

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR
INFECTIOUS DISEASES CONTROL
IN
THE KINGDOM OF CAMBODIA

May 2003

Japan International Cooperation Agency

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PREFACE

In response to a request from the Royal Government of Cambodia, the Government of Japan decided to conduct a basic design study on the Project for Infectious Diseases Control, and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Cambodia a study team from October 13 to 31, 2002.

The team held discussions with the officials concerned of the Royal Government of Cambodia, and conducted a field study at the study area. After the team returned to Japan, further studies were made, then the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Royal Government of Cambodia for their close cooperation extended to the team.

May 2003

Takao Kawakami

President

Japan International Cooperation Agency

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Infectious Diseases Control in the Kingdom of Cambodia.

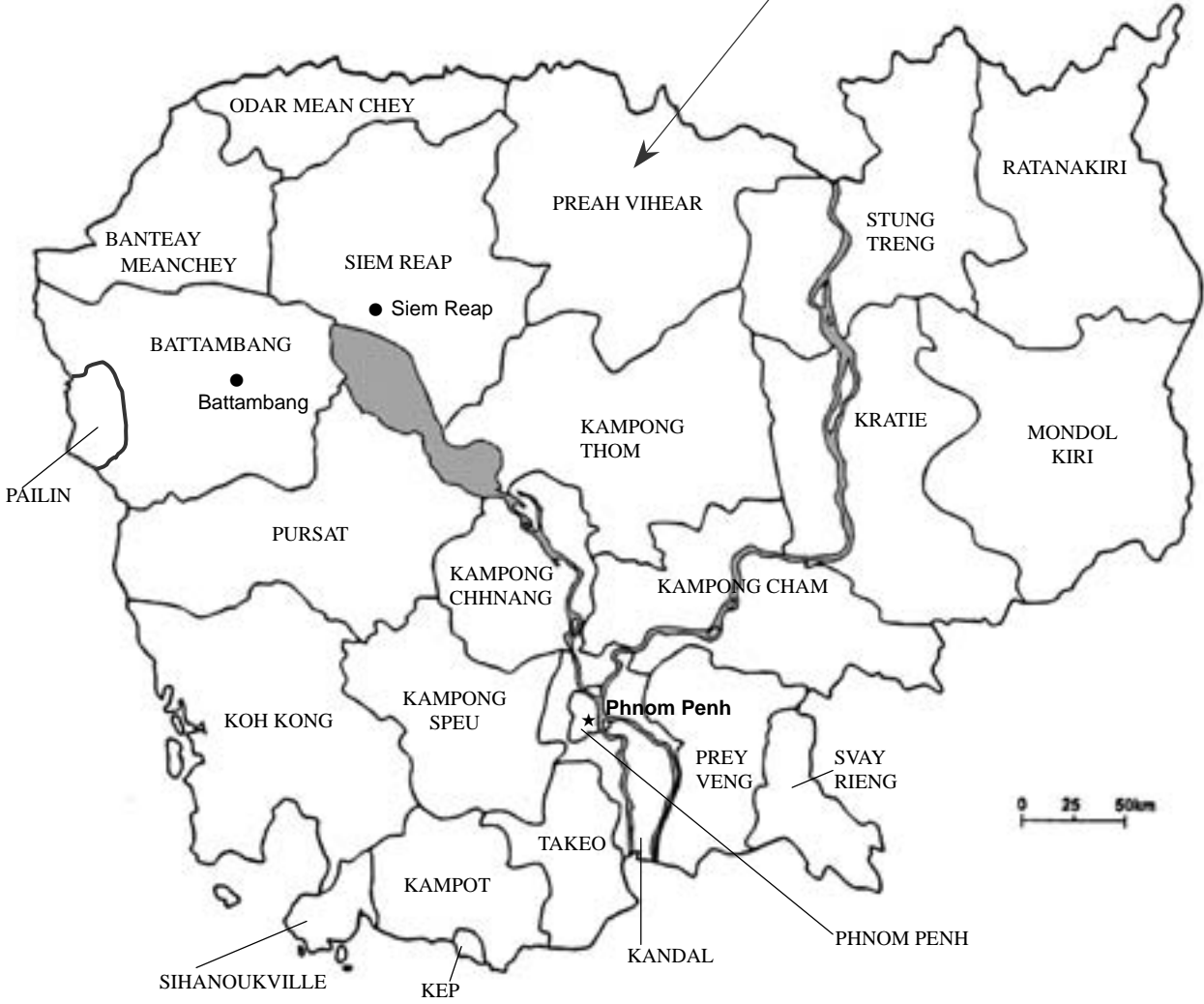
This study was conducted by Japan International Cooperation System (JICS) under a contract to JICA, during the period from October 13 to 31, 2002. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Cambodia and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Kyoko Goto
Project manager,
Study team on
the Project for Infectious Diseases Control
Japan International Cooperation System

Location Map



Cambodia

Abbreviations

AIDS	Acquired Immuno-Deficiency Syndrome
BCG	Bacillus Calmette-Guerine
CENAT	National Center for Tuberculosis and Leprosy Control
CFC	Chloro Fluoro Carbon
CMS	Central Medical Stores
DPT	Diphtheria-Pertussis-Tetanus Combined Vaccine
GDF	Global Drug Facility
HIV	Human Immunodeficiency Virus
IEC	Information Education Communication
IUATLD	International Union against Tuberculosis and Lung Disease
LP gas	Liquefied Petroleum gas
MTEF	Medium Term Expenditure Framework
NIP	National Immunization Program
OPV	Oral Polio Vaccine
UN	United Nations
UNICEF	United Nations Children's Fund
TB	Tuberculosis
WHO	World Health Organization
WPRO	WHO Western Pacific Region Office

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Chapter 1 Background of the Project

The Cambodian Ministry of Health in an effort to provide quality health services for the entire nation is implementing and gradually expanding nationwide activities by fortifying health services on the Health Center level under the National Strategy on Immunization 5-Year Work Plan, the National Health Strategic Plan for Tuberculosis Control 2001-2005, and other programs against infectious diseases.

The Kingdom of Cambodia (hereinafter to be referenced as “Cambodia”) officially launched a National Immunization Program (NIP) in 1986, which expanded to all provinces by the end of 1988. However, under the subsequent political distemper, NIP activities were suspended or cut back considerably, as the procurement or periodic replacement of cold-chain equipment and vehicles, as well as the implementation of immunization campaigns, were seriously affected. In Cambodia, cold rooms, freezers, refrigerators and vehicles that were deployed in the early 1990s through the assistance of UNICEF are still being used. These equipment are more than ten years old and severely deteriorated. The freezers and refrigerators installed in Provincial Health Offices and Operational District¹ Health Offices are of old kerosene type with limited storage space and improper temperature control. Therefore, some regions are struggling to store sufficient quantities of vaccines to cope with population growth. The wastage² of measles and OPV in Cambodia are as high as 68% and 52% respectively. Improper vaccine storage due to the scarcity of cold-chain equipment is said to be responsible for the high wastage, which need to be rectified. Immunization services in rural, mountain, and marchland areas that are to be continued and fortified through outreach activities³ are also deadlocked because of the lack of vehicles to transport vaccines and personnel.

Table 1-1 shows the current routine immunization schedule in Cambodia.

¹ Operational Districts are units responsible for managing 10 to 15 Health Centers as designated by the Ministry of Health. Many Operational Districts combine parts of different administrative districts. Operational District Health Office has jurisdiction over Operational Districts. Central Hospitals are positioned as referral hospitals.

² Vaccine wastage is a ratio of vaccine that is discarded because of breakage during transportation or nonuse. For instance, if only one person is to be immunized using a vial containing ten doses, the remaining nine doses go to waste. Thus, the wastage in this case is nine out of ten, or 90%. Vaccine wastage changes considerably depending on the packaging unit (number of doses per vial), the number of people to be vaccinated, improper temperature control of refrigerators, and various other factors.

³ Outreach activities are part of itinerant medical services, in which health workers are dispatched from Health Center to the residences of patients to vaccinate them.

Table 1-1: Vaccination Schedule in Cambodia

Name of vaccine	No. of doses	Timing
BCG	1	at birth
OPV	4	at birth and 6, 10, and 14 weeks
DPT	3	6, 10, and 14 weeks
Measles	1	9 months
Tetanus	2	at the time of confirming pregnancy and 1 month after the 1 st dose

Source: Ministry of Health (2001)

Measles vaccination has been given only once to infants at nine months. However, it is estimated that only 80% of children who received an initial dose of vaccine show immunity to measles because of a waning immunity over time or primary vaccine failure.

The 1999 surveillance identified 13,827 measles cases in 1999 and 12,327 cases in 2000, which are estimated to reflect only 40 to 50% of the actual number of cases, indicating the need for more aggressive measures against the disease. The Western Pacific Regional Office of WHO (hereinafter to be referenced as “WPRO”) now recommends to provide a second opportunity of measles vaccine. The Cambodian Ministry of Health began considering introducing this strategy, in which a nationwide immunization campaign against measles would be conducted to immunize children in different age groups, and then change the round of vaccination from one to two in the routine immunization schedule. More specifically, they began giving boosters (=additional immunization) to children under five in 2000 to enhance immunity, which continued in 2001 and 2002 among about 2.52 million people in Phnom Penh and Siem Reap, Kampong Speu, Takeo, Pray Veng, Kampong Thom, Kandal, and Banteay Meanchey provinces. The second opportunity in the routine immunizations will start in 2003, which will require twice the amount of measles vaccine. In addition, to maintain the polio-free status, additional mass immunization campaign to administer OPV to children under five needs to be conducted in the provinces bordering Thailand and other countries, from which polio virus could enter Cambodia. The sudden increase in demand for vaccines is straining the finances of the Ministry of Health.

As the immunization activities expand, the demand for syringes also increases. Cambodia introduced auto-disable syringes⁴ to immunization campaigns in 1999, began using them on a trial basis in the routine immunizations in Kampong Cham Province in 2001, and would expand the usage thereof in other Provinces starting in November 2002.

⁴ Auto-disable syringes were developed to prevent the transmitting infectious diseases through inappropriate use of syringes. They become unusable after one injection.

Accordingly, the number of auto-disable syringes to be discarded will also increase, which needs to be handled in an environmentally responsible manner. WHO and WPRO have established guidelines for the safe use and proper disposal of auto-disable syringes and recommend that used syringes should be destroyed in incinerators. Cambodia has already installed 23 auto-combustion incinerators in some Operational District Health Offices and provincial hospitals, and plans to introduce additional 26 incinerators (and ultimately to all 73 Operational Districts) in the second phase. However, because of the financial constraint, there is no prospect of procuring additional incinerators or receiving assistance from donors.

As part of measures against tuberculosis (hereinafter to be referenced as “TB”), treatment of the disease has been offered free of charge and the drugs were mostly donated by the German government. When German assistance was discontinued in 1997, the Cambodian Ministry of Health took over the procurement of anti-TB drugs and purchased them from one Cambodian company, which led to a sudden rise in national medical expenditures. Even after the forming of the procurement department within the Ministry of Health in 2001, drug price in Cambodia remained as high as three times that of international rate, and poor-quality products continued to circulate in the market. In addition to the unstable supply of drugs, more serious drug shortage is projected because of possible confusion that may be created by international tender to be introduced in 2003. If that happens, emergency purchase from Global Drug Facility (hereinafter to be referenced as “GDF”)⁵ may become necessary to ensure uninterrupted supply of TB drugs, as inconsistent or partial treatment could trigger the development of drug-resistant TB. Reform of the procurement, management, and supply systems to ensure stable procurement and distribution of high-quality drugs that meet the international standards is one of the most pressing tasks for the Cambodian government.

