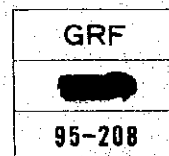
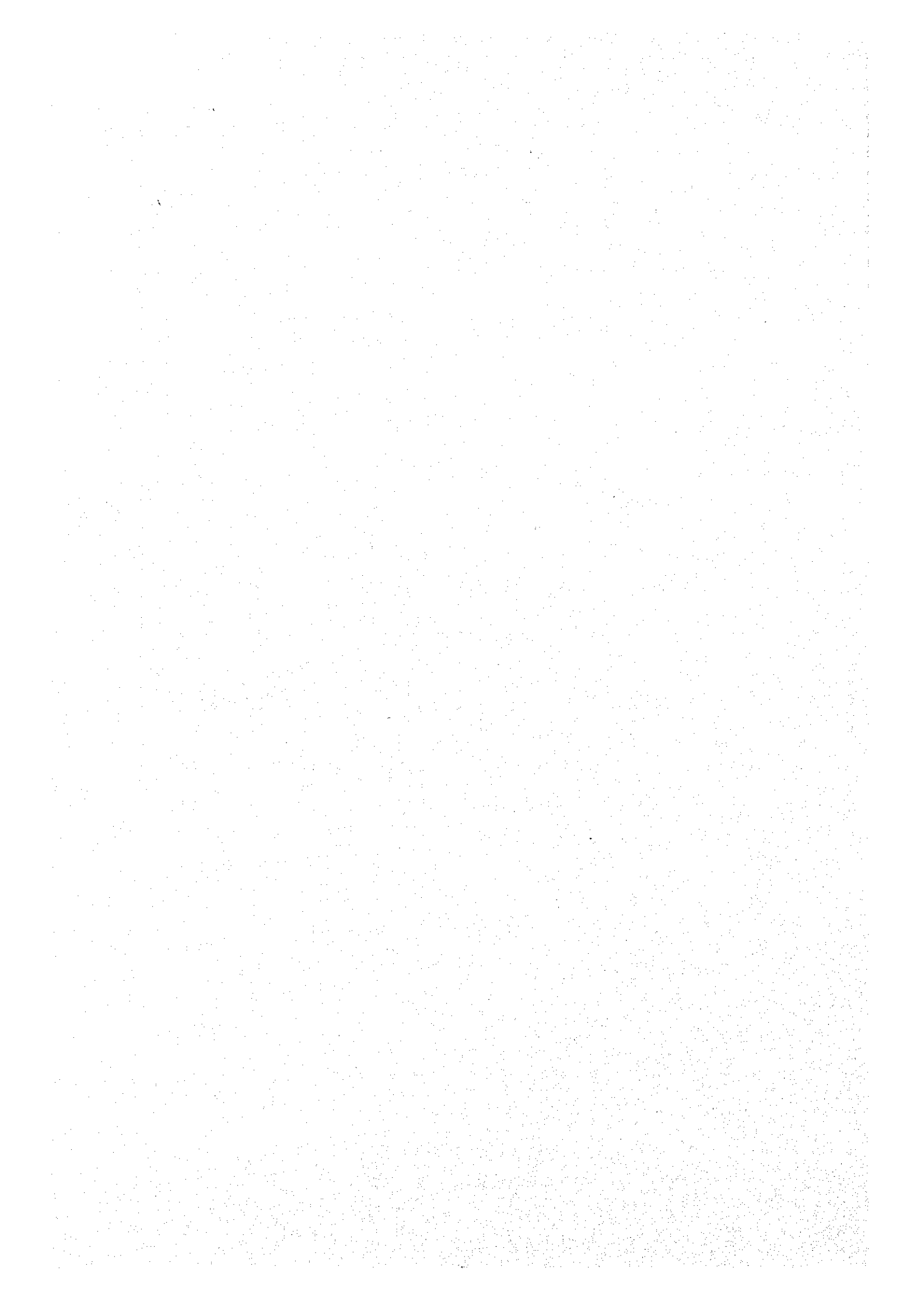


