ベトナム社会主義共和国

メコンデルタ総合開発計画

事前調査報告書

昭和 63 年 10 月

社団法人　海外農業開発コンサルタンツ協会(ADCA)

ま　え　が　き

本調査報告書は，株式会社　三祐コンサルタンツが社団法人海外農業開発コンサルタンツ協会の補助金を得て，昭和63年７月24日より８月１日までの９日間，ベトナム社会主義共和国の農業開発諸プロジェクトに関する事前調査を行った結果をまとめたものである。

ベトナム政府は，カンボジアよりの撤兵を1989年には完了し，カンボジアの和平を達成し，国を自由主義諸国に向けてオープンして，海外諸国よりの技術経済援助をてこにして，過去十数年来停滞していた経済を活性化しようとしており，基幹産業である農業の開発を急いでいる。

農業の当面の最大目標は食糧自給であり，現在約275kg／人の米の生産量を目標の330kg／人に上げようとしている。

弊社は“農業協力は，広くアジアの農民の福祉と生活の向上のためにするもの”との信念より，現今，日本の近隣の東南アジアで最も農業協力を望んでいる国の１つであるベトナムへ６年前より数度に亘り調査団を派遣，基礎的データの集積，ローカルコンディションの把握に努めている。

インドシナに和平が達成され，弊社のこのような小さな努力のつみかさねが，日本とベトナムの友好の一助となる日が出来るだけ早く来るよう望まれます。

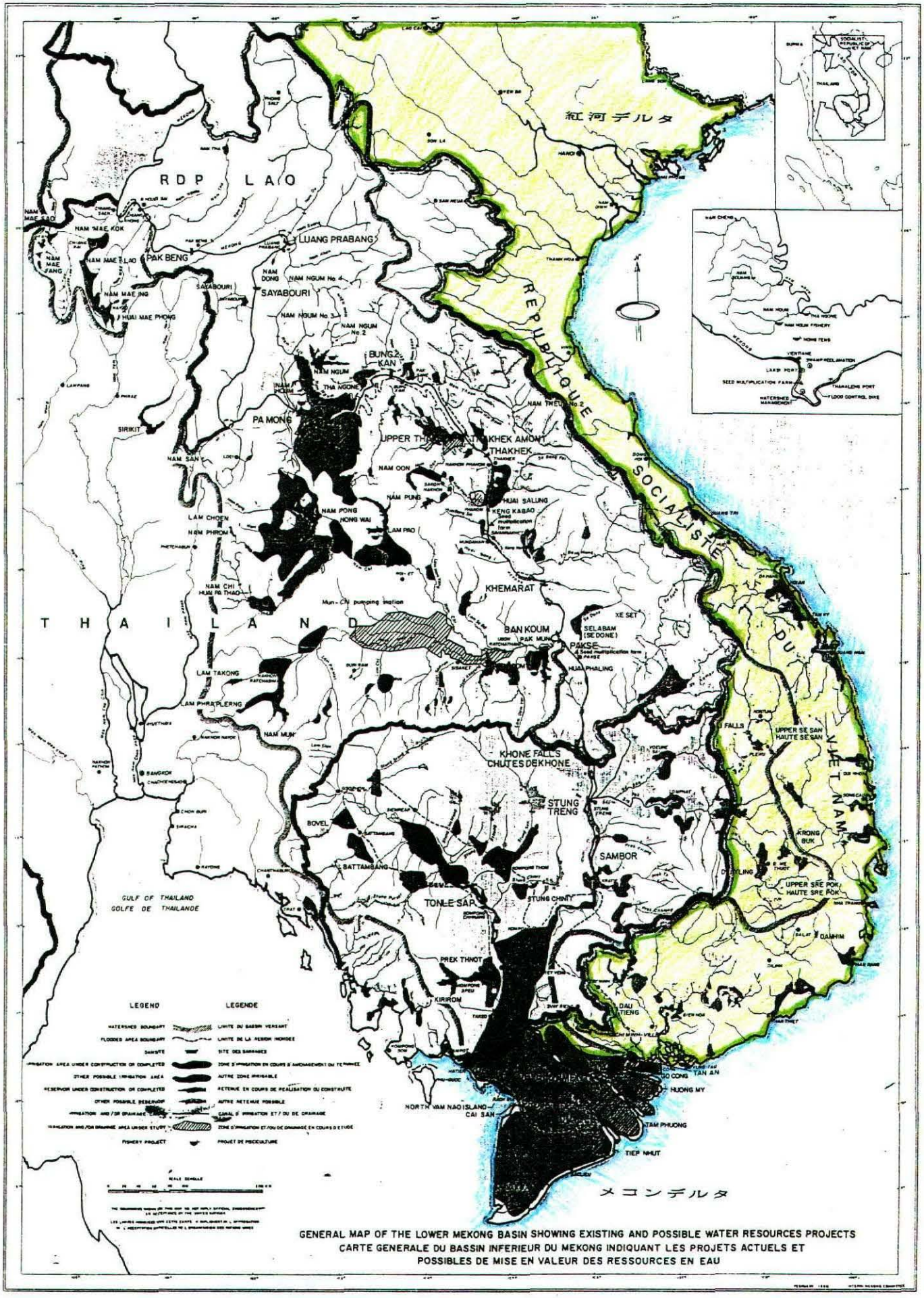
株式会社　三祐コンサルタンツ

取締役社長

久野　彦一

目　　次

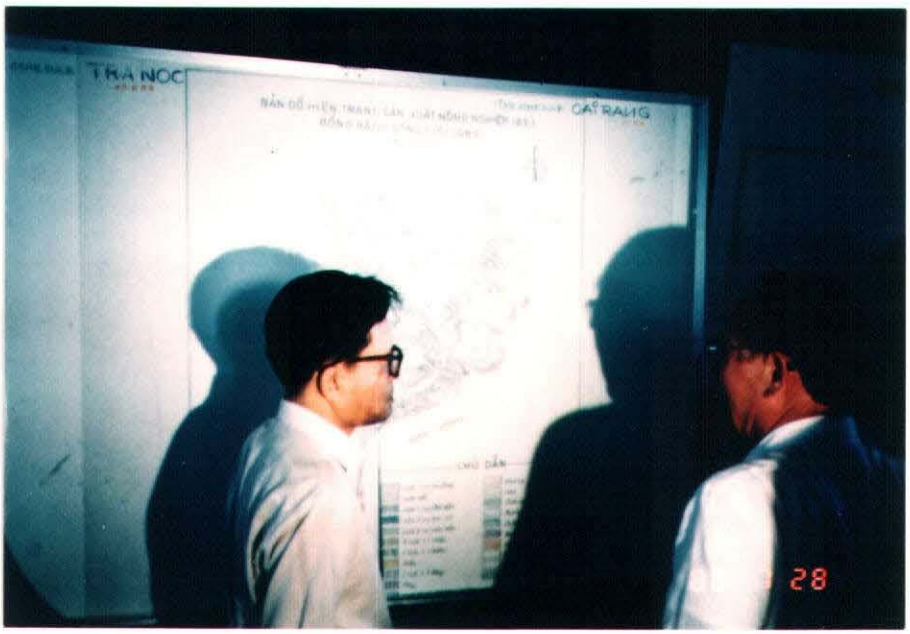
ベトナム社会主義共和国



GENERAL MAP OF THE LOWER MEKONG BASIN SHOWING EXISTING AND POSSIBLE WATER RESOURCES PROJECTS
CARTE GENERALE DU BASSIN INFERIEUR DU MEKONG INDIQUANT LES PROJETS ACTUELS ET POSSIBLES DE MISE EN VALEUR DES RESSOURCES EN EAU