DOTS⁶ in Cambodia has been proceeding favorably, meeting the target cure rates partially owing to external assistance, including the JICA National Tuberculosis Control Project that was initiated in 1999. In addition, introduction of a new treatment regimen is being planned to reduce the relapse of TB, as the conventional methods have limited efficacy for controlling recurrence and HIV complication. Pilot studies of the new regimen will start in 2003,

⁵ GDF (Global TB Drug Facility): hosted by WHO and managed by the Stop TB secretariat, established in corporation with Rockefeller Foundation, World Bank, and other organizations to assist the procurement of high-quality anti-TB drugs for DOTS.

⁶ DOTS (Direct Observed Treatment, Short Course): A TB control strategy recommended by WHO. DOTS has five key components: government commitment to sustained TB control activities; case detection by sputum smear microscopy; standardized treatment with directly observed therapy (DOT); a regular, uninterrupted supply of all essential anti-TB drugs; and a standardized recording and reporting system that allows assessment of

and if all goes well, it will be used nationwide starting in 2005. Therefore, uninterrupted supply of this drug in consistently high quality will be of vital importance to ensure the effectiveness of DOTS. In order to secure sufficient quantities of high-quality drugs and laboratory reagents before and after the switchover to the new regimen, as well as for restructuring the logistics system within Cambodia during that period, external assistance is necessary.

Under these circumstances, the Royal Government of Cambodia submitted an official request to the Government of Japan to extend assistance for the procurement of cold-chain equipment, vaccines, auto-disable syringes, incinerators that are necessary for the implementation of the National Strategy on Immunization, as well as anti-TB drugs and laboratory reagents that are essential to DOTS.

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

In 2002, the Royal Government of Cambodia initiated the Medium-Term Expenditure Framework (MTEF 2003-2007) in order to effectively allocate the national budget and foreign assistance funds among necessary projects in different sectors in a comprehensive manner. For the health sector, MTEF plans to improve health and medical services, develop human resources, and reform the health organizations, aiming at lowering the infant and maternal mortality rates, improving maternal-and-child nutrition, decreasing medical expenditures for the poor, reforming the health system, and achieving other objectives.

This Project is designed in line with the National Strategy on Immunization and the National Health Strategic Plan for TB Control that were developed based on MTEF and aims to improve the effectiveness of Cambodia's immunization activities by procuring necessary vaccines and cold-chain equipment to prevent the deterioration of vaccines, as well as to control tuberculosis by improving the case detection rate and supporting the treatment through the provision of anti-TB drugs and laboratory reagents. The goal of this Project is to reduce the morbidity of preventable diseases by procuring equipment and supplies necessary for carrying out these activities and meeting their objectives.

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

This Grant Aid Project is to assist the Royal Government of Cambodia in the implementation of the National Strategy on Immunization 5-Year Work Plan and the National Strategic Plan for Tuberculosis Control 2001–2005 by providing funds necessary for the procurement of syringes, incinerators, safety boxes and the renewal of the cold room of the

Central Medical Stores (hereinafter to be referenced as “CMS”), as well as for the procurement of freezers and refrigerators to be installed in the Provincial Health Offices, Operational District Health Offices, and immunization sites throughout Cambodia, plus vaccine carrying equipment, temperature monitoring equipment, vehicles, computers, and anti-TB drugs and laboratory reagents. This Project was designed based on the following policies and guidelines.

1. Basic Policy (target regions and population)

According to the policy of the Cambodian Ministry of Health for the implementation of the National Strategy on Immunization and the National Strategic Plan for TB Control, this Project targets in all parts of Cambodia, such as at the NIP division of the Ministry of Health, National Center for TB and Leprosy Control (hereinafter to be referenced as “CENAT”), CMS, Operational District Health Offices, referral hospitals and Health Centers. OPV will be given in a mass immunization campaign in the regions that are exposed to possible invasion of poliovirus from neighboring countries. Such areas consist of the mountainous region along the Thai border (Battambang, Banteay Meanchey, Oddar Meanchey, and Preah Vihear provinces and Pailin city), the northeastern region along the Viet Num border (Kratie, Stung Treng, Ratanakiri, and Mondol Kiri provinces), and Phnom Penh city and Kandal province, where many people live on the water of Mekong River.

The size of the target population for each implementation year in 2004 (Phase I), 2005 (Phase II), and 2006 (Phase III) is estimated based on the Ministry of Health’s 2001 statistical report on population by province multiplied by the annual population growth rate of 2.49% as set by the Ministry of Health. The target population of immunization is obtained by multiplying the total population by 3.4%, a ratio of infants. The number of target TB patients for each of the three categories defined in DOTS is estimated based on the patient index (number of patients per 100,000 population) adopted by the CENAT.

2. Policy on Natural Environment

The climate of the entire Cambodia is tropical monsoon. The temperature is 27.4°C on the average and could rise to as high as 40°C during the dry season. Therefore, the cold room refrigeration and refrigerators should be able to maintain the inside temperature between +2 and –8°C at 43°C outside temperature, and the cold room freezer and

freezers should be able to constantly keep the temperature within the –15 to –30°C range. Cold boxes and vaccine carriers to be used outdoors should have casing made of plastic or other weather-resistant materials. Equipment that needs to be kept within a specific temperature range needs to be transported and stored under the proper temperature range.

3. Policy on Social Conditions

The electric power distribution network in Cambodia is not fully developed, and power outages occur frequently. Since many local Health Centers are not connected to power supply lines, selection of cold-chain should take these factors into account. The cold rooms will be connected to stand-by generators as an emergency power source with a capacity that can cover both cold rooms at the same time. In addition, each cold room should be equipped with a back-up cooling unit that will automatically take over in case the regular cooling unit breaks down unexpectedly. Electric refrigerators will be icelined, meaning that the walls are encircled with frozen tubes to maintain the proper inside temperature during power outage. Freezers and refrigerators to be deployed in areas without power supply, gas-type equipment will be chosen, as LP gas is available in almost any part of Cambodia.

4. Policy on Environmental Protection

Although incinerating used syringes has many advantages over burial disposal, such as reduced waste volume, automatic sterilization and greater safety as needles become brittle and blunt at high temperature. However, in introducing incinerators, its possible environmental impact, such as emission of dioxin, should be carefully examined.

In addition, in order to protect the ozone layer to prevent global warming, CFC-free refrigerators and freezers should be selected.

5. Policy on Operation and Maintenance

Cambodia is in the process of standardizing cold-chain equipment and has established ten standard types.

Table 2-1: List of Standard Cold-Chain Equipment

	Central Medical Stores	Provincial Health Office	Operational District Health Office			Health Center		
			Electrified areas	Unelectrified areas	Transport of vaccine	Electrified areas	Unelectrified areas	Vaccination site
Vaccines to be refrigerated	Cold room (refrigeration)	Icelined refrigerator (Medium)	Icelined Refrigerator (Small)	Gas/electric refrigerator & freezer (Large)	20-litre cold box	Icelined Refrigerator (Small)	Gas/electric refrigerator & freezer (Small)	1.6-liter vaccine carrier
Vaccines to be frozen	Cold room (freezer)	Chest freezer (Large or Medium)	Chest freezer (Small)			Chest freezer (Small)		
Production of icepacks	Chest freezer (Large)							

Standardization of equipment is favorable to Cambodia where financial and human resources are scarce and maintenance services and spare parts are available only from a limited number of suppliers. Therefore, this Project will select cold-chain equipment that corresponds to the Cambodian standardization.

6. Policy on Model Types and Grades

1) Incinerator

As a result of surveys and field tests that were conducted under the guidance of WPRO, installation of the Sicim type auto-combustion incinerator has been selected. Considering the size of the chamber and incineration capacity, operational cost, ease-of-use for the local staff and other possible environmental impact, this model is deemed suitable for the Project.

2) Equipment Related to Vaccination Activities

This Project will procure auto-disable syringes, safety boxes, cold-chain equipment, and temperature monitoring devices that meet the standards for performance and testing defined by WHO. Such models are designed for use in developing countries. They are highly durable and heat resistant and have other design features to ensure proper storage of vaccines. Other advantages include the availability and longer stock periods of spare parts, as they undergo fewer model changes than other standard models.

3) Vaccine / Disposable Syringe

WHO has examined and selected certain manufacturers that could produce vaccines to satisfy certain quality requirements in large enough quantities at reasonable prices, and qualified them as suppliers for UNICEF and other UN organizations. This Project will procure vaccines from these manufacturers also.

Since no standards are set by WHO for disposable syringes, this Project will procure the product from manufacturers that have obtained ISO9001 or 9002 certifications to ensure the quality.

4) Computer

Computers for this Project should be IBM compatible, installed with operating systems and applications that are commonly used in Cambodia. Also, technical support and expendable supplies for the computers should be available locally.

5) Vehicle

Station wagons and pickup trucks should have sturdy body structures, high ground clearance, 4-WD, and other characteristics and functions that can withstand the bumpy road conditions of Cambodia. Motorcycles should be in 100-110 cc class so that small female health workers can have a ride easily. Availability of spare parts and repair services should be taken into consideration.

6) Anti-TB Drug and Reagent for Smear Examination

The following five types of anti-TB drugs will be procured, as they are currently used in Cambodia.

Table 2-2: Anti-TB Drugs Currently Used in Cambodia

Name of Drug	Pharmaceutical form	Abbreviation
Rifampicin + Isoniazid	Tablet	RH
Pyrazinamide	Tablet	Z
Ethambutol + Isoniazid	Tablet	EH
Ethambutol	Tablet	E
Streptomycin	Injection	S

After the switchover to the new treatment regimen in 2005 only four types of drugs will be procured, as the ethambutol +isoniazid combined drug will not be used in the new regimen. Drug manufacturers will be chosen from those that GDF recommend to international donor organizations and developing countries as a result of their joint investigation to identify companies that could manufacture drugs to consistently meet a certain quality level and supply them at a relatively low price. As for packaging of tablets, the Ministry of Health has chosen the blister package⁷ to

⁷ Contains a specific number of tablets on a sheet of blisters, by pushing which the patient can take out a needed number of tablets right before swallowing them. This type of packaging is hygienic, damp-proof, and easy to see the contents.

minimize mix-ups by the medical staff and errors in dispensing work. To make the observation of drug intake easier, each sheet will contain 1-week doses for an adult (=28 tablets).

As the quality of the reagent for sputum smear microscopy greatly influences the reliability of the examination result, it should meet the Japanese Industrial Standard or equivalent standards.

7. Policy on Procurement Method and Timeframe

The Cambodian government requested three-year supplies of equipment and supplies. The request is deemed appropriate in view of the fact that the National Strategy on Immunization plans to install refrigerators in each Health Center after the completion of the training of their entire staff members and to conduct polio immunization campaigns over a three-year period and the expanded measles vaccination over a two-year period, as well as the fact that the National Strategic Plan for TB Control will need to have sufficient quantity of anti-TB drugs in stock to expand DOTS nationwide. It should be noted, however, that both National Strategic Plans are for the five-year period between 2001 and 2005 and may be revised after that period. In addition, an increase in the detection of TB cases by DOTS expansion and the result of the pilot studies⁸ may affect the quantification of drugs. If the modification of the design of this Project becomes necessary according to these changes, further studies should be conducted for the second and third phases to obtain more accurate figures to determine the quantities of equipment and supplies to procure.

⁸ In order to establish guidelines for introducing the new regimen (=6-month treatment regimen), CENAT is planning to test the regimen on an estimated number of 400 newly detected TB cases from 2-3 Operational District Health Offices and part of Phnom Penh to compare the efficacies of the new and conventional regimen, identify possible side effects and other problems, precautions to be taken, and observe the changes in the detection and recurrence rates.

2-2-2 Basic Design

1. Equipment Plan

The table below shows the equipment items that are deemed necessary, their descriptions, applications, and quantities.

