No. 1

STUDY REPORT
ON
THE PROJECT FOR
IMPROVEMENT OF COLD CHAIN FOR
EXPANDED PROGRAMME ON IMMUNIZATION
IN
INDOCHINA

May 1995

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Chapter 1 Background of the Request

1.1 Historical Background of the Request

The worldwide Expanded Programme on Immunization (EPI) was commenced in 1977 at the suggestion of the WHO. Following that, vaccination rates have increased every year through improvement of the environment surrounding the EPI including vaccine supply setups and the cold chain etc. With the rise in vaccination rates, reports of EPI-targeted diseases are falling, and by 1992, the number of cases of polio had fallen to one-quarter of what they had been when the EPI started. Encouraged by these results, the WHO adopted a resolution to eradicate wild root polio from the face of the earth by the year 2000 in its general assembly of 1988. The West Pacific Regional Office (WPRO) of WHO has set 1995 as the target year for eradication of polio in the West Pacific region. As the eradication of polio is more likely to be achieved than the wiping out of other infectious diseases, it was considered that promotion of the polio eradication plan would contribute not only to the activities of the EPI but also to the movement for improvement of the health of women and children.

As a result of these polio-centered activities of the EPI on a global scale, the polio-free zones of the world have expanded and by 1990, they came to include all of South and North Africa, Oceania, and Western Europe.

Steady progress is also being made in the Western Pacific region, and polio outbreak cases can only be confirmed in the five countries of China, the Philippines, Vietnam, Laos and Cambodia.

In the three Indochina countries (Vietnam, Laos and Cambodia), the EPI activities were delayed as a result of long-term internal strife etc., and because the target of wiping out polio in the Western Pacific region by 1995 had become unlikely, WPRO has been advancing plans for the strengthening of EPI activities, the implementation of national immunization days (NID) and the establishment of surveillance systems in the said three nations. Moreover, UNICEF is providing vaccines and related equipment, supporting activity plans and also conducting staff development with the aim of improving women and child health levels. Japan, too, has made the three countries priority targets and is continuing to provide support, which is centered around the provision of vaccines within the bounds of technical assistance.

Three indispensable areas for the EPI activities are vaccines, cold chain equipment and finally staff, and in order to maintain and bolster the activities in the three Indochina countries, the securing of vaccines, the improvement of equipment and the development of staff are all required. However, as the said activities must inevitably target all parts of each country and thus require massive budgets, each of the countries is in a situation where it is unable to finance the necessary work through its own budget.

In view of this situation, the Governments of Vietnam, Laos and Cambodia requested the Government of Japan to provide grant aid for the improvement of cold chain equipment.

1.2 Outline of the Request

The Project aims to strengthen the EPI activities and secure the health of women and children through the provision of cold chain related equipment. The contents of each country's request which were confirmed in the course of the Study can be summarized as follows.

1 Vietnam

a) Implementing Agencies:

Vietnam Ministry of Health and the National Institute of Hygiene and Epidemiology (NIHE).

b) Target Facilities:

POLIOVAC, each region's hygiene research center, provincial hygiene and epidemiology centers, district health centers and communes.

c) Request Contents

The written request contained two equipment lists for 1995 and onwards and 1996 and onwards, however, these were compiled into one list in the course of the Study. Moreover, disposable syringes were omitted from the list and freezer trucks were added. The following indicates the final request items:

Cold storage equipment: walk-in freezer rooms, freezers, refrigerators, cold boxes, vaccine carriers,

Vehicles: freezer trucks, station wagons, motor cycles.

2 Laos

a) Implementing Agencies

Laos Ministry of Health and the National Institute of Hygiene and Epidemiology (NIHE).

b) Target Facilities

Provincial hygiene and epidemiology centers and district health centers.

c) Request Contents

Syringe kits, typewriters and copiers were originally included, however, they were omitted from the final list. The following indicates the final request items:

Cold storage equipment: freezers, refrigerators, cold boxes, vaccine carriers,

Vehicles: pickup trucks, motor cycles.

3 Cambodia

a) Implementing Agencies

Cambodia Ministry of Health and the Centre National d'Hygiene d'Epidemiologie (CNHE).

b) Target Facilities

Provincial epidemiology centers, district health centers and communes.

c) Request Contents

Reusable syringes and syringe needles and also bicycles were originally included, however, they were omitted from the final list. The following indicates the final request items:

Cold storage equipment: refrigerators, generators, kerosene, cold boxes, vaccine carriers,

Sterilization equipment: sterilizers,

Vehicles: pickup trucks, motorcycles.

Chapter 2 Conditions Surrounding the Project

2.1 Current EPI Activities and Problem Areas

1 Vietnam

a) Current State of Activities

EPI activities have been conducted in Vietnam since 1985, and since 1989, more than 85% of around 2,000,000 infants have received vaccinations. Moreover, National Immunization Days (NID) have been held each year since 1993, and polio vaccinations for children up to five years of age, tetanus vaccinations for expectant and nursing mothers and child bearing women between the ages of 13 and 35, and measles vaccinations for children in remote areas who had previously not had the opportunity to be vaccinated are being conducted every year. Furthermore, polio and measles vaccinations for infants up to one year of age, BCG vaccinations for newborn infants, and tetanus vaccinations for pregnant women and women of child bearing age are being routinely conducted throughout the year (every month). (Refer to the following table).

These activities have resulted in a dramatic fall in infectious disease contraction rates and mortality rates among children. However, looking at the figures for reported polio outbreak cases, there were 612 in 1991, 407 in 1992 and 452 in 1993. Moreover, specialists also point to areas such as a high mortality rate through measles.

Table: Results of EPI Activities in 1994

Vaccination	Vaccination rate	Remarks
Routine		
BCG	95%	For infants on a national scale
Polio	94%	Ditto
DPT	94%	Ditto
Measles	96%	Ditto
Tetanus(pregnant women)	78%	On a national scale
Tetanus(women of child bearling age)	91%	Only in area where new born infant tetanus cases are common
NID		
Polio	96.6%	
Measles	95.8%	For infants on a national scale Only in high risk communes for infant between 9-23months
Tetanus(pregnant women)	77.9%	Only in areas where newborn infant tetanus cases are common
Tetanus(women of child bearling age)	91.1%	Ditto

Note: It is said that the vaccination rates are high due to the fact that the targeted populations are unclear.

b) Problem Areas

It is ten years since EPI activities began in earnest in Vietnam, and the environment surrounding the activities has been greatly improved under guidance from WHO and UNICEF. However, there are still equipment shortages and many problem areas in the implementation setup which are greatly hindering the EPI activities. Measures to rectify these problems are required as soon as possible.

The problem areas in the EPI activities can be summarized as follows.

1) Vaccine Shortages

Vaccines to serve the country's population of more than 70,000,000 are needed, however, apart for some tetanus, rabies and polio vaccines which can be produced domestically, assistance or imports have to be relied upon to provide measles, DPT and polio (insufficient) vaccines.

2) Lack of Awareness of EPI Diseases

With farming and mountain communities covering large parts of the country and there also being a number of ethnic groups, it is difficult to thoroughly make people in all areas aware of vaccinations.

3) Insufficient Cold Chain Equipment

* Lack of Vehicles for Vaccine Transportation

Because vaccines need to be kept under appropriate temperatures,

rapid transportation is necessary. However, only Hanoi and Ho Chi Minh possess freezer trucks, and there are no such vehicles in the central region and the highland region. Moreover, the lack of vehicles also means that other means of transportation have to be relied upon for transporting vaccines from provinces to the districts. These factors, together with rising transportation loads due to the increasing vaccination rates, are beginning to hinder the transportation plan.

* Lack of Vaccine Cold Storage Equipment

Refrigerators and cold boxes for the storage of vaccines under appropriate temperatures are indispensable items for establishing and maintaining an organized cold chain system. However, equipment shortages and deterioration can be seen in the northern region, the central region and the highland region of the country where the geographical conditions are poor. As a result, district health centers without refrigerators use cold boxes and ice boxes instead for DPT storage, and such a situation is regarded as a problem by experts.

* Lack of Vaccination Syringes

Vietnam is currently in the process of adopting disposable syringes in place of reusable syringes. The lack of more expensive disposable syringes together with the increasing demand for vaccinations is leading to critical problems at the lower end of the cold chain.

2 Laos

a) Current State of Activities

Although vaccinations through UNICEF and WHO support started in 1979 in Laos, progress has been very slow and in 1992, only 23% of newborn infants received DPT vaccinations, 27% received polio vaccinations and 34% received BCG vaccinations. The underdevelopment of the health service supply setup and the fact that more than half of the country's population live in hard-to-reach areas are seen as the main factors hindering the vaccination activities.

In order to rectify this situation, the Government of Laos installed the EPI as a state project in 1993 and also started the NID to provide polio vaccinations for children of five and under, DPT vaccinations for infants of one year and under and measles vaccinations for children of two and under. As a result of this, vaccination activities, which had only been carried out in 48 districts in 1992, were expanded to 104 districts by 1994 and will cover all the country's 132 districts by 1995. As well as this, tetanus vaccinations for expectant and nursing mothers and all women of child bearing age are conducted throughout the year.

It is estimated that EPI-targeted diseases are on the decline due to the increased vaccination rates, however, looking at the figures for reported cases of polio, there were seven cases in 1993

and nine cases in 1994.

The necessity of further strengthening the EPI activities has thus been pointed out by UNICEF, and the immediate goal is to raise all vaccination rates to 80% or more by 1996.

Table: Vaccination Rates

Vactination	1991	1992	1993	1994
B C G	34%	34%	42%	66%
D P T	22%	23%	25%	46%
Polio	22%	27%	26%	55%
Measles	47%	46%	46%	70%
Tetanus(pregnant women)	13%	17%	24%	40%
Tetanus(women of child bearing age)	12%	18%	26%	48%

Note: These figures include routine and NID vaccinations.

b) Problem Areas

It is fair to say that EPI activities have only just started in earnest in Laos. Looking at the vaccination rates alone shows that dramatic improvements have been made following 1993 when the NID were started. However, as is also true in the case of Vietnam, there are still equipment shortages and many problem areas in the implementation setup which are greatly hindering the EPI activities.

The problem areas in the EPI activities can be summarized as follows.

1) Vaccine Shortages

Vaccines to serve the country's population of more than 4,000,000 are needed, however, because domestic production is impossible,imports (assistance from international agencies) have to be relied upon for almost all vaccines.

2) Lack of Awareness of EPI Diseases

With most of the population living in farming and mountain communities covering large parts of the country and there being a number of ethnic groups, it is difficult to thoroughly make people in all areas aware of vaccinations.

3) Underdevelopment of the Surveillance Setup

Because clinical diagnostic capacity in the regions has its limits, surveillance through central coordination is essential. However, the underdevelopment of communications and transport methods means that too many days are required for reporting cases and transporting specimens, and that it is thus difficult to obtain accurate examination results. The fact that immediate treatment cannot be provided for patients is also a problem. Moreover, there

is a setup whereby Laos consigns its specimen examinations to neighboring Thailand.

4) Underdevelopment of the Infrastructure

12 of the country's 19 provinces do not have electricity and so kerosene is used instead of electricity for powering refrigerators and freezers. The difficulty of managing kerosene refrigerators means that they tend to have relatively short service lives.

Moreover, due to the underdevelopment of communications, it is necessary to rely on the postal service or direct couriers in exchanging information between the central bodies and the regions, and this is obviously very time consuming. The pavement of roads, too, is only confined to the city areas and the construction of bridges etc, is not progressing. Labor must therefore be relied upon in all areas as can be seen in the use of men and horses or simple walking for delivering vaccines.