DATA FPOM MEKONG COMMITTEE

「ベ」政府によるメコンデルタの現況説明



Minister of Agriculture and Foodstuff Industry Mr. Nguyen Cong Tang とメコンデルタ開発に関する意見交換

ツドゥク人民委員会

ホーチミン市街

1．調査団員

株式会社　三祐コンサルタンツ海外事業本部　業務部

久野　格彦

2．調査日程

昭和63年７月24日より８月１日まで

７月24日　－東京－バンコク　バンコク泊

25日　－バンコク－ハノイ
－対外経済省訪問
(Ministry of Foreign Economic Relations)

ハノイ泊

26日　－国家計画委員会訪問
(State Planning Committee)
－国家科学技術委員会訪問
(State Committee for Science and Technology)
－ハノイ人民委員会訪問
(Hanoi People's Committee)
－農業食糧工業省訪問
(Ministry of Agriculture and Foodstuff Industry)
－水利省訪問
(Ministry of Water Resources)
－国家地理院訪問
(State Mapping Institute)
－商工会議所訪問
(The Chamber of Commerce and Industry of the SR Vietnam)

ハノイ泊

27日　－ハノイ－ホーチミン
－商工会議所訪問
－ (The Chamber of Commerce and Industry of the SR Vietnam)
－Nguyen Van Ich氏面談
(Deputy Secretary General of the Cabinet)
(Vice Prime Minister's Secretariat)
－農業局訪問
(Fishery Department, Fishery Product Export-Co. of Ho Chi-Minh City)
－ホーチミン市人民委員会
(Ho Chi Minh People's Committee)

ホーチミン泊

28日　－ホーチミン農業食糧工業省訪問
(Ministry of Agriculture and Foodstuff Industry)
－ツドゥク県庁訪問
(Thu Duc District Office)
－サイゴン港訪問
(Saigon Port Office)
－ホーチミン建設計画委員会訪問
(Ho Chi Minh Planning Committee for Construction)

29日　－農業食糧工業省大臣面談
(Ministry of Agriculture and Foodstuff Industry/National Food Company)
－ホーチミン－バンコク

30日　－資料整理

31日　－バンコク発

1日　－東京着

3．ベトナム側面談者リスト

(対外経済省)
(Ministry of Foreign Economic Relation)

- MR. Dinh Phu Dinh	Vice Minister
- MR. Cao Nang Gian	Sub-Manager of Export-Import Section

国家計画委員会
(State Planning Committee)

- MR. Le Danh	Vice Chairman
- MR. Nguyen Tien Thuan	対外経済局長
- MR. Le Huu Rung Hieu	同　Export
- MR. Bach Minh	同　次長

海外通商省
(Ministry of Foreign Trade)

- MR. Tran Huan Phoi	General Director
- MR. Nguyen Thi Ngol Thanh	Deputy General Director

国家科学技術委員会
(State Committee for Science and Technology)

- MR. Tran Tri	Vice President
- MR. Nguyen Xuan Bao Tam	Department for Scientific & Technical Co-operation with Foreign Countries

水利省
(Ministry of Water Resources)

- MRS. Do Hong Phan	Director of International Cooperation Department & Permanent Secretary of Vietnam National Mekong Committee
- MRS. Nguyen Cong Phuong	Head, Foreign Financed Projects Division
- MR. Vu Van Vinh	水利企画院長, Ho Chi Minh

商工会議所
(Chamber of Commerce & Industry)

- MR. Nguyen Manh Hung	Director of International Relations Development Hanoi
- MR. Ho Thi Huong	Deputy Director General Ho Chi Minh City
- MR. Le Truong Son	International Relations Dept.
- MR. Nguyen Tam	Deputy General Secretary General Director, Ho Chi Minh
- MR. Pham Van Ky	Deputy Director of International Relation Department, Ho Chi Minh
- Miss. Le Thanh Binh	International Relations Department, Ho Chi Minh

水産局
(Fishery Product Export-Co. of Ho Chi Minh City)

- MR. Huynh Van Mai	Director
- MR. Ho Kim Muon	Import-Export Manager
- MR. Pham Vn	Deputy Manager Import-Export Department

農業食糧工業省
(Ministry of Agriculture and Foodstuff Industry)

- MR. Nguyen Cong Tang	Minister
- MR. Le Van The	Deputy Minister
- MR. Nguyen Phuong Tung	中央食糧総公司　第一副総裁
- MR. Pham Truong Tho	Deputy General Director Vietnam Food Import-Export Company
- MR. Pham Tran Hoa	農業設備部品公司総裁
- MR. Dang Thac Thuan	植物保護局　副局長
- MR. Vo Mai	植物保護局　副局長
- MR. Dang Thai Thuan	Vice-Dirctor Plant Protection Department
- MR. Tran An Phong	農業企画設計院　副院長 (Institute Technic Agronomic)
- MR. Truong Cong Tin	南部農業技術院　副院長
- MR. Nguyen Khoa Sinh	農業企画設計分院　院長
- MR. Nguyen An Phong	農業企画設計分院
- MR. Vu Van Vinh	水利企画院院長
- MR. Nguyen Ton Tao	Director, Agricultural-Service of Hanoi

ホーチミン人民委員会
(People's Committee of Ho Chi Minh City)

- MR. Nguyen Vin Nghicp	Acting Vice Chairman of Ho Chi Minh People's Committee President of External Economic Relations
- MR. Nguyen Hau	Chief Director of Cabinet of the Committee Vice President of External Economic Relations
- MR. Phan Trong Qui	Export, Foreign Economic Affairs Office
- MR. Tran Bao Thanh	Foreign Economic Affairs

ツドゥク人民委員会
(People's Committee of Thu Duc District)

- MR. Nguyen Van Thuan	Chairman

内閣官房

- MR. Nguyen Van Ich	Deputy Secretary General of the Cabinet Vice Prime Minister's Secretariat

4．調査案件

今回の調査で「ベ」政府より提示され，情報を収集したプロジェクトは以下のプロジェクトである。

(1) ツドゥク地区農村総合開発計画

(2) メコンデルタ総合開発計画

(3) 北バンナオかんがい建設計画パイロットプロジェクト

(4) カイサン地区洪水防御及びかんがい建設計画

上記4案件のうち“ツドゥク地区農村総合開発計画”は過去に情報収集し現地踏査を行い，プロジェクトフォーミュレイションを終っており，今回の調査でそのフォローアップを行った。

メコンデルタの食糧増産を目ざす3案件“メコンデルタ総合開発計画”，“北バンナオかんがい建設計画パイロット・プロジェクト”，“カイサン地区洪水防御及びかんがい建設計画”はいずれも今回の調査でベトナム政府が強くその実施を望んだプロジェクトで，今回は情報収集をするにとどまった。これらメコンデルタの案件はすでにメコン委員会に通知されており，メコン委員会の1988年のWork Programmeにリストアップされている。

5．ベトナム農業の現状

ベトナムには現在約700haの耕地面積と約6千万人の農民人口がいる。ベトナム農業発展は1980年－1985年には比較的順調な成長を示したが，1986年以後むしろ生産高は減少し，大きな問題となっている。

農業の基幹である米作は，1987年の米の生産高が1,750万トンであり米の自給目標330kg／人の達成が出来ないでいる。

稲作以外の農作物としてシュガーケーン，ピーナッツ，大豆，麻，コーヒー，ゴム，茶，パイナップル，バナナ等を奨励しており，コーヒーの栽培面積が10万haをこえるなど一応実績があがっている。

