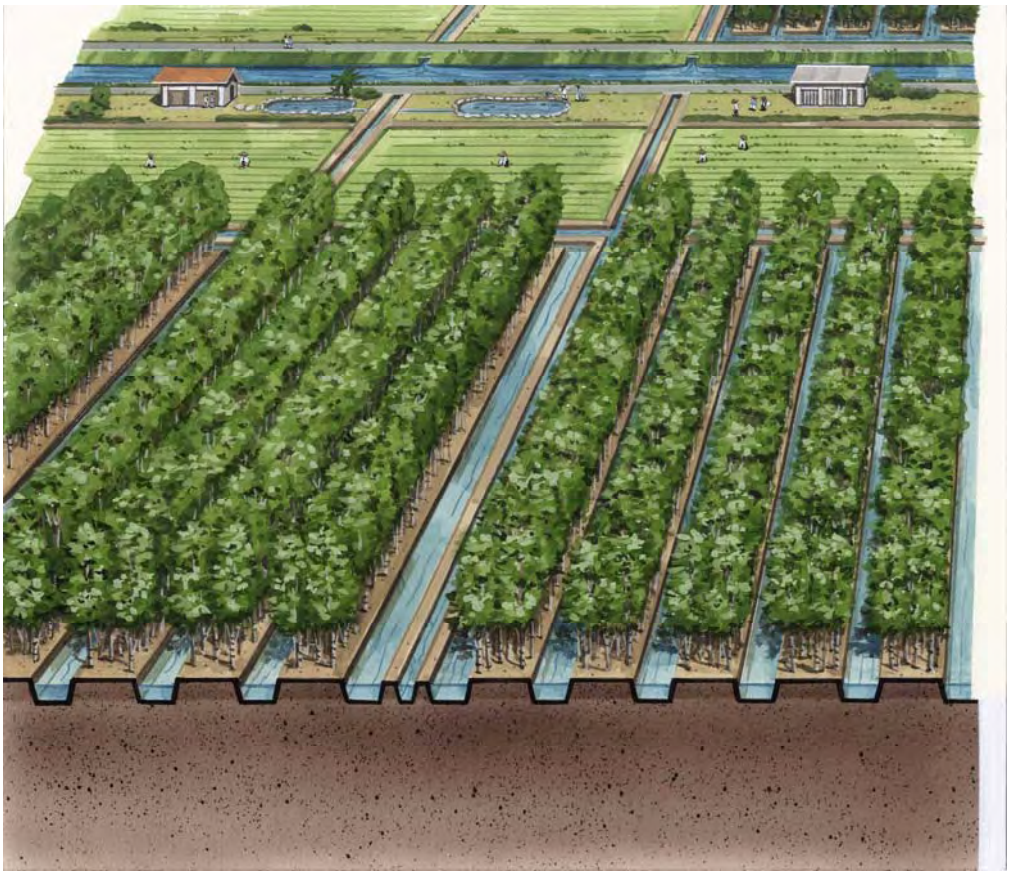
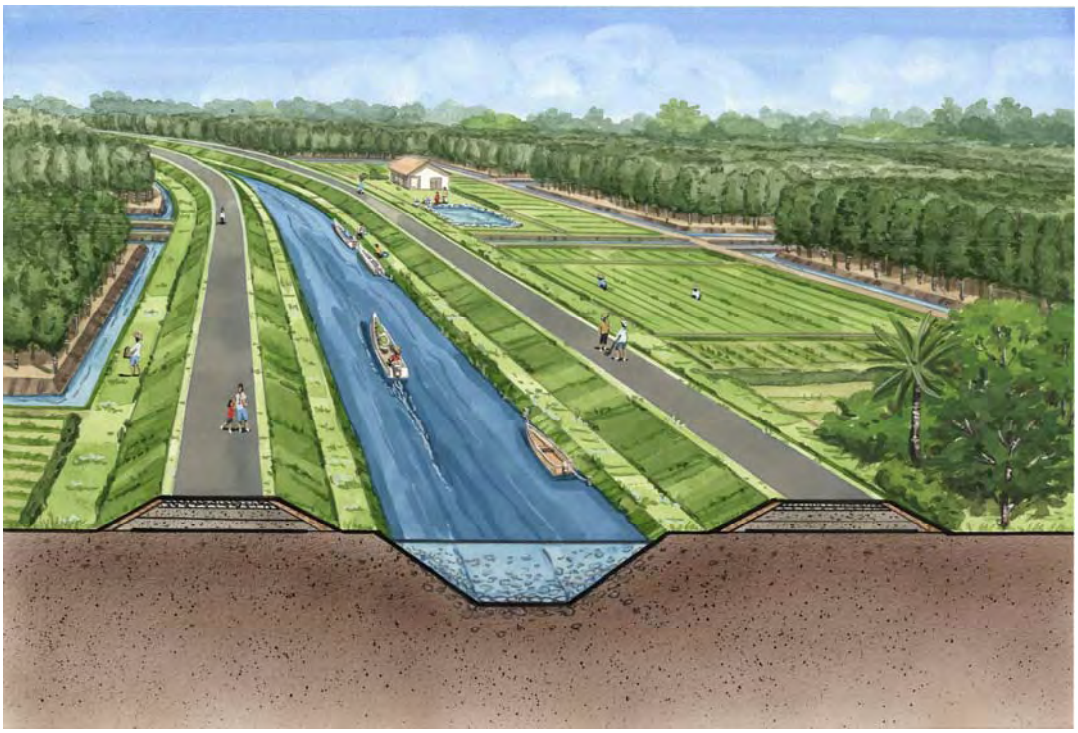


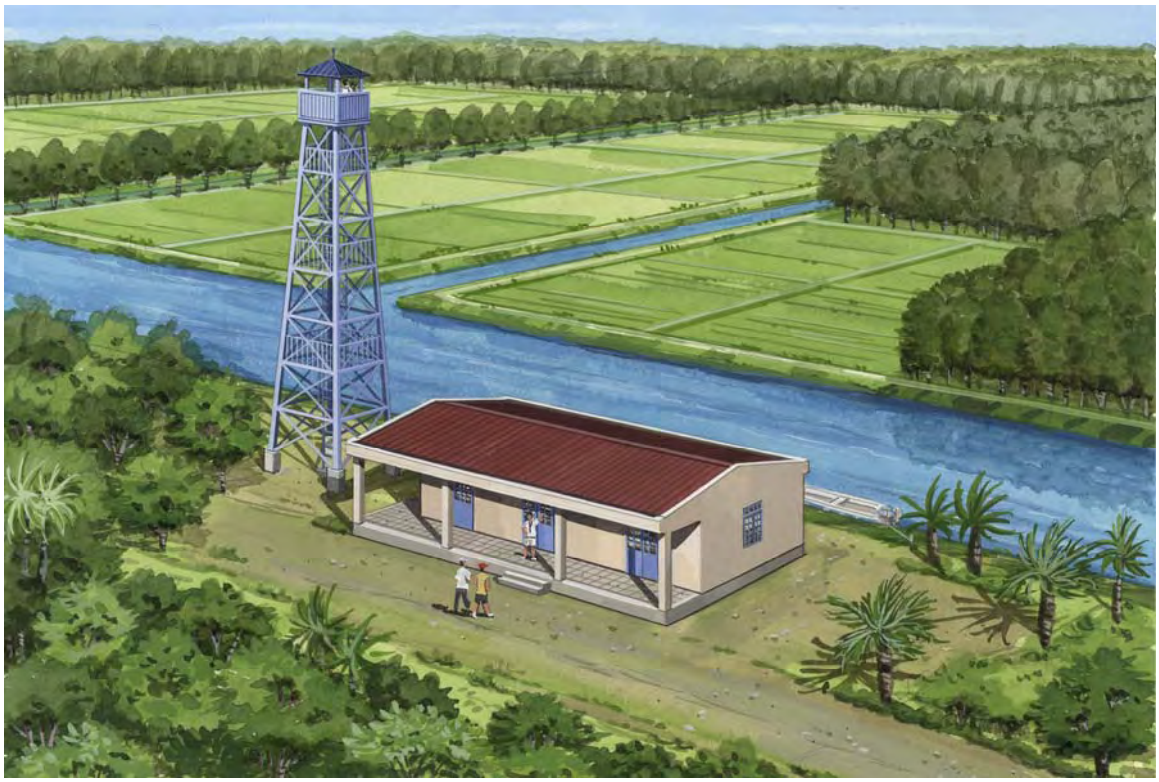
Forest Land Improvement (Embankment)



Construction of Canal

Perspective－1

Commune Road / Bridge



Forest Fire Monitoring Station / Tower

Perspective－2

Primary School

Commune Health Center

Perspective－3

LIST OF TABLES AND FIGURES

[Figures]

ABBREVIATIONS

A/A	Agent Agreement
AASHTO	American Association of State Highway and Transportation Officials
ADB	Asian Development Bank
CBR	California Bearing Ratio
CHC	Commune Health Center
CSR	Corporate Social Responsibility
DANIDA	Danish International Development Agency
DARD	Department of Agriculture and Rural Development
DOET	Department of Education and Training
DOH	Department of Health
DOT	Department of Transport
EIA	Environmental Impact Assessment
E/N	Exchange of Notes
FC	Forestry Company
GDP	Gross Domestic Product
GNI	Gross National Income
GRDP	Gross Regional Domestic Product
HCMC	Ho Chi Minh City
IEE	Initial Environmental Examination
JICA	Japan International Cooperation Agency
JICS	Japan International Cooperation System
JOCV	Japan Overseas Cooperation Volunteers
MARD	Ministry of Agriculture and Rural Development
M/D	Minutes of Discussions
NGO	Non Governmental Organization
ODA	Official Development Assistance
PMU	Project Management Unit
PPC	Provincial People's Committee
SRI	Social Responsibility Investment
VAT	Value Added Tax
VND	Vietnam Dong
WB	World Bank
WU	Women's Union

CHAPTER 1

BACKGROUND OF THE PROJECT

CHAPTER 1
BACKGROUND OF THE PROJECT

1.1 Background and History of the Project

The Socialist Republic of Vietnam (hereinafter referred to as "Vietnam") achieved an average annual economic growth rate of 7.6% in the 15 year period from 1991 to 2005, reducing the poverty ratio from 58.1% in 1993 to 19.5% in 2004. However, socioeconomic distortions, such as widening of the economic gap between urban areas and rural areas and between different regions, and environmental destruction, etc. have emerged as negative aspects of growth. Under these circumstances, the Government of Vietnam had adopted socioeconomic development, social development and environmental conservation as three principal themes for development in its 8th Five Year Socioeconomic Development Plan (2006 – 2010) with particular emphasis on support for the vulnerable and the weak and environmental conservation. According to this plan, the poverty ratio should further fall to 10 – 11% by 2010. In the forestry sector, the plan envisages an increase of the forest coverage ratio from 28% in 1995 dropped as a result of large-scale forest degradation to 42 – 43% by 2010.

In Ca Mau Province (with a population of 1.22 million in 2005) located in the southernmost part of the Mekong River Delta Region which has the largest population of the poor among Vietnam's eight regions, the large-scale destruction of forests is taking place due to the spraying of a defoliation agent during the war, development of farmland, use of firewood and creation of culture ponds. As a result, the forest coverage ratio is as low as 18.2% (2005) which is substantially lower than the national average. A large forest which extends through the U Minh Ha area (consisting of the entire U Minh Ha District and part of the Tran Van Thoi District) and which accounts for 37% of the forest area of Ca Mau Province, is the only large-scale inland forest in the province, making forestry the most important type of livelihood in the said area which is characterised by (i) unfavourable natural conditions for farming because of the predominance of acid sulphate soil and (ii) restrictions on land use (50 to 70% of available land must be afforested) for the purpose of forest conservation.

The poverty ratio in the U Minh Ha area (2005) is very high at 29.5% for the U Minh Ha District and 23.8% for the Tran Van Thoi District because of the destruction of forests mentioned above and insufficient infrastructure, such as roads and medical facilities, to support the lives and livelihoods of local residents. These figures are much higher than the corresponding figures for Ca Mau Province (19.2% in 2005) and Vietnam (19.5% in 2004), making the U Minh Ha area the poorest area in Ca Mau Province.

In addition to such social and natural conditions, a large-scale forest fire in March, 2002 destroyed 6,000 ha of forest area along with other types of damage, including the drying of peat soil and damage to farmland. This severe blow to the local economy caused hardship for local residents. To improve the situation, the Government of Vietnam commenced a programme in July, 2002 to rehabilitate former forest fire sites in the area. The objectives of this programme included the reforestation of more than 6,000 ha, improvement of nearby forest areas and improvement of the livelihoods for local residents. However, the smooth progress of this rehabilitation programme was hampered by the high level of the required reforestation techniques, the poverty of the target communities and other reasons.

Under such circumstances, the Government of Vietnam made a request to the Government of Japan in August, 2003 to implement a technical cooperation project aimed at providing technical cooperation for the former forest fire site rehabilitation programme in the U Minh Ha area. In response to this request, the Japan International Cooperation Agency (JICA) conducted the "Forest Fire Rehabilitation Project" as a technical cooperation project (hereinafter referred to as the "Former Technical Cooperation Project") for a period of three years from February, 2004. This Technical Cooperation Project incorporated wide-ranging activities, including the preparation of guidelines for reforestation techniques, dissemination activities based on the said guidelines, technological improvement for the processing and use of Melaleuca wood, strengthening of the fire prevention system, activities to assist agroforestry (including aquaculture) and various training schemes relating to the above activities. The reforestation techniques in particular had very good reputation among local farmers and the further dissemination of these techniques from the viewpoint of environmental conservation and increased income for local residents was expected to take place.

Following the end of this project, the People's Committee of Ca Mau Province reaffirmed the importance of the further dissemination of the reforestation techniques established under the former Technical Cooperation Project for the successful outcome of the former forest fire site rehabilitation programme. At the same time, the said committee recognized the necessity for comprehensive improvement of the standard of living in those communities damaged by forest fire from the viewpoint of meeting the targets of the Five Year Socioeconomic Development Plan for Ca Mau Province (2006 – 2010) in addition to the dissemination of reforestation techniques. Recognizing such local needs, the Government of Vietnam made a request to the Government of Japan for the implementation of "the project for Empowerment to the Community Damaged by Forest Fire in Ca Mau Province" under Japan's community empowerment grant aid scheme to assist the comprehensive development of communities in the U Minh Ha area.

1.2 Environmental Considerations

Based on the findings of the Field Survey II, scoping and an IEE (initial environmental examination) were conducted in accordance with the JICA's Guidelines for Environmental and Social Considerations. The scoping and IEE results are shown in Table 1-2-1 and Table 1-2-2.

Table 1-2-1 Scoping Results

Assessment Items		Assessment Results		Basis for Assessment
		During the Work	After Completion	
[Social Environment]				
1	Involuntary Resettlement	B	B	A small number of temporary houses and shops are situated on the planned routes for community roads and bridges.
2	Division of the Community	D	D	No special impacts
3	Indigenous People, Ethnic Minorities or Nomadic People	D	D	No special impacts
4	Local Conflict of Interests	D	D	No special impacts
5	Change of the Basis of Economic Activities	D	D	Positive impacts on economic activities
6	Changes of Local Facilities	D	D	Positive impacts due to construction/rehabilitation of medical facilities and school buildings
7	Impact on Transport	D	D	Positive impact of the construction of new roads and canals on local transport; temporary and minor impacts of the transportation of equipment and materials during the construction period on local traffic
8	Adjustment of Water Rights and Fishing Rights, etc.	D	D	No special impacts
9	Impact on Historical Remains and Cultural Heritage	D	D	No special impacts
10	Changes of the Landscape	D	D	No special impacts
[Natural Environment]				
11	Precious Nature	D	D	No special impacts
12	Rare Species and Indigenous Fauna and Flora	D	D	No special impacts
13	Vegetation	D	D	No special impacts
14	Changes of the Topography/Shoreline	D	D	No special impacts
15	Changes of the Groundwater Table	D	D	Although boreholes are to be constructed at schools and forest fire monitoring stations, no special impacts on the groundwater table are anticipated in view of the small consumption quantity.
16	Changes of the Flow Regime and Water Level of Water Bodies	D	D	No special impacts
17	Changes of the Water Temperature of Water Bodies	D	D	No special impacts
18	Air Pollution	D	D	No special impacts

Assessment Items		Assessment Results		Basis for Assessment
		During the Work	After Completion	
19	Water Pollution	B	B	Exposure of the pyrite layer due to forest land improvement work (embankment) and excavation for the construction of canals will cause acidification of the soil and water in the surrounding area.
20	Soil Contamination	B	B	
21	Noise and Vibration	D	D	No special impacts
22	Subsidence	D	D	No special impacts
23	Bad Odour	D	D	No special impacts

Note: The shaded items in grey are subject to an IEE.

Assessment Criteria
A: Likely to have significant adverse impacts.
B: The potential impacts are less severe than those of Category A.
C: Unknown (study or examination is required as the degree of impacts cannot be judged).
D: Unnecessary for an IEE or EIA because of little impact.

Table 1-2-2 IEE Results

Assessment Items	Assessment Results	Reasons
1. Involuntary Resettlement	B	The temporary houses and shops which currently exist on the planned routes for community roads and bridges were built on public land without permission. In regard to the necessary resettlement of local residents because of the construction of public facilities, the People's Committee of the affected communes are required to offer compensation and/or alternative land. As no serious problems have occurred in the past and also as no opinion opposing the project has been aired by people living in these houses, it is reasonably assessed that resettlement will be smoothly conducted.
19. Water Pollution 20. Soil Contamination	B	It is possible to prevent acidification of the soil by excavated pyrite by means of covering the banking surface with top soil.

Note
A : Hardly any adverse impacts.
B : Some adverse impacts but the situation is satisfactory in general.
C : The situation is satisfactory in general once some of the adverse impacts have been eliminated.
D : The situation is only partially satisfactory.
E : The examination is insufficient.
F : Revision of the plan is necessary in view of the expected serious adverse impacts.

(1) Resettlement of Local Residents

The requested routes of roads and bridges are located along canals. In most cases, no problems are anticipated in regarding to securing the necessary land as a 30 m wide section, including the canal, is public land. However, houses can be found along the existing roads or at canal intersections. At the latter points in particular, shops serving canal users can be found. As the

construction of bridges is planned at those points where a road crosses a canal, the relocation of the existing houses, etc. will be necessary to allow the construction of a road.

R-5 (B-15): House at a junction

R-8 (B-23): Retail shop at a canal intersection

As the request for the construction of roads and bridges has been made with a consensus of the people of the commune, problems of relocation and resettlement can essentially be solved within the commune.