5) Insufficient Cold Chain Equipment

* Lack of Vehicles for Vaccine Transportation

Due to the fact that two-thirds of the country is mountainous and also due to the aforementioned underdevelopment of roads and other infrastructure, the means of vaccine transportation are limited. The most general means of transportation are automobiles and motor cycles, however, most of the provinces do not possess vehicles for the EPI activities. A total of 154 motor cycles were provided by UNICEF in 1989 and 1990, however, no more have been procured since then.

* Lack of Vaccination Syringes

The Laos Ministry of Health intends to use reusable syringes for the EPI activities, however, the chronic shortage of such syringes is creating problems at the lower end of the cold chain.

3 Cambodia

a) Current State of Activities

EPI activities in Cambodia started in 1986 through foreign support from UNICEF etc. in Phnom Penh and three surrounding provinces, and two years later in 1988, they were expanded to cover all 21 provinces. Furthermore, tetanus vaccinations for expectant and nursing mothers and women of child bearing age (15 to 44) were commenced in 1989. Since then, vaccination rates remained fairly unchanged up until 1993 with the 1993 national vaccination rates among infants of one year or less being 57% for BCG, 36% for polio, 35% for MMR and 36% for measles. In 1994, however, these rates were all increased by around 20%. This does not disguise the fact that the rates are still low, and there are also large regional differences between the provinces.

Regarding polio, an experimental immunization day (SNID) was

carried out in Phnom Penh and Kandar Province in 1994 and through this, polio vaccination rates in the targeted areas rose to around 90%. Following this success, NID which targeted children of five and under, were held in February and March 1993, and these also proved successful in greatly raising vaccination rates in each province.

As for the reported numbers of polio cases, there were 135 in 1993 and 140 in 1994.

Table:Vaccination Rates among Infants

Vaccination	1993	1994
BCG	57%	78%
DPT	35%	53%
Polio	36%	54%
Measles	36%	53%

Table: Disease Cases in 1994

Vaccination	1993
Tuberculosis	15
Polio	140
Tetanus	242
Measles	784

Note: Figures include routine and NID vaccinations.

b) Problem Areas

EPI activities in Cambodia have only just started in earnest. As is the case in Vietnam and Laos, state financial aid for the activities is extremely limited and there are equipment shortages and many unsolved problems in the implementation setup. Foreign aid is essential in order to promote the EPI activities in the future, however, the construction of a domestic EPI setup is also indispensable.

The problem areas in the EPI activities can be summarized as follows.

1) Vaccine Shortages

Vaccines to serve the country's population of more than 9,500,000 are needed, however, because domestic production is impossible, imports (assistance from international agencies) have to be relied upon for almost all vaccines.

2) Insufficient Economic Support for EPI Activities

Salaries for public employees are low and payment is sometimes delayed, meaning that most public employees have to do other part-time work to supplement their incomes. Under this situation, it is difficult to secure the staff required to cooperate in the EPI activities, which require massive amounts of work.

3) Lack of Awareness of EPI Diseases Among Citizens

With most of the population living in rural areas and there being a number of ethnic groups, it is difficult to thoroughly make people in all areas aware of vaccinations. Moreover, there are areas near the border with Thailand where the anti-government militia is active, and the implementation of EPI activities in these areas is being hindered.

4) Underdevelopment of the Surveillance Setup

As is the case in Laos, the surveillance setup is underdeveloped and it is not possible to obtain accurate examination results or immediately respond to new patients. Polio specimen examinations are currently consigned to the Pasteur Institute in Ho Chi Minh, Vietnam.

5) Underdevelopment of the Infrastructure

13 of the 21 provinces in Cambodia have no electricity, and kerosene has to be used instead of electricity to power vaccine storage refrigerators in these areas. The difficulty of managing kerosene refrigerators means that they tend to have relatively short service lives.

Because vaccines need to be managed under the appropriate temperatures, fast transportation is required, however, apart from a few main roads, the road network is undeveloped, and moreover, because there are no bridges for vehicles over the Mekong River and its tributaries which divide up many areas, transportation has to be carried out by plane, ferry or boat which only adds to the difficulties. Moreover, the flat nature of the land means that rivers overflow during the rainy season, often causing the road network to become inundated. Under these conditions, it is extremely difficult to maintain the quality of vaccines and to carry out regular supply at the lower end of the cold chain setup.

6) Insufficient Cold Chain Equipment

* Lack of Vehicles for Vaccine Transportation

Vaccine transportation in Cambodia relies on a system whereby the vaccines are carried by truck from the Central Medical Store (CMS) to each of the provincial centers. The absence of transportation vehicles on the provincial level means that motor cycles and borrowed vehicles are used for transporting the vaccines to the subordinate agencies, however, due to difficulties in raising money to cover the necessary costs, NID T-shirts (provided by UNICEF) are used to advertise the activities.

* Lack of Vaccine Cold Storage Equipment

As was described earlier, kerosene refrigerators are used instead of electric refrigerators, however, the service life of the former tends to be shorter than that of the latter. The continued lack of progress in procuring cold storage equipment, combined with the fact that shorter service life kerosene refrigerators often need to be used, means that the shortage of the necessary equipment is extremely serious.

* Lack of Kerosene for Refrigerators

Because high quality kerosene is required for kerosene refrigerators, imports have to be relied on. Kerosene is regularly

supplied to the provinces by the CMS, however, this is all provided through foreign aid centered around UNICEF.

* Lack of Vaccination Syringes

The Cambodia Ministry of Health intends to use reusable syringes for the EPI activities, however, the situation in this area are the same as those described in Vietnam and Laos.

2.2 Projects of Other Donor Countries and International Agencies etc.

1 Vietnam

Assistance in this sector mainly consists of the provision of polio vaccine required for the NID. The major donor nations and agencies are Australia, Japan, America and the International Rotary Club. The NID polio vaccine assistance situation in 1994 is shown below.

Table: State of Assistance from Each Country

Donor Nation or Agency	Polio Vaccine (million doses)
AIDAB	5.2
Japan	15.0
USA-CDC	5.6
International Rotary Club	3.1
Self procurement	16.0
Total	44.9

AIDAB: Australia International Development Assistance Bureau
CDC: Center for Disease Control

2 Laos

Foreign assistance in this sector started in 1979 centered mainly around the activities of UNICEF and WHO. Currently, all vaccines required for the EPI are being provided by other countries. The main donor nations and agencies are Australia, Japan, America, Canada (the Canada Fund) and the International Rotary Club etc. For the state of assistance in fiscal 1994, refer to Section 3.4.2 (Budget). Moreover, AIDAB has promised to provide 250,000 Australian dollars for NID and other activities over a four year period starting in 1995.

The NID polio vaccine assistance situation in 1994 is shown below.

Table: State of Assistance from Each Country

Donor Nation or Agency	Polio Vaccine (million doses)
Japan	2.72
International Rotary Club	0.58
Total	3.30

3 Cambodia

It is fair to say that activities in this sector have only just begun, and all vaccines required for the EPI activities are being provided by other countries. The main donor nations and agencies are Australia, Japan, America, Canada (the Canada Fund) and the International Rotary Club etc. For the state of assistance in fiscal 1994, refer to Section 3.4.2 (Budget).

The NID polio vaccine assistance situation in 1994 is shown below.

Table: State of Assistance in 1995

Donor Agency	Amount of Assistance (US $)	Use of Aid
International Rotary Club		Polio vaccines
Japan Rotary Club	300,000	Polio vaccines
AIDAB	100,000	Activity costs
Canada Fund	342,000	Printing expenses
WHO	150,000	Technical assistance etc.
Singapore Rotary Club	-	Posters (20,000)
International Rotary Club	-	Posters (20,000)
Thailand Airlines	-	Posters air transportation
UNICEF	-	TV and radio advertising etc

2.3 State of Assistance Implementation by Japan

1 Vietnam

Grant aid projects have yet to be implemented in this sector, however, vaccines and related equipment have been provided over the past two years in the form of technical assistance.

Table: Assistance Record

Fiscal Year	Provided Items (quantity)	Cost (10,000 yen)	Remarks
1993	Polio vaccine (4milion doses), refrigerators, freezers etc.	6,000	Multi-bi assistance with UNICEF
1994	Polio vaccine Polio vaccine (6.6milion doses) Polio vaccine (6,600,000 doses)	4,000 7,000 4,000	Multi-bi assist.UNICEF For NID medical equipment

2 Laos

In the area of technical assistance, long-term specialists (doctors) have been dispatched to Laos since 1992 for the infections side of the Project for Public Hygiene (project technical assistance) being implemented by Japan and WHO. The specialists are scheduled to stay in Laos until 1997.

Moreover, although grant aid projects have yet to implemented in this sector, vaccines and related equipment have been provided for a number or years in the form of technical assistance.

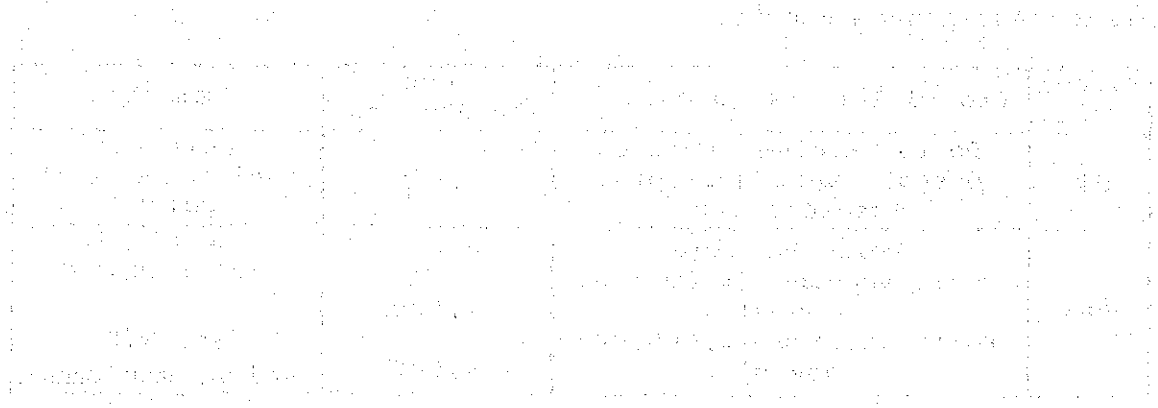
Table: Assistance Record

Fiscal Year	Provided Items (Q'ty)	Cost (1.0 milion yen)	Remarks
1991	Vehicles,refrigerators etc	4.0	Multi-bi assist. with UNICEF
1992	Vehicles,Cold box etc Vehicles,Labo. equipment, Office supplies etc	4.0 3.6	Multi-bi assist. with UNICEF For countering infections
1993	BCG and Measles vaccines, Refregerators etc	4.0	Multi-bi assist. with UNICEF
1994	BCG,and Measles vaccine, Vehicles etc	4.5	Multi-bi assist. with UNICEF

3 Cambodia

In the area of technical assistance, short-term specialists (doctors) in the field of women and child health are currently dispatched and are assisting the EPI activities as part of their work.

Moreover, although grant aid projects have yet to implemented in this sector, vaccines and related equipment have been provided for a number or years in the form of technical assistance.



