

**SUMMARY ENVIRONMENTAL IMPACT ASSESSMENT**

**PHUOC HOA WATER RESOURCES PROJECT**

**IN THE**

**SOCIALIST REPUBLIC OF VIET NAM**

**May 2003**

## **CURRENCY EQUIVALENTS**

(as of 14 April 2003)

Currency Unit - Dong (D)  
\$1.00 = D 15,450

## **ABBREVIATIONS**

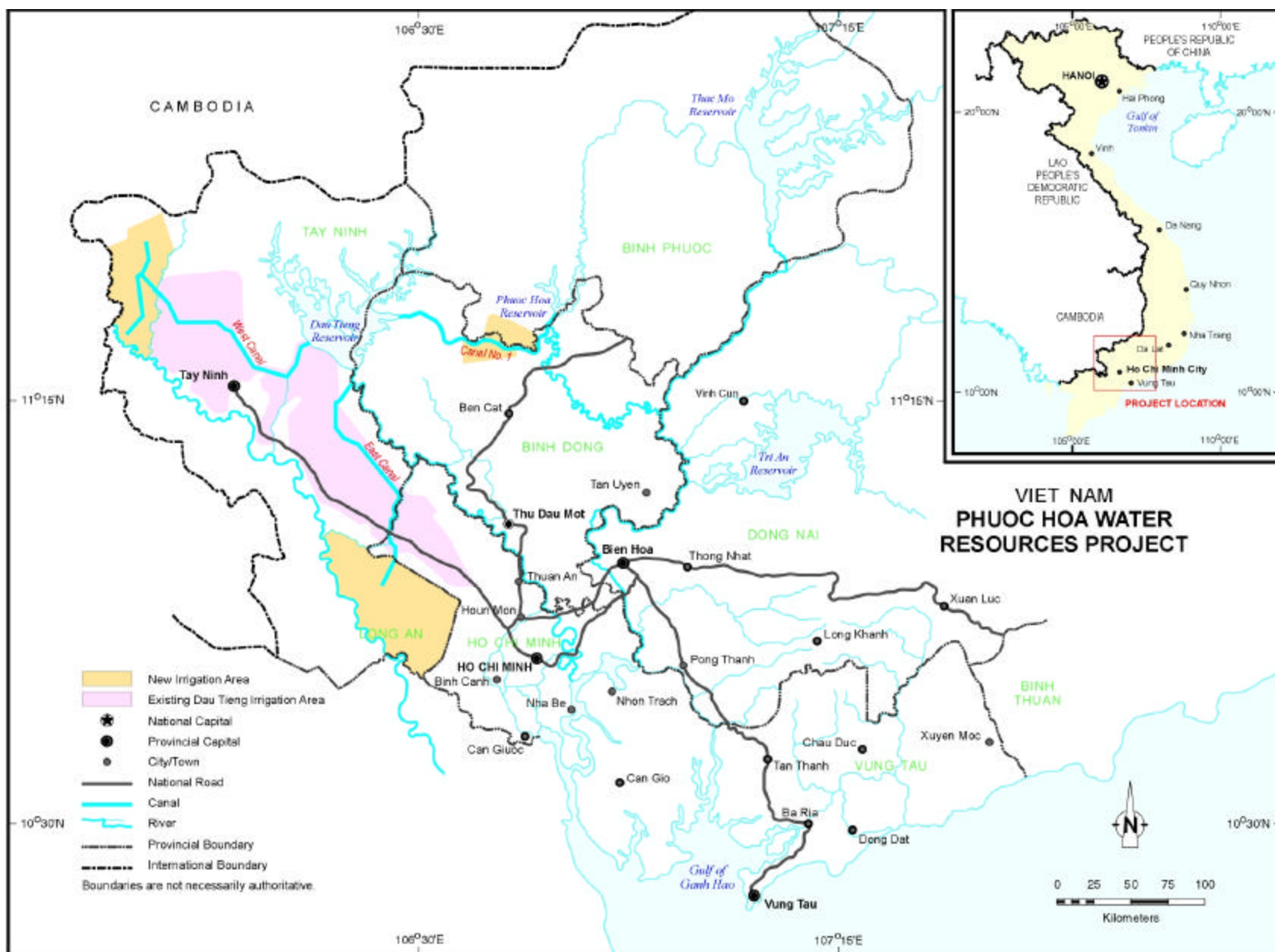
ADB	-	Asian Development Bank
DARD	-	Department of Agriculture and Rural Development
DHIS	-	Duc Hoa Irrigation Scheme
DOSTE	-	Department of Science, Technology, and Environment
EEM	-	environmental effects monitoring
EIA	-	Environmental Impact Assessment
EMD	-	Environmental Management Division (of DoSTE)
EMP	-	Environmental Management Plan
DNRBO	-	Dong Nai River Basin Organization
HCMC	-	Ho Chi Minh City
LEP	-	Law on Environmental Protection
LGXM	-	Lo Go Xa Mat National Park
MARD	-	Ministry of Agriculture and Rural Development
MONRE	-	Ministry of Natural Resources and Environment
NEA	-	National Environment Agency
NGO	-	nongovernment organization
PPMB	-	provincial project management board
PMB416	-	Project Management Board 416
PMU	-	project management unit
PPMU	-	Provincial Project Management Unit
RP	-	resettlement plan
SEIA	-	Summary Environmental Impact Assessment
SIWRP	-	Sub-Institute of Water Resources Planning
TBIS	-	Tan Bien Irrigation Scheme
TOR	-	terms of reference
VCD	-	Vam Co Dong River

## **NOTE**

In this report, "\$" refers to US dollars.

## CONTENTS

	Page
MAP	
I. INTRODUCTION	1
II. DESCRIPTION OF THE PROJECT	1
III. DESCRIPTION OF THE ENVIRONMENT	2
A. Physical Resources	2
B. Ecological Resources	2
C. Human and Economic Development	3
IV. ANALYSES OF ALTERNATIVES	4
A. The “No Project” Alternative	4
B. Alternatives Within the Project	4
V. ANTICIPATED ENVIRONMENTAL IMPACTS OF THE PROJECT	5
A. Preconstruction Phase Impacts and Mitigation Measures	5
B. Construction Phase Impacts and Mitigation Measures	7
C. Operations Phase Impact and Mitigation Measures	9
VI. ECONOMIC ASSESSMENT	10
VII. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PROGRAM	11
A. Environmental Assessment Requirements for the Project	12
B. Environmental Management Plan	12
VIII. PUBLIC INVOLVEMENT	13
IX. CONCLUSION	14
APPENDIXES	
1. Environmental Management Plan	16
2. Summary Resettlement Plan and Framework	28
3. People’s Committee Statement of Buffer Zone Development Priorities of Lo Go Xa Mat National Park	37



## **I. INTRODUCTION**

1. The Government of Viet Nam requested Asian Development Bank (ADB) assistance to finance the Phuoc Hoa Water Resources Project. The Government, assisted by ADB, prepared an environmental impact assessment (EIA) report and this summary EIA (SEIA) for the proposed Project. This report was prepared based on the preliminary feasibility study of the Project, field visits and investigations, and discussions with staff of Project Management Board 416 (PMB 416) and other related agencies and experts. The SEIA report was prepared in accordance with ADB's guidelines and requirements. ADB classifies the project as environment category A.

2. The Project aims to secure ample raw water supplies to the Saigon and Vam Co Dong (VCD) basins and to supply large areas of new irrigation to some of the poorest communes in Viet Nam. The Project consists of the construction of a barrage on the Song Be that will inundate around 685 hectares (ha) at normal water levels. A main transfer canal (Feeder Canal No. 1) will run 38 kilometers (km) from the Phuoc Hoa barrage to the existing Dau Tieng Reservoir. Three irrigation subprojects have been identified: Binh Long (6,300 ha), Tan Bien (14,400 ha), and Duc Hoa (31,050 ha).

3. The Project will modify the natural and human environment in three major sub-basins of the greater Dong Nai River Basin. The Project will generate significant changes to water use over a large area covering parts of six provinces (Binh Phuoc, Binh Duong, Tay Ninh, Long An, Ho Chi Minh City, and Dong Nai), home to some 10,600,000 inhabitants. The purpose of this report is to identify major environmental issues associated with the Project and to formulate environmental mitigation measures.

## **II. DESCRIPTION OF THE PROJECT**

4. The objective of the Project is to provide additional water in the Saigon and VCD river basins for development of irrigated agriculture and to supplement existing supplies for domestic, municipal, and industrial use in Ho Chi Minh City (HCMC) and the surrounding provinces. The Project will develop water resources infrastructure consisting of construction of a barrage and gated spillway in reinforced concrete on the Song Be River. Three new irrigation areas will be developed with a total net area of 48,130 ha: Binh Long Irrigation System in the provinces of Binh Phuoc and Binh Duong, Tan Bien Irrigation System in Tay Ninh Province, and Duc Hoa Irrigation System in Long An Province.

5. The barrage will inundate an area of approximately 685 ha. The main transfer canal linking Phuoc Hoa Barrage to the existing Dau Tieng Reservoir will abstract up to 75 cubic meters per second ( $\text{m}^3/\text{s}$ ) from the Song Be. The width of land to be permanently lost to canal construction will vary from an average of 120 meters (m) up to 180 m.

6. Water delivered ( $50 \text{ m}^3/\text{s}$ ) to Dau Tieng Reservoir will allow expansion of the existing Dau Tieng Irrigation Scheme into Tay Ninh and Long An provinces. The existing Dau Tieng West and East canals will be upgraded over a length of 62 km, and a new feeder canal will be built to connect to the Tan Bien and Duc Hoa areas. The Project will guarantee long-term raw water for domestic supply and industrial areas located along the Saigon River (Ho Chi Minh City), in Tay Ninh, and in northeastern Long An.

### III. DESCRIPTION OF THE ENVIRONMENT

7. The Project study area, which covers roughly 22,500 square kilometres (km<sup>2</sup>), includes three Dong Nai sub-basins: Song Be (8,310 km<sup>2</sup>), Saigon (4,717 km<sup>2</sup>), and VCD (8,546 km<sup>2</sup>).

#### A. Physical Resources

8. The area is in the tropical monsoon zone. Between May and October, the southwest monsoon brings humid air from the Gulf of Thailand to the Dong Nai River Basin, causing rains. There is a pronounced dry season from December to April.

9. The catchment area at the Phuoc Hoa barrage site, located 102 km upstream of the Song Be's confluence with the Dong Nai, is 5,200 km<sup>2</sup>. The catchment includes five major water bodies: the Song Be River, the Saigon River, the Dong Nai River, the Tri An Reservoir, and the Dau Tien Reservoir.

10. The Song Be is a medium-sized perennial river; at the barrage site, it is about 50 m wide and 16 m deep from the top of the river bank. The Tri An Reservoir is located on the Dong Nai upstream of its confluence with the Song Be. Water flows in the Dong Nai, at the confluence with the Song Be, have increased greatly during the dry season since the commissioning of the Tri An and Thac Mo hydropower plants. The Saigon flows 280 km before reaching the Dong Nai 40 km from the sea. Under natural conditions the tidal influence extends up to 140 km from the sea. Dau Tieng Reservoir is located on the Saigon, 120 km from its confluence with the Dong Nai. The objectives of this reservoir are water supply for the Dau Tieng Irrigation Scheme; salinity control in the Saigon for water supply and irrigation; and water supply for towns and industries in Tay Ninh Province. The VCD receives water directly from Dau Tieng Reservoir through the West Canal, from the Dau Tieng Irrigation Scheme drainage canals, and from direct industrial or domestic discharges. Releases from the Dau Tieng Reservoir are an important source of additional fresh water entering the VCD.

11. Soils in the study area are divided in two main groups: terrace soils and recent alluvium. The latter, found in the Lower Vam Co Dong (Duc Hoa District), are flooded to varying depths each season, only drying out towards the end of the dry season. The most serious problem with these soils is the presence of acid sulfate conditions.

#### B. Ecological Resources

12. Small areas of primary forest and some secondary forests still exist in the project area. Most of these are located in northwest Tay Ninh and to the west of the VCD River. Of these, Lo Go Xa Mat National Park (LGXM) is most significant. The 18,000 ha park supports a number of habitats (e.g., forest on flat lowlands and seasonally inundated forested wetlands) virtually eradicated from elsewhere in Viet Nam. LGXM is also an important stop-over for the globally threatened sarus crane (*Grus antigone*). LGXM supports many other large waterbird species and is home to a number of species endemic to southern Viet Nam and eastern Cambodia, some of which are globally threatened.