Table 2-3 Equipment List

Item	Description	Quantity		
		Phase I	Phase II	Phase III
1 Autocombustion Incinerator	Incinerating safety boxed with used syringes Distributed to 26 Operational district	26 units	—	—
2 Safety Box, Large	Waste management of immunization activities for health centers and hospitals	18,000 pcs.	19,000 pcs.	—
3 Safety Box, Medium	Waste management of immunization activities for outreach activities	50,000 pcs.	50,000 pcs.	—
4 Autodisable Syringe	0.5ml Autodisable for safety injection	3,000,000 pcs.	3,640,000 pcs.	—
5 Cold Room, Refrigeration	16m ³ prefabricated walk-in type for Measles, DPT vaccine etc	1 unit	—	—
6 Cold Room, Freezer	32m ³ prefabricated walk-in type for OPV	1 unit	—	—
7 Generator	Backup system for cold rooms during power cut	1 unit	—	—
8 Inclined Refrigerator, Large	Vaccine storage (200L class) for provincial level	10 units	10 units	37 units
9 Inclined Refrigerator, Small	Vaccine storage (40-50L class) for health centers in electrified area	2 units	2 units	8 units
10 Refrigerator and Freezer, Gas and Electric Type, Large	Vaccine storage (170L class) for operational district health office in non-electrified area	6 units	6 units	22 units
11 Refrigerator and Freezer, Gas and Electric Type, Small	Vaccine storage (70L class) for health centers	500 units	300 units	279 units
12 Chest Freezer, Small	Vaccine storage and icepack production (110L class) for operational district health office in electrified area	22 units	5 units	19 units
13 Chest Freezer, Large	Vaccine storage and icepack production (320L class) for provincial health office	10 units	5 units	2 units
14 Cold Box	Vaccine transport from central to peripheral for operational district health office	600 units	240 units	240 units
15 Vaccine Carrier	Vaccine carriage during outreach activities for health centers	1,000 units	1,000 units	1,000 units
16 Vaccine Thermometer	Temperature monitoring for refrigerator and cold box	1,000 pcs.	500 pcs.	500 pcs.
17 Temperature Data Logger	Temperature monitoring for refrigerator for provincial health office	20 units	20 units	20 units
18 Freeze Watch Indicator	Irreversible temperature indicator in case exposed to freezing	500 pcs.	500 pcs.	500 pcs.
19 Refrigerator Monitor	Dual irreversible temperature indicator Monitor mark with +10~+34°C and Freeze watch	1,000 pcs.	1,000 pcs.	1,000 pcs.
20 Cold Chain Monitor Card	Irreversible temperature indicator with monitor mark +10~+34°C	2,000 pcs.	2,000 pcs.	2,000 pcs.
21 Measles Vaccine	for Second opportunity immunization	1,410,000 doses	1,440,000 doses	—
22 Disposable Syringe	for Measles vaccine (freeze dried) dilution	141,000 pcs.	144,000 pcs.	—
23 Oral Polio Vaccine	for supplementary immunization	770,000 doses	790,000 doses	810,000 doses
24 Desktop Computer System	for data management for immunization, surveillance for cold chain monitoring	4 sets	—	—
25 Desktop Printer		2 sets	—	—
26 Lap Top Computer		2 sets	—	—
27 Portable Printer		2 sets	—	—
28 Station Wagon	for surveillance, supervising immunization activities, staff training	3 units	—	—
29 4WD Pick-up Truck, Double Cabin	Vaccine transport for operational district	6 units	—	—
30 Motorcycle	Vaccine transport for health center outreach	50 units	50 units	—

Item	Description	Quantity		
		Phase I	Phase II	Phase III
31 Rifampicin + Isoniazid	Anti-tuberculosis drugs recommended by GDF/WHO	26,537 boxes	30,607 boxes	32,482 boxes
32 Pyrazinamide		15,050 boxes	10,637 boxes	11,272 boxes
33 Ethambutol + Isoniazid		16,827 boxes	— boxes	— boxes
34 Ethambutol		9,123 boxes	6,283 boxes	6,439 boxes
35 Streptomycin Injection		204,000 units	138,000 units	142,000 units
36 Fuchsin	for smear examination in CENAT	2 kg	2 kg	2 kg
37 Methylene Blue		2 kg	2 kg	2 kg
38 Phenol Crystal		30 kg	30 kg	30 kg
39 Hydrochloric Acid		25 liters	25 liters	25 liters

Large-size incinerators, incinerator house, off-road-type motorcycles, and phone/facsimile devices that were included in the initial request were withdrawn at the time of final confirmation of the requested items during the site survey. Instead, additional request was made, such as copiers; LCD projectors; scanners; pickup trucks and wooden boats for vaccine transportation; two types of pediatric anti-TB drugs; prophylactic TB drugs; laboratory reagents and equipment for sputum smear microscopy, reagents for identifying Mycobacterium Tuberculosis, equipment for culture examination and drug susceptibility test; and simple HIV/AIDS test kits. Also, in response to the official announcement of changes in treatment regimen that took place after the site survey, the amount of anti-TB drugs were changed according to the new formula, packaging, and combination of drugs.

As a result of subsequent analysis in Japan, copiers, projectors and scanners were deleted from the list, as they were deemed not urgently needed and their usage was unclear. Wooden boats were also excluded, as they could be procured by the Cambodian side at its own account. In addition, pediatric anti-TB medicine; prophylactic TB drugs; reagents for identifying Mycobacterium Tuberculosis, culture examination, and drug susceptibility test; and HIV/AIDS test kits were eliminated. It was deemed that pediatric TB drugs could be obtained by breaking up the drugs for adults, and that reagents for identification, culture examination, and susceptibility test were not as urgently needed although such tests were medically important.

Table 2-4 below compares the requested items at the time of drafting the minutes of discussion and the items finally included in the Project.

Table 2-4 Final Request and Procurement list

Final request and M/D list	Procurement List
1 Autocombustion Incinerator	1 Autocombustion Incinerator
2 Safety box 10 liter	2 Safety Box, Large
3 Safety box 5 liter	3 Safety Box, Medium
4 Auto-disable syringe 0.5ml	4 Autodisable Syringe
5 Vaccine cold store with stand-by back up generator	5 Cold Room, Refrigeration
6 Icelined refrigerator, Large	6 Cold Room, Freezer
7 Icelined refrigerator, Small	7 Generator
8 Refrigerator & freezer, Large	8 Icelined Refrigerator, Large
9 Refrigerator & freezer, Small	9 Icelined Refrigerator, Small
10 Chest freezer, Large	10 Refrigerator and Freezer, Gas and Electric Type, Large
11 Chest freezer, Large	11 Refrigerator and Freezer, Gas and Electric Type, Small
12 Vaccine cold box	12 Chest Freezer, Small
13 Vaccine carrier	13 Chest Freezer, Large
14 Thermometer	14 Cold Box
15 Data logger	15 Vaccine Carrier
16 Freeze watch	16 Vaccine Thermometer
17 Stop watch	17 Temperature Data Logger
18 Cold chain monitoring card	18 Freeze Watch Indicator
19 Measles vaccine	19 Refrigerator Monitor
20 Dilution syringes, 5ml disposable with needle	20 Cold Chain Monitor Card
21 Oral polio vaccine	21 Measles Vaccine
22 Computer with voltage regulator	22 Disposable Syringe
23 Printer	23 Oral Polio Vaccine
24 Laptop computer for field work	24 Desktop Computer System
25 Portable printer	25 Desktop Printer
26 Fax/phone	26 Lap Top Computer
27 Photocopy	27 Portable Printer
28 Digital camera	28 Station Wagon
29 LCD	29 4WD Pick-up Truck, Double Cabin
30 Scanner	30 Motorcycle
31 4WD station wagon	31 Rifampicin + Isoniazid
32 4WD pick up truck	32 Pyrazinamide
33 Road motorcycle	33 Ethambutol + Isoniazid
34 Boat (wooden)	34 Ethambutol
35 Rifampicin 150mg+isoniazid 100mg combination tablet	35 Streptomycin Injection
36 Pyrazinamide 500mg tablet	36 Fuchsin
37 Ethambutol 400mg +isoniazid 150mg combination tablet	37 Methylene Blue
38 Ethambutol 400mg tablet	38 Phenol Crystal
39 Streptomycin 1g injection	39 Hydrochloric Acid
40 RHZ 60/30/150 combination tablet	
41 Rifampicin 60mg+Isoniazid 30mg combination tablet	
42 Isoniazid 100mg tablet	
43 Fuchsin	
44 Methylene blue	
45 Phenol	
46 Hydrochloric acid	
47 Ethanol	
48 Sputum container	
49 Slide glass	
50 Disposal gloves medium	
51 Disposable gloves large	
52 Loop disposable	
53 Capilia TB	
54 Niacin	
55 Monopotassium phosphate	
56 Sodium glutamate	
57 Magnesium citrate	
58 Malachite green (oxalate)	
59 Glycerol (glycerin)	
60 Sodium hydroxide	
61 Sodium chloride	
62 Rifampicin (RFP)	
63 Ethambutol dihydrochloride (EM)	
64 Streptomycin sulfate (SM)	
65 Isonicotinic acid hydrazide (INH)	
66 Centrifuge tube	
67 Transfer pipette 2ml, sterile	
68 Transfer pipette 3.5ml, non-sterile, plastic	
69 Filter mask	
70 Disposal tube	
71 Culture tube	
72 Dainascreen HIV-1/2 100test/kit	

2. Rationale for Calculation

1) Auto-Combustion Incinerator (Item No. 1)

The ultimate plan is to install one incinerator in each of 73 Operational Districts throughout Cambodia. As of today, 24 Operational Districts in 17 Provinces and 3 Municipalities out of 20 Provinces and 4 Municipalities have been installed with incinerators. This Project will procure 26 incinerators to install in some of the remaining Operational Districts, for which installation sites have already been secured based on the detailed preliminary survey on the environment and implementation systems conducted by the Cambodian Ministry of Health in conjunction with WHO. Construction of incinerator houses, installation work, and staff training will be carried out at each site under the guidance of WHO, which pledged to provide continued guidance and instructions to ensure proper usage and maintenance of the equipment after installation.

2) Safety Box (Item No. 2 & No. 3)

Safety boxes will be procured in the quantity to sufficiently hold the four types of syringes to be used in immunization activities as listed in the table below. They will be in two different sizes: large 10-liter type that can store 200 syringes for health facilities and 5-liter boxes that can hold 100 syringes for outreach activities.

Table 2-5: Quantity of Syringes to be Used Annually

	Auto-disable syringe ^{*1}	Syringe for diluting measles vaccine ^{*1}	Syringe for BCG ^{*2}	Syringe for diluting BCG ^{*2}	Total
FY 2004 (Phase I)	3,560,000	141,000	500,000	140,500	4,341,500
FY 2005 (Phase II)	3,640,000	144,000	511,000	144,000	4,439,000

*1: See paragraphs 4) and 7) in the following section for the details of calculation.

*2: Same method as that for counting auto-disable syringes and measles-vaccine diluting syringes is used. (BCG immunization rate – 80%, No. of doses – 1, Wastage – 84%)

The total needed quantity of safety boxes converted into 5-liter type can be calculated by using the following formula. The divisor (100) indicates that one 5-liter box can hold approximately 100 syringes. A certain amount of reserve stock is included in the needed quantity in case of disrupted supply. Here, we used 2 as the coefficient of reserve stock

as set by the Cambodian authority.

$$\text{Needed quantity (in 5-liter boxes)} = (\text{no. of syringes} \div 100) \times \text{reserve stock coefficient}$$

It is estimated that in Cambodia, 50,000 5-liter safety boxes are used annually for outreach activities, and each of the 930 Health Center uses around 20 10-liter boxes (a total of about 18,600 boxes) each year. The quantity of each type of safety box to be procured during each project phase is calculated as shown in the table below:

	Total no. of 5-liter safety boxes derived from the formula	Breakdown by capacity (qty. after adjustment)	
		10-liter	5-liter
FY 2004 (Phase I)	86,830	18,000	50,000
FY 2005 (Phase II)	88,780	19,000	50,000

3) Auto-Disable Syringe (Item No. 4)

Size of the auto-disable syringe will be 0.5 ml to hold one dose for one person. This Project will procure auto-disable syringes in the quantity necessary for giving three types of vaccines, namely, Measles, DPT + hepatitis B, and Tetanus. OPV and BCG are not included in the calculation, as OPV will be given in a special dispenser, and the dose of BCG is only 0.05 ml. Wastage coefficient was included in the calculation by taking into account the breakage and loss during transportation and by misuse during the vaccination activity. A certain amount of reserve stock was also added in case of such unforeseeable events as delay in delivery and population influx from neighboring countries.

$$\text{Qty. to procure} = (\text{target population} \times \text{coverage} \times \text{no. of doses} \times \text{wastage coefficient}) + \text{reserve stock}$$

Variables used in the calculation were as follows:

① Target population

Target population in FY 2004 and 2005 was estimated by multiplying the population in FY 2001 as published in Ministry of Health's "National Health Statistics" by the population growth rate (2.49) and the ratio of infants (3.4%).