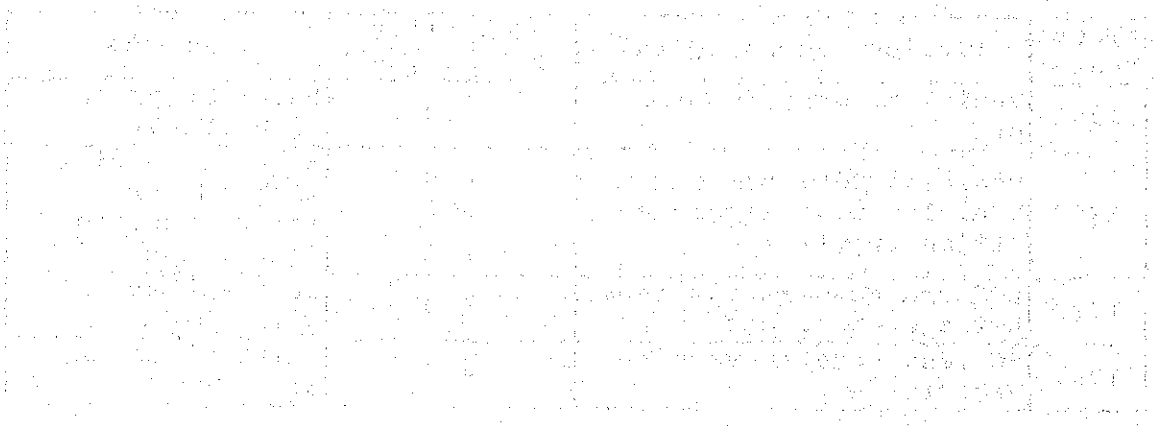


Table: Assistance Record

Fiscal Year	Provided Items (Q'ty)	Cost (1.0 milion yen)	Remarks
1992	BCG and measles vaccine etc	3.3	Multi-bi assist. with UNICEF
1993	BCG and measles vaccines, refrigerators etc	4.0	Multi-bi assist. with UNICEF
1994	BCG and measles vaccines, vehicles etc Refrigerators, freezers, cold boxes etc	4.5 4.0	Multi-bi assist. with UNICEF Medical equipment for infectious disease

2.4 State of Project Sites

The equipment is to be provided for all regions on a national scale in each of the three countries, however, the situation in each of the regions varies due to differences in the degree of infrastructure development, climatic conditions and acceptance setups etc. in each.

1 Vietnam

In terms of health administration, Vietnam is divided into four regions: the northern region, the central region, the highland region and the south region. The supervisory agencies for health activities are the Hanoi Pasteur Institute, the Nha Trang Pasteur Institute, the Institute of Hygiene and Epidemiology in the highland region and the Ho Chi Minh Pasteur Institute. Each region is divided up into provinces which act as subordinate agencies, and each province is further divided into districts. The subordinate agencies to the districts are the communes, and the Project intends to make the four regional institutes and also the immunization centers in each province, district and commune the targets for equipment improvement.

2 Laos

The top health agency in Laos is the National Institute of Hygiene and Epidemiology, which belongs to the Ministry of Health. Underneath this are subordinate agencies in each province, district and commune, and the Project intends to make the NIHE (the national supervisory agency) and also the immunization centers in each province, district and commune the targets for equipment improvement.

3 Cambodia

The top health agency in Cambodia is the Central Medical Store (CMS), which belongs to the Ministry of Health. Underneath this are subordinate agencies in each province, district and commune, and the Project intends to make the CMS (the national supervisory agency) and also the immunization centers in each province, district and commune the targets for equipment improvement.

2.4.1 Vaccine Transportation Systems

1 Vietnam

In Vietnam, vaccines for tetanus, BCG and rabies are produced domestically, while measles, DPT and polio (some) vaccines are imported.

The normal transportation routes for the vaccines are ① from the airports to the institutes (Note 1) (Hanoi National Institute of Hygiene and Epidemiology and the Ho Chi Minh Pasteur Institute), ② from the institutes to the provincial agencies, ③ from the provinces to the districts, and ④ from the districts to the target people in the communes (villages).

However, in the northern region, vaccines are transported from the superior agencies to the subordinate agencies, whereas in the southern region, it is normal for vaccines to be procured from the subordinate agencies to the superior agencies.

Aeroplanes are partially used for transportation from the institutes to the provinces, however, it is generally the case for pickup trucks and wagon cars owned by the provinces to carry the vaccines in large cold boxes. In cases where the provinces do not possess any such vehicles, the vaccines are carried by the institute vehicles or are placed on the luggage racks on the roofs of long distance buses. For transportation from the provinces to the districts, the provincially owned vehicles are used, and if such vehicles are not available, motor cycles or borrowed vehicles etc. are utilized. Although the country's main roads and a few provincial roads are asphalt paved, the roads in other areas and especially in the central region, the highland region and the northern border territories are almost all unpaved and do not allow vehicular traffic. It is therefore normal for vaccines to be transported to the communes and villages on horseback or on foot.

Note 1: only in the case of imported measles vaccines etc.

Table: Vaccine Transportation System in Northern Region of Vietnam

Tansportation Route	Means of Transportation	Frequency and Required time
From Hanoi Airport to NIHE	Vaccine are carried by NIHE-owned refrigerator truck to the NIHE-managed walk-in freezers and ref.	Few times a year/ two hours
From NIHE to the province	Vaccine are transported by NIHE-owned refrigerator truck or general trucks to the 22 northern provinces.	Once per month/ one or two days
	In Lai Chau Province, local service aero-planes are used due to the poor roads.	Once per month/ one or two days
From provinces to district	Province-owned vehicles are usally used, however, when vehicle are not available, motor cycles, boats or public buses are used.	Once per month/ one or two days
From districts to communes	Transportation is done by motor cycle, bicycle, boat or on horseback	Once per month/ one to three days

Table: Vaccine Transportation System in Southern Region of Vietnam

Tansportation Route	Means of Transportation	Frequency and Required time
From Hochimin Airport to Pasteur Institute	Vaccines are carried by Pasteur Institute-owned refrigerator truck to the NIHE-managed walk-in freezers and refrigerators.	Few times a year/ two hours
From Pasteur Institute to the provinces	In cases where the provinces do not possess vehicles, the Pasteur Institute carries out the trans-portation, however, it is normal for each province to come and collect the vaccines.	Once per month/ one or two days
From provinces to districts	Province-owned vehicles are usally used, however, when vehicles are not available, motor cycles, boats or public buses are used by districts to go and collect the vaccines from the provincial agencies.	once per month/ one or two days
From districts to communes	It is usal for the communes to go and collect the vaccines from the district agencies by motor cycle, bicycle, boat or on horsback.	once per month/ one to three days

2 Laos

Because Laos does not produce vaccines domestically, all vaccines are imported. The usual transportation routes are therefore ① from Vientiane Airport to the National Institute of Hygiene and Epidemiology (NIHE), ② from the NIHE to the provincial agencies, ③ from the provinces to the districts, and ④ from the districts to the target people in the villages.

The fact that two-thirds of the land in Laos is mountainous means that the road network is only developed in the flat areas around the main cities. The first problem to be overcome is therefore the securing of means of transportation, and for those districts or in those seasons where transportation from the central agency is difficult, local service aeroplanes are used. Moreover, because roads in the Mekong River basin are often inundated during the rainy season, transportation from the provinces down to the districts and subsequently on to the communes etc. is all done by utilizing boats and ferries. As for transportation to the mountainous areas, motor cycles, motorbikes, horseback or simple walking which are all means suited to hill climbing are the methods relied upon.

Table: Vaccine Transportation System in Laos

Tansportation Route	Means of Transportation	Frequency and Required time
From Vientiane Airport to NIHE	Vaccines are carried by NIHE-owned trucks to the NIHE-managed walk-in freezers and refrigerators.	Few times a year/ one hour
From NIHE to the provinces	The four provices(Vientiane, Borikhamxay, Khammuane and Vientiane Municipality) around the capital which possess vehicles go directly to the NIHE to receive the vaccines.	Once per month/ one day
	Local service areoplanes are relied upon to transport vaccines to the seven provinces (Luangnamtha Oudomxay, Bokeo, Luang Phabang, Xiengkouang, Savannakhet and Champasack) in mountainous areas where the road network is undeveloped.	Few times a year/ one day
	In the case of the other seven provinces that lie adjacent to the aforementioned 7 provinces, provincial cars go to the air fields to pick up the vaccines.	Few times a year/ one day
From provinces to districts	The province-owned vehicles are usally used, however, in cases where vehicles are not available or where vehicular traffic is impossible, motorbike, or boats are used.	Once per month/ one to three days
From districts to commune	Transportation is done by motorbikes or boats or on foot. Normaly, teams of two men each make collection rounds.	Four times per year/ one to three days

3 Cambodia

Because Cambodia does not produce vaccines domestically, all vaccines are imported. The usual transportation routes are therefore ① from Phnom Penh Airport to the Central Medical Store (CMS), ② from the CMS to the provincial agencies, ③ from the provinces to the districts, and ④ from the districts to the target people in the villages.

Except for some main roads and the center of the capital, vehicular traffic cannot normally be expected, and the situation becomes even worse between the provinces and districts and on the branch roads linking the districts to the communes. Moreover, the flat nature of the land and the fact that many roads in the rural areas are simply made by banking up earth means that it is common for transport to be cut off during the rainy season due to inundation. Added to this is the fact that there are no bridges over the Mekong River and its branches, and so ferries, boats and the more mobile motor cycles and bicycles etc. are used for transportation purposes.

Table: Vaccine Transportation System in Cambodia

Tansportation Route	Means of Transportation	Frequency and Required time
From Phnom Penh Airport to CMS	Vaccines are carried by CMS-owned refrigerator trucks and general trucks to the CMS-managed walk-in freezers and refrigerators.	Few times a year/ one hour
From CMS to the provinces	Provinces around the capital which possess vehicles directly go to the CMS to collect vaccines however, it is usually the case for vaccines to be transported to the province	Four times a year/ one to four days
	For transportation to the four provinces (Preah Vihear, St Treng , Tattanakiri and Mondulkiri) in the north-eastern borderregion where the road network is undeveloped, local aeroplanes are relied upon.	Twice a year/ one day
	In the case of Kratie Province, which is accessilbe by river, boats are normally utilized.	Twice a year/ one day
From provinces to district	The districts normally go to collect the vaccines from the provincial centers by motor taxi (motorbike plus wagon) or motorbike	One to four hours
From districts to commune	In the same way stated above, the commune medical staff go to the disr-ict centers to collect the vaccines	One our
From commune to target people	The villages are toured by staff on motorbikes or bicycles.	

2.4.2 Electricity and Water Situation

The electricity situation in each of the three Indochina countries is poor. Voltage levels are unstable, power stoppages are a common occurrence and frequency fluctuations also occur. Moreover, the development of the power networks is slow and there are districts which still do not have any power supply.

The freezers and refrigerators used for storing vaccines are usually powered by electric motor, however, as can be gathered from the above paragraph, some cold chain centers do not possess electrical equipment. Some towns and villages possess private generators, however, there are some cases where the use of these is limited to nighttime hours only. In Laos and Cambodia in particular, the majority of cold chain centers are without electricity and these centers have to overcome this by making use of kerosene type freezers, refrigerators and cold boxes etc. Some districts in Laos use gas, however, this is not common in the area of EPI activities.

As for water, this is required for the sterilization of syringes, however, except for the main cities, each country does not possess water supply facilities. It is generally the case for well water, river water or rain water to be utilized. This creates problems in terms of the safety of syringe sterilization and disinfecting and has led to cases, such as in Vietnam, where citizens are demanding the use of disposable syringes etc.

Table: Electricity Situation in Each Country

Country	Situation
Viet Nam	Electricity is available on the provincial and district levels, however, voltage is unstable and power stoppages are common. Some facilities receive preferential electricity supply and others have installed private generators. Voltage stabillizer are generally installed.
Laos	Power generated by Namgum Dam, which was constructed through aid from the West, is sold to Thailand and brings in precious foreign currency. However, many areas centered around the northern and southern parts of the country have no centers, only seven possess electric equipment. In some districts, voltage is unstable and power stoppage are common.
Cambodia	The electricity sector is undeveloped and, of the 21 provincial hygiene centers, only eight possess electric equipment. In some districts, voltage is unstable and power stoppages are common. In the rural villages not supplied with power, ice is relatively easy to obtain and this is used in place of ice packs.