13. In Duc Hoa District, Long An, some natural vegetation remains in areas of acid sulfate soil that are subject to periodic flooding. These simple wetlands play not only a useful role in providing habitat to wildlife, but also offer local people many benefits, including storage of flood

water and buffering against soil and water acidification. With the exception of Tay Ninh's northwestern forests and some acidic grasslands in Duc Hoa, most wetlands in the Project area have been reclaimed and converted to agricultural land.

14. The Project's most relevant and intact aquatic ecosystem is the Song Be. The river supports a freshwater ecosystem of over 100 fish species and a number of benthic invertebrates. However, this ecosystem will be severely affected by the Can Don Dam (under construction). Other aquatic ecosystems have already been subjected to significant stress from human development. For example, Tri An and Dau Tieng reservoirs have caused the loss of the main natural feeding habitat for the giant freshwater prawn (*Macrobrachium rosenbergii*) in the upstream reaches of the Dong Nai and Saigon rivers. One reason for aquatic impacts is that many of these developments do not include mitigation measures to preserve aquatic ecosystems (e.g., fish passages).

### **C. Human and Economic Development**

15. Rural population accounts for 84.7% of the total population (excluding HCMC) in the study area. Between 70.4% and 98% are farmers, depending on the location. The poorest people are in Tan Bien and Duc Hoa, with 31.7% and 21.5% of households, respectively, living under the poverty line. According to the survey, irrigation is the main priority for people in the beneficiary areas. Roads, credit, and electricity are their next priorities.

16. While the Project area is predominantly agricultural, there is considerable variation in land use simply due to the size of the area. Rain-fed crops such as sugarcane, cassava, and rubber dominate northern Tay Ninh. Annual crops such as rice, singly and doubly cropped, are the main cultivation in the north and middle VCD. Irrigated agriculture and rice production dominate mid-Tay Ninh and Duc Hoa districts (Long An). Tay Ninh also has 821 ha of production forests managed under the Government's 178 Program. Rubber plantations dominate the middle and northern part of Binh Duong, and also Binh Phuoc.

17. The most highly prized species in the Song Be is the giant freshwater prawn. According to fishermen, catches have decreased dramatically over the past 10-15 years. They attribute this to construction of Thac Mo Barrage and to overfishing. The total annual value of fisheries in the Song Be is estimated at \$73,500. Can Don Hydropower Plant<sup>1</sup> will have further negative effects on future fisheries.

18. The water quality of the Song Be, Dong Nai, Saigon and VCD rivers often does not meet Vietnamese water quality standards for several parameters, including pH, coliform bacteria, and total suspended solids. Of these rivers, the Dong Nai upstream of Bien Hoa appears to have the best water quality. Tests indicate an increase in organic pollution in the Song Be as one moves downstream. The concentration of pollutants increases in the dry season. In the Saigon, acidity increases from Ben Than to Cat Lai. Monitoring data show that organic pollution is very high, reaching its peak near HCMC. There the water quality standard for organic pollution can be exceeded by up to 94 times. During the rainy season, acidity in the VCD River is very high, reaching pH 3.8 – 4.0. Water released from the Dau Tieng Reservoir has a positive effect on water quality during the dry season.

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<sup>1</sup> Can Don Hydropower Plant is under construction and will be commissioned in 2003. It is financed by 100% government funding.

19. The Saigon and the Dong Nai rivers are the source of domestic and industrial raw water for the HCMC, Thu Dau Mot, and Bien Hoa urban areas. The Chanh My Water Treatment Plant and the future Ben Than Water Intake are located on the Saigon. The Dong Nai is the main water source for domestic and industrial use in HCMC and Bien Hoa. The Hoa An Water Treatment Plant is located on the Dong Nai. Tay Ninh Town is supplied with water directly from the Dau Tieng Irrigation Scheme. The water demand of the city is 7,000 cubic meters per day ( $\text{m}^3/\text{d}$ ) and will increase to 14,000  $\text{m}^3/\text{d}$  shortly. The Bourbon Sugar Factory is the main industrial water user in Tay Ninh Province ( $3.4 \text{ m}^3/\text{s}$ ). Raw water is brought in from the Tan Hung Canal. Three ice factories located on the West Canal draw  $5 \text{ m}^3/\text{s}$  of water in total from the canal during the dry season. The main source of water for domestic purposes in the province is groundwater from bored wells. In 1999, only 21.7% of the rural population in Tay Ninh received clean water.

#### **IV. ANALYSES OF ALTERNATIVES**

##### **A. The “No Project” Alternative**

20. If there is no action to manage and allocate water as proposed, problems relating to the competition for supply when it is limited will escalate over the years to the detriment of the overall development of the region. These problems can be subdivided into two groups: (i) those associated with domestic and industrial supply, and (ii) those associated with irrigated agriculture and rural development.

21. With water abstractions steadily increasing overall, the flow available in the dry season at intakes for municipal water supply is expected to decrease, thereby increasing the risk of water shortage for domestic, personal, and hygiene purposes. The situation would be the same for industry, except that the shortage and indeed any forecast of increasing risk of shortage could have a serious detrimental effect on the industrial and commercial confidence as a whole.

22. Agricultural production in the project area may be expected to increase slowly in the future as technological advances improve cultivation and yields in both areas that are irrigated and those that are not. Substantial regulated flows in the Song Be will continue to pass unused to the Dong Nai River and thence to the sea, while good agricultural land in the VCD Basin would remain underutilized for lack of irrigation. Rural prosperity would continue to be constrained through lack of irrigation development, which could otherwise provide a much-needed boost to the rural economy. Such a situation often leads to increased urban migration.

##### **B. Alternatives Within the Project**

23. A number of alternatives within the Project were considered during the period 1997–2002, the most ambitious being to irrigate about 100,000 ha of land, including the VCD River area and Duc Hoa, Binh Long, Duc Hoa, and Tan Bien districts. Due to the large land acquisition requirements (6,000 ha) and only marginal irrigation improvements in some areas (especially along Vam Co Dong River), the net benefits of more ambitious alternatives were low. During the feasibility study, it was learned that the highest net benefits could be achieved by paring the project down to its current—and most favored—alternative.

24. A summary of the most favored alternative is found in paras. 4–6. This most favored alternative will cost \$164 million and has an economic internal rate of return (EIRR) of 14.5%. It has the potential to cause some adverse impact on the environment (especially on forestry

lands in Tan Bien, the acid soil areas of Duc Hoa, and reduced flow impacts of the Song River). However, the Project's environmental management plan (EMP) is designed to mitigate adverse impacts and in some cases, turn adverse impacts into positive impacts. The following text details the proposed impacts, mitigation, and monitoring measures required to minimize negative impacts and maximize positive impacts created by the most favored alternative.

## **V. ANTICIPATED ENVIRONMENTAL IMPACTS OF THE PROJECT**

25. This is a social development project that aims to reduce poverty through improved water resources management in six provinces of southern Viet Nam. For this reason, the Project provides a number of significant and positive social and environmental benefits: (i) increased poverty reduction throughout the project area (improved livelihood of 169,000 project beneficiaries, including raising 33,000 beneficiaries above the poverty line); (ii) support for protection of the Tan Bien forests; (iii) remediation of 1,250 ha of acid soil in Duc Hoa District; (iv) improved roads and small bridges in four provinces; and (v) improved management and allocation of water resources (improving irrigation services to about 30,200 households; providing a major alternative water source to HCMC; reducing dependence on overtaxed groundwater in many parts of the project area, improving salinity control of the Saigon, Song Be, and Dong Nai rivers; reduced salinity intrusion in the VCD River; providing a major alternative water source to HCMC; and improving domestic and/or industrial water supply to four provinces).

26. However, screening for potential environmental negative impacts using the ADB matrix indicates that a number of negative impacts will likely occur in the preconstruction, construction, and operation phases. A summary of impacts and mitigation measures is provided in the environmental management plan (Appendix 1). The detailed impact assessment and the proposed mitigation measures are described as follows.

### **A. Preconstruction Phase Impacts and Mitigation Measures**

#### **1. Resettlement**

27. The Project will require 3,151 ha of land for reservoir and access roads, the transfer canal, main canals, primary and secondary canals, and for on-farm canals. The impacts of land acquisition are assessed as being significant and will be the most significant unmitigable environmental impact of the project. Nonetheless, land requirements for the reservoir have been minimized through careful selection of project alternatives and participatory design of canal alignments. It is estimated that a total of 2,225 households (11,138 persons) will be affected by the Project, two thirds of which will be severely affected<sup>2</sup> by loss of residence, business, and/or productive agricultural land. The proposed mitigation measure is compensation, resettlement, and rehabilitation. A summary of land acquisition requirements and impacts on affected people is found in Table 1. The detailed compensation, resettlement and rehabilitation scheme is presented in the Project's Resettlement Plan (RP). The RP and a summary RP (Appendix 2) have been prepared according to ADB guidelines and Vietnamese legislation. The total budget for RP implementation is \$18,140,000.

<sup>2</sup> Resettlement will be "significant" where 200 or more persons experience major impacts involving physical displacement from housing and/or having more than 10% of their productive, income generating assets lost.

**Table 1: Summary of Land Acquisition Requirement and Impacts on Affected People**

Physical Component	Impact on Household (HH) Structures					
	Severe Impact			Marginal Impact	Total Impact	
	Resid HH	Bus HH	Agric HH	HH	HH	Persons
Phuoc Hoa Barrage and Reservoir	109	9	435	257	810	4,083
Access Road	25		31	0	56	275
Transfer Canal	131	12	114	40	286	1,349
Binh Long Irrigation System	0	0	73	109	182	892
Tan Bien Irrigation System	110	0	173	150	433	2,296
Duc Hoa Irrigation System	78	0	183	197	458	2,243
<b>Total</b>	<b>453</b>	<b>21</b>	<b>1,009</b>	<b>753</b>	<b>2,225</b>	<b>11,138</b>

## 2. Natural Forest and Protected Areas

28. There are no Ramsar<sup>3</sup> sites within southern Viet Nam, but there are one World Heritage Site downstream of the Saigon River, one national park in Tan Bien District of Tay Ninh Province, two small production forests in Chau Thanh District of Tay Ninh Province, and a few scattered hectares of low-quality natural wetlands in Duc Hoa District of Long An Province. Of these, the only potential for significant impact lies in Tay Ninh Province, where a national park (LGXM) and two forest zones (#67 and #68) exist. Both impacts are discussed below.

29. The Project will not irrigate within LGXM. It will, however, irrigate part of the Park's buffer zone.<sup>4</sup> Buffer zone irrigation does not conflict with the Park's buffer zone development values. People's committees and the provincial Department of Agriculture and Rural Development (DARD) unanimously support irrigation in the buffer zone (see Appendix 3 for the official statement from Tay Ninh People's Committee). However, drawing settlers close to LGXM may have unintended impacts: (i) loss of habitat within the national park due to conversion of natural habitats (forest and wetlands) to agriculture; and/or (ii) local extinction of plant and animal species due to unsustainable exploitation (timber extraction, hunting, etc.). If, through these impacts, the area of natural habitat at LGXM were reduced, the capacity of the site to support intact faunal and floral communities would be irreversible. However, the impacts are assessed as mitigable.

30. It is envisaged that the following steps will be taken to mitigate impacts and maximize positive impacts. First, irrigation canals have been designed to avoid direct impacts on all natural forest ecosystems, and land designated by any local, provincial, or national government agency as having forest status. Second, the Project will support a buffer zone management and park protection program, minimize indirect environmental impacts, and maximize positive social impacts. The program objective is to ensure social and environmental sustainability in Tan Bien Irrigation Scheme (TBIS) communes. The approach is to use irrigation development as a tool to concurrently strengthen national park and production forest protection, and improve the livelihoods of local people in the TBIS. The components are listed as: (i) Component 1: Capacity Building for LGXM Park and Buffer Zone Stakeholders; (ii) Component 2: Commune

<sup>3</sup> RAMSAR Convention on Wetlands was adopted in Ramsar, Iran in 1971, and came into force in 1975.

<sup>4</sup> At least half of the 18,600 ha buffer zone land could be irrigated by the Project.

Development Plans; (iii) Component 3: Multistakeholder Resource Management; and (iv) Component 4: Biological, Biophysical, and Social Surveys.

31. The Project will not irrigate Forest Zones #67 and #68. It is possible, however, that the Project's proposed roads and irrigation canals will increase the forest's vulnerability due to impacts similar to that of LGXM. On the other hand, the impact on the flora and fauna of forested areas is assessed as mitigable. The impact of social development near forested areas is assessed as a major positive impact.