Many of the subject houses for relocation are situated on the roadway and are shabby wooden huts. The house owners are aware of the illegality of their houses and the commune authorities have accepted their temporary status. Once relocation becomes a firm prospect, the commune authorities will commence the resettlement process, including the provision of alternative land and building materials for the house owners.

In Ca Mau Province, the relocation of houses for road construction generally requires 1 – 2 months to complete, including negotiations. The flow of the resettlement process is given below.

Approval of Resettlement by the Provincial People's Committee → Approval of Resettlement by the District People's Committee → Approval by the Commune People's Committee → Talks Between the Commune Authorities and Affected Residents (on Alternative Land, Building Materials and Building Cost) → Acceptance of Resettlement by the Affected Residents

Table 1-2-3 Assessment of the Social Impacts of the Planned Road Routes

Route	Length (km)	Situation	Impact on Social Environment
1	1.0	There are private houses along the route and it may be necessary to purchase part of the frontal plot in some cases.	-1
2	5	There are private houses along the route and it may be necessary to purchase part of the frontal plot in some cases.	-1
3	4	Hardly any problems	0
4	8.2	The relocation of a retail shop at the planned bridge construction point will be necessary.	-2
5	6.5	The relocation of some sheds and houses situated at the planned bridge construction point may be necessary.	-2
6a	2.3	There are private houses along the route and it may be necessary to purchase part of the frontal plot in some cases.	-1
6b	1.7	The relocation of a house at the planned bridge construction point will be necessary.	-2
7	6.2	No problems	0
8	5	The impacts on existing housing should be considered when selecting the location of a new bridge.	0
9	3	A house has been built by the canal to have access to the existing road. The relocation of this house and other buildings will be necessary to allow the construction of a new road.	-3
10	2	No problems	0
11	2	No problems	0
12	1.5	No problems	0
13	2	No problem	0
14a	4.5	There are houses at the approach section to the existing road, forming a shopping avenue. The relocation of these will be necessary to allow the construction of a new road.	-4
14b	7.5	There are houses along the existing road. The relocation of some 5 – 10 houses will be necessary to allow the widening of the road.	-3
B-1	0.2	No problems	0
B-4	0.2	No problems	0
B-5	0.2	No problems	0
B-14	0.2	No problems	0
B-18	0.2	No problems	0
B-19	0.2	The relocation of a house will be required.	-1
B-20	0.2	No problems	0
B-22	0.2	No problems	0
B-24	0.2	The relocation of a house will be required.	-1
B-27	0.2	No problems	0
B-28	0.2	No problems	0
B-29	0.2	No problems	0
B-31	0.2	The relocation of a house will be required.	-1
B-32	0.2	No problems	0
B-33	0.2	No problems	0
B-34	0.2	No problems	0
B-35	0.2	The relocation of a house will be required.	-1
B-36	0.2	No problems	0

Note: The larger the negative impact value is, the larger the negative impact on the social environment.

R-14b: Subject site for widening of the existing road

B-19: Planned bridge construction point and target house for relocation

Roadside sign informing of building restrictions

(2) Water Pollution and Soil Contamination

The soil in the project area is acid sulphate soil containing pyrite which is acidified through contact with air and the results of the soil survey conducted under the Field Survey II indicate that this acid sulphate soil is found at a certain depth as shown in Table 1-2-4. As the excavation depth is 1.2 m for embankments and 2 m for new water channels (canals), excavated soil left on the ground leads to the leaching of sulphuric acid, acidifying the soil and water in the surrounding area. To prevent this acidification of the soil and water, the project will adopt the method of covering the banked excavated soil containing pyrite with top soil. Accordingly, the impacts of the project in terms of water pollution and soil contamination should remain minimal.

Table 1-2-4 Results of the Soil Survey for the Requested Embankment Sites

Sampling Location	Depth of Appearance of Acid Sulphate Soil	Depth of Appearance of Strong Acid Sulphate Soil
Song Trem Forest Company	50 cm <	50 – 90 cm <
April 30 Forest Company	30 – 50 cm <	70 – 120 cm <
U Minh II Forest Company	30 cm <	70 – 120 cm <
U Minh I Forest Company	30 – 70 cm <	70 – 90 cm <
Tran Van Thoi Forest Company	10 – 70 cm <	50 – 70 cm <

CHAPTER 2

CONTENTS OF THE PROJECT

CHAPTER 2
CONTENTS OF THE PROJECT

2.1 Basic Concept of the Project

2.1.1 Overall Goal and Project Goals

The 8th Five Year Socioeconomic Development Plan (2006 – 2010) of Vietnam adopts economic growth, livelihood improvement and infrastructure development as its main themes and aims at reducing the poverty ratio to 10 – 11% (new poverty line criterion) by 2010. Ca Mau Province belonging to the Mekong River Delta Region is a poor area after the Northern Mountainous Region and the Central Highland Region. Meanwhile, the Poverty Reduction Programme for Ca Mau Province which is based on the 8th Five Year Socioeconomic Development Plan (2006 – 2010) aims at reducing the ratio of households suffering from hunger and poverty from the current 19.2% to less than 10% by 2010. In the U Minh Ha, the ratio of poor households is 29.5% for the U Minh District and 23.8% for the Tran Van Thoi District (statistical data for 2005) which is much higher than the provincial average figure of 19.2%. As such, this area is a priority area for poverty reduction.The overall goal of the Project is the achievement of poverty reduction as described above and the project goals are the establishment of a means of increasing income and improvement of the basic social infrastructure, both of which are essential to achieve the overall goal.

2.1.2 Outline of the Project

To achieve the goals described in 2.1.1, the Project involves the construction of facilities and the provision of equipment for the purpose of improving the productivity of forestry and agriculture, i.e. the two principal industries in the targeted U Minh Ha area of Ca Mau Province, and the construction or expansion of such basic social infrastructure as roads, bridges, schools and medical facilities as well as the provision of the necessary equipment and materials.

2.2 Outline Design of the Requested Japanese Assistance

2.2.1 Design Policy

2.2.1.1 Basic Concept

The Project intends to increase the income of local residents engaged in forestry and agriculture in the U Minh Ha area which is the poorest area in Ca Mau Province and to contribute to the improvement of infrastructure to achieve the basic standard of living among local residents. Given the fact that the

Project will be implemented under Japan's grant aid scheme for community development, the design and supervision standards, equipment specifications and work standards, etc. will be based on local specifications/standards as much as possible. In principle, the detailed design and work supervision will be subcontracted to a local consultant while the construction work will be subcontracted to a local construction company. The subcontracts will be made by a procurement agent nominated by the Government of Japan. The equipment will be procured from local trading firms, agents and/or manufacturers to reduce the overall project cost. However, such arrangements will not prevent the participation of companies other than Japanese or Vietnamese companies in the tender. When the local design standards or equipment specifications are judged to be clearly problematic in terms of safety or functionality under normal use/operation, the parts of the buildings and members, etc. related to such inferior standards or specifications will be reinforced.

2.2.1.2 Design Concept Regarding the Natural Conditions

(1) Temperature and Humidity

The mean maximum monthly temperature and the mean minimum monthly temperature in the project area for the period from 2001 to 2005 was 29.7°C and 25.8°C, respectively while the annual average of the mean monthly temperature was 27.6°C - 27.8°C, showing a continuously high temperature of slightly less than 30°C throughout the year. The mean annual humidity (annual average of the mean monthly humidity) of 79.9% - 81.5% was also very high.

Accordingly, the buildings to be constructed under the Project will have such architectural features as air vents under the roof to deal with the high temperature and humidity to achieve good heat insulation and ventilation. As the equipment and machinery to be procured under the Project will principally be housed indoors, special measures to deal with the outside air temperature and humidity in the project area will be unnecessary. However, in the case of distribution panels and control panels, etc. for some of the equipment to be installed outdoors, the installation of a space heater inside these panels will be considered to prevent condensation inside the panels.

(2) Soil Acidification Prevention Measures

The soil survey conducted as part of the Field Survey II confirmed that a pyrite layer is found in the project area with excavation of the ground by some 50 – 70 cm. Although pyrite is an alkaline material, it is rapidly acidified through contact with air, producing a highly acidic substance which can cause adverse impacts on the surrounding ecosystem. In the worst case, wildlife can become extinct. In fact, there are areas where fish cannot live due to the adverse impacts of forest land improvement work using inappropriate method even four or five years after the completion of the work. When excavated pyrite is used as the banking soil for embankment or canal

construction work, appropriate soil treatment must be conducted. One such treatment is the covering of the pyrite with normal soil to prevent direct contact between the excavated pyrite and air.

2.2.1.3 Design Concept Regarding the Socioeconomic Conditions

As a large majority of Vietnamese people are Buddhists (some 80% with the rest being Catholic, Hoa Hao, Cao Dai or other), there are no main customs, such as Ramadan for Muslims, which will considerably affect the construction schedule and other aspects of the Project. However, for the road work and the construction work for health centres, schools and canals, it will be essential to organize a meeting in each community to explain the Project in order to facilitate local understanding of the importance of the Project in addition to publicising the work contents as well as schedule among local residents prior to the commencement of the work with a view to preventing accidental work-related accidents.

2.2.1.4 Design Concept Regarding the Local Construction Industry

Many construction companies and consultancy firms are based in the city of Ca Mau. The technical capability varies enormously from one company to another and there are only some five leading companies. Meanwhile, most building materials can be procured locally in Ca Mau from building material stores. There is no general agent which handles all structural materials, finishing materials and building service equipment, etc. and it will be necessary to procure each item as required from a specialist store. Because of the proximity of Ca Mau Province to Ho Chi Minh City which has the second largest urban population in Vietnam, all types of construction machinery and materials can be procured in Vietnam.

2.2.1.5 Design Concept Regarding the Use of a Local Consultancy Firm for the Detailed Design and Work Supervision

All types of the buildings and others to be constructed under the Project have already been constructed in Ca Mau Province and local consultancy firms have been responsible for their design, quantity survey and work supervision. Accordingly, a leading local consultancy firm can be fully relied upon for the design work, quality management, schedule control and safety management, etc.

2.2.1.6 Design Concept Regarding the Use of Local Subcontractors

Local construction companies have experience of the design and construction of health centres, elementary schools, roads and bridges. As the construction work of these does not require highly

specialized techniques/skills, local construction companies have sufficient ability to construct the planned facilities under the Project as in the case of existing buildings and structures. The range of heavy machinery to be used will be minimal and such machinery and other equipment will be mainly transported on a pontoon using canals.

2.2.1.7 Design Concept Regarding the Maintenance Capability of the Implementing Body

(1) Forests

As forest companies have been managing and operating forests, they possess basic skills and forest management capability. The target sites of the Project are selected based on the cutting and reforestation programme of each forest company and the planting and forest management costs are paid under the current budget of each company (although there is no budgetary appropriation for forest land improvement). It is, therefore, judged that there should basically not be any problems relating to forest management/maintenance.

However, to expand the scope of use of Melaleuca wood in view of the market trend for this type of wood, it will be necessary to introduce a medium to long-term forest management system instead of the system currently adopted by forest companies. The forest land improvement (embankment) work to be conducted under the Project should improve forests which can then function as practical model for desirable forest management. As the effects of the planned inputs can be maximised in this way, technical assistance will be necessary to guide forest companies to practice appropriate forest management.

In regard to model farms for combined agriculture, forestry and fisheries, each forest company has been conducting various production activities as part of its pursuit of business diversification. Here, technical assistance through the utilisation of model farms should be provided from the viewpoint of fostering dissemination workers.

(2) Forest Sector (Equipment)

- Construction Machinery

During the period of the embankment work which will be conducted by a local construction company, each forest company will be requested to dispatch a candidate excavator operator(s) to learn excavator operation and maintenance skills. Moreover, those operators or others of forest companies will be required to obtain an operator licence for construction machinery in Vietnam so that each company has a system which is capable of conducting its own embankment work using the excavator and pontoon, etc. to be provided under the Project.

- Discharge Pump

  A discharge pump will be used to drain rainwater from farmland. The Department of Agriculture and Rural Development (DARD) will teach each forest company pump operation and maintenance skills to enable each forest company to operate such pumps without external assistance.

- Fire Extinguishing Equipment

  At present, each forest company has fire extinguishing equipment albeit in insufficient quantity and conduct the fire-fighting of bush fires from time to time. The supplier of the new fire extinguishing equipment under the Project will conduct test operation and On the Job Training (OJT) regarding such equipment and the capability of each forest company to operate the new fire extinguishing equipment will be developed through the training.

- Radio Communication Equipment

  Each forest company currently operates a VHF radio communication system for disaster prevention. Those forest companies which will only receive radio handsets are fully capable of maintaining them. In the case of a forest company (Song Trem) for which a radio repeater will be provided, the equipment supplier will provide initial technical guidance, operation guidance and maintenance guidance to establish a system whereby the forest company will be able to operate the radio communication system without external assistance.

(3) Health Care Sector

Both hospitals and health centres are very eager to receive the planned equipment as soon as possible and one hospital has already dispatched staff to Ho Chi Minh City and other places to learn the necessary operating skills. As the types of equipment which are commonly used in Vietnam have been selected, there are people with experience of operating such equipment at other hospitals. Following the initial technical guidance, operation guidance and maintenance guidance to be provided by the equipment supplier, a system capable of operating the new equipment without external assistance will be developed at each hospital or health centre through the guidance.

(4) Responsible Body

The responsible body for the Project in Vietnam will be the People's Committee of Ca Mau Province. This body will entrust the contract work with the consultant and contractor to a procurement agent.

(5) Implementing Body

The Project Management Unit of which the members are representatives of organizations related to the Project will act as the implementing body. The representatives of the organizations responsible for specific sectors will check and confirm the specifications, etc. of the facilities and equipment and will make the necessary proposals for the work to be conducted by the consultant or contractor. The implementing body who is represented by DARD Ca Mau will conduct the undertakings of the recipient country which cover those necessary project items which are not included in the scope of the grant aid.

(6) Procurement Agent

An official Japanese organization specialising in procurement will act as the procurement agent for the Government of Vietnam and will conduct the selection of and conclusion of the contracts with the consultant and contractor. This body will also check the work contents and progress of the consultant and contractor and will conduct fund management, including payment to the consultant and contractor, and overall supervision of the Project.

2.2.1.8 Design Concept Regarding the Quality of Facilities and Equipment

(1) Facilities

In principle, all of the building materials for the facilities will be based on Vietnamese standards. In the case of imported materials, the standards of the exporting countries will apply. In regard to cast-in-place concrete and others of which the satisfactory quality must be verified at the building, etc. construction stage, this quality verification will be conducted as part of the work supervision based on the existing design and construction standards in Vietnam.

(2) Equipment

In principle, the equipment to be supplied under the Project will be that which can be easily procured in Vietnam and for which an agent or dealer supplying spare parts and a maintenance service exists in Vietnam. The specification level will be that of equipment which is commonly used in Vietnam because of the ease of operation and maintenance.

There are many stores which sell second-hand equipment throughout Vietnam, forming an economy based on the distribution of second-hand equipment. In view of this, the equipment to be procured under the Project will be new equipment, precluding second-hand equipment and old model equipment available in inventory.

A one year warranty after delivery will be required for each equipment as a measure to preclude poor quality equipment.

2.2.1.9 Design Concept Regarding the Construction Schedule

Following the authorisation of the Project's implementation by the Government of Japan, the Exchange of Notes (E/N) between the two countries will take place to commence the process of project implementation in accordance with Japan's grant aid scheme for community empowerment. The Project will be implemented largely in four stages, i.e. ① signing of the agreement with the procurement agent, ② selection of the consultant (detailed design, preparation of the tender documents and work supervision), ③ selection of the facility constructor and equipment supplier and ④ construction of the facilities and procurement (and installation) of the equipment. The Project will be implemented with a view to completing the work in two years after the signing of the E/N.

2.2.2 Basic Plan

2.2.2.1 Priority Order of the Components and Reasons

(1) Forestry Sector

The priority order of the components of the forestry sector is described in the following table.

No.	Requested Item	Contents of the Request (Scale and Quantity)	Details of the Contents of the Request	Priority Ranking
1	Forest Land Improvement Embankment	(1) Forest land improvement for the planting of Melaleuca (farmers' land: 2,631 ha)	(1) Embankment work for 2,631 ha of land selected based on poor tree growth and a high level of poverty from among that land for which the land use rights have already been transferred to farmers (total of some 6,000 ha) among Area ① through Area ⑤ listed below ① Area managed by U Minh I Forest Company ② Area managed by U Minh II Forest Company ③ Area managed by April 30 Forest Company ④ Area managed by former U Minh III Forest Company (currently managed by Khanh An Commune) ⑤ Area managed by Tran Van Thoi Forest Company	C
		(2) Forest land improvement for the planting of Melaleuca (land owned by forest companies: 463 ha)	(2) Embankment work for 463 ha of land owned by five forest companies	A
		(3) Procurement of construction machinery for forest land preparation work	(3) Procurement of construction machinery for the embankment work at land owned by forest companies	A
2	Canal Dredging	Dredging and widening of the existing canals (approx. 82 km) and construction of new canals (approx. 48 km) to provide a means of (i) transport for local residents, (ii) transportation for fire extinguishing equipment to fight forest fires and (iii) water supply for the fire-fighting of forest fires	• Dredging/widening: GL -2m (depth) x 8m (width) x 81.7 km (length) • New canals: GL -2m (depth) x 8m (width) x 47.9 km (length)	Dredging/ widening: B: 30.1 km C: 51.6 km New canals: A: 12.9 km B: 3.9 km C: 31.1 km
3	Establishment of Demonstration Farms	Model farms for the extension of skills as in the case of the previous technical cooperation project (240 farms in the areas managed by six forest companies)	• Compartmentation of the land by digging trenches • Supply of piglets, fish fry, vegetable seeds and seedlings, etc. for demonstration purposes	C
4	Forest Fire Control Equipment	Mobile fire pumps: 6 Communication equipment: 6 Speed boats: 6	Fire pumps and accessories (hoses: 65 mm (diameter) x 500 m (total length); 50 mm (diameter) x 1,000 mm (total length), branch lines and nozzles)	A (other than communication equipment) B (communication equipment) C (speed boats)

No.	Requested Item	Contents of the Request (Scale and Quantity)	Details of the Contents of the Request	Priority Ranking
5	Forest Fire Monitoring Facilities	Monitoring stations Monitoring towers (2 towers x 6 forest companies; 17 m in height; made of steel)	• 3 – 5 people work at any time at the monitoring station to monitor forest fires and the illegal cutting of trees (two rooms; total floor area of approx. 54 m^2) • Monitoring towers (constructed at 2 km intervals) • Subject forest companies ① U Minh I Forest Company ② U Minh II Forest Company ③ April 30 Forest Company ④ Song Trem Forest Company ⑤ Former U Minh III Forest Company (currently the Company Dissolution Committee) ⑥ Tran Van Thoi Forest Company	A
6	Revolving Fund	Fund to set up a micro-credit facility (1 billion VND)		N/A
7	Vehicles for Monitoring	Small boats (18)	Motor boats for forest fire patrol purposes; three each for the six forest companies (1) 1 x 9.5m in length with 13 HP (2) 2 x 7.7m in length with 9HP	C
8	Pump to Drain Acidic Water	Pumps to replace highly acidic water in paddy fields Output: 10 – 12 HP (15 groups x 8 communes)	Only the engines to operate the pumps are requested. The pump bodies will be locally procured by the Government of Vietnam.	C
9	pH and Salt Content Analysers	Analysers (1 x 8 communes)		C
10	Discharge Pumps	Discharge pumps for water level adjustment in paddy fields (2 x 6 forest companies)	These pumps will be used at the paddy fields of the model farms to be established at the embanked sites of the forest companies.	A
11	Wood Processing Facilities	Drying and processing of Melaleuca wood	Machinery to dry raw Melaleuca wood, to produce laminated wood and to make wood furniture, etc.	A

[Note] Priority grades: A = high priority; B = medium priority; C = low priority

Table 2-2-2-1(1)-1 and Table 2-2-2-1(1)-2 show the priority ranking of the canal work.