② Coverage

The vaccine coverage of each vaccine as set by the Ministry of Health is as follows:

Measles: 80%, DPT + hepatitis-B: 80%, Tetanus: 85%

③ No. of doses

According to the national immunization schedule, the number of doses required for each target individual by vaccine type is as follows:

Measles: 2, DPT + hepatitis-B: 3, Tetanus: 2

④ Wastage coefficient

Wastage is a ratio of broken or misused syringes that need to be discarded to the total number of syringes procured.

We used 10% wastage as calculated by WHO:

$$\text{Wastage coefficient} = \frac{100}{(100 - \text{Wastage})}$$

⑤ Reserve stock

Reserve stock is kept in case of interrupted supply. In Cambodia, the reserve stock rate is set at 25% as calculated using the formula below:

$$\text{Reserve stock} = (\text{target population} \times \text{desired coverage} \times \text{no. of doses} \times \text{wastage coefficient}) \times \text{reserve stock rate (25\%)}$$

Based on the above, the quantity of auto-disable syringes for each project phase is calculated as follows:

Table 2-6: Needed Quantity of Auto-Disable Syringes

	Vaccine	Target population (A)	Coverage (B%)	Dose (C)	Needed doses (D=A x B x C)	Wastage coefficient (F)	Qty. taking into account (F) (G=DxF)	Reserve stock rate (H)	Reserve stock (I=GxH)	Total (G+I)	Adjusted to units of 10,000
FY 2004 (Phase I)	Measles	448,578	80%	2	717,725	1.11	796,675	25%	199,169	995,844	1,000,000
	DPT+hepatitis-B	448,578	80%	3	1,076,588	1.11	1,195,013	25%	298,754	1,493,767	1,500,000
	Tetanus	448,578	85%	2	762,583	1.11	846,468	25%	211,617	1,058,085	1,060,000
									Quantity to procure		3,560,000
FY 2005 (Phase II)	Measles	459,748	80%	2	735,597	1.11	816,513	25%	204,129	1,020,642	1,020,000
	DPT+hepatitis-B	459,748	80%	3	1,103,396	1.11	1,224,770	25%	306,193	1,530,963	1,530,000
	Tetanus	459,748	85%	2	781,572	1.11	867,545	25%	216,887	1,084,432	1,090,000
									Quantity to procure		3,640,000

As the Cambodian side stated that 560,000 auto-disable syringes for FY 2004 would be secured through the assistance of UNICEF, this Project will procure 3,000,000 syringes for Phase I.

4) Cold Room (Item No. 5 & No. 6) and Generator (No. 7)

Cold rooms shall have a capacity to sufficiently store BCG, OPV, DTP+hepatitis B, Measles and Tetanus vaccines. The capacity was calculated based on the estimated volume of vaccines needed in 2004 as shown in the table below. Adding 5.0-6.0 m³ as a working space, the capacity of cold room is 32m³ (about 16.5 m² floor space) for refrigeration type and 15m³ (about 8.25 m² floor space) for freezer type.

Table 2-7: Rationale for Calculating the Capacity of Cold Room

Vaccines	Cold Room (refrigeration)				Cold Room (freezer)	
	① BCG	②DPT +hepatitis-B	③ Measles	④ Tetanus	⑤OPV (routine)	⑥OPV (campaign)
a. No. of doses per vial	20	10	10	20	10	10
b. Volume per dose (cm ³)	1.5	3.0	3.0	2.5	1.5	1.5
c. Annual requirement (no. of vials)	140,181	181,675	280,810	95,324	373,218	77,000
Capacity needed to store the above (m ³) = a × b × c	4.21	5.45	8.42	4.77	5.60	1.16
Total	①+②+③+④= 22.85 m ³				⑤+⑥= 6.76 m ³	

One generator that can supply power to both refrigerator and freezer cold rooms during power outage will be procured. The generator should have the capacity to be able to cover the maximum load at the time of starting up the cooling system. Assuming the 3-phase 220V50Hz power source and the startup amperages for the refrigeration room and the freezer room at 70A and 90A respectively, the power needed for starting up each cold room is as follows.

$$\text{Refrigeration: } \sqrt{3} (3\text{-phase}) \times 0.22(\text{A}) \times 70(\text{startup A}) \times 0.5(\text{factor: voltage drop, etc.}) = 13.3\text{KVA} \dots \textcircled{1}$$

$$\text{Freezer: } \sqrt{3} (3\text{-phase}) \times 0.22(\text{A}) \times 90(\text{startup A}) \times 0.5(\text{factor: voltage drop, etc.}) = 17.1\text{KVA} \dots \textcircled{2}$$

To add ① and ②:

$$13.3+17.1=30.4\text{kVA}$$

Based on the above, the capacity of the generator is determined to be around 30kVA.

5) Cold-Chain Equipment

- Icelined Refrigerator (Item No. 8 & No. 9)

Large refrigerators will be procured to replace deteriorated ones in the Provincial Health Offices and Operational District Health Offices in electrified regions. Small ones will be installed in Health Centers in electrified areas.

- Gas / Electric-Type Refrigerator & Freezer (Item No. 10 & No. 11)

Large gas refrigerator and freezer will be procured to replace old or broken ones in the Operational District Health Offices in regions without electric power supply. Small gas refrigerator and freezer will be installed in each Health Center throughout the country. Gas cylinders and gas flow regulators suitable for the equipment will be procured by the Cambodian side. Since the Health Centers, to which the small gas/electric-type refrigerator/freezer will be installed, have never owned this type of equipment, it will be introduced gradually over a three-year period according to the cold-chain equipment introduction plan and the training schedule developed by the NIP Division of Ministry of Health.

- Chest Freezer (Item No. 12 & No. 13)

Large chest freezers will be installed in Provincial Health Offices and small chest freezers in Operational District Health Offices to replace severely old or broken ones.

- Cold Box (Item No. 14)

All old-model cold boxes currently used in each Operational District Health Office and Health Center will be replaced, as they are more than five years and its insulation is deteriorated. As was the case with the small gas/electric-type refrigerator/freezer, one or two units will be distributed to Operational District Health Offices and Health Centers. This equipment will be of the same 20-liter type as those currently used by the Cambodian Ministry of Health.

- Vaccine Carrier (Item No. 15)

Each Health Center needs at least one vaccine carrier for outreach activities and for routine immunizations given at the Health Center. Therefore, this Project will procure one carrier for each Health Center in each project phase. The capacity of the carrier will be around 1.6 liters to hold 1-day supply of vaccines used in outreach activities.

- Temperature Monitoring Equipment (Item No. 16, No. 17, No. 18, No. 19 & No. 20)

The vaccine thermometer (No. 16) is for controlling the temperature of the cold box and the small gas/electric-type

refrigerator/freezer. The temperature data logger (No. 17) should be operated each of the 24 Operational District Health Offices. Since the Cambodian Ministry of Health currently owns four units, this Project will procure the remaining 20 in Phase I and another 20 in Phase II to renew the existing ones, whose service life expires in two years. The freeze watch indicator (No. 18) will be procured for each small gas/electric-type refrigerator/freezer. However, as the device expires in three years, the same quantity supplied in Phase I will be procured in Phase III to replace expired ones. The refrigerator monitor (No. 19) will be procured in the same quantity as the vaccine carrier. The cold chain monitor card (No. 20) will be procured in the quantity to meet the annual requirement (two cards per Health Center) based on the past usage record in Cambodia.

6) Vaccine (Item No. 21 & No. 23)

The Cambodian Ministry of Health decided to phase in a new immunization policy against measles from 2001 by providing second opportunity in which children receive an initial dose at 9 months then second dose at 6 years in order to boost the immunity and ensure the control of the disease. According to this change, this Project will procure measles vaccine in a quantity necessary to cover two doses per target individual in 2004 and 2005. OPV will be procured in the quantity to cover mass immunization activities in the mountain regions near the Thai border, the northeastern regions near the Viet Num border, and Provinces and Municipalities where many people live on the water of Mekong River.

The quantities of both vaccines were calculated based on the estimated target population in 2004 and 2005 using the formula below, which took into account the wastage coefficient (the ratio of vaccines wasted due to inadequate cold-chain equipment, breakage during transportation, and unused leftover vaccines), as well as the reserve stock as was the case with the syringes.

$\text{Needed doses of vaccine} = (\text{target population} \times \text{coverage} \times \text{no. of doses} \times \text{wastage coefficient}) + \text{reserve stock}$
--

Variables used in the calculation were as follows:

- ① Target population

Target population in FY 2004 and 2005 was estimated by multiplying the population in FY 2001 as published in Ministry of Health's "National Health Statistics" by the population growth rate (2.49) and the ratio of infants (3.4%).

② Target regions

Measles vaccine will be given nationwide. OPV will be administered in the mountainous regions along the Thai border (Battambang, Banteay Meanchey, Oddar Meanchey, and Preah Vihear Provinces and Pailin City), the northeastern regions along the Viet Num border (Kratie, Stung Treng, Ratanakiri, and Mondol Kiri Provinces), and Phnom Penh City and Kandal Province, where many people live on the water of Mekong River.

③ Coverage

The coverage of each vaccine as set by the Ministry of Health is as follows:

Measles: 80%, OPV: 90%

④ No. of doses

The number of doses required for each target individual by vaccine type is as follows:

Measles: 1 (for second opportunity), OPV: 2

⑤ Wastage coefficient

Wastage is a ratio of vaccine that was opened but not used within the same day and therefore needs to be discarded, to the total volume procured. The Cambodian Ministry of Health has set the wastage for measles and oral polio vaccines at 68% and 52 % respectively. Considering the underdeveloped cold-chain system of the country these figures are deemed appropriate. The wastage coefficient is obtained using the formula below:

$$\text{Wastage Coefficient} = \frac{100}{(100 - \text{Wastage})}$$

Wastage = Measles: 80%, OPV: 90%

⑥ Reserve stock

Reserve stock is kept in case of interrupted supply. In developing countries, the reserve stock rate is set at 20 - 30% and used to calculate the volume of reserve stock using the formula below:

Reserve stock = (target population × coverage × no. of doses × wastage coefficient) × reserve stock rate (25%)

Based on the above, the quantity of auto-disable syringes in each project phase is calculated and adjusted by rounding up the figures to units of 10,000 as shown in the table below:

Table 2-8: Needed Quantities of Measles and Polio Vaccines

	Vaccine	Target population A	Coverage B%	Dose C	Needed doses D=AxBxC	Wastage coefficient F	Qty. taking into account (F) G=DxF	Reserve stock rate H	Reserve stock I=GxH	Total J=G+I	Adjusted to unit of 10,000
FY 2004 (Phase I)	Measles	448,578	80%	1	358,862	3.13	1,123,239	25%	280,810	1,404,049	1,410,000
	OPV	163,320	90%	2	293,976	2.08	611,470	25%	152,868	764,338	770,000
FY 2005 (Phase II)	Measles	459,748	80%	1	367,798	3.13	1,151,209	25%	287,802	1,439,011	1,440,000
	OPV	167,387	90%	2	301,297	2.08	626,698	25%	156,675	783,373	790,000
FY 2006 (Phase III)	OPV	171,554	90%	2	308,797	2.08	642,298	25%	160,575	802,873	810,000

7) Disposable Syringe (Item No. 22)

Measles vaccine is freeze-dried and needs to be diluted with ‘water for injection’ at the time of vaccination. As one vial of measles vaccine will require 5ml of solution, the needed quantity of 5ml disposable syringes per vial (10 doses) is calculated as follows:

$\text{Qty. to procure} = \text{qty. of measles vaccine in doses} \div 10$
--

8) Computer (Item No. 24 & No. 26) and Printer (No. 25 & No. 27)

A total of four desktop computers (No. 24) will be procured for NIP Division of the Ministry of Health; one each for the inventory control of vaccines and cold-chain equipment and two for the management of surveillance data (using the software custom-made by WHO). Two desktop computers for inventory control will be connected to a desktop printer. Each of the two surveillance teams will be provided with one laptop computer with a portable printer to print out data.