STUDY REPORT
ON
THE PROJECT FOR IMPROVEMENT OF
EQUIPMENT FOR IMMUNIZATION
IN
THE PEOPLE'S REPUBLIC OF CHINA

December 1994

Japan International Cooperation Agency (JICA)





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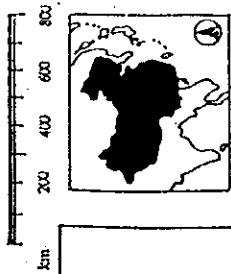


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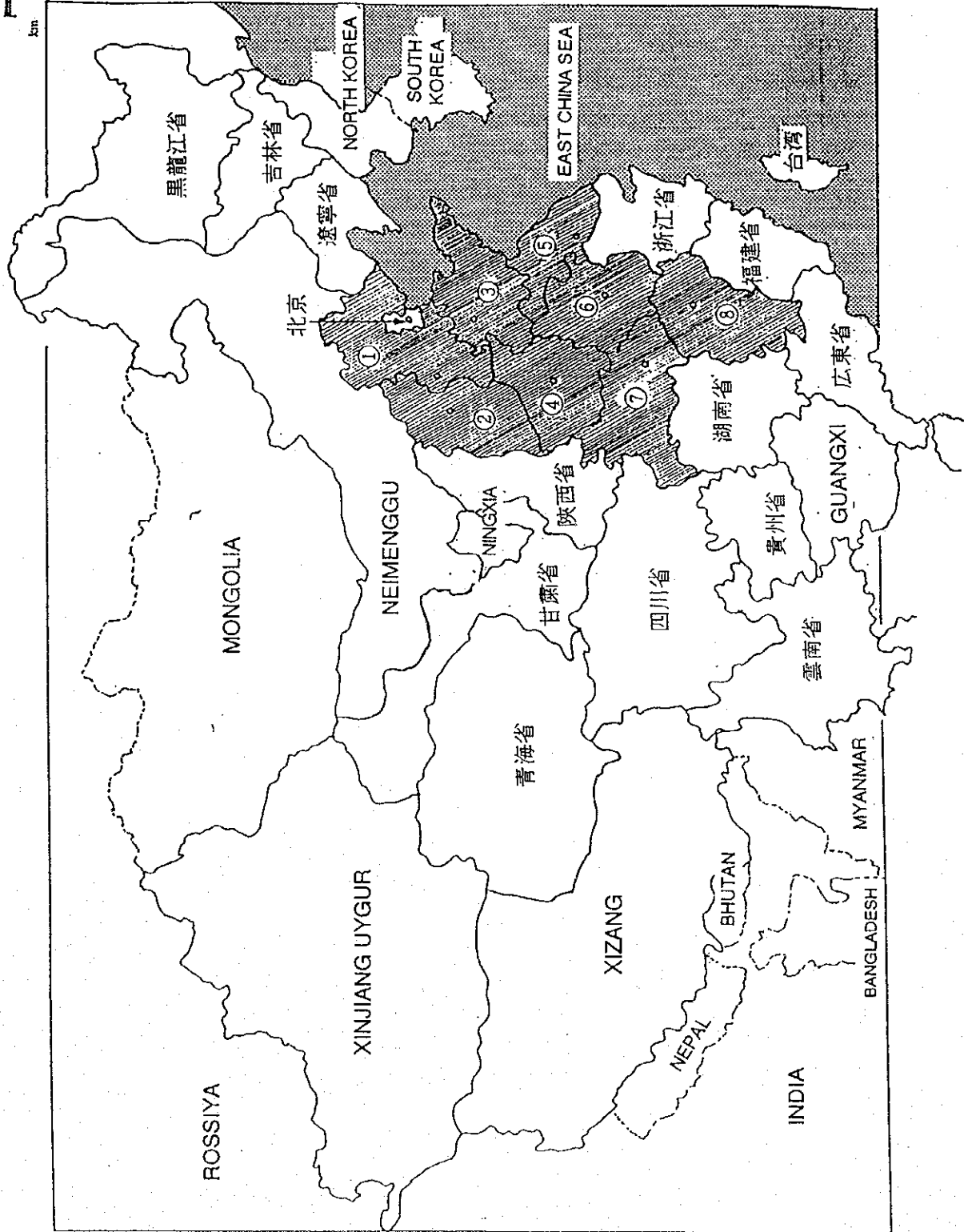
Japan International Cooperation Agency (JICA)