Table 2-2-2-1(1)-1 Contents and Assessment Results of the Request for Canal Dredging and Widening

Managed Area and Target Scope	Contents	Priority Order	
		Grade	Ranking
U Minh I Forest Company			
No. 35 Canal (between No. 90 Canal and Bo Bao Canal)	Dredging only: 10.3 km	C	-
500 m to the north parallel to No. 29 Canal (300 m east of No. 89 Canal – No. 96 Canal)	Dredging and widening: 6.7 km	B	1
300 m to the east parallel to No. 89 Canal (Bo Bao Canal – No. 29 Canal)	Dredging and widening: 5.3 km	B	3
U Minh II Forest Company			
No. 2 Canal (from 500 m west of No. 27 Canal to No. 18 Canal)	Dredging and widening: 8.3 km	B	4
No. 4 Canal (from 500 m west of No. 27 Canal to No. 18 Canal)	Dredging and widening: 8.4 km	B	2
No. 1 Canal (from No. 15 Canal to No. 17 Canal)	Dredging and widening: 1.4 km	B	5
Tran Van Thoi Forest Company			
No. 88 Canal (from No. 21 Canal to No. 29 Canal)	Dredging only: 8 km	C	-
300 m to the east parallel to No. 84 Canal (from No. 21 Canal to No. 28 Canal)	Dredging only: 7 km	C	-
700 m to the east parallel to No. 87 Canal (from No. 25 Canal to No. 29 Canal)	Dredging only: 4 km	C	-
300 m to the east parallel to No. 88 Canal (from No. 21 Canal to No. 28 Canal)	Dredging only: 6.7 km	C	-
No. 28 Canal (300 m section moving east from No. 88 Canal)	Dredging only: 0.3 km	C	-
April 30 Forest Company			
Chu Vi Vach Dong Canal	Dredging only: 7.7 km	C	-
Tieu Dua Canal + Thong Nhat Canal	Dredging only: 6.2 km	C	-
Muong Chua Canal	Dredging only: 1.4 km	C	-
Total	Grade B: 30.1 km Grade C: 51.6 km Total : 81.7 km		

Table 2-2-2-1(1)-2 Contents and Assessment Results of the Request for New Canal Construction

Managed Area and Target Scope	Contents	Priority Order	
		Grade	Ranking
U Minh I Forest Company			
T91 Canal (between No. 29.5 Canal – No. 31 Canal)	New construction: 1.3 km	B	2
U Minh II Forest Company			
No. 1 Canal (between No. 17 Canal – No. 18 Canal)	New construction: 1.0 km	B	4
No. 4 Canal (between No. 16 Canal – No. 18 Canal)	New construction: 1.6 km	C	-
Vo Doi National Park			
No. 27 Canal (between No. 90 Canal – No. 100 Canal)	New construction: 10.0 km	A	1
30 April Forest Company			
Phan Lo Vach Dong Canal (between No. 29 Canal – Xa Thin Canal)	New construction: 7.5 km	C	-
Phan Lo Vach Dong Canal (between Rach Nai Canal – Xa Thin Canal)	New construction: 5 km	C	-
Tran Van Thoi Forest Company			
T89 Canal (between T21 Canal – No. 23 Canal)	New construction: 2.0 km	C	-
T87 Canal (between No. 25 Canal – No. 28 Canal)	New construction: 3.0 km	C	-
No. 27 Canal (between T85 Canal – T88 Canal)	New construction: 2.9 km	A	1
No. 26 Canal (between T85 Canal – T87 Canal)	New construction: 1.6 km	B	3
Song Trem Forest Company			
Lo 0.5 Canal (No. 23 Canal – No. 24 Canal) + No. 24 Canal (between Lo 0.5 Canal – Lo 1 Canal) + No. 23 Canal (between Lo 0.5 Canal – Lo 1 Canal)	New construction: total 2.0 km	C	-
Lo 0.5 Canal (No. 18 Canal – No. 21 Canal) + No. 18.5 Canal (Lo 0.5 Canal – Lo 1 Canal) + No. 20.5 Canal (Lo 0.5 Canal – Lo 1 Canal)	New construction: total 4.0 km	C	-
No. 19.5 Canal (between No. 11 Canal – Xang Giua Canal) + No. 11 Canal (between No. 18.5 Canal – No. 19.5 Canal)	New construction: total 2.0 km	C	-
No. 9 Canal (between No. 19 Canal – No. 20 Canal) + No. 19 Canal (between No. 7 Canal – No. 9 Canal) + No. 19.5 Canal (between No. 7 Canal – No. 9 Canal) + No. 20 Canal (between No. 7 Canal – No. 9 Canal)	New construction: total 4.0 km	C	-
Total	Grade A: 12.9 km Grade B: 3.9 km Grade C: 31.1 km Total: 47.9 km		

[Note] Grades: A = high priority; B = medium priority; C = low priority

(2) Public Health Sector

The first priority will be given to the improvement of health centre facilities and equipment in view of the priority given to the improvement of primary medical care in communities.

In U Minh Ha area, the second priority will be given to the provision of new medical equipment for U Minh District Hospital which provides primary medical services that commune health centers cannot provide in view of the high degree of necessity for such improvement while the third priority will be given to the improvement of facilities.

The second priority will be given to the provision of new medical equipment for Tran Van Thoi District Hospital which has a shortage of medical equipment because of the deterioration of its existing equipment while the fourth priority will be given to the reconstruction of facilities.

Contents Confirmed by the Study	Scale	Evaluation Results	Priority Ranking
Expansion/reconstruction of facilities at five health centres	Total: 1,021 m^2	A	1
- Khanh An General Clinic (expansion)	322 m^2		
- Khanh Lam Health Centre (expansion)	288 m^2		
- Khanh Tien Health Centre (expansion)	180 m^2		
- Khanh Binh Tay Bac Health Centre (reconstruction)	144 m^2		
- Tran Hoi Health Centre (expansion)	108 m^2		
Procurement of new medical equipment for eight health centres		A	1
- Khanh An General Clinic			
- Nguyen Phich Health Centre			
- U Minh Town Health Centre			
- Khanh Hoa Health Centre			
- Khanh Lam Health Centre			
- Khanh Tien Health Centre			
- Khanh Binh Tay Bac Health Centre			
- Tran Hoi Health Centre			
• U Minh District Hospital: reconstruction of the gynaecology department and laboratory room	800 m^2	B	3
• U Minh District Hospital: procurement of new medical equipment		B	2
• Tran Van Thoi District Hospital: reconstruction of the medical treatment and inpatient buildings	1,520 m^2	B	4
• Tran Van Thoi District Hospital: procurement of new medical equipment		B	2

(3) Education Sector

The first priority will be given to the construction of Lam Ngu Truong I Elementary School in view of the high level of its necessity and the priority ranking of other items is given below.

Contents Confirmed by the Study	Scale	Evaluation Results	Priority Ranking
• Construction of new Lam Ngu Truong I Elementary School (requested: 12 classrooms, toilets and a well) (planned: 10 classrooms, 2 staff rooms, 10 toilet cubicles and a well)	611 m^2	A	1
• Construction of 1st Branch School of Lam Ngu Truong II Elementary School (requested: 4 classrooms, toilets and a well) (planned: 4 classrooms, 1 staff room, 4 toilet cubicles and a well)	249 m^2	A	2
• Construction of 2nd Branch School of Lam Ngu Truong II Elementary School (requested: 3 classrooms, toilets and a well) (planned: 2 classrooms)	112 m^2	B	4
• Khanh Binh Tay Bac II Elementary School (requested: 7 classrooms, toilets and a well) (planned reconstruction: 4 classrooms, 4 toilet cubicles and a well)	224 m^2	A	3
• U Minh III Elementary School (requested: 10 classrooms, toilets and a well) (planned: 1 classroom)	50 m^2	B	5
• Improvement of the toilets and wells at 6 schools		B	6

(4) Road Sector

Table 2-2-2-1(4)-1 show the priority order for roads and bridges of which the construction has been requested.

Table 2-2-2-1(4)-1 Priority Order of the Requested Roads and Bridges

Route No.	Scoring Item								Grading Result
	Road Grade	Road Network Shape	Compati-bility	Natural Environ-ment	Social Environment	Beneficia-ries	Investment Efficiency	Total Score	
1	2	2	4	-1	-1	3	4	13	B
2	2	3	4	-1	-1	5	5	17	A
3	2	3	4	0	0	4	4	17	A
4	3	5	5	0	-2	3	3	17	A
5	2	4	3	0	-1	3	3	14	B
6a	2	2	2	0	-1	3	2	10	C
6b	2	3	4	0	-2	4	3	15	B
7	2	5	3	0	0	4	4	18	A
8	2	4	4	0	0	3	3	16	A
9	2	1	3	0	-3	3	3	9	C
10	2	2	3	0	0	1	1	9	C
11	3	2	2	0	0	3	4	13	B
12	3	4	3	0	0	3	5	18	A
13	3	4	3	0	0	3	5	18	A
14a	4	1	2	0	-4	5	3	11	C

Route No.	Scoring Item								Grading Result
	Road Grade	Road Network Shape	Compati-bility	Natural Environ-ment	Social Environment	Beneficia-ries	Investment Efficiency	Total Score	
14b	4	1	1	0	-3	5	3	11	C
B-1	2	1	1	0	0	5	1	10	C
B-4	2	1	1	0	0	5	1	10	C
B-5	2	1	1	0	0	5	1	10	C
B-14	2	1	2	0	0	1	1	7	C
B-18	2	1	1	0	0	5	1	10	C
B-19	2	1	3	0	-1	5	2	12	C
B-20	2	1	1	0	0	5	1	10	C
B-22	2	1	1	0	0	5	1	10	C
B-24	2	1	3	0	-1	5	1	11	C
B-27	2	1	1	0	0	3	1	8	C
B-28	2	1	1	0	0	3	1	8	C
B-29	2	1	1	0	0	3	1	8	C
B-31	1	1	2	0	-1	3	1	7	C
B-32	1	1	1	0	0	3	5	7	C
B-33	2	1	1	0	0	3	5	8	C
B-34	2	1	2	0	0	5	1	10	C
B-35	1	1	3	0	-1	5	1	9	C
B-36	2	1	1	0	0	5	1	10	C

Grade A: high priority (score: 16 points or higher)
2.5 m wide asphalt road; 7 routes for 31.9 km (with 7 bridges)
Grade B: medium priority (score: 13 – 15 points)
2.5 m wide asphalt road; 4 routes for 11.2 km (with 4 bridges)
Grade C: low priority (score: 12 points or lower)
3.5 m wide asphalt road; 2 routes for 12 km (with 6 bridges)
2.5 m wide concrete road: 3 routes for 7.3 km (with 3 bridges)
18 bridges

Fig. 2-2-2-1(4)-1 shows the locations of the subject roads.

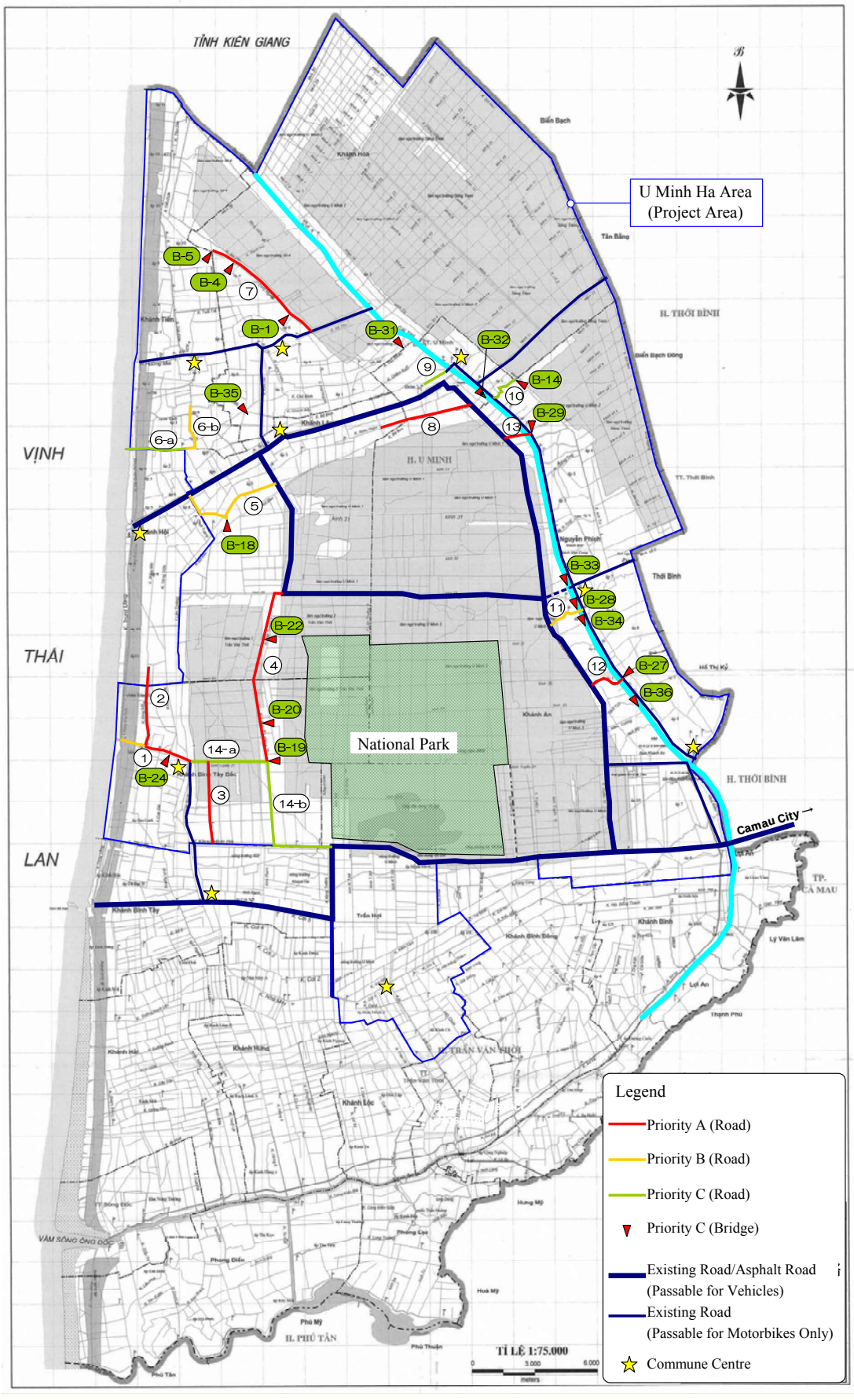


Fig.2-2-2-1(4)-1 Locations of the Requested Roads and their Assessment Results

2.2.2.2 Local Specifications and Their Improvements (Draft)

(1) Farmland and Forest Land Improvement

1) Forest Land Improvement (Embankments)

① History of Forest Land Improvement in the Project Area and Local Specifications

The use of embankments for forest land improvement was widely publicised under the Project to Develop Afforestation Techniques for Acid Sulphate Soil in the Mekong River Delta and embankments have been used in the present project area since around 2003 albeit on a small scale.

However, the introduction of the technique as a matter of formality without the provision of direct guidance on the necessary considerations in regard to the sulphate soil layer at the time of construction work (soil survey in advance and the soil treatment method, etc.) resulted in the exposure of sulphate soil in many areas where forest land improvement was attempted. The subsequent production of strong acid caused the almost total destruction of local water systems.

Embankments in the context of forest land improvement means the construction of a giant version of farmland ridges for their use as planting beds for Melaleuca. The ground on both side of the ridge (i.e. embankment) section is excavated and the excavated soil is used for banking. Although the local specifications for embankments vary from one area to another, the general dimensions are some 4 m wide trenches and some 10 m wide embankments. The height of the embankments is determined in reference to the maximum flood level of the targeted forest land improvement site while the width of the trenches and the width of the embankments are determined with reference to the feasible excavation depth (which affects the amount of excavated soil). In regard to the excavation depth, a ministerial ordinance which came into effect in 2005 stipulates that the excavation depth must not exceed 1.2 m except in the case of canals used for transportation.

② Design Concept Regarding Improvement Plan

As the Japanese procurement agent will place an order for the construction work for the Project to the contractor, the construction method to be adopted must give the maximum consideration to the possible impacts of the work on the environment. At the same time, the embankment height will be determined to facilitate the growth of Melaleuca seedlings as much as possible. Another necessary consideration is to ensure

the maximum utilisation of the existing topographical features (such as existing canals) with a view to reducing the costs as much as possible.

③ Improvement Plan

The soil survey results show that the depth of the appearance of the acid sulphate soil layer varies depending on the area or survey point and that the maximum flood level also slightly differs from one area to another. It is questionable whether or not a detailed and appropriate soil survey can be conducted prior to the implementation of forest land improvement given the available human resources, time and funding. It may also be possible that a local subcontractor is unable to meet the requirements if the project design is so detailed that it reflects the specific conditions at each target site. The planned deign (improvement plan) for the Project, therefore, will involve the standard cross-section and standard work procedure, both of which will be applicable to all of the project sites, so that the construction work can be conducted in a uniform manner. The designed embankment work will be presented as a work model for other sites with similar conditions (maximum flood level of 60 cm and pyrite appearance depth of GL -0.5m or deeper) (see Attached Drawing).