### **3. Population, Communities, and Agricultural Activities**

32. The Project will build 80 km of new feeder and main canals and enlarge and line 62 km of existing canals (Dau Tieng West and East canals). The average width of these canals will vary from 30 to 80 m. By their very dimensions, the canals will constitute a barrier to people living on both sides. However, this impact is assessed as mitigable. To minimize those impacts, a number of measures will be implemented. They are, in order of priority (i) avoid the impact (e.g., Feeder Canal No. 1 has been rerouted to avoid Village No. 2 in Minh Tan Commune.), (ii) rectify the impact (e.g., construction of bridges over feeder and main canals at appropriate locations is the main measure for mitigating this impact), and (iii) compensate for the impact (e.g., redistribute land along the canal route to ensure that farmers living on one side of the canal have all their fields on that same side).

33. The Project will construct roads close to, and parallel with several of the new canals. This impact is assessed as a major positive impact. The Project's canal roads will follow the same standards as provincial roads to maintain good access for traffic even during the rainy season. In the meantime, it is required that the Project consult with provincial and district authorities during the preconstruction phase to ensure that road widths, alignments, surfaces, and loads incorporate local knowledge and development priorities.

## **B. Construction Phase Impacts and Mitigation Measures**

### **1. Construction of Headworks and Main Canals**

34. The construction of headworks (spillway, cofferdams, embankments) and main canals will create several impacts (water quality deterioration, erosion, etc.). The excavation of the feeder and main canals will require disposal of excavated soil on about 257 ha of agricultural land alongside the canals. Runoff erosion during rains and floods from unprotected excavated areas will cause temporary soil erosion. If excavation occurs where soil is acidic (e.g., Duc Hoa), the environmental impacts of soil erosion run-off will be more significant. These impacts are collectively assessed as being mitigable.

35. A number of mitigation measures will be implemented. Example measures are presented as follows: (i) minimize the impact: environmental "best practices" should be written into contractor specifications; (ii) rectify the impact: rehabilitate all agricultural land affected by the project; rehabilitate the existing road network used for hauling construction material; and (iii) compensate for the impact: households outside the right-of-way having suffered damage from road construction or road traffic and farmers living along the canals and affected by the disposal of material should be compensated according to the RP.

## **2. Acid Sulfate Soils**

36. Along the border of the Duc Hoa Irrigation Scheme (DHIS) lie several pockets of potentially acidic sulfate soils, amounting to 1,250 ha. These soils are categorized as (i) RS 1: heavy textured, hydromorphic soils where potential acid sulfate soils lie within the first 50 centimeters (cm) of substrate (about 250 ha); or (ii) RS 2: heavy textured, hydromorphic soils where potential acid sulfate soils lie below the first 50 cm of substrate (about 1,000 ha). The Project could exacerbate environmental problems created by DHIS's acid soils during the construction phase if acid sulfate soils are excavated and later used by farmers for irrigated agriculture. The leachate from these soils will reduce pH in receiving waters. Nonetheless, this impact is assessed as mitigable.

37. The following construction mitigations are required in RS 1 and RS 2 soils: For spoil excavated using a grab dredger, the contractor should dig a small ditch between the spoil and the farmers' fields to direct runoff back into the canal. For spoil excavated using a cutter dredger, containment by the surrounding embankments will control the spread of the spoil and direct runoff back into the canal. Where feasible and advantageous, the contractor will be required to dredge one side of an existing canal to minimize exposure of and leaching from acid soils. The contractor will be responsible for mitigation and compensation for any damage to farmers' land or other assets due to excavation, based on conditions that would be specified in the contractual agreements. Consideration should also be given to cement lining of irrigation canals where they transect acid sulfate soils to prevent leaching of free sulfur and aluminum into irrigation water.

## **3. Health Risks Related to Mines, Explosives, and Toxic Substances**

38. There are landmines near the Cambodian border of Tay Ninh Province, mortar shells from previous wars are found at shallow depths in some provinces, and in general, some unexploded aerial bombs of 100 kilograms (kg) or more probably lie within the first 10 m of soil in the project area. Many agriculture areas have been demined at shallow depths. However, there has not been demining (i) in nonproductive land, especially near the Cambodian border; nor (ii) at depths greater than 2 m in most of the project area. This means that some construction activities (building new roads, barrage, and irrigation canals) may be at risk of coming in contact with unexploded ordinance. This impact is assessed as mitigable. This impact can be minimized by employing a number of mitigation measures: (i) a mine, explosive and toxic barrels detection survey must be carried out within the right of way of future irrigation canals prior to commencement of construction; (ii) all ordinance and toxic substances must be safely removed and secured before construction work begins; and (iii) waste management plans must be prepared in conjunction with the contractor before the beginning of construction works.

## **4. Impact of the Construction Works on Economic Activities**

39. The construction cost for the Project is estimated to be around \$100 million, a significant portion of which will be for the procurement of local skilled and unskilled labor to conduct a range of construction activities. Direct and indirect benefits of procuring local services will boost local economic activity over a period of 3–5 years. The impact of construction will be a major positive impact. The construction work's terms of reference (TOR) should specify a requirement for hiring a certain percentage of local people and specific interest groups (e.g., women). Local workers should be trained before the start of construction to increase their skills and minimize project delays.

## **C. Operation Phase Impacts and Mitigation Measures**

### **1. Water Quantity Changes in the Lower Song Be**

40. Reduction of water flow in the lower Song Be during the dry season in dry years will affect aquatic habitat and fisheries, riparian irrigation (6,000 ha), downstream irrigation (Ong Keo Irrigation Scheme, 5,400 ha), domestic water supply (drinking water) and water quality. During these dry years, reduction in Song Be water flow could increase salinity intrusion and cause negative impacts on the aforementioned resources that rely on freshwater supply. This impact is assessed as mitigable. The environmental impact of dry-season flows can be minimized by (i) creating a Dong Nai River Basin Organization (DNRBO) with responsibility for water management, including that of the Song Be; (ii) controlling release of water to the Song Be; a number of minimum flow rate calculation methods were employed, and based on these methods, the minimum water flow recommended for Song Be is 14 m<sup>3</sup>/s; and (iii) giving priority in the next 5 years to providing clean water to families located along the Song Be river.

### **2. Acid Sulfate Soils**

41. Along the border of the DHIS lie several pockets of potentially acid sulfate soils, amounting to 1,250 ha (previously described in the “construction impacts” section). The Project could exacerbate environmental problems created by DHIS’s acid soils during operation if farmers use water from the new canals to irrigate acid sulfate soils. The leachate from these soils would then reduce pH in receiving waters. This would have two kinds of impacts: (i) agricultural impacts—a drop in pH of receiving waters would create a drop in productivity of rice that is irrigated by those receiving waters; and (ii) aquatic impacts—low pH levels would increase the toxicity of aluminum on aquatic resources. This impact is assessed as mitigable.

42. Earlier assessments<sup>5</sup> of the DHIS acid sulfate soils proposed to modify the legal land tenure of acid sulfate soil areas and give them forest status. This may not be the most practical or beneficial mitigation measure, because there are 854 red book certificates and 122 commune certificates in the DHIS potential acid sulfate soils. Changing land tenure to Program 661 would entail a substantial compensation program. An alternate mitigation measure for the Project is to work closely with local agencies during the preconstruction phase to (i) minimize increased acidity in irrigation canals, and (ii) maximize irrigation benefits to local farmers. At present, local farmers are remediating acid soils in DHIS using acid-tolerant rain-fed crops (melaleuca, sugarcane). Consideration should also be given to cement lining of irrigation canals where they transect acid sulfate soils to prevent leaching of free sulfur and aluminum into irrigation water.

### **3. Rural Water Supply for Duc Hoa District**

43. The Project will bring fresh water to Duc Hoa District. This water can be used for a range of domestic purposes, including washing food and clothes, and in some cases, for drinking. This new source of rural water supply will improve the health of local people who do not currently have access to an adequate rural water supply. This impact is assessed as a major positive impact. A water supply pilot project using fresh water from the irrigation canal (subjected to basic water treatment) will be funded by the Project to demonstrate how to maximize the positive benefits of this impact.

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<sup>5</sup> Black and Veatch. 2000. *Feasibility Study, Main Report*; Black and Veatch. 2001.

#### 4. Fisheries and Biodiversity in the Song Be and Phuoc Hoa Reservoir

44. A barrage will be constructed and operated at the head of the Phuoc Hoa Reservoir. The barrage will be a physical barrier for migratory fishes and invertebrates along the Song Be. This barrier will, *inter alia*, create a reduction in fisheries production and biodiversity both upstream and downstream of the barrage. This impact is assessed as mitigable. However, if the proposed upstream hydropower projects (e.g., Can Don) proceed, this assessment would likely need to be changed to unknown. The reason for this change is twofold,: (i) it will be very difficult to separate the impacts of each project on the local ecosystem and project affected persons; and (ii) if impacts cannot be separated, it will be very difficult to determine if the mitigation measures proposed below are sufficient to mitigate the impacts of the Project.

45. To mitigate this impact, a number of measures need to be implemented. In order of priority, they are to (i) rectify the impact, and (ii) compensate for the impact. Rectifying the impact can be facilitated through three parallel activities: The first activity is to construct a fish-pass to help sustain species diversity both upstream and downstream of the barrage. The second activity is to establish a fish conservation area within the Phuoc Hoa Reservoir. The third activity is to establish a fisheries association to manage the various fishing activities around the reservoir, including reservoir fisheries, the fish conservation area, the fish-pass, and key fishing areas. Through these mitigation measures, the reservoir would offer quite good potential for normal capture fisheries. If the aforementioned measures are inadequate, then compensation for the impact may need to be provided by the Project. The compensation target group would be fishermen who fish either upstream of the barrage or downstream of the barrage to the confluence of the Dong Nai and Song Be.

### VI. ECONOMIC ASSESSMENT

46. The Project's adverse impacts have been identified in Section V. To mitigate these impacts, two social and environmental safeguard plans have been developed. The first is a \$18.2 million<sup>6</sup> RP. The RP costs represent 11% of the total project budget. The RP base costs can be broken down as follows: RP preparation, implementation, management, and monitoring for the barrage, reservoir area, main and transfer canals (\$10.7 million); and RP activities at three irrigation subprojects (\$7.5 million). The second is a \$1.87 million<sup>7</sup> EMP. The EMP costs represent about 1.2% of the total project budget. The EMP base costs can be broken down as follows: (i) environmental effects monitoring (\$368,550); (ii) project performance monitoring (\$51,800); and (iii) environmental mitigation measures (\$1,453,975).<sup>8</sup>

47. While the RP and EMP will mitigate most impacts, it is recognized that the Project will require 3,151 ha of land for reservoir and access roads, the transfer canal, main canals, primary and secondary canals, and on-farm canals. The impacts of land acquisition will be the most significant unmitigable environmental impact of the Project.

<sup>6</sup> Base cost: \$21.2 million with contingencies.

<sup>7</sup> Base cost: \$2.2 million with contingencies.

<sup>8</sup> These are the EMP's activity budgets. The costs of project staff to implement EMP activities (primarily international and domestic environmental specialists) are embedded in other project budgets.

48. The Project's positive benefits are summarized in Table 2.

**Table 2: Potential Positive Benefits of the Project**

<b>Benefit</b>	<b>Benefit Summary</b>
1. Increased poverty reduction throughout project area	Improved livelihood of 169,000 project beneficiaries, including raising 33,000 beneficiaries above the poverty line
2. Support for protection of Tan Bien forests	Improved forest research and forest protection in Lo Go Xa Mat – a new national park in Viet Nam; support for designing and implementing a buffer zone development plan for communes in the Lo Go Xa Mat buffer zone
3. Remediation of Duc Hoa acid sulfate soil areas	Support for environmentally sound remediation of 1250 ha of potential acid sulfate soils; improved income for farmers who have land-use rights to these soils
4. Improved roads and small bridges	Improved road access for local people; decrease in transport-related accidents/fatalities; improved movement of goods and services in selected areas
5. Improved management and allocation of water resources	Improved irrigation services to about 30,200 households; improved domestic and industrial water supply in selected areas; reduced dependence on overtaxed groundwater; provision of major alternative water source to Ho Chi Minh City; improved salinity control of the Saigon, Song Be, and Dong Nai rivers; reduced salinity intrusion in the Vam Co Dong river

## **VII. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MONITORING PROGRAM**

49. In Viet Nam, the Ministry responsible for overall environmental protection is the Ministry of Natural Resources and Environment (MONRE), created in November 2002, under which has been set up the National Environment Agency. Within each province, departments of science, technology, and environment (DOSTEs) implement this responsibility through environmental management divisions (EMDs). The newly restructured ministry will include four vice-ministers, 16 departments, one newspaper, and one magazine. The new MONRE will merge numerous departments from several national agencies. The next step in developing MONRE is for the MONRE Minister to issue a decision on how these central-level departments, newspapers, etc. will be organized.