国際協力事業団

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Contents

Location Map

Chapter 1 Background of the Project	1
1. Historical Background of the Request	1
2. Contents of the Request	4
Chapter 2 Contents of the Project	6
1. Objectives of the Project	6
2. Outline of the Project	7
1) Implementing Agencies and Operating Setup	7
2) Maintenance Plan	7
3. Design Concept	9
1) Examination of Basic Criteria	9
2) Examination of Each Item of Equipment	10
4. Basic Design	11
Chapter 3 Project Effect and Recommendation	15
1. Project Effect	15
2. Recommendation	15

Chapter 1 Background of the Project

1. Historical Background of the Request

In China child health and in particular reduction of the infant mortality rate are important issues and, in an effort to counter infectious diseases, which are the leading cause of death among children, activities of the Expanded Programme on Immunization (EPI) have been in effect since the 1950s and vaccinations are being provided to counter polio, BCG, DPT, measles and other infections. Although China is domestically producing all these vaccines, the central government basically does not provide financial aid to local agencies for their immunization activities, so after each province has procured its own supply of vaccines, they are distributed to each agency on the prefectural, county, city and township levels and the various costs involved in the immunization activities are borne by the said agencies. For this reason, there are immunization centers in some districts that due to financial difficulties are unable to prepare sufficient machinery and pay their various expenses, and this situation is hindering the spread of the EPI activities on the national scale. It was in response to this situation that international agencies such as WHO and UNICEF started to provide cooperation from the late 1970s onwards in order to reduce outbreaks of infections through the strengthening of the EPI activities and the raising of immunization rates. WHO has been providing cooperation on the software side since 1978 through the holding of training and education activities, the dispatch of specialists and the development of organizations, and so on. UNICEF started offering help on the hardware side in 1982 by procuring polio vaccines and preparing and improving such items of cold chain equipment and machinery as walk-in freezers and vehicles, etc. and in both 1985 and 1986 it further expanded the range of its cooperation activities. UNICEF has also cooperated with WHO in carrying out such activities as immunization-related lectures, training and organizational development, etc.

These cooperation activities by international agencies have resulted

in a fall in the number of cases of infectious disease outbreaks, and so on, and the outbreak rate of such acute infections as diphtheria, whooping cough and measles, etc. had fallen from 20,000 people per 100,000 or 11,830,000 cases at the time of the founding of the modern China to 235 people per 100,000 or 136,000 cases by 1992. Outbreaks of polio, too, had dropped from 10,408 cases in 1978 to a mere 667 cases in 1988. Furthermore, the "Project to Exterminate Polio from the Face of the Earth by 2000" was announced in the WHO General Assembly Resolution of 1988 and in line with this the Government of China drew up the Project to Exterminate Wild Root Polio by 1995 and has since advanced EPI activities with this goal in mind.

However, despite these efforts a huge polio epidemic suddenly occurred in China in 1989 and by 1990 China accounted for 70% of all the world's cases of polio. As the existing EPI implementation setup has become unable to cope with the rapid increase in the number of polio patients, the Government of China officially requested the Government of Japan to provide assistance in the form of technical cooperation. In response to this, the Government of Japan instructed JICA to dispatch long-term specialists to China in 1990 and the cooperation was commenced in the form of surveillance activities in Shantung Province. Following this in 1991, Project Technical Assistance was commenced centered around Shantung Province with the aim of developing a polio countermeasure model system. As a result of this cooperation, a surveillance system was constructed in Shantung Province making it easy to carry out epidemiology analysis, and this led to a drastic reduction in the rate of outbreak of polio in the said province.