Even if the soil treatment is adequately conducted, it is difficult to completely prevent the adverse impacts of the exposed acid sulphate soil. In other words, there may be occasions when the sulphate soil which is supposedly covered by top soil becomes exposed through cracked top soil or the sulphate soil is exposed to the air because of its accidental mixture with the top soil during the excavation work. Sulphate soil in excavated trenches will slowly produce acid through its reaction with the oxygen in water. As a safety measure to prevent the adverse impacts of these phenomena, the improved forest land will be enclosed by mounds so that the forest land in question constitutes a semi-closed water body in which produced acidic water is confined. The width and height of these mounds will be approximately 1 m and some 20 cm below the maximum flood level respectively. In this way, condensed strongly acidic water due to the lower water level in the dry season will not flow into a canal while acidic water diluted with rainwater will flow into a canal in the rainy season to prevent progressive concentration. These arrangements will be maintained for at least three years.

2) Model Farms for Combined Agriculture, Forestry and Fisheries

① Local Specifications

At the present project sites, the basis for the design of model farms for combined agriculture, forestry and fisheries was introduced in the form of demonstration farms in the U Minh I area under the Former Forest Fire Site Rehabilitation Project (Technical Cooperation Project). The purpose of the design in question was to enclose the premises of farming households with L-shaped canals so that the resulting positive effects would increase the income of the said households.

- Clarification of the boundaries with neighbouring farming households
- Easy adjustment of the paddy field water level and prospect of double cropping or second cropping
- Prospect of fruit and vegetable cultivation using the mounds on both sides of the canals
- Ease of afforestation, forest management and the transportation of logs using the L-shaped canals
- Use of the L-shaped water canals as a water source for fire-fighting
- Functioning as firebreaks for several years after planting because of the distance from neighbouring forest land

② Improvement Plan

In principle, the design introduced in the U Minh I area will be inherited. The size of the land and other aspects will be identical to those of a typical farming household in each area so that these farms can act as a reference model for land improvement by local farmers in the future. One improvement of the previous design is the addition of an extra water channel to make the L-shaped canal a F-shaped or inverted F-shaped canal to firmly separate the forest land from paddy fields. In this way, the water level management of the paddy fields will become easier and any adverse impacts of the forest land improvement (embankment) work on paddy fields can be prevented. The technique and procedure basically described in (1) Forest Land Improvement (Embankments) will be used for the area subject to forest land improvement. However, as the design should match the land owned by a typical farmer, embankment width and trench width are designed to be 7 m and 3 m respectively.

(2) Facilities

The standard design is adopted for both health centre buildings and elementary school buildings as outlined in the following tables.

Table 2-2-2-2-1 Outline of the Finish of Health Centre Buildings

Exterior Finish		
Roof	Angular corrugated steel sheet roofing (coloured; corrosion-proof)	
External Walls	Hollow brick (t = 200 mm); mortar and acrylic emulsion paint finish	
External Skirting	Same as external walls	
Windows and Doors	Windows	Aluminium double sliding windows
	Doors	Framed steel double doors
Interior Finish		
Ceiling	Wood frame with plastic panels (W = 200 mm)	
Interior Walls I	Hollow brick (t = 100 mm); mortar and emulsion paint finish	
Interior Walls II	Hollow brick (t = 100 mm); mortar and ceramic tile (entire wall) finish	
Interior Walls III	Hollow brick (t = 100 mm); mortar and ceramic tile (up to 1,500 mm from the floor) finish	
Interior Skirting	Same as interior wall finish	
Floor	Ceramic tile (400 mm x 400 mm) finish	

Table 2-2-2-2-2 Outline of the Finish for Elementary School Buildings

Exterior Finish		
Roof	Angular corrugated steel sheet roofing (coloured; corrosion-proof)	
External Walls	Hollow brick (t = 200 mm); mortar and acrylic emulsion paint finish	
External Skirting	Same as external walls	
Windows and Doors	Windows	Out-swinging casement windows
	Doors	Framed steel double doors
Interior Finish		
Ceiling	Concrete slab with emulsion paint finish	
Interior Walls	Hollow brick (t = 100 mm); mortar and emulsion paint finish	
Interior Skirting	Same as interior wall finish	
Floor	Ceramic tile (200 mm x 200 mm) finish	

- As the ground in Ca Mau Province is very soft, the standard design for single storey health centre or elementary school buildings requires the insertion of some 5 m long wooden piles (Melaleuca) at intervals of some 20 cm below the foundations. This use of wooden piles to strengthen the foundations will be adopted by the Project in accordance with the standard design.
- The standard design for the floor height is 500 mm for elementary school buildings and 470 mm for health centre buildings and this standard deign will be basically adopted for the Project. When the floor height is required to be higher because of the site conditions, the

Vietnamese side will prepare the land to the required height prior to the building construction work.

- The standard floor design for the ground floor in Vietnam demands the full compaction of backfilling sand and the laying of crushed stone with a mortar setting and a ceramic tile finish. However, the floor finish at all of the visited health centres and elementary schools was found to be defective. In view of this reality, the floor specifications for the ground floor under the Project will be ceramic tiling on concrete slabs. This floor will be separated from the building structure so that the floor weight of the ground floor is directly supported by the ground beneath it.
- The blackboard, pupil desks and chairs (for 30 pupils) and teacher desk and chair to be supplied for each new classroom of the subject elementary schools will be procured by the Japanese side.
- The ceilings of the existing elementary school classrooms are either an exposed roof structure or a false ceiling consisting of plastic panels. The standard design adopts concrete slabs for classroom ceilings from the viewpoint of shielding from strong solar radiation and reducing the noise of rain. Concrete slab ceilings will, therefore, be adopted in accordance with the standard design for the elementary school buildings to be constructed under the Project.

(3) Road Design

The current standard design has the following problems.

- Sloping of the approach section to the bridge.

  Although slope protection measures are in place to protect the simple abutments, the steep gradient of such slopes creates a high risk of slope collapse.

  < Remedial Measure >
  Because of the availability of space, the gradient of the slopes consisting of cohesive soil will be made gentler at 1:1.5 to reduce the area of slope protection.

- Paving on soft ground

  At present, the road design employed is for a 2.5 m concrete paved road with the targets of the design load being motorcycles, bicycles and pedestrians. For the sub-grade, the excavation and soil replacement method for the roadbed area is used to minimise the amount of the required materials.

< Remedial Measure 1 > Roadbed

The CBR value indicating the bearing capacity of the existing roadbed area is approximately 1.2 to 1.5. When the roadbed area is excavated for soil replacement, the roadbed level becomes closer to the groundwater level, making the CBR value even smaller. One recommended remedial measure is the use of the existing surface layer as the roadbed with the even laying of the sub-grade material on this layer to increase the paving strength. This can be conducted in the following manner.

a. Replace the soil mixed with organic matter or soft soil in the top 5 – 10 cm section of the existing surface layer with improved soil and shape the surface to achieve a gradient of 2% towards the road centre from both ends.
b. After shaping of the roadbed, evenly lay the cut-off sheet and pave the road surface to obtain the predetermined shape.

< Remedial Measure 2 > Paving Design

At present, 2.5 m wide commune roads are paved with concrete based on the empirical rules regarding the sub-grade conditions, weather, topography and workability in the Mekong River Delta area and the construction cost which takes the above conditions into consideration. While the standard road design allows the passage of large vehicles, motorcycles are used for the design load for 2.5 m wide commune roads. If motorcycles are still used for the design load for the planned roads under the Project, there is a possibility of reducing the road construction cost by switching from concrete roads to asphalt roads.

2.2.2.3 Basic Plan

(1) Forestry Sector

1) Forest Land Improvement (Embankments)

① Planning Policy

The improvement of 448.2 ha of forest land out of the originally requested 463.2 ha is planned, excluding 15 ha of land belonging to U Minh I Forest Company because of likely operational and management problems after the work as this area stretches over two forest compartments.

Table 2-2-2-3-1 Planned Area for Forest Land Improvement (Embankments) for Land Owned by Forest Companies

	Forest Company	Area (ha)
1	Song Trem Forest Company	50.0
2	April 30 Forest Company	85.4
3	U Minh II Forest Company	120.8
4	U Minh I Forest Company	85.0
5	Tran Van Thoi Forest Company	107.0
Total		448.2

② Forest Land Improvement Design

A uniform design will be adopted to simplify the required work. The excavation depth of the trenches will be 1.2 m which is the maximum depth allowed by the ministerial ordinance. The embankment width and trench width will be 8 m and 4 m respectively and the maximum planting area in view of securing the feasible amount of excavated soil. The embankment banking height will be 65 cm to facilitate the growth of Melaleuca at every site as much as possible. Forest land will be enclosed by mounds of 1 m in width and 40 – 60 cm in height to minimise any adverse environmental impacts on the surrounding water system.

③ Work Method and Sequence

The following method and sequence will be used.

- The ground will be excavated to a depth of 50 cm, which is a safe depth at all of the sites for forest land improvement under the Project, and the excavated soil will be piled to a height of 3.5 m on one side of the planned embankment.
- The trench section will be further excavated to a depth of 1.2 m and the excavated soil will be piled flatly at the central section of the planned embankment except for a 1 m wide section at both edges.
- The sulphate soil at the central section of the planned embankment will be covered by top soil which is initially piled to a height of 3.5 m.

2) Model Farms for Combined Agriculture, Forestry and Fisheries

① Planning Policy

The model farms will basically be planned as part of the forest land improvement (embankment) work. If a target site for embankment work is found to be unfavourable

for the establishment of a model farm because of the site conditions (maximum flood level and acidity level of accumulated water), the model farm will be set up on the nearest feasible land.

② Model Farm Design

Two model farms of 5 ha each (two in each compartment, total 10 ha) will be set up for five forest companies in correspondence with the landholding size of a typical farming household.

The land use design involves the introduction of an L-shaped canal on two sides of the plot in accordance with the typical configuration of farming household premises (residential site – paddy field – forest) and the paddy field and forest area is separated by an additional canal. The excavated soil to create the canal is banked on both sides of the canal to prevent the incursion of water to the paddy field in the rainy season. These mounds will be used for the production of fruit and vegetables.

3) Dredging, Widening and Construction of Canals

The design for the dredging, widening and construction of canals will adopt the standard canal design of 8 m in width and 2 m in depth in Vietnam. An excavation depth of 2 m leads to the inevitable appearance of the pyrite (acid soil) layer. Therefore, when the excavated soil is banked on both sides of the canal, the excavated pyrite soil will be covered by the excavated top soil to reduce the chance of the acidification of the nearby ground. The gradient of the banked slopes will be 1:1.5. Refer to the the Section 2.2.3 “Outline Design Drawings” to sees the standard cross-section of the canals.

4) Equipment

① Construction Equipment

It is empirically known that the planting of Melaleuca seedlings after the embankment work will facilitate fast growth and will substantially increase the yield of high quality wood. Therefore, embankment work will be conducted under the Project for parts of the forests owned by each forest company to increase the income of local farmers as well as local communities. In addition, excavators and pontoons will be provided for the forest companies so that these forest companies can continue their own embankment work.

Table 2-2-2-3-2 Quantity of Excavators and Pontoons to be Provided

Equipment No.	Type of Equipment	Deployment Site (Forest Company)						
		U Minh I	U Minh II	Tran Van Thoi	April 30	Khanh An	Song Trem	Total
1-1	Excavator	1	2	2	2	0	1	8
1-2	Pontoon	1	2	2	2	0	1	8

The above quantities have been decided based on the target areas for the embankment work under the Project and the total forest area (planned area for future embankment work).

However, only one excavator and one pontoon will be provided for U Minh I Forest Company as this company was provided with one each of such equipment under the previous Technical Cooperation Project. As a pontoon is used to transport the excavator and also functions as a platform for the work during the rainy season, a pontoon will be paired with each excavator.

Excavator (hydraulic excavator) specifications
Total weight: 11,000 – 14,000 kg class
Bucket capacity: 0.5 m^3
One year warranty

Pontoon specifications
Length: 12.0 m
Width: 3.9 m
Height (average): 1.3 m
Engine-driven
One year warranty

② Drainage Pumps

The DARD has requested that each forest company establish model rice cultivation farms with a view to increasing the income of farmers through the diversification of agriculture. In response to this request, it has been decided to include the establishment of model farms in the target areas for the embankment work in the scope of the Project.

Each forest company (five in total) will establish two model farms of 5 ha each. 2ha out of 5 ha lot is allocated to a paddy field.

As these farms will be surrounded by mounds to prevent the inflow of acidic water from the canals, there is a risk that the rice plants in the farming fields will be submerged at the time of much rain, necessitating the drainage of rainwater. For this reason, it has been decided to provide drainage pumps under the Project.

Assuming rainfall of 50 mm, the capacity and number of pumps are determined to enable the drainage of this volume of rainwater within 10 hours.

Rainwater volume: 40,000 m^3 x 0.05 m = 2,000 m^3
Drainage volume: 150 m^3/hr x 2x 10 hrs = 3,000 m^3 （＞2,000 m^3）

Table 2-2-2-3-3 Number of Drainage Pumps to be Provided

Equipment No.	Type of Equipment	Deployment Site (Forest Company)						
		U Minh I	U Minh II	Tran Van Thoi	April 30	Khanh An	Song Trem	Total
1-3	Drainage Pump	2	2	2	2	2	2	12

Water drainage pump specifications
Pump type : diesel engine-driven; self-priming centrifugal pump
Pump capacity : 150 m^3/hr, 12 m head
Engine capacity : 9.5 Hp
Accessories : suction pipe, strainer, discharge hoe (30 m) and hose band
One year warranty

③ Fire Extinguishing Equipment

While each forest company is responsible for conducting fire extinguishing activities to quell forest fires in its own area, forest companies are experiencing a shortage of fire extinguishing equipment because of the ageing or breaking down of their existing equipment. The quantity of the new fire extinguishing equipment to be provided has been determined to enable each forest company to conduct its own fire extinguishing activities.

Table 2-2-2-3-4 Quantity of Fire Extinguishing Equipment

Equipment No.	Type of Equipment	Situation	Deployment Site (Forest Company)						Total
			U Minh I	U Minh II	Tran Van Thoi	April 30	Khanh An	Song Trem	
2-1	Fire Pump	Existing	3	2	1	5	5	1	17
		To be Provided	**1**	**1**	**2**	**0**	**0**	**2**	**6**
		Total Operational	4	3	3	5	5	3	23
2-2	Fire Hose 65mm x 20m	Existing	75	130	50	165	400	15	835
		To be Provided	**50**	**25**	**50**	**0**	**0**	**75**	**200**
		Total Operational	125	155	100	165	400	90	1,035
2-3	Fire Hose 50mm x 20m	Existing	50	50	50	70	100	20	340
		To be Provided	**50**	**50**	**50**	**25**	**0**	**75**	**250**
		Total Operational	100	100	100	95	100	95	590
2-4	Branch Line	Existing	4	9	2	6	7	1	29
		To be Provided	**2**	**0**	**4**	**1**	**0**	**5**	**12**
		Total Operational	6	9	6	7	7	6	41
2-5	Nozzle 65mm	Existing	3	5	3	7	10	1	29
		To be Provided	**3**	**1**	**3**	**0**	**0**	**5**	**12**
		Total Operational	6	6	6	7	10	6	41
2-6	Nozzle 50mm	Existing	3	4	2	8	9	1	27
		To be Provided	**2**	**2**	**3**	**0**	**0**	**5**	**12**
		Total Operational	5	6	5	8	9	6	39

Fire pump specifications

Gasoline engine-driven fire extinguishing pump

Discharge rate : 2.05 m^3/min; 0.6 Mpa; 1.5 m^3/min; 1.00 Mpa

Capacity : $\geq$ 40.5 kW; engine speed: 5,000 rpm

Suction pipe : 100 A, 10 m with a suction strainer

Discharge port : 65 A with two fire hose connections

Total weight : $\leqq$ 100 kg

One year warranty

④ Radio Communication Equipment

Radio communication equipment is mainly used for the monitoring of forest fires and emergency communication at the time of a forest fire. All of the forest companies are experiencing a shortage of reliable radio communication equipment because of the ageing or breaking down of their existing equipment. The quantity of new equipment to be provided has been determined to enable each forest company to conduct proper communication, taking the quantity of the existing equipment into consideration.

Table 2-2-2-3-5 Quantity of Radio Communication Equipment

Equipment No.	Type of Equipment	Situation	Deployment Site (Forest Company)						Total
			U Minh I	U Minh II	Tran Van Thoi	April 30	Khanh An	Song Trem	
3-1	Radio Repeater	Existing	1	1	1	1	1	0	5
		To be Provided	**0**	**0**	**0**	**0**	**0**	**1**	**1**
		Total Operational	1	1	1	1	1	1	6
3-2	Antenna Tower	Existing	1	1	1	1	1	0	5
		To be Provided	**0**	**0**	**0**	**0**	**0**	**1**	**1**
		Total Operational	1	1	1	1	1	1	6
3-3	Antenna	Existing	1	1	1	1	1	0	5
		To be Provided	**0**	**0**	**0**	**0**	**0**	**1**	**1**
		Total Operational	1	1	1	1	1	1	6
3-4	Radio handset	Existing	7	21	2	10	2	2	44
		To be Provided	**15**	**5**	**20**	**10**	**0**	**20**	**70**
		Total Operational	22	26	22	20	2	22	114

Radio repeater specifications

VHF radio repeater: output 45 W – 50 W

One year warranty

⑤ Wood Processing Equipment

Song Trem Forest Company runs a furniture factory for the purpose of increasing its revenue through business diversification and provides employment opportunities for nearby communities. However, this factory is experiencing a shortage of equipment because of the ageing or breaking down of its existing equipment. As a result, the furniture business has been far from smooth. To assist the community, it has been decided to provide wood processing equipment for this factory under the Project. The quantity of equipment will be kept to a minimum but will be sufficient for this forest company to process wood and to produce furniture, taking the quantity of the existing equipment into consideration.