50. Viet Nam's environmental assessment framework is guided by three key national policies: (i) Law on Environment Protection (LEP)–enacted in December 1993; (ii) Decree in October 1994 to guide implementation of the LEP and providing broad guidelines; and (iii) Circular No. 490 – promulgated in April 1998 to provide guidance on setting up and appraising the environmental impact assessment report for investment projects.

## **A. Environmental Assessment Requirements for the Project**

51. According to Government Circular No. 490, the Project is subject to a Category I (full-scale) EIA. In a Category I assessment, the Proponent must prepare and submit an EIA report to MONRE for approval.<sup>9</sup> MONRE will form a review committee to evaluate the report, usually comprised of its EIA department staff, local DOSTE EMD staff members, and other government agencies whose mandate may be affected by the Project. The review committee will provide comments and advice to MONRE on the EIA report. Based on the input from the review committee, MONRE will either issue a Decision by the Minister to approve the EIA report; or issue a letter to the Proponent to request more information/clarification on the submitted EIA report. Under Circular No. 490, MONRE has 60 days to conduct the review of the EIA report and issue a response to the Proponent.

52. ADB has classified this Project as environment category A ("projects with potential significant adverse environmental impact").<sup>10</sup> The SEIA will be submitted to the ADB Board at least 120 days before it considers the Project. In the meantime, it is required that the SEIA and the full EIA report in English and Vietnamese be made available to locally affected groups and nongovernment organizations.

## **B. Environmental Management Plan**

53. The EMP's objective is to provide clear guidance on how to ensure that the Project:

- (i) complies with Vietnamese environmental laws, international environmental commitments, and ADB environment policies throughout the preconstruction, construction, and operation phases;
- (ii) employs a suitable organizational framework for environmental protection throughout the preconstruction, construction, and operation phases;
- (iii) manages/monitors mitigation measures described in the MONRE and ADB-approved EIA report;
- (iv) can provide emergency response mechanisms for unanticipated environmental issues, crises, and accidents; and
- (v) allocates appropriate financial resources to implement the EMP.

54. To achieve these objectives, the EMP identifies:

- (i) the Vietnamese legal and administrative framework under which the EIA will be approved and the EMP will be implemented;
- (ii) ADB's EIA approval requirements;
- (iii) the EMP organizational framework and the assignment of responsibilities for environmental systems design, management, and reporting; information collection; project management decisions on the environment; implementation of project management decisions; and external review of EMP activities;
- (iv) significant adverse environmental impacts that are anticipated, and their proposed mitigation measures;

<sup>9</sup> The EIA report has been formerly submitted to MONRE for approval on 11 March 2003.

<sup>10</sup> ADB. 1998. *Environmental Assessment Requirements of the Asian Development Bank*. Manila

- (v) programs to monitor both the performance of mitigation measures and the overall environmental effects of the Project on the surrounding ambient environment;
- (vi) EMP reporting procedures; and
- (vii) cost estimates for each component of the EMP.

55. The EMP is the “master document” from which all other environment-related project documents and actions are guided. This includes construction method statements, tender documents, contractor specifications, general conditions of construction contract, site environmental management plans, TORs for environmental specialists, and allocation of budgets for environmental protection and monitoring. If an ambiguity exists on how to deal with environmental issues in any of the project documents or activities, the EMP will serve as the authoritative reference document. A summary of the EMP is given as Appendix 1.

## VIII. PUBLIC INVOLVEMENT

56. Since beneficiary participation is indispensable to the Project's success, the communities and affected groups and people were consulted during the early stages of project design and preparation. This section summarizes the types of public involvement conducted during the feasibility study (2000-2001) and Appraisal Mission (2002).

57. **Group Interviews.** This survey was prepared in collaboration with specialists in different fields (agriculture, sociology, environment, economics). During the feasibility study, 20 group interviews were conducted in the different beneficiary areas. Each group interview gathered together 30 farmers and discussed problems associated with irrigated agriculture and rural development.

58. **Household Survey.** A household questionnaire was prepared in April and May 2000 with the participation of social, environmental, agroecology, and institutional management specialists. The household survey was carried out in June and July 2000. The questionnaire was conducted in 605 households within the 20 communes, scattered around the beneficiary areas.

59. **Resettlement Group Interviews.** Resettlement group interviews with affected persons were conducted in four communes affected by the Project to collect data on (i) vulnerable groups that may be adversely affected by the Project, (ii) resettlement preferences of affected families, and (iii) measures to reduce impacts.

60. **Stakeholder Meetings and Workshops.** In August-September 2000, stakeholder meetings were held in four provinces. A general meeting was organized for stakeholders in HCMC together with the major participants from each province. In November 2002, a stakeholder workshop on developing social and environmental safeguards for the TBIS was conducted in Tay Ninh. It included representatives from all key communes, districts, DOSTE, and DARD.

61. **Data Collection from Provincial Departments.** Representatives from DARD and DOSTE in each province and HCMC were met twice during the 2000 feasibility study and twice during the 2002 Appraisal Mission. During the Appraisal Mission, each of the four project DOSTEs (Binh Duong, Binh Phuoc, Long An, Tay Ninh) reviewed the draft EIA report and

provided written comments to PMB 416 on each province's issues/priorities for the Projects' environmental protection measures

62. **Interviews in the Field.** During both the feasibility study and the Appraisal Mission, one-on-one discussions were carried out with farmers, fishers, women, loggers, forest guards, representatives from commune authorities, etc. People expected to be affected by the project interventions were met in each region of the project area. All affected people were able to give their opinions freely without the participation of local authorities.

## IX. CONCLUSION

63. This Project aims to reduce poverty by optimizing water resources in six southern provinces of Viet Nam. At present, about 39% of the 169,000 project beneficiaries are below Viet Nam's national poverty line. By the end of the Project, about half of these beneficiaries should rise about the poverty line.

64. The Project will achieve these poverty reduction goals by creating the following positive project impacts: (i) Improved management and allocation of water resources (improving irrigation services to about 30,200 households; providing a major alternative water source to HCMC; reducing dependence on overtaxed groundwater in many parts of the project area; improving salinity control of the Saigon, Song Be, and Dong Nai rivers; reducing salinity intrusion in the VCD River; providing a major alternative water source to HCMC; and improving domestic and/or industrial water supply to four provinces); (ii) support for protection of the Tan Bien forests; (iii) remediation of 1250 ha of acid sulfate soil in Duc Hoa District; and (iv) improved roads and small bridges in four provinces.

65. Through the course of achieving these positive benefits, a number of negative environmental impacts may occur. However, those impacts will be minimized to acceptable levels by implementing adequate environmental mitigation measures included in the project scope. With the implementation of such mitigation measures, the overall impact is estimated to be insignificant. The most significant environmental impacts and their mitigation measures are the following:

- (i) The construction of the Phuoc Hoa Barrage will reduce water flows from their present levels in the Lower Song Be. This report proposes to reserve a minimum water flow of 14 m<sup>3</sup>/s in the lower Song Be to reduce the impact on fisheries, riparian irrigation, and water supply.
- (ii) There are about 1,250 ha of potential acid sulfate soils in the DHIS. Most of these areas are mildly acidic and are being remediated by local farmers and government agencies. It is possible that some of these areas could be remediated through project support, while others will need to be excluded from the DHIS.
- (iii) There is a new national park and two existing production forests near the TBIS. To protect forest values, the EIA has proposed a substantial environmental and social safeguards program for the TBIS.

- (iv) The construction of a barrage on the Song Be will significantly affect fisheries in the river and biodiversity. It is proposed in the fisheries report to build a fish pass on the Phuoc Hoa Barrage and support the development of a fisheries conservation area within the Phuoc Hoa Reservoir.

66. In addition to environmental impacts, the Project will have a number of social impacts. About 1,009 households will be severely affected by the Project's most significant and unmitigable impact - the permanent loss of about 2,800 ha of agricultural land. Twenty-one small businesses and 453 households will need to be relocated. In total, about 2,225 households (11,138 persons) will be negatively affected, and 3,153 ha will be acquired. To compensate for these impacts, a \$18.2 million RP has been prepared according to ADB guidelines and Vietnamese legislation. The RP is available upon request.

67. To address these and other environmental impacts, a \$1.87 million environmental management plan has also been prepared for the Project. This plan is designed to mitigate adverse impacts and to maximize the benefits of positive impacts. The plan includes mitigation measures, performance standards of those measures, and methods to monitor mitigation effectiveness. The plan also includes monitoring programs for environmental effects on surface waters, forested areas, and groundwater areas that could be affected by the Project. The plan is organized by preconstruction, construction, and operation phases.

## ENVIRONMENTAL MANAGEMENT PLAN

1. The objectives of this environmental management plan (EMP) are to describe (i) the legislative and administrative frameworks in the country on environmental impact assessment (EIA) management; (ii) implementation arrangements for the EMP; (iii) the environmental monitoring program; and (iv) reporting arrangements.

### A. Vietnamese Legal and Administrative Frameworks for EIA

2. Viet Nam's environmental assessment framework is guided by the following three key national policies:

- (i) The Law on Environment Protection (LEP) — enacted in December 1993,
- (ii) Decree 175 — promulgated in October 1994 to guide implementation of the LEP and providing broad guidelines for it, and
- (iii) Circular No. 490 — promulgated in April 1998 to provide guidance on setting up and appraising the EIA report for investment projects.

3. Viet Nam's key environmental assessment and monitoring agencies include the following:

- (i) **Ministry of Natural Resources and Environment (MONRE).** MONRE was established by a Prime Ministerial Decision on 11 November 2002. This new ministry will have four vice ministers and 16 departments, and will publish a newspaper and a magazine. The new MONRE will merge numerous departments from several national agencies. These are outlined in Decree 91/2002/ND-CP: Providing for the functions, duties, powers, and organizational structure of the MONRE.
- (ii) **Environmental Impact Assessment and Appraisal Department.** This department is under MONRE. According to Decree 91/2002/ND-CP, the Department's functions include appraising EIA reports of projects and of business and production establishments; issuing environmental standards; and issuing and revoking certificates of conformity with environmental standards in accordance with the law. It is expected that the department will be guided by Viet Nam's established regulatory framework, i.e., the LEP, Circular No. 490, Decree 175, etc.
- (iii) **Provincial departments of science, technology and environment (DOSTEs).** The environmental management division (EMD) of each provincial DOSTE is responsible for ensuring environmental protection and management of provincial matters in accordance with the LEP, Decree 175, and Circular 490. The decision to restructure DOSTEs will likely occur in 2003, after decisions have been made on how to restructure MONRE at the central level. It is expected that, regardless of where EMD is housed, its environmental protection function will remain intact. For this reason, the EMD will remain as a key partner to the successful monitoring and implementation of the Project.

### B. Implementation Arrangements for EMP

4. The executing agency for the Project will be the Ministry of Agriculture and Rural Development (MARD). The Project will be implemented by the Central Project Office (CPO)

based in Hanoi. MARD/CPO will be assisted by a team of international and local consultants to be recruited under the Project. CPO will establish a multidisciplinary Project Management Unit (PMU) in HCMC for day-to-day project management. To facilitate a decentralized approach, the CPO/PMU will be supported by five implementing agencies (IAs) including the existing project management board 416 (PMB 416), and provincial subproject offices (PSPOs) to be established in each of the four participating provinces of Binh Phuoa, Binh Doung, Tay Ninh, and Long An. PMB 416 will be responsible for construction supervision of the major civil works contracts including the Phuoc Hoa barrage, the transfer canal, and the main canals for each of the irrigation subprojects. The PSPOs will be responsible for development of the irrigation areas within each of their provinces, including resettlement, social mobilization and support programs, design and supervision of civil works contracts for primary and secondary canals, and related on-farm development. PMB 416 and each of the PSPOs will report to the CPO/PMU.

5. The attached proposed mitigation measures (Table A1.1) outline many of the various actions that will comprise this EMP. The EMP's organizational framework is designed to evolve as the Project moves through the preconstruction, construction, and operation phases.