畜産もしだいに発展してきており，豚，牛，水牛が主であるが，飼料の供給が不十分である。

ベトナム政府は農業発展を阻害している主な要素として次の4項目をあげている。

－全国430万haの水稲面積での農民１人あたりの耕作面積が少ない。

－人口増加率が高い（現在120万－130万人／年の増加）

－洪水，旱ばつ，高温等の天災が多い。

－化学肥料，農薬，農業機械，水陸運等工業製品の不足及びインフラの未整備。

6．メコンデルタの現状

メコンデルタの総面積400万haのうち210万haは農地であり，そのうち190万haが水稲栽培面積である。人口は1,400万人。うち農民人口は1,200万人，約200万戸である。メコンデルタの面積は全国面積の８％に当り，人口は全国人口の22%である。

米の収穫高はもみで平均約3.2ton/haとなっており水稲栽培面積は全国の35%となっている。

デルタ北部に約50万haの未開発地が残っており，この土地は強い酸性土壌である。

メコン河はテンザン河及びハウザン河を合せて年間流出量約5,000億トン，流量は雨期の最大約52,000㎥/sec，乾期には2,500㎥/secとなり平均流量は14,000㎥/secである。

毎年デルタのうち250万haの面積が洪水の被害をうけており，約100万haの農地は，かんがい水がかからなく旱ばつの被害をうけている。

雨量は年平均1,500㎜～2,000㎜であるが，変動が激しく，日照時間は2,700時間／年，積算温度は10,000℃である。

稲作面積190万haのうち50万haのみがかんがい施設をもっており，残りは洪水時の稲作あるいは雨水による稲作を行っている。

7．ツドゥク地区農村総合開発計画

本計画地区は，ホーチミン市の中心部より北東15kmのツドゥク県の10,770haを計画対象面積とし，６ヶ村で人口約５万人の地区である。ツドゥク県は開放時のベトナムで最大の激戦地区で，未だ数多くの戦争の被害が残っている。その為，ベトナム政府及びホーチミン人民委員会は本県の復旧，再開発を最優先プロジェクトの１つとしている。

プロジェクト地区はクリークに囲まれた標高１ｍ前後の地区と，村落がある標高５ｍ程度の小高い丘よりなる。

計画は多くの開発部門を含む農村総合開発計画で主として以下の内容からなる。

(1) 水利施設

－防波堤　22km

－クリーク整備　68km

－かんがい排水施設　244km

－その他付帯ポンプ，ゲート等

(2) 運輸，通信施設

－道路（アスファルト，グラベル）　66km

－電話線　32km

(3) 水道，電気施設

－送電線　99km

－深井戸，パイプライン

(4) サービス施設及び農場

－シードセンター，機械センター等

－各種家畜センター

(5) 貯蔵及び加工施設

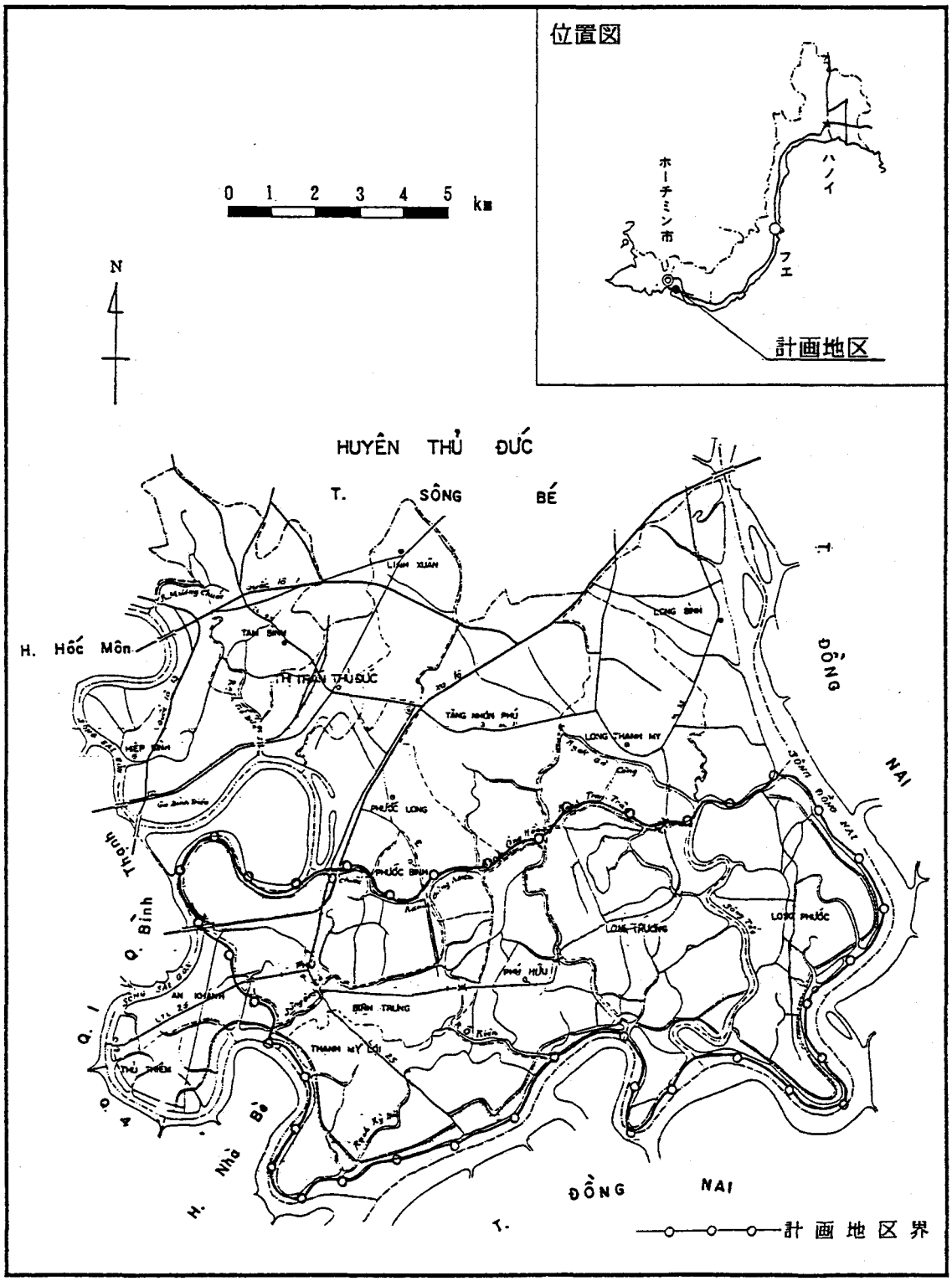
(6) 社会サービス施設

－小学校，幼稚園

－保健所

本件プロジェクトに関し「ベ」政府に提出した英文レポートを添付する。

国　名　ベ　ト　ナ　ム　　案件名　ホーチミン市ウドック地区農村総合開発計画



8．メコンデルタ総合開発計画

ベトナム国最大の穀倉地帯であるメコンデルタは，現在ベトナムの米の総生産量の約50%を産出しており，ベトナム政府農業食糧工業省及び水利省は，メコンデルタの再開発を行い，当面の国家の最大目標である食糧の自給を達成しようと，メコンデルタの農業開発を中心とした総合開発計画（マスタープラン）の策定を急いでいる。

本マスタープランの目的はメコンデルタの土地及び水資源の開発の基幹とし，農業発展を目ざしたメコンデルタの総合開発計画をまとめ，中・長期開発計画の樹立にある。現在メコンデルタにおける農業発展を阻害している主なものは，洪水，湛水，塩水浸入，硫酸塩土壌，土壌の酸性化，かんがい用水の不足などがある。

マスタープランは3ヶ年にわたりり，3フェイズにわけて行われフェイズ－1として現況調査及びプロジェクト地区の現状把握，フェイズ－2として全体開発計画の策定，フェイズ－3として優先プロジェクトの10ヶ年開発計画の策定を行う。