Chapter 3 Scope and Contents of the Project

3.1 Project Objectives

Following the start of the Expanded Programme on Immunization (EPI) in 1977 at the suggestion of the WHO, world vaccination rates, which were previously less than 10%, had risen to 80% by 1990, and the numbers of reported cases of the targeted diseases declined. However, in the three Indochina countries, vaccination rates continued to be low due to long continuing internal strife etc. In response to this, the Western Pacific Secretariat of the WHO compiled measures for eradication of polio and strengthening of the EPI in these countries and is conducting NID, establishing surveillance setups, developing staff and improving the vaccine transportation and management setups in the said countries.

The Project aims to provide equipment on a national scale for the cold chain, which is treated as a top priority issue within the EPI, and thus bolster the EPI activities, raise vaccination rates and reduce outbreaks of polio and other diseases in Vietnam, Laos and Cambodia.

3.2 Basic Concept

1) Basically speaking, the Project aims to target for improvement that equipment which, of the equipment provided over the past ten years as part of the initial EPI activities, has broken down or has reached the renewal stage. The Project also intends to make up the equipment shortages that arise following vaccination rate increases.

2) Cold chain equipment can be roughly divided into two types: vehicles and equipment for vaccine transportation and storage, and equipment for performing the actual vaccinations. The equipment requested by the three countries does not represent a problem in that it can be classified under these two groups, however, with regard to equipment models and grades, these shall basically be the same as those of equipment previously provided by UNICEF and JICA and currently in use.

3) In the three target countries, which possess subtropical or tropical climates and where road and other transportation networks are undeveloped, the safe transfer and storage of vaccines under appropriate temperatures is extremely difficult and sometimes places great loads on the staff concerned. For this reason, the importance of vehicles such as trucks and motor cycles etc. is particularly important in terms of ensuring safe vaccine management and alleviating the loads placed on the staff. Therefore, vehicles, which form the main part of the requests, shall be treated as items for procurement on condition that they are used only for the EPI activities.

4) The main objective of the Project is to develop the vaccine transportation and management setups necessary for establishing the cold chain system. For this reason, equipment used solely for surveillance and expendable items such as syringes shall, as a rule, be omitted from the target equipment of the Project.

5) The EPI activities in the three countries began in earnest during the 1980s through support from UNICEF and WHO, and they are still being carried out today. During this period, efforts have been made to build the activity setups mainly through aid from UNICEF, and with regard to the current facilities and organizations, these have been more or less established on the central, provincial, district and lower levels. The facilities and organizations are functioning well in the area of routine vaccinations, and were also active in holding the respective first NID.

With such a background in mind, it is judged that the implementation of the concerned equipment improvement within the framework of multi-by assistance with UNICEF will further raise the ease and effects of the implementation.

Furthermore, regarding the actual contents of the assistance, it is thought that the following classifications are realistic:

* Japan will provide equipment on a bilateral basis with the countries concerned,
* UNICEF will provide assistance in the areas of equipment distribution, installation and management etc.

3.3 Basic Design

The basic design for the Project shall be carried out in accordance with the following basic policies and by taking into consideration the current EPI activities situation, the state of facilities and equipment and the natural and social conditions etc. in each of the three Indochina countries.

3.3.1 Basic Policies

1) The equipment shall be used from this year's NID

The NID are scheduled to be held up until fiscal 1997 and the equipment will be utilized in both the NID and routine activities. Use of the equipment, however, shall commence from this year's NID with a view to increasing Project effect.

2) Equipment models shall be selected with levels of skill in actual use the top priority

Due to the fact that UNICEF often conducts training in the use of the cold chain equipment and that equipment standardization from the central down to the lower levels is already underway, the equipment selection shall be made to ensure that the current management abilities of the staff and the systems are put to full use.

3) Equipment shall be selected with full consideration being given to each country's conditions

In view of the environments of installation in each country, priority shall be given to the selection of robust and high quality equipment that can be appropriately and effectively utilized for long periods.

The selection of vehicles etc. in particular shall take into consideration the state of the local roads. Moreover, the service setups of local dealers shall also be taken into consideration because equipment maintenance is essential.

4) Equipment replacement parts shall not be included in the Project

In view of the fact that central management of replacement (spare) parts is difficult, the purchase of required parts according to necessity is cheaper, and the fact that future support from UNICEF can be expected, replacement parts shall, as a rule, not be included within the bounds of the Project. However, in view of the poor road conditions in each country, vehicles shall be provided complete with spare tires.

3.3.2 Design Criteria

The planning of equipment selection and equipment specifications shall be conditional upon the following criteria.

1) Electricity

* Normally speaking, voltage and frequency shall be single phase 220 V/50 Hz and three-phase 380 V/50 Hz respectively.
* In view of the poor electricity conditions in general, the electrical equipment shall, as a rule, be used in tandem with voltage stabilizers.
* All plugs shall be local standard items and ground contacts shall be attached according to necessity.

2) Kerosene

* In those areas not supplied with electricity, kerosene type items shall be provided in view of the stable kerosene supply and the experience of the staff in using such equipment.
* However, in view of the fact that the kerosene acts as the drive source which affects equipment operation and life, special kerosene with a high purity level shall be used.
* Regarding the quantity of kerosene, the amount required to power the equipment for six months shall be provided. (Note 1) Regarding the supply of kerosene following the initial six months, UNICEF has promised to carry this out.

3) Equipment Markings

* As a rule, English shall be used as the language of the markings, instructions and user manuals attached to the equipment.
* Seals stating that the equipment has been provided through

Japanese grant aid shall be applied to the equipment.

(Note 1) Kerosene supply shall be for Cambodia only.

3.3.3 Basic Plans

(1) Vietnam

The health administration facilities to be targeted by the Project are the immunization centers on the central, provincial, district and commune levels. The equipment to be provided is broadly divided into vaccine cold storage equipment and transportation equipment.

1) Cold Storage Equipment

One of the walk-in freezer rooms (20 m3) is currently under construction and will be installed in POLIOVAC, which is scheduled to start the full production of polio vaccine in the latter part of this year. The walk-in freezer room (30 m3) to be installed in the NIHE is designed to store vaccines requiring cold storage which will be distributed throughout the country. This has been made a subject for provision because it is expected that the currently owned freezer room at the NIHE will not be sufficient to handle the storage of the additional polio vaccine to be produced at POLIOVAC. The remaining walk-in freezer room (20 m3) will be installed at the Institute of Hygiene and Epidemiology in the highland region.

The refrigerators and cold boxes will be provided to the provincial and district centers and the vaccine carriers will be provided to the districts or communes.

2) Transportation Equipment

The northern region and southern region currently possess one cold storage truck each, however, because these are insufficient for covering the whole country, trucks will be provided to each of the institutes in the northern region, the central region, the southern region and the highland region. The trucks will be of one-ton class because larger trucks may not be so mobile under the poor road conditions. The trucks shall be used for both large scale vaccine transportation in short periods for the NID and also for the transportation of routine vaccines.

Station wagons will be provided to the provincial hygiene and epidemiology centers and will be used for transporting vaccines between the superior regional centers and subordinate district centers. Of the 53 provinces in the country, 29 already possess vehicles and will not, therefore, be included within the Project target sites.

Motorcycles will be provided mainly to the northern region and the highland region where there are many villages and communes in which poor road conditions make transportation by truck etc. difficult.

Table: Project Equipment for Vietnam

Cold Strage Equipment

No	Equipment	Q'ty	Specification	Purpose of Use
1	Walk-in freezer room	3	Room capacity: 30m.cu. (1) 20m.cu. (2) freezer temp.:-25℃	To be used for large scale storage of vaccines on the central or regional levels
2	Freezer	50	Freezer capacity: approximately 230L Temp.:-23 ℃	To be used for the freezing of ice packs on the provincial or district levels
3	Refrigera-tors	150	Ref. capacity: approximately 200L Temp.:+2 ℃	To be used for vaccine storage on the provincial or district levels
4	Cold boxes	1,500	Cappacity: approximaetly 20L	To be used for vaccine transportation from provinces to districts
5	Vaccine carriers	5,500	Capacity: approximetly 1.5L	To be used for carring vaccines from districts to communes and villages

Transportation Equipment

No	Equipment	Q'ty	Specification	Purpose of Use
6	Freezer truck	4	Truck dead-weight : approximately 1ton	To be used for transportation fron central centers to regions and on to the provinces.
7	Station wagons	24	Four wheel drive, gasoline vehicles	To be used for transportation from regional centers to provinces and on to districts
8	Motor cycles	150	110cc, four cycle, compete with helmet	To be used for transportation from districts to communes and on to villages

Table: List of Equipment Distribution Destinations in Vietnam

No	Province	Freezer	Ref.	Cold boxes	Vaccine carriers	Motor cycles	Station wagon	Freezer trucks
1	Ha Bac	2	3	20	70	1		
2	Hai Hung		2	20	70	1		
3	Hai Phong		3	20	100		1	
4	Ha Noi		3	20	100	1		1
5	Ha Tay		2	20	100		1	
6	Ha Tinh		4	20	150		1	
7	Nam Ha	1	3	20	70	1		
8	Quang Ninh	1	4	20	150	2	1	
9	Thai Binh		2	20	70		1	
10	Vinh Phu	1	3	20	100	1		
11	Bac Thai	2	2	20	100	3		
12	Cao Bang	2	3	60	100	11	1	
13	Ha Giang		3	60	100	8	1	
14	Hoa Binh	2	4	20	100	2		
15	Lai Chau	3	4	50	100	7	1	
16	Lang Son		4	50	100	9	1	
17	Lao Cai	3	2	50	100	8	1	
18	Nghe An		2	30	150	6		
19	Ninh Binh	2	3	10	100		1	
20	Son La		2	60	150	9		
21	Thanh Hoa		2	30	150	3		
22	Tuyen Quang		3	40	150	2	1	
21	Yen Bai		2	50	150	3		
	Subtotal	19	65	730	2,530	78	12	
1	Binh Dinh		2	20	100	1		
2	Binh Thuan		2	20	100		1	
3	Khanh Hoa	1	4	20	150	1		1
4	Thua Thien-Hue	1	4	20	150	1	1	
5	Ninh Thuan	2	2	20	100		1	
6	Phu Yen		2	30	50	1		
7	Quang Binh		2	30	50	2		
8	Quang Nam-Da Nang	3	3	40	100	4	1	
9	Quang Nagi		2	20	100	4	1	
10	Quang Tri		2	30	50	2		
	Subtotal	7	25		950	16		

Table: List of Equipment Distribution Destinations in Vietnam

No	Province	Freezer	Ref.	Cold boxes	Vaccine carriers	Motor cycles	Station wagon	Freezer trucks
1	Dac Lac	3	5	50	100	17	1	1
2	Gia Lai	3	4	50	100	11	1	
3	Kon Tum	3	4	40	100	4		
	Subtotal	9	13	140	300	32	2	1
1	Lam Dong	3	5	40	100	10		
2	An Giang	1	2	20	70	1		
3	Ba Ria-Vung Tau		2	10	60	1		
4	Ben Tre	2	3	30	100	1		
5	Can Tho		2	20	100		1	
6	Dong Nai		3	20	150	1		
7	Dong Thap	2	4	30	100	1		
8	Ho Chi Minh City		2	20	100		1	1
9	Long An		2	20	100	1		
10	Minh Hai		3	20	100	1	1	
11	Soc Trang	1	3	20	70	1		
12	Tien Giang		3	20	70	1		
13	Kien Giang		4	20	100		1	
14	Song Be		2	30	100	2		
15	Tay Ninh		2	20	100	2		
16	Tra Vinh	3	3	20	150	1		
17	Vinh Long	3	2	20	150		1	
	Subtotal	15	47	380	1,720	24	5	1
	Total	50	150	1,500	5,500	150	24	4

2 Laos

The health administration facilities to be targeted by the Project shall be the epidemiology centers in each province, district and commune which cover the whole country. The equipment to be provided under the Project is broadly divided into cold storage equipment, sterilization equipment and transportation equipment.