## **1. Preconstruction and Construction Phases**

6. CPO/PMU will be the main coordinator of this Project. Part of its responsibilities will be implementation of the Project's EMP. MARD will play a key role in the selection and management of a qualified national institute to conduct the design and construction-phase environmental monitoring, the selection and management of a qualified national or international organization to implement the Tan Bien Environmental and Social Safeguards Program, and ensuring that the EMP's design and construction mitigation measures are implemented. CPO/PMU will receive significant assistance to complete its EMP duties from (i) the international and local consultants (especially advising on monitoring design, and reviewing monitoring results and the effectiveness of mitigation measures), and (ii) the six provincial DOSTEs (especially to provide information for the monitoring plan and enforce implementation of the mitigation measures).

7. To ensure that the EMP as well as all applicable national and local environmental regulations and the Asian Development Bank's (ADB) environmental requirements can be met during the project preparation and implementation phases, CPO/PMU, assisted by the environment experts, will have the following roles and responsibilities (i) review civil works contracts in accordance with the EIA report; (ii) coordinate implementation of the EMP among the contractors, local environmental authorities (e.g., DOSTEs), and the Department of Agriculture and Rural Developments (DARDs) and the local institutes; (iii) monitor the implementation of the EMP and the civil works contracts in collaboration with local DOSTEs; and (iv) prepare the semiannual and annual environmental progress reports that will be part of the whole project progress report and submitted to MARD, ADB, and MONRE.

8. Likewise, it is also recommended that at least one environmental officer be placed in each PSPO to fulfill the following main responsibilities: (i) report to the project director within the PSPO; (ii) prepare the TOR for environmental consultants (if needed), and then take charge of their selection and guidance; (iii) review civil works contracts in accordance with EIA report; (iv) coordinate implementation of the EMP among the contractors and local environmental authorities (e.g., DOSTEs); and (v) monitor implementation of the EMP and the civil works contracts in collaboration with local DOSTEs.

## **2. Operation**

9. The Project will establish links with the Dong Nai River Basin Organization (DNRBO) through an agreement to be formalized within 12 months after loan effectiveness to ensure full stakeholder participation in decision-making on issues that affect the overall management of water resources in the basin such as operating guidelines for basin transfers, water quality and other environment matters. The office of the DNRBO should either have an environmental unit with appropriate skills and experience or contract a qualified environment team to complete the Project's EMP.

## **C. Environmental Monitoring**

10. The purpose of the environmental monitoring program is to quantitatively measure the environmental effects of the Project. The environmental monitoring program will operate through the preconstruction, construction, and operation phases. It will consist of five subprograms, each with a specific purpose, key indicators, and significance criteria. The approach of subprograms is advantageous because it will (i) link subprograms with project activities; (ii) minimize the number of parameters, and the physical and temporal scope required to achieve monitoring objectives; and (iii) be easier to develop and apply criteria of significance. The details of the mitigation monitoring program are found in the EMP of the full-scale EIA.

### **1. Subprogram 1: Song Be Water Quality/Quantity Monitoring**

11. The purpose of this program will be to determine if the Project adversely affects water quality in the Song Be River. This program will study those parameters that the headwater construction could likely influence, for example benthos, biodiversity, pH, turbidity, flow rate, and salinity. The program will run during preconstruction, construction, and operation. "Adverse impact" will be defined in part by statistical analysis (using before-after-control-impact) data comparison technique, and in part by comparing data with relevant national standards.

### **2. Subprogram 2: Water Supply Monitoring**

12. The purpose of this program will be to determine if selected water resources developed by the Project are suitable for water supply. This program will study parameters that are typical indicators of water supply quality: fecal coliform, total nitrogen (TN), total phosphorous (TP), cyanide (CN), measure of acidity/alkalinity (pH), and total suspended solids (TSS). "Acceptable water quality" will be determined by comparing data with Ministry of Health water quality standards. This program will run when water supply is being considered for domestic purposes.

### **3. Subprogram 3: Duc Hoa Acid Sulfate Monitoring**

13. The purpose of this program will be to determine if the Project-supported canals near the acid sulfate soils in Duc Hoa meet key irrigation quality criteria. During this program, (i) acid sulfate soils will be studied for composition, pH, and  $\text{Al}^{3+}$ ; and (ii) water quality in receiving canals will be studied for pH,  $\text{Al}^{3+}$ , TN, and TP. The program will run during preconstruction, construction, and operation. "Adverse impact" will be defined in part by statistical analysis (using before-after-control-impact) data comparison technique, and in part by comparing results with irrigation standards set by the local DARD, TCVN, and other projects.

#### **4. Subprogram 4: Project-wide Irrigation Canal Water Quality Monitoring**

14. The purpose of this program will be to determine if irrigation canals developed by the Project are supplying water quality suitable for irrigation. Key indicators will include: pH, turbidity, NH<sub>3</sub>, TP, pesticides, CN, and coliform. “Acceptable water quality” will be determined by comparing data with TCVN standards for irrigation water. This program will be run primarily during the Project’s operational phase.

#### **5. Subprogram 5: Biological and Hydrological Monitoring in Forested Areas**

15. The purpose of this program will be to determine the impacts of the Tan Bien Irrigation Scheme (TBIS) on the nearby Lo Go Xa Mat (LGXM) National Park. Monitoring will be part of the larger “social and environmental safeguards program” for TBIS. The program will support the park to conduct baseline studies on biological resources (biodiversity indices, ecosystem mapping, etc.) and hydrological regimes. The program will continue during TBIS construction and operation to determine if significant changes to the hydrological regime or biodiversity have occurred. “Significant change” will be determined by comparing biological resource inventories and hydrological regimes between preconstruction, construction, and operation phases.

#### **6. Mitigation Monitoring**

16. The purpose of mitigation monitoring will be to ensure that the mitigation measures presented in Section V of this report are implemented effectively. “Effectiveness” is defined for each measure as a “performance standard” within the EMP. If the monitoring reveals that the mitigation is not effective, the Project will need to either improve the existing measure or propose a new measure and performance standard. The monitoring of mitigation measures during design and construction will be the project’s international consultant. They will conduct mitigation monitoring as part of their regular inspection programs. The mitigation monitoring responsibility for the operations phase will be the responsibility of the proposed DNRBO.

### **D. Reporting Arrangements**

17. CPO/PMU will provide MARD with reports on environmental aspects during implementation as part of their semiannual progress reports and annual reports in environmental monitoring. MARD will forward these reports to MONRE and ADB. Depending on the implementation status of environmentally sensitive Project activities, ADB will perform annual or biannual environmental reviews in which environmental aspects of the project will be reviewed alongside project implementation.

### **E. Cost of Implementation of EMP**

18. The Project’s adverse impacts have been identified in the EIA report. To mitigate these impacts, two safeguard plans have been developed. The first one is about \$18.2 million<sup>1</sup> for implementation of the resettlement plan (RP). The second one is about \$1.87 million<sup>2</sup> to implement this EMP. The costs for implementing the EMP represent about 1.2% of the total project budget. The EMP base costs can be broken down as follows: (i) environmental effects monitoring (\$368,550), (ii) project performance monitoring (\$51,800), and (iii) environmental mitigation measures (\$1,453,975). A summary of the overall financial costs of EMP activities is found in Table A1.2. The costs of project staff to implement these activities (international and domestic environmental specialists, etc.) are embedded in other project budgets.

<sup>1</sup> Base cost: \$21.2 million with contingencies.

<sup>2</sup> Base cost: \$2.2 million with contingencies.

Table A1.1: Performance Monitoring Program: Summary of Impacts, Mitigations, and Monitoring Agencies

## 1. PRECONSTRUCTION PHASE

Environmental Impacts		Mitigation Measures			
Impact Domain	Impact Description	Mitigation Description	Mitigation Target	Implementation	Monitoring
Resettlement	<b>Adverse Impact; Mitigable</b> 2,225 households will be affected, 553 houses and 21 shops will be relocated.	\$17 million resettlement plan designed to meet ADB and Government resettlement policies	All Project-affected persons will be fairly compensated.	MARD, CPO/PMU, PPCs, PRCs, DRCs (see Resettlement Framework for more details)	Agencies will be selected at later date.
Land Acquisition	<b>Significant Adverse Impact; Unmitigable</b> 3151 ha will be acquired.	Land requirements have been minimized through participatory design of canal alignments and careful consideration of project alternatives	No mitigation target, but Project should ensure no more than 3151 ha will be acquired by project	MARD, CPO/PMU, PPCs, PRCs, DRCs (see Resettlement Framework for more details)	Agencies will be selected at later date.
Natural Forests and Protected Areas	<b>Adverse Impact; Mitigable</b> Tan Bien Irrigation Scheme will be developed within LGXM National Park Buffer Zone. This could (i) create further migration to the buffer zone, causing conversion of natural habitats to agriculture, and	Locate secondary and tertiary irrigation canal outside national park boundaries.	Ensure irrigation design does not adversely affect national park ecosystem.	Local design consultants, MARD, Tay Ninh DARD	PMU, Tay Ninh DOSTE, LGXM, consultant
		Ensure contractor specifications prohibit entering LGXM or using its resources.	No direct stress by contractor on LGXM	Local design consultants, MARD, Tay Ninh DARD, LGXM National Park, TBIS Commune PCs	PMB 416, PMU, Consultant, Tay Ninh DOSTE, Tay Ninh DARD, LGXM National Park

Environmental Impacts		Mitigation Measures			
Impact Domain	Impact Description	Mitigation Description	Mitigation Target	Implementation	Monitoring
	exacerbate resource extraction from LGXM; and (ii) impact the sensitive hydrological regime of LGXM wetlands.	Design and facilitate a comprehensive Buffer Zone Management and Park Protection Program. The Program includes four components: (i) capacity building for LGXM staff stakeholders; (ii) commune development plans; (iii) multistakeholder resource management of LGXM; and (iv) Biological, biophysical, and social surveys of LGXM.	(i) LGXM staff stakeholders have more skills/knowledge to protect LGXM; (ii) commune development plans established; (iii) multistakeholder resource groups established and functioning; (iv) improved scientific understanding of LGXM	Social and environmental safeguard contractors, Tay Ninh DARD, LGXM National Park, TBIS commune PCs	PMU, consultant, Tay Ninh DOSTE, Tay Ninh DARD, LGXM National Park
	<b>Adverse Impact; Mitigable</b> Tan Bien Irrigation Scheme will be developed in Phuoc Vinh commune near Forest Production Zones #67 and #68. This could create further migration to these forests and exacerbate illegal forest harvesting.	Support Phuoc Vinh Commune in developing a commune development plan. Allow Phuoc Vinh to participate in LGXM plan activities.	Phuoc Vinh Commune Development Plan established.	Social and environmental safeguard contractors, Tay Ninh DARD, Chau Thanh District PC	PMU, consultant, Tay Ninh DOSTE, Tay Ninh DARD,
	<b>Significant Positive Impact</b> Social development will occur near forested areas as a result of the irrigation of part of LGXM's National Park Buffer Zone and the road and canal development occurring near Forest Production Zones #67 and #68.	The positive impact can be maximized by implementing the Buffer Zone Management and Park Protection Program .	Improved quality of life and standard of living for buffer zone residents	Social and environmental safeguard contractors, Tay Ninh DARD, LGXM National Park, TBIS commune PCs	DOSTE, MARD
Severance of population by feeder canals	<b>Adverse Impact; Mitigable</b> Project will build about 80 km of feeder and main canals and enlarge 62 km of existing canals. Canal width ranges	Reroute Feeder Canal No.1 to avoid village No. 2 in Minh Tan commune.	Village No. 2 is not split by Feeder Canal #1.	Local design consultants, MARD	PMB 416, PMU, and consultant.
		Design and construct bridges over feeder/main canals at appropriate locations.	Local people are satisfied with bridge design and location.		