9) Vehicle

- Station wagon (Item No. 28)

Station wagons will be used at the central level (NIP Division of the Ministry of Health) for traveling to and from remote areas for the surveillance, regional mass immunization, and IEC activities. The table below shows the

frequency of use and mileage per vehicle based on the actual record. Up to six teams (or 3.5 teams on the average) carry out these activities simultaneously, requiring four station wagons on a regular basis. The NIP Division of the Ministry of Health currently owns two vehicles, one of which is severely aged, and sometimes have to borrow cars from WHO or UNICEF. This Project will replace the old station wagon and procure additional two units to complement the shortage.

Table 2-9: Frequency of Use and Mileage per Station Wagon

Activities	No. of activities/year	Average travel distance km/time	Total travel distance km/year
Preparation training	10	50	500
Supervision training	10	50	500
Follow up training	10	50	500
IEC activities	5	50	250
Routine supervision	60	50	3,000
Immunization campaign preparation	3	50	150
Joint meeting and supervision with operational district and health centers	10	40	400
Cold chain maintenance	10	40	400
Vaccine transportation	10	600	6,000
Assessment	4	70	280
Survey	60	20	1,200
Investigation cases	60	50	3,000
Total	252		16,180

- Pickup truck (Item No. 29)

Although each of the 73 Operational District Health Office should be supplied with at least one to two vehicles, only 65 are currently distributed among them, of which 31 are in poor condition. This means that only 34 trucks are actually operating in the whole of Cambodia.

The table below shows the frequency of usage and mileage per pickup truck based on the record.

As a general rule, this Project will replace the existing trucks that are either in poor condition or not repairable due to aging, while carefully examining the appropriateness of the request and proper use of the equipment to determine where to supply the vehicles by taking into account the following criteria:

- ① The region requiring trucks must encompass a vast land area (at least 10,000m² or about 4.6 times the size of Tokyo Metropolis), within which long distance traveling for vaccine transportation and other health activities is frequently required.

② Roads of the region must be underdeveloped or many of them should be unpaved or in poor condition.

③ Deployment of other types of vehicles, including motorcycles, should be taken into account.

There are six regions that meet the above conditions, namely, Kratie, Preah Vihear, Stung Treng, Ratanak Kiri, and Mondol Kiri Provinces in the northeastern mountain areas, and Koh Kong Province.

Table2-10: Frequency of Use and Mileage per Pick-up Truck

Activities	No. of activities/year	Average travel distance Km/time	Total travel distance Km/year
Preparation training	10	50	500
Supervision training	10	50	500
Follow up training	10	50	500
IEC activities	5	50	250
Routine supervision	60	50	3,000
Immunization campaign preparation	3	50	150
Joint meeting and supervision with operational district and health centers	10	40	400
Cold chain maintenance	10	40	400
Vaccine transportation	10	600	6,000
Assessment	4	70	280
Survey	60	20	1,200
Investigation cases	60	50	3,000
Total	252		16,180

- Motorcycle (Item No. 30)

Motorcycles are needed not only for vaccine transportation and other immunization activities but also for collecting used syringes. Since this Project will introduce incinerators for disposing auto-disable syringes, health facilities not currently equipped with motorcycles will be likely in need in the near future. However, in order to prevent the use of motorcycles for unintended purposes, 50 units of effectively used but deteriorated ones that are currently owned by certain health facilities will be replaced in Phase I. Currently, there are in total 70 units of motorcycles (45 aged and 20 inoperable ones) that need to be replaced, so in the Phase II the remaining 20 units and another 30 units that are expected to be deteriorated by 2004 after five years of operation will be considered to procure. The 50 units to be procured in Phase I are for replacing 25% of the entire existing motorcycles, covering 71% of those that were deemed in need of renewal as of October last year. The usage frequency and mileage per motorcycle based on the record are shown in the table below.

Table 2-11: Frequency of Use and Mileage per Motorcycle

Activities	No. of activities/year	Average travel distance Km/time	Total travel distance Km/year
Preparation training	2	40	80
Supervision training	2	40	80
Follow up training	2	50	100
IEC activities	1	50	50
Immunization campaign	3	80	240
Routine immunization	120	50	6,000
Vaccine transport	30	50	1,500
Participate monthly meeting at province	12	50	600
Joint assessment	40	40	1,600
Joint survey	60	10	600
Joint investigation cases	10	50	500
Total	282		11,350

Each station wagon, pickup truck, and motorcycle is used five days per week on the average (260 days per year). This means that they are used almost every workday, as there are about 125 holidays per year. Since each vehicle is used almost all day to carry out assigned activities, it is unlikely that they will be used for other purposes.

10) Anti-TB Drugs (Item No. 31, No. 32, No. 33, No. 34 & No. 35)

① Target population

In the table below, TB patients are divided into three categories, for each of which the number of patients is calculated based on the patient index (number of cases per 100,000 population) used by CENAT.

Table 2-12: Classification of TB Patients and Estimated Number of Cases

Fiscal Year		2004	2005	2006
Total Population (estimate)		13,193,483	13,522,001	13,858,699
Category I - new smear positive - smear-negative pulmonary TB - extra-pulmonary TB, severe form	Sputum smear positive /100,000	165	170	170
	/total population	21,770	22,988	23,560
	Extrapulmonary /100,000	12	13	13
	/total population	1,584	1,758	1,802
	Est. no. of patients	23,354	24,746	25,362
Category II - relapse cases - failure cases - return after default cases	No. of relapse /100,000	17	17	17
	/total population	2,243	2,299	2,356
	Est. no. of patients	2,243	2,299	2,356
Category III - smear-negative pulmonary TB, non severe form - extra-pulmonary TB, non-severe form	Sputum smear negative /100,000	40	50	60
	/total population	5,278	6,761	8,315
	Extrapulmonary /100,000	24	26	26
	/ total population	3,167	3,516	3,603
	Est. no. of patients	8,445	10,277	11,918

② Treatment regimen

Treatment regimen is comprised of the initial phase and the continuation phase. During the initial phase, drugs are given to make the patients smear negative and alleviate clinical symptoms, whereas the treatment regimen for the continuation phase is designed to eradicate residual bacilli for the prevention of relapse. Descriptions of treatment regimen are expressed by placing the number of months indicating the duration of treatment in front of the acronym for each drug or drug combination.

Example: 2RHZE/6EH (in case of Category I)

In the initial phase of two months, Rifampicin+Isoniazid (RH), Pyrazinamide (Z), and Ethambutol (E) are administered daily, followed by the six-month continuation phase, during which Ethambutol+Isoniazid (EH) is given every day.

As of 2002, the following treatment regimen is being used in Cambodia for treating TB under three categories. The Cambodian Ministry of Health intends to begin introducing new regimen in 2005, which includes the following changes:

- Combination of drugs for the continuation phase will be changed from Ethambutol+Isoniazid to Rifampicin+Isoniazid.
- The duration of one treatment course will be shortened from eight months to six months.

The above changes are expected to improve compliance, reduce relapses, and lower the mortality rate of HIV-complicated TB.

Table 2-13: Treatment Regimen

	until December 2004	from January 2005
Category I - a - b ⁹	2RHZE/6EH or 3RHZE/5EH	2RHZE/ 4RH or 3RHZE/ 3RH
Category II	2RHZES/1RHZE/5RHE	2RHZES/1RHZE/5RHE (no change)
Category III	2RHZ/6EH	2RHZ/ 4RH

Based on the above, required quantity of each drug for each Project Phase is calculated as shown in tables below.

⁹ 10% of treated patients do not turn sputum smear negative after two months of treatment in initial phase. For such patients, additional 1-month treatment is given.

Since streptomycin is produced in powder form, water for injection to dilute the powder right before injection should be procured along with the drug. Syringes necessary for diluting powdered drugs are available in Cambodia and therefore not included in the Project. In case of an increase in target patient population and delayed or interrupted supply of drugs during Phase II and thereafter, reserve stock of 6-months supplies will be included as recommended by IUATLD (International Union Against Tuberculosis and Lung Disease).

Needed Drug Quantity in Phase I

Drug	Classification	Quantity	Remarks
Rifampicin + Isoniazid (RH) 150/75mg	Category I -a	3,783,348	3 tablets x 2 mos (60 days) x est. cases x 90% ³
	-b	630,558	3 tablets x 3 mos (90 days) x est. cases x 10% ³
	Category II	1,614,960	3 tablets x 8 mos (240 days) x est. cases
	Category III	1,520,100	3 tablets x 2 mos (60 days) x est. cases
	Reserve stock (for 6 months)	10,283,850	50% of estimated annual requirement (20,567,700)
	Subtotal	17,832,816	
	After adjustment (tablets)	17,832,864	
	After adjustment (boxes)	26,537	672 tablets per box (28 tablets/sheet x 24 sheets)
Pyrazinamide (Z) 400mg	Category I -a	3,783,348	3 tablets x 2 mos (60 days) x est. cases x 90% ³
	-b	630,558	3 tablets x 3 mos (90 days) x est. cases x 10% ³
	Category II	605,610	3 tablets x 3 mos (90 days) x est. cases
	Category III	1,520,100	3 tablets x 2 mos (60 days) x est. cases
	Reserve stock (for 6 months)	3,573,792	50% of estimated annual requirement (7,147,584)
	Subtotal	10,113,408	
	After adjustment (tablets)	10,113,600	
	After adjustment (boxes)	15,050	672 tablets per box (28 tablets/sheet x 24 sheets)
Ethambutol + Isoniazid (EH) 400/150mg	Category I -a	7,566,696	2 tablets x 6 mos (180 days) x est. cases x 90% ³
	-b	700,620	2 tablets x 5 mos (150 days) x est. cases x 10% ³
	Category III	3,040,200	2 tablets x 6 mos (180 days) x est. cases
	Subtotal	11,307,516	
	After adjustment (tablets)	11,307,744	
	After adjustment (boxes)	16,827	672 tablets per box (28 tablets/sheet x 24 sheets)
Ethambutol (E) 400mg	Category I -a	2,522,232	2 tablets x 2 mos (60 days) x est. cases x 90% ³
	-b	420,372	2 tablets x 3 mos (90 days) x est. cases x 10% ³
	Category II	1,076,640	3 tablets x 8 mos (240 days) x est. cases
	Reserve stock (for 6 months)	2,110,758	50% of estimated annual requirement (4,221,516)
	Subtotal	6,130,002	
	After adjustment (tablets)	6,130,656	
		After adjustment (boxes)	9,123
Streptomycin (S) 750mg	Category II	134,580	1 vial x 2 mos (60 days) x est. cases
	Reserve stock (for 6 months)	68,970	50% of estimated annual requirement (137,940)
	Subtotal	203,550	
	After adjustment (vials)	204,000	