1) Cold Storage Equipment

Electric freezers and refrigerators will be provided for the hygiene centers in those provinces and districts which are served with electricity. In those areas where the power situation is poor and where equipment breakdown etc. is a cause for concern, the equipment shall be attached with voltage stabilizers for the sake of safety.

Kerosene type equipment will be used in those areas not served with electricity, and ice pack freezers and vaccine refrigerators shall be considered for provision. Ice pack freezers will mainly be provided to those districts to which transportation of vaccines takes a number of days due to poor geographical conditions and sheer area size.

Cold boxes will be provided to the provincial and district level centers and these shall be small types that are suited to those cases where they are carried by motor cycle and boat or on foot.

Vaccine carriers are normally used for short term storage and transportation, however, due to the regional differences, both types that allow relatively long storage and the normal type shall be considered.

2) Sterilization Equipment

As Laos is using reusable syringes in its EPI activities, syringe sterilizers will be added to the list of target equipment. As the use of sterilizers is mostly in communes not served with electricity, their provision together with oil hot plates will be considered.

3) Transportation Equipment

Vehicles will, as a rule, be provided to those provincial and district hygiene centers not currently possessing vehicles, and their use shall be coordinated between the superior and subordinate institutions.

Motor cycles will be provided to those areas where poor conditions make transportation by truck etc. difficult. It is judged that 125 cc class off-road type motor cycles will be suited to travelling over the numerous mountain roads and natural paths.

Moreover, spare tires for the trucks and motor cycles will be included as replacement parts under the Project due to the fact that wear and tear over the poor roads is great.

Table: Project Equipment for Laos

Cold Storage Equipment

No	Equipment	Q'ty	Specification	Purpose of Use
1	Freezer	45	Electric type with freezer capacity: apploximately 120L	To be Used for cold storage of vaccine on the provincial or district level
2	Freezer for icepack	25	Kerosene type with freezer capacity: approximately 20L	To be used for ice pack freezeing on the provincial or distirct levels
3	Refrigerator	28	Electric type with freezer capacity: approximately 120L	To be used for storage of vaccines on the Provincial or district levels
4	Refrigerator	20	kerosene type with refrigerator capacity:approximately 33L	To be used for storage of vaccines on the provincial or district levels
5	Cold box	150	Capacity:approximately 20L	To be used for transportation of vaccines from provinces to districts
6	Vaccine carrier	400	Capacity: approximately 1.5L	To be used for transportation of vaccines from districts to communes and villages
7	Vaccine carrier	1000	Capacity: approximately 1.5L	To be used for transportation of vaccines from districts to communes and villages

Sterilization Equipment

No	Equipment	Q'ty	Specification	Purpose of Use
8	Sterilizer	40	Single rack with kerosene stove	To be used for strilizing syringes and syringe needles

Transportation Equipment

No	Equipment	Q'ty	Specification	Purpose of Use
9	Pickup truck	17	4 wheel drive, diesel, double cabin type	To be used for surveillance and transpotation from central institute to provinces and on to districts
10	Motor cycle	80	125cc four cycle type with helmet	To be used for surveillance and transpotation from provinc-es to districts and on to subordinate centers

Table: List of Equipment Distribution Destinations in Laos

No	province	Electric freezers	Kerosene ice pack freezers	Electric refrigerators	Kerosene refrigerators	Cold boxes	Long term vaccine carriers	Short term vaccine carriers	Sterilizer	Pickup trucks	Motor cycle .
1	Vientiane Mnicipality	9		9				96	36	1	5
2	Phongasaly		2			24	32	40	16	1	3
3	Luang Namtha		3			12	18	30	12	1	2
4	Oudomsay	1	2		3	16	32	64	24	2	4
5	Bokeo		1		2	12	24	30	12	1	2
6	Luang Plabang	4	2				21	96	36	2	6
7	Houaphanh		3			16	32	40	16		5
8	Sayaboury	1			2		24	48	18	2	4
9	Xiengkhouang		2			18	36	45	18	1	5
10	Vientiane	5		5				64	24	1	4
11	Borikhamsay	2			3	14	21	35	14		5
12	Khammouane	5		4			36	72	27	1	4
13	Savannakhet	8		7				98	42	2	8
14	Salavane	4	2	3	2	18	36	45	20		5
15	Sekong		1		2	10	20	21	12		4
16	Champakack	6			2			96	36	2	4
17	Attapeu		2		3	10	24	30	15		4
18	Xienghone Hongsa		2				20	25	10		3
19	Saysombour		3		1		24	25	12		3
	Total	45	25	28	20	150	400	1000	400	17	80

Table: List of Equipment Distribution Destinations in Cambodia

No	Province	Electric freezers	Kerosene refrigerators	Standby generator	Cold boxes	Vaccine carriers	Sterilizer	Pickup trucks	Motor cycle
1	Phnom Penh	1	7		3	50	30		9
2	Kandal	1	1		5	40	50		7
3	KG. Chhang		1		4	40	30	1	7
4	KG. Speu		5		5	20	30		10
5	Takeo		3		4	40	35		16
6	KG. Cham Rubber Plant	2	1	1	5	100	60	1	5
7	Prey Veng		2		6	30	43		7
8	Svay Rieng				2	30	30		5
9	Pursat		1		1	15	20		6
10	Battambang	2	1	1	3	20	30	1	8
11	B.M. Chey		2		1	20	35		11
12	Siemreap	2	14		6	40	60	1	
13	Kampot		3		3	50	15	1	
14	Sihanouk Ville	1	1		1	10	15	1	
15	Koh Kong		6		2	40	25		
16	KG. Thom		5		2	25	25	1	
17	Kratie		2		2	20	15		
18	Rattanakiri		10		2	60	15		
19	Mondulkiri		5		2	10	20		
20	Stung Treng		4		1	10	10		
21	Preh Vihear		8		3	60	12		
22	KEP				3	20	20		
	CNHE	1						5	
	CMS		11		10	235	165		
		10	100	2	80	1000	800	13	100

Note: The equipment for the CMS (Central Medical Store) is intended for those districts where there are currently safety problems, or where the opening dates of facilities, transportation or general conditions cannot be grasped. The equipment will be passed on to the districts when conditions have improved.

Table: Project Equipment for Cambodia

Cold Storage Equipment

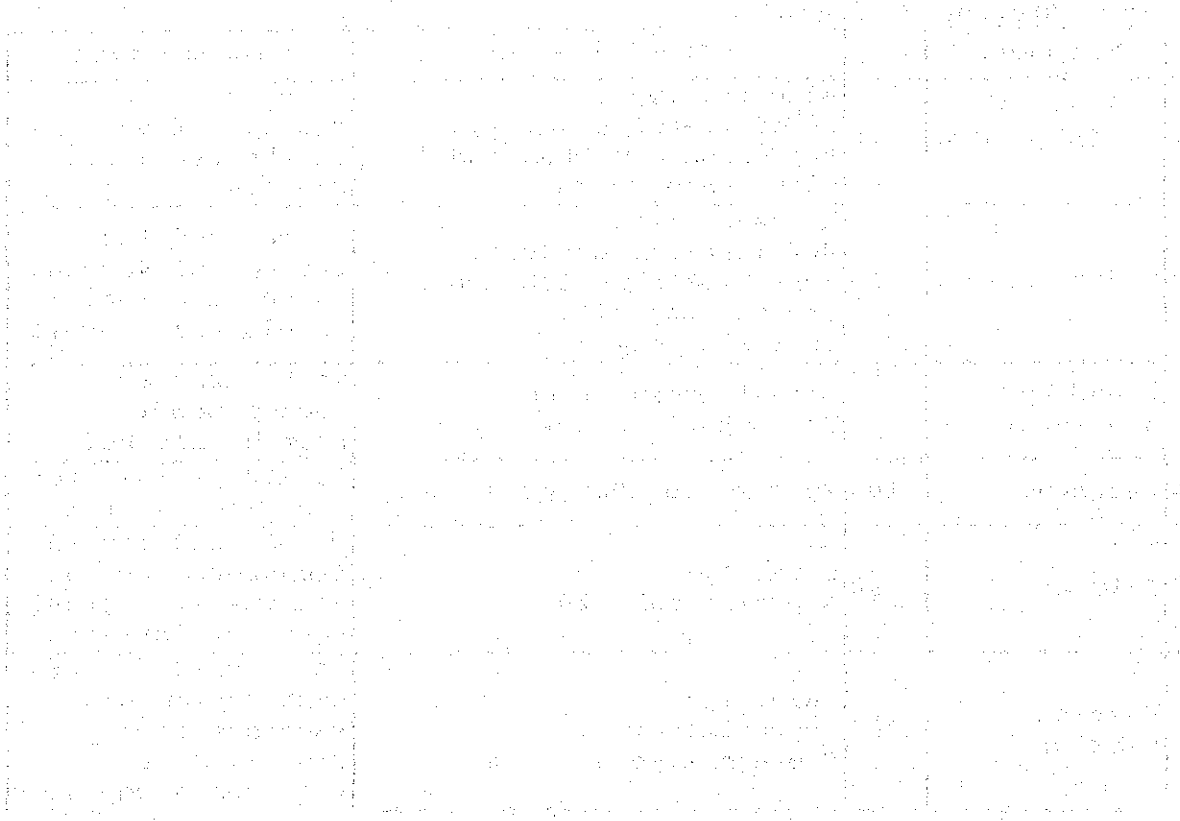
No	Equipment	Q'ty	Specification	Purpose of Use
1	Rrefrigerator	10	Electric type Refregerator capacity: approximately 250L and with spare parts	To be used for storage of vaccines in the provincial centers
2	Rrefrigerator	100	Kerosene type Refrigerator capacity: approximately 240L and Freezer capacity: approximately 33L	To be used for storage of vaccines on the provincial or district levels
3	Stand-by generator	2	Diesel engine type Out put of 10 kVA	To be used as backup power sources for Ref.
4	Kerosene	100	To come in 200L drum cans	To act as fuel for the kerosene ref.
5	Cold box	80	Capacity: approximately 20L	To be used for the Transportation of Vaccine from provinces to districts
6	Vaccine carrier	1000	Capacity: approximately 1.5L Storage time 37hours	To be used for transportation of vaccines from districts to villaves & communes