Environmental Impacts		Mitigation Measures			
Impact Domain	Impact Description	Mitigation Description	Mitigation Target	Implementation	Monitoring
	from 30 to 80 m. This will create access barrier for local people.	Redistribute land along canal route	Farmers have all their fields on one side of the canal		
Transportation (Roads)	<b>Significant Positive Impact</b> Project will construct several roads along canals, benefiting local people by improving access to schools, medical facilities, and markets. The positive impact can be maximized by employing the proposed measures:	Meet with local PCs to inform them of the proposed road design, and obtain their views/opinions on how to improve design/construction timing/etc.	Value of canal roads to local communes improved	Local design consultants, MARD	PMB 416, PMU, DOSTEs, and consultant
		Road canal design should follow provincial road standards.	Traffic access is improved, esp. during rainy season.		
		Footbridge design should incorporate security measures to avoid accidents.	Local accidents caused by use of footbridges are reduced.		
		Locate bridges far from forest areas.	Minimise access to forest areas (LGXM and Phuoc Vinh forests)		
Drainage	<b>Unknown Impact</b> Unknown impact on surface water drainage, the population, and infrastructure	Cannot be determined until potential impacts are better known	Cannot be determined until potential impacts are better known	Needs to be clarified during detailed preconstruction phase.	Needs to be clarified during detailed preconstruction phase.
Fisheries and Biodiversity in the Song Be and Phuoc Hoa Reservoir	<b>Adverse Impact; Mitigable</b> The barrage at the head of Phuoc Hoa Reservoir will create a physical barrier for fish and invertebrates along the Song Be, thus reducing fisheries production and biodiversity upstream and downstream of the barrage.	Design a fish-pass to help sustain species diversity both upstream and downstream of the barrage.	Fish pass design completed prior to construction, contracts established to construct fish pass	Local design consultants, PMU	Environmental specialists, consultant

## 2. Construction Phase

Environmental Impacts		Mitigation Measures			
Impact Title	Impact Description	Mitigation Description	Mitigation Target	Implementation	Monitoring
Construction of Headworks and Main Canals	<b>Adverse Impact; Mitigable</b> Construction of headworks and main canals will cause several impacts, including erosion and deterioration of water quality. If excavation occurs where soil is acidic, impacts from erosion run-off will be more severe.	Incorporate environmental “best practices” into contractor specifications. This includes: (i) Strictly control soil handling and limit soil disposal areas limited to the strict minimum. (ii) Involve the environmental expert in the location of borrow pits, and revegetate the sites at the end of construction. (iii) Rehabilitate all agricultural land affected by construction activities. (iv) Rehabilitate any roads damaged by hauling activities.	“Best practices” implemented according to specifications: (i) No soil dumped outside of Project-approved disposal areas (ii) Borrow pits in environment suitable locations, sites revegetated at end of construction (iii) 100% of agricultural land rehabilitated (iv) 100% of damaged roads rehabilitated	Construction Contractors	PMB 416 PMU, consultant, DARD, DOSTEs
		Compensate, according to the Resettlement Plan, households outside the right of way who have suffered damage from road construction or construction-related traffic.	Households outside of right of way are adequately compensated.	MARD, CPO/PMU, PRCs, DRCs (see Resettlement Framework for more details)	Agencies will be selected at later date.
		Compensate, according to the Resettlement Plan, farmers living along canals who have been affected by the disposal of spoil.	Farmers living along canals are adequately compensated	MARD, CPO/PMU, PRCs, DRCs (see Resettlement Framework for more details)	Agencies will be selected at later date.

Environmental Impacts		Mitigation Measures			
Impact Title	Impact Description	Mitigation Description	Mitigation Target	Implementation	Monitoring
Acid Sulfate Soils	<b>Adverse Impact; Mitigable</b> 1250 ha of potentially acid sulfate soils lie along the border of the Duc Hoa Irrigation Scheme. If these soils are excavated during construction, and then later used by farmers for irrigated agriculture, leachate may reduce pH in receiving waters.	Incorporate environmental “best practices” into contractor specifications. This includes: (i) For excavation with a grab dredger, the contractor should dig a small ditch and direct runoff back into the canal. (ii) For spoil excavated with a cutter dredger, spoil should be contained by surrounding embankments. (iii) Where feasible and advantageous, the contractor should dredge one side of an existing canal to minimize exposure of and leaching from acidic soils.	No increase in acidity of receiving waters	Construction contractors	PMB 416, PMU, DOSTEs, consultant
Health Risks Related to Mines, Explosives and Toxic Substances	<b>Adverse Impact; Mitigable</b> Land mines, mortar shells, and aerial bombs may all be found within the project area. Some de-mining has occurred at shallow depths; however, virtually none has occurred in nonproductive land and at depths greater than 2 meters. Construction activities may thus trigger Unexploded Ordinance (UXO).	Carry out Unexploded Ordinance (UXO) detection survey within the right of way of future irrigation canals prior to beginning construction.	No injuries or deaths caused by UXO detonation during construction phase	Ministry of Defense	Agencies will be selected at later date.
		Safely remove and secure all ordinance prior to beginning construction work.	No injuries or deaths caused by UXO detonation during construction phase	Ministry of Defense	Agencies will be selected at later date.
		Safely remove and secure all toxic substances and contaminated soils. Environmental experts to participate in locating storage sites.	No injuries or deaths caused by exposure to toxic materials during construction phase.	Ministry of Defense, Construction Contractor, Environmental Specialist	Agencies will be selected at later date.
		In conjunction with the construction contractor, prepare waste management plans prior to commencing construction works.	Waste management plans prepared and implemented	Ministry of Defense, Construction Contractor	Agencies will be selected at later date

Environmental Impacts		Mitigation Measures			
Impact Title	Impact Description	Mitigation Description	Mitigation Target	Implementation	Monitoring
Economic Activities	<b>Significant Positive Impact</b> A significant portion of the Project's construction costs will be for the procurement of local labor. Direct and indirect benefits of local procurement will boost local economic activity over a period of 3-5 years. The positive impacts can be maximized by employing the following measures:	Construction work's TOR to specify a requirement for local hires and specific interest groups (e.g., women)	Construction employs a minimum percentage of women and local people. Minimum will be determined during preconstruction phase.	Construction contractor	PMB 416, PPMBs
		Train local workers before construction begins to increase relevant skills and minimize project delays.	Local workers provide service of equal quality to non-locals.	Construction Contractor	PMB 416, PPMBs
Fisheries and Biodiversity in the Song Be and Phuoc Hoa Reservoir	<b>Adverse Impact; Mitigable</b> The barrage at the head of Phuoc Hoa Reservoir will create a physical barrier for fish and invertebrates along the Song Be, thus reducing fisheries production and biodiversity upstream and downstream of the barrage.	Construct a fish-pass to help sustain species diversity both upstream and downstream of the barrage.	Fish-pass constructed according to design specifications	Construction contractor	Local design consultants, PMU

### 3. Operation Phase

Environmental Impacts		Mitigation Measures			
Impact Title	Impact Description	Mitigation Description	Mitigation Target	Implementation	Monitoring
Water Quality Changes in Lower Song Be	<b>Adverse Impact; Mitigable</b> Reduction of water flow in the lower Song Be in the dry season of dry years will affect aquatic habitat and fisheries, 6000 ha of riparian irrigation, 5400 ha of downstream irrigation, domestic water supply and water quality. Salinity intrusion may also result.	Control release of water to the Song Be – minimum recommended flow is 14 m <sup>3</sup> /s.	Adequate dry-season water quantity for existing agricultural, industrial, and domestic needs	Dau Tien Irrigation Management Company	DNRBO-EU
		Over the next 5 years, give priority to providing clean water to families located along the Song Be.	Families have access to clean water over next 5 years	Dau Tien Irrigation Management Company	DNRBO-EU

Environmental Impacts		Mitigation Measures			
Impact Title	Impact Description	Mitigation Description	Mitigation Target	Implementation	Monitoring
Acid Sulfate Soils	<b>Adverse Impact; Mitigable</b> 1250 ha of potentially acidic sulfate soils lie along the border of the Duc Hoa Irrigation Scheme. Farmers using water from the new canals to irrigate acidic soils may cause a leachate from those soils that would then reduce pH in receiving waters. This could reduce rice crop productivity and increase toxicity of aluminium to fish.	Work closely with local agencies during detailed design to (i) minimize increases of acidity in irrigation canals, and (ii) maximize irrigation benefits to local farmers. Encourage farmers to continue remediating acid soils using acid-tolerant rain-fed crops.	Ensure that pH in receiving waters does not drop below a level specified during preconstruction phase. Ensure that aluminum concentrations do not exceed a level specified during preconstruction phase.	Long An Irrigation Management Company	DNRBO-EU, Long An DARD, and DOSTE
Rural Water Supply for Duc Hoa District	<b>Significant Positive Impact</b> Duc Hoa District will have access to a new source of rural fresh water. <i>The positive impact can be maximized by employing the proposed measure:</i>	A pilot project using fresh water drawn from canals and using basic water treatment should be funded by the project to demonstrate this positive impact.	New fresh water access for citizens of Duc Hoa	Long An Irrigation Management Company	DNRBO-EU, Long An DARD and DOH
Fisheries and Biodiversity in the Song Be and Phuoc Hoa Reservoir	<b>Adverse Impact; Mitigable</b> The barrage at the head of Phuoc Hoa Reservoir will create a physical barrier for fish and invertebrates along the Song Be, thus reducing fisheries production and biodiversity upstream and downstream of the barrage.	Operate a fish-pass to help sustain species diversity both upstream and downstream of the barrage.	Negligible change in species diversity	Dau Tien Irrigation Management Company	DNRBO-EU, Binh Duong DOSTE, and DOFI
		Establish a fish conservation area within Phuoc Hoa Reservoir.	Increase in fish diversity and populations in Phuoc Hoa area	Dau Tien Irrigation Management Company	DNRBO-EU, Binh Duong DOSTE, and DOFI
		Establish fisheries association to manage fishing activities around the Reservoir.	Ecosystem -level management of fisheries in Phuoc Hoa area	DOFI	DNRBO-EU, Binh Duong DOSTE

ha = hectare; km = kilometer; m = meter.

CPO = Central Project Office; DARD = Department of Agriculture and Rural Development; DHIS = Duc Hoa Irrigation System; DOFI = Department of Fisheries; DOH = Department of Health; DOSTE = Department of Science, Technology and Environment; DPC = District People's Committee; DRC = District Resettlement Committee; DNRBO = Dong Nai River Basin; Organization; DNRBO-EU = Environmental Unit; HEC-2 = Hydraulic Engineering Company# 2; LGXM = Lo Go Xa Mat National Park; MARD = Ministry of Agriculture and Rural Development; MOI = Ministry of Industry; PMB 416 = Project Management Board 416; PMU = Project Management Unit; PPC = Provincial Peoples' Committee; PPMB = provincial project management board; PRC = Provincial Resettlement Committee; TBIS = Tan Bien Irrigation System; TOR = terms of reference.

**Table A1.2: Environment Management Plan Costs**

	Quantities								Unit Cost		Base Cost							
	Preconst		Costruction			Operation			Total	(\$)	2003	2004	2005	2006	2007	2008	2009	Total
	2003	2004	2005	2006	2007	2008	2009											
<b>I. Investment Costs</b>																		
<b>A. Environmental Effects Monitoring Program</b>																		
Subprogram 1a: Song Be River-ambient/benthos/floe	4	4	4	4	4	4	4	28	2,700	10,800	10,800	10,800	10,800	10,800	10,800	10,800	10,800	75,600
Subprogram 1b: Saigon, Dong Nai, VCD rivers-salinity	6	6	6	6	6	6	6	42	650	3,900	3,900	3,900	3,900	3,900	3,900	3,900	3,900	27,300
Subprogram 2: Domestic Water Supply	6	6	6	6	6	6	6	42	2,800	16,800	16,800	16,800	16,800	16,800	16,800	16,800	16,800	117,600
Subprogram 3: Acidity Monitoring-Duc Hoa	5	5	5	5	5	5	5	35	1,950	9,750	9,750	9,750	9,750	9,750	9,750	9,750	9,750	68,250
Subprogram 4: Irrigation Canal Monitoring	4	4	4	4	4	4	4	28	2,850	11,400	11,400	11,400	11,400	11,400	11,400	11,400	11,400	79,800
Subprogram 5: Biological/Hydrological Monitoring <sup>a</sup>																		
Subtotal Environmental Effects Monitoring										52,650	52,650	52,650	52,650	52,650	52,650	52,650	52,650	368,550
<b>B. Project Performance Monitoring Program</b>	1	1	1	1	1	1	1	7	7,400	7,400	7,400	7,400	7,400	7,400	7,400	7,400	7,400	51,800
<b>C. Environmental Mitigation Measures</b>																		
<b>1. Social and Environmental Safeguards - Tan Bien Irrigation Area</b>																		
Component 1: Capacity Building	3	4	3	2	2	1	-	15	11,500	34,500	46,000	34,500	23,000	23,000	11,500		0	172,500
Component 2: Commune Development Plans	5	2	2	2	2	2	2	17	5,000	25,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	85,000
Component 3: Multi-Stakeholder Res Man	1	1	1	1	1	1	1	7	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	140,000
Component 4: Biologival, Biophysical, Social Surveys	5	2	1	1	1	1	1	12	8,800	44,000	17,600	8,800	8,800	8,800	8,800	8,800	8,800	105,600
Subtotal Social and Environmental Safeguards Tan Bien Irrigation										123,500	93,600	73,300	61,800	61,800	50,300	38,800	503,100	
<b>2. Watershed Protection - Phuoc Hoa <sup>b</sup></b>																		
Reforestration	200	200	200	200	200	-	-	1,000	320	64,000	64,000	64,000	64,000	64,000		0	0	320,000
Management and Supervision	1	1	1	1	1	-	-	5	6,000	6,000	6,000	6,000	6,000	6,000		0	0	30,000
Fish Passage		1	1	1				1	57,000		57,000	57,000	57,000		0	0	0	171,000
Subtotal Watershed Protection-Phuoc Hoa										70,000	127,000	127,000	127,000	70,000		0	0	521,000
<b>3. Site Clearance/ <sup>c</sup></b>																		
Detection and Survey	35	35	35	35	35	-	-	175	1,145	40,075	40,075	40,075	40,075	40,075		0	0	200,375
Rehabilitation	1	1	1	1	1	-	-	5	20,000	20,000	20,000	20,000	20,000	20,000		0	0	100,000
Subtotal Site Clearance										60,075	60,075	60,075	60,075	60,075		0	0	300,375
<b>4. Miscellaneous Mitigation Measures</b>																		
	1	1	1	1	1	1	1	7	18,500	18,500	18,500	18,500	18,500	18,500	18,500	18,500	18,500	129,500
Subtotal Environment Mitigation Measures										272,075	299,175	278,875	267,375	210,375	68,800	57,300	1,453,975	
<b>TOTAL COST OF EMP</b>											332,125	359,225	338,925	327,425	270,425	128,850	117,350	1,874,325

