate resources
1.2 Set up Steering Group for SBC ULAB Project	Dec. 03	TT	-	-
1.3 Formulating the Task Team	Dec. 03	TT	-	Chrin Sokha – Deputy Director DEPC Team Leader Sreng Sophal – Vice Chief Office DEPC Field Engineer Ken Choviran – Chief of Environmental Research and Technology Mgt Office. Project Researcher
1.4 Identify sources of information	Dec. 03	TT	1. Ministry of Industry, Mines and Energy 2. Ministry of Health 3. Ministry of Commerce 4. Ministry of Agriculture, Forestry & Fisheries 5. Ministry of Public Works and Transport 6. Dept. of Customs 7. Phnom Penh Municipal Authority 8. Phnom Penh Municipal Dept. of the Environment 9. Council for the Development of Cambodia 10. LAB importers	Full cooperation from the various government ministries

				Questionnaires	Revise and modify questionnaire in MOU
1.5 Draft a detailed work program	Dec. 03 to Jan 04	TT	ILMC		• Set out initial timelines and events • Circulate for comments • Meet to discuss content
1.6 Steering group meeting	Dec. 03	TT	Concerned institutions/ other stakeholder		To explain the relevant project components, including the background to the Basel Convention, and their implementation. To seek comments and feedback
1.7 Finalize a detailed work program	Jan. 04	TT	ILMC		• Check data and information needs • Finalize Questionnaires • List Government Agencies to contact • Fix milestones and timelines
1.8 Establish a methodology (investigation, research, interview, etc.) for the conducting of the Desktop study and technical study	Jan. 04	TT	ILMC		• Survey relevant Government Agencies for data on vehicle and battery imports • Detailed survey sample in Phnom Penh of 10-12 battery shops, reconditioners, garages and computer shops to determine norms for ULAB sales, use and recovery. More samples will be taken if results vary. • Conduct similar survey in three other locations representing a wealthy area, a typical urban area and a typical rural area. • Locate and sample at least one, hopefully more, remote villages using lead acid batteries for Remote Area Power Supply (RAPS). • Collate and analyze results to determine the tonnage (MT) of ULAB generated annually, the sources of ULAB, the ways that the ULAB are recovered, how and where
1.9 Submit to SBC the detailed work-plan and other related information	Jan. 04	TT			—

2.0 Desktop Study					
2.1 Data and information collection using the agreed questionnaires	Jan. to March 2004	TT/ Env. Provincial and municipal Dept.	Concerned institutions and private sectors listed in section 1	Apportion responsibility for each section or sections of the exercise to designated persons in the TT.	
2.2 Collate information and identify and fill data gaps: - Commercial - Technical - Environmental - Health – Occupational and population - Domestic - International convention compliance - Informal activities	March 2004	TT	ILMC	Fill data gaps as soon as practical or make informed assumptions	
2.3 Evaluation of environmental and human health impacts and occupational health precautions taken for the handling of ULAB.	March 2004		Ministry of Health	Share information and data to improve collaboration and participation in the project.	
2.5 Steering group meeting	March 2004	TT	Concerned institutions	Present and discuss the initial findings of the surveys including the questionnaires and the field studies.	
3.0 Field Work					
3.1 Prepare and carry out survey of ULAB recyclers/reconditioners at designated areas	Jan to Mar. 04	TT	ILMC	ILMC only in January. Site visits and interviews with owners and workers	
3.2 Prepare and survey of ULAB collectors and scavengers at designated areas	Jan to Mar 04	TT		Interview collectors, workers and scavengers to establish work patterns and health in city and provinces such as (i) Phnom Penh City; (ii) Sihanoukville City; (iii) Battambang Province; and (iv) Svay Rieng Province.	
3.3 Deliver technical report (including analysis and assessment)	Apr. 04	TT	ILMC	In preparation for distribution to the delegates for the National Workshop.	

4.0 <i>National Workshop</i>	May 04 2 days	TT	Steering Committee, contributing Government Agencies, customs, ILMC, Local Cleaner Production Center, NGO (Blacksmiths Institute)	Present findings and conclusions arising from the questionnaires, surveys and field trips. Permit the Workshop delegates to debate the main issues and impediments to the ESM of ULAB. Task the workshop delegates to determine options for: • Implementation of ESM of ULAB • National policies options for recovery of ULAB • Practical solutions to promote ULAB collection and recovery by ESM through legislation and or financial incentives • Policies to ensure compliance with International and domestic legislation for the movement of ULAB • Training programs to promote awareness of the need to recovery and recycle ULAB in an ESM. • Training programs to promote public awareness of the health and environmental dangers of battery dumping, reconditioning and repairs. • Practical measures to find useful employment of all those people involved with the unsound collection and recovery of ULAB.
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5.0 Prepare National Pan					ILMC	Take into account the suggested options presented at the workshop		
5.1 Prepare a draft National Action Plan for recycling ULAB battery through ESM at national level								
5.2 Steering group meeting to discuss the draft plan					TT	Concerned institutions	Get approval for the drat plan subject to any final amendments	
5.3 Finalize the draft plan					TT			
6.0 Stakeholder Consultation Seminar					Jul. – Aug. 04	Concerned institutions and any other stakeholders	Present the Final National Action Plan and seek support for the implementation phase	
7.0 Training Workshop					Sep. 04	–	Capacity building based on achieving the implementation of the National Action Plan and the application of the procedures needed to achieve ESM of ULAB. Training will include the necessary aspects of the Basel Convention for the transboundary movement of ULAB and the implementation of the Basel Guidelines.	
8.0 Deliver Final Project Report including Outline Guidelines for General Waste Stream Diagnosis, Assessment and Planning for ESM					Sep. 04	TT	ILMC	
9.0 Steering group meeting					Sep. 04	TT	Concerned institutions and other stakeholders	To sign off on the final report.