スタディーの重要項目として

(1) 洪水対策

(2) 塩水浸入対策

(3) かんがい計画

(4) 湛水防除対策

(5) 干拓及び土壌改良

(6) 環境問題及び水管理

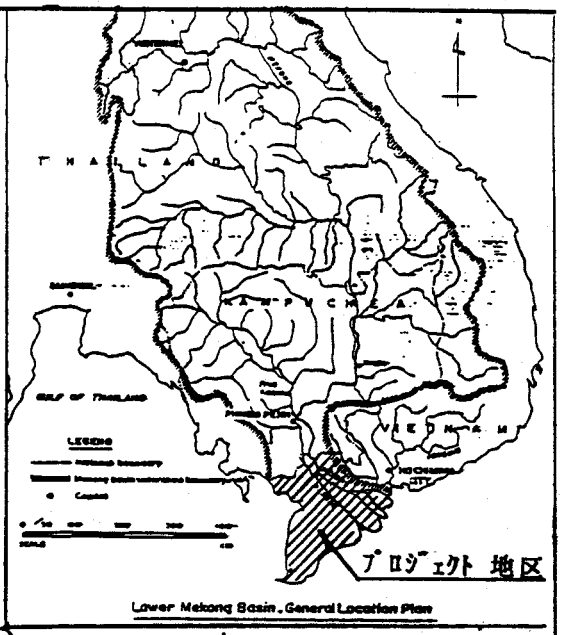
(7) 農業及び適正土壌調査

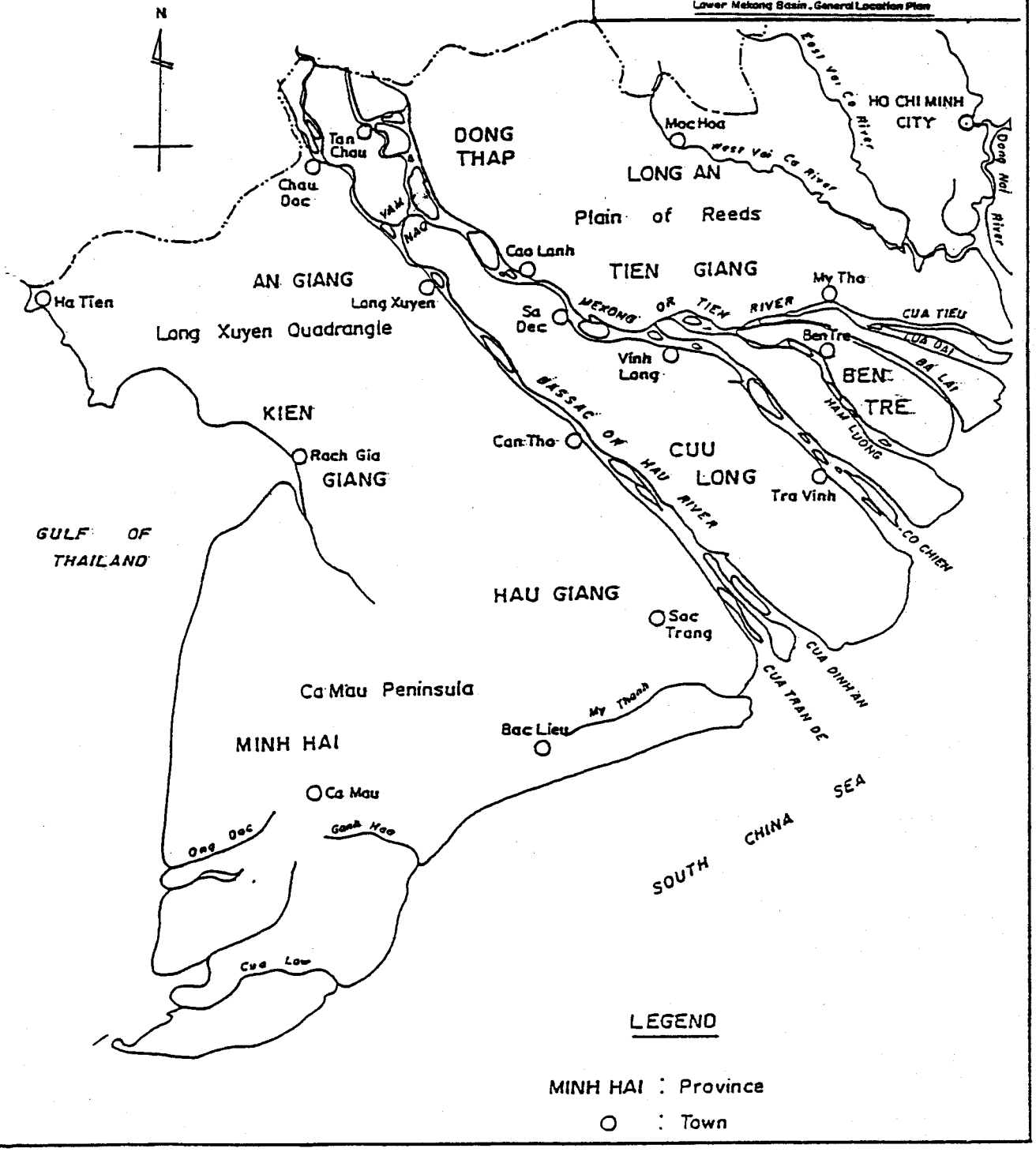
(8) 漁業

(9) 水運

等があげられる。

ベトナム国
メコンデルタ総合開発計画





9．北バンナオかんがい建設計画パイロットプロジェクト

メコン河のベトナムに於ける最上流部，メコン河とバサック河にはさまれた北バンナオ島はメコンデルタの中でも最も肥沃な土地であるが，毎年雨期には洪水に悩まされており，この湛水が年２毛作を阻害している。

「ベ」国政府水利省は1984年にフィジビリティースタディーを完成しており，1986年にその計画の一部修正を行った。

本計画はメコン委員会の1988年のワークプログラムにとり上げられている。

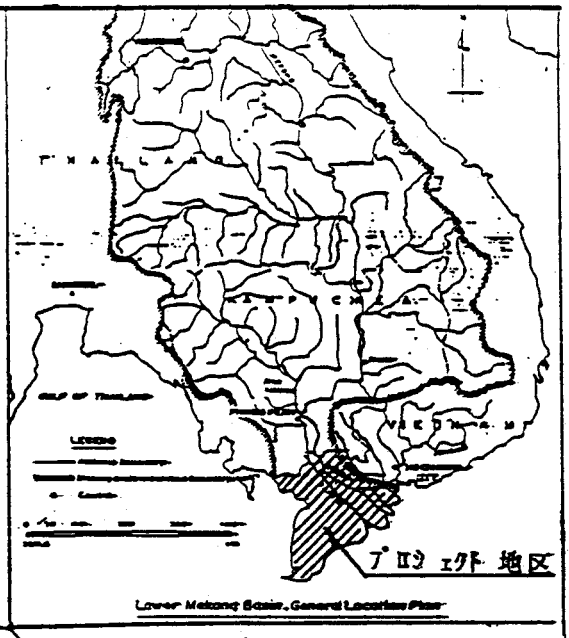
水利省はフィジビリティースタディー対象の総面積14,800haの計画のうち第１期事業化として，又，全プロジェクト地区のパイロットとして位置づけられた4,721haの実施を行う意向である。