<sup>a</sup> EMP: Subprogram 5 costs are identified under TBIS Safeguards, Component 4 (biological, biophysical, and social surveys)

<sup>b</sup> Reforestration and management of the areas surrounding Phuoc Hoa reservoir.

<sup>c</sup> Clearance of ordinance and chemicals along canal routes

## SUMMARY RESETTLEMENT PLAN AND FRAMEWORK

1. **Scope of Land Acquisition and Resettlement.** The Project will require land acquisition for reservoir and access roads, the transfer canal, main canals, primary and secondary canals (from the main canals to the irrigated areas), and on-farm canals (from secondary canals to farmers' plots). Land acquisition requirements for the reservoir have been minimized through careful selection of project alternatives. Land acquisition will be further minimized through participatory design of canal alignments. Table A2.1 presents the breakdown of land acquisition impacts estimated for each subproject. A total of 2,225 households (11,138 persons) will be affected by land acquisition. The total land to be permanently acquired will be 3,153 hectares (ha). Some land will be required also for temporary use during the construction period. It is estimated that 1,009 households will be severely affected by the permanent loss of agricultural land, and 453 households will lose their houses and will need to be relocated. Only 21 shops or small businesses attached to houses will need to be relocated.

**Table A2.1: Impacts on Land and Structures**

Physical Component	Impact on Household (HH) Structures					
	Severe Impact			Marginal Impact	Total Impact	
	Resid HH	Bus HH	Agric HH	HH	HH	Persons
Phuoc Hoa Barrage and Reservoir	109	9	435	257	810	4,083
Access Road	25		31	0	56	275
Transfer Canal	131	12	114	40	286	1,349
Binh Long Irrigation System	0	0	73	109	182	892
Tan Bien Irrigation System	110	0	173	150	433	2,296
Duc Hoa Irrigation System	78	0	183	197	458	2,243
<b>Total</b>	<b>453</b>	<b>21</b>	<b>1,009</b>	<b>753</b>	<b>2,225</b>	<b>11,138</b>
	Loss of Land (ha)					
	Resid	Agric	Ponds	Forest	Unused	Total
Phuoc Hoa Barrage and Reservoir	2	863	12	8	293	1,178
Access Road	0	37	0	0	0	37
Transfer Canal	8	392	1	0	3	404
Binh Long Irrigation System	4	256	0	0	0	260
Tan Bien Irrigation System	4	616	0	0	0	620
Duc Hoa Irrigation System	11	643	0	0	0	654
<b>Total</b>	<b>29</b>	<b>2,807</b>	<b>13</b>	<b>8</b>	<b>296</b>	<b>3,153</b>

HH = household.

2. **Scope of the Resettlement Plan and Framework.** As part of project preparation, a social analysis was carried out in the project areas. A census and inventory of lost assets was carried out for the barrage, reservoir, and transfer and main canals; and estimates were made of land acquisition impacts of the primary and secondary canals of the three irrigation subprojects. A household socioeconomic survey was conducted on a sample of 25% of reservoir affected persons, and group interviews were conducted in 8 of the total of 34 project communes. Based on the information collected, a resettlement plan (RP) has been prepared for the Project in compliance with the Asian Development Bank's *Policy on Involuntary Resettlement (1995)* and *Handbook on Resettlement: A Guide to Good Practice*. The resettlement plan will be updated following detailed design during project implementation.

3. A census and inventory of losses for the primary and secondary canals of the subproject irrigation systems will be dependent upon community participation to select the alignment and, as such, can be done only during project implementation. To guide preparation of subproject RPs for the Binh Long, Tan Bien, and Duc Hoa primary and secondary canals, therefore, a resettlement framework has been prepared, also in compliance with ADB's Policy on Involuntary Resettlement. For the development of tertiary and on-farm systems, the Project will facilitate a system of equitable contribution of land and labor by farmers within water user groups. The farmers will be responsible for contributing land and labor to build small canals over their land, for which an RP is not required.

4. **Policy Framework and Entitlements.** The policy framework and entitlements for the Project have built upon Vietnamese laws, principally the 1993 Land Law, Decree 22/CP (1998), Decree 87/CP (1994), and on ADB's Policy on Involuntary Resettlement. With the promulgation of Decree 22/CP (24 April 1998), the Government issued legislation regarding resettlement, which approaches the principles of ADB's Policy. However, provisions and principles adopted in the RP for the Project supersede the provisions of relevant decrees currently in force in Viet Nam wherever a gap exists.

5. **Project Principles.** The following basic principles have been adopted for the Project:

- (i) The principal objective of ADB's Policy and the RP and resettlement framework is to ensure that populations affected by the Project should be at least as well off, if not better off than they would have been without the Project. Affected populations should be able to maintain and preferably improve their standard of living and quality of life.
- (ii) The populations affected by the Project are defined as those who may stand to lose, as a consequence of the Project, all or part of physical and nonphysical assets, including homes, homesteads, productive lands, commercial properties, tenancy, income-earning opportunities, social and cultural activities and relationships, and other losses that may be identified during the process of resettlement planning.
- (iii) Involuntary resettlement will be minimized by identifying possible alternative project designs, and appropriate social, economic, operational, and engineering solutions that have the least impact on populations in the project area.
- (iv) The cut-off date for compensation eligibility for physical assets affected by the barrage, reservoir, and transfer and main canals is the date the census for those components was completed (31 August 2000).

- (v) A census and detailed measurement survey and baseline socioeconomic survey will be carried out for all irrigation subprojects after detailed design of each and in preparation of an RP for each.
- (vi) All project-affected people will be entitled to be compensated for their lost assets, incomes, and businesses at full replacement cost and provided with rehabilitation measures sufficient to assist them to improve or at least restore their preproject living standards, income levels and productive capacity.
- (vii) All affected populations will be equally eligible for compensation and rehabilitation assistance, irrespective of tenure status, social or economic standing, and any such factors that may discriminate against achieving the objectives outlined above.
- (viii) In the case of population relocation, efforts will be made for the existing social and cultural institutions of the people being resettled and the host community to be maintained to the extent possible.
- (ix) Preparation of RPs (as part of subproject preparation) and their implementation are to be carried out with the full participation of affected people.
- (x) Adequate budgetary support will be fully committed and be made available to cover the costs of land acquisition and resettlement and rehabilitation within the agreed upon implementation period.
- (xi) ADB will not approve of any civil works contract for any subproject to be financed from the loan proceeds unless the Government has completed satisfactorily and in accordance with the approved RP for that subproject compensation payment and relocation to new sites, and has ensured rehabilitation assistance is in place prior to obtaining possession and rights to the land. The exception is the Phuoc Hoa barrage where construction of the barrage may commence (in an off-river location) before clearing the upstream inundation. This area will be cleared before permitting the contractor to close the natural flow of the river.
- (xii) Detailed RPs for implementation will be translated into the local language and placed in project and commune offices for the reference of affected people as well as any interested groups.
- (xiii) Appropriate reporting, monitoring and evaluation mechanisms will be identified and set in place as part of the resettlement management system. Monitoring and evaluation of the land acquisition process and the final outcome will be conducted independent of the Executing Agency.

6. **Entitlement Matrix.** The project entitlements were designed to cover compensation, resettlement and rehabilitation for lost assets and restore or enhance the livelihoods of all categories (directly and indirectly affected, title holders and nontitle holders) of affected people. The entitlement matrix for the Project (Table A2.2) summarizes the main types of losses and the support entitled for each type of loss.

Table A2.2: Entitlement Matrix

ITEM	TYPE OF LOSS	APPLICATION	DEFINITION OF ENTITLED PERSON	COMPENSATION POLICY	IMPLEMENTATION ISSUES
1	Temporary loss of arable land	Loss of use of the land for a period less than 1 year	User with permanent right (legal and legalizable)	<ul style="list-style-type: none"> <li>(i) no compensation for land if returned to original user,</li> <li>(ii) cash compensation for loss of crops and trees at market prices,</li> <li>(iii) compensation for loss of net income from subsequent crops that cannot be planted for the duration of the lease, and</li> <li>(iv) Restoration of land to its previous or better quality</li> </ul>	There should be measures to improve land quality in cases of land being adversely affected or acidified.
	Permanent loss of arable land	<p>Less than 10%<sup>a</sup> of total affected assets lost due to acquisition of arable land</p> <p>Marginal impact on household income and living standards</p>	Legal user with permanent rights to use the affected land, and temporary user who will be legalized before compensation as a permanent user	<p>APs will be entitled to</p> <ul style="list-style-type: none"> <li>(i) cash compensation for acquired land at 100% of replacement cost, and</li> <li>(ii) cash compensation for crops and trees at market price.</li> </ul>	<p>Households without LURC but registered at the commune level are considered as fully legal users.</p> <p>If the viability of the remaining land is less than the minimum viable economic unit, then the entire piece of land would be acquired and the AP would fall under the next category.</p>
		<p>More than 10% of total affected assets lost due to acquisition of arable land for the inundated area and the right of way (ROW) of the canal network</p> <p>The approach taken is restoration of income loss.</p> <p>Severe impact on household income and living standards</p>	Legal user with permanent rights to use the affected land	<p>APs will be entitled to cash compensation for crops and trees at market price, in addition to one of the following options:</p> <ul style="list-style-type: none"> <li>(i) full title to land of equal area and productivity acceptable to APs, in the same or surrounding communes; or</li> <li>(ii) cash compensation for lost land at 100% replacement cost, at the informed request of APs and a rehabilitation package of allowances and income restoration under the Social Support Program.</li> </ul>	<p>Priority will be given to land compensation of equal area and productivity within the same or surrounding communes.</p> <p>Cash in lieu of land will be offered only as a last resort or at the informed request of the AP.</p>

<sup>a</sup>ADB has revised its criteria for determining significant impact as when APs lose more than 10% of their productive assets (income generating).