Bearing this successful case in mind, the Government of China has expanded similar systems into other regions and is currently carrying out vaccinations in three forms; that is to say as periodic vaccinations, mass vaccinations and emergency vaccinations. Enough vaccine to cover 368,000,000 people is required to perform these vaccinations, however, China is only able to produce and procure enough vaccine for 275,000,000 people by itself. With regard to the

procurement of the lacking vaccines for the remaining 93,000,000 people, the Government of China requested the Government of Japan to provide grant aid, and in response to this, the Government of Japan is currently implementing a grant aid project (the Polio Extermination Project) for the procurement of 24,000,000 doses of polio vaccine over three years.

At the time of the preliminary survey for the Polio Extermination Project in April 1993, it was found that, with regard to the operation and maintenance setups in the regional immunization centers, and so on, no major problems existed in the methods of polio vaccination implementation and the vaccination rates, however, with regard to the cold chain equipment, it was found that although the provision of equipment to the major provinces through UNICEF aid, which began in 1982, has been completed, there are some prefectures (19 in all) that are still to possess equipment such as freezer and refrigeration equipment, etc. due to the financial difficulties of the provinces, and that there are some items of equipment (in particular the Chinese-made refrigeration equipment, in which deterioration is severe) which require renewal due to the fact that more than 10 years has already passed since installation. For example, in the eight provinces that have been targeted under the Project, a total of 86 refrigerators currently exist in each prefecture, however, of these 25 are in need of repair and a further 16 are inoperable. The same kind of situation exists with regard to cold storage trucks, too. The repair and renewal of such existing equipment is required to ensure the proper storage of vaccines, however, the financial difficulties of each province make it very difficult for them to take the necessary budgetary measures for this purpose.

Although the repair and renewal of the above-mentioned equipment would be difficult for China to achieve independently, both the Japanese and Chinese sides confirmed in the aforementioned survey that the thorough improvement of the said equipment is necessary in order to stamp out polio in China by 1995 as part of the Polio Extermination Project and in order to effectively utilize the

equipment in all areas of the EPI activities.

It was against such a background that the Government of China requested the Government of Japan to provide grant aid for the improvement of equipment for immunization.

2. Contents of the Request

The items of equipment requested by the Government of China can be summarized as follows.

a) Walk-in-type Refrigerators and Freezers

The term walk-in-type here refers to large refrigerators and freezers that possess enough capacity to allow staff to enter them and carry out light work. Such refrigerators and freezers range in size from those that are built as single buildings to those that are built as pre-fabricated structures within existing buildings. These refrigerators and freezers are normally used for the storage of frozen or fresh foods, however, in the Project they will be used for storing vaccines. Some vaccines require storage by refrigeration while others require storage by freezing, however, as one example, although polio vaccine can be stored by refrigeration, the effective period for this is short at just one week, so it is normally stored by freezing (at -25°C it can be stored for up to six months).

b) Cold Storage Trucks

These are special vehicles used for cold transportation purposes and are usually used in the transportation of fresh foodstuffs. Although temperature control in the case of foodstuffs need only be within a certain range, much stricter temperature control is required in the case of vaccines. Such vehicles range in size from four-ton class trucks to pickup trucks and they will be used according to the objective.

c) General Vehicles (Wagon Cars)

These will be wagon cars for six passengers and shall carry large

cooler boxes in their rears and will be used for both carrying vaccines and also in surveillance work.

Table 1-1 Requested Equipment List

	Requested Equipment Name	Quantity
1.	Walk-in refrigerators (15 m ³)	20 units
2.	Walk-in freezers (9, 15 m ³)	4 units
3.	Cold storage trucks (0.75 t)	22 units
4.	General vehicles (light vans)	18 units

Chapter 2 Contents of the Project

1. Objectives of the Project

In selecting the target areas, they were limited to those prefectures which are in extreme financial difficulty and which are yet to possess refrigerator and freezer equipment, or prefecture level districts that are in urgent need of equipment improvement. Installation of equipment on the level of the provinces, which are the superior bodies, is relatively advanced while there is a certain degree of equipment diffusion among the lower level counties. In addition to these considerations, it was considered that the numbers of target areas and items of equipment in the case of targeting the lowest level townships and villages would simply be too great. The Japan side proposal for the Improvement Project was thus limited to the targeting of prefectures in urgent need of equipment improvement, and this happened to match with the request of the China side.