Needed Drug Quantity in Phase II

Drug	Classification	Quantity	Remarks
Rifampicin + Isoniazid (RH) 150/75mg	Category I -a	12,026,556	3 tablets x 6 mos (180 days) x est. cases x 90% ³
	-b	1,336,284	3 tablets x 6 mos (180 days) x est. cases x 10% ³
	Category II	1,655,280	3 tablets x 8 mos (240 days) x est. cases
	Category III	5,549,580	3 tablets x 6 mos (180 days) x est. cases
	Annual requirement	20,567,700	
	After adjustment (tablets)	20,567,904	
	After adjustment (boxes)	30,607	672 tablets per box (28 tablets/sheet x 24 sheets)
Pyrazinamide (Z) 400mg	Category I -a	4,008,85	3 tablets x 2 mos (60 days) x est. cases x 90% ³
	-b	668,142	3 tablets x 3 mos (90 days) x est. cases x 10% ³
	Category II	620,730	3 tablets x 3 mos (90 days) x est. cases
	Category III	1,849,860	3 tablets x 2 mos (60 days) x est. cases
	Annual requirement	7,147,584	
	After adjustment (tablets)	7,148,064	
	After adjustment (boxes)	10,637	672 tablets per box (28 tablets/sheet x 24 sheets)
Ethambutol (E) 400mg	Category I -a	2,672,568	2 tablets x 2 mos (60 days) x est. cases x 90% ³
	-b	445,428	2 tablets x 3 mos (90 days) x est. cases x 10% ³
	Category II	1,103,520	3 tablets x 8 mos (240 days) x est. cases
	Annual requirement	4,221,516	
	After adjustment (tablets)	4,222,176	
	After adjustment (boxes)	6,283	672 tablets per box (28 tablets/sheet x 24 sheets)
Streptomycin (S) 750mg	Category II Ann. rqr.	137,940	1 vial x 2 mos (60 days) x est. cases
		138,000	

Needed Drug Quantity in Phase III

Drug	Classification	Quantity	Remarks
Rifampicin + Isoniazid (RH) 150/75mg	Category I -a	12,325,932	3 tablets x 6 mos (180 days) x est. cases x 90% ³
	-b	1,369,548	3 tablets x 6 mos (180 days) x est. cases x 10% ³
	Category II	1,696,320	3 tablets x 8 mos (240 days) x est. cases
	Category III	6,435,720	3 tablets x 6 mos (180 days) x est. cases
	Annual requirement	21,827,520	
	After adjustment (tablets)	21,827,904	
	After adjustment (boxes)	32,482	672 tablets per box (28 tablets/sheet x 24 sheets)
Pyrazinamide (Z) 400mg	Category I -a	4,108,644	3 tablets x 2 mos (60 days) x est. cases x 90% ³
	-b	684,774	3 tablets x 3 mos (90 days) x est. cases x 10% ³
	Category II	636,120	3 tablets x 3 mos (90 days) x est. cases
	Category III	2,145,240	3 tablets x 2 mos (60 days) x est. cases
	Ann. rqr.	7,574,778	
	After adjustment (tablets)	7,574,784	
	After adjustment (boxes)	11,272	672 tablets per box (28 tablets/sheet x 24 sheets)
Ethambutol (E) 400mg	Category I -a	2,739,096	2 tablets x 2 mos (60 days) x est. cases x 90% ³
	-b	456,516	2 tablets x 3 mos (90 days) x est. cases x 10% ³
	Category II	1,130,880	3 tablets x 8 mos (240 days) x est. cases
	Ann. rqr.	4,326,492	
	After adjustment (tablets)	4,327,008	
	After adjustment (boxes)	6,439	672 tablets per box (28 tablets/sheet x 24 sheets)
Streptomycin (S) 750mg	Category II Ann. rqr.	141,360	1 vial x 2 mos (60 days) x est. cases
		142,000	

11) Reagent for Sputum Smear Examination (Item No. 36, No. 37, No. 38 & No. 39)

Quality of reagents considerably affects the results of examinations. Many reagents currently distributed in Cambodia are in poor quality and need to be replaced with higher quality products. This Project will procure basic fuchsin (No. 36), methylene blue (No. 37), phenol (No. 38), and Hydrochloric acid (No. 39) that are indispensable to sputum smear microscopy, the most important screening test for detecting TB patients. The quality of each reagent should meet applicable Japan Industrial Standard or equivalent standards. The quantity of each item will be calculated based on the required volume for the number of examinations conducted annually in Cambodia based on the actual record.

3. Distribution Plan

Table 2-14 shows the distribution plan of cold chain (incinerators, refrigerators, vehicles). Vaccines (OPV and measles), syringes, safety boxes, and temperature monitoring devices will be delivered from CMS according to the size of target population and the quantity consumed as reported by each Operational District.

Table 2-14: Distribution Plan

No	Province and Operational District	No. of Health Center	Incinerator			Icelined Refrigerator (L)			Icelined Refrigerator (M)			Gas/Elc. Refrigerator (L)			Gas/Elc. Refrigerator (M)			Chest Freezer (M)			Chest Freezer (L)			Station Wagon	Pick-up		Motorcycle	
			Ph.I	Ph.I	Ph.II	Ph.III	Ph.I	Ph.II	Ph.III	Ph.I	Ph.II	Ph.III	Ph.I	Ph.II	Ph.III	Ph.I	Ph.II	Ph.III	Ph.I	Ph.II	Ph.III	Ph.I	Ph.I	Ph.I	Ph.II			
1	Phnom Penh																											
	CHAMKAR MORN(k.da)	5												4	1													
	TUOL KORK(lech)	8												6	2													
	MEAN CHEY(tbong)	6			1									5	1													
	DAUN PPHH(choeung)	6			1									5	1													
	TOTAL	25	0	0	2	0	0	0	0	0	0	0	0	20	5	0	0	0	0	0	1	0	0	0	0	0	0	
2	Kandal																											
	TAKHMAO	14				1							7	7													1	
	KEAN SVAY	17										1	8	7	2	1											1	
	KHSACH KANDAL	9	1			1							5	2	2				1							1	1	
	KOH THOM	12	1			1						1	7	2	3				1							1	1	
	MUK KAMPOUL	6				1						1	4	2				1								1	1	
	ANG SNUOL	8				1							5	3				1									1	
	PONHEA LOEU	10	1			1							5	3	2			1								1	1	
	SAANG	12	1			1						1	8	2	2			1								1	1	
	TOTAL	88	4	0	0	7	0	0	0	0	0	3	1	49	28	21	1	0	6	0	1	0	0	0	0	5	8	
3	Kampong Chhnang				1																							
	KG.CHHNANG	23				1				1				8	10	5											1	
	KG.TRALACH	11												1	5	5	1										1	
	TOTAL	34	0	1	0	1	0	0	1	0	0	0	9	15	15	1	0	0	0	0	0	0	0	0	0	2	0	

No	Province and Operational District	No. of Health Center	Incinerator	Icled Refrigerator (L)			Icled Refrigerator (M)			Gas/Elc. Refrigerator (L)			Gas/Elc. Refrigerator (M)			Chest Freezer (M)			Chest Freezer (L)			Station Wagon	Pick-up	Motorcycle			
				Ph.I	Ph.II	Ph.III	Ph.I	Ph.II	Ph.III	Ph.I	Ph.II	Ph.III	Ph.I	Ph.II	Ph.III	Ph.I	Ph.II	Ph.III	Ph.I	Ph.II	Ph.III			Ph.I	Ph.II		
14	Kam Pot																										
	KAMPOT	10			1							4	6													1	
	ANKORCHEY	10	1			1						4	6				1									1	
	CHHOUK	15		1					1			6	8	1	1											1	
	KG.TRACH	12	1									6	4	2	1											1	
	TOTAL	47	2	1	1	1	0	0	0	1	0	0	20	24	13	2	0	1	1	0	0	0	0	0	0	2	2
15	Sihanou Ville																										
	SIHANOUK VILLE	11				1						7	2	1	1												2
	TOTAL	11	0	0	0	1	0	0	0	0	0	7	2	3	1	0	0	0	0	0	0	0	0	0	0	0	2
16	Koh Kong					1																				1	
	SRE AMBIL	6			1						1	2	3	1		1										1	
	SM CHEY	6	1								1	2	2	2													
	TOTAL	12	1	0	1	1	0	0	0	0	2	4	5	8	0	1	0	0	0	0	0	0	0	0	1	1	0
17	Kratie					1																				1	
	CHHLONG	10	1	1								6	2	2	1											1	
	KRATIE	12			1					1	2	7	2	3												1	
	TOTAL	22	1	1	1	1	0	0	0	1	2	13	4	8	1	0	0	0	0	0	0	0	0	0	1	2	0
18	Preah Vihear																									1	
	PREAH VIHEAR	12										5	6	1												1	
	TOTAL	12	0	0	0	0	0	0	0	0	0	5	6	4	0	0	0	0	0	0	0	0	0	0	1	0	1
19	Stung Treng					1																				1	
	STUNG TRENG	10										2	6	3	1												
	TOTAL	10	0	0	0	1	0	0	0	0	0	2	6	3	5	0	0	0	0	0	0	0	0	0	1	0	0
20	Rattanakiri																									1	
	RATTANAKIRI	10						1			2	5	5													1	1
	TOTAL	10	0	0	0	0	0	1	0	0	2	5	5	4	0	0	0	0	0	0	0	0	0	0	1	1	1
21	Mondol Kiri																									1	
	SEN MONORUM	13									1	6	5	2												1	
	TOTAL	13	0	0	0	0	0	0	0	0	1	6	5	5	0	0	0	0	0	0	0	0	0	0	1	1	0
22	Kep					1																					
	KEP	4	1									3	2	1	1											1	
	TOTAL	4	1	1	0	0	0	0	0	0	0	3	2	1	1	0	0	0	0	0	0	0	0	0	0	1	0
23	Pailin																										
	PAILIN	3										2	1														
	TOTAL	3	0	0	0	0	0	0	0	0	0	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Odor Mean Chey																										
	SAMRONG	9	1			1			1			8	2	1			1										
	Total	9	1	0	0	1	0	0	1	0	0	1	8	2	1	0	0	1	0	0	0	0	0	0	0	0	
	NIP, MOH																							3			
	Grand Total	930	26	10	10	37	2	2	8	6	6	22	500	300	279	22	5	19	10	5	2	3	6	50	50		

2-2-3 Implementation Plan

2-2-3-1 Implementation Policy

Equipment for this Project will be procured from the manufacturers in Japan, Cambodia, and third countries, among whom public tenders will be held. Eligible tenderers will be Japanese trading firms incorporated and registered under the law of Japan. Pre-shipment inspection for third-country products will be conducted by independent inspection agency assigned by the consultant. Vaccines and medicines will also be checked its quality by the consultant at the time of pre-shipment inspection and Project site inspection.

The implementing agencies of this Project are the NIP Division of the Ministry of Health and CENAT that are responsible for supervising the distribution and maintenance of the equipment. Distribution of actual goods will be performed by CMS.

2-2-3-2 Implementation Conditions

Certain difficulties are expected in procuring large volumes of vaccines¹⁰. Delays in delivery could occur for a number of reasons. For example, the vaccine manufacturer may need the maintenance work on the production lines, etc. Therefore, the production status of the manufacturer should be closely monitored, and if necessary, prompt measures should be taken, such as shipping vaccines from the reserve stock (in this case, make sure to check the expiration date) and switching to different manufacturers.

Vaccines will be transported by air to Phnom Penh International Airport. Other items will be delivered via ocean to and discharged at Sihanouk Ville Port, and transported by land to the handover site (CMS in Phnom Penh). Transportation of the equipment from CMS to their final destinations is the responsibility of the Cambodian side.

Those items requiring temperature control should be properly packaged and promptly transported and inspected so as not to affect their qualities. The Cambodian side is encouraged to ensure prompt customs clearance procedures and handover to CMS.

¹⁰ Problems in vaccine procurement: This Project will procure vaccines from the manufactures whose product qualities have been pre-qualified by WHO. However, sources of reliable vaccines are becoming scarce recently, as some large European vaccine makers decided not to participate in ODA projects due to irregular orders and restrictions on procurement timeframe. Therefore, the procurement plan should be carefully worked out by taking into these factors.