Table 2-2-2-3-6 Quantity of Wood Processing Equipment

Equipment No.	Type of Equipment	Specifications and Purpose of Use	Quantity
4-1	Wood Dryer	Steam dryer (including on-site installation and OJT)	1
4-2	Belt Sanding Machine	For surface finishing; finishing width: 1.3 m and above	1
4-3	Automated Double Face Planing Machine	For rough surface planing	1
4-4	Finger Joint Processing Machine	For processing glued wood, consisting of Finger Joint Cutting Machine and Bonding Machine	1 each
4-5	Tenoning Machine	For tenoning in the furniture production process	1

5) Forest Fire Monitoring Stations and Monitoring Towers

In the project area, forest fires are likely to occur in the dry season and could possibly inflict lethal damage to local forests. As the early detection and early extinguishing are basic rules to deal with forest fires, the construction of forest fire monitoring stations to detect the likely occurrence of forest fires is highly effective for forest fire prevention. In the U Minh Ha area, there has been a series of forest fires since the great fire in 2002 and fire monitoring and prevention activities are very important in an area where forestry is the main industry.

< Forest Fire Monitoring Towers >

These towers have a steel-frame construction and a height of 17 m. They are erected at 2 km intervals and their positions are determined taking the local conditions (presence of structures, etc. obstructing the view and existing facilities) into consideration.

The existing fire monitoring towers have an external ladder. In contrast, the new towers will have an internal ladder in view of safety and will also have a lightning rod to avoid being hit by lightning. (Refer to 2.2.3 for the outline design drawing.)

< Forest Fire Monitoring Stations >

A monitoring station will be constantly served by 4 – 5 people in the dry season in preparation for a forest fire. The building to accommodate these people will have two rest rooms, fire extinguishing pump room, kitchen and toilets. A well (with a manual pump) and a water tank (1 m^3) will also be constructed at each monitoring station site. The building will be a single storey, RC concrete building with a floor height of GL +500 mm. The finishing materials for the building are shown in the table below. (Refer to 2.2.3 for the outline design drawing.)

Part of Building	Specifications	
Exterior Finish		
Roof	Corrosion-proof corrugated steel roofing sheets on top of roof boards	
Walls	Hollow brick (t = 200 mm); mortar and acrylic resin enamel finish	
Skirting Boards	Acrylic resin enamel finish	
Windows and Doors	Steel windows and doors with ready-mixed synthetic resin paint finish	
Interior Finish		
Ceiling	Plastic panels (W = 200 mm) (wooden grid base)	
Walls	Hollow brick (t = 200 mm); mortar and synthetic resin emulsion paint finish	
Skirting Boards	Synthetic resin emulsion paint finish	
Floors	Ordinary room	Ceramic tiles (300 mm x 300 mm each) above concrete slabs
	Toilets	Ceramic tiles (200 mm x 200 mm each) above concrete slabs
	Fire extinguishing pump room	Concrete with metal trowel finish

(2) Public Health Sector

1) Health Centre Buildings

The existing health centres tend to have many small rooms measuring 3.6 m x 3.6 m to 3.6 m x 6.8 m, making their use inconvenient. There are three types of corridor configuration: central corridor type, side corridor (balcony) type and the type where the building has an H shape because of the arrangement of the corridors.

In general, health centres have 8 – 10 rooms, including a treatment room, gynaecology room, pharmacy, herbal remedy room, sickbay (bedroom) and staff room-cum-office. According to the request, the room size varies from 4 m x 9 m with a corridor width of 2.5 m in the case of the largest Khanh An General Clinic to 4 m x 7 m with a corridor width of 2 m for other health centres.

The health centres to be newly constructed will aim at achieving the maximum improvement within the realistic scope based on the current conditions. The facility design and execution plan will be appropriate for such local weather conditions as high temperature, high humidity, heavy rain and strong wind and such natural conditions as soft ground and a high groundwater level as well as the state of the local construction industry. Moreover, every design will take the facility maintenance and durability, construction cost and other relevant factors into consideration. On this basis, the following basic concept is adopted for the facility design.

- Reduction of the construction cost while paying attention to the ease of maintenance and durability of the facilities and buildings
- Adoption of convenient and functional room layouts

- Adoption of a design which is appropriate for the local materials, work methods and technology
- Improved durability against strong wind while also paying attention to ventilation
- Adoption of natural lighting and design facilities to shut out strong solar radiation and heat
- Standardized deign to shorten the construction period and reduce the cost

A single-side corridor design with the following standard dimensions is adapted to the buildings.

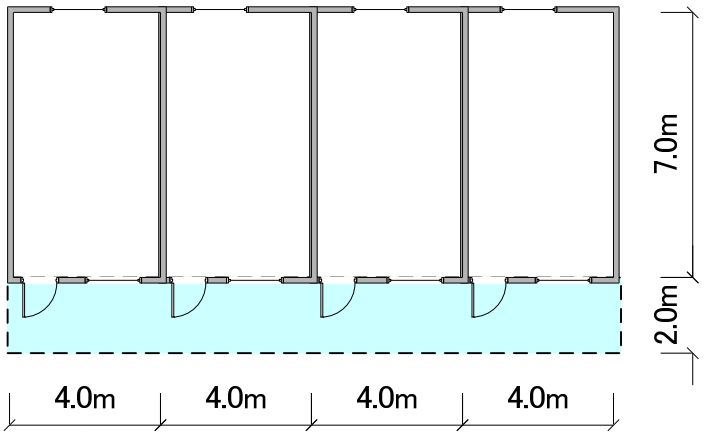


Fig. 2-2-2-3-1 Health Centre: Four Room Standard Plan

Structurally, the building will be a RC concrete single storey building with a floor height of GL +500 mm. The finishing materials for the building are shown in the table below. (Refer to 2.2.3 for the outline design drawing.)

Part of Building	Specifications	
Exterior Finish		
Roof	Corrosion-proof corrugated steel roofing sheets on top of roof boards	
Walls	Hollow brick (t = 200 mm); mortar and acrylic resin enamel finish	
Skirting Boards	Acrylic resin enamel finish	
Windows and Doors	Aluminium window frames and doors	
Interior Finish		
Ceiling	Plastic panels (W = 200 mm) (wooden grid base)	
Walls	General room	Hollow brick (t = 100 mm); mortar and synthetic resin emulsion paint finish
	Maternity room	Hollow brick (t = 100 mm); ceramic tiling (on mortar base) up to the ceiling
	Sterilizing room Postnatal care room Hand washing area	Floor level to H = 1,500 mm Hollow brick (t = 100 mm); ceramic tiling (on mortar base)
	Testing laboratory room	H = 1,500 mm to the ceiling Hollow brick (t = 100 mm); mortar and synthetic resin emulsion paint finish
Skirting	Synthetic resin emulsion paint finish	
Floor	Ceramic tiles (400 mm x 400 mm each) on top of concrete slabs	

As a result of the field survey and discussions with the Vietnamese side, the building plan for the health centres has been altered as described below, reducing the originally planned floor area.

- Khanh An General Clinic

The original plan anticipated eight rooms in one building. However, the construction of two buildings with three rooms and four rooms respectively has been agreed with the Vietnamese side because of the layout of the existing buildings. As a result, the overall floor area has now been reduced by 46 m^2 from the original figure.

- Khanh Lam Health Centre

The original plan is unchanged because there is enough space for construction at the site.

- Khanh Tien Health Centre

The original plan anticipated a room length of 7 m and a corridor width of 2 m. However, because of the limited availability of space at the planned construction site, it has been agreed with the Vietnamese side to reduce the corridor width to 1.5 m. As a result, the overall floor area has now been reduced by 10 m^2 from the original figure. As there is already a building at the planned construction site, this building must be removed.

- Khanh Binh Tay Bac Health Centre

The original plan is unchanged because there is enough space for construction at the site. However, if preservation of the original floor area is given priority, the new building is likely to interfere with the existing flowerbeds and other features, making their removal as well as repair work necessary.

- Tran Hoi Health Centre

While a building length of 12 m (equivalent to three rooms) was originally planned, it has been agreed with the Vietnamese side to reduce this length to approximately 10.8 m because of the tight space at the planned construction site, in turn due to the layout of the existing buildings. As a result, the overall floor area has now been reduced by 10.8 m^2 from the original figure.

2) Medical Equipment

A request for the provision of new medical equipment under the Project was made by a number of health centres, clinics and district hospitals via the Health Department of the Ca Mau Provincial Government and a field investigation of these medical facilities was

conducted in response to such request. The medical care system in Vietnam is that health centres and clinics are responsible for initial examination while district hospitals treat seriously ill patients. However, the budgetary shortfall across the board means a shortage of vital medical equipment and the inability of these medical facilities to procure new equipment to replace out-of-date or broken-down equipment. In view of this situation, it has been decided to provide some medical equipment under the Project. The quantity of medical equipment has been determined to be the minimal for each type of facility to perform its assigned work, taking the quantity of the existing equipment into consideration.

Table 2-2-2-3-7 List of Medical Equipment I (for Health Centres)

1 Bill of Quantity for health Center
(Medical Equipment-1)

No.	Equipment	Specification	unit	Location (Clinic and Health Center)								Total
				Khanh An	Nguyen Phich	U Minh Town	Khanh Hoa	Knanh Lam	Knanh Tien	Knanh Binh Tay Bac	Knanh Hoi	
1-1	Ultrasound diagnostic apparatus, potable type	Black and White, 1 transreceiver 3.5MHz,wide-range spectrum	pcs	1	0	0	1	0	0	0	0	2
1-2	Electrocardiograph	1 channel, 12 sub-channels to switch	pcs	1	0	0	0	0	0	0	0	1
1-3	Electric Suction Unit	output 30 litters/min	pcs	1	1	1	1	1	1	1	1	8
1-4	Mobile oxygen Concentrator	Capacity 90-95 litters of oxygen/min	pcs	2	0	0	0	0	0	0	0	2
1-5	Oxygen Cylinder	6m3, capacity 30 litters of oxygen/min	pcs	0	2	2	2	2	2	2	2	14
1-6	Steam Pressure Sterilizer	capacity 16 litters	pcs	1	1	1	0	0	0	0	0	3
1-7	Minor Surgical Instrument set	15 standard accessories	set	1	1	1	1	1	1	1	1	8
1-8	Urine analysis instrument	10 indicator	pcs	1	1	1	1	1	1	1	1	8
1-9	Nebulizer	output 8 litters/min	pcs	1	1	1	1	1	1	1	1	8
1-10	Generator	6.5kW, 220V, single phase, emergency use with 2 circuit breakers, power cables and installation	set	0	1	1	1	1	1	1	1	7
		10kW (13HP), 220V, single phase, emergency use with 2 circuit breakers, power cables and installation	set	1	0	0	0	0	0	0	0	1

Table 2-2-2-3-8 List of Medical Equipment II (for District Hospitals)

2 Bill of Quantity for district hospital
(Medical Equipment-2)

No.	Equipment	Specification	unit	Location (District Hospital)		Total
				U Minh	Tran Van Thri	
2-1	**Magnetic Hand-washer system**	**For 2 surgery persons, stainless steel, 220V, black design with pre-filter,220V**	**pcs**	**1**		**1**
2-2	**Breath support**	**Two air cylinder type with screen, capacity and pressure controlled breathening method, 220V**	**pcs**	**1**		**1**
2-3	**Medium Surgical instrument set**	**33 standard accessories**	**set**	**1**		**1**
2-4	**Mobile X-ray diagnostic apparatus**	**Max. current 160mA, 220V**	**pcs**		**1**	**1**
2-5	**Gastrofibroscope**	**With camera video system, 220V**	**pcs**		**1**	**1**
2-6	**Colposcope**	**With camera video system, 220V**	**pcs**		**1**	**1**
2-7	**Monitor**	**5 indicators, 220V**	**pcs**	**1**	**1**	**2**
2-8	**Infant incubator**	**Double layer wall, 220V**	**pcs**	**1**	**1**	**2**

(3) Education Sector

The classrooms of the existing elementary schools measure some 7.5 m x 6.5 m with a 1.2 m - 1.5 m wide corridor provided on both sides even though only the corridor on one side is actually used. Parts of some classrooms are sectioned for use as a staff room and teaching aid storage room. While toilets are housed in a separate building, many schools consist of classrooms only.

According to the standard drawing for school buildings obtained from the Vietnamese side, the standard dimensions are 6.6 m x 5.7 m for classrooms, 3.3 m x 5.7 m for staff rooms and 1.8 m – 2.0 m for the corridor width. In rural areas, the low population density means that the standard number of pupils per classroom is 24 – 30. The operation of the single shift system at all elementary schools is planned in the near future. However, as most elementary schools currently operate a double shift system, the design for the new school facilities is based on 60 pupils (30 pupils per classroom x 2). Assuming a double shift system for all five grades, each school will require at least three classrooms and one staff room. In regard to the toilets, separate toilets for teachers and pupils have been requested. However, as common toilets for both teachers and pupils can perform the intended function, the new toilets are designed for common use by teachers and pupils. The number of cubicles is determined based on one cubicle per classroom and the same number of cubicles will be introduced for males and females. The floor area for urinals for males is included in the planned floor area based on the assumption that this will occupy a floor area of approximately half of a cubicle.

The basic design concept and policies adopted for the new health centre buildings also apply to the new or additional school buildings and the following specifications are adopted as suggested by the standard school drawing in Vietnam.

- Building size: single storey
- Classroom dimensions: 6.6 m x 5.7 m
- Staff room dimensions: 3.3 m x 5.7 m
- Corridor: 2 m wide single side type
- Others: introduction of storage space in each classroom

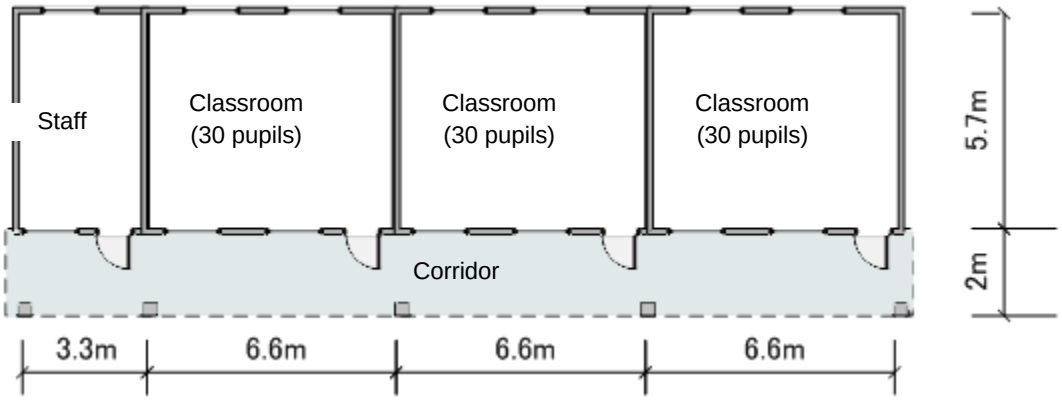


Fig. 2-2-2-3-2 Standard Plan for Three Classroom Type Elementary School

The building service facilities will be lighting, power outlets and ceiling fans. At those schools where toilets and/or a well are constructed, a toilet water supply system with an elevated water tank and septic tank, etc. will be installed as roughly illustrated in Fig. 2-2-2-3-3.

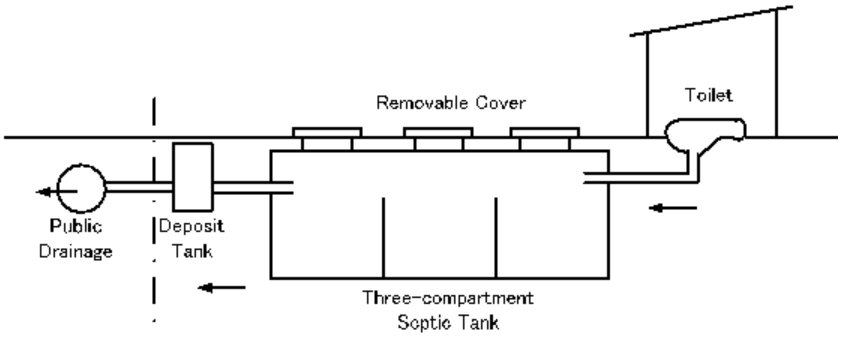


Fig. 2-2-2-3-3 Conceptual Drawing of Foul Water Drainage System

(4) Road Sector

1) Design Subjects

The outline design will be conducted for those roads and bridges of which the priority grade is assessed as "A" in Table 2-2-2-1(4)-1. The basic plan for these roads and bridges is shown in Table 2-2-2-7(4)-1.

Table 2-2-2-7(4)-1 Basic Plan for Roads and Auxiliary Bridges

Route No.	Road Length (km)	No. of Auxiliary Bridges	Bridge Span (m)/Material	Irrigation/Drainage Facilities
2	5.0	-	-	∅300, L = 3.5 m x 10 sites
3	4.0	1	10 + 10 + 10/concrete	∅300, L = 3.5 m x 8 sites
4	8.2	1	10 + 10 + 10/concrete	∅300, L = 3.5 m x 15 sites
	-	1	15 + 15 + 15/steel	-
7	6.2	1	10 + 10 + 10/concrete	∅300, L = 3.5 m x 12 sites
8	- 5.0	1 1	10 + 10 + 10/concrete 10 + 10 + 10/concrete	 ∅300, L = 3.5 m x 10 sites
	-	1	7 + 10 + 7/concrete	
12	1.5	-	-	∅300, L = 3.5 m x 3 sites
13	2.0	-	-	∅300, L = 3.5 m x 4 sites
Total	31.9	7		

2) Important Points for Road Design

a. Social Conditions

(a) As canals presently provide the main transportation routes in the area, the roads crossing canals must not disrupt the canal functions.

[Countermeasure]
Although the required clearance of a canal-crossing bridge varies from one canal to another, clearance below the girders of 2.0 – 2.5 m will be secured for transportation canals which the subject roads will cross.

A bridge over a relatively wide canal: 2.8 m clearance between the girder and the water level is secured to allow navigation.

1.5 – 2.5 m clearance between the girders and the water level is required for navigation even for a small canal.

(b) While the requested roads are parallel to canals, these canals have been simply dug out with hardly any revetments. As a result, the canal width has widened due to bank erosion, resulting in the washing of the bed of the roads which run parallel to the canals.

[Countermeasure]
The introduction of revetment will be considered depending on the necessity.

(c) As houses are situated at canal-crossing sections, their relocation will be required for the construction of roads and/or bridges.

[Countermeasure]
The introduction of a ferry service or detour will be considered as an alternative to bridge construction.

b. Natural Conditions

(a) Rainy Season
The local rainy season lasts from May to October. During this period, it rains every day, causing a high level of humidity. Although there is little concern regarding flooding due to the frequent rain, earth work will be practically impossible at the construction sites in the rainy season.