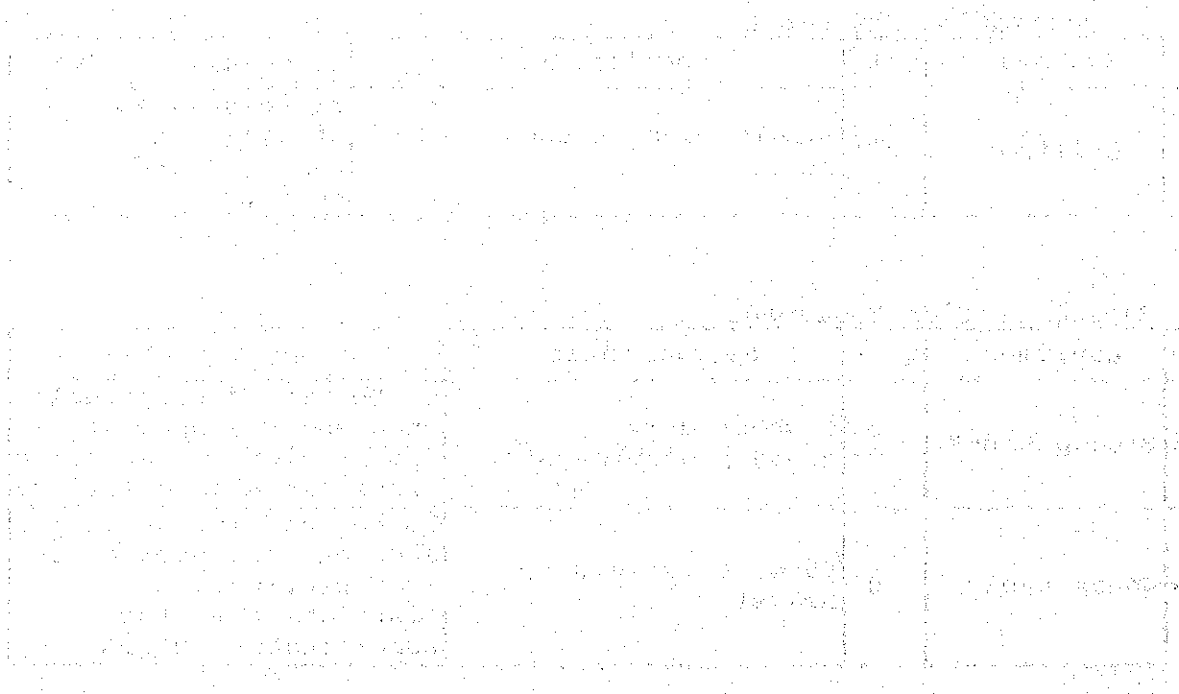
Sterilization Equipment

No	Equipment	Q'ty	Specification	Purpose of Use
7	Sterilizer	800	Single rack kerosene with stove	To be used for sterilizing syringes and needles

Transportation Equipment

No	Equipment	Q'ty	Specification	Purpose of Use
8	Pickup truck	13	4 wheel drive. diesel, double cabin	To be used for surveillance and transportation from regional centers to provinces & to districts
9	Motor cycle	100	90cc, 4 cycle,with helmet	To be used for surveillance and transportation from provinces to districts & to the subordinate centers





3 Cambodia

The health administration facilities to be targeted by the Project shall be the epidemiology centers on the central level and in each province, district and commune which cover the whole country. The equipment to be provided under the Project is broadly divided into cold storage equipment, sterilization equipment and transportation equipment.

(1) Cold Storage Equipment

In areas served with electricity, electric refrigerators will be provided to the provincial hygiene centers. These shall come attached with voltage stabilizers and in the two districts where power stoppages are frequent (two refrigerators each), generators will be attached for the sake of safety in the vaccine management.

For the provincial centers not served with electricity, the conventional kerosene refrigerators will be provided and, in view of the fact that imports of kerosene must be relied upon due to the difficulty of procuring it locally, this shall also be included within the Project bounds. However, the quantity provided shall only be enough to operate the equipment for the first six months.

Provincial and district centers are targeted for the provision of cold boxes, and these shall be small types suitable for vaccine carrying in the common cases of transportation by motor cycle and boat or on foot.

Vaccine carriers will be provided for the district centers and the communes. Ice packs are usually used as the cooling agent in vaccine carriers, however, because ice is usually used for this in Cambodia, the ice packs shall not be included. Moreover, the use of ice should not affect operations because it is relatively easy to obtain even in the regions.

(2) Sterilization Equipment

As Laos is using reusable syringes in its EPI activities, syringe sterilizers will be added to the list of target equipment. The sterilizers will be provided to the villages and communes.

(3) Transportation Equipment

Vehicles will, as a rule, be provided to those provincial and district hygiene centers not currently possessing vehicles, and their use shall be coordinated between the superior and subordinate institutions.

Motor cycles will be provided to those areas where poor conditions make transportation by truck etc. difficult. It is judged that 90 cc class motor cycles will be suitable due to the fact that the nature of the national land is flat.

Moreover, spare tires for the trucks will be included as replacement parts under the Project due to the fact that wear and tear over the poor roads is great.

3.4 Project Implementation Setup

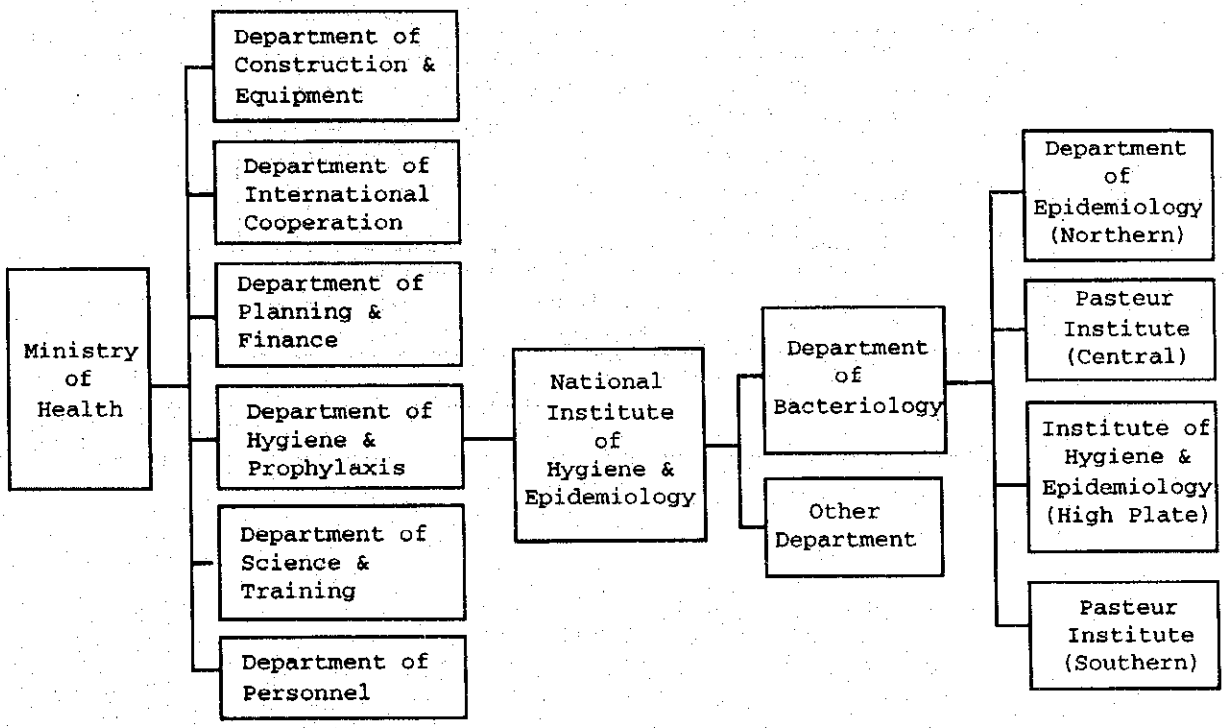
3.4.1 Organization

1 Vietnam

(1) Main Supervisory Agencies

The health administration in Vietnam is headed by the Ministry of Health and the EPI activities are being implemented over four administrative regions: the northern region, the central region, the highland region and the southern region. The supervisory agencies are the National Institute of Hygiene and Epidemiology (NIHE) in the northern region, the Nha Trang Pasteur Institute in the central region, the Institute of Hygiene and Epidemiology in the highland region and the Ho Chi Minh Pasteur Institute in the southern region. The NIHE supervises the four regions in its role as the actual implementation agency for the EPI activities.

Table: Organization Chart of the Ministry of Health and the Hygiene and Epidemiology Agencies in Vietnam



(2) Operating Agencies

The cold chain system in Vietnam is headed by the NIHE in Hanoi and comprises a network divided into the aforementioned four regions.

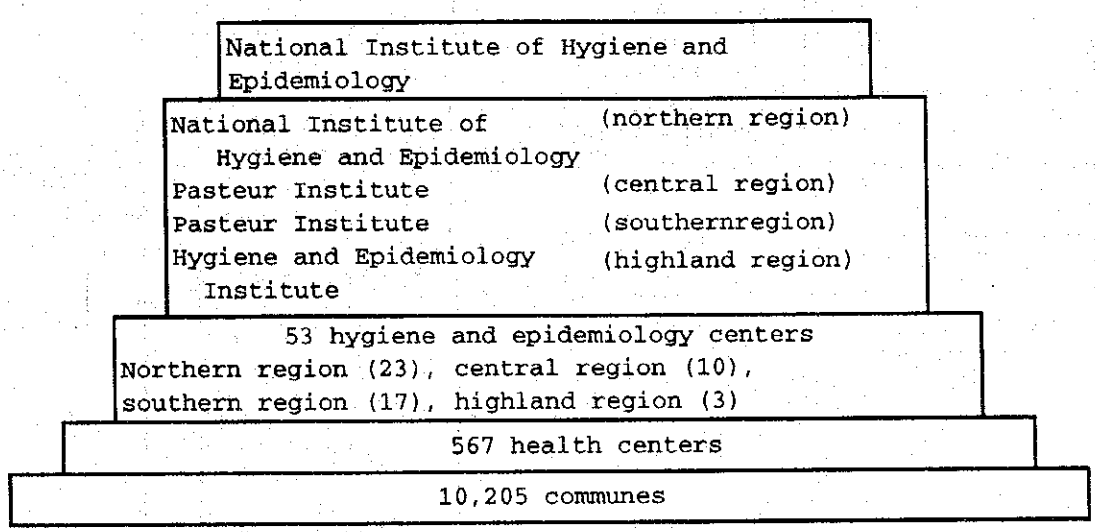
The regions are further divided into 53 provinces with each province possessing a hygiene and epidemiology center which contains

an EPI unit. The hygiene and epidemiology centers possess independent facilities and specialist EPI staff and, as well as conducting the EPI activities, they also carry out malaria countermeasures, family planning and environmental hygiene activities etc.

The provinces are further divided into 567 districts with EPI centers contained in the health centers which are usually located within the district medical facilities. The health centers possess independent facilities and specialist EPI staff and are responsible for covering between 10 and 20 communes.

The lowest unit communes consist of a number of villages with a total population of approximately 10,000. They possess primary health care facilities also responsible for the EPI activities. The facilities possess permanent staff, however, the EPI activities are conducted as part of the normal work and there are no specialist staff. Currently, 10,205 communes have been confirmed throughout the country.