SBC Cambodian ULAB project - Milestones

1. Preparatory Arrangement

- 1.1 Office preparation
- 1.2 Set up steering Group
- 1.3 Formulate the Task Team
- 1.4 Identify sources of information
- 1.5 Draft a detailed work program
- 1.6 Steering group meeting
- 1.7 Finalize a detailed work program
- 1.8 Establish a study methodology
- 1.9 Submit to SBC the detailed work-plan

2. Desktop Study

- 2.1 Data and information collection
- 2.2 Collate data - identify and fill data gaps
- 2.3 Evaluation of environmental and health impacts

3. Field Study

- 3.1 Survey of ULAB recyclers and reconditioners
- 3.2 Survey of ULAB collectors and scavengers
- 3.3 Deliver technical report

4. National Workshop

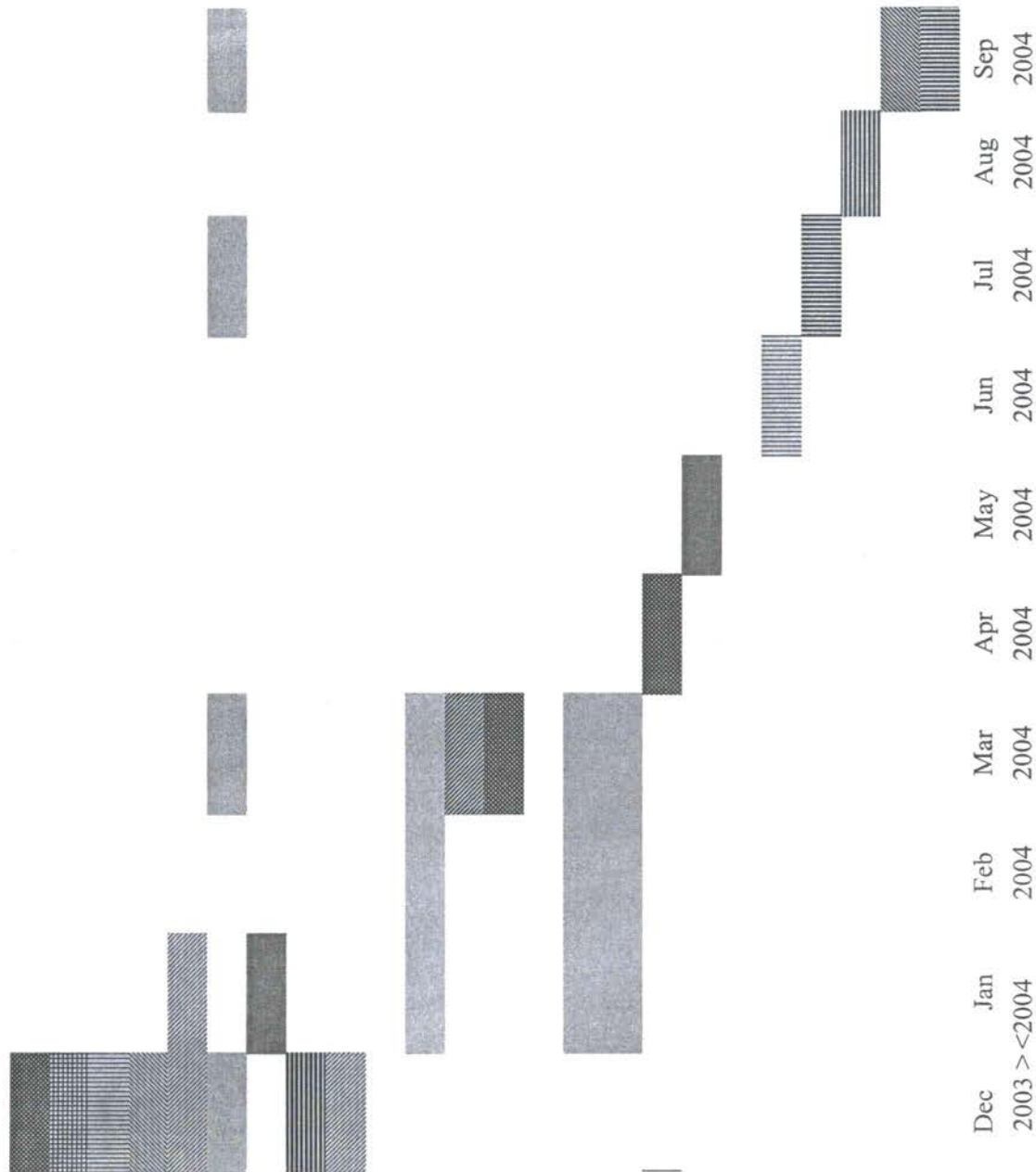
5. Prepare National Plan

- 5.1 Prepare draft National Action Plan for ULAB
- 5.1 Finalize draft National Action Plan for ULAB

6. Stakeholder Consultation Seminar

7. Training Workshop

8. Deliver Final Report for the ESM of ULAB



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