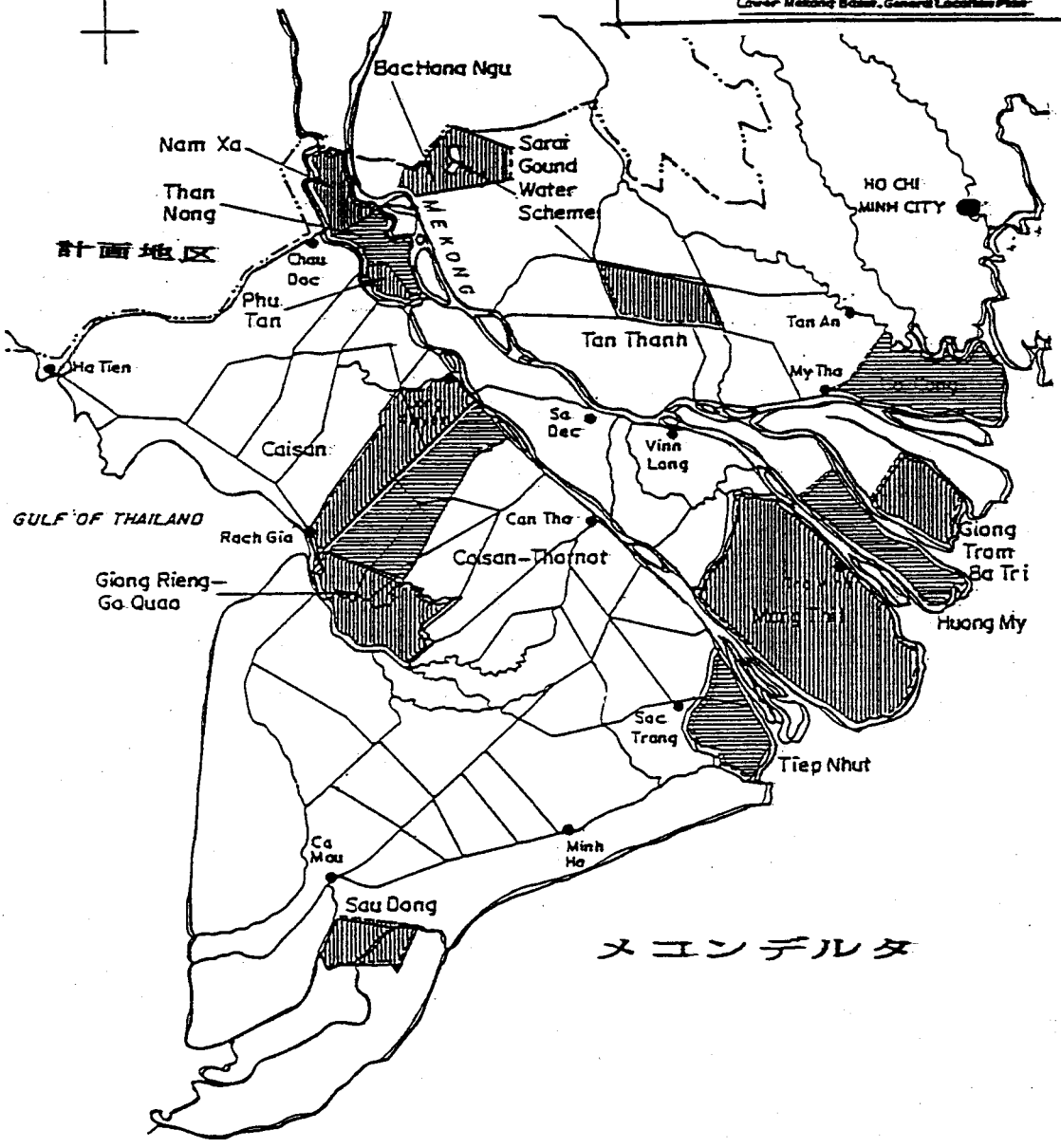
プロジェクトの事業内容は農地の湛水防除を主体として排水路及び用水路の整備，輸中堤の建設，ポンプによるかんがい施設の建設等である。

「ベ」政府は実施設計，施工を含め３ヵ年で事業完成を目ざしている。

北パンナオかんがい設計計画

パイロット プロジェクト





10. カイサン地区洪水防御及びかんがい建設計画

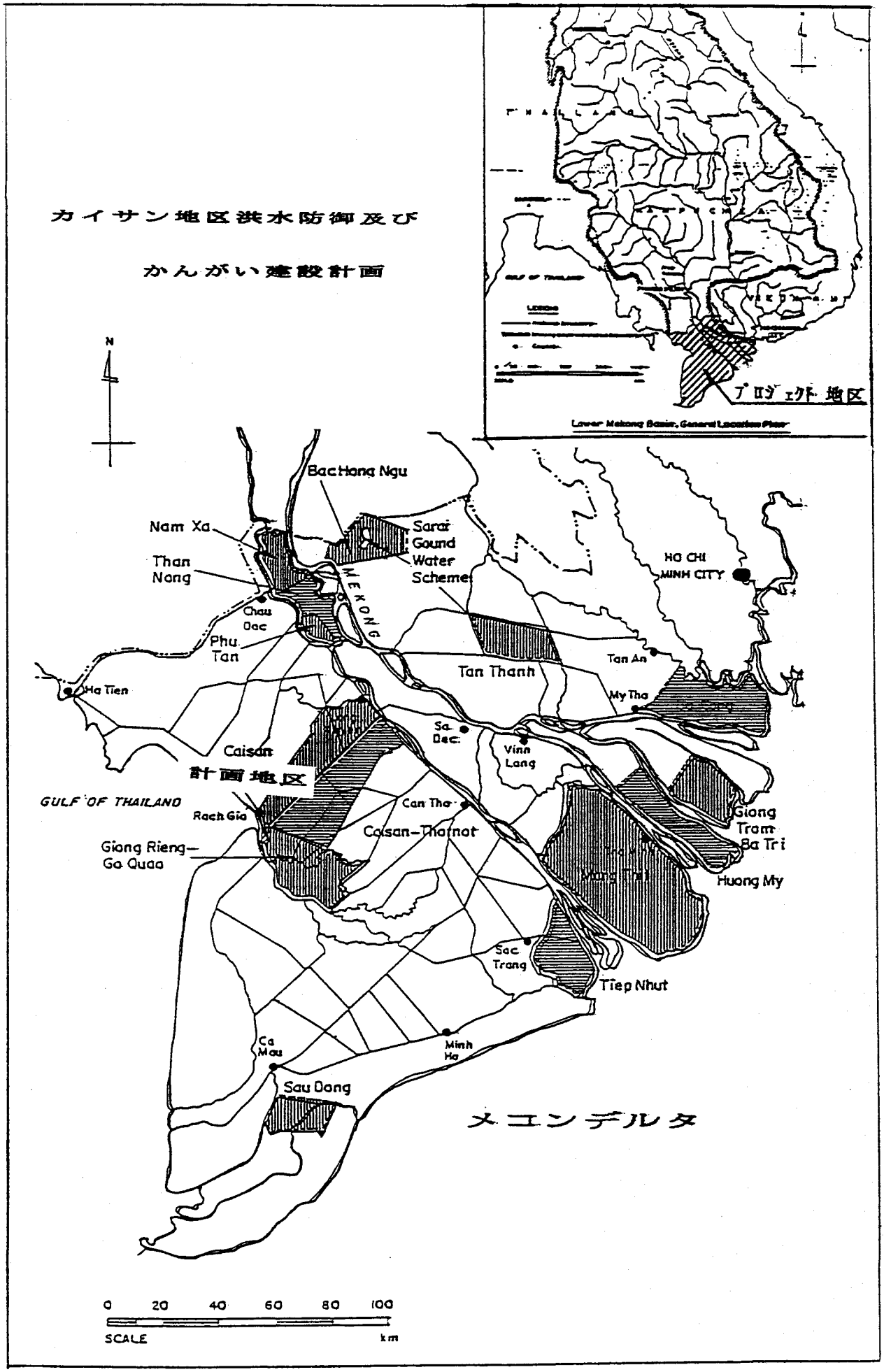
「ベ」国政府農業食糧工業省及び水利省はメコンデルタの再開発を行い，食糧自給を達成しようと，メコン河総合開発のマスタープランを策定するとともにすでにF/Sが行われている地区に於いて，パイロットプロジェクトの実施を目ざしている。