[Countermeasure]
The rainy season will be taken into consideration when the road paving schedule is prepared.

(b) Soil and Other Geological Conditions in the Mekong Delta Area
The project area is covered by some 20 m thick alluvium of the Mekong Delta. Alluvium is cohesive soil. As any disturbance of the ground further softens this soil, consolidation settlement due to the loaded weight is expected to occur. At some of the existing bridges, the abutments have become uneven because of settlement, making vehicle passage difficult. The CBR value of GL -1.0 m is measured at 1.3 – 1.5.

[Countermeasure 1]
The structural foundations (bridge foundations) will be pile foundations supported by the bedrock. 5 m long approach slabs will be introduced at the bridge approach section to counteract any settlement of the approach section after the work.

[Countermeasure 2]
As any disturbance of the existing ground leads to lowering of the bearing power, the subgrade materials will be banked on to the existing ground. Compression settlement will be prevented by asphalt concrete paving.

(c) There is a formation containing sulphate around GL -0.5 m. Because of this formation, the water in the canals tends to be acidic (around pH 3.5).

[Countermeasure]
Acid-resistant concrete will be used for the structures and road paving.

Deterioration of concrete road paving

3) Design Conditions

a. Target vehicles using the roads
Motorcycles: 200 kg/vehicle

b. Road width
Carriageway width: 2.5 m

c. Paving
Bituminous paving (asphalt macadam)

d. Design load for bridges
Commune road bridge: capable of supporting 2.8 ton vehicles
District road bridge: capable of supporting 10 ton vehicles

e. Requested bridge span
Assuming a maximum bridge length of 1.5 m, the unit spans will be planned accordingly. The unit spans and overall bridge length will be re-examined in the detailed design, referring to the actually measured canal width and particulars of nearby bridges.

f. The contents of the detailed design will conform to the standard design and specifications in Vietnam. However, the AASHTO or commonly used specifications in Japan will be referred to in order to determine new specifications for those matters which are technically problematic.

4) Types of Road Paving

Bituminous paving will be adopted for the planned roads based on the overall assessment results of the road paving cost per unit area and level of workability, etc. as shown in the table below.

Table 2-2-2-7(4)-2 Comparison of Road Paving Cost per Unit Area (m^2)

(Unit: U$)

	Concrete Paving		Bituminous Paving	
	Cost	Specifications	Cost	Specifications
Surface	25.3	Slab thickness: 10 cm	10.2	Surface thickness: 4 cm
Base Course	3.3	T = 15 cm	5.5	T = 25 cm
Sub-Base Course	2.9	T = 20 cm	2.9	T = 20 cm
Waterproofing Membrane	1.5	Including preparation work	1.5	Including preparation work
Total	33.5		20.1	

Table 2-2-2-7(4)-3 General Comparison

Type of Paving / Comparison Item	Concrete Paving		Bituminous Paving	
	Evaluation	Special Notes	Evaluation	Special Notes
Workability	O	Direct concrete placing after shaping of the base course	Δ	Asphalt is sprayed in six separate operations
Work Management	X	Mixing of concrete	Δ	
Applicability to Soft Ground	Δ		O	Can accommodate uneven settlement
Post-Work Maintenance	O		O	Shorter life expectancy that concrete paving
Construction Cost	X		O	
Overall Evaluation	Δ		⊙	

2.2.3 Outline Design Drawings

The outline design drawings for the Project can be found in the Appendix of this report and a list of the drawings is given below.

(1) Forest Land Improvement (Embankment)

F-E01 Plan for Embankment in U Minh I Forest Company
F-E02 Plan for Embankment in U Minh II Forest Company
F-E03 Plan for Embankment in Tran Van Thoi Forest Company
F-E04 Plan for Embankment in April 30 Forest Company
F-E05 Plan for Embankment in Song Trem Forest Company
F-E06 Typical Cross Section of Forest Land Improvement (Embankment)
F-A01 An Example of Combined Land Use with Agriculture, Forestry and Fishery

(2) Construction of Canals

C-C01 Typical cross section of new canal and banks

(3) Roads and Bridges

R-R01 Typical Cross Section
R-R02 Structure of Bituminous Surface Course
R-B01 Bridge General View
R-B02 Bridge Pier General View
R-B03 Bridge Abutment General View
R-B04 Bridge Superstructure Cross Section
R-B05 Bridge Approach I-Type
R-B06 Bridge Approach T-Type

(4) Buidings

1) Forest Fire Monitoring Stations and Towers

A-F01 Fire Monitoring Station
A-F02 Fire Watch Tower

2) Primary Schools

A-S01 Lam Ngu Truong I Primary School Master Plan
A-S02 Lam Ngu Truong I Primary School (5 Classrooms and 1 Teacher's room) x 2 Buildings
A-S03 Lam Ngu Truong I Primary School Toilet
A-S04 Lam Ngu Truong II Primary School-Branch 1 Master Plan
A-S05 Lam Ngu Truong II Primary School-Branch 1 (4 Classrooms and 1 Teacher's room)
A-S06 Lam Ngu Truong II Primary School-Branch 1 Toilet
A-S07 Lam Ngu Truong II Primary School-Branch 2 Master Plan

A-S08 Lam Ngu Truong II Primary School-Branch 2 (2 Classrooms)
A-S09 Khanh Binh Tay Bac II Primary School Master Plan
A-S10 Khanh Binh Tay Bac II Primary School 4 Classrooms
A-S11 Khanh Binh Tay Bac II Primary School Toilet
A-S12 U Minh III Primary School Master Plan
A-S13 U Minh III Primary School (1 Classroom)

3) Health Centers

A-H01 Khanh An General Clinic Master Plan
A-H02 Khanh An General Clinic Bldg.-A (3 Rooms)
A-H03 Khanh An General Clinic Bldg.-B (4 Rooms)
A-H04 Khanh Lam Health Center Master Plan
A-H05 Khanh Lam Health Center 8 Rooms
A-H06 Khanh Tien Health Center Master Plan
A-H07 Khanh Tien Health Center 5 Rooms
A-H08 Khanh Binh Tay Bac Health Center Master Plan
A-H09 Khanh Binh Tay Bac Health Center 4 Rooms
A-H10 Tran Hoi Health Center Master Plan
A-H11 Tran Hoi Health Center 3 Rooms

2.2.4 Implementation Plan

2.2.4.1 Work Execution and Procurement Policies by the Procurement Agent

The Project will be executed in accordance with Japan's grant aid scheme for community empowerment. Accordingly, Project execution will commence immediately after its authorisation by the Government of Japan and the signing of the Exchange of Notes (E/N) by the Government of Japan and the Government of Vietnam. The basic matters and particularly important points relating to the execution of the Project are described below.

(1) Project Implementing Body

The responsible and supervisory organization for the execution of the Project on the Vietnamese side will be the Provincial People's Committee of Ca Mau (PPC) and the project implementing body will be the Project Management Unit (PMU), the member of which will represent the various departments and bodies involved in the Project. The Department of Agriculture and Rural Development (DARD) will be responsible for the running of the PMU. After the completion of the facility construction and equipment installation under the Project, the departments and others represented in the PMU will be responsible for the operation and maintenance of such facilities and equipment. In accordance with the mechanism of Japan's grant aid scheme for community empowerment, the PMU must maintain close contact and collaborate with the procurement agent in Japan recommended by the Government of Japan and with the consultant as well as contractor selected by the said procurement agent and must fully explain the contents of the Project to local residents with a view to obtaining their cooperation for the execution of the Project.

(2) Procurement Agent

The procurement agent will be recommended by the Government of Japan to the Vietnamese side and will act as the entrusted agent for the PPC and PMU to manage all of the work related to the Project so that the agreements (regarding the detailed deign, tender, facility construction, equipment procurement and execution of the soft component) are smoothly executed in an appropriate manner. The procurement agent will also manage the project funds on behalf of the Vietnamese side.

(3) Consultant

The procurement agent will conclude a design and supervision agreement with the consultant selected by the tender process to prepare the detailed design for the facilities and equipment and the tender documents and to supervise the equipment procurement and installation work. The consultant will then prepare the detailed design and tender documents for the Project and will

conduct the construction and procurement supervision work. The consultant may provide assistance for the pre-qualification and tender if so requested by the procurement agent.

(4) Contractor

The contractor selected by the open tender organized by the procurement agent in accordance with the mechanism of Japan's grant aid scheme will conduct the construction of the facilities and the procurement and installation of the equipment under the Project.

As such after-care as the supply of the necessary spare parts and response to equipment breakdown, etc. is believed to be necessary after the completion of the Project, the contractor must give full consideration to the communication and liaisoning system with the Vietnamese side after the handing over of the facilities and equipment in question to the Vietnamese side.

(5) Necessity for Dispatch of Japanese Engineers

Although the detailed design, construction of facilities, procurement of equipment and execution of the soft component under the Project will basically be conducted by the Vietnamese consultant and contractor, it will be essential to dispatch Japanese engineers capable of the consistent management and guidance on technical issues relating to the Project to Vietnam as staff members of the procurement agent to conduct the checking of the detailed design, technical evaluation of the bids, control of the construction and equipment installation schedule and quality as well as safety management.

In regard to the forest land improvement (embankment) work and canal construction work in particular, as there are few local consultant engineers with the necessary technical expertise to minimise the adverse impacts of acid sulphate soil on the environment, the dispatch of such engineers from Japan will be essential.

2.2.4.2 Implementation Conditions (Contracts and Dispute Settlement)

(1) Situation of Construction Industry in Vietnam

There are more than 10 local companies capable of conducting the construction of the planned facilities under the Project in Ca Mau Province and its surrounding area. These companies have conducted forest land improvement (embankment) work and the construction of roads, health centres and/or school buildings for the relevant administrative bodies for these structures in Ca Mau Province in the past and can secure the services of the necessary engineers and workers. In the case of the equipment to be procured under the Project, most of the equipment can be procured in the market of Ho Chi Minh City, the second-most important city in Vietnam, and no

problems are anticipated for the import of foreign products by a local trading firm. However, the financial strength of local construction companies and trading firms may be insufficient, payment and other relevant matters must be taken into consideration.

(2) Important Points for the Planning of Work Execution

1) The project area has a dry season from November to April and a rainy season from May to October. There is little temperature fluctuation as the mean minimum and maximum monthly temperatures are 25.8°C and 29.7°C, respectively. During the rainy season, the monthly rainfall level of 200 mm – 500 mm is fairly high with the highest monthly rainfall recorded in the last five years of 541 mm. Towards the end of the rainy season, the area tends to be hit by 4 – 6 typhoons every year. It is, therefore, essential for the planning of the facility construction work, including the embankment work, to take rainwater drainage measures into consideration. The work schedule in the rainy season must also be given careful consideration.

2) The transportation of goods in the U Minh Ha area and Mekong River Delta area is mainly conducted by boats navigating canals rather than trucks on the road or cargo trains. For the execution of the Project, it is planned to use the canal network to transport not only the construction materials and construction machinery and tools required for the facility construction and equipment installation but also workers. Consequently, the transportation routes and transportation volume may be subject to some restrictions based on the transportation capacity of individual canals and other factors, making careful planning of the work schedule necessary.

3) While the electrification rate in Vietnam exceeds 90%, the U Minh Ha area, i.e. the project area, suffers from long power cuts (three times a week with a maximum power cut duration of some 12 hours each time) despite the presence of distribution lines connected to the grid. The provision of power generators will, therefore, be necessary during the facility construction and equipment installation periods as a preparatory measure for power cuts.

4) Similar to the power supply, the U Minh Ha area does not have a well-established water supply system. At those sites where a nearby borehole is unavailable, careful consideration must be given to the securing of the water supply for the work. Canal water cannot be used for concrete preparation because of its high acidity level (around pH 3).

5) When the cutting of existing trees is found to be necessary for the work, the appropriateness of the timing and scale must be checked with the PMU in advance. At the same time, the necessary measures should be taken to ensure the acceptance of the planned work by the

PPC and the understanding of local residents in order to avoid environmental problems and/or conflict with local residents.

2.2.4.3 Contract Lots and Tender

(1) Contract Lots

The contract lots described below for the construction of facilities and equipment supply will be introduced in view of the scale of the planned work and the value of the equipment to be procured.

In regard to the forest land improvement (embankment) work, five lots (five sites) will be set up because of the wide dispersion of the five subject sites and the vast subject area of 448 ha in total, and also because of the limited scope of the construction machinery which can be arranged by a single construction company.

The involvement of foreign trading firms in the export, import and local sale of goods was prohibited in Vietnam until 2006. The accession of Vietnam to the WTO in January, 2007, however, has made it possible for foreign trading firm to establish local subsidiaries in Vietnam. Because of this historical background, private companies with the business functions of a trading firm have not yet fully developed. For this reason, the individual equipment required under the Project will basically be procured directly from the manufacturer (or agent). However, in the case of medical equipment, as there is an agent which handles such equipment of various manufacturers, all of the medical equipment can be bundled into a single lot. On the other hand, Vietnamese side wants to unbundle the single lot of medical equipment into four from the view point of the capability of local agents and enhanced copmetitiveness.

Article 22-1 of the Tender Law of Vietnam (No. 61/2005/QH11) stipulates that the selection of a supplier can be based on the lowest quote among at least three bidders when two conditions, i.e. (i) the total procurement value is less than 2 billion VND and (ii) the equipment to be procured is general equipment marketed in Vietnam, are met. Meanwhile, the Procurement Guidelines for Grant Aid for Community Empowerment (Bilateral) (July, 2006, MOFA, Japan) specify the procurement methods for other than general competitive tendering as follows.

[Procurement Guidelines for Grant Aid for Community Empowerment (Bilateral)]

Part 3
II. Procurement Procedures
2. Procurement Method

(2) Procurement Methods Other Than Competitive Tendering

If competitive tendering is deemed to be inappropriate or impractical due to any of the following circumstances, the procurement agent is permitted to proceed with procurement based on selective tendering, quoted price comparison or direct contracting.

1) When spare parts or accessories for existing equipment or a type of equipment of which the number of manufacturers is limited are to be procured (in this case, direct contracting with a manufacturing or agent is expected to take place)

2) When there are adequate reasons to maintain the uniformity or continuity of the service, etc. provided under an existing contract (in this case, direct contract with the provider(s) of the service, etc. in question is expected to take place)

3) When the number of suppliers to satisfy the required qualifications in limited (in this case, either selective tendering or quoted price comparison is expected to take place)

4) When it is very doubtful that prospective tenderers will be interested in participating in competitive tendering because of the small contract amount and, therefore, the advantage of competitive tendering will be outweighed by the administrative burden involved (in this case, either selective tendering or quoted price comparison is expected to take place)

5) When re-tendering is necessary because part or whole of the original tender procedure was not successfully competed (in this case, either selective tendering or quoted price comparison is expected to take place)

6) When emergency procurement is required to provide urgent assistance for natural disaster victims or humanitarian assistance (in this case, either selective tendering or quoted price comparison is expected to take place)

7) When consultancy services are to be procured (in this case, competitive tendering based on the contents of a technical proposal or direct contracting based on the recommendation of the Government of Japan or JICA is expected to take place)

In view of the geographical condition of Ca Mau Province, i.e. the project area, being located in the southernmost province of Vietnam with poor transport access from major cities and also in view of the prospect that the number of prospective tenderers will be small due to the small contract amount for individual equipment, the selection of suppliers based on either selective tendering or quoted price comparison is recommended if the tender value is less than 2 billion VND as stipulated by the Tender Law of Vietnam.

The lots for tender and contract (draft) based on the above considerations are shown in Table 2-2-4-3-1.

Table 2-2-4-3-1 Lots for Tender and Contract (Draft)

Type of Facilities/Equipment	Description	Lots for Tender and Contract
I. Civil Engineering Work		
(1) Forest Land Improvement (Embankment)	Embankment of forest land: 448.2 ha Model Farms: 10ha x 5	Tender-1 (The successful bidder(s) for the following five lots will be decided by a single bidding.) - Lot No. 1: Song Trem F.C. (50 ha) - Lot No. 2: April 30 F.C. (85.4 ha) - Lot No. 3: U Minh II F.C. (120.8 ha) - Lot No. 4: U Minh I F.C. (85.0 ha) - Lot No. 5: Tran Van Thoi F.C. (107 ha)
(2) Construction of Canals	Total length: 12.9 km	Tender-2 (Lot No. 6)
(3) Construction of Roads and Bridges	Total road length: 31.9 km Bridges: in seven locations	Tender-3 (Lot No. 7,8,9,10) 4 Lots
II. Construction Work		
(1) Forest Fire Monitoring Stations and Towers	Monitoring stations: 12 Monitoring towers: 12	Tender-4 (Lot No. 11~14) - Lot No. 11: Monitoring stations - Lot No. 12: Monitoring towers - Lot No. 13: Primary Schools - Lot No. 14: Health Centres
(2) Elementary Schools	Construction of one new school (10 classrooms and two staff rooms) Expansion of four schools (11 classrooms and one staff room in total)	
(3) Health Centres	Expansion or reconstruction of five health centres	
III. Equipment Procurement		
(1) Construction Machinery (Excavators)	Excavators: 8	Tender-5 (Lot No. 15)
(2) Pontoons for Transportation of Excavators	Pontoons: 8	Tender-6 (Lot No. 16)
(3) Forest Fire Extinguishing Equipment and Drainage Pumps	Fire pumps and accessories: six sets Agricultural drainage pumps: 12 units	• Lot No. 17: Fire pumps and accessories • Lot No. 18: Agricultural drainage pumps.
(4) Radio Communication Equipment	Radio repeater, antenna and radio handset for six forest companies	• Lot No. 19: Radio Communication Equipment
(5) Wood Processing Machinery	Wood dryer	Tender-7 (Lot No. 20)
	Other wood processing machinery	• Lot No. 21: Other wood processing machinery
(6) Medical Equipment	Medical equipment for eight health centres Medical equipment for two district hospitals	Tender-8 (Lot No. 22~25) -Lot No.22: Mobile X-ray diagnostic apparatus -Lot No.23: Medical equipment for U Minh District Hospital -Lot No.24: Medical equipment for Tran Van Thoi District Hospital (other than mobile X-ray diagnostic apparatus) -Lot No.25: Medical equipment for health centres
	Generators for Health Centres (6.5kW x 7 and 10kW x 1)	• Lot No. 26:Generators for Health Centres

(2) Planning of the Tender

1) Consultant for the Detailed Design and Work Supervision

In Vietnam, there is more than one consultancy firm in Ca Mau Province and Ho Chi Minh City which is capable of conducting the detailed design and work supervision of the civil engineering work and building construction similar to that planned under the Project. The consultant for the Project will be selected by the following procedure.