Table: Cold Chain System

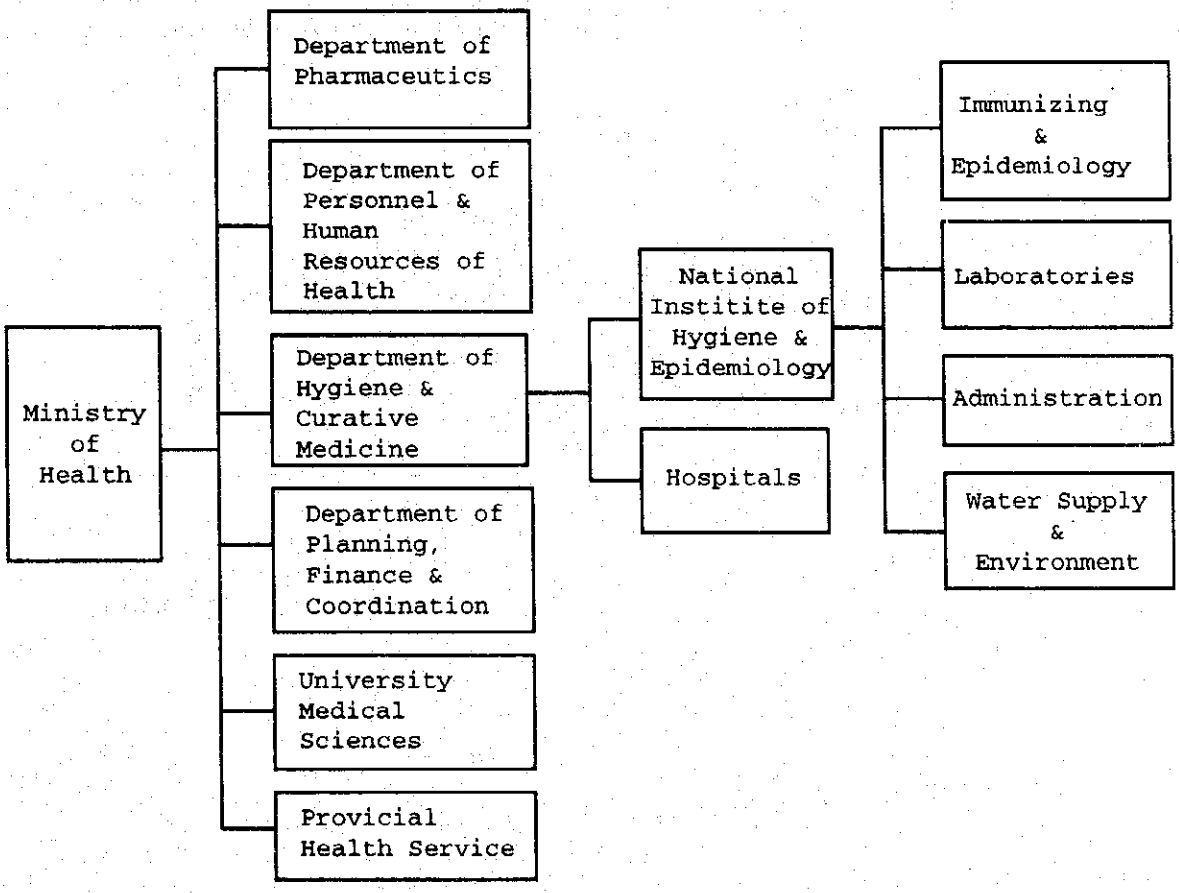


2.Laos

(1) Main Supervisory Agencies

The National Institute of Hygiene and Epidemiology (NIHE), which is the external agency of the Ministry of Health, is responsible for all hygiene and epidemiology affairs on the national scale. The Immunizing and Epidemiology Division of the NIHE is in charge of the EPI activities.

Table:Organization Chart of the Ministry of Health and the National Institute of Hygiene and Epidemiology in Laos



(2) Operating Agencies

The epidemiology setup in Laos is headed by the NIHE in the capital Vientiane and consist of the health and hygiene centers in each of 19 provinces (17 provinces plus two special districts) and the subordinate health and hygiene centers in each of 132 districts. EPI units are usually installed in provincial and district hospitals and also commune dispensaries, and 1622 such units have been confirmed throughout the country.

Vaccinations are classified into four zones according to distance from the nearest health institution and accessibility to the institutions.

Zone-0 indicates villages that are within three or five kilometers from the nearest institution, and residents in such zones must go to the institutions in order to receive vaccinations.

Zone-1 indicates villages to which health center staff can make day visits on foot, by bicycle or by canoe etc., and approximately 15% of villages are classified as Zone-1. Districts located beyond these zones are served by outreach services carried out by patrol teams.

Zone-2 indicates villages to which health center staff can make day visits by motorbike, boat or bus etc., and approximately 16% of villages are classified under this zone.

Zone-3 indicates villages to which day trips by the aforementioned means of transport cannot be made, and the majority of villages belong to this category.

Table: Cold Chain System

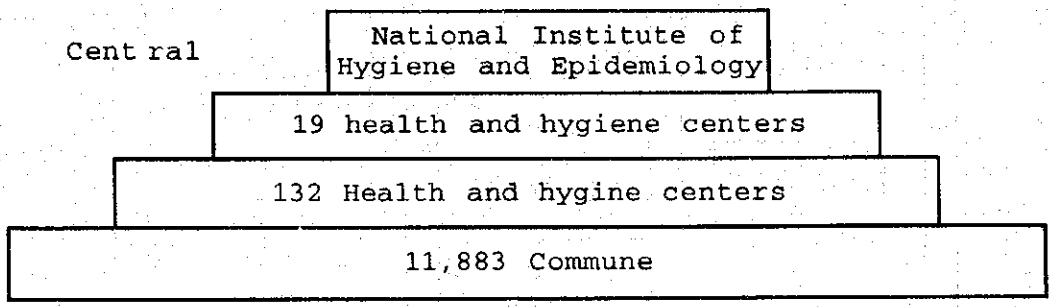
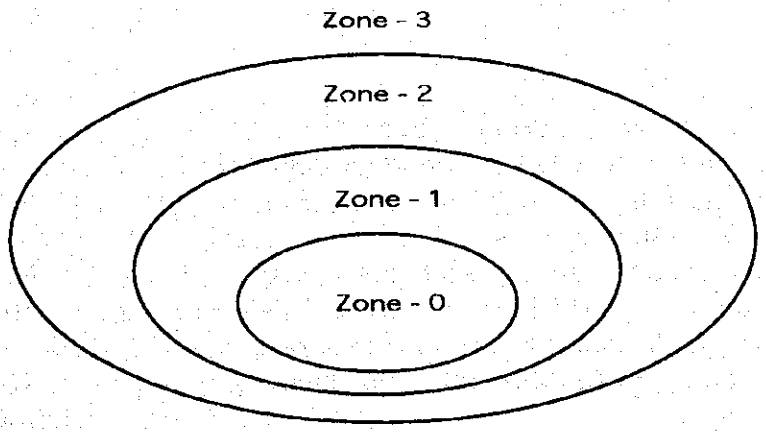


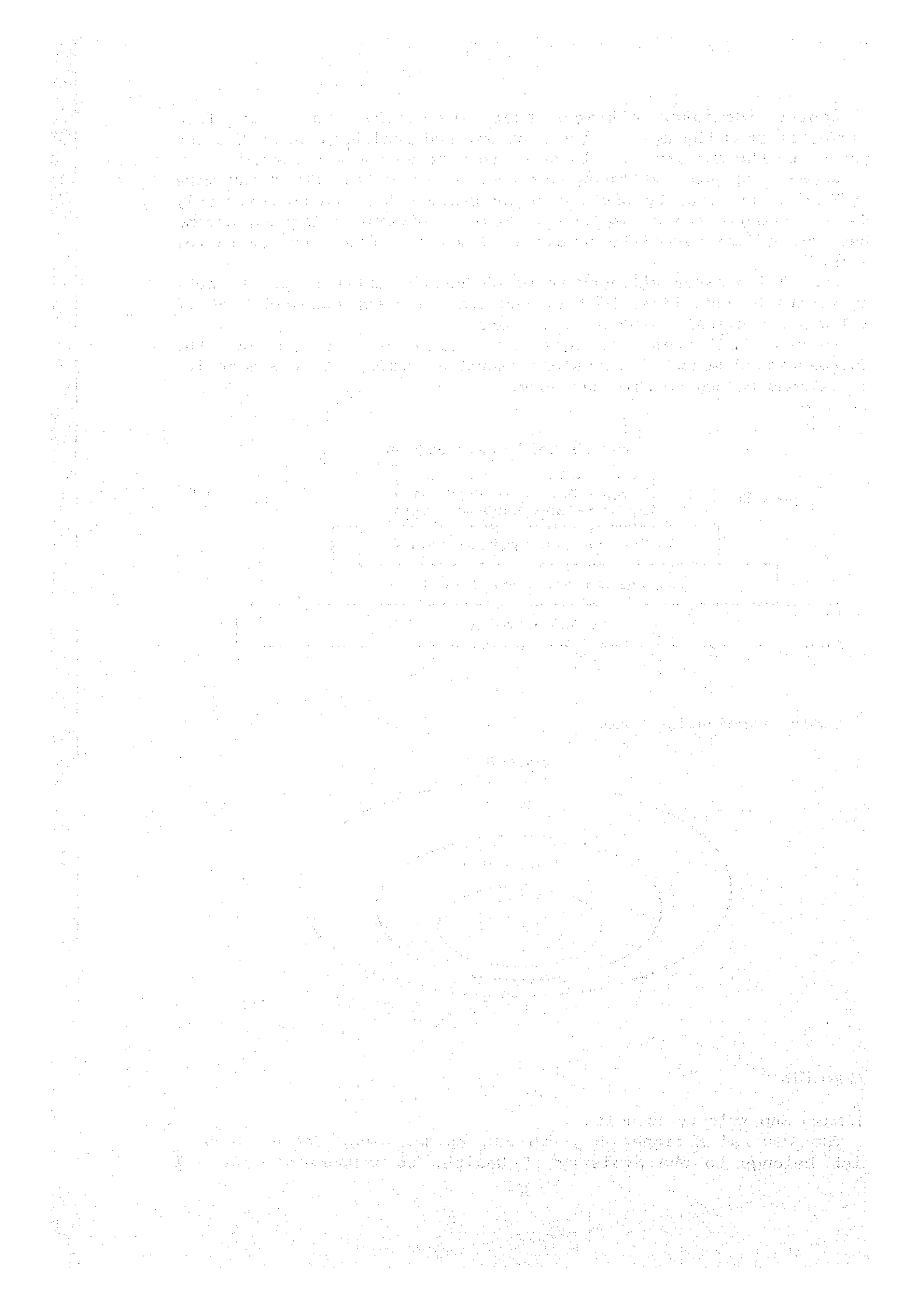
Table: Vaccination Zones



3 Cambodia

(1) Main Supervisory Agencies

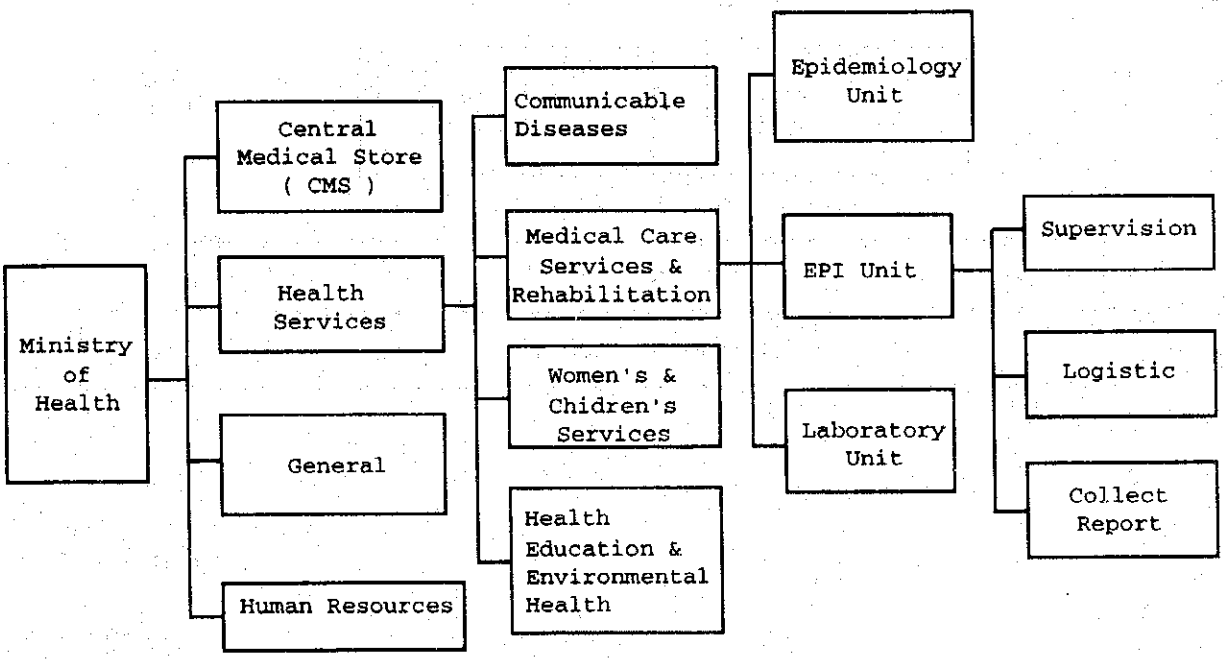
The Central National Hygiene and Epidemiology Center (CNHE), which belongs to the Ministry of Health, is responsible for all



hygiene and epidemiology matters on the national scale, and the EPI activities are performed by the EPI Unit, which is a division within the CNHE.