メコンデルタ・バサック河右岸，総面積44,000haのカイサン地区は毎年4～6ヶ月間メコン・バサック両河川よりの洪水で冠水しており，浮稲による稲作が行われている。このカイサン地区の開発計画は1974年に世銀プロジェクトとしてF/Sが行われており，1986年にメコン委員会によりアップデイトされている。

本計画の骨子はこの地区に輪中を建設して，洪水を防御するとともに輪中の内部にかんがい施設を建設しようというもの。

「ベ」政府はパイロットプロジェクトとして総面積44,000haのうち6,200haの建設を第1期工事として着手を計画している。

「ベ」政府は実施設計及び施工を含め，3ヶ年で事業を完成しようとしている。


カイサン地区洪水防御及び
かんがい建設計画
N
Bac Hong Ngu
Nam Xa
Than Nong
Sarai Gound Water Scheme
MEKONG
Chau Doc
Phu Tan
Ha Tien
Tan Thanh
Tan An
My Tho
HO CHI MINH CITY
Sa Dec
Vinh Long
Caisan
計画地区
GULF OF THAILAND
Rach Gia
Can Tho
Caisan-Thatnot
Giang Rieng-Go Quao
Giang Tram Ba Tri
Huong My
Soc Trang
Tiep Nhut
Ca Mau
Minh Ha
Sau Dong
メエンデルタ
プロジェクト地区
Lower Mekong Basin, General Location Plan
0 20 40 60 80 100
SCALE km

THE SOCIALIST REPUBLIC OF VIETNAM

Independence-Freedom-Happiness

THU DUC DISTRICT

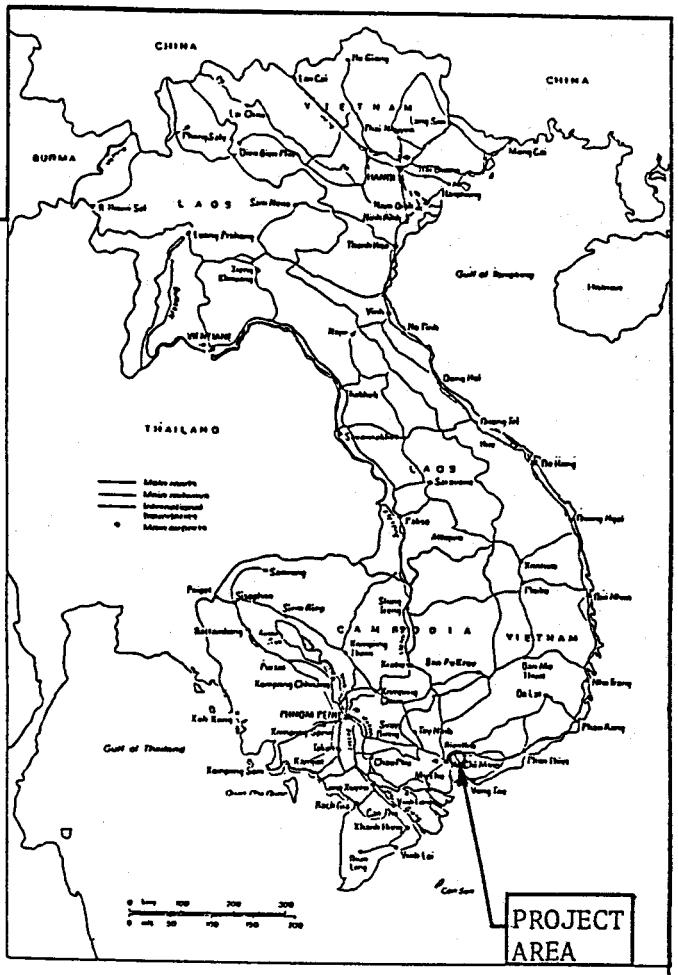
INTEGRATED RURAL DEVELOPMENT PROJECT

IN HOCHIMINH CITY

AGRICULTURAL DEVELOPMENT CONSULTANTS ASSOCIATION, (ADCA)

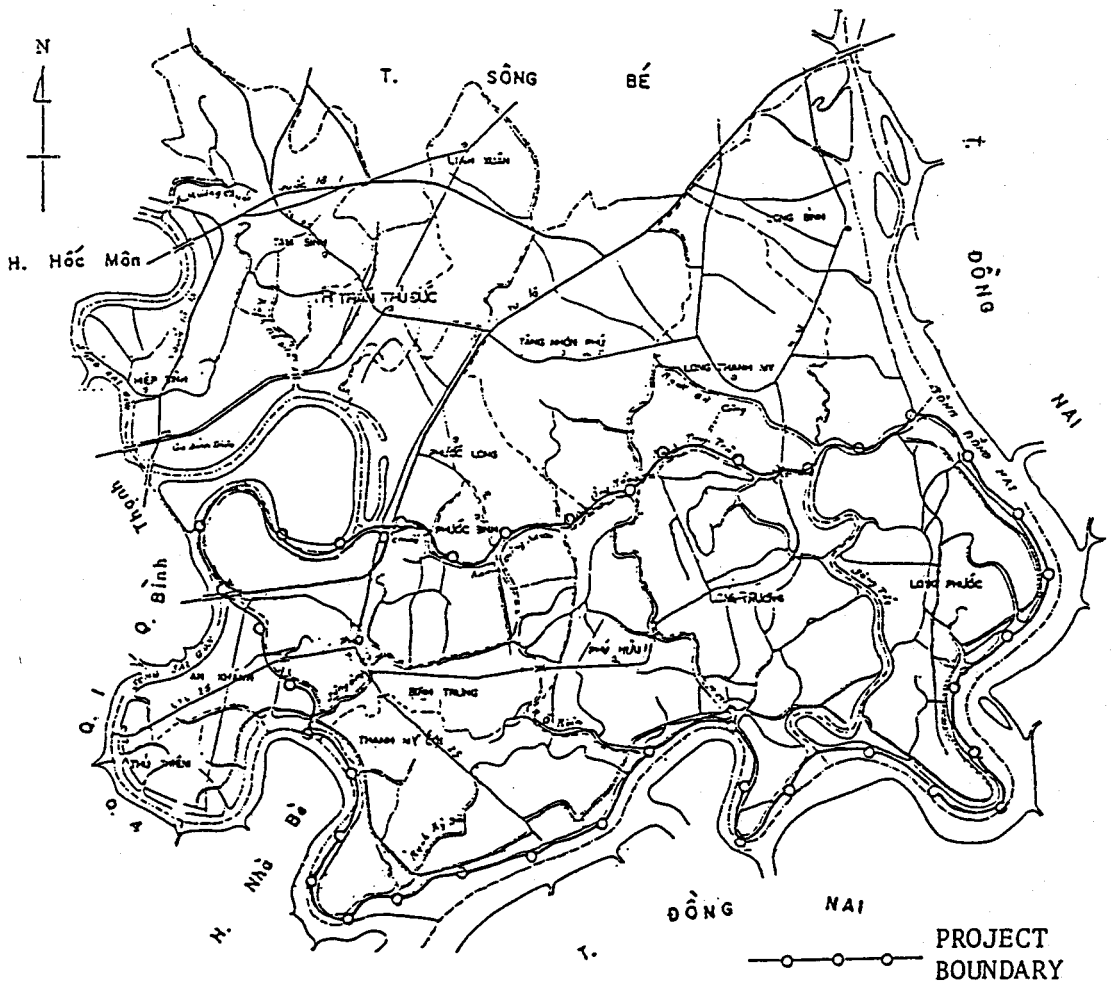
TOKYO, JAPAN

LOCATION MAP OF
THU DUC DISTRICT
INTEGRATED RURAL
DEVELOPMENT PROJECT
IN HO CHI MINH CITY



HUYỆN THỦ ĐỨC

0 1 2 3 4 5 km



THU DUC DISTRICT INTEGRATED RURAL DEVELOPMENT PROJECT
THE SOCIALIST REPUBLIC OF VIETNAM

1. Background

The Government of the Socialist Republic of Vietnam has started the rehabilitation of deteriorated facilities damaged by the war and proceeded to further development for providing necessary infrastructures. Especially, the Government emphasizes to increase the agricultural production in the country. The Government is now contemplating the Fourth Five-Year Development Plan (1986-1990) which will be issued by the end of 1986.