The Project aims to provide and improve cold chain equipment that is required for the continued advancement of EPI activities including the activities of the Polio Extermination Project.

The Project target equipment shall be as follows:

- a) Refrigerator equipment (walk-in type). This shall be the same as the equipment which was originally installed by the China side at its own cost and in which deterioration has reached extreme levels and the renewal of which is required,
- b) Walk-in-type freezers for the purpose of long-term storage of vaccines in those districts that are yet to possess such equipment,
- c) Cold storage trucks for the transportation of vaccines to be provided in order to make up shortages and to renew badly deteriorated existing vehicles, and
- d) General vehicles (wagon cars) for the purposes of vaccine transportation and surveillance.

2. Outline of the Project

1) Implementing Agencies and Operating Setup

The system of administrative division in China has the central government at the top, below which are directly supervised cities, provinces and autonomous provinces (provincial level); and below them are the prefectural level, the county level, the township level and the village level.

The implementing agency for the Project will be the China Hygiene Department (Immunization Division) and the receiving agencies will be the Immunization Departments (Bureaus) on the prefectural level in each of the provinces indicated in 2.1. The China Hygiene Department is divided into 13 divisions including the Health Division and Liaison Division, and the Hygiene and Immunization Division is responsible for providing guidance and formulating policy, and so on, for matters relating to immunization. The hygiene departments in each province are divided into the same divisions as the central department and the hygiene and immunization office of each is responsible for conducting vaccinations and all other immunization activities. The prefectures, which are the next administrative level below the provinces, possess agencies that control districts containing a certain number of cities or counties, however, as many of the prefectures are facing tougher financial situations than the counties, etc., they are yet to be able to install cold chain equipment or renew existing deteriorated equipment and so on, and it is these prefectures that are the weak link in the whole EPI setup.

2) Maintenance Plan

The China side shall take responsibility for management of the cold chain equipment from its installation through to its maintenance, as indeed it did in the case of the equipment that was provided through the cooperation of UNICEF and WHO from 1982

onwards. The engineers belonging to the maintenance sections of each immunization center on the provincial, prefectural and county levels, etc. have since 1982 been receiving training on a national level and have also been receiving training in such areas as maintenance and repair on the regional level, and they have been carrying out installation and maintenance activities. For this reason, it is not considered necessary to dispatch specialists from Japan for the same training purposes. A study of maintenance setups was made at the time of the preliminary survey in 1993, and this confirmed that the acceptance setups were adequate. According to the WHO technical officers and the members of the Peking Hygiene Department, there are no major problems concerning the maintenance of refrigeration equipment due to the fact that no great differences exist in the equipment made by different makers. With respect to the cold storage vehicles too, almost all of the existing vehicles are made in Japan and the responsible agencies have previous experience of carrying out repairs, etc., so again it was confirmed that no major problems exist.

Concerning the issue of spare parts for the refrigerator and freezer units, it was originally proposed to provide a two year supply worth 10% of the unit prices, however, instead of preparing spare parts for which there are hardly any opportunities to use, it is considered more effective to prepare an additional one or two units to act as spare parts.

With regard to the method of spare parts management on the China side, the target localities store and manage those parts for which replacement frequency, etc. is high, whereas in the case of spare parts which are not replaced frequently, the China Hygiene Department manages them in a system whereby the parts are supplied from the central level down to the localities according to necessity. As for maintenance costs, there are no particular problems regarding power costs, gasoline costs and maintenance personnel expenses, and so on.

3. Design Concept

1) Examination of Basic Criteria

The walk-in-type refrigerators and freezers will basically be installed indoors and in those cases where there are existing buildings, it will be necessary for the buildings to have enough power capability (the existing facilities can be used in the case of renewal) and to have enough room space to accommodate the equipment. Moreover, as it will be necessary to discharge heat from the refrigerators and freezers outside of the buildings, the buildings will either have to already possess ventilation fans or other air discharge equipment, or will have to possess rooms that can be easily ventilated. Regarding floors, they will need to be flat and made of concrete. In those districts where there is a risk of long-term power cuts occurring, the installation of private generators would be desirable.