① Public invitation of proposals and declaration of interest
② Preparation of a short list
③ Distribution of the terms of reference (proposal forms and order specifications, etc.)
④ Evaluation of the proposals
⑤ Contract negotiations and signing of the consultancy agreement

2) Contractors for Facility Construction and Equipment Procurement

Based on the (draft) lots for the tenders and contracts shown in Table 2-2-4-3-1, the contractors for the facility construction and equipment procurement will be selected. The contractor for the civil engineering work will be selected by the process of open competitive bidding with pre-qualification. Meanwhile, the equipment suppliers will be selected by the process of the open competitive bidding or quote comparison method in accordance with the categories shown in Table 2-2-4-3-1.

2.2.4.4 Scope of Works

The construction and other work under the Project will be divided between the Japanese side and Vietnamese side in accordance with the mechanism of Japan's grant aid scheme for community empowerment. The responsible sides for the main work items are shown in Table 2-2-4-4-1.

Table 2-2-4-4-1 Division of the Construction, Procurement and Installation Work Between the Two Countries

Work Description	Equipment Procurement		Activities (Execution/ Installation[*1]; Skill Transfer [*2]; O&M [*3])		Remarks
	Japan	Vietnam	Japan	Vietnam	
A. Forest Land Improvement (Embankment)					
1. Procurement of excavators and pontoon for five forest companies (FCs)	O			O[*2*3]	
2. Model construction of embankments in area belonging to the FCs			O[*1]	O[*2]	Total area: approx. 448 ha
3. Construction of L-shaped ditches for model paddy fields			O[*1]	O[*2]	
4. Procurement of water level adjustment pumps	O			O[*2*3]	
5. Procurement of Melaleuca wood processing equipment	O			O[*2*3]	
6. OJT on O & M skills for excavators, pontoons and wood processing equipment			O[*1]		For staff members of the FCs
B. Construction of New Canals					
1. Construction of new canals			O[*1]		Total length: approx. 12.9 km
2. Application of environmental consideration measures for the PPC's Department of the Environment				O[*1]	
3. Public notice and explanation of the work for the new canals to local residents living near the canal construction sites				O[*1]	
C. Forest Fire Prevention Equipment and Facilities					
1. Fire extinguishing pumps	O			O[*3]	With hoses and attachments
2. Fire monitoring stations (2 x 6 FCs)			O[*1]	O[*3]	
3. Fire monitoring towers (2 x 6 FCs)			O[*1]	O[*3]	
4. Radio communication equipment			O[*1]	O[*3]	
5. Site grading work (if necessary)				O[*1]	
6. Application for building permission (if necessary)				O[*1]	To the Department of Construction (DoC)
D. Construction/Expansion of Community Health Centres					
1. Construction/expansion of five health centres			O[*1]		
2. Site grading work and access road (if necessary)				O[*1]	
3. Application for building permission (if necessary)				O[*1]	To the DoC
4. Procurement of medical equipment for eight health centres and two district hospitals	O			O[*3]	
5. Installation of medical equipment				O[*1]	
E. Construction of Commune Roads					
1. Construction of commune roads			O[*1]		Total length:

Work Description	Equipment Procurement		Activities (Execution/ Installation[*1]; Skill Transfer [*2]; O&M [*3])		Remarks
	Japan	Vietnam	Japan	Vietnam	
					approx. 32 km (2.5 m wide)
2. Construction of bridges			O[*1]		Total: 7
3. Application of environmental and social consideration measures to the PPC's Department of the Environment and removal of people illegally occupying the roadway in question				O[*1]	
4. Public notice and explanation of the work for the new roads to local residents living near the road construction sites				O[*1]	
F. Improvement of Primary Schools					
1. Construction/expansion of five primary school buildings			O[*1]		
2. Site grading work (if necessary)				O[*1]	
3. Application for building permission (if necessary)				O[*1]	To the DoC
4. Procurement of blackboards, desks and chairs	O				
G. Others (Common Items)					
1. Temporary work, including the construction of site offices, preparation of construction machinery and construction of consultant office	O		O[*1]		Including temporary water and electricity supply and telephone lines, etc.
2. Temporary PMU office (with the necessary equipment and services)		O		O[*1]	
3. Land for temporary facilities, storage and work yards for the Project		O			
4. Payment of temporary water and electricity charges and telephone charge, etc.	O		O		
5. Payment of fuel and lubricant oil costs for construction machinery, etc.	O		O		During construction work

Note: O indicates the side responsible for the work in question.

2.2.4.5 Consultant Supervision

In accordance with Japan's grant aid scheme for community empowerment, the procurement agent will employ a local consultant to be responsible for the detailed design and work supervision based on the design concepts adopted in the outline design and Japanese engineers to provide guidance for staff members of the local consultant to ensure the smooth progress of the Project. During the construction period, the procurement agent will appoint and station at least one full-time manager in the project area with a view of ensuring proper schedule control, quality management, safety management and

fund management with the technical guidance of the employed local consultant and Japanese engineers. If necessary, additional Japanese engineers will be dispatched in line with the work progress to supervise the various types of work to be conducted by the contractor.

Moreover, the procurement agent will dispatch specialist engineers (Japanese or Vietnamese), if necessary, for the factory inspection and pre-shipment inspection of the equipment to be manufactured in Japan or a third country to prevent in advance any equipment problems after delivery to the project sites.

(1) Basic Concept for Work Supervision

The procurement agent will supervise the contractor with the cooperation of the local consultant and Japanese engineers in view of the smooth progress of the work to its completion within the predetermined schedule without any accidents while meeting the quality specified in the agreement. The most important points for the work supervision are indicated next.

1) Schedule Control

The planned schedule of the contractor at the time of the signing of the agreement will be compared with the actual weekly and monthly progress for the following matters. If it is judged that a delay may occur, the procurement agent will issue a warning to the contractor. The procurement agent will also demand that the contractor submit measures to prevent the delay so that the work is completed in line with the schedule.

① Checking of the work progress
② Checking of the equipment and materials which have actually been delivered
③ Checking of the production rate and actual number of engineers, technicians and workers, etc. at work

2) Quality Management

The procurement agent will supervise the contractor by means of the following actions to ensure that the latter meets the quality of the facilities and equipment specified in the contract documents (technical specifications and detailed design drawings, etc.) If it is judged to be doubtful that the required quality will be met, the procurement agent will demand that the contractor makes the necessary revisions, changes or modifications.

① Checking of the shop drawings and equipment specifications
② Checking of the factory inspection results for the equipment and witnessing of such inspection

③ Checking of the equipment installation manuals, on-site test operation, adjustment and inspection manuals and working drawings
④ Supervision of the on-site equipment installation work and witnessing of the test operation, adjustment and inspection
⑤ Checking of the working drawings for the facilities
⑥ Verification of the completed site work with the working drawings for the facilities

3) Safety Management

The procurement agent will discuss and collaborate with the site managers of the contractor to ensure the prevention of any on-site labour disasters or accidents during the construction period. Special attention must be paid to the following points for on-site safety management.

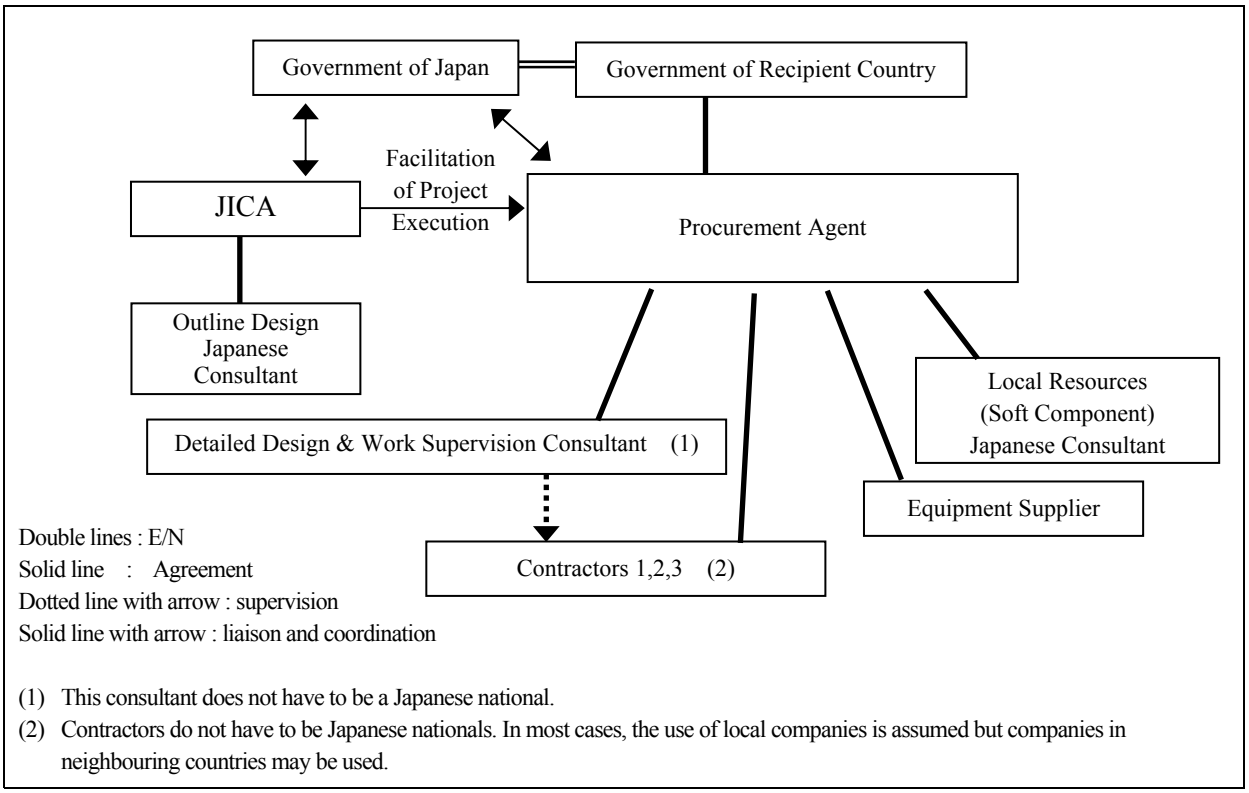
① Formulation of safety management rule and selection of a safety manager
② Prevention of disasters through the periodic inspection of machinery and equipment
③ Formulation of travelling routes for work vehicles, boats and construction machinery, etc. and strict enforcement of slow movement
④ Strict implementation of welfare measures and regular days off for worker

4) Fund Management

As indicated in the E/N between the Government of Japan and the Government of Vietnam, the procurement agent will manage the project funds on behalf of the PMU which is the project implementing body. Following the signing of the E/N, the project fund will be paid into an account opened by the implementing body at a Japanese bank. This money will then be transferred to an account opened by the procurement agent at a Japanese bank once the procurement agent agreement has been concluded between the PMU and the procurement agent. Payment to individual subcontractors and others will be made by the procurement agent in accordance with the specified payment condition of the respective agreements.

(2) General Framework for Project Execution

The relationship between the bodies involved in the execution of the Project, including that during the work supervision period, is shown in the following figure.



Source: JICA (2006),"Report for the Basic Study for Implementation of School Construction Projects Using Local Specifications and Design in Africa"

Fig.2-2-4-5-(1) Project Execution System

(3) Work Supervisors

The contractors will execute the facility construction work and equipment installation work in accordance with the work agreements exchanged with the procurement agent. It is unnecessary for the contractors to be Japanese nationals. In many cases, it is assumed that they will be local companies. But in some cases they may be companies based on a neighbouring country. Accordingly, these contractors will be responsible for schedule control, quality management and safety management during the construction period. It will be necessary for the procurement agent to use Japanese engineers to assist the work supervisors appointed by the contractors in those areas where the technical expertise of the supervisors is not fully adequate.

2.2.4.6 Quality Control Plan

The work supervisors of the local consultant with which the procurement agent has concluded a supervision agreement will conduct the actions listed below to ensure that the quality of the facilities and equipment specified in the contract documents (technical specifications and detailed design drawing, etc.) is met by the contractor(s). If they are concerned that such quality will not be met, they will consult with engineers of the procurement agent to issue a demand to the contractor(s) for revision, change or alteration. The engineers of the procurement agent will check the actions of the

work supervisors of the local consultant and will provide guidance for the work supervisors if necessary.

① Checking of the shop drawings and specifications for the equipment
② Witnessing of the factory inspection of the equipment or checking of the factory inspection reports
③ Checking of the packing, transporting and temporary on-site storage methods
④ Checking of the working drawings and installation manuals for the equipment
⑤ Checking of the factory as well as on-site test operation, adjustment and inspection manuals for the equipment
⑥ Supervision of the on-site equipment installation work and witnessing of the test operation, adjustment and inspection
⑦ Checking of the quantity of the work executed on-site against the working drawings for the facilities
⑧ Checking of the as-built drawings

2.2.4.7 Procurement Plan

Most of the construction materials to be used and equipment to be procured under the Project are produced in Vietnam. Some imported materials and equipment are readily available in the domestic market.

2.2.4.8 Initial Guidance on Operation and Other Relevant Issues

Among the equipment to be procured under the Project, the excavators (excavators) to create embankments and wood processing equipment to increase the added value of Melaleuca wood will require initial guidance on operation and subsequent operation and maintenance. An OJT plan which will be required during the period of the installation work and test operation is proposed below.

In the case of the pumps for forest fire extinguishing and medical equipment for health centres, as the planned equipment has the same specifications as the existing equipment, initial guidance on operation and subsequent operation and maintenance should be unnecessary once the equipment supplier has demonstrated the equipment at the delivery inspection stage to the Vietnamese personnel concerned.

(1) Purpose of OJT during Period of Installation Work and Test Operation

This OJT will be conducted to transfer the necessary operation and maintenance skills for the equipment to be procured and installed under the Project to the Vietnamese counterparts during the period of the installation work and test operation.

All of the equipment to be procured under the Project has been selected in consideration of the existing technical level of the forest company or health centre involved in the operation and maintenance of the existing equipment. However, as some of the planned equipment incorporates new technologies which have emerged since the delivery of the existing equipment, the engineers to be dispatched by the equipment manufacturers will provide OJT on the operation and maintenance skills to the Vietnamese personnel concerned during the period of the installation work and test operation to ensure the effective operation of the new equipment.

(2) Subject Equipment for OJT

1) Operation and Management of Eight Excavators to be Delivered to Five Forest Companies

The engineer to be dispatched by the manufacturer of these excavators for the purpose of conducting test operation and adjustment will act as the OJT instructor to train the excavator operators of the forest companies on operation and maintenance skills based on the instruction manual.

① Trainees

The trainees for this OJT will be those directly involved in the operation and/or maintenance of the excavators at the forest companies and each forest company will assign the following number of trainees.

- Chief engineer	:	1
- Operators	:	1 – 2
- Maintenance personnel	:	1 – 2 (mechanics)
Total	:	3 – 5 (per forest company)

② OJT Contents

- Classroom lecture (one day)

Basic education featuring the following items will be conducted on mainly the excavators using the instruction manual.

- Characteristics and structure of the excavators in question
- Operation and maintenance basics (basic idea of preventive maintenance, equipment functions, basic measures to deal with accidents and breakdowns, management of spare parts/tools and management of drawings/documents)

- OJT (four days)

  The engineer dispatched by the equipment supplier will conduct OJT with the following contents at the time of equipment delivery.

  • Starting up and stopping methods
  • Operating skills
  • Emergency stop method at the time of a breakdown
  • Monitoring and visual inspection methods
  • Periodic inspection and maintenance methods
  • Consumable replacement method
  • Others

2) Operation and Maintenance of Wood Processing Equipment to be Delivered to Song Trem Forest Company

The engineer dispatched by the manufacturer of the equipment in question for the purpose of conducting test operation and adjustment will act as the instructor and will train those involved in wood processing at the Song Trem Forest Company on the equipment operation and maintenance methods using the instruction manual.

① Trainees

The Vietnamese personnel to undergo this OJT will be operators and maintenance personnel who will be directly involved in the operation and maintenance of the wood processing equipment in question at the Song Trem Forest Company. It will be essential for the Song Trem Forest Company to designate the following trainees prior to the delivery of the equipment.

- Chief engineer	:	1
- Operators	:	2 – 3
- Maintenance personnel	:	2 – 3 (mechanics)
Total	:	5 - 7

② Training Contents

- Classroom Lecture (two days)

  Basic education mainly featuring the wood processing equipment (including the wood drying machine) will be provided on the following items using the instruction manual.

- Wood processing system
- Characteristics and structure of each equipment
- Operation and maintenance basics of each equipment (basic idea of preventive maintenance, equipment functions, basic measures to deal with accidents and breakdowns, management of spare parts/tools and management of drawings/documents)

- OJT (ten days)

  The engineer dispatched by the equipment supplier will conduct OJT with the following contents at the time of equipment delivery.

  - Starting up and stopping methods
  - Equipment operating skills
  - Temperature control of the dryer
  - Product assembly technique
  - Emergency stop method at the time of a breakdown
  - Monitoring and visual inspection methods
  - Periodic inspection and maintenance methods
  - Consumable replacement method
  - Others

2.2.4.9 Implementation Schedule

Following the authorisation of the Project's implementation by the Government of Japan and the signing of the Exchange of Notes (E/N) by the two countries, the procurement agent agreement (A/A) will be concluded between the PMU which is the project implementing body on the Vietnamese side and the procurement agent recommended by the Government of Japan to commence the process of project implementation in accordance with Japan's grant aid scheme for community empowerment. The Project will largely implemented in four stages, i.e. ① selection of the consultant responsible for the detailed design and work supervision, ② preparation of the detailed design and tender documents, ③ tender to select the contractor and conclusion of the construction agreement and ④ facility construction work and equipment procurement and installation work. The project implementation schedule is given in Fig. 2-2-4-9-1.