The Government of the Socialist Republic of Vietnam emphasizes to develop rural area to attain well-balanced social conditions.

The Thu Duc district has two distinct characteristics in the area. Northern area is developed as industrial and commercial areas. On the other hand, the southern lower flat area is left behind from the development and has been used for agricultural area. Due to salinity water intrusion and inundation problem in the area, the agricultural development has been suspended in the low productivity conditions. As the result, the average farm income per capita is estimated approximately 60 US$/year which is very low. Infrastructure facilities are poorly facilitated. There is no water supply system and very few irrigation facilities are provided in the area. The development gap between the nothern Thu Duc district and the southern district is too big. It is urgently needed to catch up the delay of development and to fill up the gaps by development schemes. Thus, the Government of the Socialist Republic of Vietnam requests the Government of Japan to perform the study for the integrated rural development for southern Thu Duc area to introduce and integrate the high and sophisticated technology of agriculture, livestock, aquaculture, rural development and infrastructure development.

2. Present Conditions

1) General

Hochiminh City is divided into 18 urban and suburban districts of which total area is 1,845 sq.km and the population is approximately 3.5 million. The Thu Duc district is one of the suburban district of the Hochiminh City and is located about 15 km northeast from the Hochiminh City.

Thu Duc district consists of two distinct areas in the north and south. The northern area consists of industries and commercial area extending in the hilly area. On the other hand, the southern area is agricultural area on the alluvial plain and the elevation ranges from 0.5 m to 1.5 m. This southern area is designated as the project area.

The population in the project area is approximately 50,000 as of 1985 of which 36,500 are farm households.

The total project area is approximately 9,770 ha of which 6,300 ha (64% of total area) is agricultural land, mainly paddy field, 2,200 ha (23%) is rivers and creek, 990 ha (10%) is road and residential area and rest of 280 ha (3%) is savage land.

2) Natural Conditions

The climate is generally suitable for crop cultivation throughout a year, however, precipitation varies widely according to the season and year. Annual average temperature in the project area is 27°C with a maximum monthly average of 28.8°C in April and a minimum monthly average of 25.7°C in December.

The maximum daily temperature occurred in April 1972 at 40°C and the minimum one was 13.8°C in January 1937.

The average annual rainfall in the project area was 1,914 mm. There are two distinctive seasons of rainy season from May to October and dry season from November to April. 90% of annual rainfall precipitates in the rainy season.

The monthly average temperature and rainfall are shown in Table 1.

The project area is surrounded by two rivers of the Dong Nai River and Sai Gon river. The river discharge varies very much according to the season. Low flow discharge is usually observed in March or April, while high discharge is observed in October.

The monthly average discharge for the Dong Nai and Sai Gon rivers are shown in Table 1.

Table-1. Monthly Average of Hydro-meteorological Data

	Monthly Ave. Temperature (°C)	Monthly Ave. Rainfall (mm/month)	Monthly Ave. Discharge (m^3/sec) Dong Nai River	Sai Gon River
Jan.	25.7	10	151	23
Feb.	26.6	3	94	14
Mar.	27.8	13	70	8
Apr.	28.8	42	75	7
May	28.2	210	119	22
Jun.	27.4	339	678	44
Jul.	27.0	314	1,020	59
Aug.	27.0	209	1,110	88
Sept.	26.7	336	1,260	178
Oct.	26.6	269	1,460	200
Nov.	26.3	113	838	83
Dec.	25.7	56	735	50
	Average	Total	Total Volume	Total Volume
Annual	27.0	1,914	20,111.9 MCM	2,047.9 MCM

Note: Million Cubic Meter (MCM).

The both rivers in the project area are directly affected by semi-diurnal tidal regime. High water level is observed at 1.30 m to 1.48 m during spring tide and 1.10 m to 1.13 m during neap tide. Low water level is observed at -2.3 m to -2.5 m during spring tide and -1.6 m to -1.8 m during neap tide. The water level fluctuation ranges approximately 4.0 meters to 2.9 meters.

Due to the tidal affection in the rivers, the project area is faced on severe problem of saline water intrusion, especially during dry season from January to June.

The underground water is also affected by salinity and acidity in the first aquifer, then is not suitable for cultivation, human needs and animal husbandry.

The soil type in the project area is predominant in acid sulphate and the pH varies from 4.5 to 5.7. In general, the following are four types of soil in the area:

i) Gleyed alluvial soil (pH = 4.5 to 4.8) in Long Phuoc village.
ii) Yellow old alluvial soil (ph = 5) in Cat Lai.
iii) Sour and waterlogged alluvial soil in the most of the villages.
iv) Seasonal salinized alluvial soil (pH = 5.3 to 5.7) in An Phu village.

3) Agriculture

The economy of the project area is basically agriculture with 75% of the population engaged in farming. The farming in the area is maily rice production which is heavily dependent upon natural conditions. Due to a saline water intrusion during dry season and lack of irrigation facilities, it is inevitable to grow rice once a year during rainy season only. The average unit yield of rice is about 3.3 ton/ha and

total production of rice in the project area is estimated approximately 20,000 ton/year or 12,000 ton/year in polished rice. On the basis of the total production of rice and other incomes from handicraft, the farmer's income per capita is estimated approximately 60 US$/year. There are two pumping stations for irrigation with 5 pumps each of 42 m^3/ min capacity, but one of the stations is now out of order. In the area, there are 185 plowing machines in operation, 49 rice-hulling machines, 5 animal food grinders, 161 small water pumps and 72 motorized sampans. There are 7 agricultural cooperatives.

Other crops such as maize, sweet potatoes, cassava, peanut, vegetables, etc. are also planted in small and scattered areas and their yield is quite low.

In spite of large area of water surface in the project area, aquaculture for fishery is quite limited in the natural conditions. There is no fish farming in medium and large scale production.

The project area is sometimes affected by flood and saline water intrusion caused by high tide and heavy rainfall. 36 km of dikes along the Don Nai and Saigon rivers have been constructed to prevent the flood and saline water intrusion with 5 sluice gates. But still length of the dike is not enough to prevent the inundation.

There is no large scale livestock or poultry production but family stock exist on almost every farm. According to data in the area, there are 4,160 pigs, 1,413 oxen, 753 buffalos and 85,000 poultry.

4) Infrastructures

In the project area, 12 km of bituminous 6 m width road and 38.5 km of stabilized earth or gravel road are provided. The road density is 0.67 km per square kilometer of land.

There is no water supply facilities in the area.

As for the electric distribution lines, only 7.5 km with 15 KV line is provided in the area.

There are only two pumping stations for irrigation in the area to serve the water for about 400 ha of paddy field. One of the stations, however, is not operational. There are 161 portable water pumps for irrigation.