The cooling units for the walk-in refrigerators and freezers will be limited to the plug-in type. Plug-in type units are those where the cooling and heat dissipation units are integrated and they thus make the installation work easy in that there is no need to carry out complicated pipe laying works and so on. The walls of the refrigerators and freezers will be made of prefabricated panels (with a minimum panel thickness of 100 mm) between which will be sandwiched insulating material such as polyurethane, and they shall be capable of easy setting up through assembling. The refrigerators and freezers shall be of two types; 9 m³ and 15 m³. According to the WHO standards, it is necessary to install one 15 m³ cold storage facility in districts by population units of 400,000 people, and the same standard shall be applied to the equipment to be provided by Japan.

The cold storage pickup trucks shall be fitted with 4 m³ cold boxes and cooling units and their provision will be conditional upon the receiving side possessing garages.

With regard to the installation of the equipment, no special technology is required and the receiving side already has

experience, so each of the prefectural level immunity centers, which are the recipient agencies on the China side, shall be responsible for the related work. For this reason, there will basically be no dispatch of staff from Japan to aid the installation work, however, in the event where the China side does request technical training, etc., short-term training at the time of delivery shall be included within the scope of work of the supplier.

2) Examination of Each Item of Equipment

a) Prefabricated Panels

As the prefabricated panels can be procured locally in China and, moreover, because these panels possess adequate functioning ability for use, they shall be procured in China. However, the only company that satisfies the WHO standards is the China Shotoku Shoki Corporation (which has been confirmed in joint consultations held between UNICEF and WHO). Both UNICEF and WHO already adopt this method of procurement.

b) Freezing and Cooling Units

Although such units can be procured locally in China, the locally made items are not as good as foreign items when it comes to performance and they also have problems in terms of service life, so the units to be used in the Project shall be foreign-made items including units from Japan.

c) Cold Storage Trucks

As Chinese-made cold storage cars also have problems, these shall be foreign-made (including Japanese-made) items, however, it is considered that procuring from Japan is the best alternative in that it is situated closest to China.

d) General Vehicles

The vehicles to be procured will be two-wheel-drive wagon cars

for six passengers, and it is again considered that procurement from Japan is the best alternative for the same reason as stated above.

4. Basic Design

(1) Walk-in-type Refrigerator

Refrigerator capacity: 15 m³

Purpose of use: storage of vaccines (BCG, DPT, TT, HB)

Temperature: inside set temperature will be + 6 °C ± 2 °C and outside maximum temperature will be + 43 °C.

Panel material: 50 mm or thicker panels sandwiching polyurethane or other insulating material.

Minimum density will be 40 kg/m³. Panel surfaces will either be epoxy or PVC coating with edges plated with steel sheet. Doors will be single hinge-type with locking unit attached, and they shall be openable from the inside.

Cooling unit: plug-in-type with a cooling capacity of 15 m³ (per unit). Compressor will be sealed airtight and an LP/HP switch fitted with temperature protection system will be used for control. The condenser fan will be the pressure switch control-type and be fitted with automatic demisting timer. Electricity will be three-phase, 220/380 V 50 Hz.

Accessories: The inside temperature monitor will be fitted outside and be capable of recording seven day's temperature. Inside will be lighted (with switching room fitted outside), and there will be shelves of approximately 600 mm in width.

Spare parts: a two year supply of spare parts will be provided and a contract enabling agent service for two years will be concluded.

(2) Walk-in-type Freezer

Freezer capacity: 9 m³

Purpose of use: storage of vaccines (OPV)

Temperature: inside set temperature will be $-6\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and outside maximum temperature will be $+43\text{ }^{\circ}\text{C}$.

Panel material: 100 mm or thicker panels sandwiching polyurethane or other insulating material.

Minimum density will be 40 kg/m³. Panel surfaces will either be epoxy or PVC coating with edges plated with steel sheet. Doors will be single hinge-type with locking unit attached, and they shall be openable from the inside (doors will also be fitted with anti-freeze heaters).