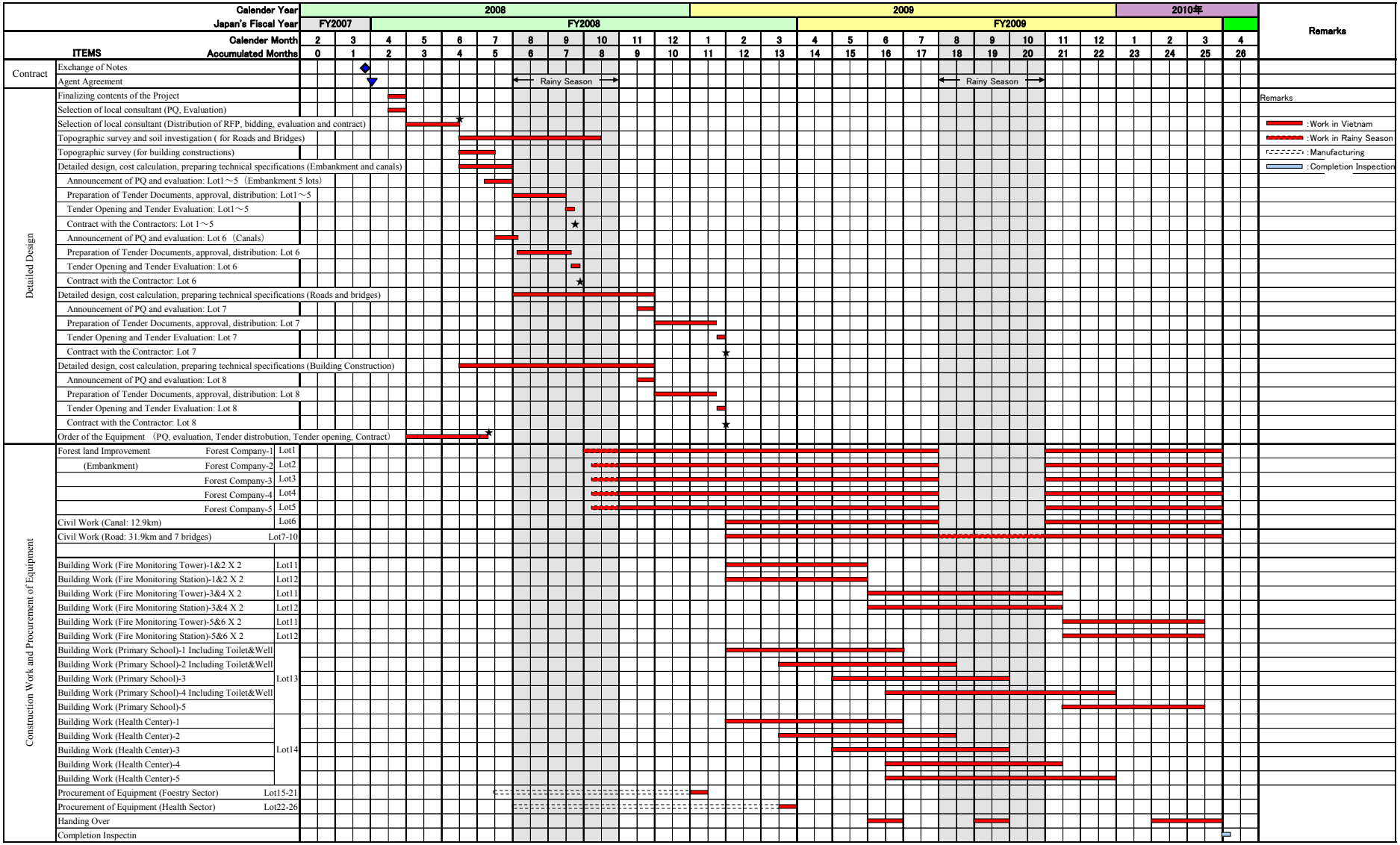


Fig. 2-2-4-9-1 Project Implementation Schedule

2.3 Obligations of the Recipient Country

In addition to the matters described in 2.2.4.4 – Division of the Construction, Procurement and Installation Work, the Vietnamese side will undertake the following matters for the implementation of the Project.

(1) Securing of the land for the construction of the facilities, demolition and removal of the existing buildings and other obstacles if necessary and preparation of the land

(2) Securing of temporary classrooms during the new school building construction period if necessary

(3) Construction of the access roads required to conduct the construction work if necessary

(4) Construction of perimeter fencing and gates if necessary

(5) Extension and connection of the water and electricity supplies to the project sites along with any other necessary incidental work

(6) Securing of the budget and manpower required for the appropriate and efficient operation and maintenance of the facilities and equipment provided under the grant aid project

(7) Accordance of Japanese and third country nationals serving for the Project such facilities as may be necessary for the entry to Vietnam and stay therein for the performance of their work

(8) Exemption of those involved in the Project from customs duties, VAT and other internal taxes and other fiscal levies imposed in Vietnam

(9) Payment of the commission for bank transfer to the Japanese bank

(10) Bearing of all expenses which are essential for the implementation of the Project but which are not covered by the Japanese grant aid

2.4 Project Operation Plan

The operation and maintenance system for the facilities and equipment to be constructed/provided under the Project and the organizations responsible for payment of the maintenance cost are shown in Table 2-4-1-1. These organizations are already operating and maintaining facilities and equipment similar to those planned under the Project and no special problems are anticipated in terms of facility and equipment operation and maintenance after the completion of the Project. In regard to the operators of the construction machinery, it has been decided that each forest company will select and train suitable people. The full-time positions at the new forest fire monitoring stations and towers will be filled by the transfer of existing staff members or new recruitment by each forest company. In the

case of the new Lam Ngu Truong Elementary School, the assignment of 25 new teachers at this school is planned.

Table 2-4-1-1 Operation and Maintenance System

Type of Facilities/Equipment	Supervising Body	Organization Responsible for O&M	Organization Paying O&M Cost
1. Civil Engineering Facilities			
(1) Forest Land Improvement (Embankment)	DARD, Ca Mau Province	Each forest company in the U Minh Ha area	As left
(2) Canal Construction	DARD, Ca Mau Province	Each forest company in the U Minh Ha area	As left
(3) Road and Bridge Construction	Department of Transport, Ca Mau Province	As left	As left
2. Buildings			
(1) Forest Fire Monitoring Stations and Towers	DARD, Ca Mau Province	Each forest company in the U Minh Ha area	As left
(2) Elementary Schools	Department of Education and Training, Ca Mau Province	Each school	Department of Education and Training, Ca Mau Province
(3) Commune Health Centres (CHC)	Department of Health, Ca Mau Province	Each CHC	Department of Health, Ca Mau Province
3. Procured Equipment			
(1) Construction Equipment (Excavators)	DARD, Ca Mau Province	Each forest company in the U Minh Ha area	Each forest company and farmer to which the forest land improvement work is entrusted
(2) Pontoons	DARD, Ca Mau Province	Each forest company in the U Minh Ha area	As above
(3) Fire Extinguishing Pumps and Drainage Pumps	DARD, Ca Mau Province	Each forest company in the U Minh Ha area	As left
(4) Radio Communication Equipment	DARD, Ca Mau Province	Each forest company in the U Minh Ha area	As left
(5) Wood Processing Equipment	DARD, Ca Mau Province	Song Trem Forest Company	As left
(6) Medical Equipment	Department of Health, Ca Mau Province	District hospital and/or CHC	Department of Health, Ca Mau Province

The construction equipment (excavators) and pontoons will be used in the future to improve the forest land owned by farmers and it is planned that the farmers will pay the equipment operation and maintenance cost.

Elementary education in Vietnam is, in principle, free of charge in accordance with the Law Concerning the Universalisation of Elementary Schools. Accordingly, the operation and maintenance cost for the elementary schools will be paid from the budget of the Department of Education of Ca Mau Province.

2.5 Project Cost Estimation

2.5.1 Initial Cost Estimation

(1) Expenses to be taken by the Japanese side

The total cost of the Project to be implemented in accordance with Japan's Grant Aid scheme will be determined before concluding Exchange of Notes (E/N) for the Project.

(2) Vietnamese Contribution Estimated Total Cost: approx. 14,600 million VND

The Vietnamese side is expected to fund the following costs among others.

① Land preparation for forest fire monitoring stations and towers: 240 million VND
② Land preparation for Lam Ngu Truong U Minh I primary school: 1,000 million VND
③ Land preparation for Lam Ngu Truong U Minh II primary school Branch-1: 350 million VND
④ Land preparation for Khanh Binh Tay Bac II primary school: 150 million VND
⑤ Procurement of furniture for primary school staff rooms: 120 million VND
⑥ Demolition of existing buildings and levelling of lands for three health centres: 90 million VND
⑦ Resettlement of houses on the route of new roads and bridges: 120 million VND
⑧ Clearing bush along the route of new roads and bridges: 100 million VND
⑨ Administration cost for Project Management Unit: 2,000 million VND
⑩ Bank commission to transfer the fund to Procurement Account from the Recipient Account: 130 million VND
⑪ Tender evaluation appraisal expenses: 300 million VND
⑫ Contingencies: 10,000 million VND

(3) Estimation Conditions

1) Estimation Timing : October, 2007
2) Foreign Exchange Rates : US$ 1 = ¥120.39(mean TTS rate from April to September, 2007)
   VND 1,000 = ¥7.3966 (mean TTB rate for the above period)
3) Work Period : The work period is as shown in the work schedule.
4) Miscellaneous : The Project will be implemented in accordance with Japan's Guidelines for Grant Aid

2.5.2 Operation and Maintenance Cost

Among the facilities and equipment to be constructed or provided under the Project, the excavators (excavators) will incur the largest operation and maintenance cost. Table 2-5-2-1 and Table 2-5-2-2 show the operation cost and the maintenance cost of the excavators respectively. The total annual operation and maintenance cost of the eight excavators will be approximately ¥6.58 million. It is planned to use these machines for the forest land improvement (embankment) work at that forest land of which the right of use is owned by farmers and that the farmers will pay the operation and maintenance cost. It is, therefore, inferred that there should not be any problems in regard to financing the excavator operation and maintenance cost.

Table 2-5-2-1 Operation Cost of Excavators

Type of Equipment	Engine Output (kW)	Fuel Consumption Rate (l/kWh)	Fuel Consumption (l/unit.hr)	Annual Operation Hours (hrs/yr)	Annual Fuel Consumption (l/unit/yr)	Annual Fuel Cost (¥ million/unit.yr)	No. of Equipment	Total Annual Fuel Cost (¥ million/yr)
Excavator (Excavator)	55.2	0.175	9.653	810	7,819	0.503	8	4.025

[Calculation Conditions]

(1) Fuel consumption rate : Based on the "Depreciation Calculation Table for Construction Machinery, etc." of the Japanese Ministry of Land, Infrastructure and Transport

(2) Annual operation hours : The standard operation hours in the "Depreciation Calculation Table for Construction Machinery, etc." (2007 Edition) of the Japan Construction Mechanization Association

(3) Unit fuel cost : Diesel oil: ¥64.35/litre (based on the field survey results)

Table 2-5-2-2 Maintenance Cost of Excavators

Type of Equipment	Engine Output (kW)	Maintenance and Repair Cost Rate (throughout the life)	Expected Life (yrs)	Annual Maintenance and Repair Cost Rate	No. of Equipment	Total Annual Maintenance Cost (¥ million/yr)
Excavator (Excavator)	55.2	45%	15	3.0%	8	2.554

[Calculation Conditions]

(1) Maintenance cost rate : Based on the "Depreciation Calculation Table for Construction Machinery, etc." (2007 Edition) of the Japan Construction Mechanization Association

(2) Expected life : Assumed to be double the standard years of use given by the "Depreciation Calculation Table for Construction Machinery, etc." (2007 Edition) of the Japan Construction Mechanization Association

(3) Annual maintenance and repair cost rate = maintenance and repair cost (through the life) ÷ number of years of use

(4) Annual maintenance and repair cost = equipment procurement cost (¥10.64 million/unit) x annual maintenance and repair cost rate x number of units

CHAPTER 3

PROJECT EVALUATION AND RECOMMENDATIONS

CHAPTER 3
PROJECT EVALUATION AND RECOMMENDATIONS

3.1 Project Effect

The implementation of the Project is expected to produce the following effects.

Present Situation and Problems	Measures Under the Project	Direct Effects and Degree of Improvement	Indirect Effects and Degree of Improvement
1. Forest fires in the dry season destroy large tracts of forest land every year due to the shortage of fire monitoring facilities and fire extinguishing equipment.	▪ Construction of forest fire monitoring stations and towers ▪ Procurement of fire extinguishing equipment ▪ Procurement of fire prevention equipment (communication equipment)	The improved forest fire monitoring and extinguishing system will reduce the number of forest fires and the area destroyed by forest fires.	The decrease of forest fire will improve the income of farmers from forestry.
2. Flooding in the rainy season hampers the growth of Melaleuca, the main forestry product, lengthening the time required to reach harvesting age.	▪ Forest land improvement (embankment) work at land of which the right of use is owned by forest companies ▪ Procurement of equipment (excavators and pontoons) required for forest land improvement	Harvesting will be possible in half the time compared to the past as the roots of Melaleuca will not be submerged even in the rainy season.	The increased harvest of Melaleuca will improve the income of farmers from forestry.
3. Flooding in the rainy season hampers the growth of rice, making the unit harvest volume in the area lower than that in other areas in the Mekong River Delta Region.	▪ Procurement of agricultural drainage pumps, targeting the paddy fields of the model farms	The water level of the paddy fields will be controlled even in the rainy season.	The rice cultivation techniques in the U Minh Ha area will improve through the practices at the model farms.
4. At present, Melaleuca wood is only used for piles. However, the growing use of concrete piles has steadily pushed down the market value of Melaleuca piles.	▪ Procurement of wood processing equipment to process Melaleuca wood for furniture use	The scope of use of Melaleuca wood will be expanded.	The preservation of the market value of Melaleuca wood will stabilise the income level of forestry-oriented farmers.
5. The insufficient state of the road network hampers local traffic, the school attendance of children and physical distribution in the area.	▪ Construction of commune roads and bridges	The road network will be lengthened by a total of some 32 km.	① Progressive vitalisation of the local economy ② Safer school routes for children
6. The insufficiency and deterioration of such primary health care facilities as community health centres and district hospitals means an insufficient health care service in terms of both quality and quantity.	▪ Extension and/or rebuilding of community health centres ▪ Procurement of medical equipment for district hospitals and community health centres	The number of beds per population of 10,000 in the U Minh Ha area will increase from the present 9.8 beds to 12.1 beds.	The health care service in the area will improve.
7. The insufficiency and deterioration of the educational and sanitation facilities mean failure to provide a good educational environment.	▪ Construction of a new elementary school and extension of existing schools (including toilets)	The number of elementary school pupils per classroom will decrease from the present 24.2 to 23.	The educational environment in the area will be improved.

3.2 Recommendations

3.2.1 Recommendations for the Vietnamese Side

It will be necessary for the Vietnamese side to conduct the following work and activities to realise and sustain the positive effects of the Project.

(1) It will be necessary to master forest land improvement (embankment) techniques and construction machinery operating skills and to widely spread the practice of forest land improvement to land of which the right of use is owned by farmers in the U Minh Ha area.

(2) It will be necessary to convey the techniques to combine agriculture, forestry and fisheries to farmers in the U Minh Ha area, utilising the model farms to be introduced and the agricultural drainage pumps to be procured under the Project.

(3) It will be necessary to establish a forest fire prevention and extinguishing system for the effective use of the forest fire monitoring facilities to be constructed and the forest fire extinguishing equipment to be procured under the Project.

(4) It will be necessary to produce marketable processed Melaleuca wood using the wood processing equipment to be procured under the Project.

(5) It will be necessary to secure funding to maintain the roads and bridges and to implement maintenance work so that the roads and bridges constructed under the Project can always be used in good condition.

(6) It will be necessary to secure funding to maintain the health care facilities and medical equipment and to implement maintenance work so that the health care facilities constructed and the medical equipment procured under the Project can always be used in good condition.

(7) It will be necessary to secure funding to maintain the educational facilities and to implement maintenance work so that the educational facilities constructed under the Project can always be used in good condition.

3.2.2 Technical Cooperation and Collaboration with Other Donors

To achieve “the establishment of a means of increasing the income of farmers in the U Minh Ha area”, which is one of the goals of the Project, it will be necessary for (i) the practice of forest land

improvement (embankments) to be employed primarily by forest companies and (ii) the combined management of agriculture, forestry and fisheries to be widely spread among farmers. In addition to the inputs under the grant aid project, such programme-based assistance as technical assistance to spread a concrete means of increasing income and assistance for a credit system to enable farmers to invest in forest land improvement and the combined management of agriculture, forestry and fisheries will be required to materialise forest land improvement and combined management. Possible schemes to be used to realise the necessary inputs to achieve the above-mentioned goal are assistance for poor farmers (2KR), technical cooperation (dispatch of experts), dispatch of senior volunteers, dispatch of JOCV volunteers, collaboration with a NGO and collaboration with private companies in the context of CSR (corporate social responsibility) in addition to the grant aid scheme. Table 3-2-2-1 lists the inputs under the Project and other scheme which may be used to provide further inputs.

Table 3-2-2-1 Possible Inputs to Supplement the Project

Expected Outcomes	(Japanese) Inputs for the Project	Sources of Inputs
1. Establishment of the corporate strength (technology and finance) of forest companies to independently conduct forest land improvement (embankments)	1.1 Procurement of construction equipment 1.2 Advisor on maintenance techniques for construction equipment 1.3 Advisor on embankment design and construction techniques 1.4 Construction cost of model embankments	1.1 Grant aid (community empowerment) 1.2 Senior volunteer; JOCV; CSR 1.3 Expert; senior volunteer 1.4 Grant aid (community empowerment)
2. Fostering of farmers capable of conducting combined management	2.1 (Same as 1.4 above) 2.2.1 Procurement of agricultural drainage pumps 2.2.2 Advisor on the combined management of agriculture, forestry and fisheries 2.3 Advisor on education and the diffusion of micro-credit	2.1 As above 2.2.1 Grant aid (community empowerment; 2KR) 2.2.2 Expert; senior volunteer 2.3 Senior volunteer, NGO
3. Improvement of the production techniques for agricultural, forestry and fisheries products	3.1 Advisor on farming techniques (rice, vegetables and fruit) 3.2 Advisor on forest management techniques 3.3 Advisor on livestock management techniques 3.4 Advisor on fisheries techniques	3.1 Expert; senior volunteer; JOCV, 2KR (soft component) 3.2 Expert; senior volunteer, JOCV 3.3 As above 3.4 As above
4. Establishment of a system enabling farmers to conduct forest land improvement (embankments and the construction of canals and mounds on their farmland)	4.1 Advisor on the system 4.2.1 Advisor on the development and operation of a credit system 4.2.2 Provision of original funds to sustain a credit system	4.1 Same advisor as that for embankments (1.3) 4.2.1 Senior volunteer; NGO 4.2.2 Counterpart fund of 2KR, CSR; SRI (social responsibility investment)

Note: Those underlined are inputs under the Project (grant aid scheme).