Generally, the infrastructure in the area is inconsiderable.

5) Social Welfare and Culture

In the project area, there are 8 elementary schools and one secondary school, and 6 medical and maternity houses with a total of 27 beds and 40 medical cadres.

For commercial service, there are 6 commercial cooperatives, one in each village, and a district's grocery store.

3. Development Concept and Strategy

Since the main production and major worker's engagement in the project area, i.e., Southern Thu Duc District, is agriculture, the first priority should be given to the agricultural development as an initial impact necessitating increase of the productivities in the district. Increasing of the agricultural production can stimulate the rural development and economic situation of the farmers and subsequently improvement of nutrition and cultures in the society can be attained for the local inhabitants. In order to ensure the increasing of the agricultural production, infrastructures such as irrigation, drainage,

flood and salinity intrusion control facilities and roads should be provided together with supporting facilities for agricultural development such as agricultural extension service, seed centre and livestock centre, etc.

Consequently, the following four major development concepts are set forth for the study:

i) Agricultural Development

Objectives of the agricultural development are to increase the production of rice, upland crops, vegetables, livestock and fish farming, through strengthening of extension services on the basis of introducing and improvement of appropriate farming technology.

ii) Supporting Facilities Development

In order to support, stimulate and encourage the farmers' activities for farming, supporting facilities for agricultural development are inevitable. To increase the productivities of agriculture, high quality and high yield variety or breed should be introduced in the project area. To introduce such high quality of variety and breed, mechanized farming technology should be practised by the farmers through the proper extension and supporting services. Therefore, supporting facilities for agricultural development should be provided in the project area, such as seed centre, breeding centre with veterinary care post-harvest facility, slaughter house, extension service centre with farm machineries and storage houses, etc.

iii) Rural Development

Rural development is inevitable to attain the well-balanced development and amenity of the local inhabitants' life and to satisfy the required basic human needs for social welfare. Considering the present social condition in the project area, following components for the rural development will be required:

- Rural water supply
- Rural electrification
- Rural communication
- Schools, hospitals, and public centres for recreation and cultural welfare.

iv) Infrastructure Development

Infrastructure development corresponds to support and ensure the target of major objectives of the development as stated above. Major components of the infrastructure development are as follows:

- Irrigation and drainage facilities
- Flood and salinity water control facilities
- Rural road.

4. Study Area

The Thu Duc district consists of two distinct areas in the north and south divided by the creeks of Dong Nhien, Kinh Ong Hong and Taru Taru. The northern area consists of industries and commercial area extending in the hilly area. On the other hand, the southern area is agricultural area on the alluvial plain and the elevation ranges from 0.5 m to 1.5 m. It is bounded on the west by the Sai Gon river, on the east and south by the Dong Nai river and on the north by the hilly area of industrial region in the Thu Duc district. This southern area is designated as the project area.

The area comprises six villages of Long Phuoc, Long Truong, Phu Huu, Binh Trung, An Phu and Thanh My Loi.

5. Objectives and Scope of the Study

The objectives of the studies for the Thu Duc District Integrated Rural Development Project are:

i) to prepare a master plan for the Integrated Rural Development of the Thu Duc District in the southern area; and,

ii) to identify, within the context of the master plan, priority projects and to provide appropriate proposals for the implementation of those projects.

The study should be emphasized on combination of several components to attain the well-balanced development in the district by means of compounding with the project components.

In accordance with the four major development concpets and strategy for (i) agricultural development, (ii) supporting facilities development, (iii) rural development, and (iv) Infrastructure development, the following scope of works has been set forth:

1) Agricultural Development

i) Rice production development

Studies for appropriate farming practice for rice based multi-cropping system and suitable cropping calendar with introducing of diversified crops on the basis of irrigated agricultural technology. To introduce the diversified crops, marketability of the crops for the Hochiminh City should be considered.

ii) Livestock and poultry development

Studies for increasing livestock and poultry production to increase the farmers' living standard.

iii) Research, institution and extension services

Studies for strengthening extension services and supporting facilities on the basis of introducing and improvement of appropriate farming technology and livestock development.

iv) Aquaculture development

Studies for introducing fish culture technology in the creeks extended in the project area for fresh and brackish water area.

2) Supporting facilities development

Studies for necessary facilities to support the agriculture, livestock and aquaculture developments.

i) For agricultural development, following facilities will be necessary to provide, such as seed centre, post-harvest facilities and extension service centre provided with farm machineries, warehouses for agricultural materials, transport facilities, etc.

ii) For livestock development, animal breeding centre provided with veterinary care and slaughter house will be required.

iii) To introduce the aquaculture development, demonstration fish farm or fishery station will be necessary to establish in the project area.

3) Rural Development

i) Rural water supply

Studies for rural water supply system for residential areas in the 6 villages in the project area.

The water quality in the project area is not suitable for potable water due to salinity water intrusion. There will be two alternatives to develop the rural water supply in the project area. One is to use deep wells in the project area and another alternative is to add the required water demand in the proposed Thu Duc water treatment plant of which main supply pipeline passes in the western side of the project area.

ii) Rural electrification

Studies for extension of existing 15 KV transmission line and distribution line with power transformer stations for rural residential area. The route of transmission line should also be considered the location of proposed pump stations for irrigation and regulators for salinity water control.

iii) Rural communication

Studies for rural communication line and exchange station for the important offices and facilities. The communication line should also be considered the proposed pumping station and salinity water control facilities for the effective and timely operation of the facilities.

iv) Culture and amenity facilities

Studies for location, number and size of schools, health care and maternity centre or hospital and public centres for recreation clubs, cinema houses, libraries, etc.

4) Infrastructure Development

i) Flood and salinity water intrusion control facilities

Studies for inundation protection and salinity water intrusion prevention in the project area to be able to keep the freshwater in the creek for irrigation water use.

In order to prevent salinity water intrusion in the creek extended in the project area, several regulators will be necessary to be facilitated in the creeks at the confluence points with the Sai Gon and Dong Nai rivers. The regulator will be necessary to attach a flup gate or double gate to be able to intake the shallow freshwater on the top of saline water in the main rivers during high tide. During flooding, all of the gates can be lifted up to drain the flood water from the project area to the main rivers. Flood protection dike will also be necessary to provide along the rivers and creeks.

The operation of the regulator will be rather difficult, therefore, several water quality monitoring devices and communication system should be provided among the regulators and proposed pumping stations for irrigation water supply.

ii) Irrigation and drainage project

Studies for irrigation blocks and location of pump stations together with a layout of irrigation canals and drainage improvement plan in the project area. The type of the proposed pump should be carefully selected on the basis of water fluctuation during high and low tide. Also the operation rules for the regulators and pumps should be studied taking into account of salinity water control, tidal effect and flood mitigation in the project area.

iii) Rural roads

Studies for improvement of district roads and layout of farm-to-market road.

The basic development concept for the infrastructures mentioned above is shown in Fig.-1.

6. Tentative Study Schedule

The Master Plan Study on Thu Duc District Integrated Rural Development Project embraces various components as previously mentioned. The study period covers about 2 years and consists of two stages as Master Plan Study and Priority Project Study.

The expertise required for the Project studies will be (1) Team Leader/Planning Engineer, (2) Hydrologist, (3) Irrigation and Drainage Engineer, (4) Soil Expert, (5) Agronomist, (6) Livestock Specialist, (7) Aquaculturist, (8) Civil Engineer, (9) Architect, (10) Water Supply Engineer, (11) Electrical Engineer, (12) Project Economist.

Fig. 1 LOCATION MAP OF THE THU DUC DISTRICT INTEGRATED RURAL DEVELOPMENT PROJECT