2-2-3-3 Scope of Works

Table 2-15 below shows the division of work between Japan and Cambodia.

Table 2-15: Scope of Works

Country	Scope of Works
Japan	Procurement of equipment Transportation of equipment to handover site (CMS in Phnom Penh) Installation of cold rooms
Cambodia	Distribution of equipment from handover site (CMS in Phnom Penh) to target facilities

2-2-3-4 Consultant Supervision

During Phase I, one Japanese engineer and one skilled Japanese technician will be dispatched to Cambodia by the Supplier to provide guidance for the installation, startup, operation, and basic maintenance/control of cold rooms (refrigeration and freezer) and generators. During Phases I, II, and III, one representative from the Supplier will be dispatched as the procurement supervisor to oversee the acceptance inspection, sorting out, and handover of the procured equipment in Cambodia.

2-2-3-5 Procurement Plan

The table below shows the sources from which major equipment items for this Project will be procured.

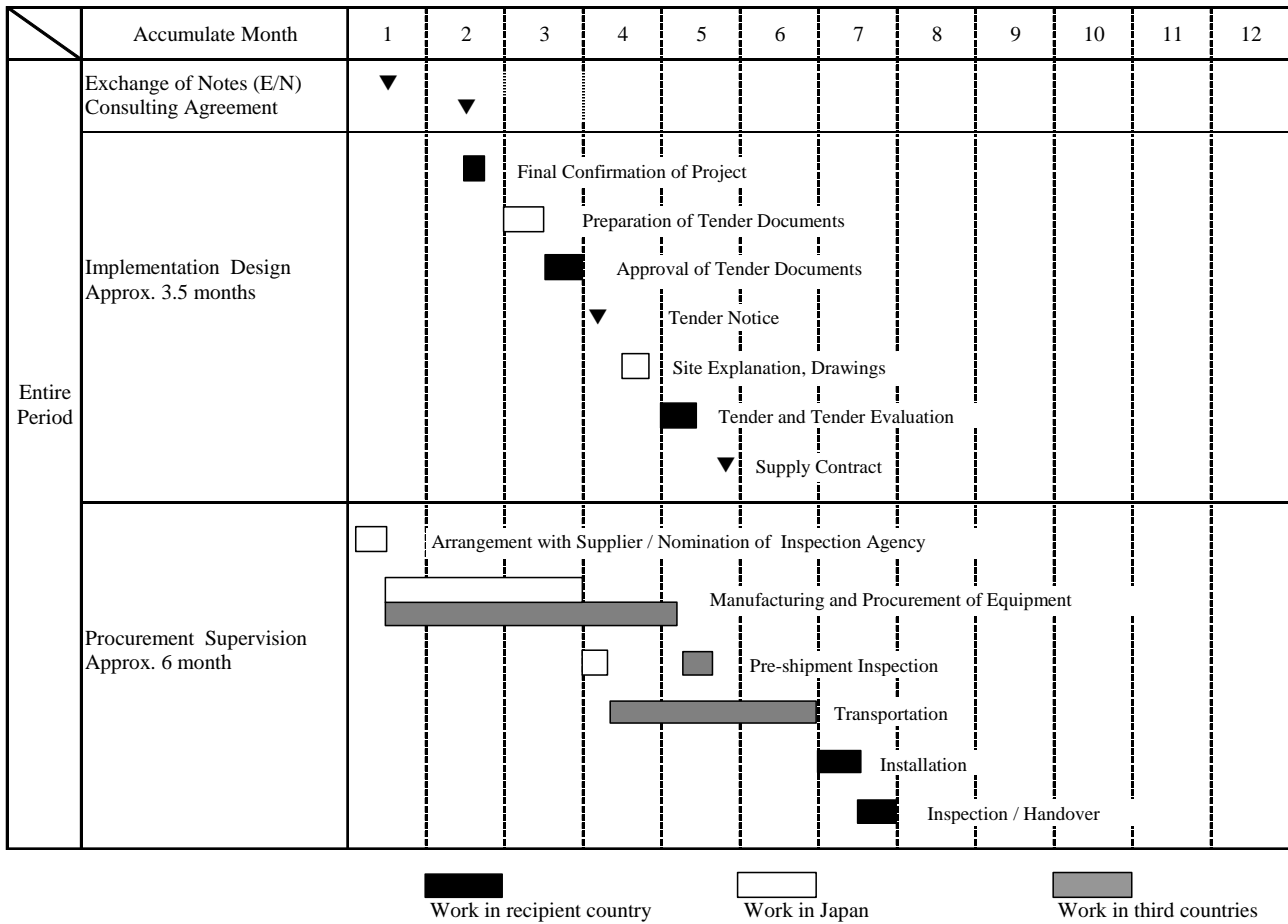
Table 2-16: Sources of Equipment and Supplies

Equipment	Cambodia	Japan	3 rd country	Reason
Auto-combustion incinerator			<input type="checkbox"/>	A specific brand is recommended by WHO/WPRO.
Safety box			<input type="checkbox"/>	WHO quality standards products are not manufactured in Cambodia or Japan.
Auto-disable syringe			<input type="checkbox"/>	WHO quality standards products are manufactured in several European countries but not in Cambodia or Japan.
Cold room / generator		<input type="checkbox"/>		Produced by more than one Japanese manufacturer but not in Cambodia.
Cold-chain equipment • Inclined refrigerator • Gas/electric type refrigerator & freezer • Chest freezer • Cold box • Vaccine carrier • Temperature monitoring equipment			<input type="checkbox"/>	WHO quality standards products are not manufactured in Japan or Cambodia. They will probably be procured from Europe or other third countries.
Vaccine			<input type="checkbox"/>	Shall be sourced from manufactures that have been pre-qualified by WHO. Although one Japanese manufacture has been qualified to produce measles vaccine, it is limited to supplying for UNICEF.
Disposable syringe		<input type="checkbox"/>		Produced by more than one Japanese manufacturer but not in Cambodia.
Computer / printer	<input type="checkbox"/>		<input type="checkbox"/>	Can be procured in Cambodia.
Automobile • Station wagon • Pickup truck		<input type="checkbox"/>	<input type="checkbox"/>	Cars are available from several Japanese manufactures, some of which have shifted their production bases to Thailand. Thus, Thailand is included as the source of the equipment.
Motorcycle	<input type="checkbox"/>			Produced by more than one Cambodian manufacturer.
Anti-TB drug			<input type="checkbox"/>	Since TB drugs officially recommended by GDF are not manufactured in Japan or Cambodia, they will be procured from India, China, or other third countries.
Reagent for sputum smear examination		<input type="checkbox"/>	<input type="checkbox"/>	Shall meet the JIS or equivalent standards. Although the equipment is produced by more than one Japanese manufacturer, Germany should be included to ensure a sufficient level of competition.

2-2-3-6 Implementation Schedule

Work schedule

Total period of work (from E/N to delivery)	:	10.5 months
From E/N to supply contract	:	3.5 months
Time of delivery (from supply contract to delivery)	:	7.0 months



2-3 Obligation of Recipient Country

The undertakings of the Cambodian side in implementing this Project consist of the following:

- ① To ensure proper and prompt customs clearance procedure for the equipment to be procured under this Project.
- ② To secure storage spaces necessary to keep the equipment to be procured under this Project, taking special precautions for properly maintaining the quality of the anti-TB drugs.
- ③ To ensure prompt distribution the equipment to their final destinations by keeping close communications with the CMS personnel in charge, as well as the staff of the target facilities.

- ④ To make necessary appropriations and employ an adequate number of personnel for the proper operation and maintenance of the equipment.
- ⑤ To carefully select appropriate sites for installing the incinerators so as not to disturb the local residents and the environment.
- ⑥ To install protective fences and other necessary facilities immediately after the arrival of the incinerators.
- ⑦ To give sufficient training to the staff to ensure the smooth collection of used syringes and the compliance to the specified incineration conditions, such as type of waste and input volume, so that the incinerators will be operated in an environmentally sensitive manner.

These tasks have already been undertaken by the Cambodian Ministry of Health in implementing the National Strategy of Immunization and the National Health Strategic Plan for TB Control and are currently being carried out under the assistance of WHO and UNICEF. Therefore, the Cambodian side is deemed capable of continuing these activities without major difficulties.

2-4 Project Operation Plan

Vaccines are regularly distributed to Health Centers, many of which are presently not equipped with refrigerators and use cold boxes instead to store the vaccines. In preparation for the installation of the small gas/electric-type refrigerator/freezer in these Health Centers under this Project, the Cambodian Ministry of Health, in conjunction with WHO, has developed guidelines for storage and transportation of vaccines and is planning to begin training of medical staff according to the training strategy.

After each immunization activity, a large quantity of auto-disable syringes will be discarded. Cambodia began using incinerators in 1998 under the guidance of WPRO, has already developed operational manuals of incinerators, and is conducting staff training. Therefore, collection and incineration of used syringes should be carried out without major difficulties under the current system.

CENAT is the implementation agency of the National Health Strategic Plan on TB Control that plans to expand DOTS. TB control activities, including free diagnosis and treatment, are carried out by CENAT in close coordination with Provincial Health Offices, Operational District Health Offices, referral hospitals, and Health Centers.

Under the operational system of the National Health Strategic Plan on TB Control which one TB control supervisor is assigned to each Provincial and Operational District Health Office to supervise and give guidance to TB staff of Health Centers that carry out DOTS. Each referral hospital has 50 beds on the average, employing about 25 staff members, out of which a TB Control Team, consisting of one doctor (who have completed eight years of medical education), one laboratory technician, and one nurse, is organized to diagnose and treat patients. At each Health Center, one clinical officer (who have received four years of medical education) and one nurse provide TB-related medical services for outpatients. Some Health Centers are equipped with a few beds to accommodate inpatient. The technical levels of the medical staff seem adequate for properly implementing the Project.

The total implementation cost of this assistance project in Phases I, II, and III are estimated at 395 million yen, 257 million yen, and 177 million yen respectively. The expenses to be borne by the Japanese and the Cambodian side according to the division of work defined above and based on the parameters listed below are estimated as follows. This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant.

1. Expenses to be Borne by the Japanese Side

		<u>Estimated Total Project Cost</u>		<u>Approx. 8.32 million yen</u>			
Item		Estimated Project Cost (in million yen)					
		Phase I		Phase II		Phase III	
Equipment	NIP	281	376	173	238	90	159
	TB Control	95		65		69	
Detail design, procurement supervision, technical guidance		20		20		19	
Total		396		258		178	

2. Expenses to be Borne by the Cambodian Side

None (No additional cost will be incurred for transporting the equipment and supplies, as they will be delivered along with other medical supplies and equipment using the regular distribution routes of the Ministry of Health. Design and construction of the buildings to enclose the incinerators will be done by WHO to suite the particular topography and other conditions of the installation sites, thus incurring no expenses on the Cambodian side.)

3. Parameters of Cost Estimation

Time of calculation : May 2003

Exchange rate : 1 US dollar = 119.29 yen

Local currency (Riel) : 1 Riel = 0.03 yen

(However, US dollar was used in the cost estimation, as the currency is widely used in Cambodia.)

Chapter 3 Project Evaluation and Recommendations

3-1 Project Effect

(1) Direct Effect

- ① About 49,000 infants and 3.17 million women in reproductive ages (childbearing ages between 19 and 49) will be given vaccines that have been properly stored.
- ② Renewing the unusable or antiquated refrigerators and distributing new refrigerators to Health Centers that have been using cold boxes will enable the Health Centers to properly maintain the storage temperature of vaccines, leading to the reduction of wastage, moreover, in the vaccine purchase cost of the Ministry of Health.
- ③ Procurement of incinerators, auto-disable syringes, and safety boxes will lead to the establishment of a comprehensive and safe immunization system, thereby preventing the spread of HIV and hepatitis-B infections.
- ④ Provision of vehicles and motorcycles will enable the health workers to travel to remote areas to give injections and education to the residents who have been deprived of such services, thereby expanding immunization coverage.
- ⑤ 200,000 patients suspected of TB infection will be able to take sputum-smear examinations, thereby improving the detection rate.
- ⑥ Procuring the needed quantity of anti-TB drugs will enable the treatment of about 21,000 TB patients.