Organizational reform has been carried out over the last few years and this is still in progress.

Table: Organization Chart of the Ministry of Health and the Central Hygiene and Epidemiology Center in Cambodia



(2) Operating Agencies

The cold chain system in Cambodia consists of a network headed by the CNHE in the capital Phnom Penh. However, the CNHE is only responsible for planning, supervision and management, and the Central Medical Store (CMS), which is a separate agency of the Ministry of Health, is in charge of the actual storage, management and transportation of vaccines, medical supplies and equipment etc. The CMS is very much like a medical supply bureau and it consists of 34 staff including eight pharmacists. The CMS also possesses its own trucks and drivers.

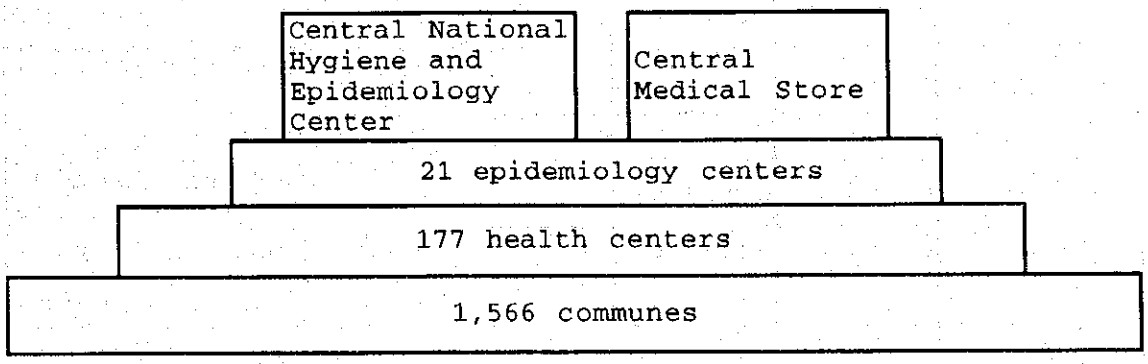
The country is divided into 22 provinces (21 provinces plus one special district) with each province possessing one epidemiology center which also includes an EPI unit. The epidemiology centers possess independent facilities and specialist EPI staff and, as well as EPI activities, they also carry out malaria countermeasures and environmental hygiene activities.

The provinces are further divided into 177 districts, and the EPI units on this level are incorporated into the medical facilities

or health centers located in each district. The EPI units here possess independent facilities (rooms) and specialist staff and are responsible for covering around 10 communes each on average.

The lowest unit communes are generally composed of between five and 10 villages and do not possess any medical facilities. The EPI activities in the communes are carried out by staff dispatched by the districts. There are currently 1,566 confirmed communes in Cambodia.

Table: Cold Chain System



3.4.2 Budget

1 Vietnam

The Ministry of Health, which is the executive agency for health matters in Vietnam, does not provide full financial support for the regional epidemiology activities, and it is the provincial and district peoples committees that are bearing the uncovered costs. This means that some provinces and districts are unable to secure sufficient budgets and thus leads to differences in the level of activities. Generally speaking, the highland region faces the most difficult financial situation, and this is said to be followed by the central region, the northern region and the southern region. Each of the regions, however, has received financial support from UNICEF, the International Rotary Club, AIDAB and Japan etc.

Table: Breakdown of EPI Activities Budget

(Unit: 1,000,000 Vietnam dong)

Source of Funds	1993	1994
Central government and regions	26,034.5	34,106.5
International agencies	30,800.0	30,800.0
Total	56,834.5	64,906.5

Table: Breakdown of EPI Costs

(Unit: 1,000,000 Vietnam dong)

	1993	1994	Percentage
Central and regions			
Printed materials etc	1,384.8	1,581.6	2%
Advertizing, education monitoring	3,808.2	4,344.4	7%
Vaccine transportation etc.	2,423.4	2,767.8	4%
Equipment repairs etc.	3,058.1	3,492.7	5%
Subtotal	10,674.5	12,186.5	
Regions(provinces, districts, and others)			
1. Daily activities			
Advertizing, vaccine transportation	8,655.0	9,885.0	15%
Education, monitoring	4,269.8	4,876.6	8%
2. NID			
Activities support costs	30,000.0	34,268.0	53%
Education expenses (district, commune)	3,231.2	3,690.4	6%
Subtotal	46,160.0	52,720.0	
Total	56,834.5	64,906.5	100%

2 Laos

Because the Ministry of Health, which is the executive agency for health matters in Laos, is unable to provide full financial support for the EPI activities and NID, the provinces are bearing some of the costs. As well as the provinces, support is also provided by such bodies as the Ministry of Culture, the Ministry of Transport, the Ministry of Education, the Laos Womens League and the Laos Youth League etc. However, there is in real terms a big reliance on support from international agencies like UNICEF and WHO etc. and also JICA and the International Rotary Club and so on. Such support is evident in almost all areas of the EPI activities from vaccine and equipment procurement to vaccine supply, actual vaccinations, staff development, surveillance and staff salaries in the institutes. The following two tables indicate, for reference purposes, the figures of financial support in fiscal 1994 and also the proposed budget for EPI activities in 1995.

Table: Financial Assistance in 1994

(Unit: US $)

Donor	Specialist salaries	Vaccine/ Equipment	Activities costs	Subtotal
W H O	45,000	105,945	110,000	260,945
UNICEF		703,653	232,762	936,415
JICA	108,000	363,575		471,575
J P A			66,000	66,000
International Rotary Club			60,000	60,000
Total	153,000	1,173,173	468,762	1,794,935

Table: Proposed Budget for EPI Activities in 1995

(Unit: US $)

Activities	Costs	Parcentage
Planning and management Routine EPI activities	27,500 250,000	2% 22%
N I D	125,000	11%
Advertising and education	83,100	7%
Surveilance	22,000	2%
Staff trainning	106,000	9%
Equipment supply	507,500	45%
Monitering and evaluation	16,000	1%
Total	1,137,100	100%

3 Cambodia

In Cambodia, the Central Medical Store (CMS), which is a separate organization of the Ministry of Health, is basically in charge of the transportation of vaccines and equipment from the central level to the provinces. The provinces are then responsible for transportation within provinces and equipment repairs etc. As for the actual vaccinations at the lower end of the cold chain, this is partially carried out by staff of the maternal and child health centers (MCHC). The EPI activities costs currently borne by the Ministry of Health consist of partial payment of CNHE staff salaries, ice purchase costs at the lower end of the cold chain, accommodation costs of regional observers, training session expenses and printing costs etc. and amount to less than

$ 83,000 in total. Financial assistance from international donor agencies such as UNICEF, WHO, JICA and the International Rotary Club is relied upon to cover the majority of the remaining uncovered

costs such as those for vaccine and equipment procurement, staff development, surveillance and CNHE staff salary subsidies etc.

The following tables indicate the financial support from international agencies for the EPI activities (including NID) and the central budget for EPI activities over the past two years.

Table: Financial Assistance in 1994

(Unit: US $)

	Vaccine	Equipment &Poster etc.	Activities suport	Subtotal
UNICEF	12,050	583,000		708,050
JICA	400,000			400,000
AIDAV			300,000	300,000
International Rotary Club	300,000			300,000
Japan Rotary Club	10,000			100,000
Total	925,050	583,.000	300,000	1,808,050

Table: EPI Activities Budget in 1993 and 1994

(Unit: US $)

Activity	1993	1994
Planning and management	14,500	15,750
Advertising and education	21,400	90,870
Staff training	33,050	56,565
Vehicle gasoline and maintenance cost	11,355	16,671
Total	80,305	179,856

3.4.3 Staff

The numbers of staff involved in direct epidemiology activities differ between the three countries due to differences in the covered areas and target populations (see table below). The staff normally consist of those responsible for epidemiology, doctors in charge, cold chain equipment managers and vaccinators etc. The staff directly involved in vaccinations at the lower end of the cold chain consist of staff performing the actual vaccinations, doctors, nurses, midwives and staff who have received special training, and these staff are also responsible for conducting MCH activities.

Regarding the cold chain management staff directly linked to the Project, one such staff member is always placed in each district level facility from the central agency and performs activities such as vaccine inventory management, temperature management and simple maintenance etc.

Table: EPI (Epidemiology) Activities Staff in Each Facility

Country	Central level	Regional level	Provincial level	Ditrict level	Commune
Viet Num	20	15 - 20	10 - 15	4 - 6	2 - 3
Rao PDR	9	-	2 - 4	2	-
Cambodia	8	-	2 - 4	2 - 3	1 - 2

UNICEF is also cooperating in the development of such staff by carrying out training on the central and regional levels divided into a number of courses.

The operation of cold chain equipment does not really require special skill, however, it is thought that the aforementioned training etc. ensures that no major problems arise in the area of operation.

Table: UNICEF Training in Each Country

Target	Training Contents
Provincial and district level responsibilities	EPI planning and management NID implementation planning Surveillance and advertising Monitoring and supervision
National EPI staff	Vaccinations and vaccine handling Cold chain equipment handling and sterilization
Medical volunteers	NID special courses
Womens Leagues and private sector groups	Basics of EPI diseases

3.4.4 Maintenance

The items of equipment to be provided under the Project in which maintenance is a problem are the refrigerators, freezers and vehicles. The other items of equipment (cold boxes, vaccine carriers and sterilizers) do not require maintenance and present no problems.

Regarding refrigerators and so on, each of the centers in the three countries possesses at least one permanent staff member responsible for management, and the equipment management and maintenance is entrusted to him.

In serious cases where the centers cannot handle problems, in Vietnam, there are agents of the maker of the planned refrigerators and it is possible to utilize these. Moreover, there are also specially assigned maintenance staff in the southern region and, providing that the means of transportation of the staff and the broken down equipment haulage setup are improved, it is thought that the situation should improve.

In Laos and Cambodia, equipment repairs are currently entrusted to the private refrigerator dealers and so on and it is thought that the same methods will be adopted in handling breakdowns in Project equipment.

Regarding the vehicles and motor cycles to be provided, drivers are able to handle minor breakdowns etc. and, because each country possesses agents and repair workshops, it is considered that there will be relatively few problems.

Regarding the costs involved in the equipment maintenance, the provinces and districts in each country which are the actual users are expected to bear the burden. Those provinces and districts which do no have the financial capacity to do this receive assistance from UNICEF. UNICEF also provides financial assistance for maintenance training and also the supply of kerosene etc.

In Laos and Cambodia where the provision of kerosene type refrigerators etc. is planned, care must be taken to ensure that both kerosene procurement and the replacement of parts etc. is carried out on a regular basis.