Cooling unit: plug-in-type with a cooling capacity of 9 m³ (per unit). Compressor will be sealed airtight and an LP/HP switch fitted with temperature protection system will be used for control. The condenser fan will be the pressure switch control-type and be fitted with automatic demisting timer.

Accessories: The inside temperature monitor will be fitted outside and be capable of recording seven day's temperature. Inside will be lighted (with switching room fitted outside), and there will be shelves of approximately 600 mm in width.

Spare parts: a two year supply of spare parts will be provided and a contract enabling agent service for two years will be concluded.

(3) Walk-in-type Freezer

Freezer capacity: 15 m³

Purpose of use: storage of vaccines (OPV)

Temperature: inside set temperature will be $-6\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and outside maximum temperature will be $+43\text{ }^{\circ}\text{C}$.

Panel material: 100 mm or thicker panels sandwiching polyurethane or other insulating material.

Minimum density will be 40 kg/m³. Panel surfaces will either be epoxy or PVC coating with edges plated with steel sheet. Doors will be single hinge-type with locking unit attached, and they shall be openable from the inside.

Cooling unit: plug-in-type with a cooling capacity of 15 m³ (per unit). Compressor will be sealed airtight and an LP/HP switch fitted with temperature protection system will be used for control. The condenser fan will be the pressure switch control-type and be fitted with automatic demisting timer.

Accessories: The inside temperature monitor will be fitted outside and be capable of recording seven day's temperature. Inside will be lighted (with switching room fitted outside), and there will be shelves of approximately 600 mm in width.

Spare parts: a two year supply of spare parts will be provided and a contract enabling agent service for two years will be concluded.

(4) Cold Storage Truck

Base vehicle: pick-up truck, single cabin, left-side handle, 0.75 tons

Refrigerator: Inside capacity 4 m³ (L 1750 x W 1550 x H 1200), with fitted rear temperature detector door plus container plus inside lighting (one door unit switch-type light)

Material: cold insulation heat insulation 50 m/min.

Aluminum flat van, floor pan with stainless steel finish

Cooling unit: set temperature will be + 6 °C ± 2 °C

Spare parts: a two year supply of spare parts will be provided and a contract enabling agent service for two years will be concluded.

(5) General Vehicle (Wagon Car)

Car model: standard-type wagon car

Displacement: 2000 cc or more

Fuel: gasoline engine

Handle: left-side handle

M.T.A.T. separate: manual, 4-5 stage

Drive system: two-wheel-drive

Seats: six seats

Color: no designated color

Accessories: radio, seat belts, spare tire

Spare parts: 10% spare parts will be provided and a contract
enabling agent service will be concluded.

Chapter 3 Project Effect and Recommendation

1. Project Effect

Implementation of the Project will advance the improvement of equipment in those districts that are yet to receive equipment or that require existing equipment renewal, and as the maintenance of polio and other vaccines will become easy as a result of this, the loss of or damage to vaccines through poor temperature control and accidents such as theft will disappear.

This will further lead to the raised effectiveness of vaccinations, thus enabling the full prevention of all infections to become possible, and this will eventually result in an increase in the size of the benefited population.

The Government of Japan's succession of cooperation projects will lead to a bolstering of the implementation setup for the EPI activities in China and eventually contribute to a reduction in the number of instances of polio and other infections. It is expected that the implementation of the Project will raise the status of Japan's aid in both China and throughout the rest of the world.

2. Recommendation

The EPI activities in China are being assisted by such international bodies as UNICEF and WHO, and as well as this the provision of cold chain equipment through loans from the World Bank is also scheduled in the near future. In order to raise the effectiveness of these multi-buy projects, including those of Japan, in the EPI activities and also to coordinate activities with other international agencies, it is necessary to carry out the mutual exchange of information.

As for the receiving agencies, they should perform regular inspections of the Project equipment and maintain repair ledgers, and they also need to lay aside reserve funds in consideration of the future maintenance and renewal of the equipment (i.e. introduce the concept of depreciation into their thinking).

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