(2) Indirect Effect

- ① Establishment of an immunization system against all major infectious diseases, as well as proper enforcement of routine vaccinations, will contribute to the reduction of morbidity.
- ② Environmentally friendly immunization activities will become possible.

- ③ Improved medical service quality on community levels will lower the morbidity of major diseases, leading to the reduction of medical expenditures.
- ④ Reduction of TB patients, many of whom belong to highly productive age groups, will contribute to the socio-economic development and mitigation of poverty in Cambodia.

3-2 Recommendations

Although the Ministry of Health is deemed highly capable of properly implementing this Project, its success will be further ensured if conscious efforts are made on the following points:

- 1) Currently, CMS has old and new warehouses that are situated apart from each other. Large quantities of medical supplies to be procured by this Project will be stored in the new CMS warehouse, where managing staffs are scarce. Therefore, proper maintenance of the medical goods at the new CMS and their prompt delivery to each Operational District Health Office should be closely monitored and ensured.
- 2) The treatment default rate of TB should be minimized to prevent the generation of drug-resistant TB bacillus strains.
- 3) All used auto-disable syringes must be collected from the vaccination sites and properly incinerated to prevent secondary infection.
- 4) Technical training should be given on the operation of the incinerators to prevent careless use that could cause the emission of dioxin to the environment.

[Appendix]-1 Member List of the Study Team

Leader

Mr. Juro CHIKARAISHI

Resident Representative, Japan International Cooperation Agency Cambodia Office

Technical Advisor

Ms. Tomoko FUJISAKI

Management Sciences for Health (MSH)

Planning Coordinator

Mr. Hisakazu HIRAOKA

Japan International Cooperation Agency

Equipment Planner

Ms. Kyoko GOTO

Japan International Cooperation System

Procurement Planner

Mr. Tetsuo KODAMA

Japan International Cooperation System

[Appendix]-2 Study Schedule

No.	Date		Itinerary			Accomm.
			Planning Coordinator	Technical Advisor	Consultant	
1	10/13	Sun	Tokyo 11:00→15:15 Bangkok (JL717) Bangkok 16:30→17:45 Phnom Penh(TG698) Meeting			Phnom Penh
2	10/14	Mon	Meeting, Embassy of Japan, JICA Plenary Session, Ministry of Health			Phnom Penh
3	10/15	Tue	Site Survey (TB) in Phnom Penh Visit and interview, CENAT			Phnom Penh
4	10/16	Wed	Site Survey (TB) in Kampong Chhnang Meeting, CENAT			Phnom Penh
5	10/17	Thu	Meeting, NIP, WHO, UNICEF			Phnom Penh
6	10/18	Fri	Visit Old CMS, Site Survey (NIP) in Kandal Meeting, WHO			Phnom Penh
7	10/19	Sat	Market Research			Phnom Penh
8	10/20	Sun	Internal Meeting Phnom Penh→Sihanoukville			Sihanoukville
9	10/21	Mon	Site Survey (NIP) in Sihanoukville Visit New CMS			Phnom Penh
10	10/22	Tue	Meeting, NIP Meeting, CENAT	Phnom Penh 18:50→ Bangkok 19:55 (TG699) Bangkok 22:10→	Meeting, NIP Meeting, CENAT	Phnom Penh
11	10/23	Wed	Discussion on Specification Report JICA	Tokyo 6:35 (JL718)	Discussion on Specification Report JICA	Phnom Penh
12	10/24	Thu	Signing of M/D Report, Embassy of Japan			Phnom Penh
13	10/25	Fri	Phnom Penh 18:50→ 19:55 Bangkok(TG699)		Market Research	Phnom Penh
14	10/26	Sat	Bangkok 22:10 → 6:35 Tokyo(JL718)		Market Research	Phnom Penh
15	10/27	Sun			Internal Meeting	Phnom Penh
16	10/28	Mon			Visit Central Laboratory Installation Site Survey	Phnom Penh
17	10/29	Tue			Report, JICA	Phnom Penh
18	10/30	Wed			Phnom Penh 20:25→ (TG699) → 21:30 Bangkok	Bangkok
19	10/31	Thu			Bangkok 8:40 → (JL708) → 16:35 Tokyo	

[Appendix]-3 List of Parties Concerned in the Recipient Country

1. Embassy of Japan

Mr. Gotaro OGAWA	Ambassador of Japan
Mr. Kazutaka ENDO	Second Secretary

2. JICA Cambodia Office

Mr. Juro CHIKARAISHI	Resident Representative
Ms. Chisa HARA	Deputy Resident Representative
Mr. Tsuyoshi YUSA	Assistant Resident Representative

3. Ministry of Health

Dr. Mam Bunheng	Secretary of State for Health
Prof. Eng Hout	Director General for Health
Dr. Sann Chan Soeung	Program Manager , National Immunization Program (NIP)
Dr. Chea Kim Ly	Assistant Program Manager , NIP
Ms. Ly Nareth	Assistant Program Manager , NIP
Mr. Chheng Morn	Staff, NIP
Dr. Mao Tang Eang	Director, CENAT
Dr. Kong Kim San	Technical Advisor, CENAT
Dr. Tan Mantha	Staff, CENAT
Dr. Kruey Chheang Tay	Staff, CENAT
Dr. Tieng Sivanna	Deputy Chief of Technical Bureau
Mr. Khloewng Phally	Staff, CENAT
Mr. Khun Kim Eam	Staff, CENAT
Mr. Ton Chhavivann	Laboratory Technician, CENAT
Dr. Chhieng Phana	Director, Bureau of Drugs and Food
Dr. Chroeng Sokhan	Vice Director, Bureau of Drugs and Food
Dr. Nam Nivanna	Director, National Laboratory for Drug Quality Control
Mr. Yary	Central Medical Stores

4. JICA National Tuberculosis Control Project

Ikushi ONOZAKI	Chief Advisor
Yuta UCHIYAMA	Drug Management Advisor
Takashi MIURA	Medical Technologist
Masaru IIZUKA	Project Coordinator

5. Kampong Tralach, Operational District Health Office, Kampong Chhnang Province

Dr. Keo Samon	Provincial TB Supervisor
Dr. Mon Rhieng Heng	Deputy Director of Operational District Health Office
Dr. Men Chansotahy	District TB Supervisor

6. Loung vek Health Center, Kampong Tralach Operational District, Kampong Chhnang Province

Mr. Povi Bith	Director
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7. Kandal Provincial Health Office

Mr. Dhan Samnang	EPI Program Manager
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8. Takhmao Operational District, Kandal Province

Dr. Chhun Chanuuthay	Chairman
Mr. Nhem Uuthy	Deputy Director, EPI Manager
Mr. Men Chantol	Deputy EPI Manager
Ms. Soth Ny	Staff, EPI

9. WHO/WPRO

Dr. Yoshikuni SATO	EPI Medical Officer, WPRO
Dr. Hiroko TANAKA	EPI Medical Officer, WPRO
Dr. James L. Tulloch	Representative, WHO Cambodia
Dr. Yang Baoping	Regional EPI Advisor
Mr. Keith Feldon	Technical Officer
Mr. Angus Pringle	Equipment Technical Officer

10. UNICEF

Dr. Mourice HOURS	Project Officer
Mr. Tomoo HOZUMI	Program Coordinator
Mr. Chum Aun	Assistant Project Officer
Ms. Ung Vanny	Assistant Project Officer

[Appendix]-4 Minutes of Discussion

[Appendix]-5 References

No.	References	Issued by	Year	original/ copy
1	Tuberculosis Standard Treatment Regimens	CENAT	2001	original
2	Health Situation Analysis 1998 and Future Direction for Health Development 1999-2003	MOH	1999	copy
3	National Health Policies and Strategies for Tuberculosis Control in the Kingdom of Cambodia 2001-2005	CENAT	2001	original
4	National Health Strategic Plan for Tuberculosis Control 2001-2005	CENAT	2001	original
5	Cambodia Demographic and Health Survey 2000	National Institute of Statistics, MOH	2000	original
6	Introduction User Fees at Public Sector Health Facilities in Cambodia (An Overview)	Health Economics Task Force, MOH	2000	copy
7	National Strategy on Immunization in Cambodia (5 year Work plan 2001-2005)	MOH	2000	copy
8	Health Sector Strategic Plan 2003-2007, Volume 1	MOH	2002	copy
9	Health Sector Strategic Plan 2003-2007, Volume 2: Medium Term Expenditure Framework	MOH	2002	copy
10	Health Sector Strategic Plan 2003-2007, Volume 3: Framework for Monitoring and Evaluation	MOH	2002	copy
11	Health Sector Strategic Plan 2003-2007, Volume 4: Framework for Annual Operational Plans	MOH	2002	copy
12	National Health Statistics Report 2001	MOH	2002	copy
13	2000 Demographic and Health Survey: Key Findings	MOH: Kiersten Johnson, Sovanratnak Sao, Darith Hor	2001	copy
14	Guidelines for Outreach Services from health center March 2001	MOH	2001	original
15	Annual Statistics of Tuberculosis in Cambodia 2000	CENAT	2000	original
16	National Budget Book 2002	MOH	2002	copy
17	Second Five Year Socioeconomic Development plan 2001-2005	Ministry of Planning	2002	copy
18	Summary of NTP 5 year budget,2001-2005	NTP	2001	copy
19	Summary Sheet for Cooperation Program; Request Survey for 2003	CENAT	2002	copy
20	National Anti Tuberculosis Committee Organized Structure (NTC)	CENAT	2002	copy
21	Staff profile for National Center for TB Leprosy Control (summary)	MOH	2001	copy
22	List of CENAT Staff	CENAT/JICA National TB Control Project	2002	copy

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23	Year 2002 Management General Expense of the National Budget 2002	Sihanoukville Province Health Department	2002	copy
24	Murder by fake drugs (BMJ V.324: p800-801)	BMJ	2002	copy
25	EPI Policy Recommendation in Cambodia	MOH	2000	copy
26	Note of record (Visit to the Central Medical Store)	MOH (Supply officer)	2002	copy
27	Table: the Minimum and Comprehensive Package of Activities (MPA and CPA)	MOH (Department of Planning & Health Information)	1997	copy
28	Gas Usage and Costs for the New Gas Powered Refrigerators	WHO	2002	copy
29	Plan of Action for the introduction of new cold chain equipment and upgrading of cold chain management	WHO	2002	copy
30	Notes for the second GAVI partner's Meeting	UNICEF	2002	copy
31	Tables: Estimated Programme Specific Costs and Financing for Current Year	UNICEF	2002	copy
32	Proposed Guidelines to strengthen the ordering, storage and distribution of vaccines in Cambodia	MOH	2002	copy
33	National Policy for the safety of injections, the Kingdom of Cambodia	MOH	2002	copy
34	Draft: Cold chain and vaccine management policy	MOH	2002	copy
35	Cambodia Background	MOH	2002	copy
36	Vaccine Wastage in Cambodia96-01	MOH	2002	copy
37	Figure: Role & Responsibilities (NIP)	MOH	2002	copy
38	Table: Immunization Coverage for Children under 1 year of age by Provinces 2001	MOH	2002	copy
39	Table: Situation of Material Inventory in 2002	MOH	2002	copy
40	Table: Cold chain Needs in Provinces with Electricity (OD with electricity having 4 months supply)	MOH	2002	copy
41	Table: Equipment Information	MOH	2002	copy
42	Summarize report for Measles supplementary from October 2001 to April 2002	MOH	2002	copy
43	Strategy for Conducting training of Health worker	MOH	2002	copy
44	General information of Sicim S.p.A	Sicim S.p.A.	1999	copy
45	CMS distribution of TB in 2001	CMS	2002	copy