ITEM	TYPE OF LOSS	APPLICATION	DEFINITION OF ENTITLED PERSON	COMPENSATION POLICY	IMPLEMENTATION ISSUES
		Illegal user	Illegal user of land without registration	(i) Assistance for acquired land corresponding to the investment in the land, and (ii) cash compensation for crops and trees at market price	
2	Loss of residential land (no structures affected)	Land acquired without structures built therein	Legal user of the affected land with permanent rights to use land	APs will be entitled to cash compensation for land at 100% of replacement cost of the land acquired.	
	Loss of residential land (with structures affected)	AP has remaining legal residential land beyond the inundated area or beyond the ROW of the canal network of at least equal to 100 m <sup>2</sup> .	Legal user of the affected land with permanent use rights	APs will be entitled to the following: (i) cash compensation for land acquired at 100% of replacement cost, and (ii) reorganization on remaining legal land behind the inundated area or beyond the ROW of the canal network and issued with LURC in due time.	
	Loss of residential land (with structures affected)	AP has remaining permanently legal or legalizable residential land less than 100 m <sup>2</sup> in rural area.	Legal user of the affected land with permanent use rights	<p>APs will be entitled to one of the following options:</p> <p>(i) Group Relocation: if there are sufficient numbers of APs warranting development of a group relocation site, full title to a plot on a fully serviced resettlement site (access and internal roads, water, electricity, drainage, access to services such as school and health center); or</p> <p>(ii) Individual Relocation: full title to a site equivalent to their area of legal land lost, and sufficient cash at replacement cost to develop their own infrastructure and services (access road, water, electricity if available, landfill); or</p> <p>(iii) Self Relocation: cash in lieu of land at replacement cost, and APs will make their own arrangements for relocation.</p> <p>Relocating APs will be entitled to a rehabilitation package (subsistence and transport allowances to assist during the transition period).</p> <p>APs will be entitled to compensation or assistance for their structures according to the legal status of the structures.</p>	<p>APs are entitled to land for land, cash for land, or a combination of the two, at replacement cost, equivalent to the area of legal land lost.</p> <p>APs who are compensated with land of larger assessed value than the former land will not have to pay the difference.</p> <p>APs resettling on their own will not have to pay conversion fees of agricultural land to residential land.</p> <p>Particular attention will be given to preferences of ethnic minority AP.</p>

ITEM	TYPE OF LOSS	APPLICATION	DEFINITION OF ENTITLED PERSON	COMPENSATION POLICY	IMPLEMENTATION ISSUES
3	Structures	Structures located in the inundated area or within the ROW of the canal network or other project components	Legal owner of the affected structure	APs with legal right to build the affected structure will be entitled to compensation at 100% of replacement cost of the affected structure in material, cash, or a combination of the two. No deduction will be made for depreciation or salvageable materials.	In rural areas, right to use land implies right to build a structure. No building permit is required.
4	Secondary APs	APs affected by land acquisition for borrow areas or individual relocation	Legal user with permanent or temporary use rights who are legalizable	Because all secondary APs are affected through loss of arable land, the provision of Section 1 (Loss of arable land) will apply to these secondary APs.	
5	Loss of business income for relocated shopkeepers	Loss of business income for relocated shopkeepers	Relocating owner of the affected shop	Relocating APs will be entitled to (i) compensation for structure at full replacement cost in material, cash or a combination of the two; no deduction will be made for depreciation or salvageable materials; (ii) a special income transition allowance of D1,400,000 to facilitate restoration of income; (iii) transport allowance; and (iv) priority to relocate to a place with equal or better commercial potential.	At the time of compensation, allowances will be adjusted to account for inflation.  APs will be given priority for relocation along highway, communal roads, and canals near bridges or footbridges to maximize their benefit from business opportunities.
6	Allowances	Materials transport allowance	Relocating APs	All relocating APs are entitled to assistance from district resettlement committees (DRCs) to transport household effects and salvaged and new building materials to relocation sites. If requested by APs, this assistance will be provided in the form of cash (D420,000).	At the time of compensation, allowances will be adjusted to account for inflation.
		Transition subsistence allowance	Relocating APs and severely affected farmer APs	All relocating APs and severely affected farmers are entitled to between D3,000,000 and D5,000,000 subsistence allowance during transition period.	
		Income transition allowance for shopkeepers relocating	APs who have businesses and are to be relocated	APs are entitled to D1,400,000 cash payment of an income transition allowance to provide for loss of income during the transition period.	
		Incentive allowance for households that move on time.	Relocating AP	Households that move according to the planned schedule are entitled to a special allowance D2,000,000–D3,000,000.	
		Allowance for persons who receive social allowance from the state	Beneficiary of social allowance who relocate	Beneficiaries of social allowance who are relocated are entitled to a special allowance of D5,000,000.	

ITEM	TYPE OF LOSS	APPLICATION	DEFINITION OF ENTITLED PERSON	COMPENSATION POLICY	IMPLEMENTATION ISSUES
7	Loss of standing crops	Crops located in the less than 20-year flood level of the reservoir area or within the ROW of the canal network or affected by other project component	Households that cultivate the land	APs are entitled to compensation in cash at market value.	APs will be given notice several months in advance regarding evacuation. Crops grown after issuance of the deadline will not be compensated.  In the 20-50 year flood level of the reservoir area, APs will be authorized to cultivate the land acquired by the project between the normal and the top water level but will not be entitled to any compensation due to eventual flooding.
8	Loss of trees	Trees located in the 20-year flood level of the reservoir area, within the ROW of the canal network or affected by other project component	Households that occupy the land where trees are located irrespective of land tenure status	APs are entitled to compensation in cash at market value on the basis of type, age, and productive value.	
9	Loss of graves	Graves located in the affected areas	Households that own the graves	APs are entitled to cash compensation for all costs of excavation, movement, and reburial.	
10	Loss of community assets	Community buildings, structures, community forest/grazing land/irrigation systems affected by temporary or permanent land acquisition or spoil disposal	Village, ward, government unit	(i) Restoration of affected community buildings and structures to at least previous condition, or (ii) replacement in areas identified in consultation with affected communities and relevant authorities Note: If income loss is expected (e.g. irrigation, community forest, community grazing land), the village is entitled to compensation for the total production loss (over 3 years); this compensation should be used collectively for income restoration measures and/or new infrastructure.	
11	Loss of income of employees or hired laborers	Employees of enterprises affected or farm laborers affected	Temporarily affected (while business is reorganizing) within remaining land	(i) Cash compensation for lost salary/wages for each month they cannot work, or (ii) assistance in securing new employment, including relevant skills training expenses if required	

ITEM	TYPE OF LOSS	APPLICATION	DEFINITION OF ENTITLED PERSON	COMPENSATION POLICY	IMPLEMENTATION ISSUES
			Permanent job loss due to relocation of business or loss of agricultural land	(iii) Cash compensation for 6 months salary/wages; or (iv) cash compensation for remaining contract period, whichever is higher; and (v) severance pay for employees; and (vi) rehabilitation under the Social Support Program	
12	Loss of income from upstream fishing	Income from fisherfolk upstream of the barrage may be affected by reduced fish in the river after barrage construction and river diversion.	Households that fish in the Song Be upstream from the barrage and whose fishing supply and therefore household income is potentially severely reduced (i.e., more than 10% of household income lost)	APs will be assisted to benefit from aquaculture in the reservoir. Any necessary training will be provided under the Project. During the transition period until the reservoir aquaculture can be developed, income rehabilitation assistance will be provided.	The need for a mitigation measure will be identified during detailed design, after which APs will be identified and surveyed, and mitigation and enhancement measures designed in consultation with APs. Priority will be given to replacing with alternate fishing opportunities.
13	Temporary impact during construction	Damage by contractors to private or public structures or land	Owner or person with use rights	(i) The contractor will be required to pay compensation immediately to affected families, groups, communities, or government agencies. (ii) Damaged property will be restored immediately to its former condition.	
14	Income restoration/ Social Support Program for severely affected and vulnerable groups	APs lose more than 10% of their productive assets (agricultural or forestry land or business) due to land acquisition for the reservoir or feeder canal and vulnerable APs.	(i) APs losing more than 10% of agriculture of forestry land, or (ii) other vulnerable APs (poor, landless, and/or female-headed households etc.).	APs entitled to income restoration assistance from the Social Support Program: agricultural/aquacultural extension assistance to intensify use of existing land, skills training for a new skill (and subsistence allowance for the trainee during the duration of the training program), access to existing credit programs and credit management, literacy training	A participatory approach will be used to design the Social Support Program and target beneficiaries during project implementation.

7. **Ethnic Minorities and Disadvantaged Groups.** The social analysis shows that 2% of the population in the project area are ethnic minorities, and although there are some pockets of concentration, they are generally integrated into the larger population. Special attention will be given to identifying and addressing the special needs of this group plus other disadvantaged groups such as the landless, poor, women-headed households, the disabled, and war veterans. They will be assisted through the project's Social Support Program under Component A2.

8. **Resettlement Strategy.** Households that have to relocate will participate in identifying and selecting options for government assistance to move to either group or individual relocation sites or to receive cash compensation and make their own arrangements for relocation.

9. **Income Restoration.** Agricultural households that are severely affected through loss of more than 10% of their productive assets will be assisted to purchase replacement land or increase productivity on remaining land, or learn new income generating skills through the Social Support Program. Businesses will be helped to relocate to viable new sites.

10. **Participatory Process of Resettlement Planning and Implementation and Grievance Mechanism.** There was an extensive consultative process during the social analysis and resettlement planning period of the feasibility study. Resettlement planning and RP preparation and implementation during project implementation will follow the Project's participatory approach using facilitators to mobilize the affected and beneficiary communities to participate in alignment selection and design, inventory of losses and socioeconomic survey, validation of compensation rates and entitlements, delivery of entitlements, design and delivery of the Social Support Program to disadvantaged and severely affected households, monitoring of impacts and benefits, and design and participation in a grievance mechanism.

11. **Institutional Arrangements.** Affected people will be organized by the implementing agencies (departments of agriculture and rural development), under guidance of the consultants, to participate in alignment selection and design, inventory of losses, resettlement planning, implementation, and monitoring. The intention is to make resettlement part of the participatory approach that is integral to the success of the Project. This will be closely linked to the social mobilization activities under Component A2.

12. **Monitoring of RP Implementation and Impacts.** The implementing agencies will be responsible for internal monitoring of the RPs and the impacts. A nongovernment organization or suitably qualified social science institute will be contracted for external monitoring and evaluation of the resettlement process and impacts. Findings will be regularly fed back into management decisions.

13. **Cost Estimates.** The estimated base cost for resettlement planning, RP preparation, implementation, management and monitoring for the RP of the barrage, reservoir area, and main and transfer canals is \$10.7 million. The estimated base cost of the three irrigation subprojects is \$7.5 million. Hence, the total estimated resettlement base costs is \$18.2 million.

14. **Implementation Schedule.** All resettlement activities will be coordinated with the civil works schedule. ADB will not approve of any civil works contract for any subproject to be financed from the loan proceeds unless the Government has completed satisfactorily and in accordance with the approved RP for that subproject compensation payment and relocation to new sites, and ensured that rehabilitation assistance is in place prior to obtaining possession and rights to the land.

**PEOPLE'S COMMITTEE STATEMENT  
OF BUFFER ZONE DEVELOPMENT PRIORITIES OF LO GO XA MAT NATIONAL PARK**

Tay Ninh People's Committee

Socialist Republic of Vietnam

No.: 457 /UB

Tay Ninh, 10 December 2002

**Re.: Land use plan of Tan Bien Irrigation Area Phuoc Hoa Irrigation Project**

**To: Management Board of Irrigation Project 416 (PMB 416)**

To serve preparing design documents of Tan Bien irrigation area and appraisal of Phuoc Hoa Irrigation Project, Tay Ninh People's Committee has the following comments on the land use plan of Tan Bien irrigation area:

1. The natural land area of the irrigation area includes 4 communes: Hoa Hiep: 8,854 ha; Thanh Tay: 2,610 ha; Tan Binh: 2,496 ha; and Phuoc Vinh: 7, 423 ha. Total: 21, 383 ha.

On the above area there are 3 communes – Hoa Hiep, Thanh Tay and Tan Binh belong to the buffer zone of Logo-Xamat National Park Project. The land use plan of the buffer zone as well as of the irrigation area of Phuoc Hoa Project mainly is for agricultural development, for each commune as follow: Hoa Hiep: 5,909 ha; Thanh Tay: 2,506 ha; Tan Binh: 1,715 ha; and Phuoc Vinh: 6,048 ha. Total: 16,178 ha.

With the land area of 16,178 ha planned for agricultural production, an irrigation area could be designed to ensure a net command area of over 13,000.

2. On arranging crops in the net command area:

In the future, with Phuoc Hoa irrigation project, the project area will be arranged for vegetables, short-term industrial crops that need irrigation such as: peanut, corn, tobacco, sugar cane, etc. those areas that have better drainage could be shifted to plant fruit trees which are of higher economic value. Besides, there are some bean, sesame crops, etc.

The above land use plan is not in conflict with the project developing the buffer zone of the Logo-Xamat national park.

Sincerely,

For Chairman of Tay Ninh People's Committee  
Vice Chairman,

Nguyen Van Chau (signed and sealed)

cc: Tay Ninh DARD  
Irrigation Construction Consulting Co.